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SUMMARY

Opening Session

A. H. Allison

After the invocation given by Dr. Milton Walker, Tyron Spearman, Executive Secretary of the Georgia Agricultural Commodity Commission for Peanuts gave a warm welcome to APRES members and guests, to the state of Georgia. Frank McGill introduced the keynote speaker, Mr. William Winkel, President of William Winkel International, Inc., a peanut brokerage firm in Talanta, Georgia. Mr. Winkel reviewed the short U.S. peanut crop in 1980 and the many problems the shortage caused in the market place. He pointed out that most importers of U.S. peanuts who held contracts and which were not fully met due to the critical shortage were understanding for the most part; but, realized for the first time that the U.S. did not always have the ability to supply enough peanuts to meet the demand under its current marketing system. Mr. Winkel spoke at length concerning what he described as "a very bright future for the U.S. peanut industry, both domestic and particularly for export." It was his opinion that the world market could stand a considerable increase in prices received for U.S. peanuts but that each segment of the industry, including the grower, must share in any price adjustments in order to provide the environment for a viable industry.

Dr. Herb Womack, Local Arrangements Co-Chairman and Dr. Milton Walker, Chairman, Technical Program Committee made appropriate announcements regarding the 1981 APRES program.

PEANUT VARIETIES: POTENTIAL FOR FUEL OIL.

Ray O. Hammons. United States Department of Agriculture, Agricultural Research Service and University of Georgia Coastal Plain Station, Tifton, Ga. 31793.

ABSTRACT

Peanut (*Arachis hypogaea* L.) oil has a demonstrated potential as a substitute or extender for diesel fuel. Research is just beginning for on-farm crushing of peanuts into fuel oil with the high-protein residue for livestock feed. On-farm fuel production would require genotypes with relatively high oil yields per acre whereas breeding work has mostly focused upon high seed yields.

Thirty peanut genotypes were investigated for oil and protein yields in field trials near Tifton, Georgia in 1980. For 11 varieties in an irrigated test, mean oil content (dry basis) was 51.2±0.97% (range 49.7 to 52.7%). The level of protein (N x 5.46) averaged 24.65±1.28% (range 22.60 to 26.70%). Seed yield averaged 4585 lb/a (d.b.) and these cultivars averaged an estimated 310 gal/a of oil.

Wider variation in oil (45.6 to 55.4%) and protein (22.06 to 29.16%) contents was found in a sample of 19 other genotypes selected for possible use as an oil crop.

At the average annual peanut yields for 1975-79 of 3118 pounds of pods, the standard commercial variety could have produced 84 million gal of oil per year on Georgia's 525,808 acre production area. The oil, meal and hull components could produce a calculated 31 million BTU/a.

Breeding for high oil yield has not been practiced in U.S. peanut breeding programs. Convergent improvement to attain higher levels of oil content, shell-out percentage, and stable yield will require 6-10 generations of crossing, backcrossing, selection and testing. Addition of a genetically distinct testa could be accomplished concurrently.

INTRODUCTION

On a global basis, peanuts (*Arachis hypogaea* L.) are grown primarily as an edible oil crop. In the United States the increased need for oil for various uses has caused an expansion in peanut production in periods of war or economic chaos. Since 1949, U. S. marketing quota acreage has been restricted to edible trade uses, with no acreage grown wholly for oil.

The peanut has considerable potential for use as a substitute or extender for diesel fuel in tractors and other farm implements. When Rudolf Diesel demonstrated the engine that bears his name at the Paris exposition of 1900, it was powered with 100% peanut oil (Nitske and Wilson, 1965). Apparently none of the onlookers was aware of this.

When energy supplies were disrupted in Europe during and after World War I, German scientists attempted to develop petroleum from peanut oil (Mailhe, 1924). Interest waxed because of economic conditions. A considerable amount of work was done in Germany, India, and China during World War II on using various vegetable oils as fuels. None of the processes developed for peanuts reached industrial application.

The Georgia peanut breeding program, begun in 1931, focused attention on breeding peanuts for commercial edible uses, including oil, and for hogging off. For oil production, hybrid strain Ga. 207-3 appeared most promising but was discarded from the edible trade because of its bland flavor (Higgins and Bailey, 1955).

In the 1950's high yielding Georgia strains with high oil contents were intercrossed or were crossed with the best yielding white-seeded peanut to provide a marker so distinctive as to prevent the oil peanut being diverted to the edible trade. Since none of the hybrids in that extensive study consistently produced oil yields better than the parental lines, it was concluded that the parents, *per se*, were more promising for commercial oil production (Hammons, 1959 a and b).

In the past two years, worries over the price and availability of oil have generated new interest in the potential of peanut oil to fuel the diesel-powered farm machinery in the peanut belt. Research is just beginning on developing genotypes with relatively high oil yields for such use.

This report describes the initial results and extrapolates yields into energy output.

MATERIALS AND METHODS

The peanut varieties were grown in 1980 as entries in the uniform peanut performance testing program at the University of Georgia research farm near Tifton. Land preparation, planting rates, cultural and production practices were essentially those recommended by the Cooperative Extension Service. Irrigation was applied during periods of low or no rainfall. Yield and shelling grade characteristics and a summary of production practices are reported elsewhere (Hammons and Branch, 1981).

The 19 lines in the one-replicate study were chosen because previously reported oil content and/or yield indicated potential use for oil production. They were grown in a nursery adjacent to the variety test and with similar production management.

Samples (1000g) were shelled using the standard FSIS procedure and yields adjusted to dry weight using the Steinlite electronic moisture tester.

A sample of 25g of seed was ground in a coffee mill to give a uniform sample for moisture and crude fat determinations. Moisture was determined by the official AOAC Method No. 27.005. Five grams of the ground seed were dried to a constant weight (ca 5h) at 95-100C under pressure of less than 100 mm mercury. Moisture was calculated as loss in weight. Crude fat was determined by Method 27.005 in which the residue from the moisture sample was extracted for 16 h in a Soxhlet-type extractor. The ether was evaporated and the residue dried for 30 min at 95-100C and cooled in a desiccator and weighed (A.O.A.C, 1975).

A 40g sample of seed from each variety was ground in a Virtis '45' homogenizer to pass a 1 mm sieve and stored in sealed polyethylene bags under refrigeration. Nitrogen was determined by digesting a 0.3g subsample by a modified Kjeldahl method, and the converted ammonia was measured as indophenol blue by automated colorimetry as described by Gaines and Mitchell (1979).

The energy used in producing peanuts in Georgia, 7,727,000 BTU/a, is from the 1974 data base printed by USDA, FEA and ERS (Marlay, et al, 1977). The energy content of peanut components from an average yield in Georgia is modified from data reported by Hammond, et al (1981).

RESULTS AND DISCUSSION

The oil and protein compositions for 6 selected varieties and 5 stable lines of peanuts grown under irrigation in 1980 are presented in Table 1. The range in oil content, 49.7 to 52.7%, was comparatively modest with A7109, Florunner and GK 184 exceeding the group mean by one standard deviation. Variation in quantity of oil per unit area was influenced primarily by seed yield. This probably reflects the fact that selection for higher oil content was not a criterion in the 5 breeding programs represented by the 11 entries.

Protein content for these genotypes averaged 24.6%, with the variation among entries similar to that previously reported (Holley and Hammons, 1968; Young and Hammons, 1973) for peanuts grown at Tifton. At the 1980 production level, the test averaged 2238 pounds of meal per acre. This material would contain approximately 50.5% protein.

These peanuts were grown with management and technology -- including irrigation -- commonly available to U. S. farmers, particularly in the Southeastern peanut belt (Hammons, 1980; Hammons and Branch, 1981). Severe heat stress was a limiting constraint during 1980.

Generally, correlations between seed oil and protein contents are negative (Holley and Hammons, 1968 ; Tai and Young, 1975), but A7109 appears not to follow this correlation as it has high values for both constituents. Florunner, on the other hand, exhibited the high oil/low protein composition which would probably be more desirable for production as a fuel oil crop.

Results on oil and protein contents for 19 additional strains and varieties of peanuts are presented in Table 2. For these genotypes there was a range of 9.8% in oil (55.4 to 45.6) and 7.1% in protein. These values approximate variation for varieties grown 20 years earlier at this location (Holley and Hammons, 1968). Again, there was a tendency for low protein strains to be high in oil or vice versa, but there were exceptions, such as *Arachis monticola* and Hua 11 which exceed the test means for both constituents. These exceptions are common enough in this 19-entry group to suggest that selection for high oil content would not necessarily sacrifice protein content.

Yield comparisons were not made for this portion of the study. However, Virginia Red, the only variety with oil content significantly above the mean (Table 2), is known to produce a mediocre crop when grown in the Southeast (Hammons, unpubl.). Although it would not be the peanut of choice for fuel oil production, the high oil content and genetically-distinctive red seedcoat should

TABLE 1. Yields of Hulls, Seed, Oil, Meal, and Protein for 11 U.S. Peanut Varieties Grown in the Irrigated National Uniform Test, Tifton, Ga., 1980 1/

Variety	Hulls	Seed	- - Oil Content - -			Meal	Protein Content	
	lb/a	lb/a	%	lb/a	gal/a 2/	lb/a	%	lb/a
UF 78307†	1468	5261*	50.6	2662*	351*	2599*	25.17	1324*
UF 78114†	1783*	5284*	50.0*	2642*	349*	2642*	25.82	1364*
GK 184†	1314*	4596	52.2*	2399	316	2197	25.12	1154
TIFRUN	1650	4724	50.7	2395	316	2329	25.44	1202
EARLY BUNCH	1590	4587	51.3	2353	310	2234	22.60*	1037
NC 7	1445	4579	51.0	2335	308	2244	22.80*	1048
FLORUNNER	1289*	4460	52.3*	2332	308	2128	23.26*	1037
UF 78309†	1515	4463	51.1	2281	301	2182	24.79	1106
GK 3	1688*	4371	49.7*	2173	287	2198	25.06	1095
A7109†	1460	4050*	52.7*	2135*	282*	1915*	26.70*	1081
FLORIGIANT	1500	4063*	52.0	2113*	279*	1950*	24.30	987*
Mean	1518	4585	51.2	2347	310	2238	24.65	1130
σ (±)	151	400	0.97	181	24	224	1.28	121

Cooperative research with W. D. Branch and T. P. Gaines, Univ. Ga. Coastal Plain Sta., Tifton, Ga., and C. T. Young, N. C. State Univ., Raleigh, N.C.

* Indicates 1 σ above or below mean. † = Experimental Line.

1/ Dry basis determinations.

2/ 7.58 lb/gal, with relative density of oil 0.914 at 15C.

put Virginia Red among the list of suitable parents in any program of breeding for higher oil yields.

There are frequent reports of genotypes with oil contents ranging between 55 and 60%. Usually these are subspecies *fastigiata* grown in the semi-arid tropics with seasons of 80 to 110 days. When these genotypes are grown in the Southeastern United States their oil contents are not strikingly high.

For the short-range period, one of the present commercial varieties or stable breeding lines (Table 1) would appear suitable for production for fuel oil. As an example, let us project the Georgia production with Florunner. At the average peanut yields for 1975-79 of 3118 pounds (in-hull) per acre, annual oil production may be calculated as 319,030 tons, or 84 million gallons, on the 525,808 acre production area.

There are several ways for figuring the energy content for peanut components. Again using the 5-year Georgia farm average pod yield, the energy output can be estimated as shown in Table 3.

TABLE 2. Oil and Protein Composition for 19 Peanut Genotypes, Fuel Oil Nursery, Tifton, Ga., 1980.

Identification		Oil	Protein
Name	Acc. data	%	%
Macrocarpa	121067	52.3	22.55*
Virginia Red	258491	55.4**	22.06*
Pondicherry	268969	52.6	23.53*
Philippine White	300947	50.1	24.30
184 A	363061	48.3	28.17
184 E	363062	48.2	28.50*
327 A	363063	49.2	27.68
Sp. 205 X Ex Italy	372317	48.8	25.01
G 153 X F334-127	372318	52.6	25.99
<u>A. monticola</u>	405933	52.3	29.16*
Hua 11	420334	52.0	27.52
Hua 113	420336	51.1	25.28
F334A-B-14	T 1385	52.0	22.99*
N. M. Val. C	T 2381	45.6**	28.12
Early Runner	T 2406	50.5	25.33
Florispan Run.	T 2407	50.4	27.52
NC 6	--	48.4	28.01
Tamnut 74	--	48.6	27.30
Tenn. Red	--	47.8*	28.06
Mean		50.3	26.16
σ		± 2.33	± 2.23

Cooperative investigations with the Univ. Georgia Coastal Plain Station. Oil analyses by C. T. Young; protein determinations (N x 5.46) by T. P. Gaines.

* = ± 1σ, ** = ± 2σ.

The high shellout of Florunner could give 2320 lb of dry seed, containing nearly 21 million BTU/a of oil. Burning the hulls would produce 4,690,000 BTU.

The left over peanut meal has a high feed value. There are two ways of figuring the value: One is as a protein source. There is the possibility that one overfeeds if the ration is formulated on energy alone.

For ruminant animals peanut meal has a high bypass protein value. Bypass protein is that protein which escapes digestion in the rumen and passes intact to the small intestine where it is readily digested and better assimilated.

The meal fraction at 5,121 BTU/lb as a digestible swine feed gives a calculated 5.6 million BTU/a for the average Georgia production.

These three components -- meal, oil and hulls -- could produce an average 31 million BTU/a, or 10,000 BTU/lb of in-hull peanuts (Table 3).

TABLE 3. Energy Content of Peanut Components: Estimates from the 5-year, 1975-79, Average Georgia Yield of 3118 lb/acre.[1/]

Component[†]	Yield lb/a	- - Energy Content - - BTU/lb	BTU/a
Meal fraction	1107	5,121[+]	5,668,947
Oil fraction	1213	17,249	20,923,037
Peanuts hulled	2320		26,591,984
Hulls	670	7,000	4,690,000
Peanuts in hull	(3118)		31,281,984
Per pound			*10,033*
Vines	3118	5,000	15,590,000
Total output			46,871,984

1/ Modified from Hammond, et al. 1981.

† Florunner at 21.5% hulls, 78.5% seed, 5.22% seed moisture, 52.3% oil and 23.26% protein.

+ As a digestible swine feed.

Although the peanut vines are not normally removed from the land, they are an available form of renewable energy source which might be considered economically feasible as petroleum sources decline. When vines from our examples are burned in a combustion chamber another 15 million BTU/a can be estimated.

The energy balance is defined as the energy input in crop production divided into the energy output of the crop (Hammond, et al, 1981). The energy input for Georgia peanuts, based upon the 1974 data base (Marlay, et al, 1977) was estimated at 7,727,000 BTU/a. Dividing the total in-hull energy content in Table 3 by the energy input, the energy balance for peanuts grown at the 5-year average yield level in Georgia is estimated at 4.05. Increased costs for manufacturing pesticides and fertilizers, among others, would change the energy input from the 1974 data base and, therefore, decrease the energy gain below 4.0.

Hammond, Samples and Tyson (1981) used the 1974 data base (Marlay, et al, 1977) for comparing the overall energy gain of peanuts and soybeans, but used a different production value for peanut in their example. They concluded that "if maximum energy production should become desirable in terms of producing liquid oil, peanuts would appear to hold more potential than soybeans in terms of yield in the Southeast."

POTENTIAL FOR GENETIC MODIFICATION

Under the assumption that high-yielding, high-oil content genotypes with distinctive white seedcoats could be produced solely for oil and protein cake as a "new" crop, B. B. Higgins (unpublished) initiated breeding in 1954 toward developing such a peanut. Five high-yielding genotypes with pink testa and average oil content of 57.3% (wet basis) were crossed with Georgia 61-42, which has a white seedcoat, average yield, and 53.2% oil.

In addition to the parents, three populations of derived progeny were tested for pod yield and oil content in F_3 to F_6 generations (Hammons, 1959a).

None of 59 F_6 progeny lines with the distinctive white seedcoats out-yielded the nonwhite (pink) parent. Of eleven selected F_5 sister lines with pink seed, none exceeded its top parent in oil yield per acre (Hammons, 1956b).

Crosses were also made among the pink-seeded parents. Eleven selected F_5 progenies were compared with their parents. One selection from Ga. 207-3 X Ga. 182-15 exceeded both parents in pod yield but not in oil yield. Another selection excelled in oil but fell short of the oil yield for Ga. 177-19 (Hammons, 1959b)

In these early studies selection pressure was exerted initially for yield and/or testa color. Subsequent selection was for oil content with seed bulking within progenies.

A much better procedure is available now. The nuclear magnetic resonance (NMR) spectrometer provides a simple, effective, rapid and non-destructive method for determining oil value in planting seed.

Two breeding techniques appear best suited for developing high-yielding, high-oil content peanuts with or without a distinctive testa marker. Several backcrosses might be used, for example, to transfer the high oil content and red testa of the Virginia Red peanut to a very productive, stable variety. Recurrent selection would likely be a more appropriate system of breeding which, through cyclic selection and crossing, is designed to increase the frequency of desirable gene and gene combinations in the population (Norden, 1973).

Yield and oil content are complexly inherited. The NMR would permit simultaneous selection pressure for oil content and seed yield at each step in the breeding program. Dr. J. C. Wynne has made the necessary random matings to initiate the first cycle of recurrent selection for high oil content at North Carolina State University (personal communication).

The NMR spectrometer would also facilitate a breeding program to screen and yield test several thousand genotypes from the world germplasm pool for high oil content. The author believes that presently documented breeding material is ample for breeding peanuts for oil. However, a great amount of intensive research must be done to develop the best yielding lines with appropriate physical properties.

Peanuts grown wholly for oil would likely occupy acreage apart from that producing peanuts for edible purposes. The development of a distinctive seed-coat marker would not be difficult but cyclic backcrossing and yield testing take time. Use of a winter nursery increase program could cut the time in half -- from 6 to 7 years to 3 or 4.

Concurrently with research to breed high-oil peanuts scientists need to consider other ramifications of the peanut-oil technology. One option is to grow peanuts as an on-farm fuel-extender crop. Jay Williams and Gordon Monroe of USDA-ARS, Tifton, Ga., are conducting exploratory research on the engineering aspects of on farm processing.

J. L. Steele and F. S. Wright, USDA-ARS, Suffolk, Va., propose on-farm oil extraction from freshly dug peanuts using a direct method of harvest developed by them (personal communication).

The recent flurry of interest in biomass conversion systems and vegetable oils as diesel fuels is not new. A proposal to use the whole plant, nuts and vines, conceived as passing through a pressure system in the presence of a reducing agent to yield a petroleum-like product, was made by W. C. Gregory at the North Carolina Experiment Station in 1961. He analyzed the cost-price relationship of farm grade peanuts to the then current price of gasoline and worked the productivity level requirements for peanuts at the then cost/acre. Byproducts in nitrogen liquors would be used in subsequent crop rotations with corn. Obviously, a great deal of exploratory research would have to be done in addition to the agronomic research (W. C. Gregory, personal communication, 1981).

As with other oil crops, such as sunflowers and soybeans, peanut currently are processed almost entirely off the farm into human food directly, oils for human consumption, and protein meal for livestock feed. However, the high proportion of diesel-powered farm machinery in the peanut belt makes the option of peanut oil use attractive if other problems can be solved. Petroleum-based fuels are currently less expensive, but as supplies dwindle, peanut oil could well become an important energy source.

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Thanks are due to a number of individuals who helped with the research, shared ideas, contributed unpublished information, or read the manuscript. Bill Branch conducted the 1980 field trials, Clyde Young made moisture and crude fat determinations, T. Powell Gaines analyzed nitrogen, and L. E. Samples computed the peanut energy values.

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Resistance Evaluation of Bacterial wilt (*Pseudomonas solanacearum* E.F.Sm.) of Peanut (*Arachis hypogaea* L.) in the People's Republic of China. Sun Darong*, Chen Chuenrung, Wang Yuring, Institute of Oil-Bearing Crops, CAAS, Wuhan City, Hubei Province.

ABSTRACT

Bacterial wilt (*Pseudomonas solanacearum* E.F.Sm.) of peanut (*Arachis hypogaea* L.) is a serious disease in southern China, usually occurring in about 10% of the planted area, but sometimes fields have up to 30% yield loss. This disease arose in some northern provinces such as Shandong and Jiangsu et al, recently. From 1974-1977, 1631 germplasms had been evaluated in a natural disease nursery and by artificial inoculation. Seeds were immersed (30 + min.) in 2-3 day old cultures (6×10^8 bacteria/ml.) of isolate 'Huong An 74-1,' a pure culture from cv. 'Huongan Zhili.' Results by these two methods showed that nine entries (0.55%) may have higher resistance to bacterial wilt. All are Spanish type, except the 'Teishan sanliyue' is a Valencia type; all originated in the south at 24N latitude, except the 'Huongchuan Zhili.' Only two cultivars, 'Xie kong chung' and 'Teishan sanliyue,' had high resistance and stability (0.12%). Xie kong chung had some resistance to leafspot (*Cercospora arachidicola* and *Cercosporidium personatum*) and leaf rust (*Puccinia arachidis*) in addition to bacterial wilt. These two cultivars are resistant germplasm and good cultivars for bacterial wilt disease areas. Some serious disease areas currently use them.

INTRODUCTION

Bacterial wilt (*Pseudomonas solanacearum* E.F.Sm.) of peanut (*Arachis hypogaea* L.) is a serious disease in southern China. The provinces of Guangdong, Guangxi, Fujian, Hubei, Anhui and Jiangxi are the most seriously diseased areas, usually occurring on about 10% of the planting area. Yields are sometimes cut as much as 30%. Recently, this disease spread to the provinces of Shandong, Jiangsu, and others with very serious outbreak in individual areas. Some diseased plants have been found in Liyu Da district of Liaoning province.

The Academy of Agricultural Science of Fujian province and the Zhanjiang District Institute of Guangdong province have conducted surveys for 50 years to determine the pathogenicity of bacterial wilt. Since that time, the agricultural academies of Guangdong and Hubei, the agricultural colleges of South China and central China and the Institute of Oil-bearing Crops of the Chinese Academy of Agricultural Science (CAAS) have developed the census and carried on research about the bio-characteristics of pathogenicity, the relations between the disease and the environment, the discriminate techniques of pathogenicity, control and germplasm evaluation.

Bacterial wilt is considered a soil-borne disease, and cultural practices such as rotation, comprise the main steps for control. Because the farmer's main income is from peanut, the highest cash crop, farmers have increased the risk of damage from bacterial wilt, by continuous cropping in the most concentrated producing areas. This practice resulted in a higher organism population level each year, hence forming a locally serious problem. With the exception of rotation, practical and economical control steps have not been discovered.

Peanut production in some other countries has had serious damage from bacterial wilt. As of 1905, yield in Indonesia had decreased about 25%; later, in southern Africa some bacterial wilt occurred and the losses were very grave. Although the disease has been reported in the U.S.A., it appears to be a minor problem.

Previous literature has reported the evaluation and release of some resistant cultivars: 'Schwarz 21,' or the derived cultivar 'Matjan' in Indonesia, and 'Ga. 119-20,' in Georgia, U.S.A. While in China similar work has found some cultivars which have differentiating degrees of resistance to bacterial wilt. For example, the Academy of Guangdong province found resistance in farmer's cultivars 'Tianjin dou,' 'Teishan zhenzhu,' and 'Suei xi da li,' and through crossing with Tianjin dou has released resistant cultivars 'Suei tian,' and 'Yui io 589.' These cultivars have been beneficial for peanut production in South China.

In 1974, the workshop for plant germplasm of China was assigned the program to evaluate the total peanut germplasm for higher levels of resistant varieties for production and breeding uses. The Institute of Oil-bearing Crops of CAAS has undertaken this project in cooperation with other member institutes. This paper reports the progress of this work.

MATERIALS AND METHODS

Natural disease nursery: Continuously cropped fields were located at the commune of Fung Gong, Huong An county, Hubei province, where the research work of the Institute of Oil-bearing Crops was established in 1961. Under such conditions, susceptible cultivars 'Huongmei zhou' and 'Huong An zhili' may be almost destroyed.

Artificial inoculation: Seed were immersed (30+ min.) in 2-3 day old cultures (6×10^8 bacteria/ml.) of isolate 'Huong An 74-1,' a pure culture from cv. Huong An zhili.

1974. Appraised the natural disease nursery, 4-16 replications.

1975. Natural disease nursery, 4 replications, one replication by artificial inoculation as check.

1976. Natural disease nursery plus artificial inoculation, 4 replications, one row plot, row length 2 meters, double planting seeds, with 10 seedlings per row.

About 50-60 days after planting, the bacteria may develop in peanut roots and plants show the following symptoms: one or two leaves from the stem tip are flaccid, the petals bend down, and the leaflets are curled. If the weather is hot and dry, the peanut plant will become wilted within several days. On cooler and rainy days, disease progress is much slower.

Disease ratings were made on a 1 - 5 scale for increasing severity.

1. Minus - 10% high resistance
2. 10 - 30% resistance
3. 30 - 50% low resistance
4. 50 - 70% susceptable

5. Plus 70% highly susceptable

Materials:

1974	316 entries, germplasm
	43 entries, breeding materials
1975	263 entries, germplasm
	476 entries, breeding materials
	207 entries, 1974 appraised, had some resistance, repeated
1976	341 entries, germplasm
	21 entries, breeding materials
	366 entries, repeated
1977	761 entries, germplasm
	18 entries, breeding materials

From 1974-1977 total appraised 2762 entries (Tab. 1), among them 1631 germplasm lines, (Tab. 2).

Table 1. Peanut Germplasm Evaluated for Bacterial Wilt, 1974-1977.

Entries	1974	1975	1976	1977	Total
Chinese germplasm	222	213	341	741	1517
Foreign germplasm	94	-	-	20	114
Total germplasm	316	213	341	761	1631
No. repeated		207	366	-	573
Breeding materials	43	476	21	18	558
Total	359	946	728	779	2762

Table 2. Numbers of Peanut Germplasm Entries Evaluated for Bacterial Wilt Reaction by Years and Province.

Province	1974	1975	1976	1977	Total
Beijing	2	2	-	-	4
Liaoning	10	11	-	45	66
Hebei	4	4	-	49	57
Henan	23	24	-	132	179
Shandong	27	28	-	293	348
Shanxi	3	3	-	20	26
Shaanxi	-	-	-	1	1
Sichuan	6	6	-	55	67
Yunan	9	10	-	16	35
Guizhou	2	2	-	-	4
Hubei	45	1	-	-	46
Hunan	5	6	-	-	11
Jiangxi	5	8	-	56	69
Jiangsu	5	7	-	3	15
Zhejiang	-	-	-	1	1
Anhui	-	-	-	2	2
Guangdong	60	82	341	24	507
Guangxi	3	3	-	1	7
Fujian	12	16	-	42	70
Xingjiang	1	-	-	1	2
Total	316	213	341	761	1631

RESULTS

Field Evaluation and Screening:

From 1974-1977 more than 2000 entries, representing a diversity of sources, were evaluated. Entries with high resistance to bacterial wilt were very rare. Only slightly more than 5% of the total entries evaluated exhibited resistance under 30%. For 1975, 1 entry (0.11%) showed high resistance, 24 entries (2.52%) showed resistance, and 33 entries (3.47%) low resistance. For germplasm only, 0.38 were highly resistant and 4.93% resistant (Tab. 3-1, 3-2).

Table 3-1. Performance of Resistance to Bacterial Wilt, 1974.

Entries Origin	Entries	Score 1	2	3	4	5
Germplasm						
Spanish	186	1	4	11	19	151
Virginia Bunch	70	-	-	-	-	70
Runner	37	-	-	-	-	37
Total	293	1	4	11	19	258
Breeding materials*	66	-	2	-	-	64
Total	359	1	6	11	19	322
Percentage	-	0.28	1.67	3.06	5.29	89.70

Scores: 1-5 in increasing susceptibility.

* Total germplasm entries 316, among them 23 entries may be hybrid progeny estimated as breeding materials.

During the 4 years study, only 9 entries showed a high level of resistance to bacterial wilt (Tab. 4). The most consistent resistance was in 'Xie kong chung.'

Description of the resistant germplasm:

1. Xie kong chung

The field performance of resistance to bacterial wilt was 94.4±7.9, 95.0±10.0, 74.1±16.4 and 92.6±3.45 percentage living plants, respectively, from 1974-1977; coefficient variance range 3.73 - 22.7%. Although resistance was less in 1976, due to artificial inoculation, the variety held the first rank in response. Laboratory tests showed 90% live plants in 1978. This cultivar occupied the first rank (92.6%) also in 1978.

Xie kong chung is typical Spanish type, with robust foliage, sparse branching and some secondary branches. Plant shape is erect and loose; flowering is sequential; leaf color is yellow green; leaflets are oblong and of medium size.

100 pods weigh about 130g, 100 seed about 52g, shelling percentage is 75% or above, and oil content is 52%.

In addition to bacterial wilt this cultivar had some resistance to leaf spot (*Cercospora arachidicola* and *C. personatum*) and leaf rust (*Puccinia arachidis*). Thus, Xie kong chung retains its leaves longer and remains vigorous until a later maturity date.

Table 3-2. Performance of Resistance to Bacterial Wilt, 1975.

Entries Origin	Entries	Score 1	2	3	4	5
Germplasm						
Spanish	44	-	2	-	9	33
Virginia Bunch	36	-	-	-	30	6
Runner	88	-	9	2	30	47
New Intro.	95	-	2	-	61	32
Total	263	-	13	2	130	118
Breeding Material	476	-	5	20	138	313
Repeated 1974	207	1	6	11	17	177
Total	946	1	24	33	285	608
Percent of Total		0.11	2.52	3.47	29.97	63.93
Percent of Germplasm		0.38	4.93	0.76	49.07	44.86

2. Teishan sanliyue (a farmer's cultivar of Teishan County, Guangdong province).

The resistance to bacterial wilt was 70.9±7.5% and 83.7±4.02% in 1976 and 1977 respectively, and the coefficient of variance ranged 82.9±4.8%.

As with Xie kong chung, when field trials were inoculated with bacteria the percentage of live plants decreased. For the 1978 laboratory test, the resistance was 98.1%, ranking with Xie kong chung. According to these and other test results, this cultivar may have a level of high resistance to bacterial wilt.

Teishan sanliyue is Valencia type; there are often 3 or more seed per pod. Plants are tall, erect, with sparse branching; leaflets are large oblong, and yellow green.

100 pods weigh 195g, 100 seeds about 50g, and shelling percentage about 73%.

Table 4. Performance of Resistant Cultivars

Cultivars	1974 Living Plant %	±	C.V.	1975 Living Plant %	±	C.V.	1976 Living Plant %	±	C.V.	1977 Living Plant %	±	C.V.
Xie kong chung	94.4	7.6	8.4	95.0	10.0	10.5	74.1	16.1	22.1	92.6	3.4	3.7
Suei tan	68.6	15.1	22.0	54.3	31.8	58.5	60.0	15.0	21.0	-	-	-
62/288	63.9	13.7	21.4	43.5	19.8	45.5	29.1	25.0	86.2	-	-	-
Huongzhuan zhili	61.3	14.9	24.3	49.3	21.9	43.6	56.9	14.0	24.6	-	-	-
Yui io 589	53.2	18.8	35.3	54.9	19.0	31.9	52.2	23.9	45.7	-	-	-
Yui io 22	52.8	19.9	37.6	34.6	19.0	54.9	43.0	15.7	36.5	-	-	-
Yui io 320	51.1	17.4	34.0	62.8	27.9	44.4	46.0	27.7	60.2	-	-	-
Teishan zhenzhu	37.5	-	-	50.2	20.8	59.3	38.0	14.6	38.4	-	-	-
Fu rong	51.6	14.1	27.3	39.2	24.9	63.5	45.8	12.9	28.1	-	-	-
Teishan sanliyue	-	-	-	-	-	-	71.9	7.5	82.9	83.7	4.0	4.8

3. Yui io 589

This peanut was developed through complex hybridization by the academy of agricultural science of Guangdong province.

In the three test years, 1974-1976, it's resistance reactions were 53.2±18.8%, 59.4±18.0% and 52.2±23.9%, respectively, with the coefficient of variance ranging 31.9-14.7%. In the 16 replication test resistance ranged 54.6 to 70.0%; in the 1978 laboratory test it was 66.9% living plants. According to these conditions, this cultivar has some resistance.

It is a Spanish type with erect habit, dense branching and tall mainstem. The foliage is robust, leaflets are oval and green in color.

100 pods weigh 176g, 100 seed 65g, shelling percentage is about 72%.

4. Suei tian

This cultivar was developed by infraspecific crossing, Sueixi dali (Spanish type) X Tianjin dou (Virginia type). It has been released for 50 decades in Zhanjiang district, Guangdong province, by academy of agricultural science.

The resistances from 1974-1976 were 68.6±15.1%, 54.3±31.8%, 60.0±15.0%. The 1975 artificial inoculation test in greenhouse was 83.3%, thus this cultivar was more resistant under heavy inoculum pressure than in the field.

It's plants are Spanish type, with sparse and loose branching, erect habit, and tall mainstem; having green foliage and oblong leaflets.

5. Huongzhuan zhili (a farmer's cultivar of Huongzhuan county, Henan province).

Three years evaluation of resistance to bacterial wilt gave 61.3±14.9%, 49.3±21.9%, 56.9±14.0% living plants, respectively. Coefficient of variance range 21.9-24.6%. For the 15 replications test the resistance range was 49.8-77.0%. In the 1978 artificial inoculation test in greenhouse the resistance was 83.3%. In conclusion this cultivar may belong to the resistance group.

The cultivar originated at high latitude (32 N).

It is Spanish type with plant erect and loose, leaflets oblong and light green.

100 pods weigh 120g, 100 seed 45g, shelling percentage is 72%, and oil content 50.9%.

Four of the five resistant cultivars are Spanish type, and Teishan sanliyue is a Valencia. Most of the Virginia runner and Dragon type (var. *hirsuta*) cultivars had low resistance, as 'Xiao zhi si' (Nan xiung county, Guangdong province), 'Zhen yan' (Zhen yan county, Yuen nan province) and 'Dung luong dou' (Baolao county, Guangdong province), and others.

On the basis of these evaluations, eight resistant cultivars were grown on a large area comparative production test with artificial inoculation in 1976. The three most resistant were Xie kong chung, Teishan sanliyue, and Yui io 589. The harvested yield was three times that of the local farmer's cultivar Huong mei zhou. Therefore, these three entries not only are resistant germplasm, but are suitable for direct cultivation in bacterial wilt disease area. (Tab. 5).

Table 5. Production Performance of Resistant Cultivars, 1976.

Cultivars	Living Plant %	Pod No. /plant	SMK %	100 pods g	100 seeds g	Yields* kg/ha
Xie kong chung	71.17	21.5	73.6	134.6	46.0	3725
Yui io 589	48.10	22.0	81.5	171.6	66.8	3101
Teishan sanliyue	75.90	20.4	71.6	197.2	62.0	3101
Teishan zhenzhu	39.50	35.1	79.3	105.4	64.2	1646
Fu rong	46.00	34.6	80.4	125.1	76.4	1606
Huong mei zhou	20.50	30.4	73.5	137.6	67.2	1144
Ga. 119-20	21.30	22.2	76.9	165.3	41.6	928
Yui io 320	34.00	29.0	82.1	154.6	80.4	643

*Including the loss due to bacterial wilt.

DISCUSSION

1. The geographical distribution of the resistant germplasm suggested that there was a relationship between environmental conditons and resistance. In our tests, all of the resistant material originated in lower latitudes. Twenty six entries had a rating of 50% or more, including 22 entries which originated at Guangdong province in southern China (south of 24 N latitude). 'Huongzhuan Zhili' is the only cultivar which originated at a latitude higher than Guangdong province (32 N). The area is located at Huei river basin, where the weather and soil type are similar to that of south China. These conditons reflect the disease distribution. These findings suggest the need for further introduction and evaluation of germplasm introduced from lower latitude areas, such as countries of southeastern Asia.

2. In China, the distribution of peanut types are influenced by weather, soil type (acidity), cropping system etc. south of the Yangzhi river, Spanish type predominates. In northern producing areas there are some Virginia bunch and runner, and small areas of Valencia type. The Virginia runner and the Dragon type (var. *hirsuta*) were popular many years ago; however, they have about disappeared since yields are lower than with Spanish and Virginia bunch. Among the germplasms which have been evaluated, some Virginia runner and Dragon type cultivars had higher levels of resistance. These may have primitive origin and have retained resistance to some diseases by natural and artificial selections. The academy of agricultural science of Guangdong province used by the cultivar 'Tianjin dou' (Virginia runner) as the resistance source, released several cultivars with resistance to bacterial wilt, e.g., 'Sueixi Dali.' These facts have prompted us to put some intensive research on the genetics of resistance and also to cultivars adapted to specific locations.

3. The cultivars of Virginia bunch type in this test mostly had originated at higher latitudes. There, the temperature and humidity do not favor to the development of disease. Therefore, bacterial wilt was not less severe and widespread in lower latitudes, consequently, these cultivars had little selection pressure for resistance to bacterial wilt.

4. Some cultivars of Spanish type, exhibited higher resistance to bacterial wilt, especially those introduced from a lower latitude area. In this test, the high resistance entries were all Spanish type, except the Valencia 'Teishan Sanliyue.'

5. The heredity and the relation of transmission of resistance of peanut to bacterial wilt are not yet well understood. Expecially, when resistance is recorded as a percentage of living plant of a population. Other factors to be considered are the soil properties, virulence of isolates, quantity of bacteria, and root system condition. The basis and knowledge for selection was judged to be difficult. Therefore, there is need for further study of the mechanism of inheritance of resistance and the relation with soil conditions.

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Separation and Removal of Aflatoxin Contaminated Kernels in Peanut Shelling Plants: Part I A Case Study. J. I. Davidson, Jr., C. E. Holaday, and C. T. Bennett, National Peanut Research Laboratory, Dawson, GA 31742.

ABSTRACT

A 20-tonne lot of Segregation 3 peanuts grown in 1979 was shelled in the USDA pilot shelling plant and 50 to 250 kg of peanut material was removed at each of 42 different locations throughout the plant. The portion of material that was removed from each location was blended, divided into four samples, ground, blended, subsampled, and the subsamples analyzed with the Holaday minicolumn method. These analyses showed that aflatoxin contamination was directly related to the stage of shelling, resistance to shelling, and inversely related to seed thickness and specific gravity of the kernels. Use of these findings in design of shelling and processing plants is discussed.

INTRODUCTION

Prevention, detection and removal of aflatoxin contamination in peanuts are major goals of the peanut industry. Removal efforts normally consist of color sorting the raw and/or blanched (skinless) kernels. Dickens and Whitaker (2) and Tiemstra (6) have reported considerable information on the efficacy of hand and electronic color sorting in removing kernels contaminated with aflatoxin. Color sorting equipment, labor (handpicking) and material losses incurred as a result of color sorting is usually the most expensive part of shelling and processing. There is a special need to improve the sorting efficiency and to find other sorting and shelling methods that will reduce the cost of these operations.

One potential method for accomplishing this objective is to concentrate prior to sorting, the contaminated kernels with a small portion of good kernels and utilize less sorting equipment and labor to obtain more efficient removal with less material loss. Potential methods reported for segregating contaminated kernels included screening (1) and specific gravity (3). Our recent research (unpublished) has indicated that certain shelling separations were effective in concentrating contaminated kernels prior to sorting.

The purpose of this paper is to provide information concerning the effectiveness of inplant shelling, screening and specific gravity operations in segregating contaminated kernels.

PROCEDURE

Figure 1 shows the major shelling, screening, specific gravity, and sorting operations normally found in commercial shelling plants. Generally, no attempt is made to concentrate contaminated raw shelled kernels prior to sorting.

This study was conducted using the USDA pilot shelling plant that has the same type of screening, shelling and sorting equipment as found in most commercial shelling plants. A 20-tonne lot of Segregation 3 Florunner peanuts (CY 1979), having an average aflatoxin contamination of 60 ppb, was shelled by independently operating each stage and phase of the plant so that samples could be collected from each major shelling, screening and specific gravity operation (a total of 42 operations).

A large (usually 50 to 250 kg) portion of material was removed from each of the 42 locations, and each portion was blended and subdivided into four working samples (12 to 62 kg) for grinding. The 12 to 62 kg working samples were coded, ground in a subsampling mill and aflatoxin was extracted from a 1100-g subsample by the improved Holaday procedure and minicolumn method (4, 5). This method was chosen because it was much quicker and cheaper than other methods.

DATA AND RESULTS

The average aflatoxin concentrations found in samples taken after the gravity tables and screeners in the first stage of plant operation are shown in Figure 2 and Table 1. The peanuts were cleaned; screened to remove the loose shelled kernels, (LSK); shelled by first stage sheller; screened to remove split kernels, oil stock and large unshelled pods; separated by specific gravity (gravity table); and screened into market grades. The peanuts that were not shelled by the first stage sheller were returned to the second stage bin for further processing. The precleaner screened the peanuts over 6.4-mm wide slots to remove the small whole and broken LSK ("red tag" LSK). The next screening operation prior to shelling removed the large LSK and the small pods with a 9.9-mm wide slotted hole screen. These peanuts were stored for further processing with the third and fourth stage of shelling. Screening immediately after shelling consisted of passing the materials over and through slotted hole screens (10.3- and 6-mm wide slots) to remove large unshelled and split kernels and then over a round hole screen (6.4-mm diameter holes) to remove broken and very small kernels (oil stock). As the whole kernels were discharged from the gravity table (specific gravity separator), samples were removed at the high (heavy), middle (medium), and low (light) deck locations. Ultralight material was discharged at the rear of the gravity table. After the peanuts were separated by the gravity table, they were screened and sized into the commercial market grades.

Both specific gravity and screening were effective in concentrating the contaminated kernels. An analysis of variance showed that the heaviest kernels from the gravity table had only a trace of aflatoxin, which was significantly different from the medium and light weight kernels. A separate analysis of the sample concentration from the screeners showed that splits and jumbos had the lowest (31 to 42 ppb) aflatoxin contamination; while mechanical damaged and small kernels had the highest aflatoxin contamination (94 to 128 ppb). It appeared that the highly contaminated red tag LSK and oil stock resulted from very small whole kernels rather than from mechanical damaged kernels because the very small and undamaged kernels (other edible) had about the same amount of aflatoxin as the red tag and oil stock.

The second stage of shelling was very similar to the first stage except that the pods that did not shell in the first stage were processed as illustrated by Figure 3 and Table 2. Only a very small percentage of the peanuts (1.2%) were shelled by the second stage sheller and all of the other edible and oil stock materials were used in sample preparations. Unfortunately, the samples of heavy kernels were lost and no data was obtained for these samples. Screening was effective in separating many of the contaminated kernels. The split kernels and large and small whole kernels had the least amount of aflatoxin (17 to 39 ppb). The medium size and smallest kernels had the most aflatoxin (75 to 138 ppb).

The third stage of shelling was very similar to the first and second stages described above except that the third stage shelling was conducted in two phases. The first phase consisted of shelling some of the pods that did not shell in the first and second stages of shelling, see Figure 4 and Table 3. There were no significant separation of aflatoxin contaminated kernels with either specific gravity or screening. However, the kernels with the highest specific gravity appeared to have less aflatoxin than found for the medium and light density kernels. On the average the small and medium size kernels had the least and the largest kernels (whole and split) contained the greatest amount of aflatoxin. Thus it appeared that the pods with the large kernels that were difficult to shell had more aflatoxin than the more easily shelled pods.

The second phase of the third stage of shelling consisted of processing the LSK and small pods, see Figure 5 and Table 4. Variability of aflatoxin contamination among the small samples of "other edibles" and "oil stock" confounded the statistical analyses. However, it appeared that the aflatoxin contamination varied inversely with kernel size and specific gravity. The jumbos, mediums, No. 1's, and splits had relatively small amounts of aflatoxin as compared to high values obtained for the smallest kernels. Surprisingly, the LSK in this lot had relatively small amounts of aflatoxin. LSK in most contaminated lots exhibit very high levels of contamination.

The fourth stage of shelling was also conducted in two phases. The first phase consisted of shelling the pods that were not shelled by the first-, second- and third-stage shellers, see Figure 6 and Table 5. All of the peanuts separated in the fourth stage of shelling were used in the aflatoxin samples. These peanuts were highly contaminated. Specific gravity was effective in concentrating contaminated kernels. There was insufficient peanuts for most of the screening operations but it appeared that screening was relatively ineffective in removing contaminated kernels in the first phase of this fourth stage operation.

The second phase of the fourth stage of shelling consisted of shelling the small pods separated from the LSK, see Figure 7 and Table 6. Both specific gravity and screening were effective in concentrating contaminated kernels. Ultra-light material, split kernels and oil stock had very high levels of contamination.

The inverse relationship between specific gravity and aflatoxin contamination is quite evident (Table 7). Utilizing the normal method of shelling (Figure 1) but removing the light and part of the medium weight kernels would have provided an estimated 45 percent of the kernels that would have less than 25 ppb of aflatoxin. Putting the kernels over an additional gravity table to direct contaminated kernels into the ultralight fraction should provide a much better separation. More research is needed to determine optimum use of specific gravity separators for concentrating contaminated kernels for further removal by sorting and/or blanching.

Average aflatoxin contamination of the peanuts in each stage and normal handling circuit was calculated and presented in Table 8. A direct relationship between the stage of shelling and aflatoxin contamination was indicated. A direct relationship between resistance to shelling and aflatoxin contamination was also indicated (e.g., compare 3a with 3b and 4a with 4b). Design and operation of the plant to maintain separate circuits for the various stages of shelling would probably provide tor better removal of aflatoxin contaminated kernels. With this particular lot the peanuts shelled by the fourth stage could have been diverted to oil stock. The peanuts shelled by the second and third stage shellers could have been sorted separately and more intensely than those shelled by the first stage sheller. For similar lots, use of independent specific gravity separations for the first and secondary (second plus third) stages of shelling would greatly enhance the concentration of contaminated kernels for more effective removal.

An inverse relationship between kernel size and aflatoxin contamination was indicated (Table 9). However, only the removal of "oil stock," "other edibles," and "LSK" provided a substantial concentration of contaminated kernels foı this lot.

DISCUSSION

The wide variability of the distribution of aflatoxin in peanuts has been well documented by Whitaker and Dickens (7, 8). Each lot has a different distribution that evidently depends upon the type and source of contamination.

However, evaluation of several lots during the past few years (unpublished data) and this particular study indicate that contaminated kernels may on the average be effectively concentrated by normal shelling, screening and specific gravity separations. These tests have indicated that aflatoxin contamination is usually related directly to the amount of LSK, stage of shelling, and resistance to shelling, and inversely related to kernel size and specific gravity.

Thus it appears that these relationships should be used in design of shelling and processing plants to provide for better concentration and removal of contaminated kernels. More research is needed to develop optimum designs for each type of operation. For example, a plant for shelling runner-type peanuts could be designed as shown in Figure 8. In this plan, separate circuits are provided for the LSK, large pods (first and second stage shelling), small pods (third stage shelling), very small pods (fourth stage shelling), and very small kernels. Flexibility and versatility are provided at the gravity tables to make use of specific gravity. In this plan the minicolumn would be very useful in determining the distribution of aflatoxin for each lot and for fine tuning the concentration and removal operations. This type of plant design should provide for higher sorting efficiencies; more effective use of sorting labor and equipment; and a considerable reduction in material losses that result from sorting, remilling and blanching operations. Additional research is needed to evaluate such proposals and to develop new methods for improving the removal of aflatoxin contaminated kernels.

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Table 1. Mean aflatoxin levels for samples removed during the first stage of shelling

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
		GRAVITY TABLES	
Specific gravity	Heavy	3 b	16.5
Specific gravity	Medium	41 a	16.5
Specific gravity	Light	71 a	16.5
		SCREENERS	
Screening	Splits	31 c	8.4
Screening	Jumbos	42 c	17.2
Screening	Mediums	49 bc	27.8
Screening	No. 1's	71 bc	4.6
Screening	Red tag LSK	94 a	3.0
Screening	Other edibles	100 a	0.9
Screening	Oil stock	128 a	0.6

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 2. Mean aflatoxin levels for samples removed during the second stage of shelling

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
		GRAVITY TABLES	
Specific gravity	Medium	31.2 a	0.30
Specific gravity	Light	32.5 a	0.30
		SCREENERS	
Screening	Splits	17.5 b	0.20
Screening	Jumbos	31.0 b	0.30
Screening	No. 1's	39.0 b	0.10
Screening	Other edibles	75.0 ab	0.02
Screening	Oil stock	125.0 a	0.02
Screening	Mediums	138.0 a	0.60

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 3. Mean aflatoxin levels for samples removed in the third stage when shelling unshelled peanuts from the second stage of shelling

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
		GRAVITY TABLES	
Specific gravity	Heavy	36.2 a	1.4
Specific gravity	Medium	96.2 a	1.4
Specific gravity	Light	75.0 a	1.4
		SCREENERS	
Screening	No. 1's	46.2 a	1.4
Screening	Other edibles	50.0 a	0.3
Screening	Mediums	58.8 a	2.7
Screening	Oil stock	77.5 a	0.2
Screening	Jumbos	171.2 a	0.3
Screening	Splits	171.2 a	1.2

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 4. Mean aflatoxin levels for samples removed during the third stage of shelling when separating whole LSK and shelling the larger nubbins

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
		GRAVITY TABLES	
Specific gravity	Heavy	36.2 a	2.4
Specific gravity	Medium	40.0 a	2.4
Specific gravity	Light	60.0 a	2.4
		SCREENERS	
Screening	Jumbos	27.5 a	0.5
Screening	Mediums	35.0 a	4.8
Screening	No. 1's	35.0 a	2.0
Screening	Splits	72.5 a	3.5
Screening	Other edibles	550.0 a	0.5
Screening	Oil stock	562.5 a	0.3

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 5. Mean aflatoxin levels for samples removed during the fourth stage of shelling when shelling peanuts from the third stage of shelling

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
		GRAVITY TABLES	
Specific gravity	Heavy, medium and light	388 a	0.07
Specific gravity	Ultralight	1000 b	0.02
		SCREENERS	
Screening	Oil stock	388 a	0.02
Screening	Splits	438 a	0.13
Screening	Whole kernels and small pods	528 a	0.09

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 6. Mean aflatoxin levels for samples removed during the fourth stage of shelling when shelling the very small pods that were separated from the LSK

Type of separation	Peanut fraction	Mean contamination 1/ (ppb)	Percent of net farmers stock
	GRAVITY TABLES		
Specific gravity	Heavy	42 a	0.24
Specific gravity	Medium and light	30 a	0.38
Specific gravity	Ultralight	1000 b	0.02
	SCREENERS		
Screening	Whole kernels and very small pods	61 a	0.64
Screening	Splits and small kernels	325 b	0.17
Screening	Oil stock	338 b	0.02

1/ Means followed by the same letter are not significantly different at the 0.05 level. Comparisons for significance should not be made between the two types of separation.

Table 7. Average aflatoxin contamination for peanuts separated by specific gravity

Specific gravity classification	Stages of shelling	Contamination 1/ (ppb)
Heavy	1, 3a, 3b, 4b	10.2
Medium	1, 3a, 3b, 4b	44.5
Light	1, 3a, 3b, 4b	69.6
Heavy, medium, light	4a, 4b	69.9
Ultralight	4a, 4b	1000.0

1/ Contamination values were computed (on a weight basis) from the data obtained from the specific stages of shelling as indicated.

Table 8. Average aflatoxin contamination for peanuts shelled by each stage of shelling

Stage of shelling	Contamination: Whole kernel 1/ (Edible) (ppb)	Split kernels (Edible) (ppb)	Small kernels (Other edible) (ppb)	Oil stock (ppb)	Total percent of net farmers stock
- 2/	-	-	-	94	3.0
1	38	31	100	128	59.5
2	79	18	75	125	1.2
3 a 3/	94	171	50	78	6.1
3 b 4/	32	72	550	562	11.6
4 a 5/	388	438	-	388	0.2
4 b 6/	34	325	-	338	0.8

1/ Contamination values were computed (on a weight basis) from the data obtained for jumbos, mediums and No. 1 kernels.

2/ This value is for the broken and small kernels in the LSK ("red tag").

3/ These peanuts were those that were not shelled in the first and second stage of shelling.

4/ These peanuts were the whole LSK and the kernels shelled out by the third stage sheller when processing the LSK.

5/ These peanuts were those that were not shelled by the first, second and third stage shellers.

6/ These peanuts were those shelled out by the fourth stage sheller when processing the LSK.

Table 9. Average of aflatoxin contamination for peanuts separated by screening

Screening classification	Stage of shelling	Contamination 1/ (ppb)	Total percent of net farmers stock
Jumbos	1, 2, 3a, 3b	43.6	18.3
Mediums	1, 2, 3a, 3b	49.3	35.9
Splits	1, 2, 3a, 3b	54.3	13.3
No. 1's	1, 2, 3a, 3b	57.4	8.1
Red tag (LSK)	-	94	3.0
Other edible	1, 2, 3a, 3b	213.3	1.7
Oil stock	1, 2, 3a, 3b	235.3	1.1

1/ Contamination values were computed (on a weight basis) from the data obtained from the specific stages of shelling as indicated.

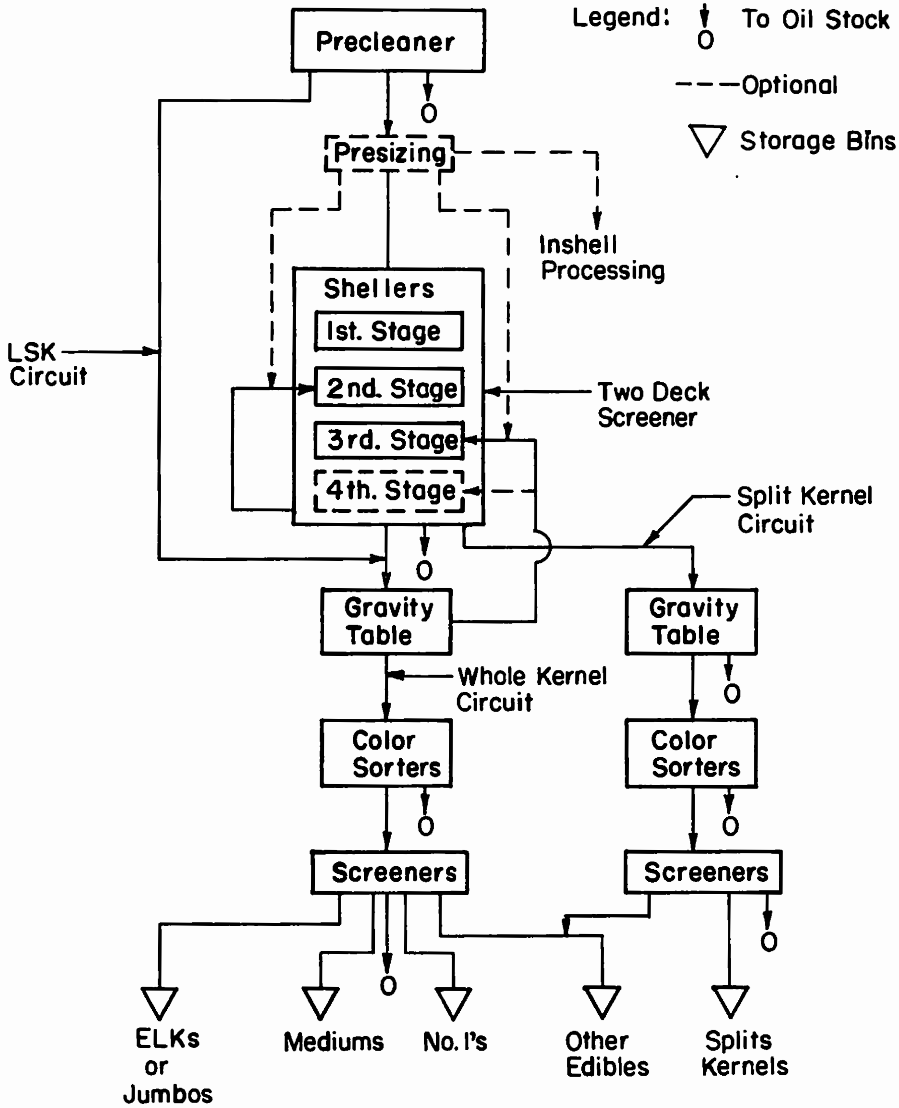

Fig. 1 Major screening, shelling, specific gravity and sorting equipment found in commercial shelling plants.

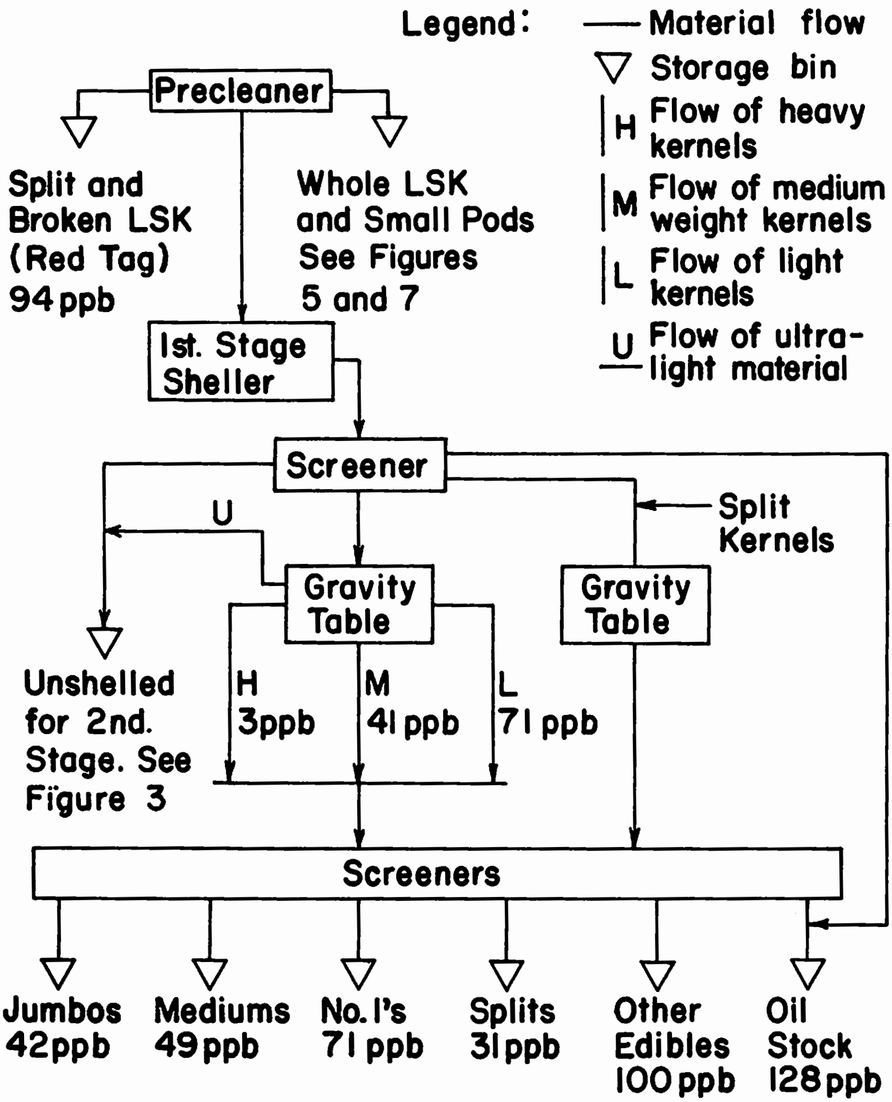

Fig. 2 Material flow and contamination levels of peanuts that were separated and shelled by 1st stage shelling equipment.

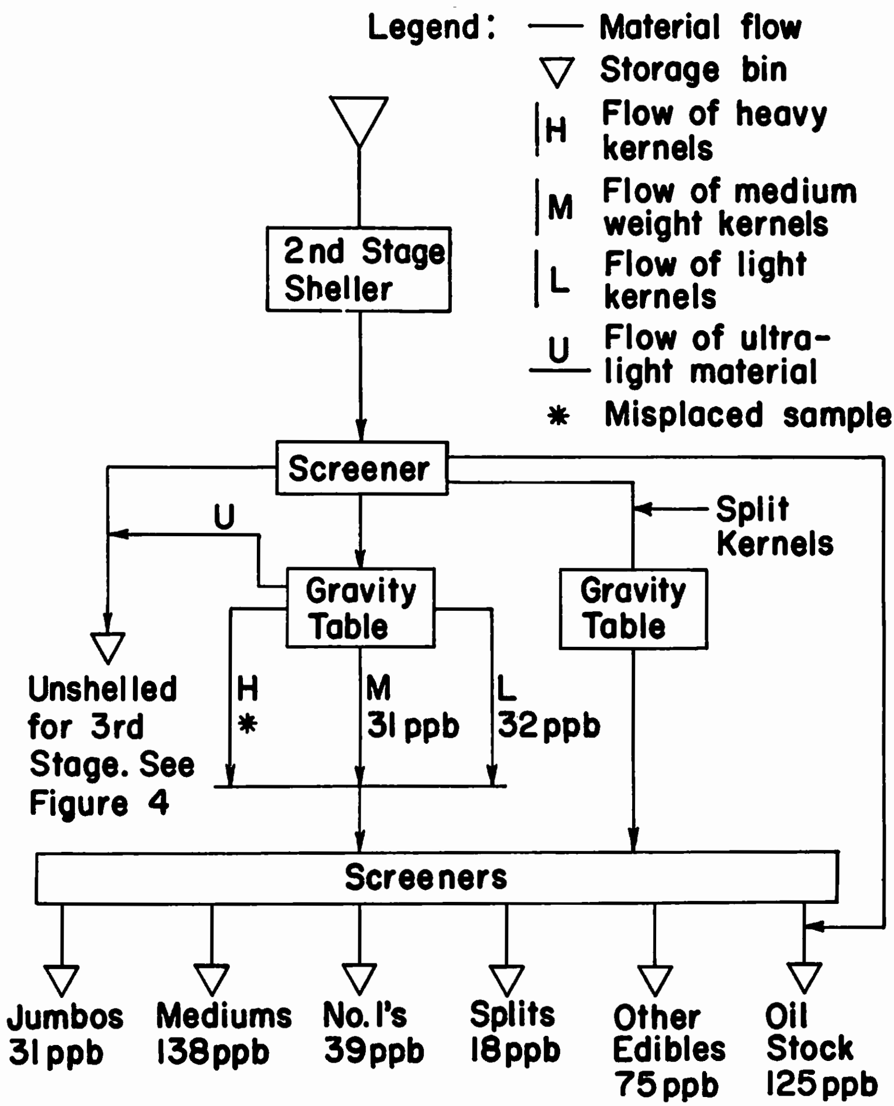

Fig. 3 Material flow and contamination levels of peanuts that were separated and shelled by the 2nd stage shelling equipment.

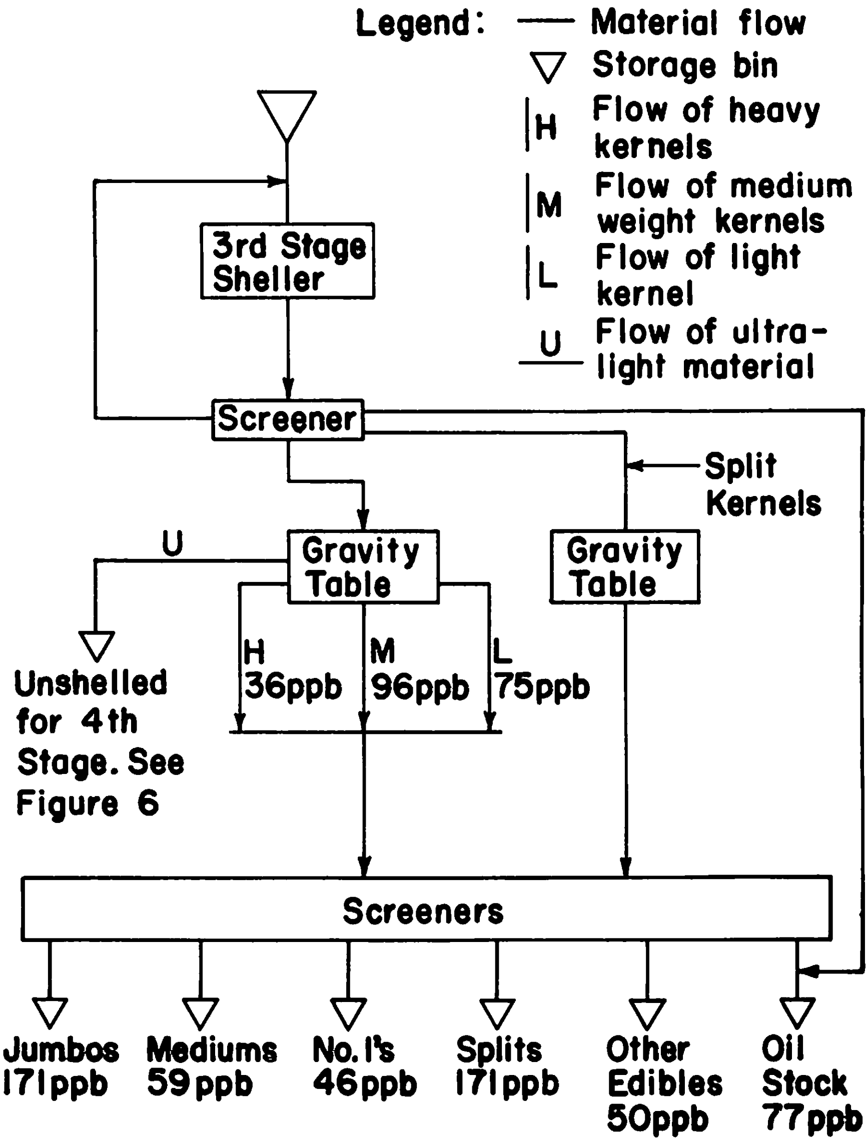

Fig. 4 Material flow and contamination levels of peanuts (unshelled from 2nd stage shelling) that were shelled and reported by the 3rd stage shelling equipment.

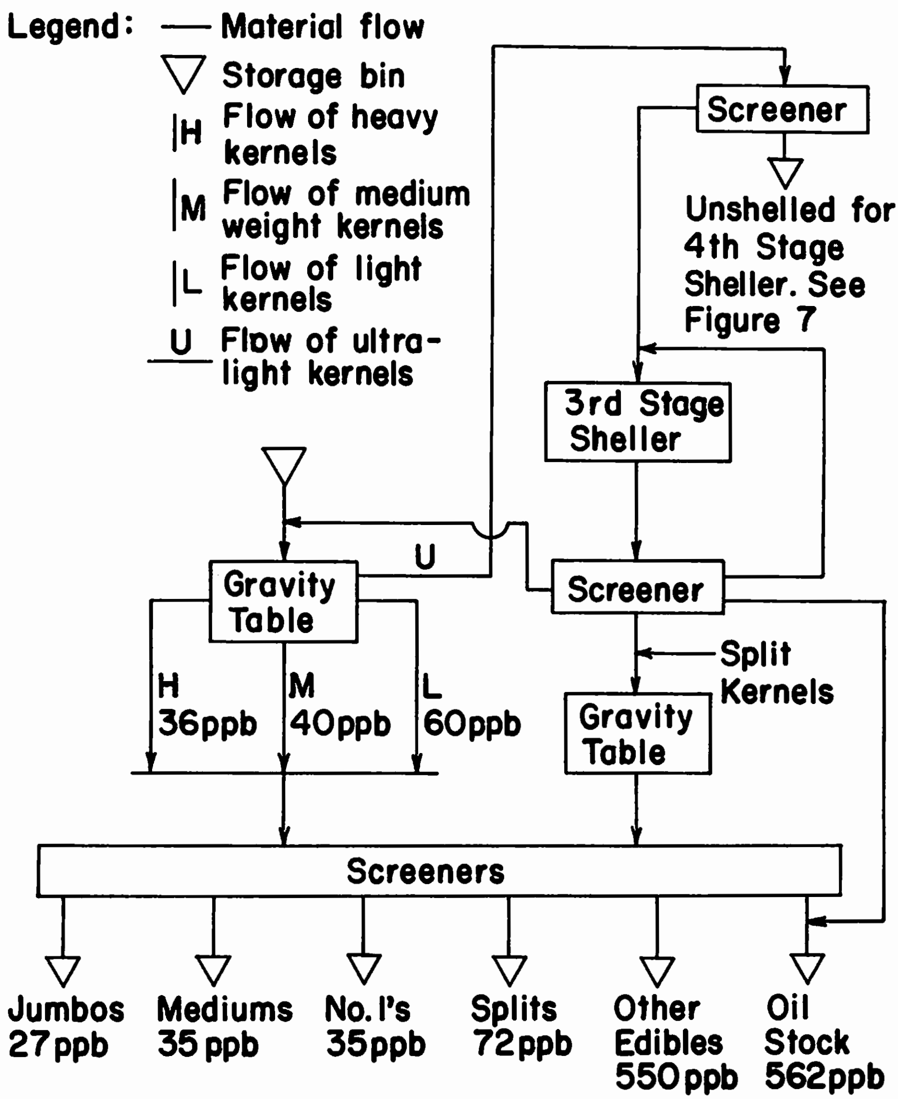

Fig. 5 Material flow and contamination levels of peanuts (LSK and nubbins) that were separated and shelled by the 3rd stage shelling equipment.

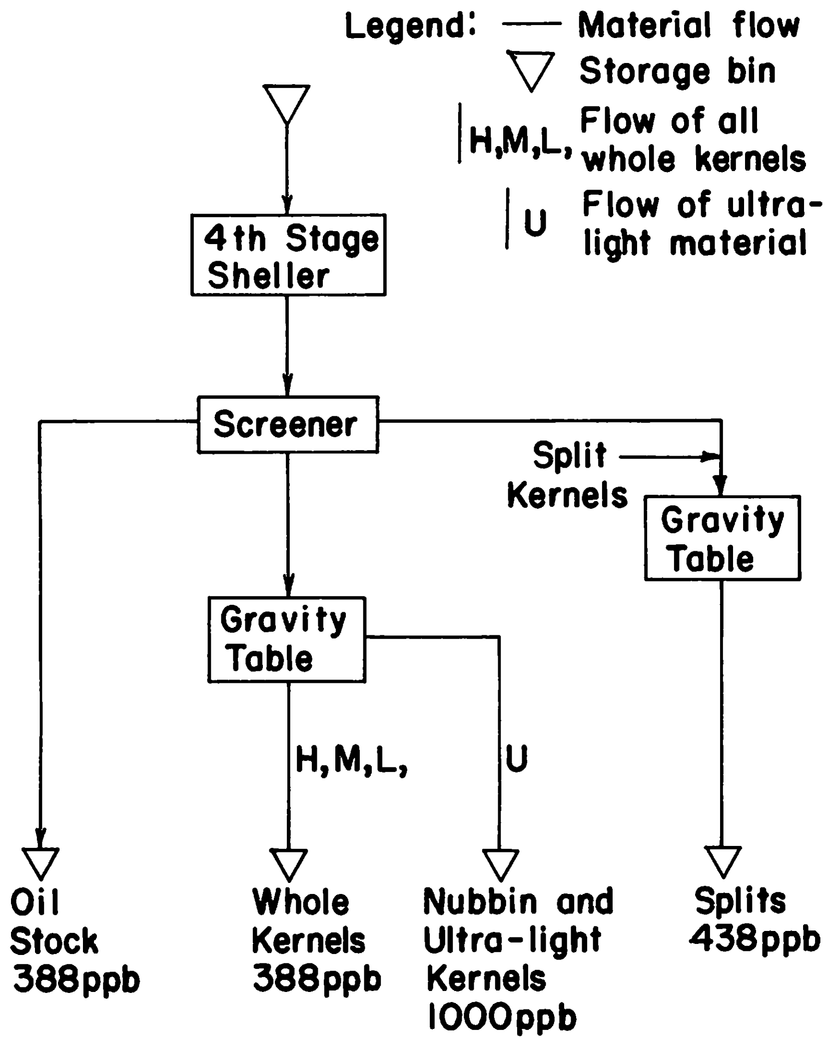

Fig. 6 Material flow and contamination levels of peanuts (unshelled from 3rd stage shelling) that were shelled and separated by the 4th stage shelling equipment.

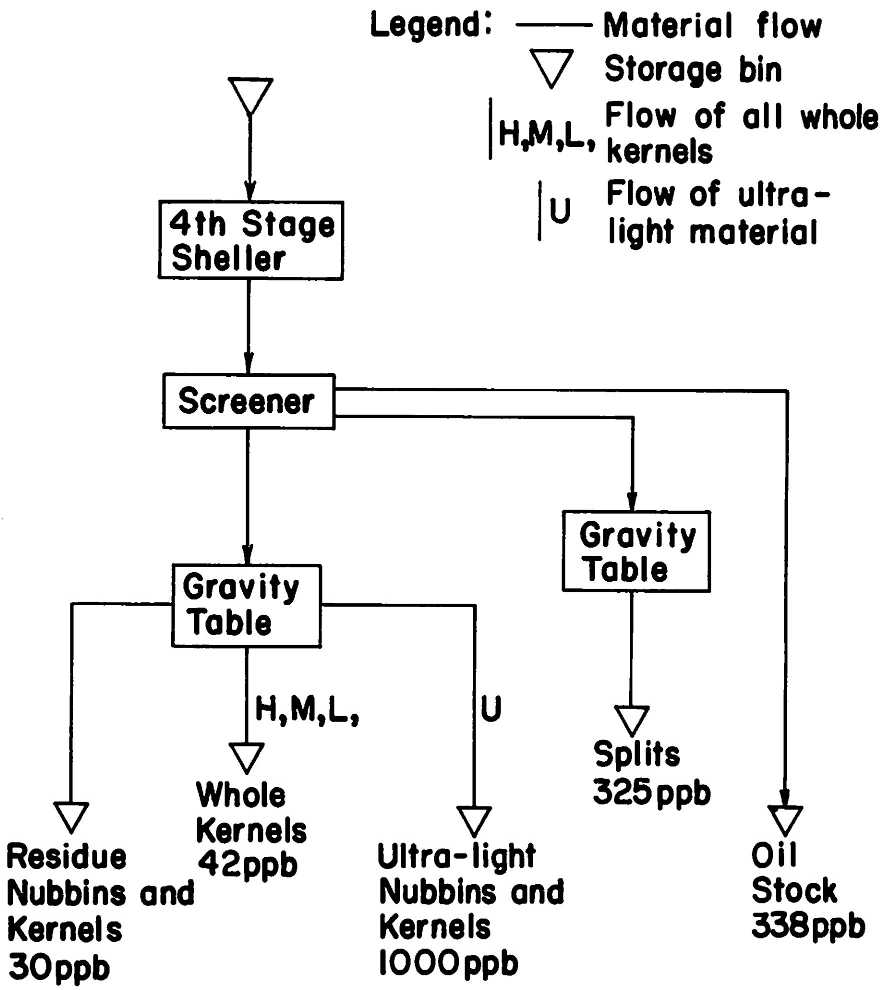

Fig. 7 Material flow and contamination levels of peanuts (very small pods in LSK) that were shelled and separated by the 4th stage shelling equipment.

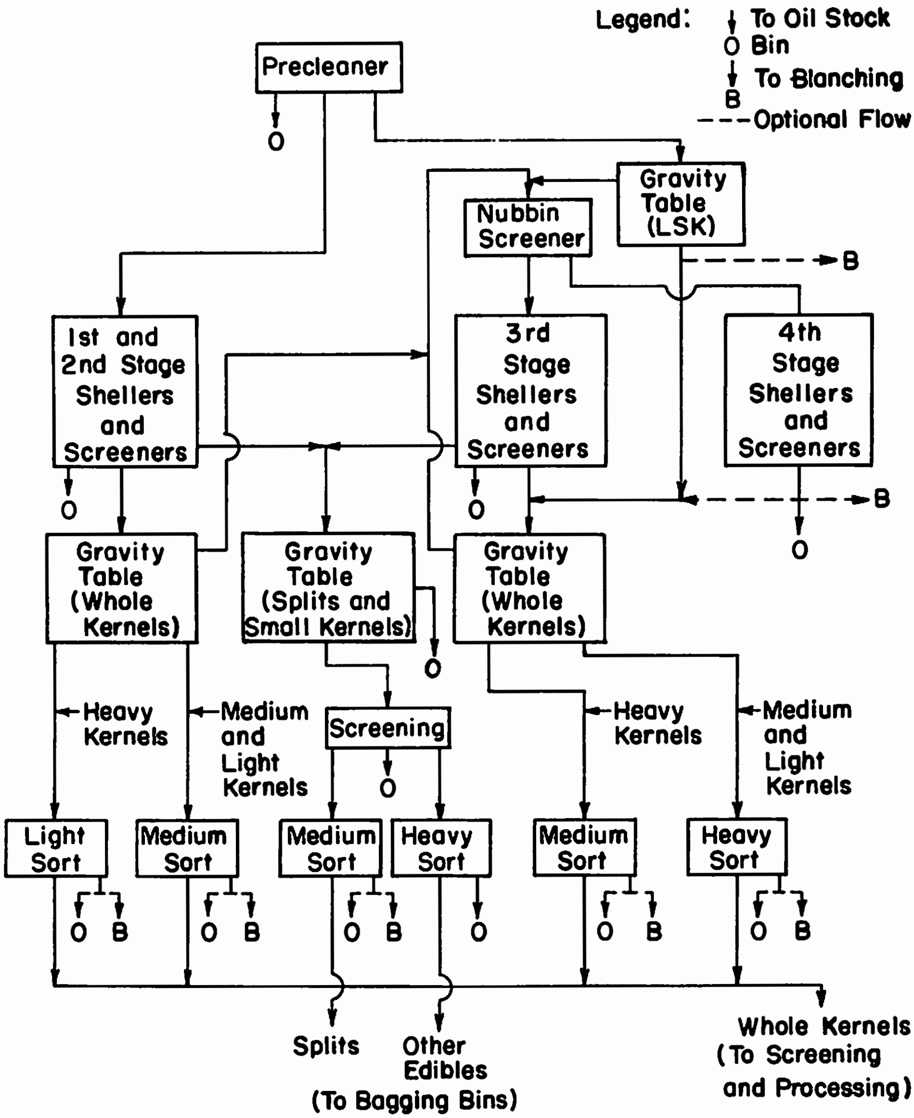

Fig. 8 Proposed flow chart for improving the removal of aflatoxin contaminated kernels at commercial shelling plants when shelling runner-type peanuts.

Relationship Between Soldiers and Aflatoxin Contamination During Storage of Farmers Stock Peanuts. J. S. Smith, Jr. and R. J. Cole, National Peanut Research Laboratory, Dawson, GA 31742.

ABSTRACT

Soldiers (columns of moldy peanuts) and samples of the peanuts surrounding the soldiers were gathered from several warehouses in which farmers stock peanuts were stored. The sound mature kernels and sound split kernels as well as loose shelled kernels from each soldier and sample were analyzed using the minicolumn method to determine aflatoxin concentrations.

Two lots of peanuts, one officially graded Segregation 1 and one officially graded Segregation 3, were used to create artificial soldiers in the warehouse by soaking samples before storage. After a 90-day storage period the samples were removed, shelled, and aflatoxin determinations were made. Results showed that moisture accumulations in farmers stock peanuts from roof leaks and condensation drips create ideal conditions for *A. flavus* growth and aflatoxin production.

INTRODUCTION

Clumps of peanuts tightly bonded by mold growth are often discovered just beneath the surface of the peanut pile during the unloading of warehouses. These clumps of moldy peanuts, generally referred to as "soldiers," result from excess moisture accumulations (2). Excess moisture accumulations that create soldiers are usually from leaking roofs, condensation drips, and improperly operated insecticide equipment (2, 4). If temperature and moisture conditions are favorable, aflatoxin-producing strains of *A. flavus* or *A. parasiticus* often develop. When the mold growth is *A. flavus* or *A. parasiticus*, the soldier and surrounding peanuts may contain high concentrations of aflatoxin, exceeding 1000 parts per billion (ppb). Dickens and Hutchison (1) noted that high concentrations of aflatoxin in less than 0.1 percent of the kernels can cause the average concentration in the warehouse to exceed present FDA tolerances for shelled peanuts.

Several small soldiers resulting from condensation drips often present more serious contamination problems than a single large soldier caused by a roof leak or a malfunctioning insecticide application system. These small soldiers often go undetected in the dusty atmosphere present during unloading because of their small size and they break up as the peanuts flow and become thoroughly mixed with good quality peanuts. The soldiers resulting from roof leaks and insecticide solution are often rather large and tend to remain in place as the other peanuts flow around them during unloading. These large soldiers are easier to locate and can often be removed with less mixing with the good quality peanuts.

The objectives of this study were (1) to determine the approximate aflatoxin concentration in soldiers and in surrounding peanuts and (2) to determine if soldiers could be created by one wetting of peanut samples.

METHODS AND MATERIALS

Natural soldiers were located in a number of warehouses during normal unloading. Samples of the soldiers and of the peanuts surrounding them, two to ten pounds each, were gathered for aflatoxin analyses by the minicolumn method (3). These peanuts had been officially graded Segregation 1 when the warehouses were filled. The samples were brought to our laboratory where the loose shelled kernels (LSK) were removed and the samples were shelled. The sound mature kernels (SMK) + sound splits (SS) and LSK from each sample were ground in a hammer mill. Each ground sample was thoroughly blended and a subsample was taken for minicolumn analysis to determine approximate aflatoxin concentration present.

Experimental soldiers were formed from two lots of peanuts with a known cultural history; one lot was grown under little or no drought stress and was officially graded Segregation 1 (Seg 1 lot) while the other lot experienced severe drought stress and was officially graded Segregation 3 (Seg 3 lot). Each lot consisted of approximately two tons of peanuts. A 32-pound sample of peanuts was randomly collected from each lot. Each sample was divided into four subsamples on a farmers-stock divider. Each subsample weighed approximately eight pounds and was placed in a small, mesh bag. Three bags from each lot were soaked overnight in separate 20-gallon trash cans filled with water. The subsamples were removed the following morning and allowed to drip-dry until midafternoon. The fourth subsample from each lot was not soaked and served as a check. It was referred to thereafter as a check soldier. Each subsample was placed in the center of a large, mesh bag containing approximately 32 pounds of peanuts from the same lot as the sample to act as a buffer. These large, mesh bags were placed in a warehouse in the upright position atop a pile of Segregation 3 farmers stock peanuts and covered with one foot of these peanuts. Subsamples remained in the warehouse from October 28, 1980, until January 26, 1981.

The moisture content of each lot was obtained for hulls and kernels before and after soaking and for each subsample and buffer when removed from storage. The farmers-stock divider was used to obtain an eight-pound sample from each buffer after storage. A farmers-stock cleaner removed all trash and LSK from each sample before shelling. The shelled samples were sized by screening and handpicking into the following categories: jumbos, mediums, number ones, sound splits, other edibles, and oil stock. The individual categories for each sample were ground and subsampled for analysis as previously described.

RESULTS AND DISCUSSION

Approximate aflatoxin concentrations from peanuts in and around soldiers formed naturally from condensation and leaks in several warehouses during storage are given in Table 1. The aflatoxin concentrations in the soldiers were generally high, whereas the concentrations in peanuts from around soldiers ranged from low to high. A possible explanation for this is that the soldiers do not usually become evident until unloading, and as the peanuts flow down the pile leaving the soldier erect, the original buffer peanuts around the soldier tend to flow away and are replaced with peanuts from another location. This makes it rather difficult to obtain a true sample of the buffer peanuts from around a soldier.

The mean aflatoxin concentration for the SMK + SS for the soldiers in Table 1 was 960 ppb with a standard deviation of 402 whereas the corresponding measurements from around the soldiers were 252 ppb and 476, respectively. Aflatoxin concentrations in the LSK's had a mean of 888 ppb with a standard deviation of 551 while the LSK's from around the soldiers had a mean of 431 ppb with a standard deviation of 562. These data show large variations among soldiers and among peanuts from around soldiers. These data illustrate how contents of an entire warehouse can become contaminated during unloading by a few highly contaminated soldiers distributed through the warehouse.

Data in Table 2 give the aflatoxin concentrations for the peanuts before and after the soldier study. Although Seg 1 lot was officially graded Segregation 1, aflatoxin was detected in number one kernels at a 20-ppb level, whereas Seg 3 lot was officially graded Segregation 3 and all kernel designations in the lot were highly contaminated. The check soldier in Seg 1 lot was relatively free of aflatoxin after storage except for 25 ppb in the jumbo segment and 50 ppb in the oil stock. Relatively low levels of aflatoxin were detected in the check buffer in number ones, LSK and other edible segments with 50 ppb in the oil stock. Extremely high levels of aflatoxin were detected in all kernel types for all soldier replications from Seg 1 lot peanuts with relatively high concentrations being detected in most kernel types for the respective buffers. The high levels detected in the buffers can be accounted for by moisture migration from the wet peanuts in the soldiers which produced _A. flavus_ growth and subsequent aflatoxin contamination.

The check soldier in the Seg 3 lot had high concentrations of aflatoxin in all categories except for jumbos which were negative and LSK which were extremely high. Aflatoxin concentrations in the check buffer were not as high as those in the check soldier except for 15 ppb in the jumbo segment. Both soldier and buffer checks in Seg 3 lot had lower aflatoxin levels than the initial sample for that lot except for a considerably higher level in the soldier LSK. Seg 3 lot soldier replications contained extremely high levels of aflatoxin in all kernel categories. Aflatoxin concentrations in Seg 3 lot soldier buffers were relatively high, but they did not exceed the initial sample levels. Aflatoxin concentrations in the soldier buffers were expected to increase somewhat, since they were in physical contact with their respective soldiers during storage. Similarly, aflatoxin concentrations in the check soldiers and buffers should have been about the same as the initial sample. Since we are not aware of any documentation indicating that the level of aflatoxin contamination decreases during storage, we conclude that the initial sample for Seg 3 lot indicated a higher aflatoxin concentration than representative for the lot.

It is important to note in Table 2 the negative aflatoxin concentrations in the initial sample, check soldier, and check buffer in the Seg 1 lot peanut kernel categories and to compare them to those in the replication soldiers and replication buffers. The same comparison should be made for the Seg 3 lot peanuts. These comparisons show the great importance of protecting any stored peanuts, regardless of segregation, from moisture and the need to remove any observed soldiers when unloading the warehouse.

Figure 1 shows the mean aflatoxin concentrations in shelled peanuts of each kernel category from the three soldiers from Seg 1 lot compared to those from Seg 3 lot.

The mean initial moisture contents, wet basis, of the hulls and kernels for the two lots of peanuts were 12.1 percent and 6.5 percent, respectively. After the overnight soaking the percent moisture content of the hulls was 56.9 while that of the kernels was 27.8. Table 3 lists the kernel and hull moisture contents for the soldier and buffer checks in addition to the soldier and buffer replications for each lot. The means and standard deviations are also given in Table 3. Small standard deviations indicate that there was little difference in the moisture contents of the checks and replications within the lots. Only the soldier portion of replication 3 in Seg 1 lot contained an excessive or dangerously high kernel moisture content for storage.

We were initially concerned that warehouse temperatures might not be high enough to promote A. flavus growth and aflatoxin production since outside ambient temperatures were rather cool before the samples were stored. However, sufficient heat was present in the peanut pile to promote the growth of A. flavus. It is important to note that the peanuts were wet only once; thus, the amount of moisture involved in creating the artificial soldiers should have been no greater than that resulting from a small roof leak or concentrated dripping of condensation over several hours. These data fully illustrate the potential that exists for contaminating a warehouse of previously high quality peanuts by having a few leaks or a condensation problem develop in the warehouse.

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3. Shotwell, O. L. and C. E. Holaday. 1981. Minicolumn detection methods for aflatoxin in raw peanuts: Collaborative study. J. Assoc. Off. Anal. Chem. (In press).
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Table 1. Aflatoxin concentrations, ppb, in and around soldiers resulting from condensation and leaks during storage

Warehouse	In soldier: Sound mature kernels + sound splits	In soldier: Loose shelled kernels	Around soldier: Sound mature kernels + sound splits	Around soldier: Loose shelled kernels
A	1200	1500	100	1200
B	350	500	12	8
C	750	1200	12	14
D	1300	*	35	*
E	1200	350	1100	500

*Not enough loose shelled kernels for testing.

Table 2. Aflatoxin concentrations, ppb, in two lots of peanuts before and after soldier study

Kernel category	Initial sample	Check Buffer	Check Soldier	Replication - 1 Buffer	Replication - 1 Soldier	Replication - 2 Buffer	Replication - 2 Soldier	Replication - 3 Buffer	Replication - 3 Soldier
(Seg 1 lot)									
Jumbo	0	0	25	0	1,500	75	10,000	15	2,500
Medium	0	0	0	25	2,500	100	750	5	2,500
No. 1	20	25	0	100	2,500	250	750	150	2,500
Splits	0	0	0	75	5,000	250	750	500	2,500
LSK	0	15	0	100	10,000	750	5,000	250	2,500
Other edibles	0	25	0	100	1,000	1,000	500	0	1,000
Oil stock	-	50	50	750	1,000	15	10,000	250	5,000
(Seg 3 lot)									
Jumbo	1,000	15	0	100	10,000	250	10,000	75	10,000
Medium	750	15	75	75	10,000	100	10,000	25	10,000
No. 1	1,000	25	250	250	7,500	500	10,000	50	10,000
Splits	1,000	100	150	150	2,500	100	10,000	200	10,000
LSK	1,000	750	7,500	1,000	2,500	750	10,000	250	10,000
Other edibles	1,000	25	250	100	10,000	750	10,000	250	10,000
Oil stock	-	75	100	100	2,500	75	10,000	150	10,000

Table 3. Kernel and hull moisture contents of samples when removed from storage

Sample		Moisture content, %, wet basis			
		Seg 1 lot		Seg 3 lot	
		Kernel	Hull	Kernel	Hull
Check	Buffer	7.4	13.0	7.4	13.5
	Soldier	7.9	12.4	7.4	13.0
Rep. 1	Buffer	7.8	14.1	7.6	15.1
	Soldier	9.6	14.7	9.0	15.0
Rep. 2	Buffer	7.3	13.0	7.5	14.3
	Soldier	8.3	15.1	8.7	15.2
Rep. 3	Buffer	8.7	14.2	7.4	14.4
	Soldier	11.2	16.9	8.7	15.3
	Mean	8.5	14.2	8.0	14.5
	Std. deviation	1.3	1.4	.7	.8

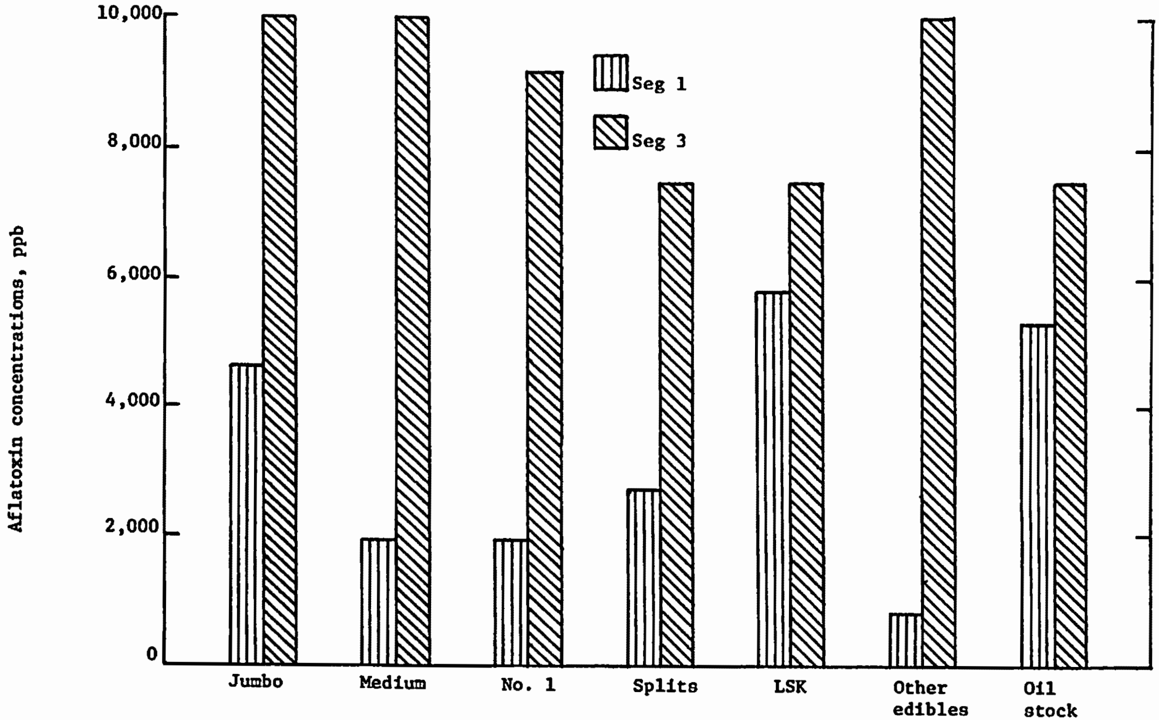

Figure 1. Mean aflatoxin concentrations, ppb, in the shelled peanuts from artificial soldiers formed from Seg 1 and Seg 3 farmers stock peanuts after a 3-month storage period.

Response to Landplaster by Virginia Type Peanuts Grown in Virginia During 1970 to 1979. D. L. Hallock* and A. H. Allison, VPI & SU, Tidewater Research & Continuing Education Center, Box 7099, Suffolk, VA 23437.

Abstract

During the period 1970 through 1979, 20, 11 and 2 tests were conducted on Aquic, Typic, and Arenic Hapludults, and 5, 4, and 1 tests on Typic, Plinthic, and Arenic Plinthic Paleudults, respectively, to measure yield and grade responses by peanuts to normal rates of landplaster (LP). These rates were 600 to 800 kg/ha of $CaSO_4$ banded (61 cm) or its equivalent broadcast. Peanut yields among these 43 sites varied from 2,240 to 5,600 kg/ha and yield responses varied from 0 to 1,270 kg/ha. The highest response occurred on a Fuquay loamy fine sand. Yield responses in excess of 300 kg/ha occurred in 14, 9 and 2 of the Aquic, Typic, and Arenic Hapludults, and in 2 and 1 of the Typic and Plinthic Paleudults, respectively. The average yield increase from LP for the 43 sites was 490 kg/ha. Increases in the contents of extra large (ELK) and sound mature kernels (SMK) due to applied LP varied from 0 to as high as 13 and 23%, respectively, but average increases were approximately 4% for both ELK and SMK in the Hapludults and 2% in the Paleudults. Seed germinability, although measured only 3 years, was increased considerably by LP in several cases. Double acid-extractable levels of soil Ca in the peanut fruiting zone varied from 300 to 1,540 kg/ha among the 43 sites, but averaged 690 kg/ha. Many yield and grade responses were not closely related to soil-test Ca levels, particularly in the Hapludult sites.

Introduction

Supplemental Ca, usually LP ($CaSO_4$), has been applied to Virginia type peanuts just prior to fruit development for many years. Many types of responses have been noted by various investigators. Landplaster has frequently increased yields and improved seed grades (1, 2, 4, 7), and may suppress certain diseases (5, 6, 7) and increase seed germination (2, 3, 4, 6).

During the 10-year period beginning with 1970, over 40 experiments have been conducted in Virginia, in which the response of peanuts to normally recommended rates of LP was measured. The results of such rates on yields and grades are summarized in this paper.

Methods and Materials

Many of the experiments reviewed in this report were conducted on private farm fields. 'Florigiant' peanuts were grown in all tests. Fertilizer, except for B, generally was not applied during the year peanuts were grown but additional nutrients were applied on the previous crop.

The Ca-source used on the plots was regular finely ground bagged landplaster (LP) which contained ca 90% $CaSO_4$. It was applied on the soil surface prior to profuse pegging. No incorporation occurred except by natural forces unless a lay-by cultivation (flat, not ridged) was necessary for weed control. The LP was either broadcast uniformly over the whole plot area or applied to a 61-cm band centered over the rows. The amount of Ca per unit area of soil covered was approximately equivalent to 600 to 800 kg/ha of $CaSO_4$ banded.

Generally, the peanut seed were planted in early May approximately 10 cm apart in 91-cm rows. Plots were four rows wide and at least 12 m long with treatments arranged in completely randomized block designs with 3 or 4 replications. Pesticides were applied according to Virginia recommendations each year. All observations and measurements were made utilizing peanuts from the two center rows of each plot.. The peanuts were combine-harvested in late September or early October. Fruit samples were graded according to standards set forth by the Fresh Products Standardization and Inspection Branch, Fruit and Vegetable Division, USDA. Soil samples of the plow layer were analyzed by rapid soil testing procedures in the State Soil Laboratory at Virginia Polytechnic Institute and State University.

Results and Discussion

The responses in peanut yields and seed grades obtained during the period 1971 to 1979 from the application of LP at rates generally recommended in Virginia are given in Table 1 for the Hapludult soils. These soils, formally called Red-Yellow Podzolic, have an acid, highly leached layer containing significant clay. During this period, experiments were conducted on three subgroups of Hapludults.

Eleven tests were conducted on Typic Hapludults, of which nine were in the Sassafras series. Yields where LP was applied averaged 4,060 kg/ha, but varied from 3,135 to 5,375 kg/ha. Increased yields from LP application varied from nil to 1,200 kg/ha with an average increase of 575 kg/ha over the 11 sites. In many cases the percentage of both sound mature kernels (SMK) and extra large kernels (ELK) was increased considerably by the application of LP. Double acid-extractable soil Ca levels in these 11 tests varied from 308 to 678 kg/ha.

Table 1. Peanut Yield and seed grade responses obtained from the application of 600 to 800 kg/ha of landplaster as a band or its equivalent per unit area broadcast on Hapludult soils during 1971 to 1979.

Year	Soil type	Yield level†	Response to landplaster Yield	SMK	Elk	Soil Ca‡
		kg/ha	kg/ha	%	%	kg/ha
		TYPIC HAPLUDULTS				
1972	Sassafras fs	4480	355	7	10	526
1973	Sassafras fs	3920	505	4	2	460
1973	Sassafras fs	5375	615	1	3	454
1972	Sassafras lfs	4480	170	2	0	448
1972	Sassafras lfs	4480	370	10	7	355
1973	Sassafras lfs	5040	1200	3	6	308
1973	Sassafras lfs	3920	310	1	1	420
1974	Sassafras lfs	3135	560	3	0	521
1974	Sassafras lfs	3135	450	3	4	678
1977	Gritney lfs	3135	840	4	4	650
1978	Rumford lfs	3585	945	5	5	560
	Mean	4060	575	4	4	489
		AQUIC HAPLUDULTS				
1971	Woodstown lfs	4255	380	1	1	640
1971	Woodstown lfs	3920	0	0	0	336
1972	Woodstown lfs	3360	250	5	2	555
1972	Woodstown lfs	3135	385	7	4	480
1972	Woodstown lfs	3360	335	3	2	482
1973	Woodstown lfs	3920	495	3	0	627
1973	Woodstown lfs	4145	0	1	1	532
1974	Woodstown lfs	3360	810	0	0	890
1975	Woodstown lfs	3920	1175	2	2	896
1976	Woodstown lfs	5600	705	3	5	1540
1976	Woodstown lfs	5600	280	3	4	1232
1978	Woodstown lfs	3360	560	4	5	1176
1971	Bertie fsl	4255	450	5	5	940
1972	Bertie fsl	2240	670	9	3	784
1973	Bertie fsl	4145	110	2	1	739
1975	Bertie fsl	4255	500	2	3	952
1972	Mattapex lfs	2800	355	2	0	970
1974	Mattapex lfs	3135	950	10	2	879
1978	Slagle fsl	4480	0	1	4	896
1978	Altavista lfs	4480	980	15	10	448
	Mean	3885	470	4	3	800
		ARENIC HAPLUDULTS				
1977	Kenansville lfs	3360	1120	23	13	392
1979	Kenansville lfs	2240	325	0	1	627
	Mean	2800	720	12	7	510

† Yields where landplaster was applied.
‡ Soil Ca level before application of landplaster.

The variance in peanut yields obtained among the 20 experiments on Aquic Hapludults was slightly larger than noted among the Typic Hapludults. Here yields varied from 2,240 to 5,600 kg/ha with an average yield of 3,385 kg/ha over this subgroup (Aquic) of soils. Yield increases where LP was applied varied from 0 to 1,175 kg/ha, but the average increase was ca 100 kg/ha lower than for the Typic Hapludults. In six cases, the yield increases from LP were less than 300 kg/ha and in 11 cases these increases averaged less than 400 kg/ha. The percentage of ELK and SMK were increased by LP by as much as 10 and 15%, respectively. Soil Ca levels in this subgroup of soils varied from 336 to 1,540 kg/ha. The average Ca level was 800 kg/ha, which was nearly double that of the Typic Hapludults.

Two experiments were conducted on Kenansville lfs (Table 1). A sizable increase in both yield and contents of SMK and ELK where LP was applied.was obtained only on one site. That site had a lower soil Ca level and generally lower yield level than for the other site. Both crops developed under relatively dry conditions during August.

Five tests were conducted on Typic Paleudult soils during 1970 and 1971 and five on Plinthic Paleudults during 1975 and 1976. Paleudult soils are old Coastal Plain soils which have highly leached very thick subsoils. Pertinent data obtained in these experiments are given in Table 2. Yield responses were appreciable on only two of the Typic Paleudult sites, one of which had over 1,000 kg/ha of soil Ca before amendment with LP. In 4 out of the 5 cases, there was a small increase in percentage of SMK. In 1971 on one Norfolk lfs, application of LP did not increase yield particularly but did increase ELK content by 7%.

Table 2. Peanut yield and seed grade response obtained from the application of 600 to 800 kg/ha of landplaster as a band or its equivalent per unit area broadcast on Paleudult soils during 1970 to 1976.

Year	Soil type	Yield level†	Response to landplaster: Yield	SMK	ELK	Soil Ca‡
		kg/ha	kg/ha	%	%	kg/ha
		TYPIC PALEUDULTS				
1970	Norfolk lfs	4930	580	0	0	1020
1971	Norfolk fs	3695	560	2	0	470
1971	Norfolk lfs	4705	0	4	0	336
1971	Norfolk lfs	3920	110	2	7	392
1971	Ruston lfs	3920	0	2	0	470
	Mean	4235	250	2	1	538
		PLINTHIC PALEUDULTS				
1975	Fuquay lfs (arenic)	4705	1270	3	4	538
1975	Dothan lfs	4255	250	2	0	666
1975	Dothan lfs	3360	600	7	2	454
1976	Dothan lfs	5600	0	0	3	1512
1976	Dothan lfs	5375	55	0	0	1176
	Mean	4660	435	2	2	869

†Yields where landplaster was applied.
‡Soil Ca level before application of landplaster.

The average yield response to LP obtained over the sites on the Plinthic Paleudults was somewhat higher than that of the previous subgroup of soils, although the responses on 3 of the 5 sites were negligible. The yield response obtained to LP applied on Fuquay lfs was considerable, being 1,270 kg/ha. Both the percentage of SMK and ELK were increased by LP application on this soil, also. One out of 4 of the Dothan lfs sites responded to LP with a substantial increase in yield and SMK content. The two sites which did not respond to LP had the highest soil Ca levels.

The relationship obtained between peanut yield responses to LP and soil Ca levels in the Hapludult soils is shown in Figure 1. The correlation between these factors was nil (r=0.03) for the experiments on the Typic Hapludults and low (r=0.27) for those on Aquic Hapludults. Perhaps the very poor correlation obtained for the former subgroup of soils may have been due to the relatively narrow range in soil Ca levels, since the largest yield response did occur in a test where soil

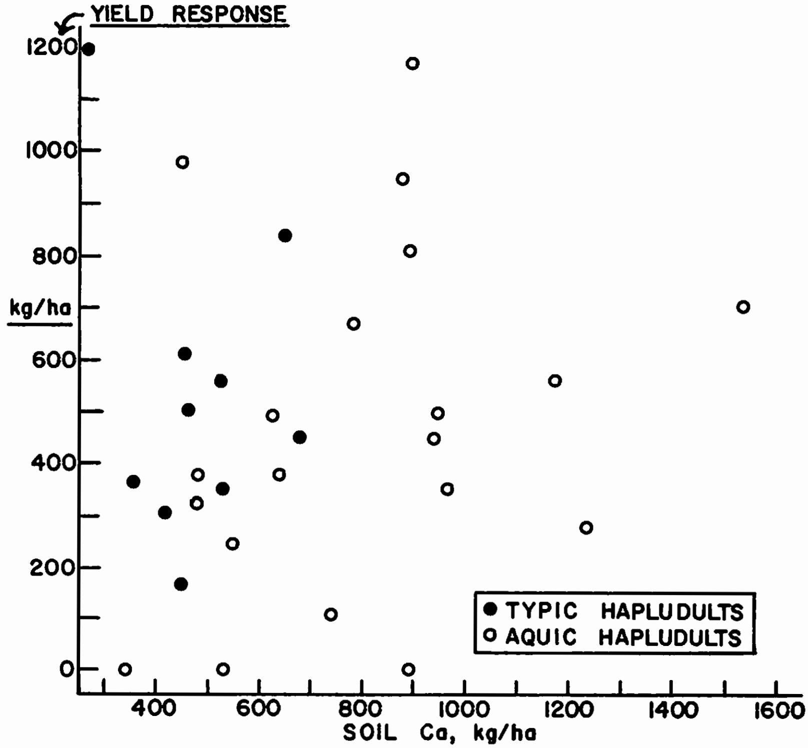

Fig. 1. Relationship between peanut yield response to landplaster and double acid-extractable soil Ca level before treatment of Hapludult soils, 1971 to 1978.

Ca levels were lowest among the Typic Hapludults. There was a trend among the Aquic Hapludults toward higher yield responses where soil Ca levels were higher. However, this trend was not significant.

The correlation between peanut yield response to LP and soil Ca levels before treatment was much higher over the Paleudult than the Hapludult soils. It was positive for the Typic subgroup and negative for the Plinthic soils. The apparent relationship found for the Typic subgroup seems anomalous, whereas that for the Plinthic soils seems normal. Of course, data from only five sites were available in each subgroup. Also, the results from one site, that in 1970 which had a dry September, markedly affected the correlation obtained. Most of the experiments on the Typic Paleudults were conducted during 1971 which had generally average moisture conditions during both August and September. Those tests on the Plinthic subgroup were conducted during 1975 and 1976 when moisture was very limiting during August but was somewhat excessive in September. Perhaps these factors accounted for the

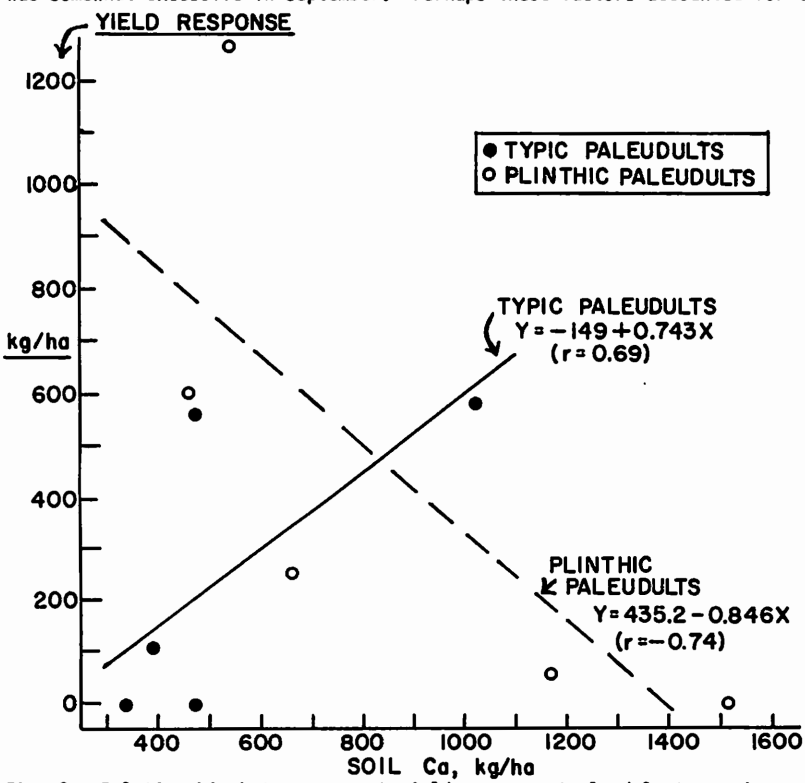

Fig. 2. Relationship between peanut yield response to landplaster and double acid-extractable soil Ca level before treatment of Paleudult soils, 1970 to 1975.

anomalous nature of these results. In general, yield and grade responses to LP may not be closely related to soil test Ca levels.

Seed germinability was determined in most of the tests conducted during 1977, 1978, and 1979. In many cases, germinability was 20 to 30% higher where LP was applied than in the check plots. This occurred particularly when seeds matured under abnormally dry conditions.

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AFLATOXIN

Drought, Irrigation, and Field Infection of Peanuts and Corn by Aspergillus flavus in Virginia in 1980. Kenneth H. Garren, USDA-SEA-AR Emeritus, Suffolk, Virginia.

Field infections of peanuts and corn by the toxicogenic Aspergillus flavus was studied in plots of an irrigation study. April-September rainfall in the study area was 40% of normal. Up to the 1980 harvests the hidden ("unseen") A. flavus infections in freshly dug peanuts--i.e. pockets of infection from which the mold proliferates when peanuts are not handled properly--varied from none to 1.5%. On 10/2/80 this hidden infection was 0.75% in irrigated peanuts and 3.5% in non-irrigated peanuts. Visible infections (the hallmark of "Seg. 3") had never been reported at digging in Virginia before 1980, but in 1980 visible A. flavus infections were found on many windrowed peanuts (pods) within a few hours after digging in the non-irrigated plots. Corn taken directly from the field to the lab had much more A. flavus infection if it came from non-irrigated plots, but careful handling of the irrigated corn was indicated. Hot, dry weather must have induced A. flavus infection in the irrigated corn. The 1980 drought's effects on aflatoxin formation in corn and on aflatoxin potentials in peanuts increased the area's 1980 economic woes.

Effects of Irrigation on Aflatoxin Contamination of Peanuts. D. M. Wilson and J. R. Stansell, University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia 31793.

Florunner and Florigiant peanuts were grown in 1974, 1975, 1976 and 1977 and inoculated with Aspergillus parasiticus 30 days after planting. Four replicates were grown in plots for 140 to 145 days under rainfall controlled shelters with six irrigation treatments: (1) wet from day 0-140, (2) dry from day 36-70, (3) dry from day 71-105, (4) dry from day 106-140, (5) dry from day 36-105, (6) dry from day 71-140. Aflatoxin concentrations from Florunner peanuts showed significant differences between treatments (P=0.01) in 1974 and 1976 but not in 1975 or 1977. In 1974 and 1976, Florunner sound mature kernels had significantly more aflatoxin in treatments 4 and 6 than in other treatments. Aflatoxin concentrations from Florigiant treatments 4 and 6 were significantly greater (P=0.01) than other treatments in 1974 and 1975, but not in 1977. No data was taken in 1976 for Florigiant peanuts. Water stress during the last 35 or 70 days of the season affected aflatoxin contamination of sound mature kernels three of the four years on one or both cultivars. Because of year to year variation, drought stress alone will not explain or indicate high levels of field aflatoxin contamination. However, in all treatments with irrigation during the last 35 days of the season no significantly high levels of aflatoxin contamination were found in any year or cultivar.

Influence of Soil Temperature and Moisture on Microflora, Aflatoxin Concentration, Maturity and Damage in Peanuts. R. A. Hill, P. D. Blankenship, R. J. Cole, T. H. Sanders, J. W. Kirksey and R. L. Greene, USDA-SEA-AR, National Research Laboratory, Dawson, Georgia.

Florunner peanuts were grown for 145 days in experimental plots in 1980. Different treatment regimes, imposed 94 days after planting, were irrigated (I); irrigated with heated soil (IH); drought-stressed (D); and drought-stressed with cooled soil (DC). Soil temperature and moisture tension at 2", 12" and 24" below the surface were measured throughout the growing season. At harvest, the incidence of the *Aspergillus flavus* group within kernels and aflatoxin concentration were increased by any kind of damage for all treatments. In sound mature kernels (SMK's) colonization by the *A. flavus* group was greatest with treatment D (75% kernels colonized), least in I (7%) and DC (11%) and intermediate for IH (26%). Aflatoxin was absent from or negligible (< 1 ppb) in SMK's with I, IH or DC treatments, but there were 244 ppb aflatoxin in D treated SMK's. The proportion of immature and damaged kernels at harvest was increased by drought-stress and decreased by irrigation, but little affected by temperature. More aflatoxin was found in immature sound than mature sound kernels. Extensive colonization of SMK's by the *A. flavus* group, and subsequent aflatoxin production, was favored by hot, dry conditions when most associated microorganisms failed to grow. Elevated temperature alone or drought stress alone did not cause aflatoxin contamination in SMK's. When the ratio of SMK's colonized by *A. flavus* compared to *A. niger* was > 19:1 there was aflatoxin contamination, but none if this ratio was < 9:1. Irrigation is recommended to prevent aflatoxin contamination in peanuts.

Fungistatic Properties of Peanut Polyphenols. John A. Lansden, USDA-SEA-AR, National Peanut Research Laboratory, Dawson, Georgia.

Various fractions of polyphenols were isolated from peanut seedcoats and hulls and were assayed for their fungistatic properties on *Aspergillus parasiticus*, NRRL 2999. The fractions were found to have different degrees of inhibition. The fractions were also assayed for their ability to inhibit aflatoxin production. Isolation and partial characterization of the polyphenol fractions were performed.

Control of Peanut Leaf Spot with a Combination of Resistance and Fungicide Treatment. D. W. Gorbet, L. F. Jackson, and F. M. Shokes, University of Florida, Agricultural Research Center, Marianna, Florida, University of California, Department of Agronomy and Range Science, Davis, California (formerly University of Florida, Plant Pathology Department), and Agricultural Research and Education Center, Quincy, Florida.

Three peanut (*Arachis hypogaea* L.) plant introductions (PIs), eight breeding lines, and the commercial cultivar 'Florunner' were grown as subplot treatments in a RCB splitplot study to evaluate leaf spot (*Cercospora arachidicola* and *Cercosporidium personatum*) resistance in 1979 and 1980. Mainplot treatments consisted of (1) no fungicide applications and applications of chlorothalonil on (2) 10-day and (3) 20-day schedules. Disease assessments were made at 20-day intervals beginning 50 days after planting. *C. personatum* (CP) was the most prevalent pathogen both years, and differences among lines in susceptibility to CP were highly significant ($P = 0.001$) at 90, 110, and 130 days assessments. Fungicide treatment had a highly significant effect on occurrence of CP at 110 and 130-days assessments both years. Defoliation and yield differences among lines were highly significant both years. Five of the breeding lines produced pod yields of over 3400 kg/ha with no fungicide, compared to 2200 kg/ha for Florunner unsprayed. PI 261893 was the most resistant to *C. personatum* of the twelve genotypes tested and showed very little yield response to fungicide application, averaging 2800 kg/ha unsprayed and 3300 kg/ha on a 10-day schedule. All breeding lines showed at least some yield response to chlorothalonil.

Transfer of Leafspot Resistance From Virginia to Spanish Peanuts (*Arachis hypogaea* L.) C. E. Simpson, O. D. Smith, D. H. Smith, and E. R. Howard, Texas Agricultural Experiment Station, Stephenville, College Station and Yoakum.

Leafspot resistance was transferred from two virginia genotypes (PI-196602 PI-196627) into spanish type peanuts. The resistant introductions had a darker green foliage color than spanish varieties and better diseased-leaflet retention under epiphytotic conditions in the field. Transfer of the visual resistance from the low yielding, late maturing virginia types into spanish lines was accomplished through backcrossing. The original cross was made in 1965, with five subsequent backcrosses. Selections for backcrossing were made from field nurseries and were based on plant and pod type, pod uniformity and maturity, and leafspot resistance. The original recurrent spanish parents were 'Starr' and two short season Texas breeding lines. Much difficulty was encountered in selecting resistant materials for backcrossing because of the masking effect of late maturity. Materials resulting from the first three backcrosses had very small pods and almost no pod uniformity. 'Tamnut 74' was substituted as the spanish parent in backcross 4 and 5. Several lines from this material were selected which had desirable pod size and uniformity. Tests indicate that the highest yielding lines have a visual color advantage over Starr and Tamnut 74, but do not retain diseased leaflets any better. The lines with the most visual resistance and leaflet retention are at least 10% lower yielding than Starr.

Breeding for Resistance to Early Leafspot in Peanut. C. C. Green, T. G. Isleib, M. A. Hamid and J. C. Wynne, North Carolina State University, Raleigh, NC.

An efficient breeding program for development of leafspot-resistant peanut (*Arachis hypogaea* L.) cultivars depends upon an understanding of the genetic control of resistance and the relationship of resistance to important agronomic traits such as yield and oil content. Yield, oil content, resistance to early leafspot (*Cercospora arachidicola* Hori) and resistance to late leafspot [*Cercosporidium personatum* (Berk. & Curt.) Deighton] as well as the relationship among these traits was determined using six peanut lines crossed in complete diallel. The six parents included the cultivars Florigiant, NC 2 and NC 5 and three breeding lines--GP-NC 343, NC 3033 and NC Ac 3139. The parents and crosses in F_2 generation were evaluated for disease severity, fruit and yield characters in two field environments. The variation attributable to general combining ability was about two to five times greater than that for specific combining ability for yield, fruit traits and disease resistance. No significant maternal nor reciprocal effects were observed for any trait indicating that nuclear genes were of primary importance in the inheritance of these traits. Genetic correlations suggested that selection for increased yield and both early and late leafspot resistance should be possible. Selections resistant to early leafspot with acceptable pod size and shape have been made.

Seedling Salt Reaction and Pod Rot Resistance in Peanut. R. Godoy, O. D. Smith, and R. A. Taber, Texas Agricultural Experiment Station, Texas A&M University System, College Station, Texas.

Heavy Pythium pod disease has been observed on areas irrigated with water of poor quality in South Texas. A study was conducted to ascertain if there is a relationship between seedling salt tolerance and pod rot resistance. Six peanut cultivars and lines (genotypes) with different levels of pod rot resistance were compared for salt reaction at four levels of salt concentration. The plants were grown in tubes filled with washed sand and were irrigated with water containing 0, 2,000, 4,000, and 6,000 ppm of a 2:1:1 mixture of NaCl, CaCl and $MgSO_4$. Plant height, dry root weight, dry shoot weight and total dry plant weight were determined 30 days after emergence. The results indicated that Goldin I, Starr and Toalson were the least affected genotypes by high salt concentrations, PI 365553 was intermediate, and Florunner was among the most affected.

In a companion study, plants of the six genotypes were grown in baskets and the pods inoculated with *Pythium myriotylum* and *Rhizoctonia solani* separately and in combination. The percentage of diseased pod tissue was estimated for each plant. Less pod disease developed on PI 365553 than on the other genotypes, among which there were no significant differences. No correlation was found between pod rot resistance and seedling salt reaction.

Combining Ability Analysis of Insect Resistance in Peanuts. J. C. Wynne and W. V. Campbell, North Carolina State University, Raleigh, NC.

Peanuts (Arachis hypogaea L.) grown in North Carolina are attacked by a complex of insects including tobacco thrips (Frankliniella fusca Hinds), potato leafhoppers (Empoasca fabae Harris), southern corn rootworm (Diabrotica undecimpunctata howardi Barber), and the corn earworm (Heliothis zea Bodie). F_2 and F_3 generation bulk progenies of a complete diallel cross of six peanut lines were evaluated for resistance to this insect complex in 1979 and 1980. The six parents were chosen to represent different levels of yield, disease resistance and insect resistance. Because of low populations during both seasons, no significant differences were found for southern corn rootworm resistance. The crosses were significantly different for resistance to thrips, leafhoppers and corn earworms. The majority of variation among crosses was due to general combining ability. Resistance of a line per se was not correlated with general combining ability effects for resistance suggesting that parental lines should be selected for resistance based on progeny performance.

Reaction of Eleven Peanut Genotypes to Southern Corn Rootworm. T. A. Coffelt and J. C. Smith, USDA, SEA, AR, Suffolk, Virginia, and Tidewater Research and Continuing Education Center, Suffolk, Virginia.

Southern corn rootworm (Diabrotica undecimpunctata howardi Barber) continues to be a problem for peanut (Arachis hypogaea L.) growers. It was first identified as a pest in Virginia peanut fields in 1916. Six, four, and eight peanut genotypes, including the susceptible cultivar Florigiant and the resistant cultivar NC 6, were field screened for pod damage due to Southern corn rootworm in 1978, 1979, and 1980, respectively. The percentage of pods damaged was determined for three pod classifications - immature, mature, and total for each genotype. In 1978, VA 751011 with 58.8 %, 54.0% and 55.5% and VA 751013 with 67.6%, 48.0%, and 54.8% had more pod damage than Florigiant with 53.3%, 28.0%, and 36.0% and NC 6 with 38.3%, 15.8%, and and 23.5% for immature, mature, and total pod damage, respectively, while VA 751014 had less pod damage with 24.5%, 15.3%, and 18.0%, respectively. In 1979, VA 751012 had more immature (48.4%) and total (49.7%) pod damage than Florigiant (31.3% and 42.7%) and NC 6 (7.2% and 18.9%), while VA 751014 had less mature (15.3%) and total (15.2%) pod damage than Florigiant (55.1% and 42.7%) and NC 6 (22.2% and 18.9%). In 1980, VA 751014 with 41.6%, 30.8%, and 31.7% and Tifton-8 with 21.3%, 33.4%, and 25.3% had less pod damage than Florigiant with 60.8%, 63.8%, and 66.3% and NC 6 with 58.8%, 42.9%, and 47.4% for immature, mature, and total pod damage, respectively. In addition, VA 751012R had less mature (11.2%) and total (26.0%) pod damage than Florigiant and NC 6.

Hybridization between Incompatible Arachis Species and Clonal Propagation of Hybrids by Tissue Culture. D. C. Sastri & J. P. Moss, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru P. O. 502 324, A.P., India.

Investigations on mechanisms of, and methods to overcome interspecific incompatibility in the genus Arachis were undertaken at ICRISAT. A. hypogaea and A. monticola were pollinated with some species of the section Rhizomatosae viz., A. glabrata Benth., A. sp. PI. No. 276233 and A. sp. PI. No. 262848. The details of the interaction of pollen with the pistils are presented and discussed.

Several techniques such as mentor pollen technique, application of growth hormones, bud and delayed pollinations and in vitro pollinations were attempted. Successful results were obtained after incompatible pollinations by treating the ovaries with plant hormones, which substantially increased the number of gynophores. When in soil, most of these gynophores developed slowly, but the rare mature pods have been sown and two hybrid plants have been raised. These hybrids grew very slowly. Several other undeveloped pods were excised for embryo culture and plants obtained in vitro.

Cotyledons, root discs, leaflet segments, flower buds and shoot meristems from A. hypogaea have been cultured, shoots induced and plants regenerated. Cotyledons from hybrids have been cultured and plants raised in vitro.

Utilizing Wild Peanut Species. 1. Amphidiploid Hybrid Derivatives. M. E. Brinkley and H. T. Stalker, North Carolina State University, Raleigh.

Improving cultivated peanuts, Arachis hypogaea L. (2n = 40), by utilizing wild species germplasm, is highly desirable, especially for disease and insect resistances. Species of section Arachis will hybridize with A. hypogaea and these taxa have the greatest potential for immediate use. To overcome sterility barriers due to different ploidy levels between the wild and cultivated species, a program was initiated to obtain 40-chromosome amphidiploids before crossing wild species with A. hypogaea. Seven hundred eighty-two seeds from fertile 2n section Arachis hybrids were colchicine treated. One hundred twenty 40-chromosome sectors from 30 unique hybrid combinations were then isolated. Most of these 4x plants had larger and thicker plant parts and increased pollen stainability than their diploid counterparts. Seed set in most amphidiploids was extremely low and many genotypes were difficult to maintain because of poor vigor. Meiotic behavior in pollen mother cells varied from regular meiosis and 20 bivalents to others with up to nine quadrivalents. Five amphidiploid combinations were then hybridized with an A. hypogaea cultivar, NC 6, and the resulting trispecific hybrids were vegetatively robust, but semi-sterile (40-70% pollen stained). The NC 6 hybrids produced very few offspring, and attempts are now being made to restore fertility in the interspecific hybrids.

Utilizing Wild Peanut Species. 2. Hexaploid Hybrid Derivatives. M. Company, H.T. Stalker and J. C. Wynne, North Carolina State University, Raleigh.

Introgression of germplasm from diploid wild *Arachis* species to *A. hypogaea* has great potential for improving cultivated peanuts. Interspecific hybrids between *A. hypogaea* (cvs. NC 2 and NC 5) and the wild species *A. cardenasii* Krap. et Greg. *nom. nud.* and *A. chacoense* Krap. et Greg. *nom. nud.* were analyzed cytologically and for leafspot resistance. The triploid F_1 hybrids were sterile, had irregular meiosis, and had very few multivalents. The F_1 hybrids of all crosses were highly resistant to *Cercospora arachidicola* Hori in field tests and had a 10-fold reduction of *C. arachidicola* conidia per lesion as compared to the *A. hypogaea* cultivars. After colchicine treating F_1 hybrids, fertility was restored in many progenies. Most plants had 60 chromosomes, but aneuploids were also observed. The 6*x* plants had up to 18 univalents and very few multivalents, indicating a low frequency of intergenomic chromosome pairing. No significant differences among the wild species, F_1 hybrids, and two generations of hexaploids were observed for *C. arachidicola* resistance in two replicated field tests. Most 6*x* plants were stable at the 60-chromosome level and produced sterile offspring when backcrossed with diploid species. When *A. hypogaea* was used as a backcross parent, several fertile pentaploid (2*n* = 50) offspring were observed. Attempts are now being made to obtain plants with 40 chromosomes and leafspot resistance.

Inheritance of Wine Seed Coat (Testa) and Yellow Flower Color in Peanuts. D. J. Banks and J. S. Kirby , USDA-ARS and Agronomy Dept., Oklahoma State Univ., Stillwater, OK 74078.

Wine seed coat color occurs, especially in the Southwest, as spontaneous mutants in peanut seeds. This color causes considerable concern for peanut shellers because "electric eye" sorters separate these off-colors, as well as inferior, diseased seeds, into culls which are crushed for oil. Thus, a significant amount of potentially edible seed stock is sold at comparatively low oil prices. Harvey (1967) showed that the wine character segregated in the F_2 in a 3:1 (flesh to wine) ratio. This suggests that the wine trait is conditioned by a single recessive gene. Studies in Oklahoma indicate that more than one gene is responsible for the wine trait. Pooled phenotypic data involving several crosses, different from Harvey's, showed acceptable chi-square values only for 13:3 and 207:49 ratios of 30 ratios tested. Models for each of these two ratios are proposed, but the latter ratio seems more plausible.

Yellow flower color, as opposed to the usual orange type, is widespread in certain wild species of *Arachis*, but it is extremely rare in cultivated peanuts. A recent yellow-flowered peanut introduction from Bolivia was studied to determine the inheritance of this trait. Yellow was dominant to orange in the F_1. Segregates in the F_2 fit 11:5 and 49:15 (yellow to orange) ratios. However, some interactions in the F_1 and F_2 resulted in partial mosaics with orange blotches along the margins of yellow standards. Knowledge about the yellow flower trait may contribute to our understanding of the evolution of the cultivated peanut.

Genotype X Environment Interactions Observed in Peanuts Under Early Vs. Normal Harvest Dates at Two Locations in Oklahoma. K. E. Dashiell, Agronomy Department, University of Florida, Gainesville, Florida (formerly Department of Agronomy, Oklahoma State University), J. S. Kirby and R. W. McNew, Department of Agronomy and Department of Statistics, Oklahoma State University, Stillwater, Oklahoma.

Genotype X environment interaction variance components were estimated from performance trials conducted at an irrigated and at a dryland location. The trials were grown in 1977 and 1978 with two harvest dates at each location each year. The traits evaluated included % OK, % SS, % TSMK, pod yield, and gross return. The objectives were to determine if it would be advantageous to select for cultivars with superior performance for different harvest dates and to determine the most efficient combination of years, harvest dates and replicates to use in a performance testing program. Analysis of the data indicates that: it may be advantageous to select for cultivars that have superior performance for different harvest dates at dryland locations for the traits % OK and pod yield; there would be little advantage gained by selecting cultivars for different harvest dates at irrigated locations; and the present testing program of three years and two harvest dates should not be reduced when testing cultivars at a dryland location, however, the number of years and harvest dates could be reduced at irrigated locations and still obtain a level of accuracy comparable to the present performance testing system.

Peanut Genotype Response to Intercropping. D. A. Knauft. Agronomy Department University of Florida, Gainesville, Florida.

An experiment was started in 1980 to determine whether selecting the highest yielding peanut genotypes in monocrop will also give the highest yielding peanut genotypes in an intercrop with corn. Genotype x cropping patterns interaction was significant. UF 67 was the highest yielding genotype in monocrop and significantly outyielded three of five genotypes, including UF 83B. However in intercrop, UF 83B was the highest yielding genotype and significantly outyielded UF 67. Yield of Florunner was not significantly different from the best yield in both cropping patterns. Leafspot control was also examined. When intercropped peanuts were sprayed every 28 days, their yield was the same as monocropped peanuts sprayed every 14 days.

PEANUT BREEDING SYMPOSIUM

Developing Country Perceptions of Researchable Problems in Peanut Production and Utilization. David G. Cummins and Curtis R. Jackson, Georgia Experiment Station, Experiment, Georgia 30212.

The Peanut CRSP Planning effort prioritized researchable production and utilization problems in developing countries by visits to 13 countries, contact with researchers from 16 developing countries at ICRISAT, and questionnaires. Evaluations were received from about 125 people in 25 countries outside the U. S. Problem areas were ranked: breeding and genetics; weeds, insects, diseases; cultural practices/management; mechanical technology; education/training; physiology/soil microbiology, seed technology; nutrition/food science; economics; aflatoxins; socio-cultural factors; farming systems/services; and storage/preservation. Sub-area examples are leafspot, rust, rosette, and drought resistance; efficient disease and insect control measures; mineral nutrition, crop management, cultivar adaptation; introduciton of simple equipment; photosynthetic efficiency, improved nitrogen fixation; production of high quality seed; efficient use of production inputs; times, sources and processes of aflatoxin contamination; inadequate infrastructure; and product storage problems; improved food products; and farmer interest in peanuts. The CRSP linkage between U. S. and developing country researchers will address these problems and provide research training opportunities.

Agronomic Improvement by the Development of Varieties Adapted to Rainfall Constraints. P. Gillier, Annual Oil Crops Dept., IRHO, Paris, France, and J. Gautreau , Inst. Senegalais de Recherches Agricoles, Bambey, Senegal.

Variations in groundnut production in the Sahel zone are related to climatic accidents due to erratic and deficient rainfall. To mitigate these drawbacks, the Institute de Recherches pour les Huiles et Oleagineux (IRHO) has undertaken research on the selection of drought-resistant plants and on the adaptation of new varieties to the rainfall cycles.

The stages of sensitivity of the plant have been defined, and several physiological tests enabling screening in the germplasm collections and progenies of crosses have been worked out:

- tests of germination at high osmotic pressure,
- tests of heat resistance,
- tests of relative growth speed,
- tests of relative transpiration,
- measurement of leaf potential levels or suction pressure.

The choices made were confirmed later by field trials.

The selection of short-cycle varieties and those with a short cycle associated with dormancy make it possible to compensate the curtailment of the rainy season in the North of the Sahel zone. Other specific cases of adaptation have been studied and resolved: very long-cycle variety (135 - 140 days), and a rosette-resistant, short-cycle, non-dormant variety.

All this research makes it possible to get the maximum possible yield in function of the quantities of water received and its distribution. The new varieties are a good guarantee for the farmers.

Peanut Agronomic Improvement by Development of Disease Resistant Germplasm. Bruno Mazzani. Centro Nacional de Investigaciones Agropecuarias, Maracay, Venezuela.

Fourteen peanut cultivars and 8 selected lines in F_9 generation from the cross 'Tarapoto' x '15607' were compared in two field trials at Maracay, Venezuela. 'Tarapoto,' a cultivar of Peruvian origin, was selected for its resistance to rust and Cercospora leafspots; whereas '15607' is a widely adapted commercial cultivar in Venezuela.

Five selected lines outyielded '15607' by 2 to 9% and 'Tarapoto' by 8 to 16%. Two selected lines descending from '15607' (female), were outyielded by '15607' itself by 8% (73.307) and 15% (73.408), and by 'Tarapoto' by 3% (73.307) and 11% (73.408). Plant population densities at harvest time showed big differences among cultivars and lines. Expressed as "number of harvested plants: number of planted seeds," maximum density value was reached by '15622' (94.8%), a Spanish cultivar introduced from USA, whereas figures for selected lines ranged from 63.2% to 78.8%. Plant density of the '15607' cultivar (84.4%) exceeded plant densities of four selected lines by differences significant at 1% level. 'Tarapoto' was 65.6%. 'Florigiant' and 'Bolivia Pintado' cultivars showed lowest plant density figures, namely 23.2 and 20.2% resp. This behavior is attributed to complex genetic-environmental interactions, directly affects peanut yields.

Fruit and seed variations ranged between normal figures, particularly the shelling percentage which was greatest in the 'Red Starr' cultivar (77.3%) and lowest in selected line 73.307 (71.7%). As observed and reported from previous trials, shelling percentage is highly sensitive to soil variations in 'Tarapoto' as well as in selected lines having 'Tarapoto' as female parent in the original cross. Cercospora leafspot incidence in selected lines ranged from 1.4 to 1.8 (2.1 in '15607' and 1.4 in 'Tarapoto'). Rust incidence in selected lines ranged from 1.6 to 2.1 (2.8 in '15607' and 1.9 in 'Tarapoto'). All figures on scales from 0 (no incidence) to 4.

These results were largely confirmed in a second comparative trial, where selected line 73.400 outyielded '15607' at the 5% significance level. Plant densities of 'Tarapoto' and all selected lines ranged from 58% (73.302) to 83% (73.408) and were exceeded at the 1% level of significance by '15607' (96%). Fruit and seed characters again showed normal ranges of variation. Cercospora leafspot incidence was lowest in selected lines 73.261 (1.1), 73.406 (1.6) and 73.302 (1.6), compared with '15607' (2.5) and with 'Tarapoto' (1.5). Rust incidence was 0.1 in the 3 selected lines already mentioned, whereas '15607' averaged 2.8 and 'Tarapoto' 0 (zero). All figures on scales from 0 (no incidence) to 4.

Highest yields were 3942 kg/ha for the selected line 73.302 (first trial) and 5187 kg/ha for the selected lines 73.400 (second trial), as compared with 3609 ('15607') and 3399 ('Tarapoto') (first trial); 4516 ('15607') and 4914 ('Tarapoto') (second trial).

The Utilization in a Breeding Program of Resistance to Late Leaf Spot of Peanuts.

David J. Nevill. Coastal Plain Experiment Station, University of Georgia, Tifton, GA.

The reactions of five F_2 progenies to inoculation with conidia of Cercosporidium personatum were studied in the laboratory at ICRISAT, Hyderabad, India. The resistant parents were Valencia-type peanuts whereas the two susceptible parents were from the Spanish and Virginia cultivar groups. From the study of the progenies of crosses between resistant and susceptible genotypes, it was concluded that resistance was determined by recessive alleles at five loci.

The inheritance of disease resistance was also investigated in an 8 x 8 half diallel set of crosses. The disease reactions of parents and F_2 progenies were studied in a field trial at ICRISAT, where there were severe epithytotics of both C. personatum and rust (Puccinia arachidis). The material was grown in two adjacent areas and one area was sprayed with fungicide to prevent disease development. The inheritance of the reduction in pod yield and the inheritance of resistance to pathogen development were studied. The conclusions of the laboratory experiments were confirmed, however, resistance derived from the Virginia group of cultivars did not conform to the expectations of this model. The response of pod yield to fungicide application was controlled by additive gene action. It was found that pathogen development and response to disease control were uncorrelated. Therefore, both these characters should be considered when selecting parents for a breeding program.

It can be concluded that the utilization of resistance should provide an important means of control of late leaf spot. Although the resistance is partial, crop loss can be reduced and it may be possible to combine the use of resistant cultivars with a minimum application of fungicides in an integrated disease control program.

Peanut Varieties and the Quality in Japan. T. Yashiki and Y. Takahashi, ChibaKen Agricultural Experiment Station, Japan.

Large grain varieties are consumed mainly as roasted pods, parched beans and fried beans in Japan. As for factors giving influence on the eating quality, the good taste of the bean is in direct proportion to the sweet flavor, the hardness and sucrose content of it, respectively. But the correlation coefficient of sweet flavor is higher than that of hardness. The good taste of the bean is in inverse proportion to the yield, one seed weight and the degree of seed fullness in the same variety. Generally Japanese like varieties which have a high sucrose content being related to sweet flavor and comparative hardness, so we have been selecting good lines from the standpoint of these two factors. The quantity of sucrose content is analyzed by liquid chromatograph. It is possible to presume the hardness of parched beans by crushing dry seeds with the hardness tester. So we intend to apply these techniques to line selection. As compared with Chibahandachi which was the leading variety in Japan, we have been breeding new lines of higher yield, better quality and disease resistance by means of the cross between Virginia type lines and Runner type ones. These lines have generally a tendency to be inferior to Virginia type varieties in sweet flavor. But from among these lines we selected new varieties possessing comparatively hard seeds, good flavor and eating quality. These varieties are spreading widely throughout this country.

SYMPOSIUM - PEANUT ENERGY

Peanut Skins as an Odor Suppressant. G. L. Newton, Department of Animal Science, UGA, Coastal Plain Experiment Station, Tifton, GA.

Tannins apparently inhibit some microorganisms and have also been shown to reduce digestibility of feedstuffs by ruminant and monogastric animals. Peanut skins which are high in tannins, were found to reduce the odor of fresh swine waste and prevent the development of characteristic putrefied odors for 10 to 14 days when skins and swine waste were mixed on an equal dry matter basis. When added to an underslat, swine waste pit initially and at 14 then 7 day intervals throughout the growing-finishing phase, for a total of 15 kg (35 pounds) per pig, peanut skins were judged to be very effective in the elimination of odors, particularly before the time the pit reached 2/3 full. After that point it was necessary to add peanut skins more often and odor control was not as complete. Consistency of the waste was affected as liquefaction was reduced and/or the skins absorbed the free liquid, but removal of the waste by a vacuum tank spreader was not hampered. Nitrogen content of the waste was 8665 mg/l (80 pounds/1000 gal) whereas in previous measurements when no skins were added nitrogen content has been 4900 to 5500 mg/l (about 50 pounds/1000 gal). The peanut skins added to the pit contained an amount of nitrogen equal to about 1/3 of the increase. In another test, after the ventilation fans had been off for 7 hours, concentrations of ammonia, hydrogen sulfide and carbon dioxide at floor level were 2.5 ppm, a trace, and .12% in a room with a manure pit which included peanut skin aditions and 10 ppm, .8 ppm, and .23% in a room with a pit containing no peanut skins. The carbon dioxide levels particularly would indicate a lowered level of microbial activity in the swine waste-peanut skin mixture.

In laboratory studies, peanut skins lowered ammonia levels in an atmosphere over swine waste to approximately 1/3 that over untreated waste. Ground soybean residue also reduced ammonia, to a lesser extent, and changed the character of the odor produced from swine waste. Peanut skins were found to reduce the pH of swine waste .3 to .6 unit. An equal adjustment of pH with acid did not eliminate odor and increasing the pH of peanut skin treated waste did not result in marked odor increase.

Peanut skin addition to manure pits seems to be a practical method for reducing the odors within swine houses and swine house exhaust air. This should allow for lowered ventilation rates during cool weather which could result in energy savings. Waste treated with peanut skins may also be of significantly more value as a fertilizer. Since microbial degradation of the waste may be retarded, the use of peanut skins in manure lagoon systems may not be advisable.

The Use of Vegetable Oils in Automotive-Type Diesel Engines. Vernon Miller, Progressive Farmer, Birmingham, AL.

We have been running a standard 1980 Chevrolet diesel pickup on a mixture of soybean oil and diesel fuel for about a year. Most of the 21,000 miles driven as of May 7, 1981, was on a mixture of degummed soybean oil and two-thirds diesel fuel. The only apparent problem that we're sure was caused by this mixture is the frequent plugging of fuel filters.

Peanut Oil for Diesel Tractors in Georgia. Robert H. Brown, Agricultural Engineering, University of Georgia, Athens, GA.

The desire of Georgia's farmers for an energy fuel which can be grown and processed on the farm could be met with peanut oil. The situation and conditions involved with this alternative will be described and the possibility of expanded usage of the fuel will be considered. Operating details and the status of current research in the use of peanut oil and diesel/peanut oil blends for operation of tractors and buses will be included.

ENTOMOLOGY

<u>Losses To Peanut Insects In Georgia - A Ten Year Summary</u>. H. Womack, L. W. Morgan and R. E. Lynch, University of Georgia and Southern Grain Insect Laboratory, USDA, SEA, AR, Tifton, GA.

Insect damage and control costs vary widely from year to year due to the insect species present and the severity of infestations. A committee on Insect and Losses was established in 1971 within the Division of Entomology, University of Georgia to determine losses and expenditures as a result of damage by the various insect pests in Georgia. Subcommittees assess economic losses and control costs based on frequency and severity of insect infestation and the extent of damage to the various commodities. Included in this assessment is the number and costs of insecticide applications for species or group of species attacking a crop. During the past ten years losses have varied from as low as $1,488,000 in 1973 up to more than $69 million in 1980.

<u>Field Evaluation of Insecticides for Lesser Cornstalk Borer Control on Peanuts in Alabama</u>. J. Ronald Weeks, Alabama Cooperative Extension Service, Wiregrass Experiment Station, Headland, Alabama.

During 1980, various insecticides and application techniques were evaluated for control of lesser cornstalk borers at 4 locations in the southeast Alabama peanut belt. These replicated demonstrations were conducted on farmer's fields where scouting reports indicated heavy infestations of borers and severe damage to peanuts.

The results from all locations were varied, depending upon soil moisture, but generally showed that the more persistent granular insecticides provided the best control, and the liquid sprays provided intermediate results between granules and the untreated check. At one location, where no rainfall occurred, no significant control was obtained by any treatment.

<u>Evaluation of Methods for Controlling Lesser Cornstalk Borer, Elasmopalpus Lignosellus (Zeller) in Drought Stressed Peanuts</u>. David B. Adams, Jay W. Chapin, and Mike J. Sullivan, Department of Extension Entomology, University of Georgia, Tifton, Ga.; Department of Entomology and Economic Zoology, Clemson University, Edisto Experiment Station, Blackville, South Carolina.

Currently, methods of control of LCSB (lesser cornstalk borer) in non-irrigated peanuts are inadequate. Several insecticides were used as directed sprays in high volumes of water to determine if LCSB could be effectively controlled. In small plot test using 76 gallon total spray volume 50% control was achieved. Under field conditions using 45 gallon total spray volume, LCSB populations increased.

Evaluation of Aerially Applied Granular Insecticides for Control of Southern Corn Rootworm. Herbert Womack, University of Georgia, Tifton, 31793.

Infestations of the southern corn rootworm have become increasingly severe in Georgia in recent years. This may be partially due to the increased use of irrigation in peanuts which provides optimum moisture conditions for rootworm development. Since most insecticides are applied to peanuts by aircraft a field test was designed to evaluate control of aerially applied granular insecticides for southern corn rootworms in peanuts. Insecticides were applied at early pegging in an irrigated peanut field and insect counts were made on 14 day intervals to determine residual activity of the insecticides tested. Yield, grade and value per acre were determined on the various treatments at harvest.

Application of Insecticides to Peanuts through Irrigation Systems. L. W. Morgan, Herbert Womack, and David Adams, Tifton, GA 31793.

An experiment to study the efficacy of application of insecticides to peanuts through an irrigation system was conducted at the Midville experiment station in 1980.

The plots were 18 rows wide and 55 ft. long, and were replicated 4 times. Two applications of insecticides were made through the system (31 July and 8 Oct.) during the season. A six-inch main line was used to deliver the water from a surface pond to 2-inch lateral lines which were placed along each side of the plots. Quick-release Rainbird® risers delivering ca. 1 acre-inch of water/hr. were used in this experiment. Each chemical was injected into the main line 100 feet before the first lateral, and applied to the individual plots with 2 risers, placed at opposite corners of the plot, in order to assure complete coverage. Approximately 1 acre-inch of water was used in each application. For each insecticide application, the system was filled with water, allowed to run for 5 minutes to assure full volume of water delivery; the insecticide mixed with a volume of water which would be delivered into the system in ten minutes was then pumped into the irrigation water being applied to the peanuts. Each plot was irrigated for a total time of 30 minutes, the pump stopped, the terminal end of each lateral line opened and enough water was pumped to flush the entire system. This process was then repeated for each insecticide.

Following the first treatment on 31 July, all plots, except the untreated check and the 1.0 lb/acre Lorsban® treatment was heavily infested with 2-spotted spider mites. The entire experiment was treated with 0.8 lbs/acre of Kelthane for mite control.

Rate of Population Increase of The Twospotted Spider Mite on Peanut Leaves Treated With Pesticides. L. S. Boykin and W. V. Campbell, North Carolina State University, Raleigh.

Several commonly used peanut pesticides were evaluated for their effect on the intrinsic rate of natural increase (r_m) of the twospotted spider mite, Tetranychus urticae Koch, on peanut, Arachis hypogaea L., in order to determine whether or not stimulation of mite reproductive potential by pesticides was a factor contributing to mite population increases in peanut fields. Mites fed on peanut leaves treated with mancozeb, carbaryl, and mancozeb + carbaryl had slightly, but consistently, higher r_m values than mites fed on leaves from the nontreated check. Mites exposed to peanut leaves treated with ammonical copper, fentin hydroxide, benomyl, and benomyl + mancozeb + carbaryl had slightly, but consistently, lower r_m values than mites exposed to the nontreated check. The data suggest that some pesticides can contribute to increased mite populations in peanut fields by stimulation of the mite's reproductive potential while other pesticides suppress mites by reduction of mite reproductive potential.

Tobacco Wireworm as a Pest of Peanuts. Patrick Lummus and John Smith. Tidewater Research and Continuing Education Center, Suffolk, Virginia 23437.

Feeding damage and populations of the tobacco wireworm, Conoderus vespertinus (Fabricius), were studied on two commercial varieties of peanuts grown in southeastern Virginia. The larvae of the tobacco wireworm was observed to attack all stages of the developing peanut plant, feeding on the root system, the hypocotyl, and the fruit. Populations were monitored on a weekly basis with a wireworm baiting technique developed for detection of wireworms in corn. Four mixtures of seed were evaluated to determine the optimum mixture for use in this technique. These mixtures were as follows: peanuts, lima beans, 1:1 peanuts + lima beans, and 1:1:1 corn + lima beans + millet. No difference was observed in the orientation of wireworms to these baits, although the corn-lima beans-millet mixture tended to yield a slightly larger number of larvae per sample. Larvae were recovered in large numbers throughout the study period, indicating continuous reinfestation and/or extensive larval migration. The heaviest infestation occurred on a study site characterized by a very heavy soil (10% clay) and planted with NC 6, a rootworm resistant variety. Wireworms were recovered in lesser numbers in each of 4 other sites planted with Florigiants and characterized by soils ranging from 5% clay to 9% clay.

Distribution of Heliothis zea Eggs and First Instar Larvae on Peanuts. N. L. Pencoe and R. E. Lynch, Coastal Plain Experiment Station, University of Georgia, Tifton, GA and Southern Grain Insects Research Laboratory, AR/SEA, USDA, Tifton, GA.

Oviposition by the corn earworm, *Heliothis zea* (Boddie), on peanuts, *Arachis hypogaea* L., was studied in the laboratory and in field cages. Highly significant differences in location of eggs were found. Numbers of eggs deposited on the upper, middle, and lower levels of the plant, respectively, occurred in a mean ratio of 9.9 : 4.9 : 1.0. Leaves were chosen approximately 86.5% of the time as oviposition sites compared to stems. In addition, the botton leaf surface was selected over the top leaf surface by a 2.1 : 1.0 ratio. The least preferred sites for oviposition were stems and the lower portion of the plant. First instar larvae exhibited a distinct preference for terminals as feeding sites.

The Value of Insect Resistance in NC 6 Variety in Virginia. J. C. Smith and T. A. Coffelt. Tidewater Research and Continuing Education Center, Suffolk, Va., VPI & SU and USDA-SEA, respectively.

The NC 6 variety was released primarily for resistance to the southern corn rootworm, *Diabrotica undecimpunctata howardi* Barber, but has moderate resistance to potato leafhoppers, *Empoasca fabae* (Harris) and corn earworms, *Heliothis zea* (Boddie) and low resistance to tobacco thrips, *Frankliniella fusca* (Hinds). Both rootworms and the variety are adapted to heavier, more poorly-drained soils. Field experiments were conducted in 1975, 1979 and 1980 to determine the value of plant resistance by utilizing various insecticidal control schemes. In 1975, untreated NC 6 and Florigiant had 11.9% and 12.5% injured fruit, respectively. A half rate of Dyfonate @ pegging reduced NC 6 injury by 65%. Untreated NC 6 and Florigiant had values about equal, while value of production from the 1/2 rate of insecticide was reduced by $138.44/hectare. Reduced rates of Temik were effective in reducing thrips injury in 1979 and 1980. In 1979, reduced rates of Dyfonate at pegging reduced injury by 94%. Values of plots receiving 1/4 rate of Temik @ planting and 1/4 rate of Dyfonate @ pegging were $329.13/hectare greater than untreated plots. In 1980, there was much variability in results. However, pegging treatments generally reduced rootworm injury. Untreated peanuts had the lowest value, whereas reduced and full rates of Dyfonate produced the highest values.

The Impact of Potato Leafhoppers, Empoasca fabae (Harris) upon Selected Cultivars of Arachis hypogaea L.

Edwin T. Hibbs, Georgia Southern College, Statesboro and Loy W. Morgan, University of Georgia, Coastal Plain Experiment Station, Tifton, GA.

Individually caged plants of a collection of 24 Arachis hypogaea L. cultivars in vegetative development were submitted to controlled numbers of potato leafhoppers, Empoasca fabae (Harris) under glasshouse conditions. The following results obtained:

1. Caged with 6 adults (unsorted sexes) for 14 days induced reductions in total green-plant weights ranging from 0 to 70%. This wide range of seedling-plant response to a fixed intensity infestation suggests that certain genotypes either tolerated the infestation without reaction, or that the genotypes were unsuitable host plants, deflecting the infestation.

2. Caged with 25 adults (unsorted sexes) for 8 days, the plants then cleared and searched for eggs, yielded an array from 0 to 37 eggs per plant. The in-plant distribution of eggs indicated 64% inserted into main-axis tissue of V-4/5 plants (25% in stems, 30% in main axis petioles, 9% in rachises of main axis leaves) and 36% in lateral shoots (10% in stems, 26% in petioles, less than 1% in rachises). Genotypes that are not attractive for egg placement provide an effective deterrent to infestation build-up. Such antixenotic plant characteristics are undoubtedly heritable.

3. Individual plants of the 24-cultivar collection caged together (in two replications, plus uninfested check) and infested for 37 days with 150 adults (unsorted sexes), offering leafhoppers free-choice of cultivars, indicated: (1) An accumulation of cast skins ranging from 1.5 to 33 per plant, and (2) a reduction in plant height (main axis) ranging from 0 to 70%. This free-choice situation indicated that certain genotypes are highly attractive to developing leafhopper nymphs, others are not. Further, it appears that the degree of attractance and the injury are not necessarily correlated.

In conclusion, the manipulation of a captive population of E fabae can provide controlled infestation intensities, or infestation qualities (e.g. developmental stages, males, or females) for screening tests that are essential to the refinement of selecting leafhopper resistant peanut genotypes. The differential plant injury caused by leafhopper feeding and oviposition elicit characteristic plant responses. Plant defense mechanisms against both types of injury are specific and probably gene controlled, therefore genetically manipulatable.

Resistance of Peanuts to a Complex of Insects. W. V. Campbell, J. C. Wynne, and H. T. Stalker. North Carolina State University, Raleigh 27650.

Peanut cultivars and breeding lines have been tested for resistance to a complex of insects in North Carolina since 1960 including thrips *Frankliniella fusca* Hinds, potato leafhopper *Empoasca fabae* Harris, southern corn rootworm *Diabrotica undecimpunctata howardi* Barber, corn earworm *Heliothis zea* Bodie, and the twospotted spider mite *Tetranychus urticae* Koch. A low level of resistance to thrips, moderate to high resistance to the potato leafhopper, high resistance to the southern corn rootworm, moderate resistance to corn earworm, and low level of resistance to the twospotted spider mite has been identified among the domestic peanuts. Some wild species of peanuts exhibit high resistance, approaching immunity, to this same complex of insects and serve as a relatively untaped source of pest resistant germplasm.

Field Evaluation of the Pheromone Mediated Behavior of the Lesser Cornstalk Borer, *Elasmopalpus lignosellus*. Robert E. Lynch, J. A. Klun, and J. W. Garner, Southern Grain Insects Research Laboratory, USDA, AR, SEA, Tifton, GA 31793.

Lesser cornstalk borer pheromone activity was monitored in peanuts, grass adjacent to peanuts, and corn. Significantly more males were captured in older peanuts than in other habitats. Females initiated mate calling between 12:00 - 1:00 A.M. and continued until just before sunup. The pheromone of the lesser cornstalk borer was identified as (*Z*)-7-tetradecenyl acetate, (*Z*)-9-tetradecenyl acetate, (*Z*)-11-hexadecenyl acetate, and (*Z*)-9-tetradecenol. Septa with 40 ug of the synthetic pheromone were found to be equivalent to virgin females in attractiveness to males. The synthetic pheromone was attractive for at least 30 days under the conditions tested.

HARVESTING AND PROCESSING

Effect of Windrow Curing Time on Peanut Harvest Losses. James H. Young, Biological and Agricultural Engineering Department, North Carolina State University, Raleigh, NC 27650.

During windrow curing, peanuts are subject to above the ground field losses. The magnitude of these losses is a function of rainfall, peanut moisture content, age of peanuts at digging, period of time peanuts have been in windrow, digger adjustments, and combine adjustments. Studies were conducted at Lewiston, NC from 1974 through 1980 on three peanut varieties (NC 5, NC 6, and Florigiant) in an attempt to determine the effect of windrow drying period and age of peanuts at digging on above ground losses. Regression equations for predicting the percentage of peanuts lost have been developed. Results indicate a trend for an initial reduction in percent above ground losses with an increase in windrow drying time during the first few days of drying followed by significant increases in percent above ground losses for longer windrow drying periods. There are also increased losses for more mature peanuts.

Design of a Peanut Drying System Using Solar Heated Water. J. M. Troeger, USDA, SEA Southern Agricultural Energy Center, Coastal Plain Experiment Station, Tifton, GA 31793.

With the soaring price of conventional fuels, the use of renewable energy sources, such as solar, has become more attractive. Peanuts require relatively low temperatures for curing so that flat plate solar collectors can supply an appreciable amount of the drying energy. The solar energy must be stored so that it is available for drying during periods when there is no solar radiation.

This report presents design parameters for estimating the sizes for collector area, storage volume and heat exchanger surface area, as well as other associated parameters for a peanut drying system using solar heated water. The design parameters were developed using a computer simulation model of a solar peanut drying system. The model was verified using experimental results from a solar water heated peanut drying system.

A Microprocessor Control System For Peanut Drying. J. L. Steele, USDA, SEA, Suffolk, Virginia.

A microprocessor based control system to optimize drying energy utilization was developed and tested during the 1979 and 1980 harvest seasons. The control system consisted of a single board microprocessor, an analog/digital converter, multiplexer, control circuitry, keyboard, printer and software. Conventional peanut dryer control was implemented in the 1979 software with some fan cycling capability. The system successfully controlled a small sample dryer in 1979. The software was expanded in 1980 to permit simultaneous control of two independent commercially available drying units. One unit was programmed for conventional peanut dryer control and the other included strategies to maximize energy efficiency. In direct comparison tests of the two control procedures, the LPG consumption was reduced by 50% and fan operating time was reduced 30% by the maximum energy efficiency strategy. A reduction in dryer capacity (about 30%) was associated with this energy savings. Typical dryer performance data, energy consumption, and energy efficiencies were presented. Potential software improvements were reviewed.

Evaluation of Cleaning Farmers Stock Peanuts Prior to Marketing. P. D. Blankenship, National Peanut Research Laboratory, Dawson, GA 31742, and J. H. Young, North Carolina State University, Raleigh, N. C. 27607.

During two harvest seasons, 103 drying wagon lots of Florunner peanuts were graded, cleaned and regraded. The effects of cleaning on grade parameters and economic value were evaluated. Observed value changes were compared to theoretical value changes assuming removal of all grade-indicated foreign materials. Neither theoretical nor experimental benefits of cleaning prior to marketing increased economic value enough to exceed the current commercial charge for cleaning.

Compacting Peanut Hulls For Storage and Transport. W. O. Slay, National Peanut Research Laboratory, Dawson, GA 31742.

Mill run peanut hulls were compacted and baled with a modified 18.7 kW longitudinal press. Hull density was increased from approximately 127 to 285 kg per cubic meter. Bale dimensions of 74 cm wide by 91 cm high by 150 cm long met stacking and load weight requirements for a 12.2 meter flatbed trailer. Labor and energy costs for baling were approximately $8 per tonne. Other costs such as transporting, depreciation, taxes, etc. were estimated at 6-10 dollars/tonne. Temperature at center of hull bales stored outdoors reached 79° C during summer. Moisture penetration of bales from rain appeared limited to outside surfaces. No spontaneous combustion from bacterial activity was noted, but bales had free air movement around each one.

NUTRITION AND PHYSIOLOGY

Effect of N Application on Peanut Yield and Seed Quality. Sunil K. Pancholy and Shaik-M. M. Basha, Florida A&M University, Tallahassee, Florida, and Daniel W. Gorbet, Agricultural Research Center, Marianna, Florida.

The effect of N application on the yield and biochemical composition of peanut seed was studied. The field experiment was laid-out in a randomized block design, employing three rates of N (0, 67 and 137 kg/ha), applied at pre-planting and four peanut lines (one non-nodulating line, two of its parental lines: PI 262090 and 487 A, and a commercial cultivar 'Florunner'). The crop was dug at 137 days after planting, yield determined, and after shelling, seed samples were lyophilized and stored at -20°C. Lyophilized seeds were ground into a meal and analyzed for oil, total protein, iodine value, and total amino acid composition. Application of N resulted in a significant increase in the yield of non-nodulating peanut line and cultivar 'Florunner'. However, a reduction in yield was observed for PI 262090 and 487 A. Oil content of the seeds remained unchanged in all the peanut lines, with 'N' application. However, the seed protein content of the non-nodulating line and PI 262090 increased (10% and 3%, respectively), with N fertilizer application. Higher iodine values were obtained for all the four peanut lines following N application. Significant increases in the basic amino acids and methionine content were observed in the non-nodulating peanut line with increasing levels of N application.

Response of Peanuts to Nitrogen and Inoculum. S. T. Ball, J. C. Wynne, S. M. Guerrant and T. J. Schneeweis, North Carolina State University, Raleigh, North Carolina.

Response of a legume in the presence of native rhizobia to the application of either inoculum or nitrogen usually indicates that the native rhizobia are either inadequate in number or inefficient in fixing nitrogen. The effect of commercial inoculum and nitrogen fertilizer (37.5 kg/ha applied monthly) on nitrogen-fixing traits, plant weight and yield on two peanut (Arachis hypogaea L.) cultivars was determined in field studies for two years.

Inoculum increased nodule number, nodule weight, $N_2(C_2H_2)$ fixed, plant weight and fruit yield for one year but had no effect on any trait for the other year. Nitrogen decreased nodule number, nodule weight and $N_2(C_2H_2)$ fixed but increased plant weight and fruit yield during both growing seasons. The two cultivars, 'Florigiant', a Virginia type, and 'Argentine', a Spanish type, were significantly different for all traits within each year despite several significant date by cultivar and nitrogen by cultivar interactions.

These results suggest that nitrogen fixation by native rhizobia does not always supply sufficient nitrogen for maximum yields of peanuts grown in North Carolina.

Some Biochemical Differences Between the Nodulating and Non-nodulating Peanut Lines.
Shaik-M. M. Basha and Sunil K. Pancholy, Florida A&M University, Tallahassee, FL, and Daniel W. Gorbet, Agr. Res. Center, Marianna, FL.

Seed and leaf composition of nodulating and non-nodulating peanut lines were compared using a non-nodulating line and its parental lines: PI 262090 and 487 A and a commercial cultivar 'Florunner'. Cotyledons were ground into a meal and defatted with cold diethyl ether and used for analyses. In general, the non-nodulating line contained lower amount of protein (24%) and oil (46%) than the nodulating lines. Gel filtration of the 2 M NaCl soluble proteins on a Sephacryl S-300 column showed the presence of relatively higher amounts of low molecular weight proteins (<100,000) in the non-nodulating line. Further, seeds of non-nodulating line contained higher amounts of amino acids such as lysine, threonine, methionine and leucine. The non-nodulating line had higher acid phosphatase activity (37 U/ml) than the nodulating lines (17 to 24 U/ml). Similarly, the leucine amino peptidase activity was higher in the non-nodulating line (214 U/ml) compared to the nodulating lines (146 to 167 U/ml). Gel electrophoresis of the seeds showed no major differences in their protein composition. The leaf chlorophyll content of the non-nodulating line was four-fold lower than the nodulating lines. Additionally, leaf protein content of the non-nodulating line was one-half that of the nodulating lines. Interestingly, the leaf sugar content of the nodulating and non-nodulating lines were similar. Supported by USDA-SEA/CR.

Cell Number in Relation to Seed Size in Peanuts. Nandini Nimbkar, W. G. Duncan and F. P. Gardner, University of Florida, Gainesville, Florida 32601.

Little is known regarding physiological processes which regulate seed growth rate and seed size. As a step toward understanding these processes underlying varietal differences in seed size, the relationship between the number of cells in the seed and seed weight was determined for five peanut cultivars. The final seed size for these cultivars ranged from approximately 270 to 1000 mg and the final cell number from 3.3 to 5.7 million. Seed weight or size was correlated with cell number more than cell size, but smaller seeds had more cells per unit of seed weight. This suggests that physiological processes controlling both cell size and number are operative in determining final seed size among cultivars.

A Distributional Concept of Pod Maturation. E. Jay Williams and J. Stanley Drexler, USDA-SEA-AR and University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia.

Pod maturity distribution (profile) data were obtained for Florunner peanuts from eight tests conducted in 1978-79 to determine distribution parameters which relate to time of optimum harvest. Profiles were determined from weekly samples by counting the number of pods at various stages of development. Developmental stages were established by color and structural characteristics of the mesocarp. Flowers were counted daily from the beginning of flowering through flower subsidence. Time of optimum harvest was determined from profiles and verified by weekly conventional harvests. Results show parallel relationships exist between flower production and pod maturity profiles, and that the shapes of the distributions determine optimum harvest time.

Pod Numbers Per Peanut Plant. W. G. Duncan, University of Florida, Gainesville.

The primary determinant of pod number per peanut plant is plant density. Within a wide range of plant population pod number per plant is directly proportional to area per plant. When plant density and planting pattern is held constant, however, the number of pods per plant for an environment is determined by partitioning factor and pod growth rate.

The partitioning factor can be modified by chemical treatment with large effects on the yields of some varieties. The growth rate per pod is genetically determined for any given temperature but can be changed by heating or cooling the soil. Depending on what determines the final seed weight, seed growth rate may or may not be correlated with seed size in peanuts as it is in most seed crops.

Computer simulation indicates that, on the basis of present knowledge, the most promising way of increasing peanut yields, under favorable growing conditions, is by extending the effective filling period of individual seeds.

Inhibition of Photosynthesis by Ethylene - A Stomatal Effect. J. E. Pallas, Jr., USDA-SEA, Watkinsville, Georgia 30677, and S. J. Kays, University of Georgia, Athens, Georgia 30602.

We have issued a preliminary report [Nature 285:41 (1980)] indicating that ethylene at hormonally significant levels will reduce net photosynthesis of the cultivated peanut nearly 50%. We report here followup studies primarily using gas analysis. In contrast to peanut, hormonal concentrations of ethylene only moderately inhibit sweet potato, Jerusalem artichoke and sunflower photosynthesis and is without effect on beans, peas, Irish potato, *Mimosa pudica*, or white clover. In peanut some significance in respect to percent inhibition of photosynthesis and photosynthetic efficiency was found. Low oxygen studies indicated that after ethylene treatment photosynthesis was lowered at all CO_2 concentrations below ambient; concomitantly, an increase in the CO_2 compensation level was found. This suggested that photosynthesis was being lowered due to a biophysical phenomenon. Diffusion resistance measurements of leaf water vapor loss made in relation to ethylene treatment showed a measurable decrease in leaf conductance thus indicating that at least a part of the ethylene effect on peanut photosynthesis is related to an increase in stomatal resistance.

Root and Shoot Growth Relationships Among Peanut Genotypes. D. L. Ketring, and W. R. Jordan, USDA-SEA-AR, Agronomy Department, Oklahoma State University, Stillwater, Oklahoma 74078, and Texas Agricultural Experiment Station, Blackland Research Center, Temple, Texas 76501.

The shape and extent of root systems influence the rate and pattern of nutrient and water uptake from the soil. In dicotyledons such as peanut the primary root and its laterals constitute the main root system. Shoot and root growth of 23 genotypes (12 Spanish- and 11 Virginia-type) were compared in greenhouse studies using clear acrylic tubes 7.5 cm in diameter and 2.2 m in length. Ranges for Spanish-types were 1.23 to 2.65 g, 214 to 409 cm^2, 95.0 to 186.8 cm, and 1.0 to 3.1 for shoot dry weight, leaf area, tap root length, and root number at 1 meter depth, respectively. Similarly, ranges for Virginia-types were 1.35 to 3.23 g, 135 to 460 cm^2, 122.4 to 192.6 cm, and 1.0 to 7.1. Correlations between shoot and root parameters indicate strong coordination between aerial and subterranean growth. However, coupling of leaf area to root length was stronger for Virginia-types than Spanish-types. Root length and numbers were highly correlated for Spanish-types, but not for Virginia-types. In another test that included two each of Virginia-, Spanish- and Valencia-types similar results were found. In separate tests, root volumes were determined. Significant differences were found among the genotypes tested. The results indicate that even within this limited sample of peanut germplasm there is considerable diversity in root growth and there is high shoot/root coordination.

Effect of Drought on Vegetative and Reproductive Development of Peanut. K. J. Boote and L. C. Hammond, Departments of Agronomy and Soil Science, respectively, University of Florida, Gainesville, Florida 32611.

Peanut (Arachis hypogaea L.) cultivars were grown under drought versus irrigation on a Lake fine sand in 1979 and 1980 to evaluate drought effects on vegetative development and timing of reproductive stages. Drought occurred naturally in 1980 and was enhanced in 1979 by covering plots with mobile rain shelters whenever rainfall was imminent. In both years, the major drought periods occurred during early pegging and pod formation (approximately 40 to 82 days). Droughts during this period reduced vegetative growth by reducing both the rate of node formation and by reducing elongation growth. Droughted plants remained 3 to 5 nodes shorter than irrigated plants even after watering was resumed. The droughts reduced reproductive growth more than vegetative growth and resulted in 51% fewer pegs and pods by day 77. Pod formation resumed upon re-watering, but the delay in achieving a pod load and the later start of pod fill caused maturity to be delayed by 10-11 days. This was evident by comparing the time course for the percentage of pods achieving "mature pod" status. For early season droughts followed by sufficient water, producers should anticipate later harvest, possibly in proportion to the days it would have taken to grow the number of nodes not produced during drought.

Preliminary Report of Studies on Peanuts From Bioregulator-Treated Plants. R. L. Ory, E. J. Conkerton, A. J. St. Angelo, and C. Vinnett, Southern Regional Research Center, P.O. Box 19687, New Orleans, Louisiana 70179, and F. R. Rittig and M. Schroeder, BASF Company, Agricultural Research Station, 6703 Limburgerhof, West Germany.

As an alternate means of trying to produce peanuts with extended shelf life/flavor properties, peanut plants were treated with different levels of bioregulators at varying times between flowering and pegging. Peanuts from untreated and treated plants were harvested, dried in the window, hand shelled, and analyzed for peroxide development, lipoxygenase activity, calcium contents, and protein patterns by gel electrophoresis and immunoelectrophoresis. Some samples were roasted and evaluated by a trained taste panel. Results showed little or no changes in calcium contents, protein patterns, nitrogen contents, peroxide values, tocopherols, and on flavor of fresh peanuts, but there was a significant decrease in the lipoxygenase activity of treated seeds compared to untreated controls. Possible implications of these findings for extending shelf life and flavor of stored peanuts and reducing energy costs for storage will be presented.

Peanut Physiological Research at ICRISAT for the Semi-Arid Tropics. I. S. Campbell and J. H. Williams, Groundnut Physiology, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru P. O. 502 324, A. P., India.

The Groundnut Improvement Program (GIP) at ICRISAT began in 1976, but the physiology sub-program only began in October, 1980. The sub-program will concentrate on the performance of peanuts when subjected to drought, heat, insect, disease, and nutrient stress. While yields in the SAT are usually low (800 kg/ha of dried pod, or less), severe stresses can reduce pod yield to zero. Present studies include drought-stressed germplasm screening, line source x time of drought stress, plant density x variety x time of drought stress interactions, and yield potential trait work. Two full season crops can be grown each year at ICRISAT. The drought and heat stress work will be done mainly in the post-rainy season while disease work will be in the rainy season. Nutrient stress and yield potential trait studies will be part of both seasons' work. Full integration of the sub-program's research projects with those of other sub-programs in the GIP is an essential feature. This integration also extends across programs within ICRISAT. Not all work can be or should be performed at ICRISAT. The sub-program will be most effective if it concentrates on field oriented studies and relies on other research institutions for special capabilities whenever necessary. Close international cooperation will be needed to solve the many problems of peanuts in the SAT.

Effects of Partial Shading on Growth and Yield of Peanuts. S. S. Rajan, F.A.O., P. O. Box 163, Baghdad, Iraq.

In Burma 60% of the area under peanuts is raised in the monsoon season with yields of 450 kg/ha, while 40% is raised in the winter season with yields of 800 kg/ha. A study to assess the effects of partial shading, thus simulating cloudy days, as a possible cause for low monsoon yields, was made at Yezin, Burma. Magwe-10, an erect type, was planted on 15 December and seven shading treatments, by providing screens of bamboo slats, 2.5 cm wide spaced 2.5 cm apart fixed at a height of 45 cm above ground, were given at intervals of 15 days each commencing from 15 days after planting. Continuous shading from planting to harvest, and no-shading, served as checks. While the unshaded check gave the maximum values for the growth traits studied, the planting-to-harvest shaded check did not give the lowest values. This indicated that there are specific growth stages so sensitive to shading as to bring down the values to lower levels than those in continuous shading. These were 45 and 90 days after planting. For all the traits these two treatments had the lowest, or not significantly different from the lowest, values. On the other hand, shading from 75 days after planting resulted in the maximum number of primary branches and pegs per plant, while not differing significantly from the highest values for the other traits. Thus, except for the period from 75 to 90 days after planting, reduction of light intensities appear to affect the crop deleteriously, and this could be one possible reason for low monsoon yields in Burma.

PATHOLOGY

<u>Relationship of Environmental Factors to Infection and Colonization of 'Florigiant' Peanut by *Sclerotinia minor*</u>. Roberta L. Dow, Norris L. Powell, and D. Morris Porter, Department Plant Pathology and Physiology, VPI, Blacksbury, Virginia; Department of Agronomy, VPI, Blacksburg, Virginia; and USDA-SEA-AR, Suffolk, Virginia.

Twenty 'Florigiant' peanut plants (I) were inoculated each week by placing a sclerotium in the lower leaf axil of a lateral branch. Observations on germination, infection, and colonization (lesion length measurements) were made weekly. Weather data and soil moisture measurements were taken throughout the season. Time of exposure of the sclerotia to the plants and environment was not a key factor for germination since the first germination of an I occurred in the same week regardless of the number of weeks after inoculation. In 1979, many infections occurred from the inoculations and lesion development was extensive by the end of the season. The change in lesion length for each I for each week of the season was regressed against the preceding two weeks' environmental variables. Factors most often important to the model were average maximum temperature for the week two weeks prior (TP) and one week prior (T) to lesion measurement, total precipitation (PP) and soil moisture (MP) of the week two weeks prior to lesion measurement. The regression relationship was negative for TP and T and positive for PP and MP. Few infections developed from the inoculations of 1980. The number of days within the week prior to lesion measurement with temperature $\leq$ 62 F (D62), the interaction of D62 with the total precipitation of the week, and the average relative humidity of this period were significant (α=.03) in a three variable model (r^2=.87) to explain change in lesion length.

Assaying Peanut Field Soil by Elutriation to Determine the Sclerotial Populations Of *Sclerotinia minor*. D. M. Porter and J. L. Steele, USDA-SEA-AR, P. O. Box 7099, Suffolk, Virginia 23437.

Sclerotia of *Sclerotinia minor* were elutriated from soil. Water pressure to the four-unit semi-automatic elutriator was maintained at ca 36 psi. Water flow and air flow were ca 64 ml/sec and ca 231 cm^3/sec/unit, respectively. Sclerotia, collected on 425 µm mesh sieves, were counted with the aid of a stereomicroscope (10X). Recovery of sclerotia from sclerotia-seeded soil during 3.0, 4.5, 6.75, 10.0 and 15.0 minutes elutriation was 65, 83, 92, 94 and 97%, respectively, and was not influenced by soil sample size (50 to 400 g). Collection of debris on sieves was influenced by both time of elutriation and sample size. Air dried samples (100 g) from *S. minor* infested soil sampled shortly following harvest in 2.5-cm increments down to a depth of 20.3 cm were elutriated for 6.75 minutes and sclerotia were collected on a 425 µm mesh sieve. The number of sclerotia in the top 2.5-cm increments of soil ranged from less than 1/100 g soil to over 30/100 g soil depending on severity of disease. Sclerotial numbers usually declined with soil depth. Plowing (turning) of soil usually mixed sclerotia throughout the plow zone (20 cm) with sclerotial numbers highest at the bottom of the plow zone. Sclerotia were recovered throughout the plow zone from farm soil with a history of Sclerotinia blight but not planted to peanuts since 1977.

Use of Aerial Infrared Photography to Determine Estimates of Peanut Crop Losses Due to Sclerotinia Blight. S. D. Thomas , N. L. Powell, D. M. Porter, and P. M. Phipps, USDA-SEA-AR, and Tidewater Research Center, Suffolk, Virginia.

Most of the peanut acreage (104,000 acres) of Virginia was photographed in 1979 prior to harvest using aerial infrared film. Infrared photographs capable of detecting symptoms of Sclerotinia blight (SB), caused by Sclerotinia minor Jag., were taken at an altitude of 3,658 m. Thirteen flight lines, flying east to west of the peanut growing region and vice versa, were plotted on topographic maps. For photo-interpretation, alternate flight lines were selected due to the north-south overlap of the photographs. Each flight line was composed of about 24 frames. Each frame was uniformly divided by a grid and fields within one quadrant, selected at random, were viewed for symptoms of SB. Total peanut acreage and the acreage exhibiting symptoms of SB in each field were measured with a planimeter. Based on spectral appearance, disease severity ratings of slight, moderate and severe were assigned to fields or portions of fields exhibiting disease symptoms. A total of 3,922 acres or 3.8% of the total acreage planted in Virginia was assessed for symptoms of SB. Almost 1,700 acres or 43% of the total acreage viewed exhibited symptoms of SB. Symptoms of SB were noted throughout the entire peanut growing region. Tractor tire injury to plants represented 35% of the total amount of SB. Based on photo-interpretation, estimates of peanut crop losses in 1979 due to SB exceeded 15% and cost Virginia growers in excess of $11,000,000.

Effect of Plant Age on the Susceptibility of the Peanut Cv. Tamnut 74 to Verticillium Wilt. H. A. Melouk and D. F. Wadsworth , USDA-SEA-AR, and Department of Plant Pathology, Oklahoma State University, Stillwater, Oklahoma 74078.

Plants of the peanut cultivar 'Tamnut 74' were inoculated with Verticillium dahliae at various ages (4, 6, 8 and 12 wk). Inoculations were accomplished by soaking the roots for 45 minutes in a conidial suspension containing 1×10^6 conidia/ml. Plants were transplanted in pots (16.5 cm) containing a mixture of soil, fine shredded peat and sand (4:1:5;v/v/v). Plants were maintained under greenhouse conditions favorable to the growth of peanuts.

Verticillium wilt symptoms appeared on all inoculated plants within two to three weeks after inoculation. Early symptoms consisted of epinasty, marginal and general chlorosis of leaves, and short internodes. Later developing symptoms involved flaccidity and defoliation of leaves and wilting of plants.

Sixty days after each of the inoculations, the effects of infection on plants were evaluated. At that time, aerial parts and roots were separated. Total pegs and pegs with fruits per plant were determined. Aerial parts and roots were dried for 15 minutes in a microwave oven at maximum power and dry weights were recorded.

Reductions in root mass, aerial plant parts, total pegs, and pegs with fruits were noted on all inoculated plants as compared to non-inoculated controls, however, the reductions were less drastic in plants inoculated at eight or twelve weeks of age.

Pod Rot Disease of Peanut at ICRISAT, India. V. K. Mehan, D. McDonald and V. R. Rao, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru P.O. 502 324, A.P., India.

A pod rot disease of peanuts was observed at ICRISAT in the 1978/79 post-rainy season crop and has been found at significant incidence in all subsequent rainy and postrainy season crops. Isolations from large numbers of rotted pods showed Fusarium solani (Mart.) Sacc. and F. oxysporum Schlecht. to be the most common invaders. Macrophomina phaseolina (Tassi) Goid and Rhizoctonia solani were the most commonly occurring of a range of other fungi present. No species of Pythium was isolated.

Field screening of the ICRISAT germplasm collection for pod rot resistance was started in 1979 and although levels of pod rot disease varied between fields and between seasons some cultivars have been found to have consistently good levels of resistance. These include J 11, NC Ac 841, Exotic 6, Var. 27, Ah 7223 and Ah 7299. In tests at ICRISAT three of these cultivars, J 11, Var. 27 and Ah 7223, have also been found to possess high resistance to colonization of seeds by Aspergillus flavus.

The Occurrence of Peanut Wilt and Stunt, Incited by Pythium Myriotylum, in Texas. B. L. Jones, Texas Agricultural Experiment Station, Stephenville, Texas 76401.

Peanut yield has declined in recent years in the low areas of many irrigated peanut fields of north central Texas. Affected plants within the low areas are stunted and many die before harvest. Foliage lacks luster, often wilts even when there is ample moisture, and leaflets may develop marginal necrosis and absciss early. Primary and lateral roots develop brown rot, and vascular discoloration develops in primary roots. Yield of diseased plants is reduced drastically. Rhizoctonia solani, Pythium myriotylum, Neocosmospora vasinfecta and Fusarium spp. were isolated from roots of diseased plants. Koch's postulates tests performed with these fungi on 'Tamnut 74' and 'Florunner' varieties indicated that Pythium myriotylum was the primary pathogen.

Efficacy of Formulations of Furmecyclox on White Mold. A. S. Csinos, Plant Pathology Department, University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia 31793.

Two formulations of furmecyclox (N-cyclohexyl-N-methoxy-2,5-dimethyl furan-3-carboxylic acid-amide) were evaluated for control of Sclerotium rolfsii on peanuts in field plots. Plots consisted of two rows 7.6 m long, replicated six times in a randomized complete block design. BASF 38906F 40 WP was applied at 1.12, 2.4 and 4.48 kg a.i./ha on July 2 and again three and six weeks later. OAC 3890 10G, at 11.2 kg a.i./ha and the standard, Terraclor + Dasanit 10-3G at 112 kg/ha were applied on July 3. The materials were applied in a 36 cm band over the row. Yields for BASF 38906F treated plots did not differ from yields on control plots ($P=0.05$), and were less than yields for Terraclor + Dasanit plots. Plots treated with OAC 3890 10G had fewer Sclerotium rolfsii disease loci and produced a greater yield than control plots or plots treated with Terraclor + Dasanit. The active ingredient of both OAC 3890 and BASF 38906F are identical, but efficacy of the active ingredient apparently is dependent on formulation and perhaps method of application.

Effects of Bacillus subtilis on Emergence of Florunner Peanut Seed. Ronald P. Clay, Paul A. Backman, Mark A. Crawford. Department of Botany, Plant Pathology, and Microbiology, Auburn University Agricultural Experiment Station, Auburn University, Alabama 36849.

Florunner peanut seed treated with ABG-4000 (B. subtilis) in the 1980 seed treatment test in Headland, Alabama exhibited substantial increases in emergence rate, field vigor rating, and total germination percentage in comparison with control seed, and recommended fungicide treatments.

Follow-up research has shown similar results in greenhouse germinations and germinator studies. Compatability of ABG-4000 with fungicides indicates an enhanced level of activity when applied in conjunction with liquid seed treatment fungicides (Gustafson). In germinator studies using a seed lot with very low germination rates (16%) and high incidence of moldy kernels (100%), ABG-4000 treated seed showed little germination improvement over the nontreated control when applied alone. These same seed, when treated with a combination of ABG-4000 and Gustafson fungicide exhibited improved germination rates and vigor beyond those found for any fungicide used alone.

The nature of this effect is not known but may be related to hormone production by the bacterium. Fungistatic effects thought to be involved in improved field emergence (1980 trials) have not been observed in the laboratory. Accelerated emergence rates may merely allow for disease escape with subsequently higher levels of emergence.

Effects of Nematicides Applied at Planting and Postplant on Peanut Yields, Root-knot Nematodes, and White Mold. N. A. Minton , D. K. Bell, and A. S. Csinos, USDA-SEA-AR, and the University of Georgia, College of Agriculture, Coastal Plain Experiment Station, Tifton, Georgia 31793.

Ethylene dibromide (EDB) and phenamiphos (PH) were evaluated in peanuts in 1979-1980 in Meloidogyne arenaria and Sclerotium rolfsii infested soil in split-plot experiments with at-plant and postplant treatments comprising the whole plots and subplots, respectively. Whole plot and subplot treatments were untreated check, EDB at 17.9 and 35.8 kg ai/ha, and PH at 1.1 and 2.8 kg ai/ha. Two-year average peanut yields ranged from 4156 kg/ha in untreated plots to 5088 kg/ha in plots that received EDB at 17.9 kg ai/ha at planting + PH at 2.8 kg ai/ha postplant. PH at 2.8 kg ai/ha applied at planting, and all postplant treatments increased yields (P=0.05). Yields were increased (P=0.05) when PH at 1.1 and 2.8 kg ai/ha was applied postplant to plots treated at planting with PH at 1.1 kg ai/ha. Also, PH at 2.8 kg ai/ha and EDB at 3.58 kg ai/ha were not enhanced by addition of any postplant treatment. Root-knot indices were reduced (P=0.05) by all at-plant or postplant treatments. Treatments did not significantly affect the incidence of S. rolfsii. These results indicate that postplant treatments may be beneficial when nematode pressure is great and no nematicide, or low rates of nematicides, are applied at planting.

The Effect of Methods of Application on the Efficacy of Selected Systemic Nematicides for Control of Meloidogyne arenaria on Florunner Peanuts and Soybeans. R. Rodriguez-Kabana and Peggy S. King, Department of Botany, Plant Pathology, and Microbiology, Auburn University, Alabama 36849.

Aldicarb, oxamyl, phenamiphos and carbofuran were applied at planting time in field experiments with Ransom soybeans and Florunner peanuts to study the effect of the method of application on their efficacy against Meloidogyne arenaria (Neal) Chitwood. Each nematicide was applied at rates of one, and two pounds a.i. per acre in the soybean tests and at one, two, and three pounds a.i./acre in the peanut experiments. Each nematicide rate in the soybean experiments was applied in-furrow, and in five and 14-inch bands followed by light incorporation; in the peanut experiments an additional seven-inch band application was included. Results indicated that in general banded applications were superior to in-furrow applications for control of the nematode and consequent yield response. Band widths of five or seven inches were adequate for optimal efficacy of the nematicides; no particular advantage was derived from the use of the 14-inch band when compared with the narrower band of the study.

Genotypic Differences in Fungal Penetration of Peanut Shells: A Factor in Selecting for Pod Rot Resistance. Luke Wisniewski, O. D. Smith, and T. E. Boswell, Texas Agricultural Experiment Station, Texas A&M University System, College Station and Yoakum.

Pod rot disease ratings have been used as a selection criterion in breeding for pod rot resistance. In several tests the "resistant" genotype PI 341885 has shown considerable pod discoloration but low percentages of damaged kernels: an indication that the fungus did not penetrate through the shell. Progeny of crosses involving PI 341885 might produce similar disease reactions and be rejected when selecting resistant lines. A selection criterion that takes into account the fungal penetration through the shell was developed. Pods with surface discoloration, because of disease, are visually selected from 300 gram plot samples and shelled separately. The percentage of sound kernels (mature and immature) from damaged pods are determined. Comparisons among genotypes in sound kernel precentages from damaged pods is a measure of shell resistance to fungal penetration. The percentage of pods without diseased shells, and the percentage of sound kernels from diseased pods provides two measures of resistance. The data verify that genotypes differ in resistance to shell penetration by pod rotting organisms and indicate that shell penetration evaluations can be a useful supplement to pod rot ratings when selecting for pod rot resistance.

Resistance to Sclerotium rolfsii in Pod Rot Resistant Lines. O. D. Smith , T. E. Boswell, and W. J. Grichar, Texas Agricultural Experiment Station, Texas A&M University System, College Station and Yoakum.

Previous reports have stated that PI 365553 has useful levels of resistance to pod rot caused by *Pythium myriotylum* and *Rhizoctonia solani*, and to the lesion nematode *Pratylenchus brachyurus*. Data from 1980 Texas field trials indicate that this genotype also resists infection by *Sclerotium rolfsii* Sacc. The number of *S. rolfsii* infection sites per plot, identifed as dead plants or branches, were counted in three replicated field tests that included PI 365553, PI 365553 x Tamnut 74 F_6 lines, commercial check varieties, and other lines selected for pod rot resistance. Fewer infection sites were found in PI 365553 and some F_6 lines derived from PI 365553 than in commercial checks. The number of infection sites in other F_6 lines from the same cross were much higher than for the P.I., suggesting that segregation has occurred and thus the trait is heritable. The relationship of the resistance to *P. myriotylum*, *R. solani*, *P. brachyurus*, and *S. rolfsii* are being studied.

Peanut Leafspot Control in Florida as Affected by Spray Initiation Date and Planting Date. G. E. Sanden, Rohm and Haas Company, F. M. Shokes, Agricultural Research and Education Center, Quincy, Florida, D. W. Gorbet, Agricultural Research Center, Marianna, Florida.

Early initiation (34 days after planting) of a peanut leafspot spray program with chlorothalonil gave higher yields, lower defoliation, and fewer lesions/leaflet than seven other progressively later initiation treatments in three years of testing. Each 14-day delay in spray initiation resulted in higher lesion numbers than for the preceding beginning date when sampled at 91, 105, and 119 days after planting. Late planting (May 21-23) resulted in a sixfold increase in the number of lesions/leaflet and a yield decrease of 764 kg/ha over all spray initiation treatments compared to the early planting date (April 22-25).

Relative Incidence of Cercosporidium Personatum and Cercospora Arachidicola in Florida and Georgia. F. M. Shokes and R. H. Littrell, University of Florida, Agricultural Research and Education Center, Quincy, Florida 32351, and University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia 31793.

In 1979 *Cercosporidium personatum* (CP) was identified as causing 79.7% of the leafspots in untreated 'Florunner' peanut plots at Marianna, Florida, by August 7 (70 days after planting). No leafspot was detected on fully expanded leaflets three nodes down from the apex of central stems in plots sprayed with Chlorothalonil (2.125 pts/A) at this date. Only low numbers of leafspots (0.5 spots/leaflet) were evident in plots treated with triphenyltin hydroxide (TPTH) (0.5 lbs/A), 60.9% of which were CP. By October 1 untreated areas were defoliated and Chlorothalonil and TPTH plots had 93.5% and 97.7% CP lesions, respectively. In mid-August, 1980 at Tifton, Georgia, irrigated, untreated, peanuts exhibited 57.6% *Cercospora arachidicola* (CA) lesions per infected leaflet and unirrigated, untreated Marianna plots had 56% CA lesions per infected leaflet. By August 31, CP represented 94.9% of the lesions in Tifton plots. Only 78.5% of the lesions in the unirrigated Marianna plots were CP by September 8. Peanuts treated with Chlorothalonil and TPTH had lower numbers of leafspots throughout the season but exhibited a similar late-season switch from CA to CP in 1980. The predominant leafspot fungus in any given disease evaluation may be affected by the assessment date.

The Effects of Using CDA Equipment to Apply Chlorothalonil to Florunner Peanuts in Georgia. K. J. Middleton, Department of Primary Industries, Kingaroy, Queensland, Australia and R. H. Littrell, Plant Pathology Department, University of Georgia, Coastal Plain Experiment Station, Tifton, Georgia.

Chlorothalonil as Bravo 500 was applied on six occasions to Florunner peanuts for leafspot (Cercosporidium personatum) control using two types of equipment. Conventional equipment was used to apply 1176 g a.i./ha in 93.6 L/ha per application. Controlled Droplet Application (CDA) equipment applying a total volume of 9.36 L/ha was used to apply 1176 g, 588 g and 294 g a.i./ha per application. In addition, the intermediate rate of fungicide was also applied by CDA in 4.68 L/ha, and in 9.36 L/ha with the addition of Amway All Purpose Spray Adjuvant. A non-sprayed control was included. Fungicide deposition on foliage, disease incidence at maturity, and yield were measured.

Fungicide deposition was enhanced by the change from conventional to CDA equipment, and further enhanced by the reduction of spray volume applied by the CDA equipment from 9.36 L/ha (J100 ml/minute) to 4.68 L/ha (<100 ml/minute). Use of the adjuvant did not affect deposition.

Disease incidence was low, and all sprayed treatments adequately controlled infection. Yield of all treatments was equal, except where the full rate of chlorothalonil was applied by CDA equipment, when a yield depression was recorded. These results follow a pattern similar to that reported previously.

Control of the Fungal Diseases of Peanuts with Sterol Inhibitor Fungicides.
P. A. Backman, Department of Botany, Plant Pathology, and Microbiology, Auburn University, Alabama 36849.

In the Southeastern United States, peanuts are grown under the influence of warm, moist, tropical air masses conducive to foliar and soil-borne fungal diseases. This disease complex is managed primarily by the applications of chlorothalonil (660 gm a.i./ha) for foliar disease control, and PCNB (quintozene) for control of stem rot (Sclerotium rolfsii). Recently, applications of the sterol inhibitor fungicides bitertanol (Bayer/Mobay) at 280 gm a.i./ha or CGA-64250 (Tilt, Ciba-Geigy) at 175 gm a.i./ha were evaluated for effects on foliar as well as soil-borne diseases. Results indicated that both fungicides effectively controlled peanut leafspots caused by Cercospora arachidicola and Cercosporidium personatum. Detailed observation of symptoms indicated that bitertanol was more effective on C. personatum, while CGA-64250 was more effective on C. arachidicola. Bitertanol showed excellent activity against Puccinia arachidis in the only year that it occurred (1978).

Addition of CGA-64250 granules (2.0%) at a rate of 840 gm a.i./ha, either to CGA-64250, or chlorothalonil-sprayed plots reduced damage from Sclerotium rolfsii by 70 to 90%. Chlorothalonil plots receiving these granules had significantly less ($P<0.05$) infection by peanut leafspots. Yields with the granule were 25-35% greater than plots receiving only foliar sprays. Improved S. rolfsii and leafspot control indicates that granular formulations of sterol-inhibitor fungicies may aid the overall performance of highly effective leafspot fungicides, and improve the overall acceptability of less effective fungicides.

Disease Assessment of Peanut Leafspot. T. E. Starkey, Department of Plant Pathology, University of Georgia, Athens, Georgia 30602.

Many methods have been used to assess the impact of peanut leaf spot caused by Cercospora arachidicola Hori and Cercosporidium personatum (Berk. & Curt.) Deighton. Among the more common are percent infection based upon infected, and/or defoliated leaflets, number of spots per leaflet, defoliation ratings and a variety of visual rating methods. The main stem of 1000 plants in a 0.3-ha field of 'Florunner' peanut were sampled 70 days after planting to determine incidence and severity of leaf spot. For each stem the number and position of infected and defoliated leaflets, the total number of leaflets, the number and position of leaf spots per leaflet, and the total height of the stem were recorded. The data from each stem were grouped so as to divide the stem into equal segments. Each segment of the stem was statistically analyzed to determine areas of large variation relative to parameter measured. Assessment methods which ignore these differences in variation may exhibit a lack of accuracy and precision. For example, the variation in the number of leaf spots in the middle of the plant is 10 times greater than at the top and twice as much as at the bottom.

Effects of Foliar Spray Programs on the Soil Microflora of Peanuts. H. G. Hancock and P. A. Backman, Department of Botany, Plant Pathology and Microbiology, Auburn University Agricultural Experiment Station, Auburn University, Alabama 36849.

Several recent reports have indicated that foliar-applied fungicides, used to control leafspot, have substantial effects on peanut diseases and seed quality. No data is available on soil microflora shifts resulting from applications of foliar fungicides. Data developed during the 1980 season evaluated these effects under irrigated and drought-stressed conditions.

Total fungal populations were similar among soil, geocarposphere or rhizosphere habitats in both irrigated and drought-stressed peanuts. However, osmophilic populations were several times greater in stressed peanuts. Significant cumulative treatment effects were observed in geocarposphere populations of *Aspergillus flavus* Link. Fentin hydroxide and thiabendazole at double recommended rates had higher geocarposphere levels of *A. flavus* than other treated and untreated plots. *Aspergillus niger* v. Tiegh. was a lesser component of the mycoflorae and was unaffected by treatment.

Populations of *Penicillum* spp. and *Trichoderma* spp. were greater in irrigated peanuts. Geocarposphere population of *Trichoderma* spp. were significantly decreased in drought-stressed benzimidazole treatments.

The low incidence of fungicide effects in irrigated peanuts indicates that component populations of the microflorae are susceptible to treatment when edaphic and climatic factors become limiting. In drought-stressed habitats, fungicide may act directly or indirectly (mediated through the plant) on specific fungal populations or antagonist populations. The dominant fungal populations being determined by these fungicide, physical and biological interactions.

Effects of Oil-Surfactant Blends and Surfactants on Peanut Leafspot When Tank Mixed With Chlorothalonil. M. A. Crawford and P. A. Backman, Department of Botany, Plant Pathology and Microbiology, Auburn University Agricultural Experiment Station, Auburn University, Alabama 36849.

Non-ionic and cationic surfactants and an oil-surfactant blend (Penetrator® 3) were tank-mixed with chlorothalonil to improve the efficacy of chlorothalonil for peanut leafspot control. The surfactants were combined in equal rates with chlorothalonil at 2.125, 1.75 and 1.25 pints per acre. Neither surfactant improved the performance of chlorothalonil at any rate, and the cationic was found to be phytotoxic.

In 2 years of field trials, Penetrator® (83% oil and 17% surfactant), was combined at 4, 8, and 16 fl oz per 15 gal water per acre with 2 pints of chlorothalonil. When 4 fl oz of Penetrator was used, chlorothalonil performance was superior to chlorothalonil used alone at 2.125 pints per acre. The 16 fl oz rate was phytotoxic and at 8 fl oz no improvement of chlorothalonil performance was observed. In the second year, 6 fl oz of Penetrator tank-mixed with 2 pints of chlorothalonil again resulted in superior disease control over chlorothalonil used at 2.125 pints. The addition of Penetrator to chlorothalonil may improve coverage and allow for lower chlorothalonil use rates while maintaining good disease control.

Identity of the Peanut Web Blotch Fungus in the United States. Ruth Ann Taber and Robert E. Pettit, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843 and George L. Philley, Texas Agricultural Extension Service, Overton, Texas 75648.

Comparison of 15 fungal isolates from peanut leaf lesions exhibiting web blotch symptoms originating from peanut plants grown in Argentina, South Africa, Georgia, Oklahoma, Virginia, and Texas show that the causative organism in all countries is *Phoma arachidicola* Marasas, Paur, and Boerema. Pycnidiospores are borne on short pycnidiophores and are predominately one-celled in culture. Large 1-septate spores were also observed in culture, as was an occasional 2-septate spore. Mature spores in pycnidia on infected leaflets become 1-septate. Optimum growth occurred at a temperature of 20°C but grew little at 5°C and 35°C. Pycnidia formed profusely at temperatures between 20°C and 25°C. The teleomorphic (sexual) state formed under natural conditions and on sterilized peanuts leaves at temperatures between 15°C and 20°C. Cultures derived from single ascospores formed sexual structures. Multicellular chlamydospores (abortive fruiting structures?) formed in culture and were also shown to be infective units.

Web Blotch of Peanut in Virginia. P. M. Phipps, Tidewater Research and Continuing Education Center, Suffolk, Virginia 23437.

Web blotch of peanut was found for the first time in Virginia on 2 October 1979 in the City of Suffolk. Surveys for the disease prior to harvest confirmed its presence in three fields in Suffolk, but not in the remaining six counties of the Virginia peanut production area. Although approximately 1 ha of a field planted to 'Florigiant' peanut sustained heavy defoliation, area-wide losses were believed insignificant. The causal fungus was apparently introduced into the region with strong winds and heavy rainfall associated with hurricane David between September 3 and 6. This hurricane originated in the south central part of the Atlantic Ocean and crossed over the Dominican Republic, Florida, Georgia, North Carolina, and Virginia. Pycnidia of *Phoma arachidicola* (syn. *Ascochyta arachidis*) were observed in leaf lesions and the fungus was consistently recovered from biopsy tissues on potato dextrose agar amended with chloramphenicol (200 µg/ml). Pathogenicity tests with comminuted leaf inoculum from naturally-infected plants were successful in reproducing the disease in the greenhouse. Both conidia and chlamydospores from axenic cultures of the fungus were demonstrated also to be effective inocula for reproducing the disease. Preliminary evaluations of peanut cultivars indicated that 'Florigiant', 'Argentine', and 'Chico' were significantly more susceptible to this disease than 'Florunner'. 'NC 3033' was the most resistant of 15 cultivars evaluated.

Glycine max: A Potential Host of the Peanut Web Blotch Fungus. D. H. Smith and R. E. McGee, Texas A&M University, Texas Agricultural Experiment Station, Yoakum and Weslaco, respectively.

Peanut web blotch, caused by *Phoma arachidicola* Marasas, Pauer, and Boerema, was first observed in Texas during the 1972 growing season. During that year web blotch symptoms similar to those on peanut foliage were observed on Bragg soybeans adjacent to a peanut field where web blotch had reached epidemic proportions (personal communication, Dugan Wells, Pearsall, Texas). On the basis of this observation, we inoculated Bragg soybeans with *P. arachidicola* in the greenhouse. Abaxial veinal necrosis, followed by the appearance of necrotic lesions was observed on Bragg soybean leaves. However, symptoms on soybean foliage did not resemble those on peanut foliage. *P. arachidicola*, reisolated from soybean leaf tissue and subsequently inoculated onto peanut foliage, induced peanut web blotch symptoms. Fourteen soybean cultivars (Bossier, Bragg, Centennial, Cobb, Coker 156, Coker 338, Coker 488, Davis, Dowling, Hutton, McNair 800, Ransom, Semmes, and Terra Vig 708) were inoculated, and veinal necrosis developed on all cultivars. However, necrotic lesions developed only on Semmes and McNair 800. In areas where highly susceptible Spanish market type peanut cultivars and soybeans are grown in close proximity, there is a potential for development of web blotch on soybeans.

Symposium

Extension-Industry Session Summary
(APRES, July 23, 1981)

Alice J. Farmer

"New Products and Product Uses:" Industry representatives from Rohm & Haas, Union Carbide, Phizer, Stoller Chemical, and Ciba-Geigy introduced new products and discussed expanded labels, all of which promise improved disease control and better yields for the peanut farmer. Rohm & Haas' Blazer label has been submitted for registration to include peanuts; Union Carbide is offering a Brominal-Amiben combination for control of Florida beggarweed. With fungicides, Ciba is considering the registration of Ridomil on peanuts and testing a new systemic (to be called Tilt) for control of most major peanut diseases. Stoller Chemical has added sprinkler irrigation to its TOP COP label and has a new eight-pound per gallon flowable sulfer (BIG 8) registred for control of rust.

"Seed Treatments:" Gustafson is offering an alternative to toxic dusts commonly used as seed treatments for peanuts. According to Kyle Rushing, Gustafson is converting existing dusts to flowables and formulating combinations containing at least two and sometimes three different active ingredients. The objective is to gain a broader spectrum of control and to reduce the handling difficulties of seed dressing dusts.

Larry Worn of UpJohn reaffirmed the integrity of traditional dust seed protectants and pointed out the advantages of Botec, a 30-30 formulation of Botran plus Captan. It is registered for control of most seedling diseases such as Rhizopus, Aspergillus niger, and Rhizoctonia solani.

"Export Markets:" Interest in export marketing is growing rapidly and according to spokesmen, Dr. Duncan McDonald (ICRISAT, India) and Ray Smith (Diamond Shamrock), the needs are great. Discussing the agriculture of Nigeria, West Africa, India, China, and Brazil, both speakers indicated that major problems exist. Poor quality seed (a 30-40% loss during seedling emergence), Cercospora diseases, rust, and web blotch are common. The concensus seemed to be, however, that the biggest hindrance to healthy peanut yields is the naivete of the farmer. Advanced chemical technology is useful only if the users have been adequately educated.

"Controlled Droplet Application:" "The field of pesticide application has not progressed at the same pace as the development of pesticides," says Frank McGarvey of Micron Corp. in Houston. The conventional spray nozzle has changed very little since its conception in the early 1900's. Controlled Droplet Application (CDA) is one of the newest methods for applying pesticides. CDA is a more efficient method of generating uniform size droplets of a specific size to deliver the pesticide exactly on target. Research has demonstrated repeatedly that pesticide and dilution rates can be reduced to a minimum and still be effective with the use of the Micron nozzles (trade-marked Micromax).

"Fungigation:" Drs. Chip Lee (Texas A&M) and Sam Thompson (University of Georgia) both concede that fungigation "is an idea whose time has arrived." Application of fungicides through existing sprinkler irrigation systems provides a timely application method at a fraction of the cost involved in ground or air application. By applying during a time of maximum leaf wetness, droplet size becomes much less important because of secondary spread of materials on the leaf surface. Results over several years have shown fungigation to meet or exceed applications by air in all cases and to closely approximate ground applications. The poof of the effectiveness of fungigation can be seen in the level of grower acceptance.

PROCESSING AND UTILIZATION

The Production of Volatiles in Peanuts at Different Roasting Temperatures Measured by Direct Gas Chromatography. N. V. Lovegren and A. J. St. Angelo, USDA-SEA, Southern Regional Research Center, New Orleans, Louisiana.

The direct gas chromatographic procedure was used to analyze the volatiles produced by heating ground peanuts at various temperatures. The volatiles were absorbed onto a cold Tenax-MPE column. Then, after the peanut sample was removed, the column was temperature programmed for the analysis. In a series of 78 miscellaneous acceptable roasted peanut samples that were analyzed, nine components of the volatile profile comprised over 80% of the total component volatiles. Of these nine components, methanol, acetaldehyde, 3-methyl butanal, N-methyl pyrrole, and trimethyl pyrazine (plus three-carbon substituted benzene) were produced at increasing rates over the tested inlet range of 104-172°C. 2-Methyl propanal increased greatly starting from 145°C, whereas dimethyl pyrazine, dimethyl ethyl pyrazine, and benzene acetaldehyde increased greatly starting from 154°C. All of these volatiles are produced at greatly increased rates above the initiation of roasting (browning) (154°C). Other volatile compounds did not increase with increase of inlet temperature, and a few increased slightly but were masked by the great increase of others.

Volatile Profile of Raw Peanuts as an Indicator of Quality. A. J. St. Angelo, N. V. Lovegren, and C. H. Vinnett, USDA-SEA, Southern Regional Research Center, New Orleans, LA.

The 1980 peanut crop suffered severe losses because of the drought in the United States. In many cases, the peanuts that were harvested had off-flavors. To offset crop losses, peanuts from several foreign countries were imported for use in various products. Many raw samples, both imported and U.S. grown, were examined by direct gas chromatography, then evaluated by sensory techniques for their flavor quality. The volatile profiles so obtained were used as an indicator of quality. In testing numerous raw peanut samples, indicators of suspect peanuts were found that could provide a means of dividing the peanuts into several different groups, such as peanuts that had possibly undergone (1) fermentation, (2) oxidation, or (3) exterior contamination. Two other indicators were also observed, but the source of peanut abuse has not yet been identified. The volatile profiles of each of these groups and several high grade controls will be discussed in regard to peanut quality.

Improved Methods for Removing Oil from "Difficult-to-Press" Peanuts. J. Pominski, H. M. Pearce, Jr., and J. J. Spadaro, Southern Regional Research Center, New Orleans, LA 70179, and J. R. Baxley, PERT Labs., Inc., Edenton, North Carolina 27932.

Commercial peanuts are hydraulically cage-pressed for subsequent use in the production of partially defatted peanuts, partially defatted flours and other products. For unknown reasons, sufficient oil cannot be removed from certain lots of peanuts. New procedures were developed on a laboratory scale for pressing these "difficult-to-press" (DTP) peanuts to increase the oil yields to a level comparable to that of "easy-to-press" (ETP) peanuts. Pressing tests show that the amount of oil removed from DTP peanuts can be increased by mixing these peanuts with ETP peanuts prior to pressing. For various mixtures of these two peanuts, oil yields obtained after pressing for 30 minutes at 2000 psi were as follows: 100% DTP-57.3% oil removed; 75% DTP-60.6% oil removed and 100% ETP-66.9% oil removed; a mixture containing 50% DTP peanuts yield as much oil as the 100% ETP peanuts. The data indicate that compressability and spacing arrangement of the peanuts being pressed probably affect the amount of oil removed. Drying the DTP peanuts to a lower moisture level also increased the amount of oil that could be pressed out. Normally, peanuts dried to 5.0-5.5% moisture for optimum oil removal. When DTP peanuts were dried from 5.6% to moistures ranging from 4.1 to 4.8%, oil yields during pressing increased from 57.3% to 68.7%.

Hydrocarbons, Steryl Esters, and Free Sterols of Peanut Oil. R. E. Worthington and H. L. Hitchcock. University of Georgia Experiment Station, Experiment, Georgia 30212.

Peanut oil contains 97-98% glycerides and 2 to 3% of a heterogenous mixture of compounds. Consequently most attention has been given to investigations of glycerides and these investigations have resulted in extensive data on glyceride fatty acid composition and more recently on glyceride structure. The classical approach to the analysis of the non-glyceride types of compounds has involved saponification followed by removal of the non-glyceride with an appropriate solvent. In this study we have separated the non-glyceride materials by non-destructive physical techniques rather than by chemical methods. Quantitation was obtained by the addition of appropriate internal standards for each lipid class to be quantitated. Types of compounds investigated were hydrocarbons, steryl esters, and free sterols. Final quantitation was made by gas-liquid chromatography (GLC). Steryl esters were converted to free sterols and fatty acid methyl esters prior to GLC. Peanut oil contained 0.15% ± 0.00032% steryl ester, 0.156% ± 0.003% free sterol and 0.049% ± 0.004% hydrocarbon. Steryl ester sterols consisted of 18.3% compesterol, 1.6% stigmasterol, 66.8% β-sitosterol, and 12.0% Δ^5-avenasterol. Free sterols fraction contained 14.0% compesterol, 12.6% stigmasterol, 62.0% β-sitosterol, and 10.0% Δ^5-avenasterol. The hydrocarbon fraction contained 59% squalene and a complex mixture of other compounds.

Composition and Quality of Imported Peanuts. Clyde T. Young, Department of Food Science, North Carolina State University, Raleigh, North Carolina 27650.

Imported peanuts from China, India, and Argentina have been analyzed for fatty acid, total amino acids, sugars, free amino acids, calcium, boron, and maturity (AMI). These results are comparable with published data on U.S. peanuts. Predictions are made on the flavor quality of these peanuts based on the chemical composition data. Present information indicate that most of these peanuts would produce acceptable peanut products. The major problems are due to aflatoxin, insect contamination, and blanching.

Effect of Growing Seasons, Locations and Planting Dates on the Total Amino Acid Composition of Two Valencia Peanuts in New Mexico. David Hsi, New Mexico State University, Middle Rio Grande Experiment Station, Los Lunas, New Mexico, Clyde Young, North Carolina Food Science Department, Raleigh, North Carolina and Melchor Ortiz, New Mexico State University, Experimental Statistics Department, Las Cruces, New Mexico.

Two Valencia peanut cultivars, New Mexico Valencia A and New Mexico Valencia C, were grown at Arch and Los Lunas, New Mexico which are about 350 Km apart. All peanuts were grown under either sprinkler or furrow irrigation. Samples were obtained soon after harvest, hydrolyzed and analyzed in Raleigh, North Carolina for amino acid content. No variety by planting date effects were noted at the Arch location; whereas, significant variety by planting date effects were noted for glutamic acid, methionine, isoleucine, and leucine at the Los Lunas location. Planting date effects were found only for glycine at the Los Lunas location and phenylalanine at both locations. Significant variety differences were found for methionine, tyrosine, phenylalanine and lysine at the Arch location and for glycine, methionine, phenylalanine, and lysine at the Los Lunas location. A significant year effect, although small, was noted for about half of the amino acids (aspartic acid, serine, glutamic acid, proline, glycine, tyrosine, phenylalaine, arginine, and the sum of all amino acids) at the Arch location.

Effects of Heat Treatment and κ-Carrageenan Addition on Protein Solubility and Viscosity of Milk Protein/Peanut Flour Blends in an Ionic Environment Simulating Cow's Milk. Ronald H. Schmidt and Marlene R. Padua, Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida 32611.

Peanut flour (PF), whey protein concentrate (WPC), sodium caseinate (SC) and blends of WPC/PF or SC/PF at peanut protein concentrations of 25, 40 and 50% were dispersed in water at 7.0% protein. The dispersions were extensively dialyzed against 11.0% reconstituted nonfat dry milk followed by heating at 60 and 80 C for 1 hr. κ-Carrageenan was added to dialyzed dispersions at levels of 0.1, 0.15 and 0.2% followed by heating at 80 C for 1 hr. Soluble protein was estimated in supernatants following mid-speed (MS) centrifugation (40,000 x g for 20 min) and ultra-speed (US) centrifugation (200,000 x g for 1 hr) at 25 C. Viscosity of protein/ carrageenan dispersions was evaluated from Brookfield viscometer data fitted to the power law function. Soluble protein in PF dispersions was lower than that of the milk proteins examined. Increased centrifugation force from MS to US did not affect soluble protein of PF while supernatant protein in the milk proteins decreased with increased centrifugation force. Increased levels of PF in the milk protein/PF blends generally resulted in lowered soluble protein. Heat treatment increased PF soluble protein, decreased WPC soluble protein and had minimal effect on SC, SC/PF and WPC/PF soluble protein. Carrageenan addition generally increased PF and WPC/PF soluble protein, lowered WPC soluble protein and did not affect SC and SC/PF soluble protein. All heated protein/carrageenan systems exhibited pseudoplastic (shear-thinning) flow behavior. Highest viscosity and consistency index (K) values were observed for WPC and for blends containing WPC. K values for all protein/carrageenan mixture increased with increased levels of carrageenan.

Occurrence and Quality of Florunner Peanuts with Purple Testae. Timothy H. Sanders and Jack L. Pearson, USDA-SEA-AR, National Peanut Research Laboratory, Dawson, Georgia 31742.

Occurrence and quality of Florunner peanuts with purple testae were examined in combined Federal-State check grade samples. Purple testa peanuts increased inversely with seed size, with up to 7.2% in the commercial grade size "other edible." Except for oil color only slight differences were found in objective quality determinations of purple and normal peanuts of the same size. Peanut butter from normal peanuts was judged better that that from purple testa peanuts but no difference was detected between normal and 7.5% purple. These data indicate the need for reevaluation of the "damage" designation of purple tests peanuts.

The number of purple testa No. 1 peanuts increased from 0.86 to 8.53 percent when pods on growing plants were exposed to direct sunlight. Misting freshly harvested peanuts for 10 days in the windrow also increased the occurrence of purple testa peanuts.

Changes in Flavor and Other Quality Factors With Seed Size and Storage Time. H. E. Pattee, J. L. Pearson, C. T. Young, and F. G. Giesbrecht, USDA-SEA-AR, Raleigh, North Carolina; USDA-SEA-AR, Dawson, Georgia, and North Carolina State University, Raleigh, North Carolina.

The relationships of seed size and storage time to peanut quality is poorly documented. To study these relationships shelled peanuts were separated over slotted screens into four seed sizes (dimensions in inches): 15/64th (ride 15/64, fall 16/64); 18/64th (ride 18/64, fall 19/64); 20/64th (ride 20/64, fall 21/64); 22/64th (ride 22/64, fall 23/64) and then placed into storage at 4° C, 50% R.H. for periods of time up to 9 months. Peanut butter from the 15/64th seeds was significantly lower in flavor quality than that from the other seed sizes. The 15/64th seeds had a significantly lower percentage of seeds which blanched after roasting, particularly at zero storage time, and were significantly higher in iodine values. The oxidative stability of the 15/64th seeds was significantly higher that the other size seeds at all storage times, but they showed the largest decrease in oxidative stability with time. The data indicate that except for oxidative stability the 15/64th seeds of Virginia-type have significantly inferior quality.

Peanut and Cowpea Meals as a Replacement for Wheat Flour in Cake-type Doughnuts. Kay H. McWatters, Department of Food Science, Georgia Station, Experiment, Georgia 30212.

Peanut and cowpea meals were used to replace wheat flour at 10, 20, and 30% levels in cake-type buttermilk doughnuts. The legume meals were designated as A - peanut meal from partially defatted, untoasted peanuts; B - peanut meal from partially defatted peanuts toasted at 160°C for 15 min; and C - cowpea meal from 1980 crop dry peas (Dixiecream cultivar). The legume meals were composed of mixed particle sizes which were substantially larger than that of wheat flour and imparted a "grainy" appearance to the test batters. With the exception of meal A at the 30% level which produced a sticky batter and incomplete cutting of doughnut centers, the legume and 100% wheat flour reference batters were easy to cut and dispense into the fryer and produced uniformly-shaped doughnuts. Legume meal batters produced fewer doughnuts, of higher average weight, than those made from 100% wheat flour. Legume meal doughnuts browned more during frying and had lower Gardner color values for lightness (L) than reference doughnuts. Sensory quality scores for appearance, color, aroma, texture, and flavor were acceptable for reference and test doughnuts, indicating that peanut and cowpea meals were compatible ingredients for use in this type of bakery product.

Expanded Utilization of Peanuts in Food Systems. E. M. Ahmed. Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida.

The relatively high contents of protein and oil in peanut kernels render them a rich source for improving the nutritional and caloric values of some food systems, thus alleviating malnutrition disorders and diseases in various parts of the world. Full-fat peanuts could be used to manufacture such food products as peanut butter and a hush-puppy type patty. Fat-free peanut flour could be used to enhance protein content of several food systems. The combination of cereal and peanut proteins may be a useful and economical source of protein for many population groups. Cereal grains such as corn, rice, sorghum and wheat are consumed in large quantities in the developed and developing countries. Bread and baked goods could become an increasingly important vehicle for the development of foods with high nutritional value. Development of weaning foods containing peanut protein would be of interest to many countries due primarily to the shortage of milk protein. A 3:1 mixture of peanut flour to dry skim milk was as effective as skim milk alone in curing infants from Kwashiorkor. Milky beverages made from soybeans are widely accepted foods in the Far East. Peanuts could be ground and formulated into peanut milk beverages and related products. Blending of peanut preparations with a dairy protein system may be advantageous in the formation of heat-coagulated structures without considerable protein modification.

Peanut Cryoproteins - Composition and Characteristics. Shaik-M. M. Basha and Sunil K. Pancholy, Florida A & M University, Tallahassee, Florida.

When a protein solution is exposed to low temperatures some proteins exhibit a reversible-precipitation phenomenon known as cryoprecipitation. Peanut protein extracts when placed at cold temperatures also show reversible-precipitation. The cryoproteins were obtained from peanut seed protein extract by fractionating it on a Sephacryl S-300 column. The resulting fractions were allowed to stand at 4°C for 24 h and the pellets were collected by centrifugation at 4°C. This procedure yielded two cryoprotein peaks (I and II) with molecular weights around 900,000 and 400,000, respectively. The cryprotein peaks did not coincide with the arachin peak. Gel electrophoresis and DEAE-cellulose chromatography showed several differences in their protein composition. However, amino acid and polypeptide composition of the two cryoproteins were similar. Critical temperature for cryoprecipitation was between 0° and 5°C. The amount of cryoprecipitation was dependent on the protein concentration of the solution and was found to be highest at 6 mg/ml for cryoprotein I and 45 mg/ml for cryoprotein II. Addition of 2-mercaptoethanol up to 20 mm to the protein solution had no effect on cryoprotein II, while it caused a 50% decrease in cryoprecipitation of cryoprotein I. Maximum cryoprecipitation was observed at an ionic strength of 0.4 M for cryoprotein I and 0.2 M for cryoprotein II. Cryoprecipitation was pH dependent and found to be highest at 7.5 for cryoproteins I and II.

PRODUCTION TECHNOLOGY

Under-Row Ripping of Peanuts In Virginia. F. S. Wright and D. M. Porter, USDA, ARS, Tidewater Research and Continuing Education Center, Suffolk, Virginia 23437.

The effects of under-row ripping on peanut yields have been under study for several years along with other tillage production practices. In this study tillage treatments included no ripping and ripping and four bed preparations replicated four times. The bed preparations were prepared flat (conventionally), with a rotary tiller and bed shaper, with a disk bedder, and with a rolling cultivator. Test plots were planted at different locations each year to be in a different soil situation. Although some soil types did have an A_2 layer, no soil situation was identified where peanut roots failed to penetrate into the subsoil region. At one location soil temperatures to a depth of 40 cm. were measured and recorded during the growing season. To evaluate these tillage treatments, yield, grade, value, and incidence of pod breakdown were recorded.

Results indicated that under-row ripping as compared to not ripping directly under the plant row adversely affected crop yield and value in some cases and had no significant effect in other cases. Under-row ripping appeared to enhance the incidence of pod breakdown. Based on these studies and the additional energy required to perform the operation, under-row ripping does not appear to be an advantageous tillage operation to use in the peanut tillage production system for Southeast Virginia.

Skip-Row Planted Peanuts in Virginia. R. W. Mozingo, VPI & SU, Tidewater Research and Continuing Education Center, Suffolk, Va. 23437.

Skip-row planting of two Virginia type peanut varieties (Florigiant and NC 7) was evaluated in 1979 and 1980 in single and twin row planting patterns. Plots were 4 rows spaced 91 cm apart. Row patterns were either single row or twin rows (18 cm apart) centered for each 91 cm row. The skip-row pattern was two rows planted and one skipped. Skip-row plantings were significantly higher for yield and value per hectare than the solid plantings. Highest yields and values were recorded with the twin row, skip planting with NC 7 and Florigiant. A significant interaction of row pattern (single or twin row) x planting pattern (solid or skip-row) was recorded. Skip-row planting increased the yield 2.8% for the single row pattern compared to 12.1% for the twin row pattern.

The Nature of Yield Responses of Florunner Peanuts to Lime. Fred Adams and D. L. Hartzog, Professor of Soil Science and Agronomist-Peanuts, respectively, Department of Agronomy and Soils, Auburn University, Auburn, Alabama 36849.

The effectiveness of spring-applied agricultural limestone and topdressed gypsum as Ca sources for Florunner peanut (Arachis hypogaea L.) production was determined in 78 on-farm experiments in southeastern Alabama during 1972-1979. Dolomitic and calcitic limestones were incorporated into the upper 10 cm of soil at a rate of 2.24 metric ton/ha, and gypsum ($CaSO_4 \cdot 2H_2O$) was topdressed at early bloom at 560 kg/ha. Limestone and gypsum were essentially equal sources of Ca except on a Bonifay sand where gypsum was inferior. Lime applied in this manner apparently increased yield and grade because of its Ca content and not because it increased soil pH. Limestone disked-in just prior to planting did not need a Ca supplement in the form of topdressed gypsum. Only one instance of Mg deficiency was identified, and that was on a low-Mg soil with very little clay in its profile.

Water-Use Efficiency of Peanuts. Luther C. Hammond and Kenneth J. Boote, Departments of Soil Science and Agronomy, respectively, University of Florida, Gainesville, FL.

Water management studies were conducted on 'Florunner' peanuts each year from 1975 through 1980 in replicated field plots on deep, well-drained sandy soils. Irrigation and portable rain shelters were used to create various levels of water supply and use. The 1977 results, for example, provided typical predictive equations which illustrate basic principles of water management for efficient production of peanuts in humid regions:

$$Y = 124I + 2240 \qquad R^2 = 0.99$$

$$\text{and } Y = 162ET - 3720 \qquad R^2 = 0.99$$

where Y is pod yield in kg/ha, and I and ET are seasonal amounts (cm) of irrigation and estimated evaportranspiration, respectively. A measure of the efficiency of irrigation management is given by the ratio of the above regression coefficients, 124/162 = 0.77. A 77 percent utilization of applied water in increasing evapotranspiration is greater than the average 50 percent utilization effectiveness on sandy soils in the Florida climate. For highest efficiency, a strategy of irrigating only the top 30 to 45 cm of the water-depleted root zone is required. These equations gave reasonable predictions of yield responses to water use in the other five years of study.

The Need for Supplemental Irrigation of Valencia Peanuts in Southern Ontario. I. C. MacGillivray, D. P. Stonehouse and R. Roy, Universiry of Guelph, Ontario.

This study was designed firstly to ascertain the impact of imposed drought conditions during each of the three major growth stages on peanut (*Arachis hypogaea* L.) yields and quality, and secondly to estimate the likelihood of drought conditions occurring and the physiological need for supplemental irrigation on Fox loamy sand in southern Ontario. The growth stages were defined as 1) early and full flowering (mid-June to mid-July), 2) late flowering and pod formation (mid-July to mid-August), and 3) pod development (mid-August to mid-September). Experiment plot trials were conducted in 1979 and 1980, based on four replicates each of a control and nine treatments representing all combinations of imposed drought and adequate moisture across the three growth stages (covering all combinations between the extremes, of "dry-dry-dry" and "wet-wet-wet"). Moveable canopies were used to exclude rainfall and create droughty conditions. Soil moisture conditions were monitored by the gravimetric method on a weekly basis. Statistically significant differences were found among treatments in both quantity (pod and kernel weights) and quality (percent SMK). On the basis of 1980 results, marketable pod yield averaged 3611 kg per hectare with a percent SMK of 65.7, and 1407 kg per hectare, with a percent SMK of 59.7, for the "wet-wet-wet", and the "dry-dry-dry" treatments, respectively; also drought in the second stage was revealed to have the greatest measurable impact on yield and quality. Examination of long-run (25-year) weather data for the Delhi region of southern Ontario, in conjunction with estimated peanut evapotranspiration rates, indicated a physiological need for supplemental irrigation in almost all years. Planned repetitions of the experimental plot trials in future years will permit assessment of the repeatability of these results across years.

Peanut Seed Germination as Influenced by Production Management Factors on North Carolina Farms. D. E. McLean and G. A. Sullivan, USAID, Bamako, Mali; and N. C. State University, Raleigh, N. C.

Peanut seed growers were interviewed to determine their seed production management practices. The practices included rotation history, pesticide applications, fertility practices, landplaster applications, use of growth regulators and harvest methods. Seed samples were collected from each participant at digging, before and after combining, and after drying to evaluate production and harvesting effects on seed germination. Sixty farmers participated in 1976, and forty farmers in both 1977 and 1978. Results revealed that the average farmer produced a peanut seed crop of 80% germination. Low soil fertility and low seed calcium adversely affected seed quality. Combining reduced germination by an average of 9% for the three years. Significant correlations among soil fertility, soil particle size, pod moisture, seed calcium, market grades and hull damage and germination were found. These correlations were small and no single production factor accounted for much of the variability in seed quality.

WEED SCIENCE AND EXTENSION TECHNOLOGY

Florida Beggarweed Control in Peanuts. B. J. Brecke and W. L. Currey, Agricultural Research Center, Jay, Florida, and University of Florida, Gainesville, Florida.

Field studies were conducted during 1977-79 at two locations in Florida to evaluate herbicide programs for Florida beggarweed control. Alachlor or cyanazine granules applied to peanuts 4 to 5 weeds following an "at cracking" application of alachlor + naptalam + dinoseb provided 95 to 100% control of Florida beggarweed while the "at cracking" application alone provided only 65 to 85% control. Neither alachlor nor cyanazine caused significant peanut injury. A sequential treatment of cyanazine preemergence plus cyanazine granules applied 6 weeks after planting also provided excellent Florida beggarweed control. However, in one year at one location severe crop injury was observed.

Postemergence Grass Control on Peanuts. W. James Grichar and T. E. Boswell, Texas Agricultural Experiment Station, Texas A&M University System, Yoakum, Texas.

A major problem for peanut growers is the lack of effective controls for grass species which escape preemergence herbicide treatments. These weeds compete with the peanut plant for moisture, nutrients, etc., throughout the growing season unless controlled by cultivation or hand weeding. A new compound, BAS 9052 + oil has looked very promising for postemergence (poe) grass control in peanuts during 1979-80.

In 1979, rates of 0.56 to 1.12 kg/ha were tested on various grass species ranging from 30.5 to 45.7 cm in height. Crabgrass (*Digitaria sanguinalis*) and signalgrass (*Brachiaria platyphylla*) control prior to harvest was 100% for the rates tested. In 1980, the treatments were applied when the grass was 0 to 15.24 cm (early application) or 15.24 to 45.72 cm in height (late application). The early application rates varied from 0.11 to 0.56 while the late application rates varied from 0.11 to 2.24 kg ai/ha. At both application dates, the 0.11 kg/ha rate gave significantly lower control of the grass species than the higher rates. The best control was obtained with the 1.12 and 2.24 kg ai/ha late applications. The yields for the check and 0.11 kg/ha late treatment were significantly lower than the other treatments.

Efficacy of Selected Peanut Herbicide Treatments Applied through Irrigation Systems. Clyde C. Dowler and D. E. Scott, USDA-SEA-AR, Tifton, Georgia.

The following herbicides were applied through center pivot systems at the Coastal Plain Experiment Station, and under grower conditions to 10 to 50 hectare size plots: alachlor at 4.4 kg/ha, benefin at 1.68 kg/ha, and benefin at 1.68 kg/ha + vernolate at 2.24 kg/ha. Water application rates were 0.62 to 1.25 cm/ha on all irrigation systems. Weed species include a wide range of annual grasses and broadleaf weeds common to the Southeastern Coastal Plain. All tests were conducted on soils representative of the peanut production area in the Southeastern Coastal Plain. All treatments were applied after peanuts were planted but before emergence. Efficacy data for each treatment was compared to untreated test plots. At some locations, comparison to conventional application methods was made.

Peanut tolerance to all herbicide treatments was good to excellent. Vernolate caused slight temporary injury to peanuts on several tests; however, the visible injury was less than that caused by conventional ground application. No peanut injury was observed from treatments involving alachlor or benefin. Weed control from all herbicide treatments applied through center pivot irrigation systems equaled or exceeded the level of activity obtained from conventional application methods. Peanut yield did not appear to be affected by this method of herbicide application.

Comparison of No-till, Minimum, and Full Tillage in Peanuts. T. E. Boswell and W. James Grichar, Texas Agricultural Experiment Station, Texas A&M University, Yoakum, Texas 77995.

Selected cultural practices were evaluated in peanuts from 1975-1980. No-till, minimum tillage, and deep burial of the cover crops were compared. Glyphosate at 2.24 kg ai/ha or paraquat at 0.84 kg ai/ha were sprayed over the no-till and minimum tillage areas to kill all vegetation prior to emergence of peanut seedlings.

Disease severity increased in no-till plots. Southern blight, caused by *Sclerotium rolfsii*, was a major problem in plots with surface residue. The number of southern blight infection sites in the no-till plots was significantly higher than the number of sites in plots where residue was buried with a moldboard plow. In 1978, soil from these plots was hand screened after harvest to determine the amount and condition of pods which remained in the soil after digging with a conventional digger. The pods from the no-till plots had the highest mean rating for pod disease (4.9), and those from the deep burial plots had the lowest pod disease rating (3.0), based on a scale of 0 = no disease and 10 = completely diseased.

Five-year average yields for the full tillage, minimum tillage, and no-till plots were 3369, 3056, and 2116 kg/ha, respectively. The percentage SMK averaged 69.2% and 68.0% for the full tillage and the no-till plots, respectively. The gross dollar value per hectare for pods from the no-till plots was significantly lower than the moldboard plowed treatment in all tests.

Integrated Pest Management in South Texas Peanuts. H. Brett Highland, Texas Agricultural Extension Service, Texas A&M University System, Pearsall, Texas 78061.

The Frio County Peanut Pest Management Program was initiated in February of 1980. This is an interdisciplinary effort involving pest management agents, entomologists, plant pathologists and nematologists. A field scouting program was developed, and techniques were developed for monitoring damaging thresholds of burrowing bugs, lesser cornstalk borers, foliage feeding insects, spider mites, leafspot, southern blight, pod rot, peanut rust and nematodes. A peanut leafspot disease forecasting method was initiated using hygrothermographs to record disease environmental conditions, leaf sampling to ascertain leafspot infestation, and integration of this data into a peanut leafspot disease advisory for use by all growers in the area. Result demonstrations included Vitavax 4G for southern blight control, and peanut leafspot development correlated with hygrothermograph data for Florunner peanuts. Program plans for the 1981 growing season will include a detached leaf method for predicting early peanut leafspot disease development, and the use of insect light traps to monitor the movement of burrowing bug populations in peanuts.

Virginia Growers to Test Leafspot Advisories in 1981. P. M. Phipps, Tidewater Research and Continuing Education Center, Suffolk, Virginia 23437.

With assistance from the National Aeronautics and Space Administration, Virginia Tech has installed a computerized agro-environmental monitoring system in Virginia. Two monitoring stations, one at Suffolk and one at Blackstone, provide information of potential value to the eastern and western parts of the Virginia peanut production area, respectively. In 1981, Virginia Tech will utilize the data from these stations to generate daily leafspot advisories according to a previously described method (D. W. Parvin, et al., 1974. Phytopathology 64:385-388). Growers may learn of these advisories by listening to local radio and TV stations, or by calling a toll-free telephone number. A code-a-phone will be used to receive telephone calls and deliver advisories. Leafspot advisories will provide information on the effect of weather conditions on leafspot development at Suffolk and Blackstone. As a pilot program, growers have been advised to evaluate advisories over the entire season on a small acreage (5 acres or less). Test areas should be sprayed within 3 days of issuance of a favorable advisory for leafspot development at the location in closest proximity to a test area. Although favorable advisories may be issued several times in a week, growers have been advised not to spray more frequently than intervals of 10 days.

A Review of the Development of Recirculating Spray Techniques and Their Use for Controlling Tall Weeds in Peanuts. Ellis W. Hauser, USDA-SEA, Coastal Plain Experiment Station, Tifton, Georgia 31793.

In the early 1960's, C. G. McWhorter, Delta Branch Station, Stoneville, Mississippi invented the recirculating sprayer (RCS). The RCS concept involves spraying weeds with lateral streams of herbicide solution which, after contact with the weeds, are directed into a catch tank and are recirculated repeatedly. After introduction of the potent non-selective herbicide glyphosate [N-(phosphonomethyl)glycine] rapid changes occurred in RCS technology. The progressive development of the RCS technique, from the earliest models of the 1960's, to the present rope-wick devices, will be described. The past, present and future impact of recirculating spray techniques on the discipline of weed science, on crop production, and on the environment will be evaluated including an overview of current research for controlling tall weeds in peanuts.

APRES BOARD OF DIRECTORS MEETING

Hyatt Regency, Savannah, Georgia

21 July 1981

The meeting was called to order by President A. H. Allison at 7:35 P.M. The following board members were present: A. H. Allison W. H. Birdsong, J. L. Butler, R. Henning, L. Hodges, R. Ory, P. Russ, D. H. Smith. Other participants were: E. B. Browne, D. Hallock, R. Hammons, D. Hsi, R. Keel, E. Long, H. E. Pattee, and O. D. Smith.

Robert Ory moved to dispense with the reading of the minutes of the 1980 Board of Directors Meetings. Seconded by J. L. Butler. Motion passed.

D. L. Hallock, Chairman of the Ad Hoc Committee on "Peanut Science and Technology", reported on the current status of this publication. J. S. Kirby moved that the report be accepted. Seconded by Robert Ory. Motion passed. The complete report is published elsewhere in this volume.

O. D. Smith presented the report of the Publications and Editorial Committee. R. Henning moved that the report be accepted. Seconded by Robert Ory. Motion passed.

Perry Russ announced that the Golden Peanut Research Award will become the Golden Peanut Research and Education Award in 1982. In addition, Perry Russ announced that all members of APRES can purchase the Peanut Buyers Guide for $20.00.

J. Wynne, Chairman of the Awards Committee, presented the report of this committee, and he also presented the proposed guidelines for election of APRES fellows. J. S. Kirby moved that the report be accepted. Seconded by W. H. Birdsong. Motion passed. The complete report on the Bailey Award recipients for the 1980 meeting and the guidelines for APRES fellows are published in this volume.

David Hsi presented the Site Selection Committee report. W. H. Birdsong moved that the report be accepted. Seconded by L. L. Hodges. Motion passed. The report is published in this volume.

R. O. Hammons presented the Golden Peanut Research Advisory Committee Report and his report as liaison with the American Society of Agronomy. J. L. Butler moved that the reports be accepted. Seconded by J. S. Kirby. Motion passed. These reports are published in this volume.

J. S. Kirby presented the APRES Nominating Committee Report. Robert Ory moved that the report be accepted. Seconded by L. Hodges. Motion passed. The report is published in this volume.

The meeting was adjourned at 9:30 P.M.

APRES BOARD OF DIRECTORS MEETING

Hyatt Regency, Savannah, Georgia

23 July 1981

The meeting was called to order by President A. H. Allison at 7:45 P.M. The following board members were present: A. H. Allison, W. H. Birdsong, J. L. Butler, R. Henning, L. Hodges, J. S. Kirby, and D. H. Smith. Others present were: E. B. Browne, Clarence Crowell, Ray Hammons, David Hsi, R. Keel, H. E. Pattee, R. E. Pettit, Olin Smith, Gene Sullivan, Doyle Welch, and Clyde Young.

Gene Sullivan presented the report of the Ad Hoc APRES Logo Committee. J. L. Butler moved that the logo currently used on APRES letterhead be adopted as the official APRES logo. Seconded by J. S. Kirby. Motion passed.

Rufus Keel presented the report of the Public Relations Committee. Robert Ory moved that the report be accepted. Seconded by W. H. Birdsong. Motion passed. The report of the Public Relations Committee is published in this volume.

Robert Pettit presented the APRES Finance Committee report. Robert Ory moved that the report be accepted. Seconded by Ron Henning. Motion passed. The complete report is published in this volume.

Clyde Young presented the Peanut Quality Committee report. L. L. Hodges moved that the report be accepted. Seconded by Ron Henning. Motion passed. The report is published in this volume.

R. Henning moved that the selling price for "Peanut Science and Technology" be established by a consensus of the following APRES representatives: Chairman of the APRES Finance Committee, Co-editors of the book, the President of APRES, the Chairman of the Publications and Editorial Committee, and the Executive Secretary-Treasurer of APRES. Seconded by J. S. Kirby. Motion passed.

J. L. Butler presented the report of the APRES Program Committee. Robert Ory moved that the report be accepted. Seconded by W. H. Birdsong. Motion passed. The report is published elsewhere in this volume.

D. H. Smith presented his report as Executive Secretary-Treasurer of APRES. R. Ory moved that the report be accepted. Seconded by L. Hodges. Motion passed. The financial report of APRES is published in this volume.

Robert Ory moved that the amended guidelines for election of APRES fellows be accepted. Seconded by Ron Henning. Motion passed. The guidelines for election of APRES Fellows are published in this volume.

The meeting was adjourned at 9:45 P.M.

Minutes of the Regular Business Meeting of the

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

Hyatt Regency, Savannah, Georgia, 24 July 1981

The meeting was called to order by President A. H. Allison at 7:30 A.M.

Bill Mills gave the invocation.

Robert E. Pettit presented the APRES Finance Committee report. W. H. Birdsong moved that the report be accepted. Seconded by Russell Schools. Motion passed.

The report of the Publications and Editorial Committee was given by Olin Smith, with additional reports by C. T. Young on the status of the APRES Methods publication, D. L. Hallock on the progress of PEANUT SCIENCE AND TECHNOLOGY, H. E. Pattee on PEANUT SCIENCE, and R. O. Hammons on PEANUT RESEARCH. J. L. Butler moved that the report be accepted. Seconded by Gene Sullivan. Motion passed.

Rufus Keel and D. M. Porter presented the report of the Public Relations Committee. C. T. Young moved that the report be accepted. Seconded by Bill Mills. Motion passed.

President A. H. Allison presented the Bailey Award. The award winning paper was "Response of *Labidura riparia* to pesticide residues in peanuts" by Nancy Aquilera de Rivero and Sidney L. Poe.

J. Wynne presented the report of the APRES Awards Committee. C. E. Simpson moved that the report be accepted. Seconded by C. T. Young. Motion passed.

J. S. Kirby presented the Nominating Committee report. Robert Ory moved that the proposed officers be elected by acclamation. Seconded by L. L. Hodges. Motion passed.

R. O. Hammons reported on the Golden Peanut Research and Education Award that will be established by the National Peanut Council in 1982 and on his activities as APRES liaison with the American Society of Agronomy. O. D. Smith moved that the report be accepted. Seconded by Rufus Keel. Motion passed.

President A. H. Allison presented the Past-President's Award to J. S. Kirby.

D. C. H. Hsi presented the Site Selection Committee report. The 1982 meeting will be held in Albuquerque, New Mexico from 13 to 16 July 1982, and the 1983 meeting will be held in Charlotte, North Carolina from 12 to 15 July 1983. C. T. Young moved that the motion be accepted. K. H. Garren seconded the motion. Motion passed.

J. L. Butler presented the Program Committee report. E. M. Ahmed moved that the report be accepted. Seconded by Robert E. Pettit. Motion passed.

C. T. Young presented the Peanut Quality Committee report. C. E. Simpson moved that the report be accepted. Seconded by Robert Ory. Motion passed.

A. H. Allison presented the President's report and then introduced J. L. Butler as the President of APRES for 1981-1982.

The meeting was adjourned at 9:25 A.M.

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

Financial Statement

July 1, 1980 to June 30, 1981

ASSETS AND INCOME

I. Assets

A. Certificates of Deposit

1.	Yoakum Federal Savings & Loan Assoc., Yoakum, TX	$ 21,835.11
2.	Cuero Federal Savings & Loqn Assoc., Cuero, TX	14,062.65

B. Savings Accounts

1.	Wallace K. Bailey Fund, Yoakum National Bank, Yoakum,TX	898.54
2.	Yoakum National Bank, Yoakum, TX	2,164.37

II. Income

A.	Balance, July 1, 1980	6,968.11
B.	Membership & Registration (Annual Meeting)	15,811.88
C.	Proceedings & Reprint Sales	290.95
D.	Special Contributions	2,050.00
E.	The Peanut	6.00
F.	Peanut Science Page Charges & Reprints	10,492.90
G.	Institutional Membership	862.00
H.	Differential Postage Assessment-foreign members	1,236.10
I.	Checking Account Interest	114.16
J.	Saving Account, Wallace K. Bailey Fund	43.84
K.	Ladies Activities	99.00
	Total	$ 76,935.61

LIABILITIES AND EXPENDITURES

III. Expenditures

1.	Proceedings - Printing & Reprints	$ 3,317.55
2.	Annual Meeting - Printing	1,010.96
3.	Secretarial	2,000.00
4.	Postage	635.00
5.	Office Supplies	1,028.81
6.	Position Bond for $5,000 (Exec.Sec.Treas)	-
7.	Travel - President	-
8.	Travel - Executive Sec. Treas.	-
9.	Registration - State of Georgia	-
10.	Miscellaneous	219.83
11.	Peanut Science	13,000.00
12.	The Peanut	-
13.	Bank Charges	14.53
14	Peanut Research	1,174.00
15.	Certificate of Deposit	-
16.	Membership	10.00
17.	Secretary-Self Employment Tax	148.00
18.	Legal Fees	-
19.	Saving Account	6,000.00
	Total	$ 28,558.68

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

Financial Statement

July 1, 1980 to June 30, 1981

I.	Assets	
	A. Certificates	$35,897.76
	B. Saving Accounts	3,062.91
II.	Balance	
	A. Checking Account - July 1, 1980	6,968.11
III.	Income	
	B, C, D, E, F, G, H, I, J. K - July 1, 1980 to June 30, 1981	31,006.83
	Total	$76,935.61
IV.	Expenses	
	July 1, 1980 to June 30, 1981	$28,558.68
V.	Balance - June 30, 1981	$48,376.93

TOTAL FUNDS, June 30, 1981

Certificates:	$35,897.76
Saving Accounts:	3,062.91
Checking Account Balance:	9,416.26
Total	$48,376.93

PRESIDENT'S REPORT

Allen H. Allison

It has, indeed, been a real privilege and honor serving as your president since July 18, 1980. Our membership continues to grow and the latest estimate by our secretary-treasurer is about 700. Thirty-six countries are represented by having membership in this society. We are extremely pleased about this and would certainly encourage more peanut scientists from around the world to attend and contribute his or her knowledge. Those of us who happen to live and work in the U.S. need, I think, to change the image of peanuts in this country from that of being just a snack food consumed at the ball park or with beer in the local tavern to that of a highly nutritious and good tasting food product which will sustain life itself. It seems, that regardless of how hard we try, we have not really created this kind of image. We also need to be cognizant of the fact that the peanut industry, in this country at least, is in trouble. We are peanut people and I'm sure within this society we have the knowledge and expertise to put our industry back on track. One way in which scientists may help is to use their knowledge and expertise to reduce production costs while maintaining high yields and quality. Quality must be recognized and dealt with worldwide, if we as an industry are to continue to succeed. Last year this organization was said "to have come of age" and is a "first rate organization." I agree wholeheartedly with this. What better evidence is needed than to look at the number and quality of papers presented here in Savannah, Georgia this week. Although, we are truly a professionally diversified group, we do share a common bond in that we are all interested, in our own particular way, in the peanut industry. Last year the entire industry was hard hit by the low production caused by the severe national drought. This along with talk of certain legislative and administrative changes, high production costs for the past four years, without corresponding increases in prices received for farmers stock peanuts, has and continues to place the U.S. peanut industry in a precarious position. The U.S. grower is mighty close to being put in the position of not being able financially to produce a continuous supply of high quality peanuts for the end-user; even though the demand is there! Somehow these problems must and I'm sure will be solved and quickly. Let us resolve to help wherever and whenever we can.

You have heard of the progress being made toward getting the new edition of the peanut book printed. This is a real milestone. Let me thank the editors, the authors and the committee members who have worked so diligently on this very worthwhile project. Before our next annual meeting, I am sure the new peanut book, Peanut Science and Technology will be available.

Last but not least, for whatever success we have had this year, most of the credit must go to our secretary-treasurer, Don Smith, his wife and their children along with all the committees who have devoted so much time, energy and enthusiasm to APRES. I truly have never worked with any group or organization who has given such find cooperation -- and I thank you all for this opportunity to serve.

Now it is my pleasure to turn the office of president over to your new president, Dr. Jim Butler. I know you will give him your full support and cooperation.

Presentation of the Seventh Annual
Bailey Award

Thirteenth Annual Meeting of the
American Peanut Research and Education Society
Hyatt Regency Savannah, Savannah, Georgia
July 21-24, 1981

by

Allen H. Allison - President, APRES
Business Meeting - July 24, 1981

This award was established in honor of an eminent USDA peanut scientist, WALLACE K. BAILEY. It is awarded each year to the scientist or scientists, who presented a paper at the prior year APRES meeting, adjudged to be the best by the Bailey Award committee. Each paper presented at the 1980 meeting in Richmond, Va. was considered for the award. Papers presented were judged for merit, originality, clarity and their contribution to peanut scientific knowledge. Papers given orally were obtained from selected authors for evaluation by the Bailey Award committee.

It is now my privilege as president of APRES, to present this year's Bailey Award to Sidney L. Poe and Nancy Aquilera de Rivero for their excellent paper entitled Response of Labidura riparia to Pesticide Residues on Peanuts. Dr. Poe, formerly of the University of Florida, is currently Head, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, Va. and was senior author. Miss Rivero, junior author, formerly from the University of Florida, has since returned to her native Venezuela. Dr. Poe will accept both awards.

PROGRAM COMMITTEE REPORT

J. L. Butler, Chairman

The printed program for the thirteenth Annual Meeting of APRES, which was held at the Hyatt Regency Savannah, Savannah, Georgia, is given below. The Extension-Industry symposium program was not in the printed program, but was handed out at the meeting. Included as an addition to the program was a listing of the eight sponsors with exhibits and the eleven sponsors without exhibits. Although not listed as an exhibitor, the Georgia Peanut Commission also had an exhibit and contributed to the success of the meeting.

One paper, "Peanut Seed Germination as Influenced by Production Management Factors on North Carolina Farms", by D. E. McLean and G. A. Sullivan, was presented in Session C at 9:30 a.m., July 23, was inadvertently left out of the printed program.

Special recognition is due to the following:

Drs. Milton Walker and Ron Henning, Chairmen, Technical Program Committee and its members

Messers Herb Womack and Gerald Harrison, Chairmen, Local Arrangements Committee and its members

Mesdames Sara Womack and Marlene Fox, Chairwomen, Ladies Program and its members

Mr. Sidney Fox and Uniroyal Company, boat trip and low-country meal

Mr. Gerald Harrison and Diamond Shamrock Co., Reception

Mrs. Sallie Keel for making the APRES Banner which was exhibited for the first time at this meeting.

Mrs Sallie Keel, Mrs. Bobbie Smith, and other members of her family for the long hours and courteous service of registration.

Also, the two companies with hospitality rooms, Nitragin and Olin.

The following organizations contributed financial support for coffee breaks, ladies hospitality, and other incidental expenses for this year's APRES Meeting. We are most grateful for their support for this meeting and for their support of the peanut industry.

SPONSORS WITH EXHIBITS

American Cyanamid Company

Ciba-Geigy Corporation

FMC Corporation

Gustafson, Inc.

Ray Hays Equipment Company

Mobile Chemical Company

Shell Chemical Company

U. S. Gypsum Company

SPONSORS WITHOUT EXHIBITS

BASF Wyandotte Corporation

Diamond Shamrock Corporation

Gold Kist, Inc.

Griffin Corporations

International Minerals Corp.

Mobay Chemical Corporation

M & M Mars

The Nitragin Company

Stauffer Chemical Company

Tom's Foods, Ltd.

Union Carbide

Ninety-four papers were presented in sixteen-paper sessions and an additional fifteen papers were presented in three symposia. Three tours were conducted to the Savannah Port Authority Docks and two tours were conducted to the USDA Stored Products Insects Laboratory. To all those who particpated in making this Thirteenth Annual Meeting a success, we express our heartfelt thanks.

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

<u>Tuesday, July 21</u>

1:00-8:00	APRES Registration - 2nd Floor

COMMITTEE MEETINGS

1:30	Ad Hoc - Peanut Book - Sloane Room
4:00	Publication and Editorial (Peanut Science) - Vernon Room
4:00	Awards - Percival Room
4:00	Site - Verelst Room
7:30	Board of Directors - Sloane Room
7:45	Finance - Vernon Room
7:45	Public Relations - Percival Room
7:45	Quality - Verelst Room

<u>Wednesday, July 22</u>

8:00-5:00	APRES Registration - 2nd Floor
8:00-5:00	Exhibits - Pre-Function

GENERAL SESSION - A. H. Allison, presiding - Regency Ballroom D, E & F

8:30	Invocation, Milton Walker
8:35	Welcome to Georgia, Tyron Spearman
8:45	Introduction of Guest Speaker, Frank McGill
8:55	Guest Speaker, B. Willem Winkel, President, Willem Winkel International, Inc., Atlanta, GA., U. S. Peanuts Here and Around the World.
9:30	Announcements Herb Womack, Local Arrangement Committee Milton Walker, Program Committee
9:40	Break

SYMPOSIUM -PEANUT ENERGY

10:00	Jim Butler, presiding
10:10	Peanut Varieties: Potential for Fuel Oil, Ray O. Hammons
10:30	The Use of Peanut Skins as an Odor Control Agent, Larry Newton

10:50 The Use of Vegetable Oils in Automotive-Type Diesel Engines, Vernon Miller

11:10 Peanut Oil for Diesel Tractors in Georgia, R. H. Brown

11:30 Discussion

12:00 Lunch

THREE CONCURRENT SESSIONS:

1. Session (A) - Plant Nutrition & Physiology - Ballroom D
2. Session (B) - Plant Pathology - Ballroom E
3. Session (C) - Peanut Breeding & Genetics - Ballroom F

SESSION A Peanut Nutrition and Physiology - Ron Henning, presiding

1:00 Effect of N Application on Peanut Yield and Seed Quality, Sunil K. Pancholy*, Shaik-M. M. Basha and Daniel W. Gorbet.

1:15 Response of Peanuts to Nitrogen and Inoculum. S. T. Ball*, J.C. Wynne, S.M. Guerrant, and T.J. Schneeweis

1:30 Some Biochemical Differences Between the Nodualting and Non-nodualting Peanut Lines. Shaik-M.M.Basha* and Sunil K.Pancholy, Florida A&M University, Tallahassee, FL, and Daniel W. Gorbet.

1:45 Cell Number in Relation to Seed Size in Peanuts. Nandini Nimbkar, W.G. Duncan, and F.P. Gardner*

2:00 A Distributional concept of Pod Maturation, E. Jay Williams* and J. Stanley Drexler.

2:15 Discussion

2:45 Break

SESSION B Plant Pathology - Alex Csinos, presiding

1:00 Relationship of Environmental Factors to Infection and Colonization of 'Florigiant' Peanut by Sclerotinia minor. Roberta L. Dow*, Norris L. Powell, and D. Morris Porter.

1:15 Assaying Peanut Field Soil by Elutriation to Determine the Sclerotial Populations of Sclerotinia minor. D.M. Porter* and J.L. Steele.

1:30 Use of Aerial Infrared Photography to Determine Estimates of Peanut Crop Losses Due to Sclerotinia blight. S.D. Thomas*, N. L. Powell, D.M. Porter, and P.M. Phipps.

1:45 Effect of Plant Age on the Susceptibility of the Peanut Cv. Tamnut 74 to Verticullium Wilt. H.A. Melouk and D.F. Wadsworth.*

2:00 Pod Rot Diseases of Peanut at ICRISAT, India. V.K. Mehan, D.McDonald*, and V.R. Rao.

2:15 The Occurrence of Peanut Wilt and Stunt, Incited by Pythium Myriotylum in Texas. B. L.Jones.

2:30 Efficacy of Formulations of Furmecyclox on White Mold. A.S.Csinos

2:45 Break

SESSION C Peanut Breeding and Genetics - A. C. Mixon, presiding

1:00 Control of Peanut Leaf Spot with a Combination of Resistance and and Fungicide Treatment. D.W. Gorbet*, L.F. Jackson, and F.M. Shokes.

1:15 Transfer of Leafspot Resistance from Virginia to Spanish Peanuts (Arachis Hypogaea L.). C.E. Simpson*, O.D. Smith, D.H. Smith, and E.R. Howard.

1:30 Breeding for Resistance to Early Leafspot in Peanuts. C.C. Green*, T.G. Isleib, M.A. Hamid, and J.C. Wynne.

1:45 Seedling Salt Reaction and Pod Rot Resistance in Peanuts. R. Godoy*, O.D. Smith, R.A. Taber.

2:00 Combining Ability Analysis of Insect Resistance in Peanuts. J.C. Wynne* and W.V. Campbell.

2:15 Reaction of Eleven Peanut Genotypes to Southern Corn Rootworm. T.A. Coffelt* and J.C. Smith.

2:30 Discussion

2:45 Break

THREE CONCURRENT SESSIONS:

1. Session (A) - Plant Nutrition & Physiology - Ballroom D
2. Session (B) - Plant Pathology - Ballroom E
3. Session (C) - Weed Science & Extension Technology - Ballroom F

Session A Plant Nutrition & Physiology - Ron Henning, presiding

3:00 Pod Number per Peanut Plant. W.G. Duncan.

3:15 Inhibition of Photosynthesis by Ethylene - A Stomatal Effect. J.E. Pallas, Jr.* and S.J. Kays

3:30 Root and Shoot Growth Relationships Among Peanut Genotypes. D.L. Ketring* and W.R. Jordan.

3:45 Effect of Drought on Vegetative and Reproductive Development of of Peanuts. K.J. Boote* and L.C. Hammond.

4:00 Preliminary Report of Studies on Peanuts from Bioregulator-Treated Plants. R.L. Ory*, E.J. Conkerton, A.J. St. Angelo, C. Vinnett, F. R. Rittig, and M. Schroeder.

4:15 Peanut Physiological Research at ICRISAT for the Semi-Arid Tropics. I.S. Campbell* and J.H. Williams.

4:30 Effects of Partial Shading on Growth and Yield of Peanuts. S.S.Rajan

4:45 Discussion

SESSION B Plant Pathology - Alex Csinos, presiding

3:00 Effects of Bacillus subtilus on Emergence of Florunner Peanuts. R.P. Clay* and P.A. Backman.

3:15 Effects of Nematicides Applied at Planting and Postplant on Peanut Yields, Root-Knot Nematodes, and White Mold. N.A. Minton*, D.K. Bell, and A.S. Csinos.

3:30 The Effect of Methods of Application on the Efficacy of Selected Systemic Nematicides for Control of Meloidogyne arenaria on Florunner Peanuts. R. Rodriguez-Kabana and Peggy S. King*.

3:45 Genotypic Differences in Fungal Penetration of Peanut Shells: A Factor in Selecting for Pod Rot Resistance. Luke Wisniewski*, O.D. Smith and T.E. Boswell.

4:00 Resistance to Sclerotium rolsfii in Pod Rot Resistance Lines. O.D. Smith*, T.E. Boswell and W.J. Grichar.

4:15 Discussion

SESSION C Weed Science and Extension Technology - Ellis Hauser and Charles Swann, presiding

3:00 Florida Beggarweed Control in Peanuts. B.J. Brecke* and W.L. Currey.

3:15 Postemergence Grass Control on Peanuts. W.James Grichar* and T.E. Boswell.

3:30 Efficacy of Selected Peanut Herbicide Treatments Applied Through Irrigation Systems. Clyde C. Dowler* and D.E. Scott.

3:45 Comparison of No-Till, Minimum and Full Tillage in Peanuts. T.E. Boswell* and W. James Grichar.

4:00 Integrated Pest Management in South Texas Peanuts. H.Brett Highland.

4:15 Virginia Growers to Test Leafspot Advisories in 1981. Santford Overton, P.M. Phipps* and N.L. Powell.

4:30 A Review of the Development of Recirculating Spray Techniques and Their Use for Controlling Tall Weeds in Peanuts. Ellis W. Hauser.

4:45 Discussion

6:00-8:00 LOW COUNTRY MEAL - OLD FORT JACKSON - UNIROYAL

Thursday, July 23

THREE CONCURRENT SESSIONS:

1. Session (A) - Entomology - Ballroom D
2. Session (B) - Plant Pathology - Ballroom E
3. Session (C) - Production Technology - Ballroom F

SESSION A Entomology - Robert Lynch, presiding

8:00	Losses to Peanut Insects in Georgia - A Ten Year Summary. H. Womack*, L.W. Morgan, and R.E. Lynch.
8:15	Field Evaluation of Insecticides for Lesser Cornstalk Borer Control on Peanuts in Alabama. J.Ronald Weeks
8:30	Evaluation of Methods for Controlling Lesser Cornstalk Borer, <u>Elasmopalpus</u> <u>lignosellus</u> (Zeller) in Drought Stressed Peanuts. David B. Adams*, Jay W. Chapin, and Mike J. Sullivan.
8:45	Evaluation of Aerially Applied Granular Insecticides for Control of Southern Corn Rootworm. R.M. Matthews and Herbert Womack*.
9:00	Application of Insecticides to Peanuts through Irrigation Systems L.W. Morgan*, Herbert Womack, and David Adams.
9:15	Rate of Population Increase of the Two-spotted Spider Mite on Peanut Leaves Treated with Pesticides. L.S. Boykin* and W.V. Campbell
9:30	Tobacco Wireworm as a Pest of Peanuts. Patrick Lummus* and John Smith.
9:45	Break

SESSION B Plant Pathology - R. H. Littrell, presiding

8:45	Peanut Leaf Spot Control in Florida as Affected by Spray Initiation Date and Planting Date. G.E. Sanden, F.M. Shokes* and D.W. Gorbet.
9:00	Relative Incidence of <u>Cercosporidium</u> <u>personatum</u> and <u>Cercospora</u> <u>arachidicola</u> in Florida and Georgia. F.M. Shokes* and R.H. Littrell.
9:15	The Effects of Using CDA Equipment to Apply Chlorothalonil to Florunner Peanuts in Georgia. K.J. Middleton* and R.H. Littrell.
9:30	Control of Foliar and Soil-borne Diseases of Peanuts with Sterol Inhibitor Fungicides. P.A. Backman.
9:45	Break

SESSION C Production Technology - Jay Williams, presiding

8:00	Under-Row Ripping of Peanuts In Virginia. F.S. Wright* and D. M. Porter.
8:15	Skip-Row Planted Peanuts in Virginia. R.W. Mozingo
8:30	The Nature on Yield Responses of Florunner Peanuts to Lime. Fred Adams and D.L. Hartzog*.
8:45	Response to Landplaster by Virginia Type Peanuts Grown in Virginia During 1970 to 1979. Daniel L. Hallock* and A.H. Allison.

9:00	Water-Use Efficiency of Peanuts. Luther C. Hammond* and Kenneth J. Boote.
9:15	The Need for Supplemental Irrigation of Valencia Peanuts in Southern Ontario. I.C. MacGillivray, D.P. Stonehouse* and R. Roy.
9:45	Break

THREE CONCURRENT SESSIONS:

1. Session (A) - Entomology -Ballroom D
2. Session (B) - Plant Pathology - Ballroom E
3. Session (C) - Harvesting & Processing - Ballroom F

SESSION A Entomology, L.W. Morgan, presiding

10:00	Distribution of Heliothis zea eggs and First Instar Larvae on Peanuts. Nancy Pencoe* and R.E. Lynch.
10:15	The Impact of Potato Leafhoppers, Empoasca fabae (Harris) upon Selected Cultivars of Arachis hypogaea L. Edwin T. Hibbs*, Loy Morgan, and H. Joel Hutcheson.
10:30	Value of Insect Resistance on NC-6 Variety in Virginia. J.C. Smith* and T.A. Coffelt.
10:45	Resistance of Peanuts to a Complex of Insects. W.V. Campbell*, J.C. Wynne, and H.T. Stalker.
11:00	Field Evaluation of the Pheromone Mediated Behavior of the Lesser Cornstalk Borer, Elasmophalpus lignosellus (Zeller). R.E. Lynch*, J.A. Klun, and J.W. Garner.
11:15	Discussion
12:00	Lunch

SESSION B Plant Pathology - R. H. Littrell, presiding

10:00	Disease Assessment of Peanut Leafspot. T. E. Starkey.
10:15	Effects of Foliar Spray Programs on the Soil Microflora of Peanuts. H. G. Hancock and P. A. Backman
10:30	Effects of Oil-Surfactant Blends and Surfactants on Peanut Leafspot When Tank-Mixed with Chlorothalonil. M.A. Crawford* and P.A. Backman.
10:45	Identity of the Peanut Web Blotch Fungus in the United States. Ruth Ann Taber*, Robert E. Pettit, and George L. Philley.
11:00	Web Blotch of Peanuts in Virginia. P.M. Phipps.
11:15	Glycine Max: A Potential Host of the Peanut Web Blotch Fungus. D.H. Smith* and R.E. McGee
11:30	Discussion
12:00	Lunch

SESSION C Harvesting and Processing - Jim Davidson, presiding

10:00	Effect of Windrow Curing Time on Peanut Harvest Losses. James H. Young.
10:15	Design of a Peanut Drying System Using Solar Heated Water. J. M. Troeger.
10:30	A Microprocessor Control System for Peanut Drying. J. L. Steele
10:45	Evaluation of Cleaning Farmers Stock Peanuts Prior to Marketing. P. D. Blankenship* and J.H. Young.
11:00	Compacting Peanut Hulls for Storage and Transport. W. O. Slay.
11:15	Discussion
12:00	Lunch

FOUR CONCURRENT SESSIONS:

1. Session (A) - Peanut Breeding & Genetics - Ballroom D
2. Session (B) - Aflatoxin - Ballroom E
3. Session (C) - Peanut Processing & Utilization - Ballroom F
4. Session (D) - Extension - Industry Plant Disease Sumposium - Ballroom B

SESSION A Peanut Breeding and Genetics - W. D. Branch, presiding

1:00	Hybridization Between Incompatible Arachis Species and Clonal Propagation of Hybrids by Tissue Culture. D.C. Sastri and J.P. Moss*.
1:15	Utilizing Wild Peanut Species. 1. Amphidiploid Hybrid Derivatives. M.E. Brinkley* and H.T. Stalker.
1:30	Utilizing Wild Peanut Species. 2. Hexaploid Hybrid Derivatives. M. Company. H.T. Stalker* and J.C. Wynne.
1:45	Inheritance of Wine Seed Coat (Testa) and Yellow Flower Color in Peanuts. D.J. Banks and J. S. Kirby.
2:00	Genotype X Environment Interactions Observed in Peanuts Under Early Vs. Normal Harvest Dates at Two Locations in Oklahoma. K.E. Dashiell*, J.S. Kirby, and R.W. McNew
2:15	Peanut Genotypes Response to Intercropping. D. A. Knauft.
2:30	Discussion
2:45	Break

SESSION B Aflatoxin - Dick Cole, presiding

1:00	Drought, Irrigation, and Field Infection of Peanuts and Corn by Aspergillus flavus in Virginia in 1980. Kenneth H. Garren.
1:20	Effects of Irrigation on Aflatoxin Contamination of Peanuts. D.M. Wilson*, and J.R. Stansell.

1:40 Influence of Soil Temperature and Moisture Microflora, Aflatoxin Concentration, Maturity, and Damage in Peanuts. R.A. Hill*, P.D. Blankenship, R. J. Cole, T.H. Sanders, J.W. Kirksey, and R.L. Greene.

2:00 Separation and Removal of Aflatoxin Contaminated Kernels in Peanut Shelling Plants - Case Study I. J.I. Davidson, Jr.*, C.E. Holaday and C.T. Bennett.

2:20 Relationship between Soldiers and Aflatoxin Contamination During Storage of Farmers Stock Peanuts. J.S. Smith, Jr. and R.J. Cole.

2:40 Fungistatic Properties of Peanut Polyphenols. John A. Lansden*.

2:45 Break

SESSION C Peanut Processing and Utilization - Kay McWatters, presiding

1:00 The Production of Volatiles in Peanuts at Different Roasting Temperatures Measured by Direct Gas Chromatography. N.V. Lovegren* and A.J. St.Angelo.

1:15 Volatile Profile of Raw Peanuts as an Indicator of Quality. A.J. St. Angelo*, N.V. Lovegren, and C.H. Vinnett.

1:30 Improved Methods for Removing Oil from "Difficult-to-Press" Peanuts. J. Pominski*, H.M. Pearce, Jr., J.J. Spadaro, and J.R. Baxley.

1:45 Hydrocarbons, Steryl Esters, and Free Sterols of Peanut Oil. R.E. Worthington* and H.L. Hitchcock.

2:00 Composition and Quality of Imported Peanuts. Clyde T. Young.

2:15 Effect of Growing Seasons, Locations, and Planting Dates on the Total Amino Acid Composition of Two Valencia Peanuts in New Mexico. David Hsi*, Clyde Young, and Melchor Ortiz.

2:30 Effects of Heat Treatment and Carrageenan Addition on Protein Solubility and Viscosity of Milk Protein/Peanut Flour Blends in an Ionic Environment Simulating Cow's Milk. Ronald H. Schmidt* and Marlene R. Padua.

2:45 Break

SESSION D Extension - Industry Plant Disease Symposium, Chip Lee, presiding

THREE CONCURRENT SESSIONS:

1. Session (A) - Peanut Breeding Symposium - Ballroom D
2. Session (C) - Peanut Processing & Utilization - Ballroom F
3. Session (D) - Extension-Industry Plant Disease Symposium - Ballroom B

SESSION A Peanut Breeding Symposium - Overcoming Major Yield-Reducing Constraints-
Ray O. Hammons, presiding

3:00	Developing Country Perceptions of Researchable Problems in Peanut Production and Utilization. D.G. Cummins* and C.R. Jackson
3:20	Agronomic Improvement by Development of Varieties Adapted to Rainfall Constraints. P. Gillier and J. Gautreau.
3:40	Agronomic Improvement by Development of Disease-Resistant Germplasm. B. Mazzani.
4:00	The Utilization in a Breeding Program of Resistance to Late Leaf Spot of Peanuts. D.J. Nevill.
4:20	Peanut Varieties and Their Quality in Japan. T. Yashiki* and Y. Takahashi.
4:40	The Resistance Evaluation of Bacterial Wilt (*Pseudomonas solanacearum* E.F. Sm.) of Peanut (*Arachis hypogaea* L.) in the People's Republic of China. Sun Darong*, Chen Chuenrung, and Wang Yuring.
5:00	Discussion

SESSION C Peanut Processing & Utilization - Sam Cecil, presiding

3:00	Occurrence and Quality of Florunner Peanuts with Purple Testae. Timothy H. Sanders* and Jack L. Pearson.
3:15	Changes in Flavor and Other Quality Factors with Seed Size and Storage Time. H.E. Pattee*, J.L. Pearson, C.T. Young, and F.G. Giesbrecht.
3:30	Peanut and Cowpea Meals as a Replacement for Wheat Flour in Cake-type Doughnuts. Kay H. McWatters*.
3:45	Expanded Utilization of Peanuts in Food System. E.M. Ahmed*.
4:10	Peanut Cryoproteins - Composition and Characteristics. Shaik-M.M. Basha* and Sunil K. Pancholy.
4:35	Discussion

SESSION D Extension - Industry Plant Disease Symposium - Chip Lee, presiding

1:00-2:00	New Products and Product Uses. (Introduction by Dr. Vince Morton, (Ciba Geigy).
2:00-2:30	Seed Treatments. Mr. Kyle Rushing, Gustafson and Mr. Larry Worn, UpJohn.
2:30-2:45	Break
2:45-3:15	Export Markets. Mr. Ray Smith, Diamond Shamrock and Dr. Duncan McDonald, ICRIS, India.

3:15–3:45	Controlled Droplet Application. Mr. Frank McGarvey, Micron Corp.
3:45–4:15	Fungigation. Dr. Paul Backman, Auburn University; Dr. Sam Thompson, University of Georgia; and Dr. Chip Lee, Texas A & M University.
4:15–4:45	Panel Discussion, Guest Speakers
4:45–5:00	Business Meeting
6:00	RECEPTION - DIAMOND SHAMROCK - BallRoom A

Friday, July 24

7:30	Breakfast - Ballrooms D,E,F
8:30	President's Address and Business Meeting - Ballrooms D,E,F
10:30	Adjourn

FINANCE COMMITTEE REPORT

Robert E. Pettit, Chairman
Darold Ketring, Vice-Chairman
Scott Wright
Lional Felts
David Bateman
Jack Simpson for T. H. Birdsong III

The Finance Committee met at 7:45 p.m. on July 21, 1981 and on July 22, 1981. A limited audit of the financial statements submitted by the Secretary-Treasurer and Peanut Science Editor was conducted and found to be in order.

The committee responded to several financial requests and submit the following recommendations to the Board of Directors:

(1) That the financial statements submitted by the Secretary-Treasurer and Peanut Science Editor be accepted.

(2) That the assistant to the Secretary-Treasurer be paid $2500 for work done for APRES during fiscal year July 1, 1981 to June 30, 1982.

(3) That the Editorial Assistant be paid $2200 for work done for Peanut Science during the fiscal year July 1, 1981 to June 30, 1982.

(4) That the request from the Peanut Quality Committee for an additional $2000 to cover the initial costs of handling and printing 300 copies of "Methods of the APRES" be accepted.

(5) That the finance committee be provided an annual report of all checks in terms of who received the check and amount paid out of funds in the accounts of the American Peanut Research and Education Society.

(6) That the recommendation from the Ad-Hoc Committee, with the endorsement of the Publications and Editorial Committee, be accepted concerning the cost of the new book "Peanut Science and Technology." The cost to be set as follows: pre-publication, printing cost plus approximately $15 and post-publication, printing cost plus approximately $20. In addition that the postage for the book be paid by the purchaser.

(7) That the publication cost of the book "Peanut Science and Technology" be financed so as to avoid financial indebtedness to the Society through negotiation with the printer along the following guidelines:

a. That the initial payment, due when the final galley proof is printed, be covered by funds from a certificate of deposit maturing on July 30, 1981.

b. That the second payment, due when the page proofs are printed, be covered by funds in the savings account and checking account.

c. That the third payment, due when the final blue line copies are received, be covered by pre-publication sales of the book.

d. That the final payment, due on delivery of the book, be covered by funds from a certificate of deposit maturing on December 21, 1981.

(8) That the editors of the book "Peanut Science and Technology" be authorized

to negotiate the payment schedule in consultation with the Finance Committee.

AMERICAN PEANUT RESEARCH AND EDUCATION SOCIETY

Proposed Budget July 1, 1981 to June 30, 1982

I. Assets		
A. Certificates of Deposits		
	1. Yoakum Federal Savings & Loan Association, Yoakum, Texas	$ 21,835.11
	2. Cuero Federal Savings & Loan Association, Cuero, Texas	14,062.65
B.		
	1. Wallace K. Bailey Fund, Yoakum National Bank, Yoakum, Texas	898.54
	2. Savings at Yoakum National Bank, Yoakum, Texas	2,164.37
II. Income		
A.	Balance Carried Forward (July 1, 1981)	9,416.26
B.	Membership and Registration (Annual Meeting)	13,000.00
C.	Proceedings and Reprint Sales	300.00
D.	Peanut Science Page and Reprint Charges	12,960.00
E.	Differential Postage Assessment	1,500.00
F.	Institutional Library Subscription	996.00
G.	Sale of Peanut Quality Committee Loose Leaf Book (Clyde Young, Editor)	2,500.00
H.	Pre-sale of Book "Peanut Science and Technology" 750 copies at $35.00 each	26,250.00
I.	Post-Sale of Book "Peanut Science and Technology" 250 copies at $40.00 each	10,000.00
	TOTAL	$115,882.93
III. Proposed Expenditures and Liabilities		
A.	Peanut Research Newsletter	$ 1,400.00
B.	Printing of Proceedings	5,000.00
C.	Annual Meeting Costs	2,100.00
D.	Secretarial Services for Secretary-Treasurer	2,500.00
E.	Expenses for Secretarial Service at Annual Meeting	500.00
F.	Postage for Secretary-Treasurer	1,500.00
G.	Office Supplies for Secretary Treasurer	1,700.00
H.	Miscellaneous for Secretary-Treasurer	500.00
I.	Printing Costs for Peanut Science	8,800.00
J.	Reprint Costs for Peanut Science	2,700.00
K.	Editorial Assistant for Peanut Science Edition	2,200.00
L.	Postage for use by Editor of Peanut Science	2,000.00
M.	Office Supplies for Editor of Peanut Science	750.00
N.	Miscellaneous for Editor of Peanut Science	250.00
O.	Cost of Printing the Book "Peanut Science and Technology"	40,000.00
P.	Promotional Material for Sale of "Peanut Science and Technology"	300.00

Q.	Labor Costs for Handling and Packaging Mail-outs of the Book "Peanut Science and Technology"	500.00
R.	Peanut Quality Committee - for Publication of Experimental Methods of APRES	3,000.00
S.	Fund Available for Travel for a Second Meeting in 1981-82	
	1. President	600.00
	2. Secretary-Treasurer	600.00
	TOTAL	$ 76,900.00

REPORT OF THE PUBLICATIONS AND EDITORIAL COMMITTEE

by

Olin D. Smith, Acting Chairman

The Committee is pleased to report the progress of the Society's publications and to offer recommendations as follows:

Proceedings

The 1980 proceedings were published and distributed to their membership through the efforts of Joe Sugg and Harold Pattee. Joe Sugg has done an outstanding job in the publication of the Proceedings and merits our appreciation for the service rendered.

Mr. Norfleet Sugg has kindly agreed to accept the responsibility for publishing the 1980 Proceedings in a manner similar to that of the past. Assistance in the collection and organization of materials will be provided by Olin Smith.

Methods Handbook

The progress regarding publication of the new Methods Handbook was reviewed. The election of an Editor for the Handbook is recommended to insure continuation of the project, and to see that the quality and management of affairs relating to this handbook are acceptable to APRES standards. Clyde Young was requested, and has consented, to serve a 3-year term in this capacity and is recommended for approval by the Society. The recommendations of the Quality Committee in reference to the Handbook were reviewed and endorsed.

Peanut Science and Technology

The progress and recommendations of the "ad hoc committee" will be presented by Chairman Dan Hallock:

"The Ad Hoc Committee, concerned with the development and publication of our new book, Peanut Science and Technology, met with the editors and many of the chapter authors on Tuesday afternoon. The editors, Dr. Young and Dr. Pattee, reported that 12 chapters have been sent to the printer and that four of those have already been printed and returned for proofing. There are nine chapters yet to be submitted to the printers. Hopefully, these are nearly ready. The authors are aware of the tight schedule our Society has requested, and we hope that those who have not completed their chapters can do so in time for the editors to meet the early January 1982 target publication date.

"Some of you may not be aware that Pierce Printing Company of Ahoskie, NC is printing the new book. They print "Peanut Science" for us. It is estimated that we may be able to have 2,500 copies of the book printed for under $40,000 which will be a real bargain. Specific recommendations for book costs and an approximate payment schedule to Pierce Printing Company were made to the Publications and Editorial Committee and to the Finance Committee.

"Other recommendations and requests made to the Publications and Editorial Committee were as follows: 1) that only high gloss paper equivalent to or better than that in the old book be used in the new book; 2) that each senior and co-author be given a loose leaf copy of his or her chapter in addition to a bound copy of the book; 3) that this Society provide free copies of the book to agencies abstracting "Peanut Science" and to the Library of Congress; 4) that the Publications and Editorial Committee arrange for pre- and post-publication publicity for the new book, and 5) that the official publication address for the new book be: The American Peanut Research and Education Society, P.O. Box 755, Yoakum, Texas 77995.

"We are certain that this Society will soon be the publisher of a very fine book containing a wealth of pertinent information about peanuts. The basic responsibility for this accomplishment is being borne by the authors and the editors, all of whom are putting forth considerable effort beyond their normal heavy work schedules. We owe each of them our deep appreciation for their endeavors on behalf of this Society and the peanut industry."

The recommendations of the "ad hoc committee" were endorsed and recommended for adoption by the Society with appreciation for service to the committee and co-editors, Harold Pattee and Clyde Young.

The willing service of Norfleet Sugg to serve as chairman of a sub-committee for the promotion and publicity of Peanut Science and Technology was accepted and recommended for your approval. The cooperation of the entire Society membership in selling the book is strongly encouraged.

The committee recommends that authorization for pricing Peanut Science and Technology be vested with the Chairman of the Publications and Editorial Committee in consultation with the two co-editors of the book and the President of APRES. This authorization is with the assumption that the price established will meet the intent of the recommendations of the Ad hoc and the Publication and Editorial Committees, and presented in the Finance Committee report.

The Committee recommends that the Finance Committee negotiate a payment schedule for printing Peanut Science and Technology with the printing company and that publication proceed as rapidly as feasible.

Peanut Science

The report of Editor Harold Pattee is presented as follows:

"Gentlemen, Fellow Members, and Guests:

"This has been a most successful year for "Peanut Science," and I wish to commend the authors, the Publications and Editorial Committee, the President, the Executive Secretary, and others who have cooperated in making this a successful and profitable year.

"The manuscript submission level has increased nearly 35%. The status of the journal is as follows:

Manuscripts submitted July 1, 1980 thru June 30, 1981		48
July-December, 1980 Issue:	16 articles - 67 pages printed	
	Index - 4 pages printed	
January-June, 1981 Issue:	18 articles - 81 pages printed	
Total:	34 articles - 152 pages printed	
Number of articles accepted or in review.		29

Printing cost per page: $8,465.71/156 = $54.27
Average length of articles: 4.1 pages
Total cost per page: $12,239.09/156 = $78.46

Printing Cost Breakdown:

Total pages	Printed pages	
161	156	$6,527.00
Reprints supplied (July-December 1980 Issue Only)		954.00
Journal cover		516.40
Taxes		321.09
Shipping charges		117.22
Galley error corrections		30.00

"In addition to these figures, I feel that the financial statement will be of interest to the membership, which I shall at this time hurriedly present:

Financial Statement
July 1, 1980 to June 30, 1981

Balance - July 1, 1980		$ 1,280.81
Received from APRES		13,000.00
Expenditures:		
Printing		8,465.71
Postage	Domestic	339.39
	Foreign	999.03

Office Expenses	Supplies	$ 542.72
P.O. Box and bulk mailing permit		85.00
Salary, editorial assistant		1,700.00
	Self-employment tax	107.24
	Total	$12,239.09
Balance		$ 2,041.72

Estimated 1980-1981 expenses - $12,250.00

Income:

Income from Peanut Science	$10,492.90
Invoices Outstanding Credited 1980	(4,505.30)
Outstanding Invoice Charges	5,961.00
Sale of back issues	-0-
APRES member subscription (574 x $2.00)	1,148.00
Library subscription (80 x $12.00)	960.00
Foreign mailing credit	999.03
Total	$15,055.63

Estimated 1980-1981 expenses - $13,490.00

Proposed Budget 1981-1982

Number of Issues 2 (July-December 1981, January-June 1982)

Estimates: Pages 160
Cost per page $55.00

Expenditures:

Printing costs		$ 8,800.00
Reprint costs		2,700.00
Editorial assistant		2,200.00
Misc. expenses		250.00
Office supplies		750.00
Postage	Domestic	450.00
	Foreign	1,500.00
	Total	$16,650.00

Income:

Page charges	$ 9,900.00
Reprint charges	3,060.00
Foreign mailing	1,500.00
APRES member subscription (590 x $2.00)	1,180.00
Library subscription (83 x $12.00)	996.00
Total	$16,636.00

"In addition to these statistics, I think you should know that the following have been nominated Associate Editors, who will succeed themselves or fill expired or unexpired-term positions and they have been approved by the Board of Directors:

Olin D. Smith
Terry A. Coffelt
A. Michael Schubert
Paul A. Backman
Sidney L. Poe
Thomas B. Whitaker
Leland D. Tripp "

The Publications & Editorial Committee, on behalf of the Society expresses appreciation to the retiring Associate Editors for their service, and recommends that a Certificate of Appreciation from the Society be issued to all who have served the allowable 6 year continuous term. We also want to express a word of thanks to Harold Pattee for his dedication and service as Editor.

Peanut Research

The report of co-editor Ray Hammons was received as follows:

"Four quarterly issues of APRES PEANUT RESEARCH (Volume 18, Issues 75-78, totaling 34 pages) were compiled, edited, published, and mailed to the membership during the year.

"Circulation was to about 635 individual members or institutions in the U.S. and abroad. The Newsletter is sent to Libraries of Land-grant institutions in the southern United States, to USDA National Agricultural Library, to various abstracting services and to several agricultural periodicals.

"PEANUT RESEARCH reported updates on people and research grants, along with several interpretive summaries.

"The FOCUS ON RESEARCH section reviewed ongoing research and extension activities at the University of Florida Marianna Station; University of Guelph, Ontario, Canada; and Oklahoma State University.

"One hundred forty-four selected references and thirty theses and dissertations were documented.

"All information issuances from APRES officers were published."

The membership is indebted to co-editors Ray Hammons and Emery Check for their service with this newsletter.

The Committee reviewed, at the request of President Allison, the measurement systems to be used in Society publications and recommends that no overall policy be adopted; that the system adopted in 1979 for Peanut Science and Technology be followed; that the procedures as published for Peanut Science be continued; and that the convenience of the audience be strongly considered in all present and future publications.

The Committee recommends, in accordance with the guidelines published by the ASA, SSSA and CSSA (P. 32, 1976 handbook), that capitalization be discontinued in Society publications for the terms spanish, virginia and valencia, when referring to types of peanuts.

Respectfully submitted,

Olin Smith, Acting Chairman
Joe Sugg, Chairman
Ron Henning
William Mills
E. Broadus Brown
Terry Coffelt
Leland Tripp
Ray Hammons, ex officio
Harold Pattee, ex officio

PEANUT QUALITY COMMITTEE REPORT

The Quality Committee met at 7:45 P.M. on July 21, 1981 during the 13th Annual Meeting. Attendence at the meeting was not as good as had been encountered in the previous two years; but, the group was very productive. Present were: Paul Blankenship, Ruth Ann Taber, Jim Steele, Terry Coffelt, Walton Mozingo, Robert Howell, Lakho Khatri, Norman Lovegren, Shaik-M. M. Basha, and Clyde T. Young.

The goals of the committee during the previous year was reviewed and it was decided that additional organization is needed so as to clarify and maintain the momentum generated by the previous committees. It was a recommendation of the group that an editorial board be established for the publication of the Methods Manual entitled, "Methods of the American Peanut Research and Education Society." This suggestion was given to the Publications Committee and the following individuals were approved: Editor, Clyde Young; Associate Editor in the manufacturing area, Lakho Khatri; Associate Editor in the production area, R. Walton Mozingo; and Assistant Editor, Ruth Taber. The Associate Editors would assist the Editor in review and acceptance of the methods for publication. The Assistant Editor would assist the Editor in soliciting writers for the different methods and other areas needed to increase the efficiency of operation of the Methods Manual Editorial Board.

It was a recommendation that the first issue of the methods would be for 50 methods which would sell for $25 plus shipping and handling cost. Anyone subscribing to 50 methods would automatically receive all of the methods up until 50 had been delivered. Next year, we will review what charges should be made for additional series of methods. Orders would be placed through Don H. Smith, Yoakum, Texas, our Executive Secretary so as to maintain uniformity in financial matters. The Methods Manual would be publicised through Peanut Research, by the means of these proceedings, and possibly in connection with the promotion and sale of the revised peanut book entitled Peanut Science and Technology. An operational budget of $3,000 was requested for 1981-82. These recommendations were approved by the financial committee and finally by the APRES membership at its annual meeting on July 24, 1981.

At the Annual Board Meeting, several individuals questioned the legal aspects of the title that had previously been selected and approved by previous committees and the Board. Dr. Bob Ory and Dr. Jim Butler were assigned the responsibilities to clarify and check on the legal aspects of the title and to notify Editor of the results.

Readers of this Quality Committee Report should see the reports in the 1978, 1979, and 1980 Proceedings of APRES for further information.

Clyde T. Young
Acting Chairman

REPORT OF THE PUBLIC RELATIONS COMMITTEE

The committee was composed of the following persons: Rufus Keel, Chairman; A. J. Norden; J. T. Ratliffe; H. Ray Smith, G. M. Grice; and D. M. Porter.

A press release relevant to the annual meeting of APRES was distributed to 22 news sources. An APRES banner was prepared and displayed in the registration area. The committee recommended that the APRES brochure entitled "History, Purposes, and Goals of APRES" be sent to all APRES members and that APRES members be encouraged to give the brochures to prospective members of APRES.

Resolutions of necrology and services were duly submitted.

RESOLUTION

Be it resolved, that the American Peanut Research and Education Society (APRES) does hereby recognize the tragic death of Bob Swinson as a loss to seed peanut growers in North Carolina and to the industry. Bob was President of Keel Peanut Company, Inc. and involved with N.C. Crop Improvement Association. He was dedicated to helping seed growers improve the quality of their seed. He will be sorely missed by his friends.

We, therefore, recommend that this resolution be included in the official minutes of the 1981 Annual Meeting of APRES and then a copy be forwarded to his widow and sons.

RESOLUTION

Be it resolved, that the American Peanut Research and Education Society (APRES) does recognize that the death of Mr. Ben M. Birdsong will be a loss to the entire peanut industry. Mr. Birdsong was past President of Birdsong Peanut Company. He was past chairman of the National Peanut Council and held numerous other industry posts.

We, therefore, recommend that this resolution be included in the minutes of the 1981 Annual Meeting of APRES and a copy be sent to his wife.

RESOLUTION

Be it resolved that the American Peanut Research and Education Society does hereby recognize that the death of Dr. George Donaldson will be keenly felt by the peanut industry. Dr. Donaldson served as Executive Secretary in the Georgia Agricultural Commodity Commission for Peanuts for 12 years and served as President of Abraham Baldwin Agricultural College. He had been honored by the Progressive Farmer as the "man of the year" and by the University of Georgia Agricultural Alumni Association for his many contributions to the Georgia Agriculture.

We, therefore recommend that this resolution be included in the official minutes of the 1981 annual meeting of APRES.

RESOLUTION

WHEREAS: Mr. Joe Sugg served for 28 years as the Executive Secretary of the North Carolina Peanut Growers Association. He was a charter member of the Peanut Improvement Working Group, and predecessor of the American Peanut Research and Education Society. He was a strong supporter of APRES and served it well in many capacities. One of his most significant contributions was his service on the Publications Committee and his behind the scenes efforts aided the entire peanut industry.

THEREFORE: Be it resolved that we, the members of APRES, wish to thank Joe for his unselfish dedication to the peanut industry and wish him well in his retirement.

RESOLUTION

WHEREAS: Mr. Astor Perry has served the peanut farmer and peanut industry for over 30 years. He was instrumental in the organization of the Peanut Improvement Working Group, the predecessor of the American Peanut Research and Education Society. He was a strong supporter of APRES, serving on numerous committees and as its president. Mr. Perry, in his position at North Carolina State University, was instrumental in increasing both the quantity and quality of the state's peanut crop.

THEREFORE: Be it resolved that we, the members of APRES, do hereby recognize and thank Mr. Astor Perry for services rendered and wish him good luck for the future.

RESOLUTION

WHEREAS: Dr. Kenneth H. Garren has served the peanut farmer, the peanut industry, and the research community with distinction and dedication. He was instrumental in the organization of the Peanut Improvement Working Group, the predecessor of the American Peanut Research and Education Society. He served APRES well over the years, serving on numerous committees and also as its president. His research contributions in the field of plant pathology are numerous. Dr. Garren, in his position as research leader with U.S.D.A. was instrumental in helping the peanut farmer understand disease problems and how to control them.

THEREFORE: Be it resolved that we, the members of APRES, recognize Dr. Garren for his outstanding contributions to peanut production and wish him well in the future.

REPORT OF SITE SELECTION COMMITTEE

BY

David Hsi, Chairman
Elbert Long, Vice Chairman
Jim Butler
Bill Branch
Walton Mozingo
Ross Wilson

As was decided by last year's Site Selection Committee and subsequently approved by the Board of Directors, New Mexico will represent the Southwest Region in hosting the 1982 meeting. This will be the first time APRES has met in New Mexico. Last year's committee, headed by Jim Butler, also selected Albuquerque Hilton as the meeting site. The special 1982 convention rates for this meeting are $50 for singles and $60 for doubles. Government/Faculty rates which require I.D. are $42 for singles and $52 for doubles. Rates for extra persons are additional $10 each. Children in same room as parents are free. Albuquerque's elevation of 5,314 feet makes it the highest metropolitan city in America. It was founded in 1706 by the Spaniards and is one of the nation's oldest inland communities. Albuquerque is in the heart of Indian pueblo country - the oldest farming civilization on the North American Continent. The 2.7 mile aerial tramway located five miles northeast of Albuquerque is the longest in North America. The tram whisks visitors from the base of 6,600 feet to the top of 10,378 feet Sandia Peak in about twenty minutes. The panoramic view at the crest covers more than 11,000 square miles. Charming and historic Sante Fe, capital of New Mexico, and secretive and hidden Los Alamos, birthplace of the atomic age, are located only 60 to 70 miles north of Albuquerque. White Sands and Carlsbad Cavern, two of the wonders of the world, are within 300 miles south and southeast of Albuquerque. The dates for the APRES meeting in Albuquerque are July 13-16, 1982.

Following the established tradition for regional rotation, North Carolina will host the 1983 meeting. Charlotte was tentatively selected as the location. The dates for the 1983 meeting are July 12-15, 1983.

Respectfully submitted,

David Hsi, Chairman

1981 AWARDS COMMITTEE REPORT

The 1980 Bailey Award recipients, N. A. de Rivero and S. L. Poe, were selected by the Awards Committee for their manuscript entitled "Response of *Labidura riparia* to pesticide residues on peanuts."

The following process was used to select the 1980 recipients:

1. The session moderators were notified of their responsibility to select a nominee for the Baily Award from their respective sessions.

2. The nominees from all sessions were obtained from the session moderators at the 1980 APRES meeting at Richmond, Virginia.

3. All nominees for the Bailey Award were informed of their selection by mail. Eight manuscripts were received by the January 2, 1981 deadline.

4. Members of the Awards Committee were sent copies of all manuscripts and score sheets on January 16.

5. The score sheets were returned by March 9, 1981. The scores did not produce a distinct winner so three manuscripts were evaluated again by the Awards Committee.

6. On May 27, President Allen Allison, President-Elect Jim Butler and Executive Secretary Don Smith were notified that the Bailey Award recipient had been selected.

On June 22, 1981 the 1981 session moderators for the 1981 APRES meeting in Savannah, Georgia were notified to select nominees for the 1981 Bailey Award.

In addition to the Bailey Award, the Awards Committee prepared a preliminary set of proposed guidelines for election of fellows to APRES. Attached is a copy of the guidelines submitted to the APRES Board of Directors for their consideration.

AWARDS COMMITTEE:

Paul Blankenship
Kenneth Garren
David C. H. Hsi
Kay McWatters
Olin Smith
J. L. Steele
Milton Walker
Johnny Wynne, Chairman

Announcement of

FELLOW ELECTIONS FOR ______
(Year)

American Peanut Research and Education Society

Fellows

Fellows are active members of the Society who have been nominated to receive the honor of fellowship by other active members, recommended by the Fellows Committee, and elected by the APRES Board of Directors. Up to six active members may be elected to fellowship each year.

Eligibility of Nominators

Nominations may be made by an active member of the Society except members of the Fellows Committee and the APRES Board of Directors. A member may nominate no more than two persons for election to fellowship in any one year.

Eligibility of Nominees

Nominees must be active members of the Society at the time of their nomination and must have been active members for a total of at least five years.

The nominee should have made outstanding contributions in an area of specialization whether in research, extension or administration and whether in public, commercial or private service activities. Members of the Fellows Committee and the APRES Board of Directors are ineligible for nomination.

Nomination Procedures

Preparation. Careful preparation of the nomination for a distinguished colleague based principally on the candidate's record of service will assure a fair evaluation by a responsible panel. The assistance of the nominee in supplying accurate information is permissible. The documentation should be brief and devoid of repetition. The identification of the nominee's contributions is the most important part of the nomination. The relative weight of the categories of achievement and performance are given in the attached "format."

Format. Organize the nomination in the order shown in the attachment, and staple each copy once in the upper left corner. Each copy must contain (1) the nomination proper, and (2) one copy of five supporting letters. Do not include more than five supporting letters with the nomination. The copies are to be mailed to the chairman of the Fellows Committee as described in the APRES PROCEEDINGS.

Deadline Date. The deadline date for receipt of the nominations by the chairman shall be January 1 of each year.

Basis of Evaluation

A maximum of 10 points is allotted to the nominee's personal achievements and recognition. A maximum of 50 points is allotted to the nominee's achievements in his or her primary area of activity, i.e., research, extension, industry service, or administration. A maximum of 10 points is also allotted to the nominee's contributions outside of his or her primary area of activity. A maximum of 30 points is allotted to the nominee's service to the profession.

Fellows Committee

Six members of the Fellows Committee shall be chosen by the President of APRES. After several Fellows have been selected, it is suggested that previous Fellows be considered for membership on the Fellows Committee. Each committee member shall serve a term of three years with two members rotating off the committee each year. Members shall be eligible for reappointment one year after having previously served on the committee. The chairman and all committee members shall be published annually in the APRES PROCEEDINGS. The vice-chairman will automatically rotate to the chairmanship of the committee.

Processing of Nominations

The Fellows Committee evaluates the nominations and sends a list of eight nominees with recommended rankings to the President of APRES by April 1 of each year. The President of APRES mails the committee recommendations to the Board of Directors to elect the six Fellows for that year. At least 3/4 of the Board of Directors must vote for a recommended Fellow to elect him or her to fellowship. Persons elected to fellowship, and their nominators, are informed promptly. Unsuccessful nominations are returned to the nominators and may be resubmitted for consideration the following year, preferably after updating.

Recognition

Fellows shall receive an appropriate framed certificate at the annual business meeting of APRES. The President shall announce the elected Fellows and present each a certificate. The members elected to fellowship shall be recognized by publishing a list of Fellows, a brief biographical sketch of each, and a brief summary of their accomplishments in the APRES PROCEEDINGS. The brief summary is to be prepared by the Fellows Committee.

Distribution of Guidelines

These guidelines and the format are to be published in the APRES PROCEEDINGS and again whenever changes are made. Nominations should be solicited by an announcement published in "Peanut Research."

Format

FELLOW NOMINATIONS FOR _____
(Year)

American Peanut Research and Education Society

TITLE: Entitle the document "Nomination of _________________ for Election to Fellowship by the American Peanut Research and Education Society," inserting in the blank, the name of the nominee.

NOMINEE: Include the name, date and place of birth, mail address (with zip code) and telephone number (with area code).

NOMINATOR: Include the typewritten name, signature, mail address (with zip code) and telephone number (with area code).

BASIS OF NOMINATION: Primary area: (Designate primary area as Research, Extension, Service to Industry, or Administration.)

Other areas: (Include contributions in areas other than the nominee's primary area of activity in the appropriate sections of this nomination format.)

QUALIFICATIONS OF NOMINEE: Complete parts I and III for all candidates and as many of II-A, -B, -C, -D, and -E as are applicable.

I. PERSONAL ACHIEVEMENTS AND RECOGNITION

A. *Degrees received:* Give field, date, and institution for each degree.
B. *Membership in professional and honorary academic societies.*
C. *Honors and awards received since the baccalaureate degree.*
D. *Employment:* Give years, organizations and locations.

II. ACHIEVEMENT IN PRIMARY FIELD OF ACTIVITY (check one of A, B, C, or D below).

A. Effective Extension Education Performance (Primary Field? _____)

Ability (a) to communicate ideas clearly, (b) to influence client attitudes, (c) to motivate change in client action. Evaluate the quality, number and effectiveness of publications for the audience intended.

B. Research Performance (Primary Field? _____)

Significance and originality of basic and applied research contributions; scientific contribution to the peanut industry; evidence of excellence and creative reasoning and skill; number and quality of publications; quality and magnitude of editorial contributions.

C. Service to Industry (Primary Field? _____)

Development or improvement of programs, practices, and products. Significance, originality and acceptance by the public. (Brief description). Evaluate the quality and effectiveness of publications to support the program or practices.

D. Administration or Business (Primary Field? _____)

Evidence of creativeness, relevance and effectiveness of administration of activities or business within or outside the U.S.A. (brief description).

E. Publications

1. *Books written.*
2. *Chapters of books written.*
3. *Books edited.*
4. *Other publications edited.*

5. *Journal articles* (no. in refereed journals ___).
(no. in other journals ___).
6. *Technical bulletins or other reports* (no. ___).
7. *Extension bulletins or other reports* (no. ___).
8. *Non-technical papers* (no. ___).
9. *Abstracts* (no. ___).

Attach lists of publications in chronological order; do not send copies of reprints.

III. SERVICE TO THE PROFESSION:

A. Service to APRES.

1. *Appointed positions* (attach list).
2. *Elected positions* (attach list).
3. *Other service to the Society* (brief description).

Service to the Society and length of service as well as quality and significance of the type of service are all considered.

B. Service to the PROFESSION OUTSIDE THE SOCIETY.

1. *Advancement in the science, practice and status of Peanut Research, education or extension, resulting from administrative skill and effort* (describe).

2. *Initiation and execution of public relations activities promoting understanding and use of peanuts, peanut science and technology by various individuals and organized groups within and outside the U.S.A.* (describe).

The various administrative skills and public relations actions outside the Society reflecting favorably upon the profession are considered here.

EVALUATION: Identify in this section, by brief reference to the appropriate materials in sections II through VIII, the combination of the contributions on which the nomination is based. The relevance of key items explaining why the nominee is especially well qualified for fellowship should be noted. *However, brevity is essential as the body of the nomination, excluding publication lists, should be confined to not more than eight (8) pages.*

SUPPORTING LETTERS: Five supporting letters should be included, at least four of which are from active members of the Society. The nominator may *not* add a supporting letter in addition to the five, but a nominator's letter may be one of the five. The letters are solicited by, and are addressed to, the nominator, and should not be dated. *Please urge those writing supporting letters not to repeat factual information that will obviously be given by the nominator, but rather to evaluate the significance of the nominee's achievements.* Attach one copy of each of the five letters to each of the six copies of the nomination. Members of the Fellows Committee and of the APRES Board of Directors are not eligible to write supporting letters.

REPORT OF THE 1980-81 NOMINATING COMMITTEE

The nominating committee consisting of R. O. Hammons, W. M. Birdsong, and J. S. Kirby, Chairman nominate the following APRES members to fill the positions described:

President-Elect --------------------------- David C. H. Hsi

Executive Secretary-Treasurer ------------- Don H. Smith

Board of Directors (USDA Representative - 3 year term) --------------------------- Darold L. Ketring

The willingness of the nominees to accept the responsibility of the position, if elected, has been ascertained.

BY-LAWS
of
AMERICAN PEANUT RESEARCH 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 education 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 of 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	:	$ 10.00
b.	Institutional memberships	:	$ 12.00
c.	Organizational memberships	:	$ 25.00
d.	Sustaining memberships	:	$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 $15.00 registration fee will be assessed at all regular meetings of the Society. The amount of this fee may be changed upon recommendation of the Finance Committee subject to approval by the Board of Directors.

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 secretary-treasurer 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 secretary-treasurer 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. Until such time as the membership reaches 200 voting members, 20% of the voting members of this Society shall constitute a quorum for the transaction of business. When the membership exceeds 200, a quorum shall consist of 40 voting members.

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 organization shall be:

a. President
b. President-elect
c. Executive Secretary-Treasurer

<u>Section 2.</u> 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. The president shall serve without monetary compensation.

<u>Section 3.</u> 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-elect shall serve without monetary compensation.

<u>Section 4.</u> The executive secretary-treasurer may serve consecutive yearly terms subject to re-election by the membership at the annual meeting. The tenure of the executive secretary may be discontinued by a two-thirds majority vote of the Board of Directors, who then shall appoint a temporary executive secretary to fill the unexpired term.

<u>Section 5.</u> 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 secretary-treasurer, 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.

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

<u>Section 7.</u> (a) The executive secretary-treasurer 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 secretary-treasurer 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 secretary-treasurer shall keep account for all monies, credits, debts, and property, of any and every nature, of this Society, which shall come into his hands or be disbursed 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 secretary-treasurer 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

<u>Section 1.</u> 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 (elected annually)

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 educational, 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. A person oriented toward research - to be named by the chairman of the Board of Directors of the National Peanut Council.

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

i. The president of the National Peanut Council - a non-voting member.

Section 2. 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 3. 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 4. 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 5. Contingencies not provided for elsewhere in these By-Laws shall be handled by the Board of Directors in a manner they deem desirable.

ARTICLE IX. COMMITTEES

Section 1. Members of the committees of the Society shall be appointed by the president and shall serve 2-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 reappointed to succeed himself, and may serve on two or more committees concurrently but shall not hold concurrent chairmanships. Initially, one-half of the members, or the nearest (smaller) part thereto, of each committee will serve one-year terms as designated by the president.

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. Publications and Editorial Committee: This committee shall consist of at least three members appointed for indeterminate terms, one each representing State-, USDA-, and Private Business - segments of the peanut industry. This committee shall be responsible for the publication of the proceedings of all general meetings and such other Society sponsored publications as directed 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 six members, one each representing the State-, USDA-, Grower-, Sheller-, Manufacturer-, and Services-, segments of the peanut industry. 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.

(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 decreased members.

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

ARTICLE X. DIVISIONS

Section 1. A Divisions 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 consistent 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 13, 1979, Tulsa, Oklahoma.

LIST OF APRES MEMBERS WITH ADDRESSES
SEPARATED BY MEMBERSHIP TYPES

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