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## Papers

Cercosporin production by the peanut leaf spotting fungi, *Cercospora arachidicola* and *Cercosporidium personatum*. M. K. Abo-El-Dahab, E. H. Wasfy, M. A. El-Goorani, H. M. El-Kasheir, E. E. Wagih and H. A. Melouk. Department of Plant Pathology, College of Agriculture, University of Alexandria, Alexandria, Egypt and USDA-ARS, Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74076.

### ABSTRACT

The in vitro production of cercosporin by three pathogenic isolates of each of *Cercospora arachidicola* and *Cercosporidium personatum* was tested in crude acetone cultural extracts by thin layer chromatography. Only one isolate of *C. arachidicola* and one of *C. personatum* produced the toxin. The amount of cercosporin produced by *C. personatum* was much greater than that produced by the *C. arachidicola* isolate. Physical characterization of the isolated red bands has shown that the three bands are very similar to those of Fajola (Physiological Plant Pathology 13:157-164) cercosporin with a characteristic absorption peak at 470 nm. The red toxin was soluble in acetone, fairly soluble in diethyl ether and ethyl alcohol and insoluble in water and petroleum ether. Since one of the three isolates of *C. arachidicola* and two isolates of *C. personatum* do not produce detectable amounts of cercosporin, the involvement of cercosporin in pathogenesis is not clear in the peanut leaf spot disease syndrome.

### INTRODUCTION

The involvement of microbial toxins in the pathogenesis of many plant diseases has been repeatedly indicated by several investigators. However, little work has been carried out on the production and characterization of toxins produced by *Cercospora* spp. and related genera. Frandsen (1955), Schlosser (1962) and Schlosser (1971) were the first to report on the production of a toxin from *Cercospora beticola*, the causal agent of leaf spot of sugar beet and called it *Cercospora beticola* toxin (CBT).

Recently, Fajola (1978) isolated two entirely different compounds from several other *Cercospora* species by thin layer chromatography using ethyl acetate: methanol (4:1) as developing solvents. These two compounds banded as a yellow band ( $R_f=0.73$ ) and a red band ( $R_f=0.68$ ) which was called cercosporin. The newly discovered toxin (Cercosporin) was found to be produced by 12 isolates, out of 20 isolates of 17 *Cercospora* species tested. In contrast, eight other isolates of eight different species produced no detectable cercosporin. According to the conidiospore morphology (Sober, 1968; Deighton, 1967, 1973; Fajola, 1976 a,b), it was found that the 12 cercosporin produced isolates were true *Cercospora* sp. whereas the 8 other isolates were not and might belong to other related genera such as *Cercosporidium* and *Cercospora* (Fajola, 1978).

The objective of this study was to compare the production of Cercosporin by three pathogenic isolates each of Cercospora arachidicola (the early leaf spot pathogen of peanut) and Cercosporidium personatum (the late leaf spot pathogen of peanut).

#### MATERIALS AND METHODS

##### Growth conditions:

Two sets each of three pathogenic isolates of Cercospora arachidicola or Cercosporidium personatum were grown in petri dishes on Peanut seed extract-oatmeal agar medium (Abo-El-Dahab et al., 1982) and kept in a growth cabinet under continuous illumination emitted from fluorescent tubes (1000 lux).

##### Extraction of the toxins:

The toxins were extracted by grinding 15 day old cultures in acetone. Pieces of gel and mycelium were pelleted by centrifugation at 2250 g at 26±2°C. The supernatants were saved and pellets were re-extracted by the same solvent and subjected to the same centrifugation. The resultant supernatants were added to the corresponding supernatants from the first extraction step. Acetone extracts were concentrated at 40°C. The extracts were fractionated by thin layer chromatography using silica gel plates (20 cm x 20 x 0.25 mm.) and ethyl acetate: methanol (4:1, v/v) as a developing solvent system (Schlosser, 1971).

##### Isolation and Physical characterization of the toxin:

About 100 ml of the toxin concentrate were spotted on thin layer silica gel plates, and developed with ethylacetate and methanol mixture. Following chromatography, the red band of the cercosporin toxin was isolated and dissolved in acetone. The acetone solution of the red band was spectrophotometrically scanned over to determine the absorption maxima.

#### RESULTS

##### Pigmentation of culture medium:

The results obtained from visual inspection of 15-day old cultures, grown on slant agar, for the production of the red colored cercosporin are summarized in Table 1.

Table 1: The in vitro production of cercosporin by isolates of Cercospora arachidicola, and Cercosporidium personatum

Fungus/isolate No.	Production of the red toxin
<u>Cercospora arachidicola</u>	
7	+
10	+
11	-
<u>Cercosporidium personatum</u>	
1	-
2	+++
4	-

+ = The red toxin was produced as evidenced from the color of the medium; the number of pluses indicates the degree of color.

+ = Red color was doubtful.

- = No red color was observed.

Results indicate that not all isolates produced colored compound in the growing medium. Only two isolates of C. arachidicola and one of C. personatum, colorized the medium with varying degrees. The latter isolate (C. personatum) was more active than the former in producing the red pigment. One isolate of C. arachidicola (isolate #7) was inconsistent in producing red compounds in the growing medium.

#### Separation of Cercosporin:

Table 2 shows that the only Cercospora isolate capable of producing the red toxin (Cercosporin) is isolate No. 10. In this isolate cercosporin was associated with the yellow compound. Isolate No. 7 of the same fungus produced the yellow compound only. Surprisingly enough isolate No. 11 of the fungus produced neither the yellow nor the red (Cercosporin) band. All three isolates of C. arachidicola were pathogenic on peanut cv. Tamnut 74.

In contrast, two isolates (No. 2 and 4) of Cercosporidium personatum produced the red toxin but with different degrees. Isolate No. 2 produced abundance of the toxin which was accompanied by the yellow compound. It is worthwhile to mention here that isolate No. 2 of Cercosporidium personatum produced the largest quantity of cercosporin as compared with the other isolates of C. arachidicola and C. personatum. Comparatively, isolate No. 4 produced the red toxin in much smaller quantities with no detectable amount of the yellow compound. Dissimilarly, isolate No. 1 produced the yellow compound but no cercosporin was detected.



#### Physical characterization of the red toxin:

The red toxin produced by isolate No. 10 of C. arachidicola and isolates No. 2 and 4 of C. personatum was isolated after being separated by thin layer chromatography using ethyl acetate: methanol (4:1; v/v) as a developing solvent. The red band obtained from each of the three different isolates was eluted in acetone and the resultant purified toxin was scanned for absorbancy in the visible light region. The three toxins were identical in that they showed a characteristic absorption peak at 470 nm.

The red toxin was soluble in acetone, fairly soluble in diethyl ether and ethyl alcohol and insoluble in water and petroleum ether.

Table 2: Visible bands observed on thin layer chromatograms of crude acetone extracts of Cercospora arachidicola, and Cercosporidium personatum

Band observed	Isolate No.	<u>Cercospora arachidicola</u>			<u>Cercosporidium personatum</u>		
		7	10	11	1	2	4
Yellow band Rf.		0.86	0.86	—	0.88	0.88	—
Red band (cercosporin) Rf.		—	0.81 <sup>a</sup>		—	0.84 <sup>a</sup>	0.82

<sup>a</sup>Cercosporin is produced in large quantity.

#### DISCUSSION

Thin layer chromatography of crude acetone extracts of six pathogenic isolates of Cercospora arachidicola and Cercosporidium personatum revealed the presence of at least two compounds. The two compounds appeared as a yellow band ( $R_f = 0.87 \pm 0.01$ ) and a red band ( $R_f = 0.83 \pm 0.01$ ). The  $R_f$  values of the two bands are slightly different from those of Fajola's. This may suggest that the two bands isolated in the present study are similar to those reported by Fajola and the discrepancy in the  $R_f$  values could be due to different experimental conditions and/or to the use of different chemical patches. The red band isolated in this study seems to be identical to the cercosporin toxin isolated by Fajola, as both compounds showed maximum absorption at 470 nm and were insoluble in water and Petroleum ether, fairly soluble in diethyl ether and ethyl alcohol and soluble in acetone. The ability of some isolates (e.g. isolate No. 7 of C. arachidicola and isolate No. 1 of C. personatum) to produce only a single (yellow) band with  $R_f$  value of  $0.87 \pm 0.01$ , may resemble the situation of other investigators who studied CBT

(Frandsen, 1955, Schlosser, 1962, 1962, 1971). Although there is little difference between the Rf value of the yellow band of our study (Rf = 0.87) and that reported for CBT (Rf = 0.82), the two compounds could be similar if not identical.

In the study of Fajola (1978) it was found that out of 20 isolates of 17 species of Cercospora obtained from 16 different hosts, only 12 isolates were able to produce the red cercosporin toxin. He found that the 12 cercosporin-producing isolates belonged to the genus Cercospora as their conidia were acircular with a dark hilum scar (Sober, 1968; Deighton, 1967, 1973; Fajola, 1978a, 1978b). In contrast the eight other isolates were not true Cercospora. He suggested that the eight-isolates might belong to other related genera such as Cercosporidium or Cercosporella.

The three isolates (No. 1, 2 and 4) of Cercosporidium used in the present investigation are not true Cercospora (Abo-El-Dahab et al., 1982) based on the criteria previously outlined by Sober (1968) and Deighton (1967, 1973). However, two of these three isolates (No. 2 and 4) were able, though with different degrees, to produce the red toxin (Cercosporin). The amount of cercosporin produced by isolate No. 2 of Cercosporidium was much greater than that produced by isolate No. 4 or even isolate No. 10 of Cercospora.

Since some isolates (No. 1 and 4) of C. personatum (Table 1) did not change the color of medium but gave a cercosporin band following TLC (Table 2), visual inspection of culture media for the production of the toxin cannot be relied on as a sole evidence for the ability of a certain isolate to produce cercosporin.

The inability of some isolates of C. arachidicola (isolates No. 7 and 11) and C. personatum (isolate No. 1) to produce detectable amounts of cercosporin in spite of their virulence on peanut cv. Tamnut 74 rules out the involvement of Cercosporin in pathogenesis as was previously suggested by Fajola (1978).

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AN AUDIBLE SCARECROW FOR PROTECTING HARVESTED PEANUT PLOTS<sup>1/</sup>  
D. J. BANKS<sup>2/</sup>

ABSTRACT

A need for protecting the pods of harvested peanut vines against the ravages of crows in research plots led to the construction of a noise-making device that is effective in repelling birds. The device consists of an automobile tape player and a 12-volt battery mounted in a water-proof box to which external horn speakers are mounted. The projected sounds are home-recorded from selected sound-effect recordings. This device has potential for use in various crops, orchards, and livestock pens where birds and other predators present problems.

Key Words: Birds, Blackbirds, Bluejays, Crows, Exploders, Grackles, Grain Sorghum, Peanuts, Pecans, Sound-effects, Sparrows, Tape Player.

Harvested peanut plants are attractive to crows because of the ease with which a delicious feast can be obtained. Mott et al. (6) discussed the problem of bird damage to peanuts on commercial peanut fields in south-central Oklahoma. They suggested alleviating the damage by employing methods involving cultural practices (early harvest), gas-operated exploders, shooting, scarecrows, and chemical baiting. All of these methods may be somewhat effective on commercial fields, but small plots of peanuts pose some special problems. Research plots are particularly sensitive to these pests. Even small losses greatly influence yield projections, making yield data unreliable. Not only are the nuts consumed or damaged by these pests, but also the vines are often scattered, causing mixing of the windrowed plots.

Conventional scarecrows and even commercial exploders (LP guns) quickly lose their effectiveness against crows and certain other birds. No doubt the stationary position of the scarecrows and the repetitiveness of the gun blast simulators, which cause no physical injury, lead the crows to conclude that the devices are harmless.

I conceived the idea that a source of highly variable noises might fool the crows for longer periods, especially if the sounds were highly alarming to their senses. A unit that is effective against crows in Oklahoma is described here.

<sup>1/</sup> Cooperative investigations of Agricultural Research Service, USDA, and Oklahoma Agricultural Experiment Station, Oklahoma State University, Stillwater, OK 74078. Journal Article #3844.

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## DESIGN AND CONSTRUCTION

The unit consists essentially of an automobile tape player, two weatherproof loud speakers, a rechargeable 12-volt wet-cell battery with a box, and a weatherproof box for housing the 8-track tape player. Earlier versions consisted of a single box (ventilated) to house both the battery and the tape player, but a two-piece unit (Figure 1) whereby the battery and the tape player are in separate boxes is more satisfactory because it prevents potential damage to the player from the acid fumes of the battery. Metal boxes are probably unsuitable for use when temperatures are high unless they are adequately shaded. A marine battery case and a plastic file folder box are satisfactory for this purpose. Dry-cell batteries could be used, but they would probably be expensive in the long run because of their relatively short life under long-term usage. No doubt the quality of components used will influence their life expectancy. The cost of each unit we built was less than \$100 (U.S.) and required about 1 hour to assemble.

The blank tapes are recorded with a conventional home tape recorder using selected sounds from commercially available sound-effects records. Sounds used have included cat fights, tropical bird calls, car races, music, sirens, and train, airplane, and jack hammer noises. The units are operated during the day and are manually turned off at night at which time the batteries are charged as needed.

## RESULTS AND DISCUSSION

The units have been highly effective in preventing crow damage in our peanut plots. When the units were operating properly, crows did not feed within the audible range of the devices for several weeks although numerous crows were present in the general area. After a few weeks, the crows started to feed on the periphery of the areas where the sound level was marginal. In such instances, moving the unit occasionally to different spots within the area increased its effectiveness.

A few studies have been made to determine the sounds most effective in alarming different kinds of birds (3,4,5,7). However, it is not known which of the selected sounds that I used are most effective against crows. Studies of Frings et al. (5) showed that crows of the same species generally respond to assembly calls and disperse upon hearing alarm calls, but their responses may be influenced by regional variations within the species. Therefore, distress calls that work in one area may not be effective in another area. Some judgment should be exercised in selecting the sounds. For example, I would hesitate to use the sounds of a crying child or barking dogs if the sounds might extend to pedestrians or nearby neighbors. Use of scarecrows with the audio feature has received local and national attention (1,2). Units similar to the one described here have been successfully used in Oklahoma to keep sparrows and blackbirds out of grain sorghum, crows and bluejays out of pecan groves, and grackles out of livestock feedlots (personal communication, Charles Denman, Oklahoma State University, Stillwater, OK, and Charles Griffin, Nobel Foundation, Ardmore, OK).

The audible principle described here may have potential use against other predators and pests such as coyotes, and field rats, etc.

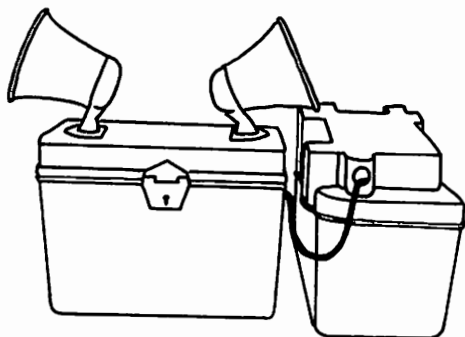


Figure 1. Audible scarecrow. Left, plastic box with speakers for housing tape player. Right, marine box for housing 12-volt battery.

#### ACKNOWLEDGEMENT

I thank Ms. Lana Wagner, Student at Oklahoma State University, for drawing Figure 1.

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## Breeding and Genetics

Interaction of Flcra Senescence and Ovary Development in *Arachis hypogaea* L.  
H. E. Pattee\* and S. J. Mohapatra. USDA-ARS and Biological and Agricultural  
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Morphologically, anthesis, floral senescence, fertilization, and peg elongation are sequential events leading to peanut (*Arachis hypogaea* L.) fruit development and have been documented widely in the literature. However, physiological relationships between these events at functional or structural level(s) have not been studied heretofore. This study was undertaken to examine anatomical and morphometric relationships between the senescence of the hypanthium and style on one hand and the elongation of the peg on the other. The fact that hypanthium elongation takes place before pollination and peg elongation does not commence until after hypanthium senescence may result from the fact that the same anatomical zone regulates both hypanthium and peg elongation. The temporal shift in meristematic activity from the hypanthial base to the ovary base seems to be related to spatial change(s) in associated hormonal regulation. Light and scanning electron microscope observations will be discussed along with morphometric data with respect to the above propositions.

In Vitro Culture of *Arachis hypogaea* Peg Tips. J. P. Moss,\* H. T. Stalker and  
H. E. Pattee, North Carolina State University, Raleigh, NC 27695.

Peg tips were excised at various lengths; the meristem was removed from some peg tips. Cultures were grown either in 14-hour daylength or in continuous dark, with and without nurse tissue. When the meristem remained intact, many pegs elongated and showed a geotropic response. When the meristem was removed, pegs did not elongate but the ovules enlarged and were released into the medium. Other responses observed included callus formation, root initiation from peg callus, and root initiation from pegs without visible callus formation. The results add to our understanding of peg elongation and fruit development and indicate the potential for culturing very young ovules and embryos, without the need to dissect them from peg tissues, leaving the funiculus undamaged and attached to nurse tissue originating from the same tissue in the peg which nourishes the ovule in vivo.

Regeneration of Anther Callus in *Arachis paraguariensis*. M. H. Seitz,\* and H. T. Stalker, Dept. of Crop Science, N. C. State University, Raleigh 27695; and P. Still, Plant Pathology Dept., Univ. of Florida, Gainesville 32611.

Anther-derived callus of *A. paraguariensis* Chad. et Hassl. (coll. KCF 11462) was generated on an N6 medium supplemented with the hormones 4-amino-3,5,6-trichloropicolinic acid (Picloram) and 6-benzylaminopurine (BAP) and with high levels of L-proline ( $2\text{--}3\text{ gL}^{-1}$ ). Within 8 to 10 weeks, after several subculture routines to obtain uniform callus, very small bud primordia were observed. These buds were transferred to an MS medium containing low levels of BAP only, where continued elongation and growth of shoots occurred. Rhizogenesis experiments were next conducted on these shoots when they were 5 mm or greater in size and showed some anatomical differentiation such as stipule-like structures and floral buds. The hormones naphthaleneacetic acid (NAA) and indolebutyric acid (IBA) were used in experiments to determine necessary hormone concentrations and optimal ratios for root initiation. While the control medium without hormone additions produced 0% roots on shoots, the medium with a ratio of  $4\text{ mgL}^{-1}\text{ NAA:}2\text{ mgL}^{-1}\text{ IBA}$  stimulated root production on ca. 30% of all shoots. Plants are currently undergoing adaptation to greenhouse conditions. Additionally, the original anther-callus line is still producing bud primordia after almost two years in culture although this occurs at a reduced rate.

*Arachis spinaclava*, a D Genome Species of Section *Arachis*. H. T. Stalker. North Carolina State University, Raleigh, NC 27695.

Fourteen or more diploid and tetraploid species belong to section *Arachis* of peanuts. Most species are cross-compatible at either the same or different ploidy levels. Chromosome pairing is normal among A genome species while hybrids with *A. batizocoi* Krap. et Greg. (B genome) are sterile with irregular chromosome pairing. A new species, *A. spinaclava*, is represented by four collections from Bolivia. The species has large fruits, a large standard, lateral branches reaching more than 2 m in length, and is characterized by sharp trichomes on pegs. The mitotic chromosomes are highly asymmetrical, as opposed to other species in the group which have mostly median chromosomes. Variation was observed in karyotype among collections for several chromosomes. However,  $F_1$  hybrids between collections were fertile and only bivalents were observed during metaphase I of meiosis. Interspecific hybrids between *A. spinaclava* and both A or B genome species were sterile and had irregular meiosis. All attempts to hybridize the species with *A. hypogaea* failed. A D genomic designation is proposed for the species, and *A. spinaclava* is cytologically isolated from all other known species of section *Arachis*.



Crossability And Cross-compatibility Of Five New Species Of Section Arachis With Arachis hypogaea L. C.E. Simpson\*, D.L. Higgins, and Wm. H. Higgins, Jr. Texas Agric. Exp. Stn., Texas A&M Univ. System, Stephenville, TX 76401.

Preliminary morphological studies of herbarium specimens, live plant evaluations and collection data indicated that five new Arachis sp. collections were members of section Arachis. A test was conducted to obtain a preliminary determination of the crossability and cross-compatibility of these species with Arachis hypogaea L. A limited number of pollinations were made using the wild species as the pollen parent. The wild species are undescribed at present, but may be identified by the following collection numbers: AViW-2796, VKRSv-6536, VMOGeSv-7303, VRSv-7635, and VRSv-7681.

Three of the species; 2796, 6536 and 7303; were collected considerably outside of the area previously recognized as the Arachis section distribution.

When cross-pollinated with A. hypogaea, the 6536 and 7635 collections produced pegs and fruits, but the ovules aborted at a very early stage. Additional crosses will be required with these accessions.

The 2796, 7303 and 7681 crosses produced pegs, fruits and seeds. The hybrid plants from A. hypogaea X 7303 have not flowered to date. Flowers from the hybrids of A. hypogaea X 2796 and 7681 have pollen counts of 12% and 13%, respectively. These high counts for triploid plants indicate a high degree of chromosome compatibility between these two species and A. hypogaea.

Maintaining Wild Arachis Germplasm. Wm. H. Higgins, Jr.\* and C.E. Simpson. Texas Agric. Exp. Stn., Texas A&M Univ. System, Stephenville, TX 76401.

For maintenance purposes, the wild Arachis germplasm can be placed into three categories: those species and accessions which produce fruit and seeds abundantly, those which produce fruit and seeds sparsely and/or under special environments, and those which produce no fruit or seeds. The first group is relatively easy to maintain and distribute (although not inexpensively.) The second and third groups present some complex and expensive problems of germplasm maintenance. Many of the Extranervosae and Ambinervosae section species are in the second group. Members of these two sections generally produce many seeds in their native habitat, but not in the USA. Approximately one-third of the Arachis section species fit into this category as well. Thus, most of the accessions of this category must be maintained vegetatively at all times, which is the case for the accessions in group three -- the non-seed producers. The accessions of the Rhizomatosae section are identified with group three.

Most species of section Erectoideae are identified as seed producers, however, seeds from members of this section have a short survival in cold storage. Two members of this section have seeds that, when dried to storage moisture, are essentially dead. As long as the seeds remain moist they can be induced (with ethylene gas) to germinate. Numerous other special cases can be identified, some of which will be discussed.

A Comprehensive Breeding Procedure for Peanut. E. J. Monteverde-Penso,\* J. C. Wynne, Dept. of Crop Science, N. C. State University, Raleigh 27695 and T. G. Isleib, Dept. of Crop & Soil Sciences, Michigan State Univ., East Lansing 48824.

A comprehensive breeding procedure for peanut (*Arachis hypogaea* L.) consisting of development of a broad-based population, recurrent selection for continued population improvement and isolation of pure lines from high yielding families at each cycle was initiated in 1974. Of 40  $F_2$  families in  $F_4$  generation selected after each cycle of recurrent selection, only five families exceeded the yield of Florigiant for cycle one, whereas all families exceeded the yield of Florigiant for the second and third cycles. Pure lines isolated from the high yielding families have yielded more than Florigiant in advanced yield trials.

Estimates of Combining Ability among Six Peanut Cultivars. S. T. Swe\* and W. D. Branch, Dept. of Agronomy, University of Georgia, Coastal Plain Experiment Station, Tifton, GA 31793.

During 1984, six parental peanut (*Arachis hypogaea* L.) cultivars and 15  $F_1$  diallel hybrids were field evaluated for general and specific combining ability (GCA and SCA, respectively). The parental cultivars were representative of two spanish, two runner, and two virginia market types. Estimates of GCA and SCA were highly significant for all 10 characteristics studied. However, GCA was of greater magnitude than SCA for each trait, except for partial biomass. Also, most  $F_1$  hybrids among botanical types exhibited considerable heterosis above midparent means for many yield related characters.

General Combining Ability for Leafspot Resistance in Peanuts (*Arachis hypogaea* L.) Allan J. Chiyembekeza\* and David A. Knauff. Department of Agronomy, 2183 McCarty Hall, University of Florida, Gainesville, FL 32611.

Nine parental lines of peanuts were evaluated at the Agronomy Farm of the University of Florida during the summer of 1983. The objective of the study was to obtain estimates of general combining ability effects for identifying superior parents for yield and leaf-spot resistance using 3 measurements of leafspot resistance (LSA, LSB and percent defoliation). To permit evaluation of disease resistance, leafspots were not controlled chemically. Otherwise standard cultural practices were used. Based on the relative magnitude of the general and specific combining ability sums of squares, the contribution of the general combining ability effect to the variation among crosses was about twice greater than the contribution of specific combining ability effects. Regression of observed on expected values (based on GCA) gave correlations of 0.71, 0.78, 0.66 and 0.83 for pod yield, an early and late evaluation of percent necrotic leaf tissue and for defoliation, respectively.

IBPGR/ICRISAT Minimum Descriptors Of *Arachis hypogaea* L. Collections II. The Variability Within Certain Characters. E.R. Howard\*, D.L. Higgins, G.D. Thomas, and C.E. Simpson. Texas Agric. Exp. Stn., Texas A&M Univ. System. Stephenville, TX 76401.

The IBPGR/ICRISAT minimum descriptors have been applied to 691 accessions of *Arachis hypogaea* L. collected in South America from December 1976 to June 1982. The data have been computerized and a large amount of variability is noted between some lines in certain descriptors.

The first 33 descriptors are passport data which have already been published in a catalog. Ranges in characteristics include the following: 97.7 to 45.0 mm (max/min) leaflet length; 41.6 to 21.0 mm leaflet width; 63.1 to 21.2 mm pod length; 19.1 to 8.3 mm pod width; 23.6 to 9.7 mm seed length; 14.1 to 5.9 mm seed width; and 115.9 to 33.4 gm per 100 seed. Of 691 accessions, 51% (353) had stem coloration; 88% (611) had peg color; 49% (340) had both stem and peg color; and 11% (75) had neither stem nor peg color.

Two accessions had white flowers, and two had yellow flowers; all remaining accessions had orange or a variation of orange flowers.

More than 26% (185) of the germplasm lines had a bicolored, or variegated, seed color. One collection had seven different seed coat colors, all grown as the farmer's one variety. Ten collections had white or a variation of white seed.

These descriptor data should be useful to researchers who utilize the germplasm.

Genetic Resources And Their Use In Enhancement Of Peanut At ICRISAT. V. Ramanatha Rao, Botanist, Genetic Resources Unit, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, A.P., India.

A large collection of peanut germplasm, consisting of 11,488 accessions, has been assembled in the Genetic Resources Unit of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). This material has been evaluated for various morpho-agronomic characters exposing the available genetic variability. The germplasm has also been screened for reaction to late leaf spot, rust, yellow mold, viruses and insect pests and a number of genotypes with varying levels of resistances have been identified both among cultivated and wild species. Since these biotic stresses are prominent yield reducers in the available commercial cultivars, incorporation of such desirable genes into adapted backgrounds is the primary objective. Genetic enhancement of peanut cultivars in relation to drought stress is also underway. Apart from this, unadapted exotic germplasm is being used for improving the yield and quality of the existing cultivars. Thus peanut genetic resources are being actively exploited for the genetic enhancement of the crop.

Breeding For Earliness In Groundnuts. M.J. Vasudeva Rao\* and R.W. Gibbons. Groundnut Improvement Program, ICRISAT, Patancheru 502 324, A.P., India.

In groundnuts maturity definitions are complicated by the indeterminate nature of the crop and subterranean pod maturation which is a cumulative process. We are now using a "staggered harvesting system" to work out an operational definition for early maturity in groundnuts. The lines under evaluation are harvested at predefined regular intervals from randomized and replicated field trials. Pod and sound mature kernel yields, shelling percentages and kernel weights, are estimated from the staggered harvests. Maturity is determined as that point of time when these maturity related characters reach their peak. Preliminary experience has indicated that this is a useful system to define the agronomic maturity in groundnuts. Using this approach, we have screened 315 breeding and germplasm lines for their early maturity in the postrainy season of 1983-84, and the rainy season of 1984, and selected 26 early maturing (90-100 days) and 22 extra early maturing (75 days) lines for further testing. Preliminary observations indicate that the early maturing lines unless harvested early, do not exhibit significant yield advantages over the currently available cultivars that mature later. These early maturing lines will fit into low rainfall environments and relay cropping systems, particularly those involving rice.

Selection For Rapid Peanut Seedling Emergence in Ontario. T.E. Michaels\*. Dept. of Crop Science, University of Guelph, Guelph, Ontario, Canada, N1G 2W1.

Peanut production in cool, short season climates such as south-western Ontario requires cultivars which emerge and grow rapidly under adverse conditions. Rapid emergence may result in somewhat earlier flowering and higher % SMK at harvest than slow emergence. The objective of this study was to contrast % emergence and % SMK as selection criteria in a recurrent selection program to improve adaptation of peanuts to Ontario. F4 bulks representing individual F2 plants from five families were evaluated in the field at Delhi, Ontario in 1982 for % emergence and % SMK. Four bulks with high % emergence and four with high % SMK were selected and intercrossed using a Comstock and Robinson Design II where the % emergence group was crossed with the % SMK group. F2 seeds derived from these crosses were evaluated for seedling vigor in growth cabinets using a seven day chill period at 7C followed by ten days at 25C. General combining ability for % emergence, % chlorotic seedlings, shoot and root dry matter was greater among lines selected for % SMK than among lines selected for % emergence. Selection based on % emergence in the field in 1982 apparently decreased genetic variability among selected lines for these vigor characteristics. No difference could be detected between the highest ranking line in the % emergence and % SMK groups for these characteristics. Specific combining ability was significant for shoot dry matter production. Field germination and flowering data from 1985 and their correlation with the seedling vigor test will also be presented.

Greenhouse Evaluation of Cultivated and Wild Peanut Species for Resistance to *Cylindrocladium* Black Rot. M. S. Fitzner,\* Dept. of Crop Science; S. C. Alderman, Dept. of Plant Pathology and H. T. Stalker, Dept. of Crop Science, N. C. State University, Raleigh 27695.

Three peanut (*Arachis hypogaea* L.) entries and 19 accessions representing 14 species of section *Arachis* were evaluated for resistance to *Cylindrocladium* black rot (CBR), a disease caused by *Cylindrocladium crotalariae*. The experiment was conducted in the greenhouse using *C. crotalariae* microsclerotia densities of 0, 5, 50 and 100 ms/g soil. A visual root rot rating (1 = no lesions, 5 = completely rotted) was made 59 days after planting. The diploid species (*A. correntina*, *A. cardenasii*, *A. spegazzinii*, *A. chacoense*, *A. villosa*, *A. batizocoi*, *A. stenosperma*, *A. duranensis*, *A. spinaclava* and four *A. sp.*) were significantly less resistant than the two tetraploid species, *A. hypogaea* and *A. monticola*. One accession of *A. monticola* (GKBSPSc 30062) and a resistant breeding line (NC 3033) had significantly lower root rot ratings (2.3 and 2.9, respectively) than NC 8C (3.9) and Florigiant (4.1). At the highest inoculum density (100 ms/g) NC 8C had a lower root rot rating than Florigiant (3.5 and 4.2, respectively). At the higher microsclerotia densities (50 and 100 ms/g), GKBSPSc 30062 had a root rot rating lower than NC 3033 and NC 8C. GKBSPSc 30062 may be a valuable source of resistance in the development of CBR-resistant cultivars.

A Study of Methods of Screening for Resistance to Pythium Pod Rot. M. J. Hood\*, O. D. Smith, K. E. Woodard, T. E. Boswell, W. J. Grichar, R. A. Taber, and R. E. Pettit. Texas Agric. Exp. Stn., Texas A&M University System, College Station, Texas 77843-2474.

Field, seedling inoculation, and anatomical studies were made on 40 breeding lines and checks to ascertain their effectiveness as screening techniques for pod rot resistance. Visual estimations of diseased shell tissue were made on threshed pod samples from tests at two sites with heavy natural pathogen infestation. The number and width of palisade mesophyll cells per unit area were measured on leaf samples from field plots, and shells were examined for thickness and uniformity of lignin bands. Survival and growth were appraised in the greenhouse following Pythium myriotylum oospore inoculation of seedlings derived from seed produced in the field plots.

Correlations among histological examinations of leaf and shell material, oospore inoculations, and visual pod disease ratings suggest that laboratory screening may be a useful supplement to visual pod disease ratings. Location x entry interactions, and inter- and intra-line variability will be discussed.

Screening *Arachis hypogaea* L. Germplasm For "Drought Tolerance." D.L. Higgins\* and C.E. Simpson. Texas Agric. Exp. Stn., Texas A&M Univ. System, Stephenville, TX 76401.

Reports of research conducted in Senegal indicate that peanut genotypes which are capable of germinating at high temperatures have been shown to withstand moisture stress better than other lines. As a preliminary study, we tested 25 germplasm lines and check cultivars at low, normal, and high temperatures for seed germinability. Our temperature ranges were 12.2°C (54°F) and 20 (68), 22.2 (72) and 30 (86), and 32.2 (90) and 40 (104) night/day for low, normal, and high, respectively. Seeds were counted, measured and photographed at four days and again at 10 days. All lines were slow to germinate and showed stunting at the low temperature. Normal temperature resulted in normal germination for most lines, with radical length averages of 6 to 12 cm in 4 days. The first of six "runs" (one-half replication) at a high temperature of 29.4 to 36.1°C (85-97°F), night/day, resulted in very rapid germination and rapid radical elongation in all lines. Subsequent "runs" were elevated to the 32.2 to 40 temperature and the first "run" was repeated. Depression of germination rate and radical elongation was evident in most genotypes with line means ranging from 0.17 to 141.00. One germplasm line (PI-475854), a breeding line (CV-65), and one cultivar (Starr) had significantly better germination rates ( $P=.05$ ) at the high temperature than all other lines tested.

Potential for Incorporation of Early and Late Leafspot Resistance in Peanut. W. F. Anderson, J. C. Wynne\* and C. C. Green. Dept. of Crop Science, N. C. State University, Raleigh 27695.

Components of resistance to both early and late leafspot caused by Cercospora arachidicola Hori and Cercosporidium personatum (Berk. and Curt.) Deighton, respectively, for  $F_2$  plants of two peanut (Arachis hypogaea L.) crosses (FESR 5-P2-B1/PI 269685 and PI 350680/GP-11C 343) were evaluated using a detached leaf technique. A few plants had greater partial resistance to both leafspots than their parents. Broad-sense heritabilities of resistance components ranged from 0.4 to 0.8. A visual rating of sporulation was correlated (0.8 to 0.9) with conidia per lesion and conidia per necrotic area. Resistance to early leafspot appeared to be inherited independently of resistance to late leafspot suggesting that a cultivar with resistance to both leafspots can be developed.

Breeding Multiple Resistant Peanut Germplasm. T. A. Coffelt\*, U.S. Department of Agriculture, Agricultural Research Service, Tidewater Research Center, Suffolk, VA 23437.

The occurrence of several peanut (Arachis hypogaea L.) disease and insect problems in Virginia since 1975 for which chemical controls are inadequate or too expensive has increased interest in developing germplasm with multiple resistance. The advantages of a multiple resistant cultivar are: 1) In a grower's field more than one disease and/or insect problem usually occurs, thus multiple resistance increases the chances for acceptance by growers and high yields; 2) Cultivars with multiple resistance will reduce the cost of production; and 3) Resistant cultivars are environmentally safe compared to pesticides. The breeding program in Virginia in cooperation with other programs has released two lines with multiple resistance, VGP-1 and Tifton-8. Six additional lines, VA 732813, VA 732815, VA 732816, VA 732817, VA 732818, and VA 751014, will be proposed for release as germplasm. VGP-1 has resistance to CBR and Sclerotinia blight. Tifton-8 has resistance to CBR, leafspot, southern corn rootworm, tobacco thrips, velvetbean caterpillar and drought. VA 732813, VA 732815, VA 732816, VA 732817, and VA 732818 have resistance to Sclerotinia blight and leafspot. VA 751014 has resistance to southern corn rootworm and Sclerotinia blight. The agronomic and quality characteristics of these germplasm lines and their usefulness in breeding programs will be discussed.

Screening for Southern Stem Rot Resistance among Peanut Cultivars. W. D. Branch\* and A. S. Csinos. Dept. of Agronomy and Plant Pathology, respectively, Univ. of Georgia, Coastal Plain Experiment Station, Tifton, GA 31793.

During 1983 and 1984, field studies were conducted to determine the agronomic performance and host-pathogen reaction of 16 peanut (*Arachis hypogaea* L.) cultivars to the soilborne disease, southern stem rot, caused by *Sclerotium rolfsii* Sacc. Four current cultivars were purposely selected to represent each U. S. market type. In general, the number of disease loci was highest among valencia cultivars and lowest for the other three market types. Also, yield and grade results revealed that virginia and runner cultivars performed better than spanish or valencia types. However, there were notable exceptions. Thus, less disease susceptibility does not necessarily mean better agronomic performance and vice versa, but the inclusion of tolerant cultivars with other chemical, cultural, and biological control measures should be beneficial in reducing this serious peanut disease problem.

Response of Breeding Lines Selected for Pod Rot Resistance to Varied Sclerotium rolfsii and Pythium myriotylum Pressure. O. D. Smith, Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474, T. E. Boswell and W. J. Grichar, P. O. Box 755, Yoakum, TX 77995; C. E. Simpson, P. O. Box 292, Stephenville, TX; and M. J. Hood, Soil and Crop Sciences, College Station, TX 77843-2474.

Eight breeding lines and four check cultivars selected for resistance to *Pythium myriotylum* and *Rhizoctonia solani* were compared for yield, grade, and disease reactions for three seasons. Replicated tests at one location were on soils infested predominantly with *S. rolfsii*, and at the other location with *P. myriotylum*. Amendments with fungicide and/or fungal inoculum were made on paired plots in each test to create varied levels of disease pressure. In *S. rolfsii* infested soil, entry and treatment effects were highly significant for percentages of sound mature kernels, damaged kernels, and total kernels; pod yield; value per acre; and number of *S. rolfsii* infection sites per 10 m of row. Entry x treatment effects were significant for pod yield, value per acre, and number of infection sites. Entry effects were highly significant for all grade, yield and value measures in soil infested with *Pythium* but the entry x treatment effects were non-significant. The performance of some breeding lines, relative to the checks, were similar for the two locations, but for others the relative performances were different. Resistance mechanisms to the fungi must differ although the resistance of parents show considerable resistance to both pathogens.



## Production Technology

Effect Of Nitrogen and Phosphorus Application On Growth And Yield Of Peanuts In Irrigated Vertisols Of Sudan. H.M. Ishag\* and M. Bakeit Said. Agricultural Research Corporation, P.O. Box 126, Wad Medani, Sudan.

Field experiments were conducted to determine the effects of 0, 43, 86, 129 and 172 kg N/ha as urea and 0, 21.5, 43 and 69.5 kg  $P_2O_5$  /ha as triple superphosphate on growth, yield and nutrient uptake of irrigated peanuts. Nitrogen application increased pod yield significantly. Response of peanuts to phosphorus application was erratic. However, highest pod yield was obtained when 86 kg N/ha and 43 kg  $P_2O_5$ /ha were applied. Phosphorus application tended to produce early flowers, early pegging and consequently longer pod filling period. Increasing the level of fertilizer nitrogen increased P uptake. Effect of nitrogen and phosphorus on the growth analysis of peanuts will be discussed.

Peanut Seed Germination and Ca Content in Response to Supplementary Calcium Application. A. H. Allison.\* Tidewater Research Center, VPI & SU, Suffolk, VA. 23437.

Previous experiments have indicated a positive correlation between seed germination and Ca content. A negative correlation apparently exists between seed germination and K content. This would imply the need for increased Ca application when K is applied to peanut. Seed of two new peanut cultivars (NC 6 and NC 7) in the V-C peanut production area absorb less Ca than other commercially available cultivars resulting in low seed germination. A three year (1981-83) study was conducted to evaluate the effects of late supplementary Ca application on seed germination and Ca content of the cultivars NC 6 and NC 7. Yield and grade were also determined. Three sources of Ca (USG Bag, USG 420, and Texasgulf Phosphogypsum) were applied at early bloom to give 907 kg/ha  $CaSO_4$ . Supplementary applications of USG bag (403 kg/ha  $CaSO_4$ ) were applied 21-30 days after initial treatments. Both cultivars absorbed significantly more Ca and had higher seed germination due to supplementary applications of  $CaSO_4$ . Yields or grades were not affected by the supplemental application. Seed Ca, germination and yields of both cultivars from untreated plots were significantly less than Ca treated plots. Recommendations for supplementary Ca applications in seed production have been implemented in Virginia.

Long-term Response of Irrigated Spanish Peanut to Factorial Treatments of Nitrogen, Phosphorus, and Potassium Fertilizer. R. M. Jones\* and J. S. Newman, Texas Agricultural Experiment Station, Stephenville 76401.

'Starr' peanut (*Arachis hypogaea* L.) was grown for seven years on irrigated plots of Windthorst fine sandy loam initially having low soil phosphorus and high potassium. A 3X4X4 complete factorial design of nitrogen (N), phosphorus (P), and potassium (K) fertilizer was used. Rates were applied annually to the same plots. Statistical analysis resulted in the regression equation  $Y = 2901 + 2.24N + 33.38P - 1.10P^2 + 0.65K + 0.011P^3 - 0.0006NPK$  which was significant ( $P < 0.002$ ) and accounted for 46.1% of the variation in pod yield. Optimum pod yield was predicted at 0, 19.57, and 0 kg/ha N, P, and K, respectively. A regression model for value per hectare was also significant ( $P < 0.005$ ) and explained 39.6% of the variation. Regression of fertilizer levels on percent sound mature kernels (SMK) resulted in a significant ( $P < 0.002$ ) cubic equation which accounted for 37.9% of the variation. Phosphorus adversely affected percent SMK, but percent damaged kernels and other kernels were not affected by fertilizer. Correlation coefficients (r) among soil test values and fertilizer for one year at various soil depths were generally significant ( $P < 0.05$ ). Soil test K was negatively correlated with pod yield at all depths between 15.2 and 91.4 cm. A quadratic relationship was indicated for pod yield and soil P for soil depths of 0-30 cm. Initial regression models for soil test values on pod yield were not satisfactory.

The Effect Of Reduced Tillage On Peanut Yields. Dallas L. Hartzog\* and Fred Adams Agronomist-Peanuts and Professor Emeritus of Soil Science, respectively, Department of Agronomy and Soils, Auburn University, Auburn, Alabama 36849.

Fourteen on-farm peanut experiments were conducted during 1982-1984 to evaluate peanuts in a reduced tillage system. The minimum-till treatments consisted of planting in (1) previous crop residue, (2) in a winter cover crop of rye or oats which had been killed with either paraquat or roundup, (3) after wheat which had been harvested for grain. Plant residue from the previous crop was either left lying on the surface or disk into the top 4 inches of soil. For conventional-till peanuts, the land was turned with a moldboard plow, disked and planted. Weed counts, white mold hits, leafspot ratings and nematode numbers were measured during the growing season. Yield and grades of peanuts were determined at harvest.

The elimination of deep tillage with a bottom plow did not affect white mold hits, leafspot ratings or nematode numbers. It did increase the number of weeds emerging early in the growing season, with two exceptions, yields and grades were not effected by the elimination of deep tillage.

Conservation Tillage of Peanuts in Virginia. F. S. Wright\* and D. M. Porter, USDA-ARS, Tidewater Research Center, Suffolk, VA 23437.

Peanut yields, quality, disease development and progression, and pod mycoflora of peanuts (*Arachis hypogaea* L.) planted in a wheat cover crop (conservationally tilled - NT) were compared to peanuts planted conventionally (CT). Three peanut varieties and three digging dates for one variety were included in both production systems. Grade data indicated NT peanuts matured later than CT peanuts. Sound mature kernels and meat content of pods from CT plots were about 20% and 10% higher, respectively, than for pods from NT plots. Other kernels were about 30% lower in CT plots than in NT plots. Yield and value of NT peanuts were about 70% of the yield and value of CT peanuts. Pod rot (*Pythium myriotylum*) severity was greatest in NT plots. However, leaf spot (*Cercospora arachidicola* and *Cercosporidium personatum*) severity (% defoliation, # lesions/leaflet, # lesions/plant) was less in NT plots. Seed (m.c. 7%) from NT plots rehydrated for 48 hours at 27°C were infested with fungi at twice the frequency as seed from CT plots. Infestation frequency of seed from the third digging date (10/15/84) was six-fold greater than infestation of seed from the first digging date (9/21/84). Pods from NT plots were infested with fungi at higher frequencies than pods from CT plots. The infestation of pods from the NT plots compared with pods from the CT plots for the first, second and third digging dates were 38%, 52% and 136%, respectively.

Weed Control, Yield, and Net Return Comparisons in Conventional and Reduced Tillage Peanuts. D. L. Colvin\*, University of Florida, Gainesville, FL 32611; G. R. Wehtje, M. C. Patterson, and R. H. Walker, Auburn University, Auburn, AL 36849.

Field experiments were conducted in 1983 and 1984 on a Dothan sandy loam (Plinthic Paleudult) at Headland, AL to investigate comparisons of conventional and minimum-tillage (MT) peanuts (*Arachis hypogaea* L.). Seventeen various (MT) production systems were included in this study and compared to the conventional treatment with respect to weed control, peanut grade, peanut yield, and net returns to land and management. At least five of the (MT) systems show interesting comparisons with conventional treatment. Weed Control from these five systems was equal to or better than the conventional systems. Slight variations in peanut quality existed but generally peanut grade was unaffected by the variables of this study. Peanut yields were similar in all six systems compared in 1983. In 1984, five selected (MT) systems out-yielded the conventional system with two of the five selected (MT) systems significantly out-yielding the conventional system. Net returns to land and management in 1983 show that all five (MT) systems netted more profit even though yields were statistically equivalent. This same trend occurred in 1984 with net returns from the best (MT) system returning \$251/ha more money than the conventional system.

The authors wish to thank Brown Manufacturing, Ozark, AL for valuable input in this study and the use of the RO-TILL planter.

Diseases, Arthropod Pests, and Drought Situation of Peanut in Senegal - 1984 Crop Season. D.H. Smith\* and P. Subrahmanyam, Texas A&M University Plant Disease Research Station, Yoakum, TX. 77995.

Information on the major constraints of peanut production in Senegal was obtained in September 1984. The survey trip was supported by Peanut CRSP, USAID grant No. DAN-4048-G-SS-2065-00. One hundred and twelve fields, representing all major peanut production areas of Senegal, were surveyed. Drought stress contributed to crop losses in nearly all northern and central regions of Senegal, i.e., in Louga, Thies, and Diourbel. Early leafspot contributed to crop losses in Sine-Saloum, Senegal Oriental, and the Casamance. Rust was observed at two locations in the Casamance, but was not economically important. Pod rot contributed to yield losses in some fields in Diourbel and Sine-Saloum. Peanut clump was observed in Senegal, but it is currently a minor disease. Chlorotic and stunted plants, probably infected with Scutellonema cavenasii were observed in northern and central Senegal. Millipedes and aphids were destructive in parts of northern and central Senegal.

The Use Of Plastic Mulch In Peanut Production. F. J. Adamsen\*, F. S. Wright and D. M. Porter, USDA-ARS, Tidewater Research Center, Suffolk, VA 23437.

Peanuts mulched with black plastic were evaluated at two locations for diseases and soil moisture evaporation. One location had a history of Sclerotinia blight, caused by Sclerotinia minor. Mulched plants grew faster than nonmulched plants. At both locations, leafspot (Cercospora arachidicola and Cercosporidium personatum) was less severe under mulched conditions. At one location pod rot (Pythium myriotylum) severity increased six-fold in mulched plots. Severity of Sclerotinia blight at the location having a history of this disease was greatly reduced by mulching. During the early part of the growing season, evaporation was reduced by mulch; however, evaporation differences lessened as the plant canopy developed. Mulch prevented water from entering the soil over the seed bed. However, water was able to enter the seed bed along breaks in the plastic between the rows. This prevented normal leaching of Ca into the fruiting zone for proper pod development and increased pod rot severity under mulched conditions. Pegs had difficulty in penetrating the mulch through small holes (2mm) except at points where plants emerged. As a result of poor peg penetration, yields under mulched conditions were 35% lower than yields under nonmulched conditions. Also, pods produced under mulch were less mature (based on lower shelling percentage and percent extra large kernels) than pods produced by nonmulched plants.

The Influence of Row Pattern, Seeding Rate and Irrigation on the Yield and Market Quality of Runner Peanuts. A. C. Mixon\*. USDA-ARS, Department of Agronomy, Coastal Plain Experiment Station, Tifton, GA 31793

Three-year results involving the cultivar Sunbelt Runner grown in 2- and 4-row patterns and seeded at 112 and 151 kg/ha yielded 9.6% more weight of pods (5561 kg/ha) when irrigated (30 centibar automatic tensiometer control) than from no supplemental irrigation (5074 kg/ha). The 4-row pattern yielded 6.6% more pods (5488 kg/ha) than the 2-row pattern (5146 kg/ha). Also the 151 kg/ha seeding rate produced 3.4% more pods (5406 kg/ha) than the 112 kg/ha seeding rate (5227 kg/ha). Yearly variation in yield resulted in year by row pattern and year by irrigation interactions. No treatment effects were noted for market grade components.

Economic Analysis of Producing Peanuts Using a Skip-Row Pattern. Timothy D. Hewitt\* and Daniel W. Gorbet. Food and Resource Economics Department and Agronomy Department, University of Florida, Agricultural Research and Education Center, Marianna, FL 32446.

A peanut skip-row planting study was evaluated for three years at the Marianna AREC. The study was initiated in response to extension agent and grower interest because of changes in the government peanut program. 'Florunner', *Arachis hypogaea* L., peanuts were evaluated under non-irrigated conditions in 1979, 1980, and 1981 with five treatments: solid planted peanuts in rows 91 cm apart; 2 rows of peanuts 91 cm apart, 2 skip rows (182 cm); 4 rows of peanuts, 2 skip rows (182 cm); 2 rows of peanuts (182 cm) and 4 rows of soybeans (364 cm); 4 rows of peanuts (364 cm) and 4 rows of soybeans (364 cm).

The skip-row plantings were significantly higher for yield per hectare than the solid plantings. The value per hectare also increased significantly for the skip-row plantings. The skip-row plantings resulted in a 30% increase under the two row plantings. When four rows of peanuts were planted together, one-half of the yield increase was lost. Increased production costs were also observed in the skip-row plantings for land, machinery, fertilizers, and chemicals. The economic analysis of skip-row plantings indicated that the yield benefits would balance against irrigation costs and that skip-row plantings are cost effective under land values of the Southeast.

MH-30, BCC-3 and Bud Nip: Their Influence on Peanut Seed Yields and Grade Characteristics. R. K. Howell\* and J. G. Buta, USDA-ARS, Beltsville, Md. 20705

Segments of the peanut processing industry desire more natural uniformity of peanut seed size than is presently available. Peanut cultivars within all peanut market types bloom and set pods during several reproductive cycles during a growing season; therefore, heterogeneity of peanut pod and seed size is inherent in cultivated peanuts. Can plant growth regulators (PGR) selectively and chemically prune reproductive tissues to improve the uniformity of peanut pod and seed size? MH-30SG, Off Shoot-T, BCC-3, Prime +, and Bud Nip, presently used for sucker control in tobacco, were applied to provide thorough foliar coverage in mid-August to replicated field plots of 'NC-7' and 'Tannut-74' peanuts that were seeded in early May 1984 in Maryland. Pod yields from treated plants were equal to or significantly less but never significantly more than pod yields from untreated control plants. MH-30SG @ 6 lbs ai/A on 'NC-7' significantly suppressed pod yields (2795 lbs/A) but significantly increased ELK (55%) seed weight (104g), SMK (64.8%) and reduced DK (5.2%) as compared to controls that produced 3545 lbs/A, 49.5% ELK, 98g/100 seed, 60% SMK, and 8.8% DK, respectively. Bud Nip @ 1 lb. ai/A treated and control plants produced statistically the same pod yields but treated plants had significantly higher pod weights grading fancy (90%) and seed weight (102g/100seed) than controls (82.7%) and (97g), respectively. NC-7 plants treated with 5% BCC-3 produced statistically the same % fancy pods, %ELK, g/100 seed, % meat as controls but significantly higher % SMK and significantly fewer damaged kernels than control plants. No treatment significantly changed the seed weights from those of Tannut-74 control plants. Percent SMK were significantly higher from treated than from control plants. Bud Nip @ 1 lb. ai/A treated plants produced significantly more SMK (67%), fewer SS (4.2%) and more meat (78%) than untreated plants. Off-Shoot-T and Prime + initiated some plant responses but not to the same extent as BCC, MH30SG, or Bud Nip. Both systemic and contact chemicals were used in this study and it is concluded that some of these chemicals and possibly other PGR chemicals can enhance peanut seed and pod uniformity.

'Florunner': The Perennial Peanut. C. S. Kvien\*. University of Georgia, Tifton, GA 31793.

Although the cultivated peanut (*Arachis hypogaea* L.) is currently classified as an annual herbaceous plant, our studies over the past several seasons indicate it may more correctly be thought of as a perennial. Nutrient movement studies (carbon and nitrogen) indicate that at harvest, there is movement of nutrients to all plant parts not just to the fruit. Flowering and fruit set also occur long after the optimum harvest date. Frost, disease, and drought seem to be the major factors in ending the peanut's growth. By controlling these factors, we were able to keep peanut plants (cv. Florunner) living in the field for over two seasons.

Field Evaluation of Peanut Cultivar-Bradyrhizobium Specificities. T. D. Phillips\* and J. C. Wynne, Dept. of Crop Science; T. J. Schneeweis and G. H. Elkan, Dept. of Microbiology; N. C. State University, Raleigh 27695.

The peanut (Arachis hypogaea L.) is generally considered promiscuous since it forms symbioses with a diverse group of Bradyrhizobium from the cowpea miscellany. However, the specificity of strain NC92 for cultivar Robut 33-1 has resulted in significant increases in yield in several tropical studies. The objective of this study was to investigate the specificity of NC92 for Robut 33-1 under North Carolina field conditions. No significant specificity was found for NC92 and Robut 33-1 or for several other host-strain combinations in two years of field studies in North Carolina. Significant yield increases resulted from inoculation in a field with a low native population of Bradyrhizobium but no yield increases resulted when inoculation occurred in fields with high native populations of Bradyrhizobium.

Initiation Of A National Coordinated Peanut Systems Research Project. J. I. Davidson, Jr.\* USDA-ARS, National Peanut Research Laboratory, 1011 Forrester Drive SE, Dawson, GA 31742.

Several workshops were held to determine the status, needs and priorities for peanut systems research. Based upon the results of these workshops, a coordinated research project was initiated to provide a library of information and submodels from which an integrated peanut systems model could be developed. The main component will consist of a plant growth model that will have support components such as soil and water, pest, and complementary components such as quality, harvesting, drying, handling, storage, shelling and marketing. Several coordinators have been selected to compile available information and develop minimum data sets and standard sampling procedures for determining the information needed to develop and validate the component models. These coordinators and others yet to be selected will work with modelers, cooperators, and other contributors in groups to set objectives; make plans; develop and validate models; to provide technology transfer to users of the research; and to document contributions of individuals for professional advancement. Success of this project will depend largely upon maximum involvement of APRES members. Participation by interested members will be greatly appreciated.

## Plant Pathology - Nematology

Response of peanut cultivars to fenamiphos in a field infested with northern root-knot and ring nematodes. P. H. Phipps\* and T. A. Coffelt. Tidewater Research Center, VPI&SU and USDA AR, Suffolk, VA 23437.

Four peanut cultivars were planted in a field of Emporia fine sandy loam infested with Meloidogyne hapla (Kh) and Heterodera ornata (Ho) on 9 May 1984. Each cultivar was evaluated with and without fenamiphos (2.24 kg/ha), applied at planting in a 20-cm band and incorporated ca 8-cm deep with a rolling cultivator gang directly in front of planters. In addition to standard production practices, all plots received aldicarb (1.12 kg/ha) in-furrow at planting and fonophos (2.24 kg/ha) at pegging on 20 July. Plots were two rows (0.9-m apart, 12.2-m long) and replicated in four randomized complete blocks. Nematode populations in soil were determined 0, 72 and 138 days after planting. Significant suppression of Kh populations by fenamiphos was detected only in the 138 day samples from plots planted to NC 7 and NC 8C. Fenamiphos suppressed significantly populations of Ho on NC 7 according to soil assays at 72 and 138 days after planting. All cultivars produced higher yields with fenamiphos treatment, but only the yield and value increases of NC 6 and NC 7 were significant ( $P=0.05$ ). Over all cultivars, yield of treated and untreated averaged 4329 and 4318 kg/ha, respectively. The dollar/ha increases in value with fenamiphos were as follows: Florigiant, \$141; NC 8C, \$190; NC 6, \$440; and NC 7, \$623.

Influence Of Tillage, Nematicide And Fungicide-Insecticide Treatments On Double-Cropped Peanut In Wheat Stubble. H. A. Minton\*, A. S. Csinos, and L. W. Morgan, USDA,ARS, Department of Plant Pathology, and Department of Entomology, University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia 31793.

Pest development and control was studied in double-cropped peanut planted in stubble following winter wheat in 1984 on three sites with different pest problems. Site 1 was infested with Meloidogyne arenaria and Sclerotium rolfsii; site 2, Pratylenchus brachyurus and S. rolfsii; and site 3, S. rolfsii. The same insects were common to all sites. Treatments at all locations consisted of tillage (moldboard plow and rip-plant), nematicides (phenamiphos, 2.8 kg a.i./ha; aldicarb, 2.8 kg a.i./ha; and control), and fungicide-insecticide (PCNB, 11.2 kg a.i./ha + chlorpyrifos, 2.2 kg a.i./ha; chlorpyrifos, 2.2 kg a.i./ha; and control). Nematode population densities in sites 1 and 2 in both tillage systems were low, hence yields were not affected significantly by nematicides. Soil insect damage to pods did not differ among treatments. The incidence of S. rolfsii was generally less in rip-plant plots than in moldboard plow prepared plots in all sites. Average yields for the three sites were greater in moldboard plow prepared plots (5298 kg/ha) than in the rip-plant plots (4908 kg/ha). PCNB + chlorpyrifos reduced incidence of S. rolfsii and increased yields significantly at all sites. Chlorpyrifos reduced incidence of S. rolfsii at sites 1 and 3, but did not increase yields at either site.



The Effect of Selected Rotation Systems with Peanut, Soybean, and Corn on Populations of *Meloidogyne arenaria*. C. F. Weaver\*, R. Rodríguez-Kabana, and H. Ivey, Department of Botany, Plant Pathology, and Microbiology, Alabama Agricultural Experiment Station, Auburn University, AL 36849.

The effect of 9 rotation systems on populations of *Meloidogyne arenaria* was studied for 8 years in a field which was initially lightly infested with the nematode. Monoculture of Florunner peanut (P) resulted in increased populations of the nematode each year, conforming well to a logistic equation model. Nematode populations did not increase with monoculture of corn (C) or Bragg soybean (S) or a rotation system consisting of P followed by 2 years of C; however, when 1 or 2 years of P was followed by a single year of C, nematode populations increased on peanuts as with the monoculture of P. Alternating P and S resulted in low populations of the nematode for the first 5 years, but resulted in high populations in the remaining years when P was grown. Peanut followed by a year each of S and C maintained low populations of the nematode for the first 6 years of the study and high populations when peanut was planted in the last 2 years.

Evaluation of Selected Nematicides for Control of *Meloidogyne arenaria* in Peanut. R. Rodríguez-Kabana\* and P. S. King, Department of Botany, Plant Pathology, and Microbiology, Alabama Agricultural Experiment Station, Auburn University, AL 36849.

A 5-year study was conducted to evaluate the relative efficacy of at-plant applications of aldicarb, carbofuran, EDB, ethoprop, oxamyl, and phenamiphos for control of the root-knot nematode *Meloidogyne arenaria* (Neal) Chitwood and to increase Florunner peanut (*Arachis hypogaea* L.) yields. Each year EDB was applied at rates of 8.4 and 16.8 L/ha, ethoprop at 2.2 and 4.4 Kg a.i./ha and the remaining nematicides at 1.1 and 2.2 Kg a.i./ha. All nematicide applications reduced larval populations of the nematode in the soil and increased yields. For all nematicides the low rate resulted in the highest ratio of yield increase to the amount of nematicide used. The relation between yield (Y) and nematicide rate (N) could be described by  $Y = Y_m - e^{b-kN}$ , where b and k are constants, and  $Y_m$  represents the maximal theoretical yield. Larval numbers in soil were negatively and linearly related to the amount of nematicide added. Highest yields during the study were obtained with applications of aldicarb, EDB, and oxamyl and the lowest with carbofuran and ethoprop; yield response to phenamiphos was intermediate. The most effective nematicides for suppressing larval populations were EDB and aldicarb and the least effective were carbofuran and ethoprop.

Influence of Salinity on Peanut Growth and Vesicular-Arbuscular Endomycorrhizal Fungus Infection. T. D. Riley\*, R. A. Taber, O. D. Smith, and R. M. Taylor. Dept. of Plant Pathology and Microbiology, Dept. of Soil and Crop Sciences, Texas A&M Univ., College Station, TX 77843, and Texas A&M Univ. Research and Extension Center, El Paso, TX 79927.

Ten peanut cultivars were planted in far West Texas alkaline soil (pH 8.0) to determine the effects of salinity on peanut growth and infection by Rhizobium and vesicular arbuscular endomycorrhizal fungi (VAMF). Preliminary results of the first year's test revealed no Rhizobium nodulation on the cultivars planted. VAMF infection ranged from 0% to 60% of roots colonized in cultivars Tamnut 74 and NC8C respectively. In the second year, plots were irrigated with 600 ppm or 2100 ppm TDS water. A commercially prepared Rhizobium inoculum was applied which resulted in effective nodulation. Peanut yields were reduced by approximately 25% at EC 4.1 dS/m. VAMF chlamydospore populations were greatest at higher salinity levels and decreased with decreasing saline conditions. Percentage of roots colonized in all cultivars was <5% and independent of chlamydospore population. These results indicated that chlamydospore germination was influenced by salinity levels while infection may be affected by other factors such as nutrient levels.

Vesicular-Arbuscular Endomycorrhizal Fungi Associated with Peanut: Germplasm Acquisition. R. A. Taber\*, O. Nopamornbodi, and L. Ilag. Dept. of Plant Pathology and Microbiology, Texas A&M Univ., College Station, TX 77843; Dept. of Agriculture, Soil Microbiology, Bangkok, Thailand; and Dept. of Plant Pathology, Univ. of Philippines, Los Banos, Laguna, Philippines.

Vesicular-Arbuscular endomycorrhizal fungi (VAMF) are beneficial fungi associated with the roots of most herbaceous plants, including peanuts. Peanut roots and soils are being examined for presence of VAMF in major peanut growing areas of the world. In the Philippines, 7 Glomus spp. (G. monosporum, G. multicaulis, G. caledonium, G. convolutum, G. intraradices, G. microcarpum, and G. mosseae), 2 Gigaspora spp. (G. margarita and G. gregaria), 3 Sclerocystis spp. (S. dussii, S. rubiformis, and S. sinuosa) and Acaulospora scrobiculata were identified at 16 sites. In Thailand, 10 sites were sampled. Five Glomus spp. (G. mosseae, G. multicaulis, G. melanosporum, G. microcarpum, and G. intraradices), 3 Sclerocystis spp. (S. sinuosa, S. clavispora, and S. coremioides), 4 Gigaspora spp. (G. margarita, G. nigra, G. reticulata, and Gigaspora sp.), and several Acaulospora spp., including A. scrobiculata were identified. This study indicates a greater diversity of VAMF species associated with peanuts in SE Asia than in the USA. Glomus chlamydospores and Gigaspora azygospores were found in weed seeds in soil in all three countries. In the USA, both Gigaspora and Glomus species are associated with peanuts grown in the eastern part of the country whereas Glomus species predominate in the Southwest. These fungi are being established in pot culture for assessment of field performance.

Multi-State Peanut Inoculation Trials. R. S. Smith\* and J. C. Davis, The Nitragin Co., Inc., Milwaukee, WI 53209.

The response to Rhizobium inoculation (Soil Implant) was evaluated with peanuts (Arachis hypogaea L) at eleven locations in five states in 1984. All sites except one had grown peanuts previously and therefore had indigenous peanut rhizobia in the soil. Soil Implant was applied with the seed in the furrow at recommended rates (6 to 8 lbs./acre). When eleven sites were analyzed as replications Soil Implant gave higher yields than the uninoculated control at nine of the sites with an average increase of 190 lbs./acre. Although this was not statistically significant ( $P=.10$ ) net economic advantages with Soil Implant were positive in nine of the locations. The yield response ranged up to 24%. Peanut grades were determined and dollar value per acre calculated. This indicates the economical benefits obtained in most sites when peanuts are inoculated with Soil Implant.

Effects of triazole fungicides on soil-borne diseases of peanuts. P. A. Backman\* and M. A. Crawford, Dept. of Botany, Plant Pathology and Microbiology, Ala. Agric. Exp. Sta., Auburn University, AL 36849.

Yield response of florunner peanuts to control of Cercospora and Cercosporidium leafspots often has not been commensurate with the degree of control of the target diseases, particularly when some sterol-inhibitor fungicides of the triazole family have been used. In leafspot control tests conducted in 1984, the triazole fungicides XE-779 (Chevron Chemical Co.) and BAY HWG-1608 (Mobay Chemical Corp.) both increased peanut yields more than 1,300 kg/ha over the standard chlorothalonil program (yielding 5,200 kg/ha) without improving leafspot control. Data on nontarget diseases indicated that these two fungicides achieved >90% control of Sclerotium rolfsii. Similar control of S. rolfsii has been achieved with propiconazole (Ciba-Geigy's Tilt) but on an erratic basis. Since triazole fungicides are translocated in the transpiration stream, it is probable that the active ingredient must either be washed off the foliage or have been directed to the soil surface by the spray nozzles to achieve soil-borne disease control. Greenhouse research has indicated that XE-779 also suppresses chronic root rot caused by Rhizoctonia. The control of these two important soil-borne diseases, plus leafspot, indicates a potential for triazole fungicides to find a use in peanuts, particularly if yield improvements like those observed in 1984 can be repeated.

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Performance Characteristics of Dicloran, Iprodione and Vinclozolin for Control of Sclerotinia Blight of Peanut. T. B. Brenneman\*, P. M. Phipps, and R. J. Stipes. Tidewater Research Center, VPI&SU, Suffolk, VA 23437.

A technique utilizing excised peanut stems was devised to evaluate fungitoxicity of dicloran (D), iprodione (Ip) and vinclozolin (V) to Sclerotinia minor at standard spray rates of 10, 3.3 and 2.5 mg/ml, respectively. Fungicides were applied until runoff at random sites in a field of Florigiant peanuts on 30 August 1984. Lateral limbs of plants were collected immediately after treatment and weekly thereafter for bioassay. Stem segments 8-cm long were excised from the median section of each limb, wound inoculated with mycelial plugs of S. minor, and incubated in moist chambers at 20 C. Lesion development was monitored at 24 hr intervals and data used to quantify fungitoxicity. Weekly bioassay results showed V to be the most persistent product followed by D and Ip. Comparisons of fungicidal and non-fungicidal treatments by the Fisher Exact Test ( $P = 0.05$ ) indicated that V and Ip act to prevent initial infection. D was less active in preventing initial infection, but was the most effective inhibitor of lesion elongation according to the Wilcoxon Rank Sum Test ( $P = 0.05$ ). The excised stem technique has been a useful method to determine comparative fungicide activity and persistence as well as the nature of fungicide resistance. For example, isolates that developed resistance to these fungicides in vitro were found to be inhibited by the same chemicals applied to detached stems.

Control of Sclerotium rolfsii and Rhizoctonia solani in Peanut with Tolclofos-methyl and Flutolamil. A. S. Csinos\*, Dept. of Plant Pathology, University of Georgia, Coastal Plain Experiment Station, Tifton, Ga. 31794

Candidate fungicides were evaluated on peanut (Arachis hypogaea L.) grown on a Tifton loamy sand with a history of southern stem rot (incited by Sclerotium rolfsii) and Rhizoctonia limb blight. Tolclofos-methyl 5G at 1.4, 2.8, 5.6 and 8.4 kg ai/ha and flutolamil 50 WP at 1.4, 2.8 and 5.6 kg ai/ha were applied in a 40 cm band over peanut rows at pegging time. Materials were tested separately but compared to nontreated control plots and plots treated with a standard, PCNB 10G at 11.2 kg ai/ha. Materials were incorporated by afternoon showers which were frequent during July. All tolclofos-methyl treatments significantly reduced the numbers of disease loci 47 days post treatment and at digging, except the lowest rate, 1.4 kg ai/ha, which was not significantly different from the PCNB treated plots or the control at digging. Plots treated with 8.4 kg ai/ha of tolclofos-methyl reduced Rhizoctonia limb blight. Only tolclofos-methyl at 2.8 and 8.4 kg ai/ha increased yields. All rates of flutolamil reduced numbers of disease loci 47 days post treatment and at digging and had fewer disease loci than plots treated with PCNB. Rhizoctonia limb blight was reduced by only the highest rates of flutolamil. All rates of flutolamil increased yield over the control and PCNB treated plots. These fungicides provided excellent control of Southern stem rot and reduced damage from Rhizoctonia solani.

Effect Of Calcium Sulfate On Pod Rot Of Peanut cv. 'Early Bunch'. A. B. Filonow<sup>1</sup>, H. A. Melouk<sup>2</sup> and M. Martin<sup>3</sup>. Department of Plant Pathology<sup>1</sup> and USDA-ARS<sup>2</sup>, Oklahoma State University, Stillwater, OK 74078; and Agricultural Chemicals Department,<sup>3</sup> E. I. duPont de Nemours & Co., Newark, DE 19714.

Greenhouse and microplot experiments were conducted to determine if calcium sulfate ( $\text{CaSO}_4$ ) at rates equivalent to 1120 kg/ha or 2240 kg/ha would reduce pod rot of peanut cv. 'Early Bunch'. In two greenhouse experiments, peanuts were grown in pots containing soil naturally infested with Pythium myriotylum and Rhizoctonia solani (AG4). In other experiments, 50-day-old plants in pasteurized soil were inoculated in the pegging zone with soil amended with P. myriotylum.  $\text{CaSO}_4$  was applied prior to pegging. Controls were plants grown in pathogen-infested soils without  $\text{CaSO}_4$  and in noninfested soils with and without  $\text{CaSO}_4$ . Plants were harvested about three months after  $\text{CaSO}_4$  application and pods were assessed for pod rot severity using an index of 1-4, where 1=no discoloration and 4=>75% discoloration of the pod.  $\text{CaSO}_4$  at 1120 kg/ha or 2240 kg/ha did not significantly ( $p=0.05$ ) reduce pod rot severity compared to controls. Pod yields, root dry weights or shoot dry weights were not significantly ( $p=0.05$ ) increased over the controls. Microplot experiments using soil artificially infested with P. myriotylum and/or R. solani (AG4) and with 2240 kg/ha  $\text{CaSO}_4$  applied confirmed these results.  $\text{CaSO}_4$  increased the calcium content of shells and kernels over those not receiving  $\text{CaSO}_4$ ; however, there was no correlation between calcium content and disease severity of pods from treated soils.

Effect of Fungicides on Rate of Disease Progress of Sclerotinia Blight of Peanut. K. E. Jackson\* and H. A. Melouk. Department of Plant Pathology and USDA-ARS, Oklahoma State University, Stillwater, OK 74078

The effectiveness of iprodione (Rovral), vinclozolin (Ronilan), and DCNA (Botran) to control Sclerotinia minor on peanut cv. 'Florunner' was investigated. Seeds were planted on May 16, 1984 at Caddo Research Station, Ft. Cobb, Oklahoma in plots (3.65 x 12.19 m) with rows spaced at 0.91 m apart. Treatments were replicated 4 times in a randomized complete block design. Fungicide applications began on August 3 after the initial infection of S. minor was observed and were applied 3 times during the season. Incidence of S. minor was determined on August 3, 15, September 9, 21, and October 8 (harvest date). Fraction of Sclerotinia blight diseased plants at each evaluation was determined by the number of plants infected divided by number of total plants in plot. Rate of disease progress ( $r$ ) was calculated for simple interest diseases as follows:  $r = 1/t_2 - t_1 \cdot \log_e 1 - x_1 / 1 - x_2$  where  $t$ =time (days) and  $x$ =fraction of diseased plants. A significant negative correlation ( $r^2=0.80$ ) was obtained between the average rate of disease progress and yield when pooled over treatments. Fungicides that lowered the rate of disease progress significantly increased peanut yields when compared to no fungicide. Iprodione, vinclozolin, and DCNA significantly reduced the rate of disease progress following the first fungicide application. The fungicides iprodione and DCNA gave better control and increased peanut yields when applied in late September than in early September.

A Method to Quantify Rhizoctonia solani Inoculum Density for Greenhouse and Field Resistance Screening of Peanut Germplasm. K. E. Woodard\*. Texas Agricultural Experiment Station, Stephenville 76401.

Rhizoctonia solani was grown on sterile grain sorghum seed for two weeks. After drying, the culture was ground to pass a 20 mesh screen. Particles retained on a 42 mesh screen were counted and germinated on water agar. The number of viable particles in 1.0 g ground material (GM) was determined to be 2900. Each viable particle was considered to be one propagule of R. solani. Greenhouse tests were conducted with 5.8 kg soil/flat. The number of propagules recovered from soil was determined by a screening method (Phytopathology 67:566-569).

Sterile and nonsterile soil was used in greenhouse tests and untreated 'Tamnut 74' peanut seed were used in all tests. Seedling survival in sterilized soil at 21 days was 95, 69, 40, 21, 4, and 0%, and recovery of propagules/100 g soil was 0, 8, 14, 18, 17, and 17 for 0, .10, .25, .50, 1.0, and 2.0 g GM, respectively. Seedling survival in nonsterile soil was 76, 79, 74, 26, 5, and 1% and recovery of propagules/100 g soil was 3, 3, 5, 15, 17, and 17 for 0, .25, .50, 1.0, 2.0, and 4.0 g GM, respectively.

Seedling survival in field plots at 21 days was 75, 68, 57, 30, and 8%, and recovery of propagules/100 g soil was 0, 3, 10, 7, and 17 for 0, .25, .50, 2.5, and 5.0 g GM/10 row-ft, respectively.

Effects of Bacillus subtilis on Seedling Emergence and Pod Yield on Spanish Market Type Cultivars and Florunner. A.J. Jaks, D.H. Smith\*, R.E. Davis, and B.D. Dolton, Texas A&M University Plant Disease Research Station, Yoakum, TX. 77995.

A Bacillus subtilis seed treatment either alone or in combination with fungicide seed treatments was evaluated in twelve separate tests over four years. Florunner was included each year, but three different spanish market type cultivars were planted during the four year testing period. Pod yield data were obtained in eight tests conducted in 1982, 1983, and 1984. At ca 2 weeks after planting, the percentage emergence for Florunner was 50.7 for untreated seed and 56.5 for treatments that included B. subtilis as compared with 57.1 and 65.4 for untreated and Bacillus treated seed at ca 4 weeks after planting. At ca 2 weeks after planting, the percentage emergence for spanish market type cultivars was 63.7 for untreated seed and 62.5 for treatments that included B. subtilis, as compared with 78.7 for untreated and 78.2 for Bacillus treated seed at ca 4 weeks after planting. Florunner pod yields in four tests over a 3 year period were 2574 lb/A for untreated seed as compared with 2986 lb/A for treatments that included B. subtilis seed treatments. Pod yields for spanish market type cultivars in four tests over a 3 year period were 2289 for untreated seed as compared with 2426 for treatments that included B. subtilis. Visual differences in plant vigor were not observed in these tests.

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Evaluation of *Bacillus thuringiensis* for Peanut Leafspot Control in Five States. H. W. Spurr, Jr.\* and G. R. Knudsen, USDA-ARS, Tobacco Research Laboratory, Oxford, NC 27565; J. E. Bailey, NC; R. H. Littrell, GA; D. H. Smith, TX; and T. R. Young, FL.

In small-scale field tests, *Bacillus thuringiensis* (Bt) provided 70% control of early leafspot (*Cercospora arachidicola*). In 1982, a large-scale field test was performed in NC. Bt was formulated with xanthan gum and talc into a wettable powder and applied at intervals. Defoliation by early leafspot was reduced by 30% and peanut yield increased by 582 lbs/A. In 1984, this formulation of Bt was field-tested in VA, NC, FL, GA and TX. Sprays contained  $10^7$  bacterial spores/ml and were applied at 14-day intervals for control of early and/or late leafspot (*Cercosporidium personatum*). Leafspot diseases were more severe at all sites than observed in NC in 1982. Significant, but low control of early leafspot was obtained in VA and FL and no control in NC. No control of late leafspot was observed in GA and TX. These results indicate the need for both increased efficacy and a wider spectrum of activity if bacterial agents are to successfully control peanut leafspot under environmental conditions that promote severe disease.

A Simulation Model Explores Fungicide Application Strategies to Control Peanut Leafspot. G. R. Knudsen\* and H. W. Spurr, Jr., USDA-ARS, Tobacco Research Laboratory, Oxford, NC 27565.

Our computer simulation model (Phytopathology, in press) was used to explore the relative benefits of fixed-interval (14-day) vs weather-based advisory fungicide scheduling to control *Cercospora* leafspot of peanut. The dependent variable was predicted cost (crop loss + control cost). Sensitivity of this variable to changes in protectant fungicide efficacy (probit of % inhibition vs log dose model) and persistence (exponential decay model) was examined using historical and simulated weather data. Predicted cost was generally lower for the advisory system. An exception was in a very warm, humid season with an effective and persistent fungicide, in which case sprays using the advisory were unnecessarily frequent. Generally, predicted disease incidence was lower and less sensitive to fungicide characteristics under the advisory system. It was assumed that a grower could always spray on the same day recommended by the advisory; if this assumption was not met (i.e., a delay of two or more days), any cost advantage of the advisory was reduced.

Predicting Yield Response of Peanut to Various Disease Severity Levels of Late Leaf Spot (*Cercosporidium personatum*) by Measuring Reflectance of Sunlight from Peanut Canopies. F. W. Nutter, Jr.\* and R. H. Littrell, Departments of Plant Pathology, University of Georgia, Athens 30602 and Coastal Plain Station, Tifton 31793.

Measuring the spectral quality of sunlight reflected from peanut canopies in discreet wavelength bands may provide a more objective method of assessing leafspot severity than visual assessment methods. To test this hypothesis, 200 leaf spot epidemics of different intensities were established in peanut (*Arachis hypogaea* cv. 'Florunner') field plots by using fungicides that differed in control efficacy and by altering fungicide schedules. Disease severity was measured 115 days after planting by visual assessment (comparing leaves to standard area diagrams) and by recording the quality of sunlight reflected from peanut canopies in 50 nm wavelength band widths in the 500- to 850-nm wavelength range using a hand-held multispectral radiometer. Critical point regression models were developed to relate either reflectance values ( $X_1$ ) or visual disease severity measurements ( $X_2$ ) to pod yield ( $Y$ ). Critical wavelength bands from 550 nm to 850 nm all explained a greater proportion of the variation in yield ( $R^2$  ranged from 71 to 76%) compared to the model based on visual leaf spot severity assessments ( $R^2=65\%$ ). Besides providing more accurate and objective estimates of yield potential in response to late leafspot epidemics, reflectance-based yield predictions for the 200 plot experiment were derived in less than 4 hours, whereas the visual method required more than 80 hr. Use of reflectance data to assess leaf spot severity should provide more uniform, accurate, and objective leaf spot evaluations from location to location, and year to year to evaluate control strategies.

Cercosporin production by the peanut leaf spotting fungi,  
*Cercospora arachidicola* and *Cercosporidium personatum*.

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The in vitro production of cercosporin by three pathogenic isolates of each of *Cercospora arachidicola* and *Cercosporidium personatum* was tested in crude acetone cultural extracts by thin layer chromatography. Only one isolate of *C. arachidicola* and two of *C. personatum* produced the toxin. The amount of cercosporin produced by one of the isolates of *C. personatum* was much greater than that produced by the other or even by the *C. arachidicola* isolate. Physical characterization of the isolated red bands has shown that the three bands are identical to the Fajola's (Physiological Plant Pathology 13: 157-164) cercosporin with a characteristic absorption peak at 470 nm. The red toxin was soluble in acetone, fairly soluble in diethyl ether and ethyl alcohol and insoluble in water and petroleum ether. Since one of the three isolates of *C. arachidicola* does not produce detectable amounts of cercosporin, the involvement of cercosporin in pathogenesis is not clear in the peanut leaf spot disease syndrome. (See paper, page 13.)



Field and Greenhouse Evaluation of Components of Partial Resistance to Early Leafspot in Peanut. C. C. Green\* and J. C. Wynne. Dept. of Crop Science, N. C. State University, Raleigh 27695.

Ten peanut (*Arachis hypogaea* L.) genotypes were evaluated for components of partial resistance to *Cercospora arachidicola* Hori in the field and in two detached leaf tests in the greenhouse. The genotypes were significantly different for all components of resistance measured in the field and for most components measured in the greenhouse. In the field necrotic area  $\text{mm}^2/10 \text{ cm}^2$  leaf area was correlated ( $r = .58$ ) with lesion number/ $10 \text{ cm}^2$  leaf area and with total lesion number ( $r = .76-.76$ ), predicted number of days after planting (X) to reach a standard lesion count, and defoliation. In the greenhouse only necrotic area ( $\text{mm}^2$ )/ $10 \text{ cm}^2$  leaf area and total sporulation were correlated ( $r = .71-.83$ ) in both tests. Necrotic area ( $\text{mm}^2$ )/ $10 \text{ cm}^2$  leaf area measured in the field was correlated ( $r = .66$ ) with its measurement in the greenhouse. Total sporulation in the greenhouse was correlated ( $r = .66$ ) with lesion increase in the field. Thus, evaluation and selection for components of partial resistance in the greenhouse can be used to develop resistant lines for the field.

Advances in Deployment of the Peanut Leafspot Advisory in North Carolina Using an Electronic Weather Station. Jack E. Bailey\*, C. A. Matyac. Box 7616, Dept. of Plant Pathology, North Carolina State University, Raleigh, N. C. 27695-7616.

The absence of a suitable weather data base has limited the implementation of the peanut leafspot advisory system in North Carolina. Portable, solar-powered, electronic weather stations, were developed (1985) to deploy Jensen and Boyle's (1966) leafspot advisory model. A dew point sensor was developed in an effort to reduce the effects of dust and other common farm contaminants on the accuracy of atmospheric moisture readings. Ten to fifteen 'forecasters' will be tested in 1985 on North Carolina farms for their accuracy and general acceptance by the farming community. It is expected that many growers and county agents will develop their own local advisory systems.

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Concentration of Chlorothalonil Spray Droplets on Yield of Florunner Peanut.  
R. H. Littrell, Department of Plant Pathology, University of Georgia, Coastal Plain Station, Tifton, GA 31793.

Chlorothalonil as Bravo 500 was applied at 0.62 kg/ha (1/2 dose) and 1.24 kg/ha (full dose) in 9 liters, 28 liters, or 56 liters/ha using the CDA appliance. Sprays were initiated 45 days after planting and applied every 14 days until two weeks of harvest. After the fifth application, the concentration of Chlorothalonil residue was determined on the top, middle, and lower canopies. A conventional boom spray (CBS) was also used to apply full and 1/2 dose of Chlorothalonil in 94 liters of spray/ha. Pod yield from plots treated with the CBS was considered maximum. Plants treated with the CDA appliance reached maximum pod yields when 1/2 dose was used in 9 liters of spray. Significant yield reductions were found when full dose of fungicide was used. Maximum pod yields were obtained when 28 liters of spray at full dose were used. Significantly less than maximum yield was obtained when 1/2 dose was used with CBS or 56 liters of spray using the CDA. Residue concentration tended to be negatively correlated with yield when fungicide was applied with the CDA appliance. There was no association detected between yield and residue using the CBS. Highest concentration of residue detected in the top canopy when peanuts were treated using the CBS or the CDA in 28 liters of spray.

Effects of fungicides on the control of peanut rust in Alabama. M. A. Crawford and P. A. Backman, Department of Botany, Plant Pathology and Microbiology, Ala. Agric. Exp. Sta., Auburn University, AL 36849.

Peanut rust caused by Puccinia arachidis is a late season disease in the southern United States which can be very destructive under the proper environmental conditions. In fungicide trials conducted over the past 10 years at Headland, Alabama, for the control of peanut leafspots, chlorothalonil applied on a 14-day schedule of 1.2 kg/ha has consistently controlled peanut rust. There has been little difference found in the efficacy of chlorothalonil in controlling rust when applied either at a 10-day or 14-day spray interval. Chlorothalonil used at 875 g/ha in a full season program (14-day schedule, 6 applications) was less effective in controlling peanut rust than at 1.2 kg/ha. Applying chlorothalonil with CDA equipment (Micromax 1.5 gpa) significantly improved the efficacy of chlorothalonil at 875 kg/ha. In 1984, in which a severe outbreak of peanut rust occurred, chlorothalonil (1.2 kg/ha), bitertanol 25 WP (280 g a.i./ha), HWG 1608 (210 g and 280 g a.i./ha), XE-779 25 WP (45 g/ha) + chlorothalonil (581 g/ha) and XE-779 25 WP (280 g/ha) alternating with chlorothalonil (1.2 kg/ha) were very effective in controlling peanut rust. Generally, it has been observed that the triazole fungicides have been less effective than chlorothalonil against peanut rust; however, there is considerable variability within the group.

Disease Progress of Early Leaf Spot (*Cercospora arachidicola*) in Two Peanut Genotypes. H. A. Melouk. USDA-ARS, Box 1029, Dept. of Plant Pathology, Oklahoma State University, Stillwater, OK 74078

Peanut genotypes Pronto and OK-FH 14 were planted June 6, 1984 at Bixby, OK. Each plot consisted of 4 rows that were spaced 0.91 m apart and were 6.15 m long. Each genotype was planted in 4 plots in a complete randomized design. Ocular estimates (nearest 5%) of leaf necrosis and leaf defoliation were determined on September 6, 13, 20 and 27. Total disease was calculated at each date as described by Plaut and Berger (Peanut Science 7:46-49, 1980). Rate of disease progress was calculated using the logistic equation for a compound interest disease. Rates of disease progress for Pronto and OK-FH 14 were 0.036 and 0.012, respectively. Conidial density (conidia/mm<sup>2</sup> of necrotic area) of *Cercospora arachidicola* did not differ significantly between the genotypes at the determination dates.

Resistance to *Didymella arachidicola* in Wild *Arachis* Species. P. Subrahmanyam and D. H. Smith, Texas A & M University Plant Disease Research Station, Yoakum, TX. 77995; and C. E. Simpson\*, Texas Agricultural Experiment Station, Texas A & M University System, Stephenville, TX. 76401.

Reactions of 50 accessions of wild *Arachis* species to peanut web blotch (*Didymella arachidicola*) were tested in the glasshouse. Accessions classified as resistant included six of *A. batizocoi*, 12 of *A. duranensis* nom. nud., three of *A. appressipila* nom. nud., one each of *A. sylvestris*, *A. cardenasii* nom. nud., *A. paraguariensis*, *A. glabrata*, *A. pintio* nom. nud., and *A. monticola* and five (species unnamed) of section *Arachis* nom. nud., and one each of sections *Ambinervosae* nom. nud., and *Erectoides* nom. nud. One accession of *A. glabrata* was immune to *D. arachidicola*. These sources of resistance may be useful in interspecific hybridization programs.

Effect of Leafspot Spray Cycle on Some Quality Factors of Peanuts. T. H. Sanders<sup>1</sup>, D. W. Gorbet<sup>2</sup>, F. M. Shokes<sup>3</sup>, and J. L. McMeans<sup>1</sup>. <sup>1</sup>USDA, ARS, National Peanut Research Laboratory, Dawson, GA 31742, <sup>2</sup>Agricultural Research Center, University of Florida, Marianna, FL 32446, and <sup>3</sup>Agricultural Research and Education Center, University of Florida, Quincy, FL 32351.

Peanut leafspot control is critical to maintaining yield of peanuts, but the relationship of leafspot control to various quality factors has not been adequately investigated. As part of studies in 1981 and 1983 to identify breeding lines with leafspot resistance and assess the effect of leafspot spray cycles on those lines, quality parameters were determined on peanuts from three breeding lines with different levels of resistance to leafspot and the cultivar 'Florunner.' Main plot treatments consisted of 1) no fungicide applications, 2) applications of chlorothalonil (500 g/l) on 14-day intervals, and 3) 20-day intervals. After yield data had been collected, 700 g samples were shelled and sized. Seed riding 7.14 mm (18/64 in) and 7.94 mm (20/64 in) slotted screens were combined and analyzed for free-fatty acids, total carbonyls, carbohydrates, fatty acid profile, and percent oil. Of these various parameters, total oil, seed size distribution, and fatty acid profile changed in response to the spray cycle. Generally, with the 14-day interval, total oil was slightly higher, seed size distribution was shifted upward, and fatty acid profile contained a greater percentage of linoleic acid and less percentage of oleic acid. These data suggest a change in quality that may be ascribed in part to loss of mature pods and/or increased soil temperature as defoliation increases.

Resistance of Three Peanut Breeding Lines to Cercospora Leafspot. K. V. Pixley\*, F. M. Shokes, D. W. Gorbet, and K. J. Boote, Dept. of Agronomy, Univ. of Florida, Gainesville, FL., NFREC, Quincy, FL, AREC, Marianna, FL., and Univ. of Florida, Gainesville, FL

Three peanut breeding lines with varying degrees of resistance to leafspot diseases, were compared to the cultivar 'Florunner' under good and no leafspot control. Leafspot epidemic development was monitored at 10-day intervals, by four methods: 1) proportion of diseased tissue was assessed in three leaf canopy layers, 2) disease progress on individual leaves was recorded from leaf appearance until leaf abscission, 3) canopy defoliation was estimated using leaf counts on plant main stems, and 4) leaf area index (LAI) was measured as a further indicator of defoliation. Apparent infection rates of breeding lines F81206, F80202, and MA72x94-12 were only 55, 65, and 50% as great as that of Florunner. Proportion necrotic tissue began its rapid increase 20 or 30 days earlier on Florunner than on the breeding lines. Individual leaves of the breeding lines had slower apparent infection and longer time to leaflet abscission than leaves of Florunner. Areas under disease progress curves of Florunner were 5 to 16 times greater than those of the other genotypes. Defoliation began earlier, lowered LAI more rapidly, and was more complete on Florunner than on the three breeding lines. Rate-reducing resistance to leafspot, and greater leaf growth during pod fill, enabled the breeding lines to maintain high LAI, favorable for photosynthesis and yield achievement, longer than Florunner.

Peanut Scab (*Sphaceloma arachidis* Bit. & Jenk.), L.M.Giorda\* and M.Bragachini. Manfredi Experimental Station-Cordoba-INTA, Argentina. EEA.Manfredi, 5988 Manfredi.

Efforts to manage the disease caused by *Sphaceloma arachidis* in Argentina were focused on screening for resistance and assaying different fungicides. Screening for resistance was performed using commercial cultivars and also the peanut germplasm collection (housed at Manfredi Experimental Station). The cultivars most affected were Manfredi 68 INTA, Virginia 5 and 3 INTA, Blanco Santa Fe, Blanco Rio Segundo INTA and Florunner. Cultivars selected as resistant were Colorado Irradiado INTA, Colorado Comun and Bolivian types.

Among fungicides assayed, Benomyl (50 wp) was tested for efficacy against peanut scab on the Manfredi 68 INTA peanut cultivar using a split-split plot design with 4 reps. The fungicide was applied to plants grouped according to two disease levels- 2 and 3.5 (based on a 1 to 5 scale)-. The fungicide was applied twice during the season (at 70 and 90 DAP) at the rate of 125 gm a.i./ha. The fungicide controlled both peanut scab and early leaf spot over time at the two levels of damage considered. Benomyl treated plots showed significant differences over controls for seed and pod numbers, weight (100 seeds and pods), percentage of healthy and diseased pods, and yields. Average yield reduction was 30.3 and 32.7 % for the 2 and 3.5 disease levels, respectively.

Western Blotting for Detection of Peanut Mottle Virus and Peanut Stripe Virus.

J. L. Sherwood. Department of Plant Pathology, Oklahoma State University, Stillwater, OK 74078

Western blotting was used to detect single or double infections of plants with peanut mottle virus (PMV) and peanut stripe virus (PStV). Leaf samples were ground in 0.01 M phosphate buffer, pH 8.0, diluted in electrophoresis sample buffer and heated for 5 min at 95C prior to electrophoresis in 12% polyacrylamide gels. After electrophoresis, proteins were transferred to nitrocellulose sheets at 100V for 45 min. Western blots were performed by first blocking unbound sites on the nitrocellulose with 5% non-fat dry milk in Tris-buffered saline (TBS), pH 7.4, for 30 min, followed by incubation in a 1/200 dilution of PMV and/or PStV antiserum in TBS (the latter antiserum provided by J. Demski, U. of Ga.) for 45 min. This was followed by incubation in protein-A-peroxidase (2 ng/ml in TBS) for 45 min, followed by 4-chloro-1-naphthol plus hydrogen peroxide in TBS. With purified virus, as little as 25 ng of either PMV or PStV was detected. Because of the difference in migration of the coat proteins of PMV and PStV both may be detected in doubly infected plants. The assay can be performed in approximately 6 hours when minigels are used for the initial electrophoretic separation and does not require the antiserum to be fractionated or bound to an enzyme as is the case with ELISA.

## Harvesting, Curing, Storing, Marketing and Utilization

The Effect of Microwave Drying of Shelled Peanuts on Energy Requirements, Physical Properties, Mycological Growth and Germination Potential. S. R. Delwiche<sup>1</sup>, W. L. Shupe<sup>1</sup>, J. L. Pearson<sup>2</sup> and T. H. Sanders<sup>2</sup>. <sup>1</sup>USDA-ARS, Southern Agricultural Energy Center, Tifton, GA 31793 and <sup>2</sup>USDA-ARS, National Peanut Research Laboratory, Dawson, GA 31742.

Peanuts of the Florunner variety at moisture contents ranging between 8% and 22% (wb) were shelled and microwave vacuum dried at treatment rates of 4, 8, 16 and 32 times the nominal recommended rate for conventional wagon drying. Electrical energy per unit dry mass supplied to the microwave generators was closely equivalent to the energy content of L. P. gas used in wagon drying. An analysis of variance indicated that the propensity of microwave treated kernels toward splitting and skin slippage was insignificant when compared to conventional within shell deep bed dried control samples. Significant differences ( $\alpha=0.01$ ) existed for presence of Aspergillus flavus on kernel surfaces of the pooled microwave treatments compared to check samples though differences among the microwave treatments were insignificant. Aflatoxin was not detected on any microwave or control treatments. The percentage of normal strong germinated kernels from microwave treatments was significantly lower ( $\alpha=0.01$ ) than that of the control samples with germination decreasing with increasing microwave process rate.

Quality Comparisons Between Microwave-Vacuum-Dried and Heated-Air-Dried Florunner Peanuts. J. L. Pearson<sup>1</sup>, T. H. Sanders<sup>1</sup>, J. L. McMeans<sup>1</sup>, S. P. Delwiche<sup>2</sup>, W. L. Shupe<sup>2</sup>, and J. L. Butler<sup>1</sup>. <sup>1</sup>USDA, ARS, National Peanut Research Laboratory, Dawson, GA 31742, and <sup>2</sup>USDA, ARS, Southern Agricultural Energy Center, Coastal Plain Experiment Station, Tifton, GA 31793.

Thirty-two quality parameters and other variables of Tifton, Georgia-grown, 1984-crop, Florunner peanuts were evaluated after the peanuts had received microwave-vacuum (MV) treatment, conventional (heated-air) drying of shelled kernels (CS) or conventional drying treatment of in-the-hull peanuts (CH). Four rates of MV drying (4x, 8x, 16x, 32x) were distributed evenly (1 each per Block) over a 4 X 4 Latin Square design of 4 harvest dates (Blocks), one week apart, X 4 segments of drying time (Orders), one day apart. Additionally, CS and CH samples (1 each per intersection) were prepared. Quality tests of medium and larger kernels were run after 5 to 8 mos. cold storage.

In a full analysis by General Linear Models (GLM) procedure of the MV Latin Square (no CS or CH), the following numbers of quality parameters and other variables showed significant differences (5%) among the test factors: Block = 12, Orders = 7, MV Rates = 1. ANOVA among means of 6 drying treatments (CS, CH and 4 rates of MV) found significant (5%) difference for only 3 quality parameters. Flavor was not one of them.

EFFECT OF CHILLING INJURY ON WINDROWED PEANUTS. J. A. Singleton and H. E. Pattee, USDA, ARS, Departments of Botany and Biological and Agricultural Engineering, N. C. State University, Box 7625, Raleigh, NC 27695-7625.

Peanuts (cv. Florigiant) were exposed to chilling temperatures the first three nights after they were dug and windrowed (inverted windrows) at the Peanut Belt Research Station, Lewiston, NC. Minimum air temperatures during the first, second, and third nights were 1.6°C, -0.8°C, and -0.9°C, respectively. Temperatures remained above 4.2°C until the peanuts were harvested at ca. 25% moisture (wet basis). After the peanuts were dried to ca. 8% moisture, ethanol concentration in chilled seeds with diameters between 5.95 mm and 6.75 mm were higher than in larger chilled seeds with diameters between 6.75 mm and 8.33 mm from the same treatment. Normal ethanol concentrations were observed for both large and small seeds in the control. Specific conductivity of leachates from the small diameter chilled seeds was 2 to 3 times higher than the control. Only small differences were observed in the specific conductivity of leachates from the large diameter seeds for the chilled treatment and the control. Germination of seed exposed to chilling temperatures and the control were 74% and 88%, respectively. Respiration of small seeds in windrowed peanuts was affected when exposed to temperatures near 0°C whereas the affect on larger seeds was negligible.

A Semi-Underground Warehouse Model for Farmers Stock Peanuts. J. E. Smith, Jr. and T.H. Sanders, USDA-ARS, National Peanut Research Laboratory, 1011 Forrester Drive, SE, Dawson, GA 31742.

A 3 m long x 1.5 m wide x 1.5 m deep precast concrete tank 8 cm thick was waterproofed and installed in the ground with the top of the tank at ground level. Two courses of 20 cm concrete blocks were installed around the top and the warehouse was covered with a sheet-metal gable roof having a 1/2 pitch. This gave a peanut storage capacity of 10.2 m<sup>3</sup>. A small fan located in the south gable gave a headspace air change rate of once every two minutes. Thermocouples and relative humidity sensors were placed at various locations throughout the warehouse before filling. Temperatures and relative humidities were recorded at 2-hour intervals throughout the 8-month storage period. Peanut samples located throughout the model warehouse stored as good or better as those in a conventional warehouse.

Required Equilibrium Time for Peanut Moisture Content Determination with Electronic Moisture Meters. J. H. Young, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, North Carolina 27695-7625.

During the 1984 peanut harvest season, peanut samples were removed from dryers at varying moisture contents, shelled immediately for moisture determination, and then tested in a Dickey-john GAC-II moisture meter after various periods of storage (up to 24 hrs) in moisture proof containers. Oven moisture contents were then determined for the samples. The differences between oven moistures and meter readings were initially quite high for high moisture peanuts but were considerably reduced during the 24 hour storage period. Smaller changes in moisture readings were obtained for peanuts near the levels normally experienced in the marketing process. Similar equilibration tests were conducted with freshly shelled samples taken from storage. Results indicate that some of the initial deviation between oven and meter readings was still present even though moisture equilibrium within the kernels had already been achieved. This suggests an initial effect on meter readings of the damage caused in the shelling process.

Aflatoxin - Incidence, Segregation and Destination in Australia. A. Baikaloff\* and M. J. Read, The Peanut Marketing Board, P.O. Box 26, Kingaroy, 4610, Australia.

The occurrence of aflatoxin in the Australian peanut crop is mainly due to regional, late season drought stress. The Peanut Marketing Board uses a mini-column test to segregate positive (>16 ppb) farmers' stock at the point of delivery. To check the effectiveness of this segregation, an investigation was made to quantify the incidence of aflatoxin at several major points in the deshelling, grading and blanching operations. The "positive" segregation contained an aflatoxin concentration eight times higher than the "negative". Seventy-one per cent of the aflatoxin through the shellers was concentrated into the oil milling kernels, which comprised sixteen per cent of the total kernels. Oil kernels from "negative" and "positive" stock averaged 48 ppb and 253 ppb respectively. It appears that in excess of fifty per cent of the aflatoxin in the product which was roasted and blanched was lost and/or degraded in the operation.



An Audible Scarecrow for Protecting Harvested Peanut Plots. D. J. Banks. USDA-ARS, Plant Science and Water Conservation Laboratory, P.O. Box 1079, Stillwater, OK 74076.

A need for protecting the pods of harvested peanut vines against the ravages of crows in research plots led to the construction of a noise-making device that is effective in repelling birds. The device consists of an automobile tape player and a 12-volt battery mounted in a water-proof box to which external horn speakers are mounted. The projected sounds are home-recorded from selected sound-effect recordings. This device has potential for use in various crops, orchards, and livestock pens where birds and other predators present problems. (See paper, page 19.)

Co-precipitation of Peanut and Soybean Milks to Form Tofu. T.O.M. Nakayama.\* Department of Food Science, University of Georgia Experiment Station, Experiment, GA 30212.

A mixture of one-third (w/w) peanuts and two-thirds soybeans was used to prepare tofu in a traditional manner. Calcium sulfate was used as the precipitant. The resulting curds were shown to reflect the increased contribution of lipid from the peanuts. Inorganic analyses revealed no significant differences between the tofu made from peanuts, soy, and the mixture. Analysis of protein and amino acid indicates a similar result, suggesting that the protein-lipid complex is precipitated as a whole. Spoilage under ordinary conditions at room temperature indicated that the pH drops in a similar manner, yielding an acidified product. Implications of these and the role of peanuts as an ingredient will be discussed.

Effect of Seed Size on the Fatty Acid Composition of Peanut Cultivars. R. W. Mozingo\*, T. A. Coffelt and J. C. Wynne. VPI&SU and USDA-ARS, Tidewater Research Center, Suffolk, VA 23437 and Dept. of Crop Sci., North Carolina State University, Raleigh, NC 27607.

Five virginia-type peanut (*Arachis hypogaea* L.) cultivars grown at the Peanut Belt Research Station in Lewiston, NC and Tidewater Research Center in Suffolk, VA for three years (1982-84) were evaluated for fatty acid composition. The cultivars used were NC 7, VA 81B, NC 6, Florigiant and GK 3. Each cultivar was sized into three shelled commercial grades (extra large, medium and No. 1) for analysis. Significant differences were observed among cultivars for all fatty acids, oleic/linoleic (O/L) ratio and computed iodine value. Increase in the peanut seed size from No. 1 to medium to extra large grade resulted in a significant increase in the percentage of stearic, oleic and arachidic acids and a significant decrease in the percentage of palmitic, linoleic, eicosenoic, behenic, and lignoceric acids. Significantly lower computed iodine values and significantly higher O/L ratios were recorded for the larger seed sizes.

Meat Quality Characteristics and Backfat Fatty Acid Composition of Swine As Affected by the Consumption of Peanuts Remaining in the Field After Harvest. R. O. Myer\*, R. L. West and D. W. Gorbet. University of Florida, AREC, Marianna, FL 32446.

Meat quality characteristics and changes in backfat fatty acid composition were evaluated in swine that were allowed to obtain part or all of their weight gain during the growing-finishing (G-F) period (26 to 104 kg) from gleaning peanuts (P) remaining in the field after harvest. Thirty-six pigs were allotted evenly among the following six treatments: 1) pigs fed a corn-soybean meal diet (C) during the entire G-F period (CCC); 2) pigs fed C for the first two-thirds of the G-F period and then allowed to glean P for the last third (CCP); 3) P for the first third and C for the last two-thirds (PCC); 4) C for the first third and P for the last two-thirds (CPP); 5) P for the first two-thirds and C for the last third (PPC); and 6) P during the entire G-F period (PPP). Fat of carcasses from pigs in CPP, PPC and, in particular, PPP groups was softer ( $P < .05$ ) than those from pigs in CCC, CCP and PCC groups. Ratio of unsaturated to saturated fatty acids in backfat increased ( $P < .05$ ) in proportion to the amount of weight gained while pigs gleaned P, mainly due to increases in C18:1 and C18:2 and decreases in C16 and C18. The gleaning of P by swine for more than one-third of the G-F period detrimentally affected carcass fat firmness and loin marbling scores, but had no effect on palatability of broiled loin chops.

The Influence of Anhydrous Ammonia on Dry Seeds of Peanut. L. W. Woodstock\* and H. Tsao, Seed Research Laboratory, ARS, Beltsville, MD 20705 and Horticulture Dept., University of Maryland, College Park, MD.

The toxic effects of anhydrous ammonia on dry seeds of peanut (Arachis hypogaea CV. 'Florigiant') were assessed in this study. Peanut seeds were exposed to 0, 20, 200, 2000, 20000 and 200000 ppm  $\text{NH}_3$  for 2, 6, 12 and 24 hours at 25°C and then planted on moist paper towels and scored for germination. The toxic effects of  $\text{NH}_3$  became more severe with exposure duration, e.g., a 2-hr exposure to 20000 ppm  $\text{NH}_3$  was not injurious, whereas a 24-hr exposure was lethal. A 24-hr exposure to 2000 ppm  $\text{NH}_3$  caused some reduction in seedling growth.  $\text{NH}_3$  concentrations of 20 and 200 ppm did not result in injury, even after a 24-hr exposure. We conclude that levels of  $\text{NH}_3$  likely to be encountered in a warehouse following a leak (i.e., 20-200 ppm) are unlikely to have an adverse effect on the germination or growth of peanut seeds.

An Evaluation of Peanut Marketing Alternatives Under Changing Government Policies. D. H. Carley\*, J. E. Epperson and S. M. Fletcher. Dept. of Agricultural Economics, University of Georgia, Experiment, GA 30212.

Until the changes in government support price policies in 1981 peanut growers were primarily price takers having little experience with competitive markets. With decreasing quotas and unlimited production of additional, there is increasing competition for quota and additional peanuts among buyers. Tie-in forward contracts between farmers and buyers are now quite common. A shift in government policy to even less intervention may lead to the need for different marketing alternatives. A random sample of 530 peanut farmers, 95 middlemen and 57 processors responded to a questionnaire concerning their attitudes toward the need and acceptance of different alternatives. Alternatives included cash markets, formal forward contracts, futures markets, electronic market exchanges, farmer cooperatives and federal marketing orders. In addition, on farm or rented storage by farmers may become desirable which may increase the need for improved quality control. Most market participants were satisfied with current methods of marketing peanuts. Under a no government price policy scenario most were in favor of more formalized methods. Analysis of variance and multivariate probit analysis indicate statistically significant differences in attitudes and reasons for acceptance among the market participants. In developing new methods for marketing peanuts identification of differences in attitudes and acceptance are important.

# Entomology and Weed Control

Influence of Host, Planting Date, and Host Developmental Stage on Damage by the Lesser Cornstalk Borer. R. E. Lynch\* and J. E. Funderburk, Insect Biology and Population Management Research Laboratory, USDA-ARS, Tifton, GA 31793, and North Florida Research and Education Center, Quincy, FL 32351.

Research was conducted for 2 years at Tifton, GA, and Quincy, FL, to determine the influence of peanut, soybean, corn, and sorghum planting dates and stage of plant development on damage by the lesser cornstalk borer, Elasmopalpus lignosellus (Zeller). During June, July, and early August, corn and sorghum were most susceptible to lesser cornstalk borer damage. Damage was greatest to plants in the seedling stages of growth. However, during late August, September, and October, peanut and corn were the most susceptible to lesser cornstalk borer damage. The lesser cornstalk borer not only damages seedling plants but also attacks essentially mature corn and sorghum.

Sensitivity Analysis of a Mathematical Model for Lesser Cornstalk Borer Population Dynamics on Florunner Peanuts. T. P. Mack\*, B. Reed and J. W. Smith. Zoology-Entomology Department, Alabama Agricultural Experiment Station, Auburn University, AL 36849.

A population model for lesser cornstalk borers (Elasmopalpus lignosellus (Zeller) (Lepidoptera: Pyralidae) attacking Florunner peanut plants has been developed. Sensitivity analyses were conducted on the model to determine the importance of the 48 model constants in determining model behavior. A 16 by 256 fractional factorial design was employed for each analysis, where the 48 constants were combined into 16 groups, and each group was varied by plus or minus 20% according to the factorial. The model was run for 35 days each of the 256 times it was run for a particular sensitivity analysis. The variables calculated each time the model was run included the peak width, peak maximum, and the population sum for the lesser cornstalk borer egg, larval, pupal and adult populations. Sensitivity analyses were conducted under six sets of environmental conditions because the environment influences model behavior. During extended periods without rain, the degree day requirements for the immature stages were very important in determining model behavior. The age distribution of the initial adult population and the number of individuals within each age class were also very important. During periods with rainfall, soil moisture became very important, particularly the soil moisture at which oviposition is decreased and at which larval mortality is assumed to occur.

Effect of Various Planting-Time and Pegging-Time Chemical Combinations on Southern Corn Rootworm Infestations in Peanuts. J. C. Smith\* and J. L. Steele. VA Tech and USDA-ARS, respectively. Tidewater Research Center, Suffolk, VA 23437.

EPA-registered, granular, systemic insecticides were applied at recommended rates as in-furrow or band applications at planting, and pegging-time. Chemicals applied at planting included aldicarb, phorate, disulfoton, carbofuran and fenamiphos. Chemicals applied at pegging-time were carbofuran, phorate, fonofos, ethoprop and chlorpyrifos. A randomized complete block design was used at one site in Greensville and Isle of Wight Counties and at two sites in the City of Suffolk. Generally, all treated combinations gave satisfactory control of rootworms. Yields and values did not always positively correlate with efficacy data. There was consistently more rootworm injury in plots treated at planting-time with systemic insecticides than in plots which were untreated at both planting and pegging or at pegging-time alone.

Effects of the Use of Pesticide Combinations for Control of Insects, Soil-borne Diseases and Nematodes in Peanuts. L.W. Morgan\* and A.S. Csinos, Coastal Plain Experiment Station, University of Georgia, Tifton, Georgia and N.A. Minton, USDA/ARS, Tifton, Georgia.

Combinations of insecticides, fungicides and/or nematicides for control of soil-borne insects, diseases and nematodes in peanuts following wheat were studied at Tifton in 1984. The experiments were conducted on 3 sites, each with a different species of nematode. Lesser cornstalk borer larvae, Elasmopalpus lignosellus z, and southern blight, Sclerotium rolfsii, were present at all three locations. Treatments at all locations consisted of tillage (mold-board plow and rip-plant), nematicides (phenamiphos, 2.8 kg a.i./ha; aldicarb, 2.8 kg a.i./ha; and control), and fungicide-insecticide (PCNB, 11.2 kg a.i./ha + chlorpyrifos, 2.2 kg a.i./ha; chlorpyrifos, 2.2 kg a.i./ha; and control. Nematode population densities in both tillage systems were low, and yields were not affected significantly by nematicides. The incidence of S. rolfsii was generally less in rip-plant plots than in mold-board plow prepared plots in all sites. Average yields for the three sites were greater in mold-board plow prepared plots (5298 kg/ha) than in the rip-plant plots (4908 kg/ha). PCNB + chlorpyrifos reduced S. rolfsii and increased yields significantly at all sites. Chlorpyrifos reduced S. rolfsii at sites 1 and 3 but did not increase yields at either site. Insect populations were light in all locations. There were no differences among treatments for insect control. Insect damage to pods affected neither % sound mature kernels or yield.

Comparison of Pests and Pest Damage in No-Till and Conventionally-Planted Peanuts. W. V. Campbell\*, G. A. Sullivan and E. W. Rogister. North Carolina State University, Department of Entomology and Department of Crop Science, Raleigh, NC 27695-7613, and Northampton County Extension Office, Jackson, NC 27845.

Cultivars 'NC 6' and 'Florigiant' were planted in winter rye that had been treated with paraquat herbicide two weeks prior to planting. Data were collected on the plant stand, the number of thrips, leafhopper damage, corn earworm damage, pod damage, and yield of no-till peanuts compared with conventionally-planted peanuts in a split-plot design. Yields were less in no-till peanuts and the yields reflect the 25% lower plant stand of no-till peanuts compared with conventionally-planted peanuts. Thrips counts were lower in no-till peanuts than in conventionally-planted peanuts. Potato leafhopper damage was lower in no-till peanuts but corn earworm damage was the same. Pod damage from insects was slightly higher in no-till but pod rot was lower in no-till peanuts. Differences in pests and pest damage on the cultivars NC 6 and Florigiant will also be discussed.

Sources of resistance to jassid (*Empoasca kerri* Pruthi), thrips (*Frankliniella schultzei*), and termites (*Odontotermes* spp) in peanut, *Arachis hypogaea* L.  
P.W. Amin\*, K.N. Singh, S.L. Dwivedi, and V.R. Rao. Groundnut Improvement Program, and Genetic Resources Unit, ICRISAT, Patancheru P.O., A.P. 502 324, India.

During three years of field trials 1000 peanut accessions were screened for resistance to the jassid, *Empoasca kerri*; 2700 for resistance to the flower thrips, *Frankliniella schultzei*; and 530 for resistance to the pod scarifying termite, *Odontotermes* spp. This resulted in the identification of some accessions having resistance to individual pests, and some having resistance to all three. Accessions NCAc 343, NCAc 17888, NCAc 10033, and NCAc 1113 and the cultivar M 13 have resistance to one or more pests, and also yielded more than the commonly grown cultivar TMV 2. Accessions NCAc 2230, NCAc 2243, NCAc 2240, and NCAc 2242 had higher levels of resistance than those previously mentioned, but yielded poorly. The resistant lines are being used in a breeding program together with high yielding but susceptible cultivars.

Genetic Analysis of Trichome and Yield Attributing Traits of Peanut Genotypes Resistant to the Jassid (*Empoasca kerri*, Pruthi) and their Utilisation in Resistance Breeding. S.L. Dwivedi\*, P.W. Amin, and R.W. Gibbons. Groundnut Program, ICRISAT, Patancheru P.O., A.P. 502 324, India.

From three years of field screening at ICRISAT Center, twenty genotypes with stable resistance to jassids (*Empoasca kerri*) have been identified. Resistance was associated with a high density of long trichomes on leaves. F<sub>1</sub> progenies obtained from a 10 x 10 complete diallel were studied to determine the inheritance of leaf trichomes, resistance to jassid leaf yellowing symptoms, and four yield traits. Both additive and nonadditive genetic variance were important for the presence of long trichomes on the leaf midrib and petiole. However, predominantly nonadditive genetic variance was observed for long trichomes on the leaf margin. Similarly, both additive and nonadditive variance were equally important for numbers of mature pods, mature pod weight, mature seed, mature seed weight and also for jassid injury. Nc Ac 2230 and Nc Ac 2232 were the best combiners for resistance to leaf yellowing and long leaf trichomes. Nc Ac 343, which has multiple pest resistance, was the best combiner for yield attributing traits.

Several hundred selections, derived from crosses involving these and other resistant sources, were evaluated for yield and resistance to jassids. A number of selections with excellent pod and kernel traits have outyielded the popular Indian cultivar, JL 24, by 40-130%.

Losses to Peanut Insects In Georgia, 1981-1984. H. Womack, L. W. Morgan and R. E. Lynch, University of Georgia and Insect Biology and Population Management Laboratory, USDA, SEA, AR, Tifton, GA.

Each year members of the Division of Entomology, University of Georgia determine losses due to insect damage and cost of control. Damage varies extensively from year to year. A review of weather patterns over these years show that one set of weather conditions favor the development of one group of insects and different weather patterns favor other insects.

Pirimiphos-Methyl Residues on Packaged Food Commodities When Applied As an Ultra-Low Volume Space Treatment. L. M. Redlinger\*, H. B. Gillenwater and R. A. Simonaitis. USDA-ARS, Stored-Product Insects Research and Development Laboratory, P. O. Box 22909, Savannah, GA 31403.

Two space treatment tests using two types of aerosol dispensers and two formulations to obtain pirimiphos-methyl residue data on 15 types of packaged food commodities are described. In each test, pirimiphos-methyl was applied as an aerosol at the rate of  $17.7 \text{ mg(AI)/m}^3$  at 3-week intervals in a  $21,521\text{-m}^3$  warehouse. Pirimiphos-methyl 7E was applied without dilution in one warehouse and as a 5% EC formulation in water in the other. Assessments for distribution and residue accumulation were made at selected periods. Residue analysis of packaged commodity surfaces showed insecticide distribution in the warehouse was more uniform when applied as a concentrate than when applied as a dilute formulation.

Pirimiphos-methyl residues from the exposed top unit, ranged from  $< 0.01$  to 4 ppm depending on commodity and type of packaging material. Flour, grits and shelled peanuts had the highest residues at the end of the 8-month test. Dried pitted prunes had the lowest residue ( $< 0.01$  ppm). Very little difference in residue accumulation on the commodity was observed between the formulation 7E applied without dilution and the 5% EC formulation in water.

The Behavior and Fate of 2,4-DB in Pitted (*Ipomoea lacunosa*) and Tall (*Ipomoea purpurea*) Morningglory Plant and Cell Cultures.

M. A. Barker, L. Thompson, Jr., Research Scientist and President, American Agricultural Services, Inc., Cary, N.C. 27511, F. T. Corbin, and G. A. Sullivan,\* Professors of Crop Science, N.C. State University, Raleigh, N.C. 27650.

The fate and behavior of 2,4-DB [4-(2,4-dichlorophenoxy)butyric acid] was studied in tall morningglory (*Ipomoea purpurea* (L.) Roth #PHBPU) and pitted morningglory (*Ipomoea lacunosa* (L.) #IPOLA) whole plants and cell suspension cultures. In tall and pitted morningglory whole plants, most of the recovered  $^{14}\text{C}$  was present on the surface of the treated leaf or in the leaf cuticle. Pitted morningglory absorbed more  $^{14}\text{C}$  than did tall morningglory in the whole plant and cell culture studies. In whole plant studies, tall morningglory translocated more  $^{14}\text{C}$  to the roots than did pitted morningglory. The moiety isolated from tall morningglory roots was 2,4-D. Tall morningglory exuded 2,4-D into the nutrient solution. In the treated leaf of whole plants and in cell cultures the primary metabolites of pitted morningglory were hydrophilic compounds and 10-(2,4-dichlorophenoxy)decanoic acid (nonphytotoxic) while in tall morningglory the primary metabolites were hydrophilic compounds and 2,4-D (phytotoxic). Differential metabolism of  $^{14}\text{C}$ -2,4-DB appears to be responsible for the relative susceptibility of the two species.



Effects of Tank Mixes of Bentazon and/or 2,4-DB with Postemergence Grass Herbicides on Annual Grass Control. W. James Grichar\* and T. E. Boswell (Retired). Texas A & M University Plant Disease Research Station, Yoakum, Texas 77995.

Tank mixes of bentazon and/or 2,4-DB with fluazifop-butyl, fluazifop-p-butyl, sethoxydim, or haloxyfop-methyl were evaluated on peanuts for the past two years. In 1983, fluazifop butyl at 0.28 and 0.42 kg ai/ha gave generally less grass control in a tank mix with either bentazon or 2,4-DB than when applied alone. Sethoxydim at 0.28 or 0.42 kg ai/ha was not greatly affected by tank mixes (control varied between 75-87%) except at 0.28 kg ai/ha plus 2,4-DB at 0.34 kg ai/ha where grass control was only 23%.

In 1984, fluazifop-p-butyl alone at 0.21 and 0.28 kg ai/ha gave 93 and 96% grass control prior to harvest. Tank mixes of fluazifop at 0.21 kg ai/ha with bentazon and/or 2,4-DB gave control which varied from 75-87%. With the 0.28 kg ai/ha rate of fluazifop in various tank mixes, control varied from 85-88%. Haloxyfop-methyl alone at 0.14 and 0.28 kg ai/ha gave 95 and 98% grass control, respectively. Tank combinations with haloxyfop at 0.14 kg ai/ha gave grass control which varied from 84-91% while with the 0.28 kg ai/ha rate of haloxyfop, grass control was above 97%. No significant reduction was noted for control of nutsedge or broadleaves when these tank mixes were applied.

# Physiology and Irrigation

Irrigation Scheduling Using a Canopy Temperature Stress Degree Day Index To Induce Variable Water Stress in Field-Grown Florunner Peanut. A. M. Schubert\* and T. H. Sanders. Texas Agricultural Experiment Station, Yoakum, TX 77995, and USDA-ARS, National Peanut Laboratory, Dawson, GA 31742.

Differential canopy/ambient temperature, as measured by an infrared thermometer, was used in a stress degree day index to schedule irrigation in Florunner peanut at Yoakum, Texas in 1984. Canopy temperatures were measured daily in the early afternoon. When canopy temperature was higher than ambient, the plants were assumed to be under water stress. The number of degrees Celsius by which canopy exceeded ambient were averaged for each treatment and means totaled each day until the sum exceeded a pre-set value. That treatment was then irrigated the following day. Treatments included plots watered at 5, 10, 15, 20, and 25 Stress Degree Days (SDD) and an unwatered check.

There was a significant linear decline in peanut yield and value per acre as SDD level increased. The wettest treatment, 5 SDD, yielded 2977 kg/ha, while 10, 15, 20, 25 SDD, and the check yielded 2673, 2570, 2452, 1701, and 1513 kg/ha, respectively. Crop values varied from \$1898/ha for 5 SDD to \$932/ha for the check. Increased water stress also increased the proportion of small kernels.

This stress degree day index appears promising as a tool for systematically subjecting field-grown peanuts to variable levels of water stress.

Studies on Water Relations of Peanut Under Rainfed and Irrigated Conditions. 'I. T. Huang\* and D. L. Ketring. Dept. of Agronomy, Oklahoma State University, and USDA-ARS, Stillwater, OK 74076.

Water relation components (water and osmotic potential, relative water content (RWC), and stomatal resistance) are important attributes which may be related to drought tolerance among peanut genotypes. Five and six genotypes in 1983 and 1984, respectively, (Florunner, Comet, Pronto, Spanhoma (1984 only), and breeding lines OK-FH13 and OK-FH14) were grown under rainfed (RF) and irrigated (IR) conditions. Ground cover (%) showed significant differences between RF and IR and among genotypes in 1983. In 1984 under RF, virginia-type genotypes had higher % ground cover than spanish types. Measurements of water relation components were made at different plant growth stages. There were significant differences in water relation components between RF and IR treatments at 67 and 81 days after planting (DAP) in 1984, but not at 54 DAP. No significant differences in water relation components were found among genotypes. Highly significant linear correlation coefficients were found among water relation components at 81 DAP. Significant reductions in pod yield (kg/ha) and %SNK occurred under RF, but no significant differences were found among genotypes. Spanish genotypes had higher %SNK's than virginia types in 1983. Yield reductions due to water deficit under RF were 82.5 and 96.6% in 1983 and 1984, respectively.

Water Stress Effects On The Water Relations And Nitrogen Fixation Of Two Peanut Cultivars. J.M. Bennett\*, S.L. Albrecht, and K.A. Albrecht. Agronomy Dept., Univ. of Florida and USDA-ARS, Gainesville, FL 32611.

Florunner and Pronto peanut (*Arachis hypogaea* L.) cultivars were grown in pots in a greenhouse and subjected to soil drying. The objective of the study was to determine the effect of soil water deficits on the water relations, stomatal response and nitrogenase activity ( $C_2H_2$  reduction) of the two cultivars during a soil drying cycle. Measurements of leaf and nodule water potentials, leaf osmotic and turgor potentials, stomatal resistance, nitrogenase activity and soil moisture were determined frequently at midday during an 18-day water stress period. Increases in stomatal resistance were observed for both cultivars as leaf water potentials and leaf turgor potentials declined below -1.4 and 0.25 MPa, respectively. Nitrogenase activity was severely reduced as leaf and nodule water potentials declined below -1.4 MPa. However, correlation of water potential and nitrogenase activity was low for leaf and nodule potentials above -1.4 MPa. Data suggested that nitrogen fixation was sensitive to plant water deficits. In this study, both peanut cultivars responded similarly to the imposed water deficits.

Yield and Quality Response of Florunner Peanuts to Applied Drought at Several Growth Stages. J. R. Stansell\* and J. E. Pallas, Jr., University of Georgia, Department of Agricultural Engineering, Coastal Plain Experiment Station, Tifton, GA 31793 and USDA-ARS, Plant Physiology, Watkinsville, GA 30677.

Florunner peanuts, grown in drainage lysimeter plots and protected from rainfall by automatic shelters, were subjected to 35 and 70 day periods without irrigation during a 4 year study. Yields and kernel quality were compared to peanuts irrigated throughout the season when the surface 30 cm of the soil profile dried to an average soil water suction of 20 kPa. Among 35 day drought periods, drought from 71-105 days after planting was most severe, reducing yield from 5165 to 3584 kg/ha. Next in severity was drought from 36-70 days with an average yield of 4055 kg/ha, followed by drought from 106 days after planting till harvest with a mean yield of 4521 kg/ha. Midseason 70 day drought (36-105 days after planting) reduced the average yield to only 1387 kg/ha, while a 70 day drought from 71 days after planting through harvest reduced yields to 2592 kg/ha. Plant utilization of profile water stored at depths up to 120 cm was apparent, and explains somewhat the drought tolerance of peanuts.

Screening Valencia Peanuts for Tolerance to Salt Stress. David Hsi. Agric. Science Center, New Mexico State University, Los Lunas, NM 87031.

Peanuts have been grown continuously under irrigation in New Mexico since 1920. Nearly all peanuts cultivated in recent years are of the Valencia type. Build up of high salt content in the soil, from a combination of long term irrigation with well water containing considerable salts, and little or no leaching of accumulated salts under arid climate, threatens profitable peanut production in trouble areas of eastern New Mexico. Hundreds of Valencia peanut genotypes from the world collections are being screened at seedling stage for salt tolerance. Electrical conductivities, or threshold levels, are being carefully monitored for effective screening in hydroponic cultures under controlled laboratory conditions. Cell and tissue cultures will be screened further in liquid or plate cultures adjusting to various salt concentrations. Results indicated that differences in salt tolerance existed in the genotypes screened to date. Development of salt tolerant Valencia peanuts will likely increase production in salt damaged fields and will also make it possible to utilize the abundant reserve of underground saline water in New Mexico.

The Effect of Explant Composition, Explant Orientation, and Light Intensity on the In Vitro Differentiation of *Arachis villosulicarpa* Hoehne Leaf Explants. B. R. Johnson\* and R. M. Pittman. Department of Botany and Microbiology, and USDA-ARS and Department of Agronomy, Oklahoma State University, Stillwater, OK 74078.

Fully expanded leaflets from mature greenhouse-grown plants of *Arachis villosulicarpa* Hoehne were cut into 2-mm<sup>2</sup> explants and cultured on the major minerals of Murashige and Skoog, Gamborg's B-5 vitamins, 30 g/l sucrose, 7 g/l agar, pH 5.8 with 1 mg/l each of benzyladenine and naphthaleneacetic acid. Half of the explants were placed with the upper epidermis in contact with the agar and half with the lower epidermis in contact with the agar. A 16/8-hour light/dark period was used at four light intensities: 53, 49, 45, and 43  $\mu\text{E m}^{-2} \text{sec}^{-1}$ . Half of the explants contained a segment of the mid-vein, while half did not. Explant orientation was important, with almost twice as many explants forming shoots when the lower epidermis was in contact with the agar. Inclusion of the mid-vein reduced the number of shoots formed per explant, and a lower proportion of explants produced shoots compared with those containing no mid-vein. Light intensity was also important. While 74% of the explants produced shoots at the highest light intensity, only 64% did so at the second highest, 11% at the third highest, and 23% at the lowest light intensity.

Photosynthetic Characteristics and Their Relation to Chloroplast Pigments of a Wild X Cultivated Triploid Hybrid, Its Parents, and Its Autopolyploid. I. S. Campbell\* and J. E. Pallas, Jr. USDA-ARS, Southern Piedmont Conservation Research Center, Watkinsville, GA 30677.

Photosynthetic light response, diurnal photosynthesis ( $P_n$ ) fluctuation, and  $CO_2$  compensation point were studied. Arachis hypogaea var. Chico ( $2n=40$ ), A. chacoense ( $2n=20$ ), their triploid cross and colchicine induced hexaploid were studied. Maximum  $P_n$  response at  $1200-1400 \mu mol m^{-2} s^{-1}$  photon flux was compared to data obtained by Banks, Eskins and Pittman for chlorophylls a and b, carotene, lutein, neoxanthin, and violaxanthin. The  $P_n$  max was 32.1, 21.5, 40.7, and 39.5 for Chico, A. chacoense, triploid, and hexaploid, respectively. All plants showed diurnal variation with a marked drop in  $P_n$  in the late afternoon after 8 to 9 hours of illumination at  $400 \mu mol m^{-2} s^{-1}$ . The compensation points were in the range 50-55 ppm  $CO_2$  except for the hexaploid which was ~ 85 ppm. The former range is the same as found for cultivated peanut. No significant correlations were found between  $P_n$  and any pigments. However, a positive trend was found for chlorophyll b and neoxanthin and a negative trend for the ratio of chlorophyll a to b.

Apparent Sap Velocity in Peanut. D. L. Ketring\*, P. I. Erickson, and J. F. Stone. USDA-ARS, Plant Science and Water Conservation Laboratory, and Dept. of Agronomy, Oklahoma State University, Stillwater, OK 74076.

Peanut genotypes have been identified that differ in rooting traits (length, numbers, dry weight). Under low soil moisture conditions extensive rooting could aid in maintaining plant hydration by penetration into larger soil volume. Another consideration is the effectiveness of a given root mass for extracting water from soil. An estimate of root-effectiveness among peanut genotypes was made by measurement of apparent sap velocity ( $A_v$ ) under well-watered and stress conditions in the greenhouse and field. Under well-watered conditions in the greenhouse,  $A_v$  ranged from about 0.8 to 1.2 cm/min. As stress was induced by withholding water,  $A_v$  declined to less than 0.5 and greater than 0.6 cm/min for the most and least affected genotype, respectively. Measurements of plant growth (shoot and root) indicated that greater  $A_v$  under stress was not due to differences in root mass, but most likely due to root function. Under irrigated conditions in the field,  $A_v$ 's were similar to well-watered plants in the greenhouse.  $A_v$ 's were less under rainfed conditions, and genotypes differences occurred.

A Specific and Sensitive Method for Quantitating Peanut Lipoxygenase. B. A. Triplett\*. USDA-ARS, Southern Regional Research Center, New Orleans, LA 70179.

Lipoxygenase is an enzyme present in peanuts which catalyzes the formation of fatty acid hydroperoxides leading to deterioration of seed quality. In an effort to screen plant growth regulators that may suppress the amount of lipoxygenase in mature seeds, a highly specific and sensitive method for detecting lipoxygenase in peanut samples has been developed. Proteins separated by SDS-polyacrylamide gel electrophoresis are electrophoretically transferred to a nitrocellulose membrane. The membrane is treated with antibodies directed against purified peanut lipoxygenase. Anti-lipoxygenase antibodies are detected by treatment of the membrane with biotin-conjugated goat anti-rabbit antiserum and avidin conjugated horse-radish peroxidase. Using this "Western blot" procedure, nanogram quantities of peanut lipoxygenase can be detected in crude cell homogenates. Antibodies to peanut lipoxygenase will cross-react with lipoxygenases from other legumes in the Western blot procedure even though no cross-reaction is detected in Ouchterlony immunodiffusion assays. After the antibody is shown to be specific, protein samples can be directly applied to the nitrocellulose membrane. Hundreds of samples can be evaluated for lipoxygenase content in a single working day from immuno-dot blots. The technique will be invaluable for rapidly screening peanut samples to which plant growth regulators have been applied as well as screening peanut cultivars for lipoxygenase null expressors.

Differences in Photosynthetic Capacity Among Peanut Genotypes Related to Carbon Fixation by Mesophyll Cells. J. E. Pallas\* and N. Paz. USDA-ARS, Southern Piedmont Conservation Research Center, Watkinsville, GA 30677.

To help explain the large variability in the net photosynthetic rate ( $P_N$ ) of different genotypes of the cultivated peanut (*Arachis hypogaea* L.),  $CO_2$  fixation was studied in isolated leaf cells of three selected peanut genotypes. Even with destruction of leaf integrity essentially the same order in  $CO_2$  fixation ability was found with the isolated cells of a genotype as previously determined on whole leaves. NC4 isolated leaf cells had the greatest capacity for fixing carbon followed by Florunner and Spanhoma. The difference between Florunner and Spanhoma was much less, however, than previously found in whole leaf studies possibly indicating the earlier difference was related to leaf structure. NC4 had the greatest response to increasing temperatures but only moderate response to elevated  $[O_2]$  which may be related to its high carboxylation/oxygenation ratio. NC4 also has high sensitivity to an interaction between high temperature and high  $[O_2]$ . In the NC4 genotype high photosynthetic capacity is related to biochemical and/or biophysical attributes of the mesophyll cells themselves. Further studies ferretting out these attributes should aid in tailoring more efficient peanut genotypes as well as other crop species.

Plant Growth Measurements and Flower Counts of Five Peanut Cultivars Grown in Virginia. J. L. Steele\* and T. A. Coffelt. USDA, ARS, SAA, Tidewater Research Center, Suffolk, VA 23437.

Field data on the growth and flowering characteristics of five diverse peanut (*Arachis hypogaea* L.) cultivars were collected during the 1982, 1983 and 1984 growing seasons. Plant height, width and total plant dry weight were determined weekly for the cultivars Florigiant, NC 6, NC 7, Early Bunch and VA 81B. Daily flower counts and harvest yield and grade were also determined. The cultivars varied in growth habit from very upright (VA 81B) to prostrate (Florigiant) and in maturity from early (VA 81B) to medium-late (NC 6). Significant differences were observed among cultivars in plant height and width, but little differences were observed among cultivars in total plant dry weight. Average daily flower count per plant was statistically different among cultivars. Early Bunch and VA 81B were consistently low in flower count per plant across years while all cultivars varied significantly in count and seasonal flowering patterns with years. Flower counts, plant weight and harvest yield were compared with estimates from a peanut growth simulation model. Late season flower counts and cultivar differences were not predicted by the simulation model.

Seasonal Trends in Carbohydrate and N Concentrations of Plant Parts of Florunner Peanut and Bragg Soybean. K. J. Boote\*, R. L. McGraw, and D. E. McCloud, University of Florida, Gainesville, FL 32611.

A field experiment was conducted on May 5-planted Florunner peanut and Bragg soybean to compare these two species for the potential contribution of re-mobilized protein and carbohydrate to seed growth. Weekly samples of leaf, stem, podwall, and seed were analyzed for N and total available carbohydrates.

While Florunner trends were less dramatic, both species mobilized considerable N (protein) from leaves, stems (plus petioles), and roots during their respective seed filling phases. Seedfill of Florunner extended from 70 to 133 days during which leaf N declined slowly from 4.01 to 2.85%, stem N, from 1.65 to 1.13% and root N, from 2.19 to 1.50%. Bragg's seedfill phase occurred from 112 to 154 days during which leaf N declined from 4.25% to 2.16%, and stem N declined from 1.51 to 0.54%. Soybean roots had much lower N than peanut roots, and declined from 1.53 to 0.81% N between 105 to 161 days.

Total available carbohydrate (TAC) in leaves averaged 6 to 7% and showed no species or seasonal trends after 35 days of age. Stems were higher in TAC and clearly showed that carbohydrate was mobilized during seedfill in both species. Peak stem TAC's were 14 and 17% for peanut and soybean at 84 and 105 days, respectively, and declined to minimums of 8 and 3% by the end of seedfill. Soybean root % TAC declined to very low levels during seedfill. The higher % TAC and % N of peanut roots is consistent with peanut's perennial tendency.

# Mycotoxins

Fungi Affecting The Germination Of Sclerotia Of *Aspergillus Flavus* In Soil. J. P. Stack and R. E. Pettit\*, Department of Plant Pathology and Microbiology, Texas Agricultural Experiment Station, College Station, Texas 77843.

Numerous fungi became associated with sclerotia of *Aspergillus flavus* (AF) buried for 7-14 days in nonsterile sandy-loam field soil at -0.1, -1.0, or -10.0 bars matric potential at 20 or 35 C. At -1.0 bar and 35 C (conditions conducive to germination) approximately 20% of the sclerotia were colonized by *Chaetomium* spp (Ch) or *Gliocladium* spp (Gl). These sclerotia did not germinate. When Gl-colonized sclerotia were transferred from soil to an agar medium, hyphal and sporogenic germination occurred. Although germination was suppressed in soil, the colonized sclerotia were not rendered completely inviable. This also occurred with sclerotia colonized by *Paecilomyces varioti* and a *Trichoderma* sp. The Ch isolate produced ascocarps on and adjacent to AF sclerotia in soil. The Ch isolate also demonstrated good growth potential in soil when introduced on a lignite carrier. Experiments are underway to microscopically determine the nature of association of Ch and Gl isolates with AF sclerotia in soil.

Evaluation of Soil Calcium as Methods of Prevention of Preharvest Aflatoxin Contamination of Peanuts. R. J. Cole\*, A. S. Csinos\*, P. D. Blankenship\*, T. H. Sanders\*, T. P. Gaines\*, and J. I. Davidson. USDA, ARS, National Peanut Research Laboratory, Dawson, GA 31742, and \*University of Georgia, Tifton, GA 31794.

Studies during 1984 using the environmental control plots evaluated the use of available calcium in the peanut geocarposphere to protect the developing seed from preharvest aflatoxin contamination. Florunner peanuts were planted on May 1, 1984 and soil environmental stress conditions (moisture and heat) previously determined to be optimum for preharvest aflatoxin contamination were initiated August 6 (97 days after planting) and maintained until harvest (September 20, 1984 - 142 days after planting). Calcium treatments were 0, 58 and 230 lbs/acre calcium as  $\text{Ca SO}_4$  added to pretreatment levels. The levels of calcium in the kernels from the 0 and 230 pound treatment levels were significantly different, reflecting a response to added calcium in spite of relatively high pretreatment levels of soil calcium. There was no significant difference between kernel calcium in the 0 and 58 lb treatments. Aflatoxin analyses of the various commercial grade categories from the various treatments showed no significant relationship between aflatoxin contamination and kernel calcium level. It was concluded that application and uptake of calcium by the peanut seed was not a viable method to prevent preharvest aflatoxin contamination of peanuts subjected to stress conditions ideal for aflatoxin contamination. However, these data should not be construed to mean that the practice of adding calcium in the form of gypsum should be discontinued.



Comparative Susceptibility Of Four Experimental Peanut Lines And The Cultivar Florunner To Preharvest Aflatoxin Contamination. P. D. Blankenship\*, R. J. Cole and T. H. Sanders. USDA-ARS, National Peanut Research Laboratory, 1011 Forrester Drive SE, Dawson, GA 31742.

Four peanut genotypes, selected as resistant to invasion by Aspergillus flavus in laboratory screening with rehydrated, stored seed and Florunner cultivar were subjected to preharvest drought and temperature conditions conducive to A. flavus invasion and aflatoxin contamination. Preharvest aflatoxin contamination of peanuts has been previously correlated with geocarposphere temperature and moisture conditions during drought. All genotypes tested were highly contaminated with aflatoxin. This study indicates that a critical assessment should be made of the value of using the current laboratory method to select germplasm for resistance to A. flavus invasion and assuming resistance to aflatoxin contamination under field conditions.

Effects of *Aspergillus parasiticus* Inoculation, Calcium Rates and Irrigation on Peanuts. D. M. Wilson\*, M. E. Walker, T. P. Gaines, A. S. Csinos, T. Win, and B. G. Mullinix, Jr. Coastal Plain Exp. Stn., Univ. of Georgia, Tifton, GA 31793.

The effects of calcium (gypsum) applications on preharvest aflatoxin contamination of peanuts have been variable in experiments at Tifton, GA. In some years gypsum applications have significantly decreased aflatoxin contamination, in other years no significant aflatoxin contamination has been observed. These experiments were designed to test the effects of irrigation, gypsum rates and inoculation with Aspergillus parasiticus Speare (NRRL 2999) on mycoflora and aflatoxin content. Two rows of plants in each plot were inoculated by sprinkling a spore suspension of A. parasiticus on the plants at early bloom. The experimental design included two irrigation regimes and four gypsum rates. Soil samples were collected three times during the season and at harvest to monitor soil populations of the A. flavus group (A. flavus and A. parasiticus). Peanut pods were collected at harvest for P, K, Ca, Mg, aflatoxin and mycoflora analyses. No aflatoxins were found in any treatment. Soil populations of the A. flavus group were significantly higher from inoculated plots for the first two collections only. A. parasiticus apparently did not persist in the soil throughout the growing season. However, A. parasiticus inoculation resulted in a significant reduction in peanut yield and value. More kernels were infected with the A. flavus group and other fungi with zero gypsum than with the other gypsum treatments. The relationship between calcium nutrition and infectivity of the A. flavus group in peanuts may be a factor in preharvest aflatoxin contamination.

Relationship of Storage Conditions on the Mycoflora of Irrigated Peanuts.

D. M. Porter\* and J. L. Steele. USDA, ARS, SAA, Tidewater Research Center, Suffolk, VA 23437.

The effects of constant storage conditions (long-term, up to 120 days at 31 C, RH 75-80%, and short-term, up to 32 days at 21, 27 and 32 C, RH >95%) on mycoflora of peanut seed grown under irrigated and nonirrigated conditions during three growing seasons were determined. Conventionally harvested peanuts from irrigated and nonirrigated plots in loamy fine sand soils, were dried to a moisture content of 8-10%. Samples were then subjected to artificial storage conditions. Under the long-term storage conditions, fungal infestation of irrigated and nonirrigated peanut seed was 41% and 30%, respectively. Total seed mycoflora increased with long-term storage time. The isolation frequency of A. flavus in seed from both irrigated and nonirrigated plots also increased with long-term storage time. Aspergillus flavus was isolated more frequently in seed from irrigated plots (10.2%) than from nonirrigated plots (6.8%). Under short-term storage conditions, seed from irrigated plots were infested with fungi at a higher frequency (46%) than seed from nonirrigated plots (40%). Average seed infestation (30, 40 and 50%) increased with temperature (21, 27 and 32 C, respectively). At 32 C, A. flavus was isolated from seed at three times the frequency (20%) of that from seed stored at either 21 or 27 C. Total seed infestation increased with time in storage; however, increases in the isolation frequency of A. flavus were observed only after 16 days of exposure to adverse storage conditions.

Comparing the Number of Lots Accepted and Rejected by the Visual, Minicolumn, and TLC Methods When Testing Farmer Stock Peanuts for Aflatoxin. T. B. Whitaker\*, J. W. Dickens. USDA, ARS, Biological and Agricultural Engineering Dept., N. C. State University, Box 7625, Raleigh, NC 27695-7625.

The efficacy of the visual, minicolumn, and TLC method to test farmer stock peanuts for aflatoxin was determined. Aflatoxin test results from 2300 grade samples of farmer stock peanuts was used to determine the distribution of farmer stock lots according to their aflatoxin concentration. This distribution and computer models that simulate the testing of farmer stock peanuts for aflatoxin were used to determine, for each of the 3 methods, the percentage of lots accepted and the average aflatoxin concentration in the accepted lots. Results indicate that for a given percentage of accepted lots, the visual method had less aflatoxin in the accepted lots than either the minicolumn or TLC methods.

Varietal Resistance in Peanuts to Aflatoxin Production. V.K. Mehan<sup>2</sup>, D. McDonald, and N. Ramakrishna. Groundnut Program, ICRISAT, Patancheru P.O., A.P. 502 324, India.

Rehydrated, mature, undamaged seeds of 502 peanut genotypes were scarified, inoculated with an aflatoxigenic strain of Aspergillus flavus, and tested for aflatoxin production after incubation at 25°C for 10 days. All genotypes supported some production of aflatoxin. Significant varietal differences in levels of aflatoxin production were found. Genotypes U 4-7-5 and VRR 245 produced the lowest levels of aflatoxin (<10 µg/g seed) whereas the commonly grown spanish cultivar, TMV 2, produced aflatoxin at levels of over 150 µg/g seed. Eight selected genotypes with low, moderate and high capacity to support aflatoxin production were further tested using seed from one rainy season crop, and two irrigated postrainy season crops. Genotypic differences in levels of aflatoxin production were consistent over seasons. Levels of production were lower in seeds from the rainy season crop than in seeds from the two postrainy season crops.

# Disease Assessment

Disease assessment methods for germplasm and fungicide evaluation

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## INTRODUCTION

The purposes of this paper are to give a review of disease assessments methods that are available in plant breeding and fungicide testing. It is not my purpose to critique the actual methodologies and philosophies of screening for disease resistance or for activity against pathogens. Thus questions, for example, of how to make assessments during the periods of initial screening compared with elite selection will largely not be covered. Similarly, the use of germplasm or fungicides to monitor the composition of pathogen populations (as in racial surveys, virulence frequency analysis, or in the detection of fungicide insensitivity) will not be covered. The scope of the paper is quite general and will purposefully not make specific reference to peanuts as the principles dealt with are quite general. The paper consists of several sections: the reasons for making disease assessments; the scale of assesement, whether in the greenhouse or in the field; the importance of host plant and inoculum factors; and some comments on interpretation of the results of disease assessments. Throughout this paper there will be an epidemiological bias.

## WHY DISEASE ASSESSMENT?

Horsfall and Cowling (1978) posed the question 'why measure disease' and pointed out the relative paucity of research into assessment methods. Despite these author's optimism at the time, there is little evidence that the situation is changing. In a recent inclusive book to commemorate the 75th anniversary of the American Phytopathological Society, not a single chapter was devoted to the topic and indeed in only two chapters (Teng and Oshima, 1983; Rouse, 1983) was there any substantive discussion. But the reasons for disease assessment remain essentially the same: despite many advances in biochemical and physiological knowledge, a true understanding of the interaction of host plants and their pathogens will not be obtained until its manifestation as disease can be quantified. Similarly, it is not possible to understand epidemics, the final expression and ultimate test of disease resistance or of fungicide efficacy, unless the means to measure disease are available. And yet those involved in the practical task of assessing disease - as in germplasm and fungicide evaluation - do so on an almost daily basis and should have every expectation that advances be made in assessment methods.

The advantages and disadvantages of methods of disease assessment are now discussed, but restricted to visual assessment of whole plants, either individually or in populations. Techniques involving tissue culture or, at a higher level, the use of remote sensing and/or crop loss as a reflection of disease, will not be discussed.

## GREENHOUSE EVALUATION

The attraction of greenhouse rather than field evaluation of germplasm and fungicides is self-evident in that environmental control

can be practiced, the integrity of individual plants can easily be maintained, security is usually ensured, plant material can easily be challenged with the pathogen, and infection conditions manipulated. Especially if juvenile plant material is being examined, a greater number of plants can be screened at a higher frequency. In general, it is also possible to make more detailed assessment of disease, although this may run contrary to the previous assertion. The main problem with greenhouse evaluation, even of mature plants, is that one can never be sure that the evaluation will give an adequate prediction of field performance, whether for reasons associated with intrinsic resistance or with some other plant characteristic whose effect only becomes apparent in the field. Problems with the greenhouse environment have been discussed several times; for example by Rahe (1981), though less often with respect to fungicides. Recently, there has been an increasing interest in assessing components of resistance in the greenhouse, arising as much from epidemiological theory as from the expression of quantitative resistance, and which links greenhouse evaluation firmly to the field.

#### Components of resistance

Parlevliet (1979) considered in great detail the components of resistance that reduce the rate of epidemic development. The basic idea is simple and seductive: any reduction in a component of resistance such as reduced infection frequency, less prolific sporulation per lesion or pustule, or a lengthened latent period should lead to less disease in the field. A considerable number of trials have now been done, not necessarily in practical breeding programs or fungicide tests, in which components have been assessed in 'monocyclic'

tests in the greenhouse. Although such tests are time-consuming and often give conflicting results when repeated, some interesting results have been obtained. Firstly, there can be a certain independence in components of resistance (Jeger, Jones and Griffiths, 1983) at least where there has not historically been high levels of selection for resistance to a given pathogen. This has the implication that infection characteristics are not necessarily the best or only criteria for screening for resistance. Secondly, it may be found that one particular component is most highly correlated with field performance, which is of obvious importance for determining selection strategies, but unfortunately the component varies with the system under consideration and few generalizations can be made.

#### Epidemiological action of fungicides

What is less appreciated is that the components idea can equally be applied to fungicides. Fungicides are effective because they prevent infection, eradicate infections that are incubating, reduce effective spore production by either interfering with colony development or affecting the viability of formed but not yet dispersed spores, or curtail the life span of sporing colonies. There are great differences in the abilities of different fungicides to act in these different ways. Even more than with components of resistance, the epidemiological consequences of fungicides which act protectively, curatively, or as anti-sporulants needs further elucidation. In my view this is equally as important as determining the biophysical mode of action of fungicides.

#### FIELD EVALUATION

Field evaluation of resistance or fungicide efficacy presents the

greatest challenge to plant pathologists, breeders and those involved in fungicide evaluation. How best to devise field trials that give an adequate reflection of a cultivar's or fungicide's performance? Obviously a great variety of problems in both experimental protocol and interpretation of results can arise. Some of these problems, at least with respect to fungicides, were discussed by Byrde (1981). Here two kinds of problem associated with field trials are considered: how to measure disease, and how to represent the performance of a cultivar or fungicide in the field.

#### Incidence-severity relationships

In my view this is the single most important step in developing procedures for field assessment of disease. If a reliable relationship can be found between the two variables, then only incidence (i.e. presence or absence on some defined plant unit) rather than severity (i.e. proportion of plant unit area diseased, lesion numbers per unit area) need be assessed. The value of the relationship has been demonstrated many times in disease management (Butt and Barlow, 1979) and assessments of loss (Jeger, 1984a), and should be of equal importance in plant breeding and fungicide testing. In some cases relationships are found that are unaffected by fungicides or cultivars, but differences do occur (Seem and Gilpatrick, 1980; Seem, Gilpatrick, and Pearson, 1981; Jeger, 1981; Jeger, 1984a). On occasion it has been found that fungicides (or resistant cultivars) work by reducing severity rather than incidence (eg. Miller, Jeger, and Cox, 1985) but this does not necessarily imply a different incidence-severity relationship. A detailed review on incidence-severity relationships was provided by Seem (1984).



### Field keys

An equally important procedure where estimates of severity are deemed essential is the use of field keys. These are now available for a range of crops, and plant parts including leaves, stems, reproductive structures, tubers and roots, and a range of visual symptoms (James, 1971; Anon, 1976). Some keys are largely qualitative with few classes, whereas others have a large number of classes corresponding to actual percentage values of severity. The use of such keys rather than arbitrary indices is recommended whenever possible.

### Epidemiological analysis

Having measured disease, the problem is how to represent the epidemic as a measure of the effectiveness of the resistant cultivar or fungicide. A major problem, especially in small field plots, is interplot interference, the 'cryptic error' of Vanderplank (1963), due to inoculum transport from plot to plot. Thus, small plot experiments involving foliar pathogens rarely give an adequate test of resistance or fungicide efficacy on a truly field scale. Provided, however, that the number of treatments is relatively small, then experimental design can go some way towards mitigating this problem.

Assuming that problems in experimental design can be dealt with, there are four main ways to analyze an epidemic: in terms of disease at some arbitrary point in time, the rate of disease increase (in time and/or in space) calculated on the basis of an epidemiological model, the asymptote or upper limit to disease, and the area under the disease progress curve. If there is a key host phenological stage such that disease at that time is critical then the first measure is entirely justified. The second measure has appealed most to epidemiologists

concerned with rates as the driving force behind an epidemic, although it has led to some abuse in both comparing breeding lines and fungicides. The third, in my view, is one of the most neglected yet simplest of the measures. It has been neglected because pathologists have long been under the illusion, due in part to measuring disease as a proportion, that the upper limit to disease takes on the value 1.0 independently of any management practice. It has been shown, theoretically and empirically, that a major effect of fungicides is to decrease the asymptotic value of disease (Jeger, 1984b). Similar phenomena may occur with plants showing adult plant or other time-varying resistance. The fourth measure, the area under the curve, integrates all the above elements of an epidemic and has the advantage that it can be calculated directly from the data, eg. using the trapezoidal rule rather than an epidemiological model, but whether it is intrinsically superior to other measures has yet to be demonstrated.

#### THE IMPORTANCE OF PLANT AND INOCULUM FACTORS

To this point my main concern has been with the quantitative assessment of disease. The host plant and inoculum that interact to cause disease have only obliquely been mentioned. The host plant is important from various standpoints. Resistance may be ontogenetically-determined or differ in varying environments. It is often necessary to standardize disease assessments to be made at known growth stages. The development of host-growth keys parallel with disease keys (Anon, 1976) is a recognition of this necessity. Also, some pathogens attack more than one plant part, eg. Venturia inaequalis attacks leaves, shoots and fruits, and there is no guarantee that the susceptibility of one plant part correlates with that of another (Jeger, 1981).

Similarly, the ways in which inocula are prepared may play a major role in determining the evaluation of resistance. Single-spore isolates of the pathogen, which are not necessarily typical of natural populations, give erroneous assessment of useful resistance; whereas bulked populations, especially from a given locality, give a more realistic assessment. In some cases, and not infrequently, it is possible to draw wrong conclusions because of errors in isolation and maintenance of inoculum.

#### THE PROBLEM OF DISCRIMINATION

Plant pathologists, breeders and those involved in fungicide evaluation alike seem more obsessed than most in attaching all the supposed justifications of statistical significance to their results. Tables of results are consistently cluttered with lower case symbols indicating levels of mean separation. It seems imperative to state which cultivars or fungicides are different. In my view, whatever statistical rigor editors may wish to impart to their journals, such separation is rarely worth the paper it is printed on. Exceptions are when a priori standards of comparisons or contrasts can be made (eg. glabrous- vs non-glabrous- leaved cultivars, or different fungicide formulations). Of much more importance is the overall precision of the evaluation, the standard error on the difference between means, and the stability of ranking over a series of tests. Evaluation of germplasm and fungicides should be concerned more with estimating the amount of variation, rather than with significance testing. Discrimination should remain the domain of the biologists; statistical tests can provide guidance but do little to ease this responsibility.

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Peanut Foliar Disease Assessment F. M. Shokes, R. D. Berger, D. H. Smith, University of Florida, NFREC, Quincy, Department of Plant Pathology, Gainesville, Fl., and Texas Agricultural Experiment Station, Yoakum, Tx.

Many disease assessment techniques are used to assess foliar diseases of peanut (Arachis hypogaea L.). For models of disease loss there is a need to express disease intensities with precise inputs. A standard assessment method would aid researchers to interpret data collected from other peanut-growing areas of the world. A disease assessment system must i) be easy to use so that raters can be readily trained, ii) allow rapid estimation of disease intensity, iii) be applicable over a wide range of conditions, iv) provide an accurate measure of disease, and v) provide results which are reproducible. The accuracy and reliability of an assessment system for use by different observers can be determined by

$$\rho = \sigma_T^2 / (\sigma_T^2 + \sigma_j^2 + \sigma_E^2)$$

in which  $\sigma_T^2$  is the true variance,  $\sigma_j^2$  is the observer effect,  $\sigma_E^2$  is the error variance and the sum of these is the total variance.

Reproducibility of a method can be determined by a test-retest of disease assessment and measuring the reliability using the correlation coefficient (r). With an assessment method for peanuts based on three canopy layers, inter-rater reliability estimates were 0.85 for % necrotic area, 0.67 for defoliation, and 0.69 for total disease severity. Test-retest correlation coefficients were as high as 0.80 for % necrotic area, 0.88 for defoliation, and 0.82 for total disease severity. Three observers ranked in the same order in relation to reliability for two tests-retests of the system on 30 randomly chosen plots. Testing of assessment systems which meet the desired criteria is needed to develop a method which might be a feasible standard to assess foliar diseases of peanut.

**Problems in Assessment of Root Rot Diseases: Role of Soilborne Pathogen Ecology.** M. K. BEUTE, Department of Plant Pathology, North Carolina State University, Raleigh, 27695-7616.

The subterranean nature of root rots creates considerable difficulty in assessment of disease development in crop plants. Evaluation of disease resistance in breeding programs, efficacy of chemical controls and effectiveness of management practices to reduce root rot severity (or incidence) often require destructive sampling of plants at time intervals or some technique of estimating reduced plant vigor, visual symptoms, etc. When roots are observed, disease severity is usually assessed on a "subjective" scale using some modification of the McKinney index. Most root rot diseases are debilitative rather than destructive because root systems are incrementally removed (pruned) and decay is a progressive phenomenon. Physical stress is often critical to symptom development because limited root dysfunction is not detrimental to plant maintenance under optimum environmental conditions. Resistance to root rot pathogens is generally incomplete, i.e. multigenic in nature and partially effective. Resistance or susceptibility to root rot pathogens is determined by inoculum density and environmental factors occurring during infection. Preliminary studies in the greenhouse (pots, soil benches), rhizotron and field microplots are useful in breeding and management strategies. However, verification of control data under crop production situations is absolutely essential. Assessment in field plots, however, is complicated by numerous factors. Characteristics of inoculum distribution (density, patchiness), chemical and physical properties of soil, abiotic and biotic predisposition (nematodes, etc.) and inherent adaptation of cultivars contribute to incidence and rates of disease progress. Disease progress for root rot pathogens is illusory; being the final product of host growth and resistance, pathogen biology and physical environment interacting over time. Disease progress, where a monocyclic pathogen is involved, may appear to increase exponentially due to symptoms expression (over time) being a function of incomplete resistance as affected by inoculum distribution. Assessment of root rot disease should begin with a critical review of ecological behavior of each pathogen.

Problems in Assessing Severity of Diseases Incited by Plant-Parasitic Nematodes. J. L. Starr, Dept. Plant Pathology and Microbiology, Texas Agricultural Experiment Station, College Station, Texas 77843.

#### ABSTRACT

Assessment of severity of diseases incited by plant-parasitic nematodes is difficult due to the generally nondiscript nature of the symptoms of these diseases. Diagnosis of the cause of plant damage believed to be due to nematodes usually requires assay of the nematode population to confirm the presence and the identity of the pathogen. Thus, disease severity assessments require a measurement of both plant damage and the nematode population. Plant damage is mostly frequently measured using a 0-5 subjective index scale. This system is applicable to root and pod necrosis, root galling, and overall plant vigor. The relationship between nematode populations at different times during the growing season and plant growth, along with the importance of assaying all relevant portions of the nematode population, are discussed.

#### INTRODUCTION

Peanuts are susceptible to several species of plant-parasitic nematodes. The most frequently encountered pathogenic species in peanut-producing regions of the USA include Meloidogyne arenaria and M. hapla (root-knot nematodes), Pratylenchus brachyurus (lesion nematode), Belonolaimus longicaudatus (sting nematode), and Cricanemella ornata (ring nematode). Yield suppression by these pathogens can exceed 50% in severely infested fields.

For foliar diseases incited by bacterial, fungal, or viral pathogens, disease intensity is commonly measured in terms of disease incidence and/or severity of disease symptoms. Symptom severity for many diseases can be measured in terms of percent of the plant exhibiting symptoms, number of lesions per leaf, or by severity class index. Pathogen population densities are not usually measured when assessing severity of foliar diseases. In contrast, for diseases of roots and other below ground plant organs incited by nematodes or other soilborne pathogens, there is generally an absence of discrete, diagnostic symptoms which can be used to estimate disease severity. Methods for estimating nematode population densities with some degree of accuracy, however, have been available for many years. Thus, estimates of severity of disease due to plant-parasitic nematodes have usually involved estimates



of the pathogen's population density. In this paper the need for using some measure of plant damage along with pathogen population density in estimating disease severity will be discussed.

#### ESTIMATING PLANT DAMAGE DUE TO NEMATODES

The most conspicuous symptoms of plant damage due to nematode pathogenesis are stunting, chlorosis, and poor root development accompanied by root necrosis. Root-knot nematodes are generally considered to be the only nematodes that cause diagnostic symptoms due to the distinctive root galling induced. It is the absence of good diagnostic symptoms that has led nematologists to rely so heavily on pathogen population dynamics.

The problem of a lack of diagnostic symptoms, however, can be overcome. In most cases investigators have used some type of subjective rating system to measure plant damage in terms of overall plant vigor, total root development, root-necrosis, or root galling. Powell et al. (3) used a 0-5 index to rate root necrosis; where 0 = no necrosis, 1 = 10% root necrosis, 2 = 11-25%, 3 = 26-50%, 4 = 51-75%, and 5 75% of the root necrotic. A disease severity rating was then obtained from the root necrosis indices by use of the following formula:

$$\text{Disease Severity} = \frac{\left[ \begin{array}{c} \text{No. Plants} \\ \text{in class 1X1} \end{array} \right] + \left[ \begin{array}{c} \text{No. Plants in} \\ \text{Class 2X2} \end{array} \right] + \dots + \left[ \begin{array}{c} \text{No. Plants in} \\ \text{Class 5X5} \end{array} \right]}{\text{Total Number of Plants in the Treatment} \times 5} \times 100$$

The same procedure can be used to develop a disease severity rating based on indices of general vigor, root system development, or root galling.

I prefer using a 0-5 index scale rather than a more limited 1-4 or an expanded 0-10 scale. The 0-5 scale generally gives sufficient range to detect differences among treatments which may not be possible with a more limited scale. Furthermore, as this system is subjective, the precision of a more expanded scale is unwarranted.

Regardless of the index scale used, I like to have a visual representation of the index available as a reference when evaluating plant response to nematodes. Both Barker et al. (2) and Zeck (7) have published schematic representations of 6-point and 11-point scales, respectively, for the rating of root galling. An alternative is to obtain a photographic record of the index scale that can be used as a visual reference (Fig. 1).

This system should be applicable to estimating severity of nematode damage to peanuts and can be used to rate either root or pod damage. Because of the presence of rhizobium nodules on peanut roots, indexing root galling of peanuts is more difficult. While individual nodules are easily distinguished from root-knot galls, the presence of numerous nodules makes it more difficult to examine an entire root system and assign it to the appropriate severity class with an acceptable degree of accuracy.

#### ESTIMATING NEMATODE POPULATION DENSITIES

It is important that estimates of nematode population densities be combined with assessments of plant damage in estimating severity of disease caused by nematodes. This is due not only to the nonspecific nature of damage, but also because of the frequent involvement of other organisms as secondary pathogens in the etiology of nematode diseases. If nematode population densities are not considered, there is a risk of assigning a significantly greater amount of damage to the nematodes than actually occurred.

Nematode populations at the time of planting, at six to eight weeks after planting (mid-season), and at harvest can usually be related to crop growth response. Of these three time periods for estimating population density, the mid-season sampling time is probably the most accurate. Estimating nematode numbers in the spring can be difficult because nematode populations are generally at a minimum and possibly below a threshold of detection. This is especially true for M. arenaria and B. longicandatus, whose populations are frequently below detection limits in the spring (1, 6). The relationship between nematode population density and crop growth response at harvest can be difficult to determine due to the effect of plant damage by the nematodes on the ability of the plant to support nematode reproduction. Frequently, high levels of crop damage are associated with lower nematode populations at the time of crop harvest than are low levels of plant damage. Relating mid-season nematode population densities to crop growth response avoids the problem of a threshold of detection with samples taken at planting and the confounding effect of host damage on population dynamics associated with sampling at harvest. Rodriguez-Kabana et al. (4), however, have related the numbers of juveniles of M. arenaria present in the soil near the time of harvest to yield losses in peanut.

There are many different sampling schemes and extraction methods that can be used to estimate nematode population densities; each has its own inherent advantages and disadvantages. In this paper I would like to emphasize the importance of considering all relevant portions of a nematode population. For example, with migratory endoparasitic nematodes, such as P. brachyurus, the majority of the nematode population is likely to be within the host roots during periods of active plant growth (5). Thus, estimates of population densities based solely on nematodes in the soil per se can be highly misleading. For root-knot nematodes, eggs in the soil can constitute more than 90% of the total population during the interval from the completion of the first generation in the spring until shortly after crop harvest (6, Starr; unpublished data). As with P. brachyurus, failure to consider this portion of the nematode populations can result in a highly inaccurate estimate of population density.

#### SUMMARY

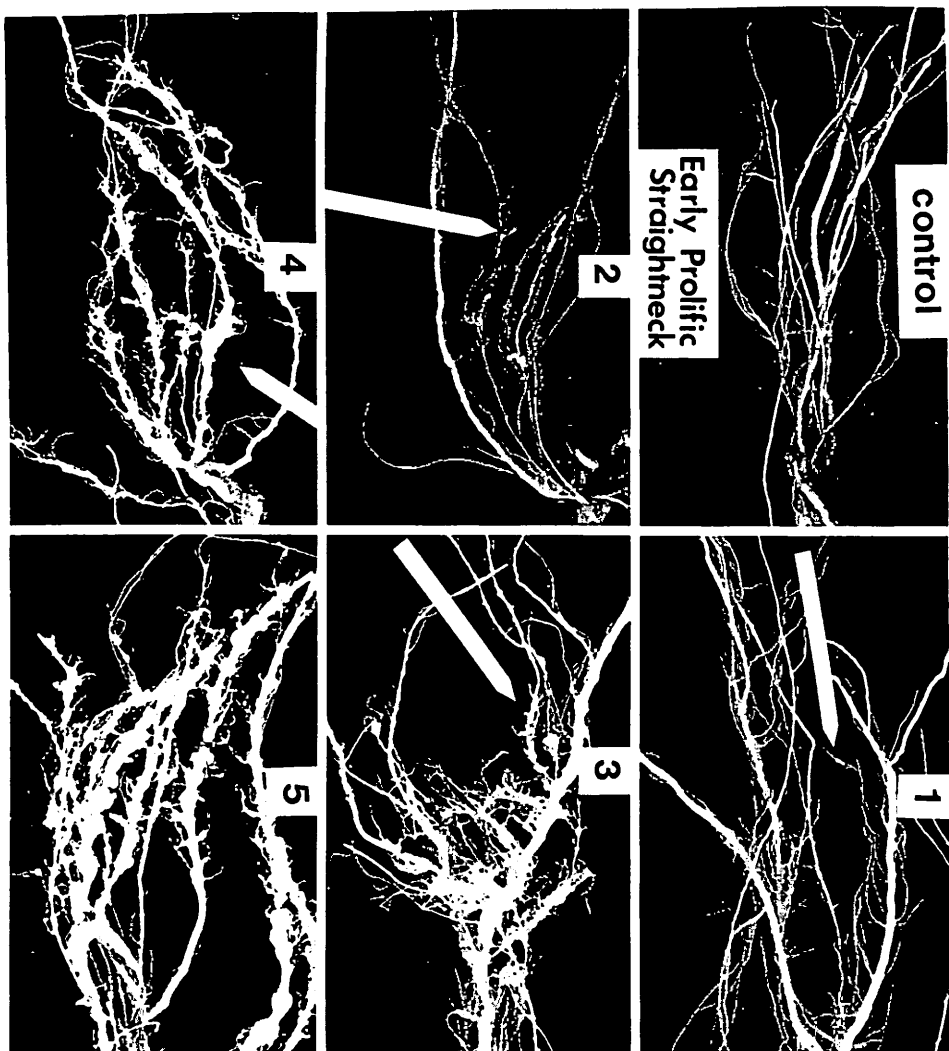
Because diseases incited by plant-parasitic nematodes are generally characterized by an absence of discrete, diagnostic symptoms, conventional and accurate assessment of disease severity due to nematodes is difficult. When appropriate methods used to determine nematode population densities are coupled with a subjective rating of plant damage, however, an indirect assessment of disease severity is possible. The rating of plant damage by nematodes is most conveniently done by utilizing a subjective index (0-5) of root necrosis, plant vigor, or root galling.

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FIGURE 1. A root-galling index for assessing severity of disease incited by Meloidogyne spp. where 0 = no galling, 1 = up to 10% root-galling, 2 = 11-25% root-galling, 3 = 26-50% root-galling, 4 = 51-75% root-galling, and 5 = 76-100% root-galling. Roots shown are Early Prolific Straightneck squash infected with M. incognita.



## Extension and Industry

A Summary of the Effectiveness of Cinnmethylin (SD 95481) for Controlling Annual Grass Weeds in Peanuts. R. H. Heilmann\* and R. H. Bierman. Shell Development Company, Atlanta, GA 30339 and Houston, TX 77060.

Cinnmethylin (SD 95481), CINCH<sup>(R)</sup>, is a new preemergence herbicide being developed by the Shell Chemical Company for the control of annual grass weeds in peanuts, cotton, soybeans, and other crops. Excellent tolerance to cinnmethylin has been exhibited by peanuts, even at application rates higher than necessary for effective weed control. Three years of field research has shown that greater than 90% control can be expected of grasses commonly infesting peanut fields, including, but not limited to, goosegrass, crabgrass sp., foxtail sp., signalgrass sp., panicum sp. (including Texas panicum), and johnsongrass seedlings emerging from seed. In U.S. herbicide field trials conducted from 1981 through 1984, cinnmethylin applied preemergence at 1.12 kg/ha has provided greater than 80% overall grass weed control for a minimum of six to eight weeks following application. In the southeast and northeast states, overall grass weed control at the same use rate has averaged greater than 90% for nine to twelve weeks after application. Preplant incorporated and cracking applications of cinnmethylin have also demonstrated excellent peanut tolerance and effectiveness in controlling annual grass weed species.

R Baythroid: A Pyrethroid Insecticide For The Control of Insects Infesting Peanuts. J. Fortino\* and A. D. Cohick, Mobay Chemical Corporation, 6077 Primacy Parkway, Suite 310, Memphis, TN. 38119-5799.

Baythroid pyrethroid insecticide has been evaluated in laboratory, greenhouse and field testing for control of various insect pests. Worldwide testing in field and vegetable crops, fruit and nut crops and ornamental plants has shown it to be an excellent, non-systemic foliar insecticide.

Field trials have been conducted with Baythroid in 1979 through 1984 for insect control in peanuts. Good to excellent control of various species has been reported at rates as low as 0.025 lb active ingredient per acre. Especially good control of corn earworm (Heliothis zea), velvetbean caterpillar (Thermesia gemmatilis) and redneck peanutworm (Stegasta bosquella) is reported with corresponding crop protection.

Peanut Insect Control with Ammo 2.5 EC. S. A. Ryerson\*, Associate Biologist, 3406 88th Street, Lubbock, TX 79423.

Peanut research activities in the southern and southeastern United States have shown Ammo 2.5 EC insecticide, applied as a foliar spray, will provide economic control of several pest species. In general, Ammo 2.5 EC applied at 0.04 lb ai/A achieved commercial control levels (80+%) for corn earworm, velvetbean caterpillar, and armyworm. Higher rates of Ammo 2.5 EC (0.075 to 0.1 lb ai/A) were necessary to control thrips and rates as high as 0.08 lb ai/A were unable to economically control lesser cornstalk borer. FMC Corporation continues to gather additional pest data on peanuts using Ammo 2.5 EC toward future registration objectives.

Advances In Granular and Dry Flowable Chemical Formulations With Pneumatic Applicators. Pat Patterson\*. District Manager, Gandy Company, 528 Grandrud Road, Owatonna, MN. 55060.

The trend in granular application of pesticides and herbicides will be toward use of smaller quantities of more concentrated granulars.

Update on New Peanut Seed Treatments. Bill Hairston.\* Gustafson, Inc., 17400 Dallas North Parkway, #220, Dallas, Texas 75252.

Since the introduction of the PRO-IZED® Flowable System for peanuts, Gustafson has continued to test new candidate materials in an effort to maintain a treatment combination that offers excellent field performance consistent with available chemistry. In 1984, tests conducted using RTU™-PCNB in lieu of BOTRAN® 30C showed excellent results. University and Gustafson trials demonstrated improved stands and faster emergence when compared to the conventional PRO-IZED II Seed Treatment with BOTRAN 30C. Label clearance for RTU-PCNB on peanuts is expected to clear prior to September, 1985.

A new biological seed treatment for peanuts, QUANTUM™-4000, was introduced by Gustafson for use on 1985 peanut seed. This product consists of a unique strain of Bacillus subtilis that colonizes the developing root system and provides protection from root diseases caused by Rhizoctonia spp. and Fusarium spp. Tests conducted over the past four years in fields where peanuts have been planted with a two year or less rotation have demonstrated an average yield increase of 10% or about 300 lbs./acre.

Weed Control Systems in Peanuts with FUSILADE™ 2000 as the Primary Grass Herbicide.  
Jim Lunsford\*, ICI Americas Inc., 102 Nottingham Court, Enterprise, Alabama 36330.

FUSILADE 2000 (fluazifop-P-butyl) has been evaluated as the primary grass control component in several herbicide systems in peanuts. Controlling annual and perennial grasses with a postemergence herbicide offered more consistent control under limited tillage concepts as opposed to PPI and PRE treatments. Herbicide systems which showed the most consistent broadspectrum control in peanuts started with a cracking spray. FUSILADE 2000 applied 3-4 weeks after the cracking spray offered superior control versus applications made earlier or later than this period. If needed, 2,4-DB was applied 3-5 days after FUSILADE 2000. When supplemented with cultivation and good growing conditions to establish the peanut canopy competition, excellent annual grass control was obtained with a single FUSILADE 2000 application. Where perennial weeds existed or under adverse growing conditions, a second FUSILADE 2000 treatment was needed. This second application was made three weeks later with the first fungicide application.

White Mold, *Sclerotium rolfsii*, Suppression In Peanuts By Ponfos, (Dyfonate)  
Soil Insecticide Treatments. A. S. Csinos and C. R. Andress\*. Dept. of Plant Pathology, University of Georgia, Coastal Plains Experiment Station, Tifton, GA 31793, and Stauffer Chemical Company, P.O. Box 1381, Houston, TX 77251.

*Sclerotium rolfsii*, the cause of white mold in peanuts, causes a loss of \$35-40 million per year in Georgia alone. During three years, '82-84, field trials have been conducted to identify additional compounds to control this disease. In fields with history of peanuts-peanuts-sorghum, RCBD trials were conducted with fungicides, insecticides and combinations of these on florumner peanuts. Following inoculation, the chemicals were applied in an 18-inch band using 100 GPA. *S. rolfsii* disease loci were counted before and after digging the peanuts. Results through 1982-1984 at Tifton, Georgia show Dyfonate demonstrated significant fungistatic properties against this disease. Field test data are shown on color slide transparencies.



BAY HWG 1608: An Efficacious Experimental Fungicide For The Control Of Certain Peanut Foliar Diseases. R. F. Nash\* and R. D. Rudolph, Mobay Chemical Corporation, 1587 Phoenix Blvd., Suite 6, Atlanta, GA. 30349

Since 1982, the experimental fungicide BAY HWG 1608 has been widely tested in the U.S. for control of foliar diseases of peanuts. BAY HWG 1608 has proven to be especially efficacious against early leaf spot (Cercospora arachidicola), late leaf spot (Cercosporidium personatum), and rust (Puccinia arachidis) at dosages from 0.07 to 0.28 Kg ai/ha. Dosages of 0.07 and 0.14 kg ai/ha, require an adjuvant, for acceptable activity. Peanut yields with BAY HWG 1608 have been superior to Bravo when both C. arachidicola and C. personatum and/or P. arachidis were present at economic levels. In trials where C. arachidicola was the only disease of economic importance, BAY HWG 1608 provided a yield response equal to Bravo. The excellent results with BAY HWG 1608 have been observed in both full season spray programs and applications based on an Advisory Program.

Helena Chemical Company: New and Continuing Developments. Allen Underwood and Tony Clark. Helena Chemical Company; Suite 3200 - Clark Tower, 5100 Poplar Avenue, Memphis, TN 38137.

Testing of sterol inhibiting fungicides with the adjuvants Agri-Dex, Penetrator and Soy-Dex continues.

In work done in 1983 and '84 in Alabama, Tilt fungicide was used to compare Penetrator crop oil concentrate, Soy-Dex soybean oil adjuvant (85:15) and water when applied to peanuts. Results indicated that Penetrator significantly increased the uptake of Tilt into peanut leaf tissue when compared to Soy-Dex and water. In addition, the rapidity with which uptake was accomplished was also significantly better. Although better than water alone, Soy-Dex was not as effective in moving Tilt into leaf tissue.

In the same study, there was strong evidence that when compared to conventional application methods, Micromax application systems was inferior as to the total amount of uptake and the rapidity of uptake at the 1 hour, 3 day and 7 day treatments.

Herbicide testing with Agri-Dex, Soy-Dex and Induce and fungicide testing, both contact and systemic, with Penetrator, Surfix and Induce continues. Data indicate that adjuvant effect is pesticide specific and species specific.

Rizolex: An Effective New Fungicide for Soil-borne Diseases. H.A. Terwedow\* and C.C. Jensen. Velsicol Chemical Corporation, 341 East Ohio Street, Chicago, IL 60611.

Rizolex® is the tradename for tolclofos-methyl, a fungicide from Sumitomo Chemical in Japan being developed since 1984 for the North American markets by Velsicol Chemical Corporation. A contact fungicide with good residual, Rizolex is active on soil-borne pathogens of the Basidiomycetes. Chief among the pathogens controlled are species of the genera Rhizoctonia, Sclerotium, Typhula, and Helminthosporium. Velsicol is conducting field trials in a number of crop and non-crop markets, including peanuts. In peanuts, Rizolex demonstrates excellent activity on Sclerotium rolfsii, superior in many regards to the standard PCNB. Other labelling possibilities for peanuts include Sclerotinia spp., pod rot, and seedling diseases. An EUP is anticipated for 1986 with commercial labels by 1987 or 1988.

Control of Peanut Nematodes Using Furadan 4F Applied Through Irrigation. ✓  
\*E. V. Gage, FMC Corporation, San Antonio, TX.

Furadan 15G applied at 1.5 lb ai/A as an at-plant, banded application continues to provide competitive and economic control of root knot nematodes in Texas peanuts. Utilization of Furadan 4F treatments at-pegging in research studies have shown additional viability and flexibility in controlling nematodes. Furadan 4F injected through sprinkler irrigation at rates of 1.0 and 2.0 lb ai/A significantly increased peanut yields over untreated peanuts and provided the grower with reduced application costs. FMC will continue to pursue expanded use patterns for Furadan 4F and it is our goal to include chemigation on future peanut labels.

Effects of oil-surfactant blends on propiconazole residues and peanut leafspot with Tilt® fungicide. J. M. Hammond\*, Ciba-Geigy Corp., Greensboro, NC, and P. A. Backman, Auburn University, Ala. Agric. Exp. Sta., Auburn University, AL 36849.

Penetrator-3® (83:17 petroleum oil:surfactant blend) and Soydex® (85:15 soybean oil:surfactant blend) were evaluated (0.3% v/v) as adjuvants for effects on Tilt 3.6 EC peanut foliar disease control and propiconazole residues. Both adjuvants were compared to the aqueous Tilt system. Penetrator use resulted in much quicker (1 hour) movement of propiconazole into the leaf tissue, while Soydex was intermediate. Total residues at 7 days were 2-times greater where adjuvants were used. Control of both peanut rust and leafspot were improved with adjuvants in this test. Overall, Penetrator was superior in preserving propiconazole residues and in controlling disease when compared to the aqueous or Soydex-adjuvanted Tilt spray programs.

Occurrence of Botrytis Blight in Western Texas Peanut Fields. \*Thomas A. Lee, Jr. and K. E. Woodard, Texas Agricultural Extension Service and Texas Agricultural Experiment Station, Stephenville, Texas 76401.

Botrytis Blight caused by Botrytis cinerea was identified on Arachis hypogaea in Western Gaines County Texas in September, 1984. The fungus attacked both above and below ground portions of the plant and pods. Symptoms included rapid death of the plant followed by an immediate breakdown of all plant parts. Infected tissue was at first covered by a mass of white to gray conidia and later by numerous flattened black irregular shaped sclerotia. Repeated laboratory isolations were necessary to definitively prove that this disease was caused by B. cinerea and not Sclerotinia minor with which it was initially confused.

# Tissue Culture

## PEANUT TISSUE CULTURE INTEREST GROUP REPORT

A meeting of APRES members with interests in peanut tissue culture research and methodology was held on July 10, 1985, from 9:30-11:30 p.m.

In attendance were: Don Banks, USDA-ARS, Stillwater, OK; Scott Campbell, USDA-ARS, Watkinsville, GA; David Hsi, New Mexico State University, Los Lunas, NM; Becky Johnson, Oklahoma State University, Stillwater, OK; Norman Lovegren, USDA-ARS, New Orleans, LA; Phil Moss, ICRISAT, India; Jim Pallas, USDA-ARS, Watkinsville, GA; Harold E. Pattee, USDA-ARS, Raleigh, NC; Roy Pittman, USDA-ARS, Stillwater, OK; Morena Seitz, North Carolina State University, Raleigh, NC; Rebecca Sellars, New Mexico State University, Las Cruces, NM; Charles E. Simpson, Texas A & M University, Stephenville, TX; Tom Stalker, North Carolina State University, Raleigh, NC; Kristin Steffgen, New Mexico State University, Los Lunas, NM; and Barbara Triplett, USDA-ARS, New Orleans, LA.

The meeting was the second for the informally organized group. The first meeting was held during the 1982 APRES meetings in Albuquerque, New Mexico (see Proc. Am. Peanut Res. Educ. Soc. 14:122, 1982).

After introductions, each participant explained their specific interests in peanut tissue culture. Areas of interest included 1) regeneration of wild and cultivated genotypes, 2) embryo culture, 3) anther culture, 4) suspension culture, 5) protoplast culture, and 6) general culture methods for photosynthesis studies.

Various peanut tissue culture problems that have occurred in various laboratories were discussed. These problems have included methods for isolating and regenerating protoplast, suspension cell culture, anther culture and genetic and morphological sources of explants.

The group agreed that communications between peanut tissue culture researchers could be improved by a free exchange of information relating to the interest for each scientist and group. It was decided that a list along with the addresses of people with tissue culture interests would be compiled. The list would then be sent to all known persons with interests in peanut tissue culture research. The list could be updated as new names become apparent. Roy Pittman will compile the list and will proceed with the initial mailings.

It was suggested that brief reports concerning tissue culture interests, progress, objectives and the availability of Graduate Assistantships and/or Postdoctoral positions in tissue culture be sent to the "Peanut Research" newsletter and other appropriate communications to better inform the public about peanut tissue culture research.

Submitted by R. N. Pittman  
USDA-ARS  
Stillwater, OK

# Society Business

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY  
Board of Directors Meeting  
El Tropicano Hotel, San Antonio, Texas  
July 9, 1985

President Gale Buchanan called the meeting to order at 7:05 p.m. The following individuals were present: Gale Buchanan, Ron Sholar, Fred Cox, Don Smith, Terry Coffelt, Johnny Wynne, Olin Smith, W. E. Dykes, Perry Russ, D. F. Bateman, Max Grice, Leland Tripp, Marvin Beute, Mike Schubert, Ben Witty, Walt Mozingo, Harold Pattee, Gerald Harrison, Aubrey Mixon, and Terry Grinsted.

Ron Sholar presented the Executive Officer report. Dr. Durward Bateman was introduced as the Southern Agricultural Experiment Station Directors representative to APRES.

W. E. Dykes presented the Finance Committee report. The society had a profit of approximately \$8,000 in 1984-85. The proposed budget for 1985-86 will include receipts of approximately \$55,000 and expenditures of approximately \$51,000. The Finance Committee recommended a capital expenditure of \$5,000 for the purchase of a computer with appropriate software. The Finance Committee report was accepted.

Terry Coffelt presented the Editorial Committee report. Harold Pattee reported that an attempt would be made to publish three issues of Peanut Science in the next year. Aubrey Mixon presented the Peanut Research report. Dr. Sam Ahmed has been appointed as editor of Quality Methods. The committee recommended that insurance on unsold copies of Peanut Science and Technology not be purchased due to high cost. The committee also recommended a new format for abstracts for the Proceedings. Don Smith suggested that previous meeting sites of the APRES meeting be listed in the Proceedings. The report of the Editorial Committee was accepted.

The Peanut Quality Committee report was presented by Max Grice. The Committee report addressed aflatoxins and foreign materials in peanuts. The committee report was accepted.

Leland Tripp presented the Public Relations Committee report. The report was accepted.

Jay Williams and Stan Drexler were announced as winners of the Golden Peanut Research and Education Award. Harold Pattee announced that Al Allison, J. W. Dickens, and Thurman Boswell have been selected as Fellows of APRES. The report was accepted.

Marvin Beute presented the Bailey Award Committee report. The report was accepted.

Mike Schubert presented the Site Selection Committee report. Walt Mazingo announced that the 1986 meeting will be at the Pavillion Towers in Virginia Beach, Virginia. The dates will be July 14-18. Ben Whitty announced that the 1987 meeting will be in Orlando, Florida, at the Mariott. The dates are July 13-17. The committee report was accepted.

The Program Committee report was made by Don Smith. The report was accepted.

President Gale Buchanan commented on the possibility of developing graduate student participation awards and involvement in APRES. It was agreed that President-elect Don Smith would appoint a committee to look into this area.

Fred Cox discussed a proposed change to the by-laws for selection of officers. The proposed change involves securing nominees for each position and changing the method of selecting the executive officer from election by the membership to appointment by the Board of Directors. These changes were approved for submission to the membership in the official business session.

Fred Cox presented the Nominating Committee report. The report was accepted.

The meeting was adjourned at 8:45 p.m.

Minutes of the Regular Business Meeting of the  
AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY  
El Tropicano Hotel, San Antonio, Texas  
July 12, 1985

The business meeting was called to order by President Gale Buchanan at 8:30 a.m. Committee reports as indicated on the agenda were made. Copies of the reports are found in the Proceedings.

Of significance was that the Society approved a change in the method for selecting the executive officer of the Society. The old and new methods are indicated below.

OLD:

Article VII, Section 3:

The officers and directors shall be elected by the members in attendance at the annual general meeting from nominees selected by the Nominating Committee or members nominated for this office from the floor. The president, president-elect, and surviving past-president shall serve without monetary compensation.

Section 4:

The executive officer may serve consecutive yearly terms subject to re-election by the membership at the annual meeting. The tenure of the executive officer may be discontinued by a two-thirds majority vote of the Board of Directors, who then shall appoint a temporary executive officer to fill the unexpired term.

NEW:

Section 3:

The officers and directors, with the exception of the executive officer, shall be elected by the members in attendance at the annual general meeting from nominees selected by the Nominating Committee or members nominated for this office from the floor. The president, president-elect, and surviving past-president shall serve without monetary compensation. The executive officer shall be appointed by a two-thirds majority vote of the Board of Directors.

Section 4:

The executive officer may serve consecutive yearly terms subject to appointment by the Board of Directors. The tenure of the executive officer may be discontinued by a two-thirds majority vote of the Board of Directors who then shall appoint a temporary executive officer to fill the unexpired term.

This change has been incorporated into the By-Laws.

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

Balance Sheet as of

	<u>June 30, 1985</u>	<u>June 30, 1984</u>
<u>ASSETS</u>		
Cash in Checking Account	\$ 20,761.66	\$36,749.49
Certificate of Deposit #1	11,087.46	10,000.00
Certificate of Deposit #2	7,321.12	0.00
Money Market Account	16,318.24	0.00
Savings Account (Wallace Bailey Fund)	1,056.35	965.04
Inventory of Books	<u>43,509.20</u>	<u>47,274.64</u>
TOTAL ASSETS	\$100,054.03	\$94,989.17
<u>LIABILITIES</u>		
None	<u>0.00</u>	<u>0.00</u>
BALANCE	<u>\$100,054.03</u>	<u>\$94,989.17</u>



# AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

## Statement of Activity for Year Ending

	<u>June 30, 1985</u>	<u>June 30, 1984</u>
<b>RECEIPTS</b>		
Membership & Registration	\$23,783.26	\$21,399.37
Proceedings & Reprint Sales	11.00	28.50
Special Contributions	525.00	3,400.00
Peanut Science & Technology	8,277.89	13,155.89
Peanut Science Page Charges & Reprints	11,123.67	11,604.12
Institutional Membership	0.00	1,632.50
Differential Postage	1,862.23	2,167.50
Checking Account Interest	1,115.06	1,108.96
Savings Account Interest (Wallace Bailey)	91.31	2,511.60
Ladies Activities	883.00	0.00
Certificate of Deposit #1 (interest)	1,087.46	22,819.55
Certificate of Deposit #2 (prin. & int.)	7,321.12	0.00
Money Market Account (prin. & int.)	16,318.24	0.00
Quality Methods	836.00	1,175.63
<b>TOTAL RECEIPTS</b>	<b>\$73,235.24</b>	<b>\$79,371.12</b>

## EXPENDITURES

Proceedings Printing & Reprints	\$ 2,750.96	\$ 4,380.48
Annual Meeting	5,153.11	3,912.86
Secretarial	7,352.59	3,150.00
Postage	2,518.47	555.00
Office Supplies	902.44	587.69
Travel - Officers	706.29	421.24
Registration - Corporation	0.00	20.00
Miscellaneous	421.02	467.95
Peanut Science	16,400.00	15,059.00
Peanut Science & Technology	65.00	26,806.63
Bank Charges	67.00	350.72
Peanut Research	2,047.40	1,384.30
Certificate of Deposit #1	0.00	10,000.00
Certificate of Deposit #2	7,000.00	0.00
Money Market Account	15,000.00	0.00
Membership	67.50	54.33
Secretary - Self-Employment Tax	396.97	210.38
Legal Fees	610.00	62.00
Quality Methods	680.47	389.20
Sales Tax	87.72	282.67
<b>TOTAL EXPENDITURES</b>	<b>\$62,226.94</b>	<b>\$58,094.45</b>
<b>EXCESS RECEIPTS OVER EXPENDITURES</b>	<b><u>\$11,008.31</u></b>	<b><u>\$21,276.67*</u></b>

### Cash in Checking Account:

Beginning 1985:	\$36,749.49	1984: \$15,472.82
Ending 1985:	\$20,761.66	1984: \$36,749.49

\*Over \$20,000.00 of this excess came from C.D.s.

AGRICULTURE'S CHALLENGE  
Gale A. Buchanan  
Dean and Director  
Alabama Agricultural Experiment Station  
Auburn University, Alabama

Few of us have experienced as difficult times in agriculture as exists today. The acute financial problems of many farmers and the generally depressed agricultural marketplace leave little doubt that the role and importance of research and extension continue to escalate.

Most of you will recall that last year I talked about the importance of the State Agricultural Experiment Station and Extension Service programs to the peanut industry. Those of us involved in these programs have an exceedingly challenging opportunity to find the best path out of the dilemma that exists today.

If there is a silver lining, I believe it is that both farmers and consumers -- especially consumers -- have a heightened awareness of the importance of agricultural research and extension programs. There are still those who blame agriculture's problems on 'over-kill' by research and unbridled production by our farmers. If the problem was this simple, we could solve it in one growing season. Unfortunately agriculture's problems are far more complex and the challenges to find solutions are far more serious than at any time in our nation's history.

There is no doubt that research and its extension to our farmers have played a key role in the development of peanut production as we know it today. But is this enough? Enough to ensure that we will still be in the peanut business regardless of upcoming legislation? Enough to prevent the 20-25% of farmers in peanut-producing states who are delinquent on debts from going out of business? Enough if other peanut-producing countries decide to further compete for our world markets?

We recently held the first ever International Conference on Soil Dynamics at Auburn. One of the featured speakers at this meeting, Bob Lanphier, President of an agricultural equipment company in the Midwest and a key industry advisor to Secretary of Agriculture John Block, made some provocative predictions about the role of agricultural research in the salvation or ruin of American agriculture. He said, "with less effort than was required to put a man on the moon, we can increase yields and decrease costs per unit of output such that our commodities will be competitive wherever markets exists. He further offered the challenge that we should be thinking in terms of American farmers selling corn for \$1.50 a bushel and making a profit at that price." Such a national commitment could solve many of agriculture's problems. You might not agree with all he said, but I sure like his attitude.

In a recent address to the Brookings Institute's Executive Leadership Seminar on Critical Public Policy Issues, Dr. Terry B. Kinney, Jr., Administrator of the Agricultural research Service, suggested some ways in which agricultural research can make us more competitive. Dr. Kinney says to,

1. Focus research on technologies which can lead to new products from our farm surpluses,
2. Put greater research effort into product quality and post-harvest aspects,
3. Improve farmers' returns on their investment,
4. Develop more cost-effective ways to protect our basic resources -- soil and water -- from erosion and pollution, and
5. Improve and increase research efforts on basic sciences and newly emerging technologies.

Dr. Kinney is on target and, in my opinion, he has identified some particularly pertinent and relevant points.

The real challenge is how can we accomplish Dr. Kinney's suggestions. My greatest concern is our ability to address such problems, but of equal concern is the apparent perception on the part of some state and national leaders that maintaining the strength, efficiency, and productivity of American agriculture through agricultural research is not sufficiently important to justify a high priority among the funding demands for research dollars. This apparent lack of appreciation for agricultural research, particularly at the national level, can only make it increasingly difficult to obtain the funds necessary to adequately meet the highest priority research needs of agriculture and forestry. Of even greater concern is the growing trend in some circles toward antitechnology. One can only hope that this is but a fad and will be rejected by thinking people.

Scientists involved in any area of research can suggest dozens of ways in which their research efforts could be enhanced by better funding for equipment, supplies, and support personnel. In fact, many creditable and worthwhile research ideas are not being considered in our Nation's agricultural experiment stations because of lack of resources. To illustrate this point, usually fewer than 25% of research proposals submitted to USDA are funded. In the just released results of this year's competition for Animal Health Special Research Grants, only 12% was funded. By far, the majority of these proposals are of excellent quality and would contribute to improvements in agriculture. Scientists working in the system recognize the need for many, new and expanded research projects, and they have the expertise to perform such research. Unfortunately, this recognition and competence is not matched by the funding of agricultural research.

Unlike many areas, such as in engineering, in which precise research goals can be defined and accomplished in a specified period of time, most objectives in agricultural research are moving targets. Agricultural problems are constantly changing, so our goals must be constantly redefined. Furthermore, agricultural researchers are constantly raising their sights.

The time-worn argument that lack of funds can be solved by redirecting resources to work on more relevant research problems hardly deserves a response. Redirecting the entire agricultural budget of the United States Department of Agriculture would not allow work on all the new problems that face us

today. To state the problem clearly, agricultural research is woefully underfunded.

As recently as 1980, the state agricultural experiment stations were receiving only 23% of the federal funds that go to support food and agricultural research. Even more distressing, however, is that only 2% of the federal dollars going to research and development go to agricultural research.

The attitude of the current administration in Washington offers no encouragement. The executive budget submitted to Congress in February calls for a reduction of 14% in funding for the state agricultural experiment stations through Cooperative State Research Service (CSRS) items in the USDA budget and an overall 6% reduction in all agricultural research. At the same time, there is a projected 22% increase in the research and development budget for defense and 6.4 and 6.9% increases for National Aeronautics and Space Administration and National Science Foundation, respectively. These are your priorities for research as perceived by this administration.

I wonder, if we had a National mandate with adequate funding and unlimited access to the mental resources of this country, what could we do to ensure that the United States remains the top producer of quality peanuts in the world and that our farmers continue to be prosperous. I spent most of my professional career as a weed scientist, so it's only natural that I would think first of weed control. Could we develop more efficient ways of using herbicides and thereby reduce their cost? Have we fully explored management concepts that would reduce the weed control needed? We know that we can reduce the amount of weed control needed in peanuts by as much as 25% simply by adjusting row spacing. Are there biological agents that would effectively control our most troublesome weeds? We have only scratched the surface, but a fungal pathogen has successfully controlled sicklepod in a number of experiments.

Could we produce near perfect prescription pesticides on a field-to-field basis. Could we develop prescription tillage for every soil type and field configuration in the major peanut producing areas of our country? In short, could we provide the technology to allow our farmers to reduce cost 35% and increase yields 50%. We can't do it with 'muscle power'. There are limits to the amount of chemicals or the size of equipment we can use, and we may be close to these limits in peanut production today. But we aren't close to the limits of new technology to more efficiently utilize these tools. Only through 'brain power' will we be able to reach new levels of production. Back to the bottom line question, could we provide the technology to make \$250 a ton peanut profitable if we had a National mandate to do so. I think few in this group would doubt that we could do it.

If we could do it in peanuts, certainly we could in corn, soybeans, wheat, and virtually all commodities. Wouldn't such a dramatic turn about in world export markets rapidly reduce our country's gigantic federal debt? Wouldn't it restore much of our country's lost prestige overseas? Maybe it would be even more important than putting a man on the moon?

The United States has the single best opportunity of any country in the world to convert food power, whether it be peanuts, corn, or wheat, to political power. Our ratio of cultivatable land area to people is about 5 to 1, compared to 2 to 1 for most areas of the world. We have a system of agricultural research unique to the world and envied by all. I think we can use those assets more effectively and the American Peanut Research and Education Society has a vital role to play. We, as a society, are committed. Unfortunately, we do not have a national commitment.

When asked some of these same questions about increasing production and decreasing input cost, one administrator replied, "Sure we can do it, all it takes is time and money." After a short pause he added, "In inverse proportions."

I mentioned earlier that I sensed an increased awareness of agriculture's problems and the need for agricultural research. I get this from visits with various farm and consumer groups, but an event that occurred last spring really stands out in my mind to highlight this feeling.

A team of Auburn researchers completed one phase of a long-term peanut rotation study and found some interesting results -- some of which will be reported at this meeting. We wanted to get this information to farmers in the peanut-producing area of our State, but the results weren't complete and needed some explanation. Plus we didn't have time to go through the usual dissemination process and get the information to farmers prior to the 1985 planting season. So we decided to have a press conference and have the scientists explain the test. We had no idea what the media response would be.

The response was tremendous. We had TV stations, the State radio network, several farm magazines and daily and weekly newspapers represented. That they came was important, but more impressive was their interest in what was said and the informed, intelligent questions they asked. Why? Because they understood the importance of peanuts to the economy of their part of the State. And they knew the research information being discussed at the press conference would be important to their audience. Not just to farmers, because peanuts add hundreds of millions of dollars to the economy of that nine-county area and even more to the Southeast U.S.

I don't know what it would take to get the kind of National commitment that Mr. Lanphier described to support agricultural research. I certainly hope it doesn't take the ruin of our agricultural industry to do so. But I do believe the general public is more supportive and understanding of agriculture and agricultural research and extension than we think.

I don't believe there is a panacea cure for agriculture's problems. These problems are leading to a major upheaval on the farm, not all together different than the dust bowl and depression years. As the number of farmers gets smaller and smaller, what we do as scientists will be more closely scrutinized. We will be held more accountable for our efforts. Likewise the stakes for farmers will be higher, and each of their actions in producing a crop will be more critical. The

current catch-phase in agriculture seems to be 'prescription farming'. Some refer to it as 'hard times' farming. I hope it won't take more hard times to encourage greater efficiency. If so, we should all work every day as if times are hard.

There are signs of encouragement. Many legislators, both at the state and national level, are sufficiently enlightened to appreciate and understand the importance of a strong agriculture and the role of research in keeping agriculture strong. I sense a renewed concern on the part of consumers, farm organizations, and individual farmers that agricultural research programs play a crucial role in agriculture. I am impressed that, for the most part, there is an honest appreciation of what such research organizations should and can do. Hopefully such support will translate into the kind of commitment needed to reach the potential that each of us knows exists.

APRES

Report of the Executive Officer

July 12, 1985

We have just closed out the last fiscal year and as always, we view the annual meeting somewhat as the last official act of that year. But obviously we don't stop there. We use this gathering of researchers, Extension specialists, and Industry to again confirm that our Society truly represents all segments of the peanut industry: the gatherers, extenders, and users of peanut information. Never is this so evident as at our annual meeting. Not only do we use this meeting to cap off a year, but we use it as a source of inspiration for beginning the next.

Our preliminary accounting shows that over 260 individuals registered for this meeting not including those attending only the producer session. The 260 attending the scientific sessions were joined by approximately 140 spouses and children which is probably one of the highest numbers we've had. But more importantly than the numbers, our members have again profited from the sharing of knowledge to enhance our collective abilities to grow, process, and use peanuts.

Our membership figures show that prior to this meeting we had 680 members in five categories:

- 453 Individual
- 105 Institutional
- 33 Student
- 29 Sustaining
- 60 Organizational

We have gained a significant number of new members at this meeting.

Our society continues to be a highly solvent operation. I won't give the complete financial report; however, I can tell you that our net worth now stands at just over \$100,000.00, an increase from last year.

APRES, Executive Officer's Report  
July 12, 1985  
page two

I would like to publicly thank Gale Buchanan for the highly organized and efficient manner in which he has served as your president. This has made my job much easier.

I've enjoyed serving the Society in this capacity for the past two years.

James R. Sholar  
Executive Officer

JRS:mls



## PROGRAM COMMITTEE REPORT

Members of the Local Arrangements, Technical Program Committee, and Ladies' Program Committee are listed at the end of this report. Two former APRES Presidents (Olin Smith and Leland Tripp) chaired the Technical Program and Local Arrangements committees very effectively. Bernadine Tripp, spouse of a former APRES President, Executive Secretary-Treasurer, APRES Fellow, and NPC-GPREA award recipient gave competent leadership to the Ladies' Program Committee.

The technical program included 129 presentations on diverse topics, ranging from crow management to culture of peanut peg tips. Meeting highlights included a Presidential address by G. A. Buchanan, a Keynote address by Henry G. Cisneros, presentation of APRES awards, a mini-symposium on Disease Assessment Methodology, and a Peanut Production Symposium of special interest to peanut producers.

The tours for ladies, peanut open golf classic, SDS Biotech party, Uniroyal barbecue, coffee break refreshments provided by various sponsors, and the Friday morning breakfast sponsored by the Southwestern Peanut Shellers Association contributed to a memorable meeting in the Alamo city.

Many persons who share a common interest in the welfare of the peanut industry contributed to the success of this meeting. To all of those persons who took time to serve APRES, we extend our sincere appreciation.

### Program Committee

D. H. Smith, Chairman

#### Local Arrangements:

Leland Tripp, Chairman  
George Alston  
Mark Black  
James Blalock  
Noble Kearney  
T. A. Lee, Jr.  
Norman McCoy  
J. W. Steward

#### Technical Program:

O. D. Smith, Chairman  
William J. Grichar  
Mark J. Hood  
T. A. Lee, Jr.  
M. J. McFarland  
Forrest Mitchell  
Robert E. Pettit  
K. C. Rhee  
A. M. Schubert  
Charles E. Simpson  
Jim P. Stack  
Jim L. Starr  
Ruth A. Taber

#### Ladies' Program:

Bernadine Tripp,  
Chairperson  
Barbara Lee  
Lynann Simpson  
Charlotte Alston  
Thelma Smith  
Bobbie Smith

PROGRAM  
for the  
Seventeenth Annual Meeting  
of the  
American Peanut Research and Education Society, Inc.

TUESDAY, JULY 9

1:00-8:00 APRES Registration  
1:00-5:00 Ladies Hospitality

COMMITTEE MEETINGS AND DISCUSSION GROUPS

1:30 Finance - W. E. Dykes, presiding  
1:30 Editorial - T. A. Coffelt, presiding  
1:30 Site Selection - A. M. Schubert, presiding  
3:00 Public Relations - L. D. Tripp, presiding  
3:00 Peanut Quality - Max Grice, presiding  
3:00 Germplasm Advisory Committee - C. E. Simpson, presiding  
7:00 Bailey Award - M. K. Beute, presiding  
7:00 Board of Directors - G. A. Buchanan, presiding

WEDNESDAY, JULY 10

8:00-5:00 APRES Registration  
8:00-5:00 Exhibits  
8:00-5:00 Ladies Hospitality

GENERAL SESSION  
D. H. Smith, presiding

8:23 Invocation - A. M. Schubert  
8:30 Presidential Address - G. A. Buchanan  
8:45 Keynote Address - Henry G. Cisneros, Mayor of San Antonio  
9:15 Presentation of Honorary Awards - G. A. Buchanan  
9:30 Announcements  
L. D. Tripp, Local Arrangements Committee  
O. D. Smith, Technical Program Committee  
9:35 Break

THREE CONCURRENT SESSIONS

1. SESSION A--BREEDING AND GENETICS
2. SESSION B--PRODUCTION TECHNOLOGY
3. SESSION C--PLANT PATHOLOGY - NEMATOTOLOGY

# SESSION A. BREEDING AND GENETICS

D. J. Banks, presiding

- 10:00 Interaction of Floral Senescence and Ovary Development in Arachis hypogaea L. H. E. Pattee\* and S. C. Mohapatra.
- 10:15 In Vitro Culture of Arachis hypogaea Peg Tips. J. P. Moss\*, H. T. Stalker and H. E. Pattee.
- 10:30 Regeneration of Anther Callus in Arachis paraguariensis. M. H. Seitz\*, H. T. Stalker and P. Still.
- 10:45 Arachis spinaclava, a D. Genome Species of Section Arachis. H. T. Stalker\*.
- 11:00 Crossability and Cross-compatibility of Five New Species of Section Arachis with Arachis hypogaea L. C. E. Simpson\*, D. L. Higgins and Wm. H. Higgins, Jr.
- 11:30 Maintaining Wild Arachis Germplasm. Wm. H. Higgins, Jr.\*, and C. E. Simpson.
- 11:45 Lunch

# SESSION B. PRODUCTION TECHNOLOGY

G. D. Alston, presiding

- 10:00 Effect of Nitrogen and Phosphorus Application on Growth and Yield of Peanuts in Irrigated Vertisols of Sudan. H. M. Ishag\* and M. Bakeit Said.
- 10:15 Peanut Seed Germination and Ca Content in Response to Supplementary Calcium Application. A. H. Allison\*.
- 10:30 Long-term Response of Irrigated Spanish Peanut to Factorial Treatments of Nitrogen, Phosphorus, and Potassium Fertilizer. R. M. Jones\* and J. S. Newman.
- 10:45 The Effect of Reduced Tillage on Peanut Yields. D. L. Hartzog\* and F. Adams.
- 11:00 Conservation Tillage of Peanuts in Virginia. F. S. Wright\* and D. M. Porter.
- 11:15 Weed Control, Yield, and Net Return Comparisons in Conventional and Reduced Tillage Peanuts. D. L. Colvin\*, G. R. Wehtje, M. G. Patterson and R. H. Walker.
- 11:30 Diseases, Arthropod Pests, and Drought Situation of Peanut in Senegal--1984 Crop Season. D. H. Smith\* and P. Subrahmanyam.
- 11:45 Lunch

# SESSION C. PLANT PATHOLOGY-NEMATOLGY

J. L. Starr, presiding

- 10:00 Response of Peanut Cultivars to Fenamiphos in a Field Infested with Northern Rootknot and Ring Nematodes. P. M. Phipps\* and T. A. Coffelt.
- 10:15 Influence of Tillage, Nematicide and Fungicide--Insecticide Treatments on Double-Cropped Peanut in Wheat Stubble. N. A. Minton\*, A. S. Csinos and L. W. Morgan.

- 10:30 The Effect of Selected Rotation Systems with Peanut, Soybean, and Corn on Populations of Meloidogyne arenaria. C. F. Weaver\*, R. Rodriguez-Kabana and H. Ivey.
- 10:45 Evaluation of Selected Nematicides for Control of Meloidogyne arenaria in Peanut. R. Rodriguez-Kabana\* and P. S. King.
- 11:00 Influence of Salinity on Peanut Growth and Vesicular-Arbuscular Endomycorrhizal Fungus Infection. T. D. Riley\*, R. A. Taber, O. D. Smith and R. M. Taylor.
- 11:15 Vesicular-Arbuscular Endomycorrhizal Fungi Associated with Peanut: Germplasm Acquisition. R. A. Taber\*, O. Nopamornbodi and L. Ilag.
- 11:30 Multi-State Peanut Inoculation Trials. R. S. Smith\* and J. C. Davis.
- 11:45 Lunch

### THREE CONCURRENT SESSIONS

1. SESSION A--SYMPOSIUM: MAXIMIZING PRODUCTION EFFICIENCY
2. SESSION B--HARVESTING, CURING, STORING PEANUT
3. SESSION C--PLANT PATHOLOGY

#### SESSION A. SYMPOSIUM: PEANUT PRODUCTION L. D. Tripp, presiding

- 1:10 Rhizobium Needs. R. W. Weaver.
- 1:40 Nutrient Needs. D. L. Hartzog.
- 2:10 Seed Quality. G. A. Sullivan.
- 2:55 Break

#### SESSION B. HARVESTING, CURING, STORING PEANUT D. L. Welch, presiding

- 1:10 The Effect of Microwave Drying of Shelled Peanuts on Energy Requirements, Physical Properties, Mycological Growth and Germination Potential. S. R. Delwiche\*, W. L. Shupe, J. L. Pearson and T. H. Sanders.
- 1:25 Quality-Comparisons Between Microwave-Vacuum-Dried and Heated-Air-Dried Florunner Peanuts. J. L. Pearson\*, T. H. Sanders, J. L. McMeans, S. R. Delwiche, W. L. Shupe and J. L. Butler.
- 1:40 Effect of Chilling Injury on Windrowed Peanuts. J. A. Singleton and H. E. Pattee\*.
- 1:55 A Semi-Underground Warehouse Model for Farmers Stock Peanuts. J. S. Smith, Jr.\*, and T. A. Sanders.
- 2:10 Required Equilibrium Time for Peanut Moisture Content Determination with Electronic Moisture Meters. J. H. Young\*.
- 2:25 Aflatoxin--Incidence, Segregation and Destination in Australia. A. Baikaloff\* and M. J. Read.
- 2:40 An Audible Scarecrow for Protecting Harvested Peanut Plots. D. J. Banks\*.
- 2:55 Break

SESSION C. PLANT PATHOLOGY

J. E. Bailey, presiding

- 1:10 Effects of Triazole Fungicides on Soil-borne Diseases of Peanuts.  
P. A. Backman\* and M. A. Crawford.
- 1:25 Performance Characteristics of Dicloran, Iprodione and Vinclozolin for Control of Sclerotinia Blight of Peanut. T. B. Breneman\*,  
P. M. Phipps and R. J. Stipes.
- 1:40 Control of *Sclerotium rolfsii* and *Rhizoctonia solani* in Peanut with Tolclofos-methyl and Flutolamil. A. S. Csinos\*.
- 1:55 Effect of Calcium Sulfate on Pod Rot of Peanut cv. 'Early Bunch'.  
A. B. Filonow\*, H. A. Melouk and M. Martin.
- 2:10 Effect of Fungicides on Rate of Disease Progress of Sclerotinia Blight of Peanut. K. E. Jackson\* and H. A. Melouk.
- 2:25 A Method to Quantify *Rhizoctonia solani* Inoculum Density for Greenhouse and Field Resistance Screening of Peanut Germplasm.  
K. E. Woodard.
- 2:40 Effects of *Bacillus subtilis* on Seedling Emergence and Pod Yield on Spanish Market Type Cultivars and Florunner. A. J. Jaks,  
D. H. Smith\*, R. E. Davis and B. D. Dolton.
- 2:55 Break

THREE CONCURRENT SESSIONS

1. SESSION A--SYMPOSIUM: MAXIMIZING PRODUCTION EFFICIENCY
2. SESSION B--PRODUCTION TECHNOLOGY
3. SESSION C--PLANT PATHOLOGY

SESSION A. SYMPOSIUM: PEANUT PRODUCTION

L. D. Tripp, presiding

- 3:15 Irrigation Regimes. J. I. Davidson, Jr.
- 3:45 Maturity Determination. R. H. Henning
- 4:15 Discussion
- 5:00 Adjourn
- 7:00-9:00 SDS BIOTECH Party

SESSION B. PRODUCTION TECHNOLOGY

W. M. Vaclavik, presiding

- 3:15 The Use of Plastic Mulch in Peanut Production. F. J. Adamsen\*,  
F. S. Wright and D. M. Porter.
- 3:30 The Influence of Row Pattern, Seeding Rate and Irrigation on the Yield and Market Quality of Runner Peanuts. A. C. Mixon\*.
- 3:45 Economic Analysis of Producing Peanuts Using a Skip-Row Pattern.  
T. D. Hewitt\* and D. W. Gorbet.
- 4:00 MH-30, BCC-3 and Bud Nip: Their Influence on Peanut Seed Yields and Grade Characteristics. R. K. Howell\* and J. G. Buta.

- 4:15 'Florunner': The Perennial Peanut. C. S. Kvien\*.
- 4:30 Field Evaluation of Peanut Cultivar-Bradyrhizobium Specificities. T. D. Phillips\*, J. C. Wynne, T. J. Schneeweis and G. H. Elkan.
- 4:45 Initiation of a National Coordinated Peanut Systems Research Project. J. I. Davidson, Jr.\*
- 5:00 Adjourn
- 7:00-9:00 SDS BIOTECH Party

#### SESSION C. PLANT PATHOLOGY

T. E. Boswell, presiding

- 3:15 Evaluation of *Bacillus thuringiensis* for Peanut Leafspot Control in Five States. H. W. Spurr, Jr.\*, G. R. Knudsen, J. E. Bailey, R. H. Littrell, D. H. Smith and T. R. Young.
- 3:30 A Simulation Model Explores Fungicide Application Strategies to Control Peanut Leafspot. G. R. Knudsen\* and H. W. Spurr, Jr.
- 3:45 Predicting Yield Responses of Peanut to Various Disease Severity Levels of Late Leafspot (*Cercosporidium personatum*) by Measuring Reflectance of Sunlight from Peanut Canopies. F. W. Nutter, Jr.\*, and R. H. Littrell.
- 4:00 Cercosporin Production by Both Peanut Leaf Spotting Agents, *Cercospora arachidicola* and *Cercosporidium personatum*. M. K. Abo-El-Dahab\*, E. H. Wasfy, M. A. El-Goorani, H. M. El-Kasheir, E. E. Wagih and H. A. Melouk.
- 4:15 Field and Greenhouse Evaluation of Components of Partial Resistance to Early Leafspot in Peanut. C. C. Green\* and J. C. Wynne.
- 4:30 Advances in Deployment of the Peanut Leafspot Advisory in North Carolina Using an Electronic Weather Station. J. E. Bailey\* and C. A. Matyac.
- 4:45 Concentration of Chlorothalonil Spray Droplets on Yield of Florunner Peanut. R. H. Littrell\*.
- 5:00 Adjourn
- 7:00-9:00 SDS BIOTECH Party

#### THURSDAY, JULY 11

- 8:00-12:00 APRES Registration
- 8:00-5:00 Exhibits
- 8:00-3:00 Ladies' Hospitality

#### THREE CONCURRENT SESSIONS

1. SESSION A--ENTOMOLOGY
2. SESSION B--IRRIGATION, PHYSIOLOGY
3. SESSION C--PLANT PATHOLOGY

SESSION A. ENTOMOLOGY  
F. Mitchell, presiding

- 8:00 Influence of Host, Planting Date, and Host Developmental Stage on Damage by the Lesser Cornstalk Borer. R. E. Lynch\* and J. E. Funderburk.
- 8:15 Sensitivity Analysis of a Mathematical Model for Lesser Cornstalk Borer Population Dynamics on Florunner Peanuts. T. P. Mack\*, B. Reed and J. W. Smith.
- 8:30 Effect of Various Planting-time and Pegging-time Chemical Combinations on Southern Corn Rootworm Infestations in Peanuts. J. C. Smith\* and J. L. Steele.
- 8:45 Effects of the Use of Pesticide Combinations for Control of Insects Soil-borne Diseases and Nematodes in Peanuts. L. W. Morgan\*, A. S. Csinos and H. A. Minton.
- 9:00 Comparison of Pests and Pest Damage in No-till and Conventionally-planted Peanuts. W. V. Campbell\*, G. A. Sullivan and E. W. Rogister.
- 9:50 Break

SESSION B. IRRIGATION, PHYSIOLOGY  
M. J. McFarland, presiding

- 8:00 Irrigation Scheduling Using a Canopy Temperature Stress Degree Day Index to Induce Variable Water Stress in Field-grown Florunner Peanut. A. M. Schubert\* and T. H. Sanders.
- 8:15 Studies on Water Relations of Peanut Under Rainfed and Irrigated Conditions. M. T. Huang\* and D. L. Ketring.
- 8:30 Discussion
- 9:00 Water Stress Effects on the Water Relations and Nitrogen Fixation of Two Peanut Cultivars. J. M. Bennett\*, S. L. Albrecht and K. A. Albrecht.
- 9:15 Yield and Quality Response of Florunner Peanuts to Applied Drought at Several Growth Stages. J. R. Stansell\* and J. E. Pallas, Jr.
- 9:30 Screening Valencia Peanuts for Tolerance to Salt Stress. D. Hsi\*.
- 9:50 Break

SESSION C. PLANT PATHOLOGY  
M. C. Black, presiding

- 8:00 Effects of Fungicides on the Control of Peanut Rust in Alabama. M. A. Crawford\* and P. A. Backman.
- 8:15 Disease Progress of Early Leafspot (Cercospora arachidicola) in Two Peanut Genotypes. H. A. Melouk\*.
- 8:30 Resistance to Didymella arachidicola in Wild Arachis Species. P. Subrahmanyam, D. H. Smith and C. E. Simpson\*.
- 8:45 Effect of Leafspot Spray Cycle on Some Quality Factors of Peanuts. T. H. Sanders\*, D. W. Gorbett, F. M. Shokes and J. L. McMeans.

- 9:00 Resistance of Three Peanut Breeding Lines to *Cercospora* Leafspot. K. V. Pixley\*, F. M. Shokes, D. W. Gorbet and K. J. Boote.
- 9:15 Peanut Scab (*Sphaceloma arachidis* Bit. & Jenk.). L. M. Giorda\* and M. Bragachini.
- 9:30 Western Blotting for Detection of Peanut Mottle Virus and Peanut Stripe Virus. J. L. Sherwood.
- 9:50 Break

### THREE CONCURRENT SESSIONS

1. SESSION A--ENTOMOLOGY AND WEED CONTROL
2. SESSION B--PHYSIOLOGY
3. SESSION C--PANEL DISCUSSION: DISEASE ASSESSMENT

#### SESSION A. ENTOMOLOGY AND WEED CONTROL

R. E. Lynch, presiding

- 10:10 Sources of Resistance to Jassid (*Empoasca kerri* Pruthi), Thrips (*Frankliniella schultzei*), and Termites (*Odontotermes* spp.) in Peanut, *Arachis hypogaea* L. P. W. Amin\*, K. N. Singh, S. L. Dwivedi and V. R. Rao.
- 10:25 Genetic Analysis of Trichome and Yield Attributing Traits of Peanut Genotypes Resistant to the Jassid (*Empoasca kerri*, Pruthi) and Their Utilization in Resistance Breeding. S. L. Dwivedi\*, P. W. Amin and R. W. Gibbons.
- 10:40 Losses to Peanut Insects in Georgia, 1981-1984. H. Womack\*, L. W. Morgan and R. E. Lynch.
- 10:55 Pirimiphos-Methyl Residues on Packaged Food Commodities When Applied as an Ultra-low Volume Space Treatment. L. M. Redlinger\*, H. B. Gillenwater and R. A. Simonaitis.
- 11:10 The Behavior and Fate of 2,4-DB in Pitted (*Ipomoea lacunosa*) and Tall (*Ipomoea purpurea*) Morningglory Plant and Cell Cultures. M. A. Barker, L. Thompson, Jr., F. T. Corbin and G. A. Sullivan\*.
- 11:25 Effects of Tank Mixes of Bentazon and/or, 2,4-DB with Postemergence Grass Herbicides on Annual Grass Control. W. J. Grichar\* and T. E. Boswell.
- 11:40 Discussion
- 11:55 Lunch

#### SESSION B. PHYSIOLOGY

R. N. Pittman, presiding

- 10:10 The Effect of Explant Composition, Explant Orientation, and Light Intensity on the In Vitro Differentiation of *Arachis villosulicarpa* Hoehne Leaf Explants. B. B. Johnson\* and R. N. Pittman.
- 10:25 Photosynthetic Characteristics and Their Relation to Chloroplast Pigments of a Wild X Cultivated Triploid Hybrid, Its Parents, and Its Autopolyploid. I. S. Campbell\* and J. E. Pallas, Jr.
- 10:40 Apparent Sap Velocity in Peanut. D. L. Ketrings\*, P. I. Erickson and J. F. Stone.



- 10:55 A Specific and Sensitive Method for Quantitating Peanut Lipoygenase. B. A. Triplett\*.
- 11:10 Differences in Photosynthetic Capacity Among Peanut Genotypes Related to Carbon Fixation by Mesophyll Cells. J. E. Pallas\* and N. Paz.
- 11:25 Plant Growth Measurements and Flower Counts of Five Peanut Cultivars Grown in Virginia. J. L. Steele\* and T. A. Coffelt.
- 11:40 Seasonal Trends in Carbohydrate and N Concentrations of Plant Parts of Florunner Peanut and Bragg Soybean. K. J. Boote\*, R. L. McGraw and D. E. McCloud.
- 11:55 Lunch

SESSION C. Mini-Symposium: Disease Assessment  
D. H. Smith, presiding

- 10:10 Disease Assessment: Methods for Germplasm and Fungicide Evaluations. M. J. Jeger.
- 10:25 Peanut Foliar Disease Assessment. F. M. Shokes, R. D. Berger and D. H. Smith.
- 10:40 Problems in Assessment of Root-rot Diseases: Role of Soilborne Pathogen Ecology. M. K. Beute.
- 10:55 Problems in Assessing Severity of Diseases Incited by Plant-Parasitic Nematodes. J. L. Starr.
- 11:10 Discussion
- 11:55 Lunch

THREE CONCURRENT SESSIONS

- 1. SESSION A--EXTENSION AND INDUSTRY
- 2. SESSION B--BREEDING AND GENETICS
- 3. SESSION C--MYCOTOXIN

SESSION A. EXTENSION AND INDUSTRY  
T. A. Lee, Jr., presiding

- 1:10 A Summary of the Effectiveness of Cinmethylin (SD-95481) for Controlling Annual Grass Weeds in Peanuts. R. H. Heilmann\* and R. H. Bierman.
- 1:25 Baythroid: A Pyrethroid Insecticide for the Control of Insects Infesting Peanuts. J. Fortino\* and A. D. Cohick.
- 1:40 Peanut Insect Control Using Ammo 2.5EC. S. A. Ryerson\*.
- 1:55 Advances in Granular and Dry Flowable Chemical Formulations with Pneumatic Applicators. P. Patterson\*.
- 2:10 Update on New Peanut Seed Treatments. B. Hairston\*.
- 2:25 Weed Control Systems in Peanuts with FUSILADE 2000 as the Primary Grass Herbicide. J. Lunsford\*.
- 2:40 Break

## SESSION B. BREEDING AND GENETICS

W. D. Branch, presiding

- 1:10 A Comprehensive Breeding Procedure for Peanut.  
E. J. Monteverde-Penso\*, J. C. Wynne and T. G. Isleib.
- 1:25 Estimates of Combining Ability Among Six Peanut Cultivars. S. T. Swe\*  
and W. D. Branch.
- 1:40 General Combining Ability for Leafspot Resistance in Peanuts (Arachis hypogaea L.). A. J. Chiyembekeza\* and D. A. Knauff.
- 1:55 IBPGR/ICRISAT Minimum Descriptors of Arachis hypogaea L. Collections II. The Variability Within Certain Characters. E. R. Howard\*,  
D. L. Higgins, G. D. Thomas and C. E. Simpson.
- 2:10 Genetic Resources and Their Use in Enhancement of Peanut at ICRISAT.  
V. Ramanatha Rao\*.
- 2:25 Breeding for Earliness in Groundnuts. M. J. Vasudeva Rao\* and  
R. W. Gibbons.
- 2:40 Selection for Rapid Peanut Seedling Emergence in Ontario.  
T. E. Michaels\*.
- 2:55 Break

## SESSION C. MYCOTOXINS

T. D. Phillips, presiding

- 1:10 Fungi Affecting the Germination of Sclerotia of Aspergillus flavus in  
Soil. J. P. Stack and R. E. Pettit\*.
- 1:25 Evaluation of Soil Calcium as Methods of Prevention of Preharvest  
Aflatoxin Contamination of Peanuts. R. J. Cole\*, A. S. Csinos,  
P. D. Blankenship, T. H. Sanders, T. P. Gaines and J. I. Davidson.
- 1:40 Comparative Susceptibility of Four Experimental Peanut Lines and the  
Cultivar Florunner to Preharvest Aflatoxin Contamination.  
P. D. Blankenship\*, R. J. Cole and T. H. Sanders.
- 1:55 Effects of Aspergillus parasiticus Inoculation, Calcium Rates, and  
Irrigation on Peanuts. D. M. Wilson\*, M. E. Walker, T. P. Gaines,  
A. S. Csinos, T. Win and B. G. Mullinix, Jr.
- 2:10 Relationship of Storage Conditions on the Mycoflora of Irrigated  
Peanuts. D. M. Porter\* and J. L. Steele.
- 2:25 Comparing the Number of Lots Accepted and Rejected by the Visual,  
Minicolumn, and TLC Methods When Testing Farmer Stock Peanuts for  
Aflatoxin. T. B. Whitaker\* and J. W. Dickens.
- 2:40 Varietal Resistance in Peanuts to Aflatoxin Production. V. K. Mehan\*,  
D. McDonald and N. Ramakrishna.
- 2:55 Break

## THREE CONCURRENT SESSIONS

1. SESSION A--EXTENSION AND INDUSTRY
2. SESSION B--BREEDING AND GENETICS
3. SESSION C--MARKETING AND UTILIZATION

SESSION A. EXTENSION AND INDUSTRY

T. A. Lee, Jr., presiding

- 3:15 White Mold, *Sclerotium rolfsii*, Suppression in Peanuts by Fonfos (Dyfonate) Soil Insecticide Treatments. A. S. Csinos and C. R. Address\*.
- 3:30 BAY HWG 1608: An Efficacious Experimental Fungicide for the Control of Certain Peanut Foliar Diseases. R. F. Nash\* and R. D. Rudolph.
- 3:45 Helena Chemical Company: New and Continuing Developments. A. Underwood\* and T. Clark.
- 4:00 Rizolex: An Effective New Fungicide for Soil Borne Diseases. H. A. Terwedow\* and C. C. Jensen.
- 4:15 Control of Peanut Nematodes Using Furadan 4F Applied Through Irrigation. E. V. Gage\*.
- 4:30 Effects of Oil-Surfactant Blends on Propiconazole Residues and Peanut Leafspot with Tilt Fungicide. J. M. Hammond\* and P. A. Backman.
- 4:45 Occurrence of Botrytis Blight in Western Texas Peanut Fields. T. A. Lee, Jr.,\* and K. E. Woodard.
- 5:00 Adjourn
- 5:30-10:00 UNIROYAL BAR-B-Q

SESSION B. BREEDING AND GENETICS

J. S. Kirby, presiding

- 3:15 Greenhouse Evaluation of Cultivated and Wild Peanut Species for Resistance to *Cylindrocladium* Black Rot. M. S. Fitzner\*, S. C. Alderman and H. T. Stalker.
- 3:30 A Study of Methods of Screening for Resistance to *Pythium* Pod Rot. M. J. Hood\*, O. D. Smith, K. E. Woodard, T. E. Boswell, W. J. Grichar, R. A. Taber and R. E. Pettit.
- 3:45 Screening *Arachis hypogaea* L. Germplasm for "Drought Tolerance". D. L. Higgins\* and C. E. Simpson.
- 4:00 Potential for Incorporation of Early and Late Leafspot Resistance in Peanut. W. F. Anderson, J. C. Wynne\* and C. C. Green.
- 4:15 Breeding Multiple Resistance Peanut Germplasm. T. A. Coffelt\*.
- 4:30 Screening for Southern Stem Rot Resistance Among Peanut Cultivars. W. D. Branch\* and A. S. Csinos.
- 4:45 Response of Breeding Lines Selected for Pod Rot Resistance to Varied *Sclerotium rolfsii* and *Pythium myriotylum* Pressure. O. D. Smith\*, T. E. Boswell, W. J. Grichar, C. E. Simpson and M. J. Hood.
- 5:00 Adjourn
- 5:30-10:00 UNIROYAL BAR-B-Q

SESSION C. MARKETING AND UTILIZATION

Max Grice, presiding

- 3:15 Co-precipitation of Peanut and Soybean Milks to Form Tofu. T. O. M. Nakayama\*.

- 3:30      Effect of Seed Size on the Fatty Acid Composition of Peanut Cultivars.  
R. W. Mozingo\*, T. A. Coffelt and J. C. Wynne.
- 3:45      Meat Quality Characteristics and Backfat Fatty Acid Composition of  
Swine as Affected by the Consumption of Peanuts Remaining in the Field  
After Harvest. R. O. Myer\*, R. L. West and D. W. Gorbet.
- 4:00      The Influence of Anhydrous Ammonia on Dry Seeds of Peanuts.  
L. W. Woodstock\* and H. Tsao.
- 4:15      An Evaluation of Peanut Marketing Alternatives Under Changing  
Government Policies. D. H. Carley\*, J. E. Epperson and  
S. M. Fletcher.
- 4:30      Discussion
- 5:00      Adjourn
- 5:30-10:00 UNIROYAL BAR-B-Q

FRIDAY, JULY 12

- 7:30      Breakfast and Awards Ceremony
- 8:30      Business Meeting
- 10:00     Adjourn
- 8:00-10:00 Ladies' Hospitality

## SPONSORS

Acknowledgement--On behalf of APRES members and guests, the Program Committee wishes to thank all organizations for their generous monetary and material contributions, thus making it possible for us to provide enjoyable entertainment in the evenings and also to furnish beverages and refreshments during breaks without having to increase registration fees at this annual meeting.

Coffee breaks on July 10 and 11 are provided by the following sponsors:

American Cyanamid Company	Kocide Chemical Company
BASF Wyandotte Corporation	Lilly Research Laboratories
CIBA-GEIGY Corporation	Mobay Chemical Corporation
Dow Chemical Company	Nitragin Company Inc.
Duphar Company	Nor-Am Chemical Company
E. I. du Pont de Nemours & Company, Inc.	Oklahoma Peanut Commission
Elanco Products Company	Rhone-Poulenc Inc.
FMC Corporation	Rohm and Haas Company
Gandy Corporation	Spraying Systems Company
Griffin Corporation	Stauffer Chemical Company
Gustafson, Inc.	Texas Peanut Producers Board
Helena Chemical Corporation	U.S. Gypsum
ICI Americas	Velsicol Chemical Company

The Southwestern Peanut Shellers Association is providing the breakfast on July 12, 1985.

We extend special thanks to SDS Biotech for sponsoring the SDS Biotech party on July 10, 1985.

We extend special thanks to Uniroyal for sponsoring the barbecue on July 11, 1985.

Peanuts Provided by:

- Alabama Peanut Producers Association
- North Carolina Peanut Growers' Association
- New Mexico Peanut Growers Association
- Oklahoma Peanut Commission
- Texas Peanut Producers Board

Wilco Peanut Company Provided Texas Mirrors for Spouses

APRES  
Finance Committee Report  
July 9, 1985

The Finance Committee met at 1:30 p.m. on July 9, 1985. The auditor's report and Peanut Science Editor's report were reviewed and found to be in order.

The cash position of the Society was enhanced by \$8,830.30; the inventory of Peanut Science and Technology was reduced by \$3,765.44, thereby increasing the net worth by \$5,064.86.

Present Net Worth: \$100,054.03.

The Committee prepared a proposed budget, and made the following recommendations to the Board of Directors:

1. It is proposed that a sales effort be organized to sell Peanut Science and Technology. The budget provides \$800.00 for this endeavor.
2. It is proposed that the Board of Directors approve a capital expenditure of \$5,000.00 to purchase a micro-computer/word processor.

Respectfully Submitted,

Finance Committee:

W. E. Dykes, Chairman  
T. E. Boswell  
H. A. Melouk  
T. West  
J. Bone

# AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

## 1985-1986 BUDGET

### RECEIPTS

Membership & Registration	\$ 24,000.00
Proceedings & Reprint Sales	10.00
Special Contributions	3,000.00
Peanut Science & Technology	4,500.00
Peanut Science Page Charges & Reprints	16,400.00
Differential Postage Assessment - Foreign Members	1,800.00
Interest	4,000.00
APRES Methods Books	<u>1,000.00</u>
Total Receipts	\$ 54,710.00

### EXPENDITURES

Proceedings - Printing & Reprints	\$ 3,000.00
Annual Meeting	5,500.00
Secretarial	7,875.00
Postage	3,000.00
Office Supplies	1,000.00
Travel - Officers	1,000.00
Miscellaneous	700.00
Peanut Science	24,000.00
Peanut Science & Technology	800.00
Bank Charges	200.00
Peanut Research	2,200.00
Legal Fees	1,000.00
APRES Methods Books	<u>1,000.00</u>
Total Expenditures	\$ 51,275.00

Excess Receipts over Expenditures	\$ 3,435.00
Cash - Beginning of Period	\$ 56,544.00
Cash - End of Period	\$ 59,954.00

#### PUBLICATION AND EDITORIAL COMMITTEE

Six committee members were present at the annual meeting, July 9, 1985, at San Antonio, Texas.

Harold Pattee reported that 33 manuscripts were submitted to Peanut Science from July 1, 1984, to June 30, 1985. The January-June 1984 issue consisted of 16 articles and 55 pages. The July-December 1984 issue consisted of 16 articles and 56 pages plus 3 index pages. Eleven articles have been accepted for publication in the January-June 1985 issue. Average article length was 3.6 pages.

Aubrey Mixon reported on Peanut Research.

Sam Ahmed reported on Quality Methods.

Terry Coffelt reported that 164 copies of Peanut Science & Technology had been sold this year and that President Buchanan had appointed an ad-hoc committee to develop new sales.

Terry Coffelt reported that the Proceedings of the 1984 meetings were published with 126 pages consisting of 93 abstracts from 7 technical sessions, 3 symposia, and 2 discussion groups.

The committee recommends to the board that we adopt the use of a new abstract format to facilitate the printing of the proceedings and uniformity.

The committee recommends to the board that insurance on unsold copies of the book not be purchased due to the high cost.

The committee recommends the appointment of Dr. Tommy Nakayama to the editorial board of Peanut science to replace Dr. Sam Ahmed who has completed a 6-year term. The committee recommends that other Associate Editors whose 3-year terms have ended be reappointed.

The committee has previously recommended that Dr. Sam Ahmed be appointed as Editor of the Peanut Quality Methods Book to replace Dr. Clyde Young who resigned.

The committee, in behalf of the Society, expresses appreciation to our editors, authors, reviewers, and other contributors to our Society publications.

Respectfully submitted:

D. J. Banks  
W. T. Mills  
N. Sugg  
C. Kvien  
A. M. Schubert  
T. A. Coffelt, Chairman  
A. C. Mixon, Ex-Officio  
H. E. Pattee, Ex-Officio  
C. T. Young, Ex-Officio



APRES PEANUT QUALITY COMMITTEE

MINUTES OF MEETING

El Tropicano Hotel  
San Antonio, Texas

Tuesday, July 9, 1985  
3:00 P.M.

The meeting was called to order at 3:00 P.M. with 27 members present.

We discussed the importance of quality and what the APRES Quality Committee can do to help get better quality in peanuts. It was recommended that we should continue research and continue to try to educate every phase listed below:

- A. Peanut field production practices
- B. Maturity testing - digging date
- C. Handling and drying
- D. Storage after drying
- E. Processing (shelling)
- F. Storage after processing
- G. Shipping

We discussed all the above phases and what had been done thus far, and how we can educate and put into practice what we already know.

We discussed the major concerns of peanut quality --

- 1. Aflatoxin
- 2. Foreign material
- 3. Pesticide residue

Mr. J. W. Dickens gave a report on a committee assignment from last year on grading procedures and what might be done to upgrade this process, but had no new recommendations. We requested this appointed committee to continue looking into this area.

The meeting was adjourned at 4:30 P.M.

#### REPORT OF SITE SELECTION COMMITTEE

The meeting was called to order by A. M. Schubert, chairman. There were five members and one guest present.

R. W. Mozingo and J. L. Steele reported on plans for the 1986 meeting in Virginia. Following review of the contract, brochures, and other information, the committee approved their recommendations. Dates for the meeting will be July 14-17 with the main activities beginning Tuesday, July 15. Room rates will be \$60 for singles, doubles, triples, and quads with a \$10 charge for rollaways. Room rates will be in effect 3 days prior to and 3 days after the meeting. The Pavilion Tower is a Dunfey Resort, located 6 blocks from the beach. There is shuttle service to the beach and bus service to Norfolk. One important caution was expressed; the meeting time is during the peak tourist season. Early reservations will be essential, because alternate housing will be difficult or impossible to obtain.

Dan Gorbet and Ben Whitty reported on plans for the 1987 meeting. They presented summaries of proposals by four hotels in the Orlando area. Following review of the facilities and proposal details, the committee approved the Orlando Marriott as the first choice and instructed them to continue with contract negotiations with the hotel.

A. M. Schubert reported that the Oklahoma committee members have begun a survey of facilities for 1988 and would present several sites for committee consideration at the 1986 meeting.

R. L. Ory proposed that the 1988 meetings be held in New Orleans with the officers and technical program people from Oklahoma. Local arrangements would be handled by the New Orleans members. Dr. Ory reported that he had discussed the possibility with some Oklahoma members. The committee decided that if the Oklahoma members agree to the arrangement, the committee would consider the proposal. Otherwise, the plans for the 1988 Oklahoma meeting site would continue.

The APRES Board of Directors made two additions to Site Selection Committee actions: (1) In light of the large attendance in San Antonio, the Virginia delegation should contact the hotel and request larger meeting rooms; and (2) In regards to the New Orleans proposal, the whole APRES membership would have to be given an opportunity to have input on any decision to alter the present rotation among the Southwest, Virginia-North Carolina, and Southeast peanut growing areas.

#### Committee members:

A. M. Schubert, Chairman, Texas  
R. E. Pettit, Texas  
J. L. Steele, Virginia  
R. W. Mozingo, Virginia  
E. B. Whitty, Florida  
D. W. Gorbet, Florida  
R. Berberet, Oklahoma  
B. L. Clary, Oklahoma

PUBLIC RELATIONS COMMITTEE

3:00 P.M. July 9, 1985

Motion made by Dallas Hartzog, seconded by Paul Blankenship, that we recognize Mrs. James Earl Mobley who passed away July 4, 1985. Passed.

The committee votes to send a resolution to SDS Biotech and Uniroyal from APRES expressing our appreciation for their sponsorship of the two social events that are held annually with this association.

There being no further business, the meeting adjourned at 3:45 P.M.

RESOLUTIONS

Whereas, Louise Culpepper Mobley, Route 1, Shorterville, Alabama, passed away July 4, 1985,

Whereas, Mrs. Mobley gave long and dedicated support to her husband, Mr. James Earl Mobley, Sr., as he labored to improve the welfare of the peanut farmer and total peanut industry,

Therefore, be it resolved that we remember with reverence the life of Mrs. Mobley and her contribution to the peanut farmers and peanut industry through the unselfish and enduring support of her husband,

Therefore, be it resolved that the American Peanut Research and Education Society does hereby adopt this resolution on the 12th day of July, 1985.

Whereas, SDS Biotech, formerly Diamond Shamrock Corporation, has contributed to the enjoyment of the annual meeting by supporting a social event,

Whereas, the event gives APRES members and families a time of fun and fellowship,

Whereas, this annual social provides an incentive for people to attend the meeting,

Now, therefore, be it resolved that we express our sincere appreciation to all SDS Biotech representatives for their generous and continuing support of APRES.

Whereas, Uniroyal Chemical Company enhances the social life of the annual APRES meeting with an annual barbecue,

Whereas, the event always provides an enjoyable period of fellowship for APRES members and families,

Whereas, this annual social is an incentive for people to attend the meeting,

Now, therefore, be it resolved that we express our sincere appreciation to all Uniroyal representatives for their generous and continuing support of APRES.

## BAILEY AWARD COMMITTEE REPORT

The 1985 Bailey Award for best paper presented at the 1984 meeting in Mobile, Alabama, went to K. V. Pixley, K. J. Boote, F. M. Shokes and D. W. Gorbet for their paper entitled

"Growth and Partitioning Responses for Four Genotypes to *Cercospora* Leafspot"

The selection process was basically as in the previous year (see the 1983 APRES Proc. Vol. 15, p. 163) except that only one paper from each of seven areas of specialization was nominated for the final judging. The following is a listing of the dates and activities of the Bailey Award Committee for 1984-85:

- 1) All nominees (7) were notified of their selection by mail on August 8, 1984.
- 2) Charles E. Simpson (past chairman) was asked to substitute for Dan W. Gorbet because Dr. Gorbet was a senior author on one paper and a junior author on a second paper submitted for evaluation.
- 3) Seven manuscripts were received by December 31, 1984.
- 4) Members of the Committee were sent copies of manuscripts and score sheets on January 2, 1985.
- 5) All score sheets were received by chairman before March 15, 1985. The scores produced a distinct winner.
- 6) President Gale A. Buchanan, President elect Don Smith and Executive Officer J. R. Sholar were notified of the winning paper on March 22, 1985.

The other six papers judged by the committee were, alphabetically by senior author:

- 1) Adamsen, F. J. Cation Exchange Constants for a Gaspon Model from Peanut Production Soil.
- 2) Chapin, J. S. Control of Lesser Cornstalk Borer with Granular Chlorpyrifos.
- 3) Cole, R. J., P. D. Blankenship, T. H. Sanders, and R. A. Hill. Relation of preharvest aflatoxin contamination to duration of environmental stress.
- 4) Gorbet, D. W., A. J. Norden, F. M. Shokes and D. A. Knauff. Agronomic response of two resistant lines to leafspot management.
- 5) Weaver, C. F., R. Rodriguez-Kabana and P. S. King. Combinations of 1,3-D and aldicarb for control of *Meloidogyne arenaria* in peanuts.
- 6) Wright, F. S., D. M. Porter, N. L. Powell and B. B. Ross. Irrigation and tillage effects on peanut yields in Virginia.

Seven areas of specialization to be used in nominating papers presented at the 1984 meetings are:

- (1) Plant Pathology - Nematology
- (2) Production Technology - Pest Management
- (3) Physiology, Seed Technology, Processing and Utilization
- (4) Entomology
- (5) Breeding and Genetics
- (6) Extension Technology, Harvesting and Storing
- (7) Mycotoxins

Symposium papers were not considered for the Bailey Award as decided by the Board of Directors.

Bailey Awards Committee 1985:

Respectfully submitted, M. K. Beute, Chairman  
R. F. Hooks  
D. L. Ketríng  
C. E. Simpson, substituting for D. W. Gorbet  
J. C. Smith  
C. Swann

## GOLDEN PEANUT AWARD ADVISORY COMMITTEE REPORT

Documentation for candidates for the Golden Peanut Research and Education Award were forward by the National Peanut Council to individual members of the Golden Peanut Research and Education Award Advisory Committee for evaluation. Each member of the Committee evaluated the materials that were submitted and the candidates were ranked accordingly. Each individual's evaluation was returned directly to the National Peanut Council which selected the recipients for the award.

J. L. Butler, Chairman  
J. F. McGill  
T. B. Whitaker  
D. A. Emery  
A. J. Norden  
L. Tripp

## NOMINATING COMMITTEE REPORT

The committee is pleased to nominate the following:

### PRESIDENT-ELECT

Morris Porter  
Tidewater Research Center  
Suffolk, VA

### EXECUTIVE OFFICER

J. Ron Sholar  
Oklahoma State University  
Raleigh, NC

### BOARD OF DIRECTORS

#### State Employee Representative

Johnny Wynne  
North Carolina State University  
Raleigh, NC

#### Industry Representative (Production)

Gerald Harrison  
SDS Biotech Corporation  
Albany, GA

### 1984-85 Nominating Committee:

J. E. Mobley  
J. S. Kirby  
F. R. Cox, Chairman

Liaison Representative Report  
American Society of Agronomy  
American Peanut Research & Education Society

The 76th Annual Meeting of the American Society of Agronomy (ASA) was held in Los Vegas, Nevada on November 25-30, 1984. The theme for the convention was "Agronomy: Biotechnology in Action". Approximately 1,870 papers were given in 250 sessions and 15 symposia of the ASA and its affiliates, the Crops Science Society of America (CSSA) and Soil Science Society of America (SSSA).

William E. Larson was installed as president and Dale Moss as president-elect of ASA; Robert F. Barnes as president and James B. Beard president-elect of CSSA; and E.C.A. Runge as president and John Pesek president-elect of SSSA.

At least 14 papers concerning peanut were presented in the joint sessions. H.T. Stalker chaired the one session assigned entirely to peanut.

The Liaison Representative participated in the Society Officers at the November 25 Board Meeting. The 1985 Annual Meeting will be held December 1-6 in Chicago.

Respectfully Submitted  
O. D. Smith

## FELLOWS COMMITTEE REPORT

The Fellows Committee nominates the following persons for election to fellowship by the American Peanut Research and Education Society:

Thurman E. Boswell  
James W. Dickens  
Allen H. Allison

### Fellows Committee:

Kenneth Garren  
Astor Perry, Chairman  
Ray Hammons  
Leland Tripp  
Harold Pattee  
Allan Norden  
William Campbell

## FELLOWS - 1984 American Peanut Research and Education Society

Thurman E. Boswell, Professor in Charge, Plant Disease Research Station, Texas A & M University, Yoakum, Texas, has been active in peanut disease and weed control research since 1951. He has authored or co-authored over 50 scientific and professional publications and abstracts. He initiated the chemical weed control program for the Texas Agricultural Experiment Station and has carried on active weed control work through the years. In the area of peanut disease research he has: 1-concentrated on developing an understanding of the lesion nematodes and effective means for their control, including such innovations as split applications of nematicides; 2- researched problems related to soilborne disease development and methods of control including the control of southern blight and pod rot by fungicides; 3-worked cooperatively with plant breeders to develop varieties resistant to soilborne diseases. He was co-investigator in the release of the Toalson variety and the discovery of resistance of numerous breeding lines to the lesion nematode, *Pythium myriotylum*, *Rhizoctonia solani*, and *Sclerotium rolfsii*. In all these efforts the majority of his work has been conducted with growers where the problem existed.

Dr. Boswell has served as associate editor for Peanut Science and on the finance, public relations, and program committees of APRES.

James W. Dickens--Agricultural Engineer, USDA, Agricultural Research Service, North Carolina State University, Raleigh, North Carolina, has been engaged in engineering research on peanuts for the past 31 years. He has authored more than 74 publications, including 5 chapters in books, dealing with harvesting, curing, aflatoxin control, and the development of grading equipment. He was one of the researchers who helped develop the techniques to move from hand methods of harvesting to mechanical harvesting and artificial curing. He designed and developed the equipment used throughout the country in sampling and grading peanuts, a major development in implementing the quality control program that began in 1964. His development of a rapid method to detect aflatoxin-contaminated lots of peanuts as well as sampling procedures and equipment has helped the American peanut industry provide consumers with high quality products during a period when there has been great concern about carcinogens in food products. His research at the farm level to develop methods to reduce the possibility of aflatoxin contamination has been of great value to both growers and the peanut industry.

Mr. Dickens has served as president and vice-president of APRES and has served as chairman of the nominating committee and the marketing standards subcommittee of the quality committee. He was active in PIWG serving as secretary/treasurer in 1968 and helped with the transformation of PIWG into our present day APRES.

Mr. Dickens has gained an international reputation and has visited several countries to help them develop effective methods of aflatoxin detection and control.

Allen H. Allison--Extension Agronomist-Peanuts, Tidewater Research Center, Suffolk, Virginia, has been Virginia's peanut specialist since 1962. Prior to that he was peanut breeder at the Tidewater Station from 1950-1954 and agronomist for the Smith-Douglas Fertilizer Company from 1954-1962. He has authored or co-authored over 100 scientific articles, technical bulletins, and abstracts. He has shown unusual skill in determining the needs of the peanut growers and developing and implementing an effective extension program to meet those needs. Major emphasis has been placed on developing a team of scientists to help determine the most effective production techniques to maximize net returns for the growers in his area. He has played an important role in helping develop practices that result in the highest quality seed at both the farm and seed processor level. Major emphasis in dealing with production problems has been the use of on-farm applied research plots to check the effects of cultural practices on both yield and quality and their ultimate effect on net profits.

Mr. Allison has served as president and president-elect of APRES as well as serving on the nominating, fellows, by-laws, public relations, and resolution committees at various times since APRES was organized. He was also active in PIWG prior to its transformation to APRES.

Mr. Allison is internationally recognized for his expertise in peanut production techniques. He served as group leader for a U.S. delegation of peanut leaders on a People-To-People tour to the Republic of China conducting two seminars on peanut production in Shandong Province.



3Y-LAWS  
of  
AMERICAN PEANUT AND EDUCATION SOCIETY, INC.

ARTICLE I. NAME

Section 1. The name of this organization shall be "AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY, INC."

ARTICLE II. PURPOSE

Section 1. The purpose of the Society shall be to instruct and educate the public on the properties, production, and use of the peanut through the organization and promotion of public discussion groups, forums, lectures, and other programs or presentations to the interested public and to promote scientific research on the properties, production, and use of the peanut by providing forums, treatises, magazines, and other forms of educational material for the publication of scientific information and research papers on the peanut and the dissemination of such information to the interested public.

ARTICLE III. MEMBERSHIP

Section 1. The several classes of membership which shall be recognized are as follows:

a. Individual memberships: Individuals who pay dues at the full rate as fixed by the Board of Directors.

b. Institutional memberships: Libraries of industrial and educational groups or institutions and others that pay dues as fixed by the Board of Directors to receive the publications of the Society. Institutional members are not granted individual member rights.

c. Organizational memberships: Industrial or educational groups that pay dues as fixed by the Board of Directors. Organizational members may designate one representative who shall have individual member rights.

d. Sustaining memberships: Industrial organizations and others that pay dues as fixed by the Board of Directors. Sustaining members are those who wish to support this Society financially to an extent beyond minimum requirements as set forth in Section 1c, Article III. Sustaining members may designate one representative who shall have individual member rights. Also, any organization may hold sustaining memberships for any or all of its divisions or sections with individual member rights accorded each sustaining membership.

e. Student memberships: Full-time students who pay dues at a special rate as fixed by the Board of Directors. Persons presently enrolled as full-time students at any recognized college, university, or technical school are eligible for student membership. Post-doctoral students, employed persons taking refresher courses or special employee training programs are not eligible for student memberships.

Section 2. Any member, participant, or representative duly serving on the Board of Directors or a Committee of this Society and who is unable to attend any meeting of the Board or such Committee may be temporarily replaced by an alternate selected by the agency or party served by such member, participant, or representative upon appropriate written notice filed with the president or Committee chairman evidencing such designation or selection.

Section 3. All classes of membership may attend all meetings and participate in discussions. Only individual members or those with individual membership rights may vote and hold office. Members of all classes shall receive notification and purposes of meetings, and shall receive minutes of all Proceedings of the American Peanut Research and Education Society.

#### ARTICLE IV. DUES AND FEES

Section 1. The annual dues shall be determined by the Board of Directors with the advice of the Finance Committee subject to approval by the members at the annual meeting. Minimum annual dues for the five classes of membership shall be:

- a. Individual memberships : \$ 15.00
- b. Institutional membership : \$ 15.00
- c. Organizational memberships: \$ 25.00
- d. Sustaining membership : \$100.00
- e. Student memberships : \$ 4.00

Section 2. Dues are receivable on or before July 1 of the year for which the membership is held. Members in arrears on July 31 for dues for the current year shall be dropped from the rolls of this Society provided prior notification of such delinquency was given. Membership shall be reinstated for the current year upon payment of dues.

Section 3. A registration fee approved by the Board of Directors will be assessed at all regular meetings of the Society. The registration fee for student members shall be one-third that of members.

#### ARTICLE V. MEETINGS

Section 1. Annual meetings of the Society shall be held for the presentation of papers and/or discussions, and for the transaction of business. At least one general business session will be held during regular annual meetings at which reports from the executive officer and all standing committees will be given, and at which attention will be given to such other matters as the Board of Directors may designate. Also, opportunity shall be provided for discussion of these and other matters that members may wish to have brought before the Board of Directors and/or general membership.

Section 2. Additional meetings may be called by the Board of Directors, either on its own motion or upon request of one-fourth of the members. In either event, the time and place shall be fixed by the Board of Directors.

Section 3. Any member may submit only one paper as senior author for consideration by the program chairman of each annual meeting of the society. Except for certain papers specifically invited by the Society president or program chairman with the approval of the president, at least one author of any paper presented shall be a member of this Society.

Section 4. Special meetings or projects by a portion of the Society membership, either alone or jointly with other groups, must be approved by the Board of Directors. Any request for the Society to underwrite obligations in connection with a proposed special meeting or project shall be submitted to the Board of Directors, who may obligate the Society to the extent they deem desirable.

Section 5. The executive officer shall give all members written notice of all meetings not less than 60 days in advance of annual meetings and 30 days in advance of all other special project meetings.

#### ARTICLE VI. QUORUM

Section 1. Forty voting members shall constitute a quorum for the transaction of business at the business meeting held during the annual meeting.

Section 2. For meetings of the Board of Directors and all committees, a majority of the members duly assigned to such board or committee shall constitute a quorum for the transaction of business.

#### ARTICLE VII. OFFICERS

Section 1. The officers of this Society shall consist of the president, the president-elect, the immediate surviving past-president and the executive officer

of the Society who may be appointed secretary and treasurer and given such other title as may be determined by the Board of Directors.

**Section 2.** The president and president-elect shall serve from the close of the annual general meeting of this Society to the close of the next annual general meeting. The president-elect shall automatically succeed to the presidency at the close of the annual general meeting. If the president-elect should succeed to the presidency to complete an unexpired term, he shall then also serve as president for the following full term. In the event the president or president-elect, or both, should resign or become unable or unavailable to serve during their terms of office, the Board of Directors shall appoint a president, or both president-elect and president, to complete the unexpired terms until the next annual general meeting when one or both offices, if necessary, will be filled by normal elective procedure. The most recent available past president shall serve as president until the Board of Directors can make such appointment.

**Section 3.** The officers and directors, with the exception of the executive officer, shall be elected by the members in attendance at the annual general meeting from nominees selected by the Nominating Committee or members nominated for this office from the floor. The president, president-elect, and surviving past-president shall serve without monetary compensation. The executive officer shall be appointed by a two-thirds majority vote of the Board of Directors.

**Section 4.** The executive officer may serve consecutive yearly terms subject to appointment by the Board of Directors. The tenure of the executive officer may be discontinued by a two-thirds majority vote of the Board of Directors who then shall appoint a temporary executive officer to fill the unexpired term.

**Section 5.** The president shall arrange and preside at all general meetings of the Board of Directors and with the advice, counsel, and assistance of the president-elect and executive officer, and subject to consultation with the Board of Directors, shall carry on, transact, and supervise the interim affairs of the Society and provide leadership in the promotion of the objectives of this Society.

**Section 6.** The president-elect shall be program chairman, responsible for development and coordination of the overall program of the educational phase of the annual meetings.

**Section 7.** (a) The executive officer shall countersign all deeds, leases, and conveyances executed by the Society and affix the seal of the Society thereto and to such other papers as shall be required or directed to be sealed. (b) The executive officer shall keep a record of the deliberations of the Board of Directors, and keep safely and systematically all books, papers, records, and documents belonging to the Society, or in any wise pertaining to the business thereof. (c) The executive officer shall keep account of all monies, credits, debts, and property of any and every nature accrued and/or disbursed by this Society, and shall render such accounts, statements, and inventories of monies, debts, and property, as shall be required by the Board of Directors. (d) The executive officer shall prepare and distribute all notices and reports as directed in these By-Laws, and other information deemed necessary by the Board of Directors, to keep the membership well informed of the Society activities.

#### ARTICLE VIII. BOARD OF DIRECTORS

**Section 1.** The Board of Directors shall consist of the following:

- a. The president
- b. The most immediate past president able to serve
- c. The president-elect
- d. State employees' representative - this director is one whose employment is state sponsored and whose relation to peanuts principally concerns research, and/or educational, and/or regulatory pursuits.
- e. United States Department of Agriculture representative - this director is one whose employment is directly sponsored by the USDA or one of its agencies, and whose relation to peanuts principally concerns research, and/or education, and/or regulatory pursuits.
- f. Three Private Peanut Industry representatives - these directors are those whose employment is privately sponsored and whose principal activity with

peanuts concerns: (1) the production of farmers' stock peanuts; (2) the shelling, marketing, and storage of raw peanuts; (3) the production or preparation of consumer food-stuffs or manufactured products containing whole or parts of peanuts.

g. The president of the National Peanut Council.

h. The executive officer - non-voting member of the Board of Directors who may be compensated for his services on a part-time or full-time salary stipulated by the Board of Directors in consultation with the Finance Committee.

Section 2. Terms of office for the directors' positions set forth in Section 1, paragraphs d, e, and f, shall be three years with elections to alternate from reference years as follows: e, 1972; d and f(1), 1973; and f(2) and f(3), 1974.

Section 3. The Board of Directors shall determine the time and place of regular and special meetings and may authorize or direct the president to call special meetings whenever the functions, programs, and operations of the Society shall require special attention. All members of the Board of Directors shall be given at least 10 days advance notice of all meetings; except that in emergency cases, three days advance notice shall be sufficient.

Section 4. The Board of Directors will act as the legal representative of the Society when necessary and, as such, shall administer Society property and affairs. The Board of Directors shall be the final authority on these affairs in conformity with the By-Laws.

Section 5. The Board of Directors shall make and submit to this Society such recommendations, suggestions, functions, operations, and programs as may appear necessary, advisable, or worthwhile.

Section 6. Contingencies not provided for elsewhere in these By-Laws shall be handled by the Board of Directors in a manner they deem desirable.

Section 7. An Executive Committee comprised of the president, president-elect, immediate surviving past president, and executive officer shall act for the Board of Directors between meetings of the Board, and on matters delegated to it by the Board. Its action shall be subject to ratification by the Board.

#### ARTICLE IX. COMMITTEES

Section 1. Members of the committees of the Society shall be appointed by the president and shall serve three-year terms unless otherwise stipulated. The president shall appoint a chairman of each committee from among the incumbent committeemen. The Board of Directors may, by a two-thirds vote, reject committee appointments. Appointments made to fill unexpected vacancies by incapacity of any committee member shall be only for the unexpired term of the incapacitated committeeman. Unless otherwise specified in these By-Laws, any committee member may be re-appointed to succeed himself, and may serve on two or more committees concurrently but shall not hold concurrent chairmanships. Initially, one-third of the members of each committee will serve one-year terms, and one-third of the members of each committee shall serve two-year terms, as designated by the president. The president shall announce the committees immediately upon assuming the office at the annual business meeting. The new appointments take effect immediately upon announcement.

Section 2. Any or all members of any committee may be removed for cause by a two-thirds approval by the Board of Directors.

Section 3. The existing committees of the Society are:

a. Finance Committee: This committee shall include at least four members, one each representing State and USDA and two from Private Business segments of the peanut industry. This committee shall be responsible for preparation of the financial budget of the Society and for promoting sound fiscal policies within the Society. They shall direct the audit of all financial records of the Society annually, and make such recommendations as they deem necessary or as requested or directed by the Board of Directors. The term of the chairman

shall close with preparation of the budget for the following year, or with the close of the annual meeting at which a report is given on the work of the Finance Committee under his chairmanship, whichever is later.

b. **Nominating Committee:** This committee shall consist of at least three members appointed to one-year terms, one each representing State, USDA, and Private Business segments of the peanut industry. This committee shall nominate individual members to fill the positions as described and in the manner set forth in Articles VII and VIII of these By-Laws and shall convey their nominations to the president of this Society on or before the date of the annual meeting. The committee shall, insofar as possible, make nominations for the president-elect that will provide a balance among the various segments of the industry and a rotation among federal, state, and industry members. The willingness of any nominee to accept the responsibility of the position shall be ascertained by the committee (or members making nominations at general meetings) prior to the election. No person may succeed himself as a member of this committee.

c. **Publication and Editorial Committee:** This committee shall consist of at least three members for three-year terms, one each representing State, USDA, and Private Business segments of the peanut industry. The members will normally serve two consecutive three-year terms, subject to approval by the Board. Initial election shall alternate from reference years as follows: private business, 1983; USDA, 1984; and State, 1985. This committee shall be responsible for the publication of Society-sponsored publications as authorized by the Board of Directors in consultation with the Finance Committee. This committee shall formulate and enforce the editorial policies for all publications of the Society subject to the directives from the Board of Directors.

d. **Peanut Quality Committee:** This committee shall include at least seven members, one each actively involved in research in peanuts - (1) varietal development, (2) production and marketing practices related to quality, and (3) physical and chemical properties related to quality - and one each representing the Grower, Sheller, Manufacturer, and Services (pesticides and harvesting machinery in particular) segments of the peanut industry. This committee shall actively seek improvement in the quality of raw and processed peanuts and peanut products through promotion of mechanisms for the elucidation and solution of major problems and deficiencies.

e. **Public Relations Committee:** This committee shall include at least seven members, one each representing the State, USDA, Grower, Sheller, Manufacturer, and Services segments of the peanut industry, and a member from the university of the host state who will serve a one-year term to coincide with the term of the president-elect. The primary purpose of this person will be to publicize the meeting and make photographic records of important events at the meeting. This committee shall provide leadership and direction for the Society in the following areas:

(1) **Membership:** Development and implementation of mechanisms to create interest in the Society and increase its membership. These shall include, but not be limited to, preparing news releases for the home-town media of persons recognized at the meeting for significant achievements.

(2) **Cooperation:** Advise the Board of Directors relative to the extent and type of cooperation and/or affiliation this Society should pursue and/or support with other organizations.

(3) **Necrology:** Proper recognition of deceased members.

(4) **Resolutions:** Proper recognition of special services provided by members and friends of the Society.

f. **Bailey Award Committee:** This committee shall consist of at least six members, with two new appointments each year, serving three-year terms. This committee shall be responsible for judging papers which are selected from each subject matter area. Initial screening for the award will be made by judges, selected in advance and having expertise in that particular area, who will listen to all papers in that subject matter area. This initial selection will be made on the basis of quality of presentation and content. Manuscripts of selected papers will be submitted to the committee by the author/s and final selection will be made by the committee, based on the technical quality of the paper. The president, president-elect and executive officer shall be notified of the Award

recipient at least sixty days prior to the annual meeting following the one at which the paper was presented. The president shall make the award at the annual meeting.

g. Fellows Committee: This committee shall consist of six members, two representing each of the three major geographic areas of peanut production and with balance among state, USDA and private business. Terms of office shall be for three years with initial terms as outlined in Section 1 of this ARTICLE. The committee shall select from nominations received, according to procedures adopted by the Society (P148-9 of 1981 Proceedings of APRES), qualified nominees for approval by the Board of Directors.

h. Golden Peanut Research and Education Award Committee: This committee shall consist of six previous Golden Peanut Award recipients, representing each of the three areas of peanut production. Terms of office shall be for three years as outlined in Section 1 of this Article. This committee shall serve as an advisory committee by screening nominations received by the National Peanut Council. The final selection shall be made by the National Peanut Council. For even-numbered years, the award shall be made for research accomplishments and for odd-numbered years, the award shall be made for educational accomplishments.

i. Site Selection Committee: This committee shall consist of eight members, each serving four-year terms. New appointments shall come from the state which will host the meeting four years following the meeting at which they are appointed. The chairman of the committee shall be from the state which will host the meeting the next year and the vice-chairman shall be from the state which will host the meeting the second year. The vice-chairman will automatically move up to chairman.

#### ARTICLE X. DIVISIONS

Section 1. A Division within the Society may be created upon recommendation of the Board of Directors, or members may petition the Board of Directors for such status, by a two-thirds vote of the general membership. Likewise, in a similar manner, a Division may be dissolved.

Section 2. Divisions may establish or dissolve Subdivisions upon the approval of the Board of Directors.

Section 3. Divisions may make By-Laws for their own government, provided they are consistent with the rules and regulations of the Society, but no dues may be assessed. Divisions and Subdivisions may elect officers (chairman, vice-chairman to succeed to the chairmanship, and a secretary) and appoint committees, provided that the efforts thereof do not overlap or conflict with those of the officers and committees of the main body of the Society.

#### ARTICLE XI. AMENDMENTS

Section 1. These By-Laws may be amended consistently with the provisions of the Articles of Incorporation by a two-thirds vote of all the eligible voting members present at any regular business meeting, provided such amendments shall be submitted in writing to each member of the Board of Directors at least thirty days before the meeting at which the action is to be taken.

Section 2. A By-Law or amendment to a By-Law shall take effect immediately upon its adoption, except that the Board of Directors may establish a transition schedule when it considers that the change may best be effected over a period of time. The amendment and transition schedule, if any, shall be published in the "Proceedings of APRES".

Amended at the Annual Business Meeting of the American Peanut Research and Education Society, Inc., July 12, 1985, San Antonio, Texas

# 1984-85 APRES MEMBERSHIP

Individuals	453
Students	33
Organizations	60
Sustaining	29
Institutions	105
<b>TOTAL</b>	<b>680</b>

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