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# PROCEEDINGS



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1977 ANNUAL MEETING  
of the  
AMERICAN PEANUT  
RESEARCH AND  
EDUCATION ASSOCIATION, INC.  
at  
ASHEVILLE, NORTH CAROLINA

GENERAL SESSION  
Wednesday, July 13, 1977, a.m.

Some Dimensions of Research and Educational Programs in Peanuts

an address by

J. E. Legates

North Carolina State University

We welcome you to North Carolina for the Ninth Annual Meeting of APREA. It is also a privilege for me to have the opportunity to discuss research and education in the context of our most newsworthy crop, the peanut.

Unfortunately, my remarks come from the biased background of a former university professor and now an administrator. Nevertheless, I will make every effort to keep the bias as factual as possible. Those of you not directly associated with a university represent highly progressive agri-business and industry operations. You appreciate the importance of research and education in agricultural growth and development. In fact, you have contributed in a significant way in creating and promoting the research and technology that now enables our agriculture to meet the needs of 214 million citizens, plus providing an export of agricultural products in excess of \$22 billion.

Too many Americans are not aware of the remarkable role that research and education have played in bringing the benefits of agriculture directly to their homes and kitchens. Like the air we breathe and the water we drink, the critical contributions of agriculture are too often simply taken for granted.

Our universities have evolved over the years to meet the educational needs of our citizens. Establishment of Land-Grant Colleges marked a revolutionary change in the educational philosophy of 19th century America. Higher education in our nation was about to repeat the traditional European pattern, where only the wealthy or well-born were permitted to enroll. Fortunately the passage of the Morrill Act in 1862 providing grants of land to the states, 30,000 acres for each Congressman, to establish colleges for "the purpose of teaching such branches of learning as are related to agriculture and mechanic arts," extended the democratic principles of our growing nation into the field of higher education.

Henry Ward Beecher stated that "the philosophy of one century is the common sense of the next." This applies most appropriately to our Land-Grant Universities in that the philosophy of service born with the passage of the Morrill Act has been a guiding force in defining the role of universities during the 20th century. The responsibility of the University must be that of education. We are charged with providing information, knowledge and training, i.e. education in the broad sense. In the long run if we go beyond the bounds of education, the role of another cooperating segment of agriculture is encroached upon, and the university's role as an educational institution is rightly subject to challenge. The division of labor in agricultural development must be understood and respected.

It is fortuitous that in agricultural colleges our research programs through the experiment stations and our extension programs through the extension services have developed in coordination with our academic programs. The value of having teaching and research personnel working in concert was rapidly recognized. Research

and critical inquiry make an essential contribution to the vitality of the university community and the production of new knowledge. From this new knowledge food production can be increased, diseases can be conquered or controlled; thereby, giving many the opportunity to enjoy an abundant life.

Research is not something to be drawn upon merely to meet emergencies. A major portion of our efforts should be directed to put calculated pressure on long existing questions. In applying this pressure and effort to these knotty and resistant problems, the researcher provides the university with another important resource. As background for his ongoing research, the investigator must be abreast of latest developments in his field. Hence, when problems arise, the researcher with his background of information and experience can be invaluable in providing guidance to the solution of troublesome current problems as they emerge.

Particularly those of you in Extension know that research results alone are not the end of the chain of responsibility. "Knowing how" is not enough. The information must be taken to the farm, into the home and to the broader reaches of the community to be used in meeting human needs. Research and extension must join with commitment and zeal to make knowledge useful. We must not have our clients ask as in the words of T. S. Eliot, "Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?"

As we seek to harness resources to meet emerging needs, there are three key characteristics of society, industry, agriculture, research or education of which we should be aware. I believe these characteristics will continue to describe our situation, certainly during the remainder of this century. These are:

1. Rapid increase in knowledge
2. Increasing specialization
3. Growing interdependence of societal units

In recent years we have experienced an increase in scientific knowledge that has approached an almost exponential rate. During this century we have had what has been referred to as a "knowledge explosion." More scientific facts have been uncovered and more scientists have been at work during the last seventy-five years than during the entire previously recorded history of man. Whereas only the independently wealthy could undertake intellectual and scientific inquiry in the immediate past centuries, the productivity of society has now become sufficient to permit a high proportion of our citizens to undertake research and educational endeavors for the public good. We anticipate the continuance of this situation as we look to the next century. Our further progress as a nation depends upon the continued rapid increase in knowledge and its application.

The second key feature of our society is that of increasing specialization. The capacity of the human intellect has not kept pace with this onslaught of new knowledge and information. Hence, we have sought to train and accept responsibilities in more narrow and specific fields, striving to maintain a coordinated comprehension of the broader picture of our business, profession or discipline.

Examine your own business or profession over the past years. I suspect with the exception of those who have taken on broadened administrative roles that your own responsibilities have become more specialized and intensified. You have



probably brought into your organizations persons who possessed specialized qualifications which could be used to advantage. We can enhance our individual proficiency and move to a more intricate level of comprehension as we narrow the scope of our undertakings. Such concentrations of our talents and energies have been and will continue to be the key to increased productivity, provided we can "put it all together."

The third compelling characteristic growing out of the rapid increase in knowledge and our trend toward specialization is the increasing interdependence of business and societal units. All of the specialties of the system must mesh together with fine precision, or we do not gain the real increases in productivity that are inherently available to us. Cooperation and interdependence have and must more and more replace the individualistic and self sustaining philosophy of our pioneering years.

Peanut research and education have no immunity from these trends. I am sure the number of persons attending your meeting this year and the number of diversity of the presentations are much larger than for your first meeting in 1969. Your program reflects the large number of disciplines involved in undergirding the many facets of the peanut industry: agronomy, biochemistry, entomology, economics, genetics, nematology, nutrition, physiology, plant pathology and others. The tiny peanut must be bewildered by being dissected and parceled into so many portions, particularly when all of this information must be reassembled in the final production, processing and utilization of the peanut. We must each do our very best in the search for truth in the assigned area. Then all must join hands in merging the information to develop a meaningful program to increase the productivity and usefulness of the peanut.

We in North Carolina have a sizeable peanut industry, even though we cannot boast of the volume of our sister state which catapulted its genial and smiling peanut entrepreneur to the White House. Our cash farm sales total approximately \$75 million and the 4-Sight forecast by our Agricultural Extension Service projects an increase to \$100 million by 1982.

We are pleased that our producers and our General Assembly have supported a many faceted research and extension effort for peanuts. It is my hope that we have contributed responsibly to the progress of the industry and this Association. Certainly we have sought information and guidance from those of you from other states and nations. Hunger and truth know no geographical or ideological bounds, even though economic barriers often must be overcome.

Our peanut research and education program at North Carolina State University has been a balanced one, including genetics and breeding, seed physiology, plant nutrition, pest management, disease control, storage, and product development. Permit me to identify a few highlights.

In genetics and breeding there has been a continuing search for new germ plasm. In the early 1950's Dr. Gregory took peanuts just over the mountains from us to Oak Ridge for radiation to see if favorable mutations could be found. The so-called "atomic" peanut was developed and released. The search for new genetic material throughout the world has continued. Several new species have been described and

new material has been collected that would bring the total potentially to 50-70. Diallel crosses of many of these species have been made to characterize them and to provide a known reservoir of resistance to nematodes, immunity to leafspot and resistance to spider mites.

Cylindrocladium black rot was discovered in North Carolina in 1970. We in North Carolina and Virginia, I understand, are troubled much more by this disease than the remainder of the United States peanut growing area. Our plant pathologists and crop scientists have made much progress in gaining an understanding of this disease. Chemical control has been relatively ineffective, but progress is being made in locating resistant or tolerant varieties and strains.

Weed and pest control programs draw upon both chemical and biological approaches. Economic considerations are of major concern. Insects, also, know that peanuts taste good as the spider mite, root worm, tobacco thrip, potato leafhopper, army worm and the corn earworm include the peanut plant in their diet. Considerable success has been achieved in developing a variety with insect resistance. The NC-6 variety has excellent yield and quality characteristics. Its acceptance by the grower would measurably reduce our dependence on insecticides.

Seed quality has been medium to poor in recent years. Efforts are being directed to change the seed growers self-image. Currently they see themselves as peanut producers rather than peanut seed producers. Emphasis is being given to the three critical phases of production, harvesting and drying in the improvement of seed quality. Nutrition, including calcium, plus many physiological factors are also being examined. This problem has such urgency that our industry has provided significant support for these investigations. Considerable progress has been made during the last two years.

Peanuts are grown to be eaten. Even though it is said that "you cannot eat just one peanut," presumably too few people in the world are eating their first peanut. We need more consumption. Our Food Science Department has a major effort in the development of peanut products. This research has resulted in the commercial development of such products as Planter's Old Fashioned Peanuts. Other products are on the way. Dr. Hoover will be discussing the use of peanuts in beverages and for desserts at this meeting.

Our Extension Service has provided a comprehensive long-range plan for peanut production pointing to 1982. In addition to recognizing the major problems whose solution hinge heavily on research needs that have been identified, reducing costs of production must be given special attention. The total production system must be examined for efficiencies to make the peanut competitive with other protein and oil sources for our nation and world.

There are many needs and correspondingly many opportunities. Attacking each of these will require a calculated investment in funds, manpower and facilities. The potential for payoff is great. Evidence to date indicates that there is a slowing of the rates of increase in production for both plants and animals. Energy restrictions and costs are bound to slow the increases in labor productivity. Inflation plus environmental and regulatory concerns have eroded our resources. Overcoming such challenges require substantial, long-term research commitments, but

they can provide high payoffs. Increasing our investment in agricultural research and extension education can help to lower food costs, contribute to a favorable balance of trade, and provide an essential reserve capacity for food production to meet our own and urgent world needs.

Throughout the years and particularly today, there is a special need for a mutuality of understanding among educational and industrial segments of the peanut industry. I am sure Dr. Tripp wants the American Peanut Research and Education Association to serve as a forum, where new knowledge and findings are presented for evaluation and where industry and education can interface.

We have a strong agriculture in the United States because each member of the system; farmer, processor, supplier, distributor, educator and retailer, is provided incentives and accepts responsibility in the division of labor.

I am certain that I speak for the agricultural administrators of the Land-Grant Universities in our peanut belt in assuring you that we want our institutions to be full partners in your research and educational efforts.

## A Manufacturer Views the Current Peanut Situation

an address by

R. P. Gardner, President

National Peanut Corporation

I recall quite vividly going to Suffolk, Virginia in the spring of 1961, my first exposure to the peanut industry. Up to that time I was familiar with peanuts in the can or at a nut counter. But on February 1, 1961, Standard Brands and Planters Nut and Chocolate Company became associated and I came down from New York on one of those corporate "temporary assignments". It has been an exciting sixteen years, full of opportunity and often with problems. Since that time two words have become indelibly impressed in my thoughts. QUALITY - PRICE.

So, when Astor Perry asked me to discuss "How a Manufacturer Views the Current Peanut Situation", for a few minutes I felt the opportunity to talk to a group who has a major impact on the Peanut Industry. Research and Education is primary support of our Industrial life, but research needs objectives.

So, let's spend a few minutes looking at these two key words which are so closely related and with regard to our United States business should not be separated. QUALITY is difficult to define; it is certainly variable. We view the definition as a class, grade, a distinctive trait, an excellence of character. Some years ago in the case of peanuts, the U. S. Department of Agriculture and the Industry, in its wisdom, established the Peanut Administrative Committee charged with the responsibility to administer a QUALITY control program. The attention of this committee has vacillated at times but we know the real concern was related to a QUALITY problem known as aflatoxin. In the early days the subject was very hushed - and we tried to keep out of the view of the public. The Peanut Administrative Committee has done a very responsible job and has been of very great assistance in causing QUALITY peanut products to be delivered to the consumer. But it functions in the area of "removal" of contamination. In this regard I claim leadership of the cheering section for Bill Dickens. The visual detection of mold contaminated Farmer's Stock Peanuts and the warehouse storage controls which Bill and his team developed has done more than anything I know to remove aflatoxin contaminated peanuts from edible streams. But since the inception of the PAC, the U. S. consumer has paid more than 31 million dollars in an indemnification program to remove bad quality peanuts from food channels. In any language that is a bundle of money. I do not know how many more dollars have been spent on Research related to aflatoxin. But I believe that once aflatoxin contamination finds its way into edible streams only small quantities are actually removed. What really happens in the distribution system of the peanut industry? Farmer's stock peanuts from numerous producers in several counties are stored in a warehouse. The peanuts are removed from the warehouse and several others and delivered to a handler's shelling plant. This distribution system causes dilution and the resulting shelled peanuts end up at "no detectable" levels of contamination; but somewhere in the lot there may be contamination. As the scientific community continues to improve its ability at

identification, much greater emphasis must be placed on prevention of contamination. I am concerned that so few Research Projects are in progress relating to aflatoxin.

(The effect of phase of development on the sensitivity of groundnuts to environmental conditions - J. H. Williams and G. L. Hildebrand)

(The influence of soil groups and growing seasons on market quality of Valencia peanuts - D. C. H. Hsi and M. D. Finkner)

(Effect of water stress at different stages of growth on peanut yields - C. K. Martin and F. R. Cox)

Can aflatoxin be prevented through seed genetics? Is it possible to treat seed and prevent growth of *A. flavus* mold? Is it perhaps possible to treat the soil and prevent growth of *A. flavus* mold? Prevention is an important project and deserves a great deal of your attention.

Perhaps total prevention is unfeasible. But down the road the FDA will pursue tighter controls. How do we go about detoxification of contaminated peanuts? Some years ago work was done on detoxification of cottonseed meal. I have not heard of successful work on peanuts where flavor and nutrients are retained and the product suitable for food use - Can we pursue such a project.

We have not had any major problems with aflatoxin in peanut products in recent months, but you know there have been some FDA recalls. Fortunately, at the time of the incidents there was other more important front page news and the result was little public reaction. But with the public concerns with such widely consumed items as sugar, salt, saccharin, food additives, etc. can we continue to be so fortunate. With a peanut farmer in the White House, we can expect greater publicity on future peanut problems. I urge you to give this problem the highest priority.

There have been many Research Projects over the years related to increasing farm yields. Yields have increased dramatically but we also know that prices paid for Farmer's Stock have risen greatly, especially since 1969. The consumer has not shared in Producers improved efficiency. In 1961, when I came into the peanut industry, the total U.S. peanut crop was about 830,000 tons at a support level of \$221, and had a value of a little more than 180 million dollars. The 1976 crop of about 1,850,000 tons had a total value of about 750 million dollars. In one sense this measures great progress. I believe those who are willing to risk their assets to provide food and fiber for the nation are entitled to a guaranteed reasonable return. But I am greatly concerned about the declining consumption this year and am certain the price of peanuts is a major cause. Peanut purchases by the consumer are an impulse purchase and must compete with many other snack items on the supermarket shelf. Peanut Butter retails at about 95 cents per pound. There are other sandwich fillers which cost less.

In these days of increasing demand on discretionary income, impulse buying takes a different turn. I am certain supermarket unit pricing and nutritional labeling are helpful to the consumer in making decisions on how to spend her food budget. We all know that nutritionally, peanuts measure up, being much more nutritious than most alternative "snack" foods. But price is another subject. Where

does Research fit into this area?

Again, when I entered peanut business, it was still a familiar sight to see peanuts stacked in the fields, operations of stationery shellers and many farm hands were involved. For our business that system produced a very fine peanut for salting.

Over the years we have educated the consumer to look for QUALITY in our Cocktail Peanuts as a relatively high percentage of whole kernels. Right or wrong, the consumer of salted peanuts, from a nut dish in a home setting, perceives whole peanuts as QUALITY. The changes in the system of handling peanuts, from the farm to the consumer, has changed much during the last fifteen years. With today's handling, 20 percent more SMK are required to produce today's can of peanuts than fifteen years ago. From the time we get the peanut crop, we start splitting the peanuts. In today's system 200 pounds of SMK at the Inspection Station are required to produce 100 pounds of salted Cocktail Peanuts.

As previously stated, that is up by 20% from 15 years ago. And, in my opinion, unfortunately the percentage of whole peanuts in the can is not as good as it was then.

All of you know what that means. That is part of the PRICE structure. I have stated on other occasions, \$415 per ton may not be too much to pay a farmer for his peanuts, but we need to find a way to deliver that value, through the system, to the consumer, for we must remember the consumer pays the way for each of us. Last year the price of Virginia Splits ranged around 25 cents per pound and one of our test kitchen people remarked to me a great deal could be done with those peanuts at 25 cents. But, of course, we must remember, for the sheller to stay in business he must find a buyer who is willing to pay a very high premium for the whole kernels if he is to sell those splits at 25¢. Because those splits were acquired by the sheller as SMK at a cost of more than 30 cents per pound. So, as a priority project, I would urge your attention to this matter. It is very broad in scope, mechanical combine, curing, shelling, blanching. But we need to find the means of delivering the value to the consumer, before other foods displace greater quantities of peanuts.

Then, of course, there is another factor - the PRICE paid the producer for his crop. I realize this is very dangerous ground to explore, but as businessmen, we must. Our peanut allotments have been handed down through families, have been purchased at considerable cost and have been sold at times at handsome profits. We also know farm yields vary from perhaps 800 lbs. to 5 or 6,000 lbs. per acre. From an economic standpoint, if we are to produce peanuts to meet a consumer need rather than a government surplus, we should produce that requirement as efficiently as we can.

For those who desire to produce a less efficient acreage, competition will require that he meet the price of the more efficient. So, in order to protect the allotment of the less efficient, we should develop the means of identifying their needs and alternative crops. For as the make-up of Congress continues to change with strength of urban areas, the Peanut Program as we have known it faces even greater challenges.

And we must face that time and somehow prepare for it. There are those who would produce peanuts if we were operating with an open program. Good farm yields would increase income for some even at prices as low as \$300 per ton. It is difficult to predict where this is down the road, but it may not be far. We need to develop the new and innovative products and uses. We need to position ourselves to use a greater supply of low cost peanut protein.

I must take at least a moment to encourage greater production of Virginia type peanuts. This is not to be done by greatly increasing the price of the Virginia type, however, as some would do. For a higher price would simply force this peanut away from the consumer. I do believe the consumer has a preference for Virginias as salted nuts, but it still must meet the competitive market among all the snack foods.

There are many other concerns to a manufacturer in delivering QUALITY at an acceptable price.

Foreign material, stones, glass and corn kernels, etc. In a ton of peanuts, foreign particles may not be considered numerous, but to the customer who gets a single stone in a can, there is no concern for the average.

Improved cleaning devices are needed. Defects in packaging, leaking cans, allows the food to become stale and rancid. In a worldwide distribution system, we find products on the shelves more than a year old. And again, on the average, cans and glass provide a high package integrity, but the customer who gets the leaker and stale peanuts is not concerned with averages. BHA and BHT are not entirely acceptable. Can more suitable antioxidants be found or more satisfactory packaging. Or do we need to return to many regional packaging operations and supply only local trade areas in order to increase inventory turnover, and cause product to be consumed within several months of processing. We, of course, do not feel this is a viable alternative. In many parts of the world, peanuts are still roasted by the homemaker. But the great volume of world consumption is related to the peanut oil. We need to increase our efforts for human consumption of peanut protein worldwide. But again, perhaps we've gone full circle. In some areas of the world aflatoxin is a far greater problem and the peanut oil is essentially free of this contamination.

But let me leave you with two primary objectives: Aflatoxin prevention deserves more attention - and secondly, delivery of the farm value of our production through the system to the consumer.

Thank you for inviting me to be with you. I have a very great interest in your work and we are grateful for your contributions to the industry.

PLANT PATHOLOGY AND NEMATOTOLOGY, SESSION 1

Wednesday, July 13, 1977, a.m.



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Efficacy of Sulfur Formulations as Tank Mixes with Fungicides for Disease Control in Peanuts. P. A. Backman and J. M. Hammond, Auburn University.

Comparisons of recommended fungicides with and without sulfur for peanut leaf-spot control revealed two classes of response. The moderately effective fungicides (fentin hydroxide and copper hydroxide) showed significant improvement in yield and disease control with the addition of sulfur. For the most effective fungicides (captafol and chlorothalonil) sulfur provided little or no improvement in either disease control or yield. Comparisons of available sulfur formulations revealed the following order of performance (highest to lowest): flowable, wet-milled; flowable, air-milled; flowable; molten-process; wettable, air-milled. The non-performance of sulfur as a tank mix with captafol and chlorothalonil is attributed to the already excellent level of disease control with these products. Evaluation of Sclerotium rolfsii disease levels in test plots revealed that there were greater numbers of diseased sites in sulfur-sprayed plots than in those where the recommended fungicides were used alone. A lower pH on the soil surface is thought to improve the competitive advantage for S. rolfsii.

Sixteen peanut lines representing diverse germplasm were evaluated in the greenhouse and field for resistance to *Cercospora* leafspot. In greenhouse tests Spantex and Starr had consistently fewer lesions than NC 3033 and AC 3139. In field evaluations, with naturally occurring inoculum, the reverse was true. Defoliation of the lines was compared in chlorothalonil sprayed and nonsprayed plots. NC 3033, NC 5 and AC 3139 were more resistant to defoliation than Starr, Tennessee Red, Spantex, Argentine and Spancross. Spancross had an intermediate number of lesions at all sample dates but had the highest defoliation due to disease. A disease index which represents the interaction between number of lesions per leaf and percent defoliation due to disease indicated that NC 3033, NC 5 and AC 3139 are more resistant than Spantex, Argentine, Starr and Tennessee Red. The disease reaction of cultivars grown continuously in the greenhouse was different from those grown outside for 2 weeks prior to inoculation. Plants exposed to weathering tended to have fewer lesions than those grown in the greenhouse; the reduction in lesion number was the most striking on NC 3033. The defoliation ratio technique for comparing entries in field plots resulted in less variability in data than other techniques. Visual estimation of percent leaves infected, however, was a rapid, efficient method for evaluation when large numbers of plants per entry are available. Entries considered to be the most useful as parents in a *Cercospora* leafspot resistance breeding program are NC 3033, AC 3139, and NC 5.

Screening for Resistance of Peanut Genotypes to Cercospora Leafspot by a Detached Leaf Technique. Hassan A. Melouk and Donald J. Banks, Oklahoma State University.

Compound leaves of various Arachis genotypes were inoculated with Cercospora arachidicola by misting both surfaces with a spore suspension ( $2 \times 10^4$  spores/ml) using a DeVilbiss atomizer (No. 152). Individual leaf petioles, each supported by a foam plug, were immersed in Hoagland's solution in 1 x 14 cm test tubes. The tubes were placed on racks in a clear plastic chamber on a greenhouse bench. Temperature in the chamber was maintained at 27-30 C and relative humidity was maintained at 80-90% by hanging wicks of cheesecloth on both sides of the chamber. Ten to 12 days after inoculation, necrotic spots began to appear on leaves of susceptible peanut genotypes. Leaflets on leaves with leafspot symptoms began to defoliate at 18-21 days after inoculation. Except in a few cases, non-inoculated leaves of susceptible and inoculated leaves of resistant peanut genotypes remained normal during the entire length of the screening procedure.

The Use of Aerial Infrared Photography to Determine Severity of Sclerotinia Blight of Peanuts. D. M. Porter and N. L. Powell, USDA-ARS, Suffolk and Virginia Polytechnic Institute and State University.

Sclerotinia blight of peanuts, caused by Sclerotinia sclerotiorum, has become widespread throughout the peanut growing areas of Virginia. The severity of this disease in 1976 was monitored using aerial infrared photography. Disease patterns within peanut fields were easily detected with infrared photography. Areas of infection ranged from slight to severe within each field. As Sclerotinia blight symptoms become more pronounced on the imagery, the amount of pods lost into the soil at harvest increased. In areas of fields classified as being slightly, moderately and severely infected on the imagery actual pod losses exceeded 800, 1300 and 1800 pounds per acre, respectively. About 300 pounds of pods were lost in non-infected areas. The number of sclerotia per gram of soil was ten times greater in soil taken from severely infected areas than from areas only slightly infected with S. sclerotiorum. A relationship between mechanical damage by tractor wheels passing over branches of peanut plants and subsequent infection by S. sclerotiorum was detected on infrared photography. Infection levels were twice as great in rows having mechanical damage than in adjacent rows without damage. Yields were correspondingly greater in nondamaged rows than in rows with mechanical damage.

Peanut Peg Strength and Anatomy as Related to Disease Resistance. Ronald J. Thomas, Ruth Ann Taber, Billy L. Jones, and Robert E. Pettit, Texas A & M University, College Station and Stephenville.

A need has existed to discover peanut types with added peg strength and disease resistance. Strengths of pegs from several hundred plant introductions were tested by hand pulling. Thirty cultivars, with pegs of varying strengths, were chosen for detailed examination. The forces necessary to break the pegs from the pods were measured with an Instron tension load cell. Peg sections were studied with the light and scanning electron microscopes in an effort to identify anatomical characteristics which might be responsible for increased peg strength. Pegs of several plant introductions had detachment forces more than double those of pegs of commercial varieties. Pegs of the strongest cultivar (PI 393647) required an average of 37.2 newtons for detachment while the weakest cultivar tested (PI 365553) required 11.4 newtons. Pegs of commercial varieties required from 8.3 to 19.5 newtons for detachment. Peg strength was correlated with the amount of lignification in the sclerenchyma fiber cap cells of the vascular bundle. Lignified secondary wall thickenings of PI 393647 completely filled the lumen of the fiber cap cells. Bundle caps of this cultivar were broad and crescent shaped with relatively small spaces between them in the vascular ring. In contrast, bundle cap cells of the weakest peg (PI 365553) had larger lumina and vascular bundles with rounded caps which were spaced farther apart and contained fewer cells. Closely spaced bundle caps with more highly lignified cell walls may function as barriers to peg rotting fungi.

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Effectiveness of Nematicides in Combination With the Fungicide Carboxin for Control of Root-Knot Nematodes and Southern Blight of Florunner Peanuts.  
R. Rodriguez-Kabana, E. G. Ingram and Peggy S. King, Auburn University.

The effectiveness of nematicides alone and in combination with the fungicide carboxin against root-knot nematodes (Meloidogyne arenaria) and southern blight (Sclerotium rolfsii) was studied under field conditions. The chemicals were tank mixed, sprayed in an 18" band, and covered by a single pass of the disk. Alone, the nematicides phenamiphos, ethoprop and fensulfothion were applied 4 lb a.i./A, while the fungicide carboxin was applied at 3 and 5 lb a.i./A. In combination, the nematicide-fungicide mix was applied 4 lb a.i./A nematicide plus 3 lb a.i./A fungicide. Significant reductions in soil populations of root-knot larvae were as follows: ethoprop, 91%; phenamiphos, 89%; carboxin at 5 lb a.i./A, 88%; phenamiphos + carboxin, 82%; fensulfothion + carboxin, 65%; and ethoprop + carboxin, 56%. Significant increases in yield were as follows: phenamiphos + carboxin, 53.5%; phenamiphos, 39%; ethoprop + carboxin, 30%; fensulfothion, 28%; and ethoprop, 24.5%. A similar pattern of response was recorded for improvement in plant appearance which was attributed to control of both root-knot and S. rolfsii. Although carboxin at the 5 lb a.i./A rate significantly reduced larval populations, yield was decreased 14%. In general, combination of the nematicide with the fungicide carboxin resulted in increased yield over that of the nematicide alone.

The effectiveness of spray-disk applications of the fumigant DBCP for control of root-knot nematodes (*Meloidogyne arenaria*) was studied for two years in peanut field experiments. The nematocide was sprayed at planting time in an 18" band and was immediately covered by a single pass of a disk. Rates of applications were: 0, 0.25, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, and 4.0 gal/acre of the Fumazone 86 E formulation of DBCP. All treatments were delivered using a standard herbicide sprayer and a total spray-volume of 17 gal/acre. A treatment with the recommended chisel application (1 gal/acre, 2 chisels/row) of the fumigant was also included. Each treatment was represented by eight plot (2-row x 33') replications arranged in randomized complete blocks. Numbers of root-knot nematode larvae in soil were significantly reduced by all DBCP treatments; however, greatest (> 80%) reduction was obtained with spray-disk rates of 1.5 gal/acre or higher, and with the standard chisel application. General appearance of plots one month before harvest was significantly better only in plots receiving spray-disk applications of DBCP at rates higher than 0.50 gal/acre and those with the standard chisel treatment. Yields increased in an almost linear fashion in response to DBCP rates in the range 0.5-3.5 gal/acre; differences between the two highest rates were not significant. Yields for the conventional chisel treatment were 62% above the control and 11% below yields obtained with the 3.5 and 4 gal/acre spray-disk application. Results also showed that yield from a spray-disk application of 2.0-2.5 gal/acre was equivalent to that from the conventional chisel application.

PROCESSING AND UTILIZATION, SESSION 2

Wednesday, July 13, 1977, a.m.



Air Flotation Velocities and Physical Properties of Peanuts and Foreign Materials.  
Paul D. Blankenship and E. J. Williams, National Peanut Research Laboratory,  
Dawson and Georgia Coastal Plain Experiment Station, Tifton.

Physical properties of size, thickness, length, specific gravity, and flotation velocity were determined for various separations of peanut (Arachis hypogaea L.) pods, kernels and foreign materials. This information should facilitate adjustment of conventional precleaning equipment and design of more effective precleaning systems. Pods had overall thicknesses large enough to allow removal of an average of 22% of the raisins and 32% of the rocks from the pods by screening. More than 96% of the peanut vines, weed stalks, and taproots were over 1 in. long. Rocks and soil clods had specific gravities 2 to 4 times greater than pods. Flotation velocities for all of the materials varied from 100 to 3000 ft/min with most of the materials having velocities of 1000 to 2700 ft/min.

Observed Effects of Chemicultural Practices on the Processing and Product Quality of Peanuts. Sam R. Cecil and Ellis W. Hauser, Georgia Station and Coastal Plain Experiment Station.

Following 1963-70 monitoring of the influence of various agents and methods of application of herbicides on the quality of peanuts (Arachis hypogaea L.) for salting, studies of processing quality were expanded to include the effects of several combinations of agricultural chemicals such as may be employed in standard production practices. Although hundreds of samples of cleaned farmers stock peanuts were obtained from 1971-76 field trials of growth regulator, fungicide, insecticide and herbicide combinations, major emphasis was placed on comparisons of minimal and maximal applications of herbicides, with and without the systemic insecticide disulfoton, in 9 varieties variously grown in 1973-76 at 2 locations in south Georgia. As in previous studies, minimal or moderate uses of agents had little effect on milling or processing yields, or on sensory quality of the salted peanuts, and in many comparisons these were favorably influenced by use of the insecticide. Maximal or full-sequence applications of herbicides, however, usually resulted in some decrease in milling and processing yields even in the apparently least sensitive varieties. Seasonal variations were quite definite in one or more varieties in each of the three major botanical types, and milling losses due to thicker shells and smaller kernels, processing losses due to uneven development of color in blanching or cooking, were quite serious in at least one season for Florunner and an experimental Virginia stain. Variations in sensory quality were relatively less serious, although uneven color, slightly harder texture, and flat or slightly overdone aroma and flavor were noted in several of the full-sequence treatment samples.

Probability Distributions of Peanut (Arachis hypogaea L.) Seed Size. James I. Davidson, Jr., Paul D. Blankenship, and Victor Chew, National Peanut Research Laboratory and University of Florida.

Standard probability distributions were fitted to experimental seed size data for Florigiant, Florunner and Starr peanut varieties to provide relationships in selecting screen sizes, and for studying the effects of variables (such as climate) on seed size and quality. Characteristics displayed by distribution plots of the experimental data showed that the normal and logistic distributions had the best potential for fitting the data. The density functions for both types of distributions were developed for several different lots of peanuts. In each case, both the normal and logistic density distributions provided an excellent fit to the experimental data. The largest deviations of experimental values from those predicted by the equations occurred for the lots that were the least or most mature. The logistic distribution generally provided a better fit than the normal distribution. A logistic distribution was also fitted to the average of the data for each variety.

The Effect of Linoleic Acid, Phospholipid, and Tocopherol Concentration on the Autoxidative Stability of Peanut Oil. Joanne Hokes, R. E. Worthington and R. O. Hammons, University of Georgia Agricultural Experiment Stations, Experiment and Coastal Plain Station, Tifton, GA.

Peanut (*Arachis hypogaea* L.) oil was analyzed to define autoxidative stability in relationship to tocopherol, phosphatide and linoleic acid concentrations. Thirty-one cultivars were observed from the crop years 1969, 1970, 1971 and 1976. All were grown at the Agronomy Research Farm in Tifton, Georgia. Most varieties were represented in more than one crop year.

Tocopherols were measured with a polarograph, allowing samples to be rapidly analyzed with negligible degradation and an error factor of  $\pm 11$  ppm.

A multiple regression equation for the prediction of stability of cold-pressed oils was devised for the four crop years. Eighty-seven per cent of the stability could be correlated with total tocopherol/per cent linoleic acid. This is a much more substantial relationship than has been observed in the past. Other minor components of the oil and error due to the 24-hour leeway in measuring stability (oven days) would account for the other 13%.

Phosphatides have often been observed as having a synergistic effect on oil stability. Cold-pressed oils contained lesser amounts of phospholipids than did solvent extracted oils. Solvent extracted oils were generally slightly lower in tocopherol content probably due to better extraction of oil and dilution of the tocopherol. The solvents used rank as follows according to increasing oxidative stability and phosphatide concentration of extracted oil: chloroform:methanol (3:1) > cyclohexane > ether > acetone > cold-pressed. Removal of phosphatides with the addition of acetone and the application of freezing temperatures lowered oil stability. Residual solvent had no effect on oil stability. The more polar solvents are efficient at extracting "bound" phosphorus compounds. Though the extended stability may not be due to phospholipids, it is almost assuredly associated with the very polar fraction of the seed oil.

A Method for Analysis of Interactions Between Lipid Peroxides and Amino Acids  
as Related to Peanut Quality. James C. Kuck, Allen J. St. Angelo, and  
Robert L. Ory, Southern Regional Research Center, New Orleans, LA

As part of investigations on the effects of lipid peroxides on protein quality in stored peanut (Arachis hypogaea L.) products, a thin-layer chromatographic system was developed that utilizes a single-phase solvent procedure to separate and identify complexes formed between peroxidized lipids and amino acids. These complexes were separated on a thin-layer plate coated with silica gel G, developed with a solvent system of petroleum ether-diethyl ether-glacial acetic acid, then sprayed with copper acetate-phosphoric acid solution to locate the separated components. After repeating this procedure on preparative plates, the separated components were scraped off and identified by other analytical techniques. Results from infrared and mass spectroscopy indicated that the complexes formed from the amino acid-peroxidized lipids were new reaction products rather than "associated complexes".

Chemical Induction of Urease in *Arachis hypogaea*. Thomas A. Lindheimer and Julius L. Heinis, Florida A & M University.

Protein prepared from the peanut (*Arachis hypogaea* L.) is nutritionally deficient in the amino acid methionine. The survey for a peanut variety with ideal methionine content has thus far proven unproductive. Polyacrylamide gel electrophoresis has shown that certain protein components are richer in methionine than others. Chemical induction of these high methionine components offers a possible solution to the problem. Cell culture studies with soybean (*Glycine max* [L. Merr.]) have shown that the synthesis of urease (urea amidohydrolase), which has a high methionine content, can be induced by growing cultures in the presence of urea as the primary nitrogen source. We are presently exploring this phenomena in peanuts.

We have thus far partially purified urease from peanuts by means of its solubility properties and by detergent gel electrophoresis. In order to establish background data for future tissue culture studies, quantitative analyses for urease are now being performed on five varieties of peanuts and other legumes.

Changes in Tannin-Like Compounds of Peanut Fruit Parts During Maturation.  
Timothy H. Sanders, National Peanut Research Laboratory.

As an initial study to examine the possible role of tannin-like compounds in peanut (*Arachis hypogaea* L.) resistance to fungus invasion, the content of these compounds was determined in hull, seed coat, and seed of Florunner peanuts at selected physiological maturity stages. Hull tannins increased significantly after stage 9, seed coat tannins increased significantly to stage 9 then decreased, and seed tannins did not change. Fruit parts of cured peanuts containing several maturity stages were similar in tannin content to the more mature uncured fruit parts. Physical and chemical characteristics of hull and seed coat tannins were similar and indicated that both are condensed tannins.

POSTER SESSION

Wednesday, July 13, 1977, p.m.



Detection by Remote Sensing of Cylandrocladium Black Rot in Peanut Fields During 1974 and 1976. J. S. Lewis, N. L. Powell, K. H. Garren, G. J. Griffin, and P. R. Cobb, Virginia Polytechnic Institute and State University and USDA-ARS, Suffolk.

Because of the difficulty involved in ground measurements of infected areas, remote sensing was utilized to estimate yield losses due to Cylandrocladium crotalariae, Cylandrocladium black rot (CBR), in the Virginia peanut region during 1974 and 1976. Aerial infrared imagery and follow-up ground studies indicates that in 1976 there was approximately a 300 percent increase in the number of fields infected with CBR as compared with 1974. All peanut fields which were infected with CBR in 1974 showed enlarged CBR infected areas in 1976 if they were replanted to peanuts. The infected acreage within a field ranged from less than one percent to greater than fifty percent. There was essentially no peanut yield in the diseased areas. Data indicate that CBR is rapidly spreading throughout the Virginia peanut growing region and is causing spiraling increases in economic losses to growers.

BREEDING, SESSION 1

Wednesday, July 13, 1977, p.m.

A Colchicine Method which Achieves Fertility in Interspecific Peanut Hybrids.  
Donald J. Banks, Oklahoma State University.

A high degree of sterility is usually expressed in interspecific hybrids of Arachis. Improved fertility may occur when autopolyploidy is induced in such hybrids. The following method has proven effective for inducing fertility in several diploid x diploid (wild x wild) and diploid x tetraploid (wild x A. hypogaea) hybrids: The essential features of the technique involve germinating hybrid seed vertically, radicles down, in rolled, wet paper towels for 3 to 6 days to produce straight roots about 10-30 mm long. The resulting seedlings, seed coats removed, are inverted and placed in test tubes containing 0.2% aqueous colchicine immersing only the epicotyl and cotyledons. After a 6-hour colchicine treatment at 29C in an illuminated growth chamber the seedlings are rinsed in water and planted immediately in sandy soil with the cotyledons and epicotyls left exposed slightly above the soil surface. The seedlings are grown in the greenhouse where they are watered sufficiently to promote good root growth taking care to keep soil off the epicotyls. These treatments can kill up to 50% or more of the seedlings but the survivors, although slow growing, usually produce one or more polyploid branches with fertile flowers. Judicious pruning of the surviving normal branches helps force growth of the slowly growing polyploid tissues. Best results were achieved in the spring and summer when growing conditions in the greenhouse were optimum.

General (GCA) and specific combining ability (SCA) estimates have been made for early generations of a diallel cross of six diverse peanut lines in North Carolina. Subsequent evaluation of early generation testing in crosses of the same lines indicated that selection for yield in early generations was ineffective, and it was speculated that such selection would not be appropriate if significant additive epistatic variance was present in late generations.

Progeny from the six-parent diallel were evaluated for the  $F_1$  through  $F_5$  generations to determine if evidence existed for epistatic effects. Over generations, estimates of SCA variance, which is comprised of dominance and epistatic genetic variance, did not decrease as expected for yield and other traits. By the  $F_5$ , dominance could account for little of the total genetic variance, indicating epistasis. Estimates of dominance and epistatic variance were obtained using an iterative least squares procedure. For yield and four of five fruit characters measured, estimates of epistatic variance were larger than those of dominance variance. The reference population was that which would be obtained by random mating of the six parents.

It was concluded that there is probably considerable epistatic variance for the traits studied in populations derived from crosses of diverse peanut lines. Selection would therefore be most effective if practiced in late generations.

Organization of Peanut Documentation. I. Preliminary List of Terms and a World Register of Cultivars. R. J. Varnell, University of Florida.

Preliminary work on peanut documentation included a survey of scientists' needs and the development of a minimum list of terms. Scientists' needs were determined by their responses to two sample lists; (1) a broadly-based glossary and (2) a comparative list of peanut scoring methods. The survey showed that a majority favored a list consisting exclusively of peanut terms and that a working document should present appropriate scoring methods with a glossary appended. Accordingly, no more than 20 terms have been identified which are necessary for describing cultivars. Twenty-five to thirty other terms provide additional descriptive information. A preliminary computerized register of peanut cultivars includes approximately 10,000 entries, representing information from collections in the United States, Venezuela, Argentina, Israel, Senegal, the Republic of South Africa, and the Philippines. The register identifies the collections in which each entry resides and includes available agronomic and morphological data for each entry. Additional information from other countries has been requested.

Reaction of 45 Peanut (*Arachis hypogaea* L.) Lines to 5 Fungal and Insect Pathogens.  
T. A. Coffelt, D. M. Porter, J. C. Smith, and K. H. Garren, USDA-ARS, Suffolk and Virginia Polytechnic Institute and State University.

The purpose of this study was to determine the reaction of 45 peanut breeding lines and plant introductions to rust, cylindrocladium black rot (CBR), pod breakdown (PB), leafspot (LS) and thrips under natural field infestations. Replicated CBR screening tests were conducted in Isle of Wight County VA in 1975 with 30 lines and in 1976 with 15 lines. Florigiant and Spancross were used as checks. Rust screening tests were conducted at Isabella, Puerto Rico in 1976 with 30 lines in a replicated test and 15 lines in an unreplicated test. Replicated PB screening tests were conducted at Suffolk, VA with 30 lines in 1975 and 20 lines in two tests in 1976. Florigiant and Early Runner were used as checks. Two replicated screening tests with 20 lines were conducted in 1976 at Suffolk, VA for leafspot and thrips damage. Florigiant was used as the check in both tests.

Five lines (GA. 722105, VA. 732017 and VA. 751607 in 1975 and VA. 7329043 and VA. 751908 in 1976) had fewer CBR infected plants/plot than the most resistant lines previously identified (Spancross and NC 3033). P.I. 372298 had significantly more infected plants/plot than the other entries in the 1975 test. Visual ratings in 1975 of pod and root damage by the CBR pathogen indicated root and pod resistance to CBR may be controlled by different genetic mechanisms. All lines tested were susceptible to rust. However, two lines from Nigeria (P.I. 372263 and P.I. 372303) had less leaf area damaged by rust than two lines (P.I. 259747 and P.I. 350680) previously reported as resistant to rust. Seven lines (VA. 751607, GA. 722210, P.I. 365553, NC 3033, VA. 750915, VA. 750917 and P.I. 362129) had less PB in 1976 than the most resistant check (Florigiant). One line in each test-VA. 7329017 in 1975, P.I. 372577 in test 1, 1976 and VA. 7329076 in test 2, 1976-had significantly more PB than the other lines. In LS test 1, P.I. 365553 and P.I. 371961 had significantly less LS than the other entries. In LS test 2, NC 3033, VA. 750912 and VA. 750916 had significantly less LS than the other entries. None of the 20 lines tested for thrips damage were resistant, although significant differences were observed among lines. The range in susceptibility to these five peanut pathogens among the lines tested, indicated that less susceptible varieties could be produced through breeding.

Multiple pest resistance was observed in some lines. GA. 722105 and VA. 751607 were resistant to both the CBR and PB pathogens, while P.I. 365553 and P.I. 371961 were resistant to both the PB and LS pathogens. The most multiple pest resistance was observed in NC 3033, showing resistance to to the CBR, PB and LS pathogens.

The Groundnut Breeding Project at Reading aims to utilise desirable characters from wild Arachis species. The first objective has been to introduce Cercospora resistance from A. chacoense and A. cardenasii which are immune to Cercospora arachidicola and resistant to C. personatum respectively. Hexaploids have been produced using these and other diploid species, including an unnamed accession 'HL 410', and have been exposed in field trials to C. personatum in India and to C. arachidicola in Malawi.

The plants were assessed for growth habit, vigour, flower and peg production, incidence of Cercospora and degree of defoliation.

The leafspot scores of the hexaploid plants show that within each of the three main types of hexaploid there are plants resistant to Cercospora. Hexaploids from A. hypogaea x A. cardenasii were the most resistant in India, as expected, but they were also resistant when exposed to C. arachidicola in Malawi. This was not expected, as other workers had reported that A. cardenasii was susceptible to C. arachidicola.

The lines selected for resistance in the field are being used in further crosses with both diploid and tetraploid parents, and with other lines.

Arginine Maturity Index: Relationship with Other Traits in Peanuts. Ray O. Hammons, Peter Y. P. Tai and Clyde T. Young, Coastal Plain Experiment Station, Tifton and North Carolina State University.

Spancross, Florunner, and Florigiant cultivars were used to determine the relationship between arginine maturity index (AMI) and other traits in peanuts. Samples were taken weekly from 66 days after planting in 1973 and biweekly from 72 days after planting in 1974. AMI-1 was measured on fresh fruit samples whereas AMI-2 was measured on dry seed samples. The relationship between these two characters was greater than  $r = .85$  in each cultivar tested. Both AMI-1 and AMI-2 were positively related to % OK and negatively related to pod yield, % TSMK, % TK, % DM and % Mature Seed. Among these correlations, AMI-pod yield was weakest whereas AMI-% TSMK was strongest. The quadratic polynomial,  $Y = a + bx + cx^2$ , was used to fit the distribution curve for each trait. Both Florunner and Florigiant appeared to have similar patterns in all traits except % mature seed, but these differed from those for Spancross.



Data of both early- and late-maturing groups from the Georgia peanut variety trials under irrigated and non-irrigated management at two locations in 1975 and 1976 were used to estimate the magnitude of the variety X environment interaction of pod yield, %TSMK, %OK, %DK, %TK, %ELK, and g/100 seed. Irrigation treatment caused marked responses of varieties and interaction effects for some of these traits. Both first- and second-order interactions varied under different treatments and for different traits. The substantial magnitude of the second-order interaction of varieties X locations X years in most traits examined indicated that the varieties X years was different at the different locations. The relatively small values for varieties X location and for varieties X years indicate there were no consistent location or year effects on differential varietal response for those traits during this period of testing. However, the results indicate that variety component significantly exceeded the first- and second-order interactions and suggest that the varietal effect would be consistently present.

Breeding Discussion Group. A. J. Norden, Chairman.

These topics were discussed and the individual listed is cited as a resource person if additional information should be communicated:

- 1) Comparison of colchicine methods for changing ploidy level (J. P. Moss, Reading, England; D. J. Banks, ARS, Okla. State Univ.).
- 2) Elimination of duplication among accessions in regional and world collections of A. hypogaea and establishment of common use terms as acceptable descriptors in taximetrics (R. J. Varnell, Univ. Fla.; R. W. Gibbons, ICRISAT).
- 3) Arginine Maturity Index: experience with the 1976 crop year (C. T. Young, N. C. State Univ.).
- 4) Breeding in Central America to combine agronomic yield with resistance to both leaf rust and Cercospora (J. Romero, Honduras).
- 5) Resistance to leafspot may be influenced by the number of loci and the rapidity with which Cercospora evolves new races.

PHYSIOLOGY AND SEED, SESSION 2

Wednesday, July 13, 1977, p.m.

Genotypic Differences in Rate and Duration of Peanut Fruit Growth. K. J. Boote,  
University of Florida.

Peanut fruit growth characteristics were observed on 14 peanut genotypes in 1975 and 1976 at Gainesville, FL. to evaluate differences in fruit filling rate and duration and to correlate the duration of linear fill to internal shell coloration and shelling percentage. Recently-penetrated pegs were tagged every 2 days until 5 pegs per plant were tagged. At 7 times during the season, 5 plants per cultivar were sampled and the internal shell coloration and dry weight of fruits and seeds observed. For uniformity, only undamaged, 2-seeded, 2-loculed fruits were included in the analysis.

Fruit growth rates of genotypes were essentially linear up until shell coloration was first observed; beyond that point, fruits of most cultivars continued a slower rate of dry weight increase. Browning of the inside of the shell coincided with seed compression against the shell and suggests that duration of linear fill is limited by shell size.

Fruit filling rate and duration differed among genotypes. Dixie Runner had the slowest fruit growth rate at 21 mg/fruit/day whereas NC-FL 14 grew at 64 mg/fruit/day. Fruits of Early Runner, Starr, Spangcross, and a Valencia line grew at 27 to 29 mg/fruit/day. Florunner and Apollo fruits grew approximately 35 mg/day whereas Virginia type fruits such as Early Bunch and Florigiant grew at 46 to 48 mg/day. The duration of linear fruit fill depends on the combination of pod size and seed growth rate. Genetically altering this combination offers potential to increase yields through longer filling periods.

Five peanut cultivars expected to differ widely in yield were grown in the field and harvested weekly, using large samples. The purpose was to discover the physiological reasons for their yield variation. The major factor that explained the differences found was the partitioning of assimilate between vegetative and reproductive growth during the filling period. The lowest yielding variety, Dixie Runner, partitioned only 38% of its total assimilate to its fruit while the highest yielding, Early Bunch, partitioned 72%. Early Bunch yielded over twice as much as Dixie Runner in this experiment.

No mechanism that would explain these differences in partitioning among varieties has been identified, but it seems likely that the partitioning factor determines the fruit set rather than partitioning being determined by the number of fruit set and the resultant sink. In this experiment the number of fruit per plant increased in a linear manner, as determined by weekly counts, until a maximum number was reached. There was no discernable relationship between the rate of flowering and the rate at which new pegs or new fruits were initiated. Between a third and a half of all pegs became fruits. There was an inverse relationship between the amount of assimilate partitioned to the fruit and the apparent quality of the foliage canopy late in the season which suggested that breeding peanuts for higher partitioning factors might be self limiting.

Two methods were used to calculate the numerical value of the fraction of the total assimilate used for fruit growth during the filling period which we called the partitioning factor. One was by computer simulation, using our model, PENUTZ, the other by comparison of slopes of regressions taken from the field data. The agreement between the two methods was satisfactory. As an additional check the estimated assimilate partitioned to fruit for each variety divided by the estimated assimilate demand for a single pod gave a reasonable estimate of the number of peanuts per plant.

The growth of plant cells and tissues on defined media offers new approaches to the study of biochemical and genetic processes. This laboratory has succeeded in developing callus cultures from peanut epicotyl, hypocotyl and cotyledon tissues. Surface-sterilized tissue explants were placed on modified Murashige-Skoog's medium containing 2 ppm of each of the growth regulators 2,4-D, NAA and kinetin. Callus tissue developed after 3-4 weeks after which time it could be transferred to other experimental media in attempts to characterize differentiation, enzyme-induction and organogenesis.

Cotyledon callus tissue has been shown to be quantitatively different in protein composition when compared to fresh cotyledons using SDS-PAGE (electrophoresis) techniques. Also, callus tissues have been shown to exhibit approximately a 3-fold increase in the relatively high-methionine protein component urease, when grown in a medium containing urea as a primary nitrogen source.

Limited callus formation was also obtained from protoplasts prepared by enzymatic digestion of peanut leaves. Callus formation in suspension cultures occurred after 10-12 weeks. Experiments to establish techniques required to develop complete peanut plants derived from both protoplasts and callus cultures are in progress.

Growing Season and Location Effects on Seedling Vigor and Ethylene Production by Seeds of Three Peanut Varieties. D. L. Ketring, C. E. Simpson and O. D. Smith, Texas A & M University, College Station and Stephenville

Seeds of three peanut (*Arachis hypogaea* L.) varieties from two growing seasons (1974 and 1975) and four growing locations in Texas were tested for germinability and ethylene production. Since ethylene is an important regulator of peanut seed germination, changes in its production in relation to differences in early seedling growth were sought.

Three growth distributions and ethylene production patterns were found:

(1) When the majority of the seeds in the population had a high degree of vigor (78<sup>+</sup>8% of the seedlings had a hypocotyl-radicle length  $> 2$  cm at 70 hr of germination), they also had a characteristic ethylene production maximum at 21 hr of germination. (2) When the majority of the seeds in the population had a low degree of vigor (only 30% of the seedlings had a hypocotyl-radicle length  $> 2$  cm) ethylene production was reduced at 21 hr and the maximum occurred at 45 hr of germination. (3) An intermediate condition between (1) and (2) was found in which reduced vigor was associated with about a 50% reduction in ethylene production at 21 hr by the high ethylene producing varieties (Starr and Tamnut 74), but was not significantly changed for the Florunner variety, which naturally produced less ethylene than the Spanish-type varieties. Reduced seedling vigor was significantly correlated with decreased ethylene production at 21 hr for Starr and Tamnut 74, but not for Florunner. Both seedling growth and ethylene production were altered by growing season and location. Thus, natural modifications in the growth potential of peanut seedlings was accompanied by changes in their capacity to produce ethylene, a natural regulator of peanut seed germination. This was most evident for the Spanish-type varieties which had high rates of ethylene production during the initial hours of germination.

Sixty peanut fields throughout eastern North Carolina were sampled to determine management practices that decrease peanut seed quality. Sampling times were at digging, before combining, after combining and after drying. Seeds were treated with a Granox/Vitavax mixture prior to germinating at 25°C for 8 days; diseased seedlings were culled at 4 days. Seedlings were examined for germination abnormalities, calcium deficiencies and decay. Peanuts from samples obtained before combining and after drying were planted in two locations in North Carolina to relate standard germination results with field performance.

We found that only one-fourth of the growers produced seeds with a germination of 85% or better. Three-fourths of the fields had a soil pH of 5.6 or less in mid-season. Seed calcium levels from 20% of the fields did not meet the minimum level of 480 ppm suggested for quality seed. Samples averaged 66.2% sound mature kernels.

The percentage of germinable seedlings was significantly decreased by the effects of combining, reducing average germination from 89% to 81%. The drying procedure did not significantly affect germination. No significant difference in germination was found to exist between standard laboratory tests and on-farm plant-outs; laboratory results from seeds collected after drying gave a germination of 79.1% and field results gave 81.5%.

Combining significantly increased abnormal seedlings from 5.2% to 14.8%; there was no significant increase by the drying procedure.



Comparative Performance of Peanut Seeds under Laboratory and Field Conditions.  
G. A. Sullivan and J. C. Wynne, North Carolina State University.

Peanut seeds were evaluated in the laboratory and in 24 field locations during 1974-1977. The purpose of these studies was to compare the laboratory performance of peanut seeds with subsequent field emergence under various planting environments.

In the laboratory, 200 seeds from each lot were evaluated by the standard germination test procedures. In the field, 200 seeds were planted with four replications per location. Field emergence counts were taken 21-24 days after planting.

Field emergence varied as much as  $\pm 25$  percent from laboratory germination results. No specific factors causing the wide variations in field emergence among locations were identified. Germination tests are not precise predictors of field emergence, but are good indicators of relative field performance when comparing several seed lots. Field emergence of peanut seeds is influenced by variety, location and years. Variety-location, variety-year and variety-location-year interactions were statistically significant.

These studies show that standard germination test results do not provide sufficient information to the peanut farmer for making seedling rate decisions. Each field appears to have a stand establishment potential that encompasses variety, seed quality, temperature, moisture and several other yet unidentified factors.

Papers presented in the preceeding session were opened for questions by the discussion leader.

Photosynthate production, translocation and partitioning were discussed. It was pointed out that peanut varieties may differ greatly in the proportion of photosynthate translocated to fruit. The question of whether more photosynthate was translocated to fruit because there were more of them or whether there were more fruit because more photosynthate was partitioned to them was discussed. It was pointed out that although plant dry matter continued to increase in late season, photosynthesis (as measured by  $\text{CO}_2$  uptake) declined. Additionally, it was postulated that photosynthesis rate late in the season may have little effect on the amount of fruit set since Florunner sets significantly more fruit than Dixie Runner while Dixie Runner has a higher  $\text{CO}_2$  uptake rate.

It was generally agreed that much research is needed in order to more fully answer questions relating to peanut physiology.

POSTER SESSION

Wednesday, July 13, 1977, p.m.

Adsorption of Direct Dye on Carbon from Peanut Hulls. A. W. Stelson, W. R. Ernst, and P. Bagherzadeh, Georgia Tech.

The 1983 federal water quality guidelines for the textile industry have generated interest in the removal of textile dye by tertiary treatment methods. These guidelines will contain a specification on color in mill effluent. Tertiary treatment of textile waste streams can be obtained through carbon adsorption. The cost of carbon is an appreciable percentage of fixed capital and operating costs. Peanut (Arachis hypogaea L.) hulls are a potential source of carbon.

In a laboratory study, peanut hulls that had been pyrolyzed in a continuous, moving bed reactor, were activated by heating in a tube furnace in the presence of steam in order to increase surface area.

Solutions of a commercial dye--Direct Orange 34--were contacted with various amounts of the activated carbon for a fixed period of time, then filtered and analyzed for residual dye concentration. The data obtained from this study--mg adsorbed dye/gm carbon versus residual dye concentration in solution--were plotted and found to fit a Freundlich isotherm.

Dye adsorption was investigated in packed bed adsorption studies. The dye solution was passed, at a constant flow rate, up through a ten inch long column packed with peanut hull carbon. Effluent dye concentration was determined at regular time intervals. The effects of carbon particle size and flow rate were investigated. Graphs of effluent dye concentration versus time showed typical breakthrough behavior, with total color removal up to the point of breakthrough.

PLANT PATHOLOGY AND NEMATOTOLOGY, SESSION 1

Thursday, July 14, 1977, a.m.

Monitoring *Cylindrocladium* Black Rot Development in Two Peanut Fields by Remote Sensing. K. H. Garren, N. L. Powell, G. J. Griffin, and P. R. Cobb, USDA-ARS, Suffolk, and Virginia Polytechnic Institute and State University.

*Cylindrocladium* black rot (CBR) disease of peanuts is caused by the soil borne fungus *Cylindrocladium crotalariae*. The rate of disease development within two peanut fields during one growing season and the spread of the pathogen within these fields over two consecutive years were monitored by remote sensing. The sensor used was an aerial mapping camera utilizing infrared false color reversal film. The film format was positive transparencies 22.86 x 22.86 cm with an approximate scale of 1:23,000. Imagery was collected of both fields in the latter part of the growing season during both years of the study. Ground information used to correlate with the imagery was collected in both years by on-site inspections and follow-up laboratory studies. This included noting visual disease symptoms on the plants in the field during the growing season and recovery of microsclerotia from soil samples in the laboratory on a sucrose-TBZ selective medium. Results of the study indicate there was an excellent correlation between diseased areas detected on the imagery and diseased areas actually found in the field. *Cylindrocladium crotalariae* microsclerotia were confirmed to be present in the soil samples taken from infested areas. In one field the microsclerotia/g soil ranged from 0.8 to 85.2 while in the other the range was 6.0 to 65.2. Soil samples taken from uninfested areas did not contain any microsclerotia. Evaluation of the imagery indicates that the disease spreads during the growing season as well as becoming more severe during subsequent growing seasons.

*Cylindrocladium crotalariae* isolates, originating from naturally-infected resistant and susceptible hosts, were studied to determine their virulence on resistant and susceptible peanut genotypes. The susceptible hosts included peanut, soybean, blueberry, Acacia Koa, and sickle pod, and the resistant host was the peanut breeding line NC 3033. Seventy-nine isolates originating from the resistant host and eleven isolates originating from the susceptible hosts were tested by inoculating 5 replicates (2 plants/replicate) each of the susceptible peanut Florigiant and the resistant peanut breeding line NC 3033.

The mean virulence of isolates from the susceptible hosts did not differ from that of isolates from the resistant host, although selection pressure was applied only for one resistant host cycle. Differences were noted, however, among isolates from the resistant host when ranked for virulence. Isolates from the resistant host showed the highest degree of virulence on the resistant breeding line NC 3033, but were no more virulent on the susceptible peanut Florigiant than isolates originating from susceptible hosts. Previous studies have described the resistance levels of peanut genotypes by measuring the disease response to differing inoculum densities, and microsclerotial production in resistant and susceptible hosts. Epidemiological implications, based on the stability of resistance and pathogen variability due to selection pressure, include strategies for cropping systems and the need for a broad genetic base for the development of *Cylindrocladium* Black Rot resistant cultivars.

Relationship of Inoculum Density and Time to Incidence of *Cylindrocladium* Black Rot of Peanut in Naturally-Infested Fields. P. M. Phipps, M. K. Beute and B. A. Hadley, North Carolina State University.

Four peanut fields planted to the cultivar Florigiant were selected to determine the relationship of microsclerotia (ms) densities to incidence of *Cylindrocladium* black rot (CBR). Six plots (3.7 x 3.7 m) were established in each field in July 1976 at locations having none to 10% of the plants expressing initial symptoms of infection by *Cylindrocladium crotalariae*. In each plot, 2-cm-diameter core samples of soil were taken to a depth of 15 cm at 45-cm intervals in the four rows of peanuts. After thorough mixing, soil from each plot was assayed by the elutriation method to determine numbers of ms free in soil. Visual counts of diseased plants in each plot were made in July and prior to harvest in October.

Densities of ms in plots ranged from 0 to 25/g soil. Regression analysis of log ms density and log disease incidence corrected for multiple infection ( $\log_e \frac{1}{1-x}$ , where  $x$  = % disease incidence) showed their relationship to be significantly positive at  $P = 0.01$ . According to the regression line, 0.8 ms/g and 24.5 ms/g soil would result in 10 and 50% disease incidence, respectively, by the time of harvest. Regression lines for disease in July and October had similar slopes (0.47 and 0.56, respectively), but differed markedly in  $x$  intercepts; indicating that disease incidence is dependent on time and inoculum density. For example, near 200 ms/g soil would result in 50% disease in July, whereas only 24.5 ms/g would be required for 50% diseased in October. The practical application of these findings toward development of a CBR diagnostic and advisory service are the subject of current field investigations.



Control of Southern blight (caused by Sclerotium rolfsii), a major soil-borne disease of peanuts, has been difficult and at best only 50-70% effective. To date, the only effective treatments have involved fungicides applied as granular formulations. This method involves use of copious quantities of bulky material which can only be applied using special granular applicators. A method to deliver liquid fungicides for effective control of S. rolfsii has been developed at the Auburn University Agricultural Experiment Station in Alabama and is reported here. The key to effective post emergence control using liquid fungicides involves the use of a conventional ground sprayer with hollow cone nozzles. Drops are attached to the spray boom directly over the row centers and two nozzles are attached to a swivel at the end of the drop. Boom height is adjusted so that the nozzles are in the peanut plant 5 to 6 inches above ground level and treat a 6-8 inch band on the soil surface in the crown and pegging area of the plant. Nozzle tips should be of sufficient size to deliver a minimum of 20 gpa at a pressure of 60 to 90 psi. This insures delivery to the soil surface and small droplet size for maximum performance. The fungicide should be applied from mid-bloom to early pegging (50-70 days after planting) for best results. Results at the Auburn University Agricultural Experiment Station have shown that Vitavax 3F and Terraclor 2 EC are as effective as their previously proven granular counterparts in control of Sclerotium rolfsii when applied using this method. Two years data (1975-1976) showed a significant yield increase accompanied by a corresponding reduction in number of disease loci attributable to S. rolfsii in plots treated with a banded applications of Vitavax 3F or Terraclor 2EC. The Vitavax 3F plots were treated at a rate of 1.0 lbs per acre and Terraclor 2EC at a rate of 10 lbs per acre. The Vitavax 3F treated plots also had better quality kernels using Federal-State Inspection Service, USDA, grading procedures as judgment criteria. Development of this method of application has benefitted the Alabama farmer in 2 ways: 1) The farmer has a choice of liquid or granule application, both equally effective, to suit his particular farming operation. (2) The necessity for a costly granular applicator with limited use is eliminated.

Effect of Selected Land Preparation Practices on Peanut Yield, Grade, and Incidence of *Sclerotium rolfsii* - 1975-76. E. Jay Williams, E. Dale Threadgill, James L. Butler, and Randel A. Flowers, Coastal Plain Experiment Station, Tifton.

Burial of organic residue with a moldboard plow equipped with coulters, disk hillers, or cover boards is a well established method of controlling *Sclerotium rolfsii* (white mold) in peanuts. Compaction layers or plow pans were present at or below normally turned depths in many soils of the Coastal Plain. The crop response from breaking plow pans and containing the organic residue 4-5 inches below the soil surface is not well established.

Five methods involving deep turning with a moldboard plow were evaluated for breaking plow pans. They were chisel plowing followed by deep turning (C+DT), deep turning with integrally mounted chisels (DT/C), deep turning followed by in-row subsoiling and disk bedding (DT+RH), deep turning followed by an in-row subsoiler-planter with a 28-inch coultter cutting through buried organic residue ahead of subsoiler (DT+RP), and deep turning alone (DT). In addition, in-row subsoiling and disk bedding (RH), and a combination of in-row subsoiling and chiseling was evaluated without turning.

In 1975 a severely moisture-stressed crop had white mold counts that ranged from 4-6 loci/100 ft. of row. White mold was not influenced by land preparation method and was randomly distributed throughout all plots. There was no significant difference in yield or grade from any conventional chiseling or subsoiling operation compared to DT (2702 lbs./ac., 65 percent SMK). However, a high degree of subsoil shatter induced by multiple passes of a spring shank chisel without turning resulted in a 15 percent yield increase and a 4 percent higher grade.

In 1976 there were no significant differences in yield or grade among DT (3620 lbs./ac., 66 percent SMK), C+DT, DT/C, and DT+RP even though plants were subjected to moisture stress several times throughout the growing season. White mold counts ranged from 6-7 loci/100 ft. of row for these practices. Yields, however, were reduced by DT+RH (3330 lbs./ac.) and RH (3114 lbs./ac.). White mold counts for these practices were 9 and 10 loci/100 ft. of row, respectively.

Effect of Two Strains of the Peanut Mottle Virus on Fatty Acids, Free Amino Acids, Total Amino Acids, and Protein of Six Peanut Lines. Allan R. Hovis, Clyde T. Young and Cedric W. Kuhn, North Carolina State University and University of Georgia.

Peanut (*Arachis hypogaea* L.) cultivars (Starr and Florunner) and four peanut introductions (Numbers 261945, 261946, 261973, and 261980) were each separately inoculated with a mild strain (M2) and with the necrosis strain (N) of the peanut mottle virus. The effects of these virus strains on the chemical composition of peanut seed were evaluated. The chemical characteristics varied with the type of virus infection. The greatest effect was on fatty acids and the least on the total amino acids. In general, peanuts infected with the necrosis strain showed: (1) a decrease in the percentages of stearic and oleic acids, while linoleic, arachidic, behenic, and lignoceric acids increased, (2) an increase in the levels of the free amino acids glycine, alanine, isoleucine, histidine, lysine, and arginine, and (3) a slight increase in methionine for the total amino acids. Peanuts infected with the mild strain generally showed: (1) slight increases in linoleic and linolenic acids, (2) little effect on the free amino acids, and (3) a small increase in tyrosine and a slight decrease in serine for the total amino acids. No treatment effect was noted on the protein content.

Spectral Signature of Peanut Plants Infected with *Cylindrocladium crotalariae*.  
N. L. Powell and D. M. Porter, Virginia Polytechnic Institute and State University  
and USDA-ARS, Suffolk.

The percent reflectance spectra of peanut plants exhibiting varying stages of vigor and stress caused by the soil-borne fungus *Cylindrocladium crotalariae* was obtained in 1975 and 1976. Five groups of plants ranging from healthy to killed were scanned in situ with a Spectral Data Model 31 Telespectroradiometer. The percent directional reflectance values at intervals of 12.5 nm over the range of 400-1000 nm and also at 1025, 1050, and 1075 nm were obtained. This information is needed to determine the proper combination of sensors which should be utilized in studies of the development and spread of *Cylindrocladium* black rot in peanut fields during a growing season. Results of this study indicate that the *Cylindrocladium crotalariae* infected plants with varying stages of development exhibit unique spectral signatures in the range of 400-1075 nm.

Questions were first directed towards environmental conditions needed for infection of peanuts by Cylindrocladium crotalariae. Dr. P. M. Phipps outlined the requirements of temperature and moisture for infection of the pathogen. His answers were based on his research on the subject and he indicated that their data will soon appear in an article in Phytopathology.

Another series of questions were raised regarding spectral signature of peanut plants infected by Cylindrocladium crotalariae. Dr. N. L. Powell gave a brief summary on the practicality of remote sensing to detect disease and help the farmer. He pointed out that equipment is currently being tested that can be mounted on ordinary aircraft for these purposes. He also discussed the effect of cloudiness and season on variability of spectral signatures.

A third subject of discussion was the use and application of the fungicide carboxin (vitavax) for control of Sclerotium rolfsii on peanuts. R. Rodriguez-Kabana and M. K. Beute discussed the Alabama and North Carolina experiences, respectively. Generally, it was decided that higher gallonage/acre was required than for leafspot control. Whether the fungicide is applied at early bloom, pegging time, or later in the season, it has to be directed to the collar or soil surface and away from the foliage.

PROCESSING AND UTILIZATION, SESSION 2

Thursday, July 14, 1977, a.m.

Corn muffins were fortified with peanut, soybean and LC cottonseed flour to contain 12.7, 10.7 and 8.8% protein. No differences were observed in the sensory acceptance ratings of muffins fortified with peanut or soybean. Muffins fortified with LC cottonseed flour were less acceptable than those prepared with peanut or soybean flours. Dietary fibers were added to peanut protein fortified muffins (12.7%) in amounts equal to 3 and 6%. Both levels of fiber fortification were equally accepted by sensory panelists.

The ability of corn muffin mixes to satisfy nutritional requirements was tested on mice of the C59BL/FN strain. Body weight measurements revealed that the mice consuming the high protein (12.7%) and high fiber (6%) muffins increased their body weight 91% as compared to high protein (12.7% low fiber (3%) muffins which increased their body weight by 75%. Whole carcass proximate analysis revealed no significant differences in the content of body water, protein, lipid and ash. Similarly, analysis of the liver showed no differences in the distribution of these constituents except the animals consuming the unfortified corn muffins. These animals exhibited increased lipid content in their liver.

The Effect of Curing Conditions on Flavor Quality and Volatiles Profiles of Peanuts. Mona L. Brown, J. I. Wadsworth, H. P. Dupuy, and James L. Steele, Southern Regional Research Center, New Orleans and Tidewater Research Center, Suffolk, VA

Plant breeders and producers of peanut products are interested in relatively simple, rapid, and objective methods for predicting flavor quality of peanuts to supplement the subjective evaluations of taste panels. In initial work at this laboratory, direct gas chromatographic (GC) analysis of the volatile components of small samples of 2 series of raw peanuts gave a negative correlation between the ethanol content of the raw peanuts and flavor scores (Cler method) of the roasted peanuts. In the present work, these methods were applied to 12 samples of 1 variety of Virginia peanuts that were cured under various conditions. The GC method consisted of weighing 740 mg of ground, raw peanuts into a glass liner, which was then inserted in the heated inlet of a GC and allowed to remain in place for 22 min while the volatiles were swept onto the cooled head of a Porapak P column. The liner was removed and the GC programmed at 3° per min to 190°C. A negative correlation was again obtained between ethanol content and flavor scores. Some correlation coefficients between GC data and Cler scores for the 12 samples were: -0.90, using the ethanol peak area; -0.94, using the ratio of ethanol-to-total volatiles; and +0.82, using the ratio of methanol-to-total volatiles. In addition, the direct GC method demonstrated what has been shown by more laborious procedures, i.e., curing conditions affect the volatiles profile as well as the flavor quality of peanuts. Samples cured isothermally at 95-97°F had ethanol contents below 90 integrator counts/mg sample while the samples cured isothermally at 103° and 109°F had ethanol contents of 680 and 1450 counts/mg, respectively.



Evaluation of Five White Testa Peanuts for Potential Use as Food Supplements.  
E. J. Conkerton, E. D. Blanchet, R. L. Ory and R. O. Hammons, Southern Regional  
Research Center, New Orleans and Coastal Plain Experiment Station, Tifton.

During recent years the nutritional and economic advantages of using plant proteins in human food have become apparent. The leguminous oilseeds -- peanuts and soybeans -- are among the more accepted plant proteins for food use. Peanuts have properties equal to or better than soybeans, but they are not as attractive to the United States food processor because of their higher price. In searching for cultivars that could be competitive with soybeans both nutritionally and economically, a white-testa peanut was examined. This cultivar had low concentrations of flatus producing sugars, lacked flavor and had a high calcium content. Production costs could be reduced because blanching would not be required to produce a high-quality, cream colored flour. Since this initial study, samples of four additional white-testa cultivars have been obtained. All five cultivars were examined for possible use as protein supplements in food. Flours and isolates were prepared and evaluated chemically for protein content, amino acid pattern, and gel- and immuno-electrophoretic patterns. Experimental field plots were grown to determine seed germination potentials and yields. The results indicated that two of the cultivars had good biochemical profiles and produced well in the field. These cultivars, Spanwhite and PI288160, were selected for more extensive study.

Some Solubility Properties of Peanut (*Arachis hypogaea* L.) Seed Protein and the Individual Components. Marvin Felder and Clifton F. Savoy, Florida A & M University.

Peanut flour was extracted at several temperatures with H<sub>2</sub>O and 10% NaCl solution to examine the solubility of the seed protein and the individual protein components. Dry weight and protein data revealed that more than 50% of the peanut protein was H<sub>2</sub>O soluble under the test conditions regardless the temperature of extraction. The temperature did influence protein solubility, however, with the least amount solubilized at 6 C (51%) and the most at 75 C (62%). The five major protein components present in the peanut flour (Savoy, C. F. 1976. Biochem. Biophys. Res. Commun. 68: 886-893) were observed to be H<sub>2</sub>O soluble, but were not completely removed from the insoluble fraction by only one extraction. The minor components were less soluble, and a breakdown of protein at 90 C was revealed. More than 62% of the total protein and almost complete removal of the major protein components occurred upon repeated extraction.

Extraction of sample using NaCl solution at 28 C resulted in the solubilization of more than 53% of the total protein. However, the separation of the major and minor components was not as pronounced as was observed after H<sub>2</sub>O treatment under the same conditions. Repeated extraction of a NaCl insoluble fraction resulted in removal of additional protein, and the final insoluble residue consisted largely of high molecular weight component and several minor ones.

Effect of Blending Plant Materials on Protein Quality. I. Peanut and Citrus Seed Proteins. Robert L. Ory, Edith J. Conkerton, and Antonio A. Sekul, Southern Regional Research Center, New Orleans.

Oilseeds are receiving much attention as sources of edible protein, although they are generally low in certain essential amino acids, such as lysine, methionine, tryptophane, and/or isoleucine. One of the best ways for increasing the amino acid balance of these proteins is to blend two or more of them with the desired amino acids. Blends of defatted peanut flour (low in methionine) and a reportedly high-methionine citrus seed flour in 3:1, 1:1, and 1:3 ratios were prepared on a laboratory scale. The original flours and the blends were evaluated chemically for protein solubility, amino acid composition, total protein content, gel electrophoretic protein patterns, methionine levels, and available lysine levels. Solubility of peanut proteins is much higher than that of citrus seed proteins, precluding the use of blends in preparation of protein co-isolates for some types of beverages. Because of their properties, these blends would probably find better use in cloudy, fruit-flavored or milk-type beverages, or in solid food items such as meat extenders, bakery goods, dry soup or gravy mixes.

Effects of Packaging Material, Atmosphere, Moisture, Temperature and Time on Peanut Food Quality and Germination. J. L. Pearson, W. O. Slay and C. E. Holaday, National Peanut Research Laboratory.

A cooperative study of peanut packaging and storage was undertaken to develop more efficient use of energy and space while maintaining a high level of food quality and seed germination. Twenty-five-pound samples of shelled Florunner peanuts were treated to test three pairs of variables, i.e., (1) two storage moisture (7.6% and 6.9%) X (2) two laminated packaging films (nylon-EVA resin and nylon-saran-EVA resin) X (3) in-package atmospheres (vacuum [29 in. Hg.] and vacuum plus partial backflush [to 14 in. Hg.] with nitrogen gas). The resulting 8 treatment combinations were duplicated for each of the three storage periods of the experiment (3, 6 and 12 months) and were placed in cardboard cartons and stored under ambient-warehouse conditions.

Three controls (all 7.6% kernel moisture) were also duplicated for each storage period. Two of the controls were of shelled Florunners in burlap bags. One of these was ambient-warehouse stored, and the other was refrigerated (37°F. and 65% R.H.). The third control was in-the-shell Florunners, bulk-stored (in a pallet box) under ambient-warehouse conditions.

Analysis of variances by storage periods and quality parameters showed only a few meaningful differences among the 11 treatments and controls for the 3-month and 6-month periods. After 12 months, the flavor of peanut "butter" from the nylon-EVA-bag, nitrogen-flush treatments was significantly better than butter from the other treatments and was not significantly different from the refrigerated control. The 7.6% initial-storage-moisture samples produced significant extremes of peanut butter color, the controls producing the lightest and the nylon-saran-EVA bags the darkest butter.

Throughout the test, the refrigerated control and the nitrogen-flush treatments showed the strongest tendency to maintain the light skin color of the raw kernels.

In a related segment of the study, germination of Florunner seed peanuts after 3 months storage was better for nylon-EVA-bag treatments than the burlap-bag controls. After 6 months, nitrogen-flushed seed also germinated better than vacuum-packed ones.

This study appears to have identified new options for peanut packaging and storage which could reduce space and energy requirements for the peanut industry.

Direct Extraction Process For The Production of a White Defatted, Food-Grade Bland Peanut Flour. II Heat and Moisture Treatment. J. Pominski, H. M. Pearce, Jr. and J. J. Spadaro, Southern Regional Research Center, New Orleans, LA.

A process has been developed for producing a white, bland, defatted flour from peanuts by direct extraction. Processing investigations on a bench scale showed that suitable conditions for producing the flour were moistening blanched peanuts to 12%, heating the peanuts to 180°F and keeping them at this temperature for 30 minutes while maintaining 12% moisture, drying at 180°F until the moisture content decreases to about 6%, and flaking the treated peanuts followed by direct solvent extraction. The raw peanut flavor was eliminated by the moistening and heating treatment of the blanched peanuts. A study of processing conditions such as flake moisture, flake thickness, extraction time and their effect on residual lipids as determined by a multiple linear correlation showed that the most important factors were (1) the moisture content of the flakes, and (2) the extraction time. Flake thickness was not significant. Residual lipids in the extracted meals ranged from 1.0 to 1.8%. The flour has a high protein solubility (85%) and is suitable for food uses. The conditions determined on a bench scale were used as a basis for continuous extraction pilot plant runs.

Processing and Utilization Discussion Group. J. L. Ayres, Chairman.

Following the presentation of seven papers on processing and utilization, a discussion of these papers was held. Points discussed were protein water solubility analysis by different techniques, the importance of various volatiles in peanut flavor, advantages of utilizing white testa peanuts for non-roasted peanut products and application of controlled atmosphere packaging for bulk peanut storage.

The question of the proper factor for converting nitrogen value to protein was asked and a spirited discussion ensued. Nutritionists generally agreed that finished food should be used for the proper nitrogen factor. Processors indicated that this would be costly due to limitation on food formulations. All discussants agreed that current protein guidelines have problems in conveying true nutrient content of food since no single food is consumed alone.

POSTER SESSION

Thursday, July 14, 1977, p.m.

Effect of Quantity of Light on the Early Growth and Development of the Peanut.  
F. R. Cox, North Carolina State University.

In order to model the growth and development of peanuts (*Arachis hypogaea* L.), the effects of the quantity and quality of radiation must be understood. Two photon experiments were conducted in which light intensity and the duration of the intense light were varied and Florigiant peanuts grown. Dry weights of leaflets, petioles and stems, leaf area, and number of flowers were measured at 4 to 5 day intervals over a 39 or 46 day growth period. Top dry weight increased markedly with an increasing amount of total photosynthetically active radiation at low levels below 13, increased less rapidly between 13 and 23 and increased little at greater than 23  $\text{E m}^{-2} \text{ day}^{-1}$ . Leaf area differed due to light treatment much as did top dry weight but differences in light did affect the leaf area per gram of leaflet and the leaflet to top ratio. That the latter also was related to top weight should be useful in modeling. The main stems were quite elongated under the low light treatments but light quality may be a factor in this response. The number of flowers was markedly reduced as less light was received by the plants. Regression techniques were used to fit an equation to describe a daily radiation factor to be used in a simulation model. This daily radiation factor compared well with those from field estimates. These relations emphasize the importance of radiation only at quite low light levels. There was no apparent interaction between intensity and duration so use of total light should be valid.



ENTOMOLOGY AND GENERAL, SESSION 1

Thursday, July 14, 1977, p.m.

Control of an Insect Complex With a Resistant Variety, 'NC 6'. W. V. Campbell, J. C. Wynne and D. A. Emery, North Carolina State University, Raleigh.

Research was initiated in 1960 to screen peanut lines for resistance to a complex of insects. In 1976 'NC 6' was released as a peanut cultivar with multiple insect resistance. It has a low level of resistance to the tobacco thrips, moderate resistance to the potato leafhopper and a high level of resistance to the southern corn rootworm.

Since NC 6 is not immune to insects, tests were established to determine minimum insecticide rates in a management or integrated control program. NC 6 was compared with 'Florigiant' for insect damage, insect control with a decreasing amount of insecticide and yields. Tests were established in fields with a history of high rootworm damage.

Insecticide rates currently recommended for rootworm control on commercial susceptible peanuts may be reduced 75 to 80% on NC 6 variety and obtain comparable insect control.

NC 6 will outyield Florigiant by ca. 20% in rootworm problem fields in the absence of insecticides. When low rates of insecticides are applied NC 6 will yield ca. 16% more peanuts than Florigiant.

Populations of Pests and Their Natural Enemies in Florida Peanuts. J. R. Mangold,  
D. A. Nickle, and S. L. Poe, University of Florida.

Ten Alachua County, Florida, peanut fields ranging in size from ca. 12 to 40 acres were surveyed from July 6 to October 2, 1976 for density of foliage feeding insects and their predators. In addition, parasites were reared from field collected larvae in the laboratory. Twenty-one species of foliage feeding caterpillars were collected in weekly samples by the plant shaking method. Of 15,640 larvae counted, 39% were velvetbean caterpillar, Anticarsia gemmatilis Hubner, 26% fall armyworm, Spodoptera frugiperda (J. E. Smith), 15% corn earworm and tobacco budworm, Heliothis spp., 11% plusiinae loopers, 6% granulate cutworm, Feltia subterranea (F.), 2% other Spodoptera spp. and 1% other lepidoptera. The greatest density per row foot of the 5 most numerous species was velvetbean caterpillar--12, fall armyworm--6, Heliothis spp.--3, loopers--1, and granulate cutworm--0.5.

The most numerous predators in diurnal plant shakes were ants (40%), earwigs (20%), spiders (18%), big eyed bugs (10%), ground beetles (4%), and damsel bugs (3%). Parasitism of the major foliage feeding larvae was 7% velvetbean caterpillar, 37% fall armyworm, 20% Heliothis spp., 88% loopers, and 28% granulate cutworm.

All peanut pest management programs require an integrated production approach involving field scouting of insect pests, plant diseases, nematodes and weeds. Weekly assessments of these pests should aid producers in making key production decisions and increase net profits. Changing producer production practices has been a problem encountered by the Comanche County Peanut Pest Management Program. Program evaluations have shown that significant progress has been made by program participants in realizing increased net profits over non-program participants.

Texas crop yields fluctuate from year to year due to erratic weather conditions. In central Texas, peanuts are grown in a monoculture with only rye or small grains separating the seasons as a cover crop. Many fields have been in peanut production for 30 to 40 years. Severe insect, weed, nematode, and disease problems occurring in most fields contributed to a 1976 1350 lbs. per acre county peanut average. These problems cannot be economically controlled each year, especially when dealing with such low yield potentials. Existing cultural and chemical practices are not adequate for this type of production management. A crop rotation program must be developed and implemented before significant yield increases can be obtained.

Insecticidal Control of Southern Corn Rootworm Larvae in Florunner and Tifrun Peanuts in Georgia. L. W. Morgan and J. W. Todd, Coastal Plain Experiment Station, Tifton.

This study was made in order to compare the effects of several insecticides applied at pegging, on larval control, quality and yield of Florunner and Tifrun Peanuts.

The 2 varieties of peanuts were planted in adjoining blocks in a field at Plains, Ga. with a history of annual peanut infestation of larvae of the southern corn rootworm (Diabrotica undecimpunctata howardi Barber). One-half of each block of the 2 varieties was treated with granular Disyston at the rate of 1.0 lb. AI/A at planting. Seventy-three days after planting the granular applications were made. Recommended agronomic practices, including chemical weed control at planting, and 2 applications of Butyrac<sup>(R)</sup> during the season for additional control of broadleaf weeds, were followed throughout the growing season. The peanut foliage also received periodic applications of a fungicide for leafspot suppression. At harvest, plot weights were obtained, and a one hundred pod sample from each plot was examined for injury by larvae of the SCR. Varying degrees of larval control were obtained, but percent pod damage by the larvae was not correlated with yield. Pod damage in Orthene treated plots was consistently higher than pod damage in other treatments. In the Florunner variety, the highest yield was obtained from the plots treated with Disyston and Orthene.

In both varieties in this test, Disyston-treated plots averaged about 100 lbs/A higher than those receiving no Disyston, but the differences were not significant at the 5% level.

Effects of Controlled Mechanical Defoliations on Yield Quality and Quantity of 'Florunner' Peanuts in North-Central Florida. David A. Nickle, University of Florida.

'Florunner' peanuts in field plots in north-central Florida were mechanically defoliated by hand-picking either 0, 1, 2, 3, or 4 leaflets of all leaves, corresponding to 0, 25, 50, 75, and 100% defoliation, respectively. Single defoliations at 21, 42, 63, 84, or 105 days after "cracking" were made in a random block design of 21 treatments. Also, six multiple 50% defoliation treatments were made at intervals of 21, 42, and 63 days; 21, 42, 63, and 84 days; 21 and 42 days; 42 and 84 days; and 63 and 84 days, respectively. All plants were harvested 140 days after "cracking". Results of single defoliations suggested that yield reduction is most severe for all levels of defoliation between 63 and 84 days after "cracking", with about 8% reduction for 25% defoliations and 50% reduction for 100% defoliations, and become less severe at 105 days (0-20% reduction). Although because of physiological stress of massive leaf excisions to the plant, yield reductions in mechanical defoliations are probably higher than that attributed to equivalent defoliations by actual insect consumption, it is suggested that mechanical defoliations demonstrate the most vulnerable period in the plant phenology to yield reduction by defoliation.

Effects of defoliation on yield quality were observed: (1) kernel weight was reduced by 42-68% with 75 and 100% defoliations at 63, 84, and 105 days, and this resulted in lower U.S. grades of peanuts; (2) the percent damaged peanuts increased to as high as 26.9% as the level of defoliation increased; and (3) the weight of kernels was higher among the multiple defoliation treatments than in either single defoliation treatments or no defoliation treatments.

Peanuts (Arachis hypogaea 'Florunner'), infested with sicklepod (Cassia obtusifolia L.) and Florida beggarweed (Desmodium tortuosum Sw.), were grown in 20, 40, and 80 cm rows on a Dothan sandy loam at Headland, Alabama and on a Greenville sandy clay loam at Plains, Georgia. The peanuts were maintained free of sicklepod and Florida beggarweed for 0, 2, and 5 weeks or throughout the season. The entire experimental area was treated with benefin (N-butyl-N-ethyl- $\alpha$ ,  $\alpha$ ,  $\alpha$ -trifluoro-2, 6-dinitro-p-toluidine) applied as a preplant incorporated treatment to control grasses. Unwanted escape weeds were removed by hand.

In the absence of weeds, peanut yields generally increased with decreasing width of row. While the magnitude of the effect varied between 20 to 40 and 40 to 80 cm spacings, most experiments revealed a yield increase over the entire range of row spacings studied. The relationship of row spacing to peanut yields was also observed where peanuts were maintained weed-free for either none or a fraction of the growing season. In each experiment there was significantly less weed growth with closer spaced rows. While the overall yields of peanuts were generally lower where weeds competed for a fraction of the season, the influence of row spacing on competitiveness of the peanut canopy remained relatively constant. Also, the influence of row spacing on competitiveness of peanuts was remarkably similar on the two soil types.

AGRONOMY, SESSION 2

Thursday, July 14, 1977, p.m.



Effect of Harvest Date on Dry Matter, Arginine Maturity Index (AMI) and Yield of Eight Varieties of Peanuts. Clyde T. Young and R. Harold Brown, North Carolina State University and University of Georgia.

Eight varieties of peanuts (Tifspan, Spanscross, Starr, Argentine, Virginia Bunch, Early Runner, Florigiant, and Florunner) were grown for two successive years at the Southwest Branch Station, Plains, Georgia. Each variety (four replications) was harvested at six weekly intervals and analyzed for dry matter, arginine maturity index (AMI), and yield. Statistical analysis showed significant year, variety, and harvest effects on these three variables. Most of the major interactions also were significant. The relationship between the AMI and dry matter for varieties ranged from 0.63 to 0.85. Those relationships for the AMI and yield ranged from 0.34 to 0.83. The AMI data for each variety for each year were analyzed for best curve fit. The fourth power equations gave the best fit with  $r$ -square values of 0.907-0.995. Slides of these curves on AMI are presented.

#### ABSTRACT

The Federal-State Inspection Service, Portales, New Mexico, sampled over 13,000 loads of irrigated Valencia peanuts (*Arachis hypogaea* L.) from 1964 to 1969. The samples were individually analyzed for percentages of sound mature kernels (SMK), other kernels (OK), damaged kernels (DK), hull discoloration (DISC), loose shelled kernels (LSK) and foreign material (FM). The information thus obtained was related to three major soil groups (1, 2 and 3), three minor soil groups (4, 5 and 6), and to temperature and precipitation records from May to October. Significantly higher averages of SMK were produced by soil groups 1 and 6 than any of the other four soil groups. The average DISC from soil group 1 was significantly lower than those of soil groups 3 and 5 but equivalent to that for the other soil groups. Soil group 3 showed the highest average DISC. Fewer DISC and DK were produced in 1964, but SMK was next to highest. The mean maximum and average temperatures of the 1964 growing season were about 2° F and 1° F, respectively, higher than those of the other four growing seasons. The total precipitation during the 1964 season was next to lowest in the six year period. The high DISC in 1966 occurred before digging and was caused by *Thielaviopsis basicola*, a soil-borne pathogen. *Alternaria* sp. and *Penicillium* sp. caused most of DISC after digging in 1969, a year which had a wet October. Negative correlation coefficients (1% level) were obtained between SMK and OK, SMK and DK, or SMK and DISC whereas positive correlations (1% level) were obtained between OK and DISC or DK and DISC. No correlation between OK and DK was found.

#### INTRODUCTION

Eastern New Mexico produces over 90 percent of Valencia peanuts in the United States. Valencia peanuts are high quality eating peanuts and are sold primarily roasted or raw in the hulls.

In recent years a peanut blackhull disease, incited by the fungus *Thielaviopsis basicola*, has reduced the market quality of the Valencia peanuts and caused financial losses to the producers. Valencia peanuts having 25 percent or more blackhulled pods are sold at the Spanish peanuts loan price, 20 to 30 dollars a ton less than Valencia peanuts loan price. Furthermore, microbial damaged kernels are frequently associated with the blackhulled peanuts. Peanuts which have 2.5 percent or more damaged kernels and no visible *Aspergillus flavus* are classified as Segregation II peanuts and sold at a discount price under the government loan program. Also, Segregation II peanuts which contain more than ten percent foreign matter must be cleaned before they are eligible for government payment.

It has been observed that peanuts from some locations in the area had less blackhull and damaged kernels than peanuts from other locations in the same years. Also, peanuts in some years were distinctly inferior to those in other years. This study, which covered a six year period from 1964 to 1969, was designed to show the influence of soil groups and growing seasons on peanut quality.

## MATERIALS AND METHODS

During the period from 1964 through 1969 information on peanut quality was gathered from official grading reports. The following six quality factors were recorded:

- Sound mature kernels (SMK) (including both wholes and splits)
- Other kernels (OK) (mostly undersized immature)
- Damaged kernels (DK)
- Hull discoloration (DISC)
- Loose shelled kernels (LSK) (from 1966 through 1969)
- Foreign material (FM) (from 1966 through 1969)

The number of official gradings reported varied from 1800 to approximately 2400 per year. The information thus obtained from the official Grading Stations of the New Mexico Department of Agriculture was related to soil groups and harvest dates according to peanut producers and farm locations. The majority of the peanuts were grown in Soil Groups 1, 2 and 3 (see appendix).

Data from individual peanut loads were recorded separately for analysis. Statistical analysis of the data for each of the six quality factors and simple correlation coefficients among all combinations of the four variables (SMK, OK, DK and DISC) were computed.

The appendix contains the means of six market quality factors as arranged by years or by soil groups. The appendix also contains temperature and precipitation data for the six growing seasons (1964 to 1969) and brief description of six soil groups.

## RESULTS AND DISCUSSION

Averages of the six market quality factors of Valencia peanuts by soil groups, are found in Table 1. Production of sound mature kernels seemed to be enhanced by Soil Groups 1 and 6 which produced significantly higher averages of SMK than any of the other four soil groups. Soil Groups 1 and 6 also produced smaller amounts of other kernels although the average percent of OK from Soil Group 1 could not be differentiated statistically from the averages of any of the other soil groups except Soil Group 4. The average percent of discolored peanuts from Soil Group 1 was significantly lower than those of Soil Groups 3 and 5 but could not be separated from the averages of the other soil groups. Soil Group 3 showed the highest average percent DISC, an amount which was significantly higher than averages from Soil Groups 1, 4 and 6.

Table 1. Several year averages of six market quality factors of Valencia peanuts, by soil groups, Portales, New Mexico

Soil Group	Sound Mature Kernels <sup>1</sup>	Other Kernels <sup>1</sup>	Damaged Kernels <sup>1</sup>	Hull Discoloration <sup>1</sup>	Loose Shelled Kernels <sup>2</sup>	Foreign Material <sup>2</sup>
	-----pct-----					
1	67.17 a <sup>3</sup>	4.59 bc	.88 a	15.37 c	6.72 a	9.40 a
2	65.88 b	4.88 ab	1.26 a	20.34 abc	6.39 a	8.85 a
3	65.47 bc	4.95 ab	1.39 a	25.84 a	6.37 a	9.24 a
4	64.62 c	5.28 a	1.23 a	19.36 bc	6.15 a	8.54 a
5	65.05 bc	5.13 ab	1.33 a	22.56 ab	5.97 a	9.33 a
6	67.81 a	4.00 c	1.06 a	17.74 bc	5.65 a	7.67 a
Average	66.00	4.80	1.19	20.20	6.21	8.84

<sup>1</sup>Six year averages

<sup>2</sup>Four year averages

<sup>3</sup>Values followed by the same letter are not significantly different at the 5% level. Duncan's Multiple Range Test.

Table 2 shows the averages of six soil groups for each of the six market quality factors, by years (1964 to 1969). Significant differences were detected between years for all attributes under study except foreign matter. Few DISC and DK were produced in 1964 which also resulted in the next to highest SMK. The mean maximum and average temperatures of the 1964 growing season were about 2° F and 1° F, respectively, higher than those of the other four growing seasons (Appendix Tables 8 and 10). The total precipitation received during the 1964 season was next to lowest in the six year period (Appendix Table 7). Highest amounts of DISC were in 1966 and 1969 (28.6% and 28.8% respectively). Even though the discoloration percentages were nearly equally high in 1966 and 1969, the discoloration was caused by different sets of factors in those two years. In 1966, the precipitation was heavy in the month of August and accompanied by very low temperatures (Appendix Tables 7 and 8). These conditions were conducive to the development of peanut blackhull incited by the soil-borne fungus *I. basicola* (on the basis of actual microbial isolation studies). Over 25 percent of the peanut pods were discolored at the time of digging. In 1969, the precipitation was very light in the month of August and accompanied by rather high temperatures. These conditions were not conducive to the peanut blackhull incited by *I. basicola* and consequently the peanut pods were mostly clean at digging time. An unusually high amount of rainfall fell in October of 1969 after the peanuts were dug, inverted, and left in the field for curing. The peanut pods became moldy and spotted under humid conditions. The discoloration was largely caused by the moldy growth of two fungi, *Alternaria sp.* and *Penicillium sp.* In 1966, a high amount of pod discoloration was associated with a low amount of SMK and high amounts of DK and LSK. In 1969, pod discoloration and fungal growth were mostly on the pod surface and were associated with average amount of SMK, a low amount of DK and a very low amount of LSK. Discoloration and other market quality factors were average or near average in 1965, 1967 and 1968. Kernel quality was not as good as in 1964 and was much better than that produced in 1966. There were no differences in FM between years.

Table 2. Averages of six soil groups for each of the six market quality factors, by years, Portales, New Mexico

Year	Sound Mature Kernels	Other Kernels	Damaged Kernels	Hull Discolor- ation	Loose Shelled Kernels	Foreign Material
-----pct-----						
1964	66.64 ab <sup>1</sup>	4.65 b	.52 c	10.50 c		
1965	66.32 bc	4.26 b	.54 c	16.69 bc		
1966	64.49 d	4.51 b	2.65 a	28.61 a	8.53 a	9.33 a
1967	67.64 a	4.40 b	1.02 bc	16.27 bc	6.01 b	9.04 a
1968	65.41 cd	5.71 a	1.16 b	20.34 b	6.59 b	9.27 a
1969	65.56 bcd	5.31 a	1.25 b	28.83 a	3.72 c	7.71 a
Average	66.00	4.81	1.19	20.21	6.21	8.84

<sup>1</sup>Values followed by the same letter are not significantly different at the 5% level. Duncan's Multiple Range Test.

Correlation coefficients were computed between four market quality factors, (SMK, OK, DK, and DISC) on the basis of six years data and are shown in Table 3. Correlations between SMK and OK, SMK and DK, or SMK and DISC were significantly negatively correlated. Associations between OK and DISC or DK and DISC were significantly positively correlated. There was no significant association between OK and DK. Except for the factor DISC, the results were similar to those obtained in Georgia on the basis of one year data (1972)<sup>1</sup>.

Table 3. Correlation coefficients between four market quality factors, on the basis of six years data, Portales, New Mexico

	Sound Mature Kernels	Other Kernels	Damaged Kernels	Hull Discolor- ation
Sound Mature Kernels		-.7339**	-.4304**	-.3878**
Other Kernels			.0150	.2326**
Damaged Kernels				.3704**

Significance for 13,234 degrees of freedom at 1% level exceeds .081.

#### Appendix

Brief description by Dr. L. A. Daugherty of the NMSU Agronomy Department of each of the six soil groups (associations) is as follows (the paragraphs are mainly from the Soil Conservation Service (in service) Form 5 Soil Interpretation Tables or a generalization of the SCS soil series description):

##### Group 1. Red Sandy Land; Amarillo-Springer

The Amarillo series is a member of a fine-loamy, mixed, thermic family of Aridic Paleustalfs and comprises deep, well drained, moderately permeable upland soils that have reddish brown fine sandy loam or loamy fine sand A horizons and thick reddish sandy clay loam subsoils. Prominent accumulations of CaCO<sub>3</sub> occur at depths of 30 to 60 inches. Slopes range from 0 to 5 percent.

The Springer series is a member of a coarse-loamy, mixed, thermic family of Udic Paleustalfs and has light brown loamy fine sand surfaces and reddish sandy

<sup>1</sup>Y. P. Tai and Clyde T. Younge. 1973. Analysis of sample quality data from a Georgia peanut receiving station. Journal of Amer. Peanut Res. and Educ. Assoc., Inc. Volume 5, Number 1, pp. 75 to 82.

loam and loamy sand subsoils extending below 60 inches. Permeability is moderately rapid. The topography is undulating or hummocky and slopes vary from 0 to 8 percent

#### Group 2. Mixed Sandy Land; Clovis-Arvana

The Clovis series is a member of a fine-loamy, mixed mesic family of Ustollic Haplargids and consists of deep, well drained soils. They formed in mixed old alluvium on upland alluvial fans. Typically the surface layer is a fine sandy loam about 5 inches thick, the subsoil is a sandy clay loam about 20 inches thick, and the substratum is a very fine sandy loam high in lime content. Slopes are 0 to 8 percent.

The Arvana series is a member of a fine-loamy, mixed thermic family of Petrocalcic Paleustalfs and consists of moderately deep, well drained, nearly level to gently sloping soils of uplands. The soil formed in calcareous loamy materials. In a representative profile, the surface layer is brown fine sandy loam about 8 inches thick. The sandy clay loam subsoil extends to a depth of 28 inches. The subsoil is reddish brown in the upper 16 inches and yellowish red below 24 inches. The substratum is loamy caliche materials that are indurated in the upper 10 inches. Slopes range from 0 to 3 percent.

#### Group 3. Valley Filled Soils; Portales-Arch

The Portales series is a member of a fine-loamy, mixed thermic family of Aridic Calciustolls and consists of deep well-drained soils formed in calcareous alluvial sediments modified by wind on uplands. Typically the surface layer is a grayish-brown loam and clay loam about 8 inches thick. The subsoil is a pale brown clay loam about 10 inches thick, and the substratum a white and very pale brown clay loam. Slopes are 0 to 5 percent.

The Arch series is a member of a fine-loamy, mixed, thermic family of Ustochreptic Calciorthids and consists of deep well-drained soils formed in moderately coarse and medium textured sediments high in lime on plains. In a representative profile the surface layer is brown fine sandy loam about 10 inches thick. The subsoil is pale brown light sandy clay loam about 7 inches thick. The substratum is white and light gray clay loam and light clay loam to 60 inches or more. Slopes are 0 to 5 percent.

#### Group 4. Portales Springs Chalky Soils; Drake-Church

The Drake series is a member of a fine-loamy, mixed (calcareous), thermic family of Typic Ustorthents and consists of deep, well drained, nearly level to sloping soils of uplands. The soil formed in calcareous eolian materials. In a representative profile, the surface layer is grayish brown loam about 8 inches thick. The next layer is light brownish gray clay loam about 17 inches thick. The lower layer is light gray clay loam and extends to below 80 inches. Slopes range from 1 to 10 percent.

The Church series is a member of a fine, mixed, mesic family of Aquic Camborthids and consists of deep, moderately well drained, nearly level to level soils which occur on low benches surrounding large enclosed basins or playas on the High Plains. These soils have gray, calcareous clay loam A horizons and light gray, strongly calcareous B<sub>2</sub> and C horizons. Runoff is slow and permeability is very slow. The regolith is water-deposited sediments.

#### Group 5. Poker Flat Chalky Soils; Arch-Drake

The Arch series: see group 3.

The Drake series: see group 4.

#### Group 6. Playa Lake Chalky Soils; Drake-Mansker

The Drake series: see group 4.

The Mansker series is a member of a fine-loamy, carbonatic, thermic family of

Calciorthidic Paleustolls and consists of deep, well drained, nearly level to sloping soils of uplands. The soil formed in calcareous, loamy eolian material. In a representative profile, the surface layer is grayish brown loam in the upper 6 inches, dark grayish brown clay loam in the next 6 inches. The clay loam subsoil extends to depths greater than 66 inches, and has prominent accumulations of calcium carbonate below 12 inches. The subsoil is pink in the upper 16 inches and reddish yellow below 28 inches. Slopes range from 0 to 8 percent.

Appendix Table 1. Average percentage of sound mature kernels, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1964	67.25	66.42	65.58	66.61	64.90	69.00	66.63
1965	67.83	66.17	65.57	64.71	65.21	68.38	66.31
1966	65.85	64.16	63.41	62.39	63.16	67.88	64.48
1967	68.89	67.75	66.03	67.48	66.56	69.07	67.63
1968	66.95	65.90	66.64	62.84	64.05	66.00	65.40
1969	66.25	64.85	65.57	63.71	66.40	66.53	65.55
Average	67.17	65.88	65.47	64.62	65.05	67.81	66.00

Appendix Table 2. Average percentage of other kernels, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1964	4.45	4.68	5.06	4.48	4.87	4.33	4.65
1965	3.89	4.55	4.73	4.87	4.64	2.85	4.26
1966	4.80	4.96	4.96	4.79	4.57	3.00	4.51
1967	4.14	4.04	4.68	4.52	5.06	3.93	4.40
1968	4.98	5.34	4.84	6.96	6.89	5.22	5.71
1969	5.27	5.69	5.44	6.06	4.74	4.65	5.31
Average	4.59	4.88	4.95	5.28	5.13	4.00	4.81

Appendix Table 3. Average percentage of damaged kernels, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1964	.37	.63	.72	.21	.87	.33	.52
1965	.43	.56	.85	.13	1.21	.08	.54
1966	1.40	2.42	2.71	3.92	2.57	2.88	2.65
1967	.76	1.18	1.49	1.13	.72	.86	1.02
1968	1.12	1.32	1.17	1.08	1.71	.56	1.16
1969	1.19	1.43	1.42	.91	.91	1.63	1.25
Average	.88	1.26	1.39	1.23	1.33	1.06	1.19



Appendix Table 4. Average percentage of discolored pods, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1964	7.49	11.09	14.62	8.00	10.13	11.67	10.50
1965	11.80	16.38	23.94	11.65	22.27	14.08	16.69
1966	21.57	29.04	40.66	17.61	39.08	23.64	28.60
1967	10.20	17.39	27.61	16.35	14.67	11.36	16.26
1968	16.48	20.51	20.33	26.82	20.85	17.00	20.33
1969	24.69	27.60	27.86	35.71	28.35	28.72	28.82
Average	15.37	20.34	25.84	19.36	22.56	17.75	20.20

Appendix Table 5. Average percentage of loose shelled kernels, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1966	8.43	8.44	8.03	8.87	7.53	9.84	8.52
1967	6.80	6.51	6.11	5.00	6.56	5.07	6.01
1968	7.62	6.62	7.37	7.90	6.00	4.00	6.59
1969	4.02	4.00	3.98	2.83	3.79	3.70	3.72
Average	6.72	6.39	6.37	6.15	5.97	5.65	6.21

Appendix Table 6. Average percentage of foreign materials, by years and by soil groups, Portales, New Mexico

Year	Soil Group						Average
	1	2	3	4	5	6	
1966	10.79	9.30	8.98	10.03	8.00	8.88	9.33
1967	8.69	8.80	10.06	7.13	11.11	8.43	9.04
1968	10.95	9.42	10.11	9.82	8.65	6.67	9.27
1969	7.16	7.86	7.79	7.20	9.56	6.70	7.71
Average	9.40	8.85	9.24	8.55	9.33	7.67	8.84

Appendix Table 7. Precipitation in inches by months, May to October, Portales, 1964-1969

Year	May	June	July	Aug.	Sept.	Oct.	Total
1964	.85	2.77	.43	1.22	2.31	.03	7.61
1965	2.95	2.91	3.61	1.67	2.50	.53	14.71
1966	1.28	4.80	.50	4.52	3.01	.03	14.14
1967	.27	4.20	4.02	2.19	1.24	.06	11.98
1968	1.58	.03	2.89	1.77	.11	.39	6.77
1969	4.27	3.13	4.02	.62	3.02	3.69	18.75

Appendix Table 8. Mean monthly maximum temperatures in °F, May to October, Portales, 1964-1969

Year	May	June	July	Aug.	Sept.	Oct.	Average
1964	86.6	92.3	97.9	94.1	84.0	79.9	89.1
1965	83.8	89.4	94.3	92.2	85.8	78.3	87.3
1966	86.2	89.4	98.1	87.9	85.0	76.6	87.2
1967	86.3	90.1	93.0	89.9	84.6	79.7	87.3
1968	-	95.7	90.9	91.7	86.8	81.2	-
1969	84.3	89.8	96.7	95.3	85.0	69.6	86.8

Appendix Table 9. Mean monthly minimum temperatures in °F, May to October, Portales, 1964-1969

Year	May	June	July	Aug.	Sept.	Oct.	Average
1964	49.3	56.5	64.6	62.0	56.8	41.6	55.1
1965	51.3	57.8	63.1	60.0	53.0	38.7	54.0
1966	49.5	59.9	65.4	60.2	54.2	38.4	54.6
1967	47.2	60.6	63.6	60.2	54.9	41.8	54.7
1968	-	59.2	62.7	62.3	52.0	42.9	-
1969	51.4	57.2	65.6	63.7	56.9	43.2	56.3

Appendix Table 10. Mean monthly temperatures in °F, May to October, Portales, 1964-1969

Year	May	June	July	Aug.	Sept.	Oct.	Average
1964	68.0	74.4	81.3	78.1	70.4	60.8	72.2
1965	67.6	73.6	78.7	76.1	69.4	58.5	70.7
1966	67.9	74.7	81.8	74.1	69.6	57.5	70.9
1967	66.8	75.4	78.3	75.1	69.8	60.8	71.0
1968	-	77.5	76.8	77.0	69.4	62.1	-
1969	67.9	73.5	81.2	79.5	71.0	56.4	71.6

#### Acknowledgement

The authors thank the personnel at the Federal-State Inspection Service of the New Mexico State Department of Agriculture and at the Agricultural Stabilization and Conservation Service of the U. S. Department of Agriculture at Portales, New Mexico. Their excellent cooperation made this study possible.

Tracking the Elemental Content of Peanut Leaves from Plants Under Intensive Irrigated Culture. J. B. Jones, Jr., J. R. Stansell and J. E. Pallas, Jr., University of Georgia, Coastal Plain Experiment Station and USDA-ARS, Watkinsville, respectively.

The plant analysis technique has proven to be a useful tool to evaluate the elemental status of plants to determine nutrient element sufficiency. This technique was applied to 'Florunner' peanut (*Arachis hypogaea* L.) plants under intensive irrigated culture at Tifton, Georgia. Upper mature leaves were collected for elemental analysis at 3- or 4-day intervals beginning June 21 through October 1, 1976. The analyses of the leaves included the elements N, P, K, Ca, Mg, Mn, Fe, B, Cu, Zn, and Na. Final peanut yields only ranged from 4241 to 4547 kg/ha. Although every effort was made to obtain top yields, these lower than anticipated fruit yields may have been due in part to possible nutritional stresses. The leaf analyses indicated possible N, Mn, and Zn deficiencies during the sampling period. In late June, leaf N levels dipped to 2% while Zn and Mn concentrations reached a low of 15 and 20 ppm, respectively. Visual Mn deficiency symptoms were evident for the first 2 weeks in July when leaf Mn concentrations were 20 to 23 ppm. The elemental concentrations found in this study differ considerably from what has been reported elsewhere. Also, the change in concentration differs somewhat from that reported by others. Some of this difference is due to location effects as well as the plant part taken for analysis. The tracking of the nutrient element status of the peanut plant, as was done in this study, may prove to be an essential technique to explain growth characteristics during the season which affects final peanut yields.

This study was designed to determine effects, unconfounded by seasons, of 0- to 5-year old bahiagrass sod on yield and quality of subsequent peanut (Arachis hypogaea L.) crops; and to provide information as to factors responsible for the observed beneficial effects.

Essentially the experiment was a 6 x 4 x 2 factorial in a randomized complete block arrangement. Previously designated plots were seeded each year to bahiagrass while the remaining plots were maintained in a cultivated crop rotation of corn and peanuts. Duplicate soil samples taken annually were analyzed for major plant nutrients and for nematodes. After a period of 5 to 7 years all the plots were planted to peanuts for two successive years. A total of 21 responses were measured associated with yield and quality of peanuts, nematode counts, and soil characteristics. Not all nematode responses were analyzed because of a high percentage of zero values.

Twelve of the 15 responses actually analyzed were affected by the length of time the land was in sod. Peanut yield and quality increased with years in sod, with the greatest improvement occurring after one year. The percent shriveled seed and concealed damage decreased with years in sod and again the reductions were most pronounced between the 0 and 1 year old sod treatments. In every case the first crop of peanuts following sod was better than the second. However, as the number of years in sod increased, differences between the first and second peanut crop diminished. Years in sod had an affect on the level of major soil nutrients but no regular trends were shown. Numbers of Lance nematodes were significantly reduced by age of sod while Ring nematodes were not. Eleven of the 15 responses showed significant interactions between the length of time in sod and season and/or crop order.

Plant Soil Water Relations of Florunner Peanuts Under Droughty Conditions. J. E. Pallas, Jr., J. R. Stansell, and T. J. Koske, Southern Piedmont Conservation Research Center, Coastal Plain Experiment Station, and University of Georgia.

Droughty conditions are implicated in bringing about low yields, poor grades and germination and an increased incidence of aflatoxin. However, very little is known as to when drought is most critical during the growth cycle of the peanut (*Arachis hypogaea*). Five droughty treatments and their ability to induce plant water stress and affect leaf conductance were studied and compared to a control under rainfall protected plots on Tifton loamy sand. Yield, SMK, plant water stress and leaf diffusional resistance as affected by treatment were studied. Drought was instigated by withholding irrigation. An early, middle and late drought period of short duration and an early and late extended drought were evaluated. In general, the yield, SMK, and leaf water potential were decreased with an increase in the duration and/or the lateness of the drought. The leaf diffusion resistance increased with an increase in the duration and lateness of drought. Leaf water potentials of -30 bars were recorded for several treatments with values as high as -45 bars for one treatment. The water potential of the control plants never exceeded -12 bars. Leaf diffusional resistance was low and thus conductance high when plant water stress was not a factor. The diffusional resistance was frequently less on the upper than on the lower leaf surface. By the day following irrigation much of the plant water stress that developed during drought was relieved and leaf diffusional resistance also returned to near normal. The peanut plant appears to have an extraordinary ability to adapt to droughty conditions.

Response of Florunner (*Arachis hypogaea* L.) Peanuts to Sources of Limestone and Rates of Magnesium. Milton E. Walker and Ben G. Mullinix, Coastal Plain Experiment Station.

Soils of the Coastal Plain of Georgia generally are low in soil Mg, yet research has not shown a yield response to application of magnesium to peanuts.

A study was initiated to investigate the effects of sources of limestone and rates of magnesium on soil pH, K, Ca, and Mg levels, as well as yield, grade, and leaf uptake of K, Ca, and Mg in Florunner peanuts. The limed areas previously had received either dolomitic or calcitic limestone at 3,363 kg/ha. Magnesium ( $\text{MgSO}_4$ ) rates were 0, 67.3 and 134.5 kg/ha.

Peanut yields were not affected by rates of Mg, but did respond to lime sources in 1975. However, in 1976, plots treated with calcitic limestone did give a yield response to Mg treatments. The percent sound mature kernels (SMK) was increased with dolomitic and calcitic limestone. The percent Mg contained in the peanut leaf increased with each increment of Mg regardless of liming sources. Leaf Mg was much higher in the older leaves than new leaves in 1975 but reversed in 1976.

These data indicate that peanuts will respond to Mg and limestone and that increased leaf Mg on low Mg soil does not necessarily increase yields.

The effect of moisture stress on peanut (*Arachis hypogaea* L.) yield may vary according to the intensity of the stress, the duration of the drouth, and the stage of growth of the crop. These aspects were studied in the field during a three-year period utilizing normal weather patterns and soil variability on peanuts grown with and without irrigation treatments. The treatments were imposed to limit the soil moisture tension at certain times during the growing season. Soil moisture was measured periodically and the daily tension modeled mathematically. Several harvests were made so the optimum yield was available for each planting date. Yield was then related to the degree and duration of stress as it occurred at various stages of growth. These stages were calculated beginning with the time of flowering. There was not a marked difference in the degree of stress used in the range studied between one and five bars. There were striking effects, however, associated with duration of stress and stage of growth. A drouth of limited duration had little or no effect, but the effect became more and more magnified as its length increased. In these studies significant measureable decreases in yield due to drouth only occurred during the period 50-80 days after flowering began. In this time span the effect became more severe at the latter part of the period. It is possible that too few dry days occurred before this span to afford a good estimate, and there were also insufficient days beyond 80 days after flowering for a good estimate.



Agronomy Discussion Group. E. B. Whitty, Chairman.

Points of discussion centered on the formal papers presented earlier in the session. Physical and chemical properties of soils, whether inherent because of soil type or due to changes brought about by grass sod, were postulated as being important factors affecting peanut growth, yield, and quality. Rooting depth of peanuts was discussed. In the area of plant nutrition, it was noted that tissue testing is in its infancy as far as peanuts are concerned, but with much more research on techniques, tissue testing could be a valuable tool in evaluating and maintaining a satisfactory nutritional status of the peanut plant. Ratios of nutrients were deemed to be of much importance in peanut nutrition. The duration and time of drought stress on peanuts, as well as methods of evaluating drought stress and determining when to irrigate, were discussed. The relationship between arginine levels and maturity of different varieties of peanuts was also discussed.

POSTER SESSION

Thursday, July 14, 1977, p.m.

Survey of Sclerotinia Blight Disease Losses in Peanut Fields by Remote Sensing.  
P. R. Cobb, N. L. Powell, and D. M. Porter, Virginia Polytechnic Institute and  
State University and USDA-ARS, Suffolk.

Sclerotinia blight of peanuts, caused by the soil-borne fungus Sclerotinia sclerotiorum, has become widespread throughout the peanut growing region of Virginia. This study was undertaken to determine peanut losses caused by this disease in Southeast Virginia.

Four separate areas within the peanut growing region were intensively surveyed for the disease using aerial infrared imagery and field observations for 1974, 1975, and 1976.

Results indicate that in 1974 Sclerotinia blight disease caused slight to moderate damage. For 1975 the disease damage was slight to none. During the 1976 growing season disease damage was moderate to severe.

In comparing the four areas over the three year period one exception to the above pattern occurred. One area contained peanut fields with slight to moderate disease damage during the 1974 growing season. There was no detectable disease damage within this area during the 1975 or 1976 growing seasons.

Sclerotinia blight caused considerable economic loss to the peanut growers of Virginia during the 1976 growing season. The economic loss from this disease was much less in 1974 and almost non-existent in 1975.

GENERAL SESSION

Friday, July 15, 1977, a.m.

Effect of Host Plant, Rhizobial Strain, Temperature, and Time of Inoculation on Nitrogen Fixation in Peanuts. T. Schneeweis, J. C. Wynne, G. H. Elkan and T. G. Isleib, North Carolina State University.

Inoculation of peanuts (*Arachis hypogaea* L.) with the proper nitrogen fixing bacteria often increases yield, seed quality and oil and protein content. Some strains of rhizobia symbiotic with peanuts infect and form symbiotic relationships more efficiently than others. Recent field studies in North Carolina indicate that a composite of rhizobial strains nodulate and fix nitrogen differentially when several host genotypes are grown in inoculated soil.

The effects of temperature, time of and time after inoculation on nodulation and nitrogen fixation were investigated using six host genotypes and four *Rhizobium* strains. Of three harvest dates in the phytotron, plants showed more nitrogen-fixing activity at 17 days after inoculation than at 34 or 51 days. Under a cooler temperature regime (26 C day/22 C night), differences were found among host genotypes for ratings of the number of nodules and for the actual nodule counts. There were count differences among *Rhizobium* strains. Under a warmer regime (30 C day/26 C night), host and date-by-host interactions were found for fixation activity; host, strain, and host-by-strain interaction effects for nodule counts; strain and date-by-host interaction effects for number ratings; and host and strain effects for ratings of nodule size. In the greenhouse, host differences and age-by-strain interaction were found for fixation rate, while the time of inoculation within 20 days after planting had no effect.

### Abstract

An international improvement program for peanuts in the semi-arid tropics commenced in 1976 at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India, following recommendations made by a group of consultant scientists in 1974. Peanuts are one of the most important legumes in the semi-arid tropics and are a valuable source of food, oil and foreign exchange. Yields are low, however, and average around 800 kg/ha compared to localized yields in excess of 3,000 kg/ha in highly developed countries. Disease is one of the most important factors limiting yields, and the research program is concentrating on incorporating resistance to such major peanut pathogens as Cercospora leafspot, rust (Puccinia arachidis) and yellow mold (Aspergillus flavus). ICRISAT will serve as a major germplasm centre for the genus Arachis. We have already received over 5,000 cultivars.

### Introduction

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) was created in 1972 at Hyderabad, India with four main objectives:

1. To serve as a world centre to improve the genetic potential for yield and quality of sorghum, pearl millet, pigeonpea, chickpea and peanuts.
2. To develop farming systems which will help to increase and stabilize agricultural production through better use of natural and human resources in the seasonally dry semi-arid tropics.
3. To identify socio-economic and other constraints to agricultural development in the semi-arid tropics and to evaluate alternative means of alleviating them through technological and institutional changes.
4. To assist national and regional research programs through cooperation and support and to contribute further by sponsoring conferences, operating international training programs and assisting extension activities.

The Institute occupies 1394 hectares of land some 25km northwest of Hyderabad, with soils representative of large areas of land typical of the semi-arid tropics.

### The Peanut Program

#### Background

In 1974 a team of four consultants was invited to Hyderabad to review world research needs of peanuts, to consider whether ICRISAT ought to help meet these needs and if so, to suggest a possible program of international research. It was concluded that the crop required international research, it would be an appropriate subject within the mandates of the international agricultural research system and ICRISAT was the appropriate centre as groundnuts are primarily a crop of the semi-arid tropics (Bunting *et al.* 1974).

During 1975 preliminary agronomic trials were conducted at the ICRISAT site. It was shown that not only was it a suitable area for growing peanuts throughout the year, but the major pests and diseases were present to allow a considerable amount of on site resistance testing to take place. In 1976 a detailed plan of

research was accepted by the governing board of ICRISAT (Gibbons, 1976) and breeding, pathology and microbiology programs commenced. By the end of 1977 further programs in cytogenetics, physiology, entomology and intercropping should be underway.

#### Constraints

The major constraints facing small scale farmers are pests, diseases and an unreliable rainfall pattern which result in low yields of around 800 kg/ha, or less, compared to the yields of around 3,000 kg/ha, or even higher, achieved in highly developed countries as the USA. Although high research yields of around 6,000 kg/ha have been achieved in the developing world, they usually result from the use of expensive plant protection measures or supplementary irrigations which are beyond the reach of poor farmers. Many developing countries have few trained personnel and rely only on the introduction of improved cultivars from abroad rather than conducting their own hybridization programs. There is now general agreement that hybridization is essential for peanut improvement (Norden, 1973) particularly for the incorporation of disease or pest resistance with suitable yield and quality characteristics as well as yield per se.

#### Objectives

The main objective of the program is to produce high yielding breeding lines with resistance to drought and the major groundnut pathogens. It is not the intention to produce new cultivars but to supply breeding lines with suitable characters for further selection to be practiced on them. Germplasm will also be distributed on a wide scale. Close working relationships will be developed with both national and regional programs as well as with the ICRISAT Farming Systems, Training and Economics programs.

#### Programs and Progress

**Breeding and Germplasm.** ICRISAT has been designated as a major germplasm centre by the International Board for Plant Genetic Resources (IBPGR) and during the past year we have received some 5,000 accessions from India and abroad. During 1976 two partial plantings of the current collection took place and the entire present collection was sown in June 1977, for agronomic evaluation and classification on the system of Gibbons et al. (1972). We hope to increase our germplasm accessions in the future and to initiate documentation procedures and computerized storage of data in conjunction with the IBPGR.

In the leafspot breeding program, we are cooperating with the University of Reading, United Kingdom, in the transfer of resistance to Cercospora arachidicola and Cercosporidium personatum from wild Arachis species (including A. sp. 10602, A. sp. 10017 and, A. sp. HL 410) to A. hypogaea. Hybrids at the triploid level were treated with colchicine at Reading to produce hexaploids, and vegetative cuttings from these hexaploids were rooted at ICRISAT and exposed to leafspots from infector rows of A. hypogaea. Apparently highly resistant material was selected for further screening and backcrossing to A. hypogaea during the 1977 monsoon season. Seed set in these hexaploids varied from zero to over 100 kernels per plant. A surprising number of seed was also harvested from the triploid material and this will be examined cytologically when planted.

Rust resistant material has been received from the USA (PI 298115 and PI 259747) and Puerto Rico (14 natural hybrids, FESR 1-14) and is being crossed with a wide range of high yielding but susceptible cultivars. A similar programme is underway with lines reported resistant to *A. flavus* (Mixon, 1976).

At present between 80 and 100 crosses are being made every day, and this will be continued throughout the year but it is expected that in the future these numbers can be considerably expanded. Other breeding programs, apart from increased yield per se, will be for drought tolerance and attempting to combine earliness with seed dormancy.

Pathology. Rapid progress has been made in virus studies over the last year. A virus causing economic losses in certain areas and known in India since 1966 (Reddy et al., 1968) as 'bud blight,' 'bud necrosis' or 'ring mottle' has been identified as tomato spotted wilt virus (TSWV) on symptomology, host range, physical properties and serology. A mechanical transmission technique has been perfected (Ghanekar and Nene, 1976) and rapid screening of germplasm for resistance is underway. Progress has been made on purifying and identifying other local viruses tentatively known as 'veinbanding,' 'chlorotic spot,' and 'phyllody.'

The main aim of the virology programme will be to survey the world distribution of important viruses and to precisely identify them by modern techniques in conjunction with other institutions. Of particular importance is to confirm the distribution pattern of groundnut rosette virus (GRV), peanut mottle virus (PMV), and peanut stunt virus (PSV) and to screen the germplasm for sources of resistance to PMV and PSV.

In the fungal program the immediate goals are to produce reliable testing methods for determining resistance to the major fungal pathogens. A simple and effective whole plant inoculation technique for rust, using suspensions of uredospores, has been successfully employed under laboratory conditions. The adaptation of this technique for field testing should present few problems. A detached leaf technique, also for rust, appears to be very promising (Subrahmanyam -unpublished data). Production of large numbers of spores of *Cercosporidium personatum* from culture has proved to be more difficult but progress is being achieved by using maltose agar with added thiamine and inositol. A routine testing laboratory for aflatoxin determinations will also need to be established.

It is important that an international network of testing stations is set up for not only evaluating breeding material resistant to the major pathogens, but also to monitor the appearance of physiological races of fungi which may develop or already occur.

Microbiology. The ICRISAT microbiology program covers all three legume crops and also the cereals. In peanuts, the aim is to produce more effective strains of rhizobia, to ameliorate factors limiting nitrogen fixation and to investigate the potential for enhancing fixation by selection and breeding. It has already been demonstrated that there are large differences between cultivars in their ability to form nodules at the ICRISAT farm. During the current season some 450 lines will be screened for nodule number and nitrogen fixing activity. This will be followed by a crossing and selection programme to produce plants with enhanced nitrogen fixing



ability. Future work will be concerned with the relationships between carbohydrate distribution in the plant and nitrogen fixation.

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Exploration for Arachis (Peanuts) in South America. W. C. Gregory, A. Krapovickas, D. J. Banks, Chas. E. Simpson and José Pietrarelli\*, North Carolina State University, Univ. de Ciencias Agrarias, Corrientes, Argentina, Oklahoma State University, Texas A & M University and Estacion Experimental, Manfredi, Argentina.

The International Board for Plant Genetic Resources (IBPGR), during 1976-77, supported the further collection of Arachis germplasm in South America. The work was divided into 3 phases. Phase One concentrated collection along the perimeter of the Gran Pantanal located in the western half of the Mato Grosso, south of Caceres. Phase Two began in N. W. Argentina near Salta and covered adjacent regions of southern Bolivia, N. to Santa Cruz, parts of the Beni, and east to the western edge of the Pantanal. Phase Three collections were made in the Rio Apa region of Paraguay, parts of nearby Mato Grosso, two localities in Sao Paulo State and in Corrientes Province, Argentina.

The immediate purpose of the collection was to obtain hitherto uncollected Arachis germplasm before the great land development process in S. America, especially in Brazil, eliminated these resources or altered the natural geographic and evolutionary patterns of the genus. A secondary purpose had to do with the promotion of at least two national germplasm centers; one in S. America, and one in the USA as a part of the international Arachis germplasm conservation under development at ICRISAT. A national center for Arachis has been designated at the Instituto Agronomico in Campinas, S. P., Brazil by the Centro Nacional de Recursos Geneticos (CENARGEN). A recommendation that the USA pursue a similar procedure has been made to the U. S. National Plant Genetics Resources Board. The idea is that the international center and the two national centers could serve under a common informational and exchange system for the world-wise preservation and distribution of the genetic resources of peanuts. Detailed reports of the collection work have been sent to IBPGR, FAO, Rome, Italy.

\* In each individual country local personnel joined in the work and were of inestimable help. Only members of the international team are listed here because of space limitation. The national teams are duly recognized in the detailed reports submitted to IBPGR.

Structural Features of Leafspot Tolerant and Susceptible Peanut Genotypes. Ruth Ann Taber, Donald H. Smith and Robert E. Pettit, Texas A & M University, College Station and Yoakum.

All peanut varieties of agronomic importance are susceptible to several foliar diseases. In order to reduce the cost of peanut production, resistant varieties are urgently needed. The purpose of this study was to determine structural features of tolerant and susceptible peanut leaflets with the ultimate goal of using this information to develop a foliar disease resistance screening program. The following genotypes were selected for examination: P. I. 269685, P. I. 109839, PDRS 76, PDRS 11, Tamnut 74, Florunner, 10038 and 10017. Leaflet sections were frozen in liquid nitrogen, freeze dried, mounted on Al stubs, coated with 24 carat gold in an argon atmosphere and examined with a Jeol-35 Scanning Electron Microscope operating at 15 or 25 KV. Additional leaflet sections were embedded in paraffin, sectioned with a rotary microtome, and stained with safranin and fast green prior to examination with a compound microscope. Wax deposits were observed on all adaxial surfaces of peanut leaflets, and the wax particles were structurally similar. The wax deposits appeared to be rod-shaped when viewed from above and as platelets from a side view. Platelets were oriented both horizontally and obliquely. Platelet distribution patterns were variable with some surface areas devoid of platelets. Abaxial surfaces were smooth. Stomatal distribution patterns were similar on leaves of all genotypes, but stomatal size varied among genotypes. Smaller stomatal sizes were associated with disease tolerance in P. I. 269685. Hyphae of the web blotch fungus grew immediately beneath the cuticle on the adaxial leaflet surface. Direct penetration of the adaxial leaflet surface by an unidentified fungus and Cercospora arachidicola was observed. Cercospora also penetrated the leaflets through stomata. Internal cellular details were similar among the genotypes which were examined. Differences in numbers of tannin cells were observed, and this may be useful in obtaining presumptive evidence of tolerance to foliar diseases.

Solar Drying of Peanuts in Georgia. J. M. Troeger and J. L. Butler, USDA-ARS, Tifton.

Three drying systems were compared: (1) Water was heated in a flat plate solar collector, stored and then used to heat the drying air through a heat exchanger. (2) Air was heated in a flat plate solar collector and used directly for drying with no storage. (3) Air was heated in a conventional system with liquified petroleum gas.

Solar energy provided 50 to 60% of the energy used to heat the drying air. With no storage, this percentage varied widely, depending on the solar radiation available. With energy storage, the percentage of solar energy was nearly the same for all tests.

Specific energy input (SEI) (KJ/gram water removed) for heating the drying air was significantly less for the solar heated air system. The solar heated air system, however, required about twice as much drying time. SEI varied widely among tests, depending on initial moisture, ambient conditions and the length of time for drying.

The solar heated air system had a maximum temperature of 44°C (111°F) for a few hours each day. The solar heated water system increased the temperature of the drying air as much as 22 C deg. (40 F deg). However milling quality, as measured by sound split kernels, was not significantly different among systems within tests.

Use of solar energy can result in significant reduction in the energy used to heat the drying air with no significant loss of milling quality.

#### ABSTRACT

An ice cream type peanut dessert and a beverage were developed and evaluated. Full fat roasted peanuts (ground) were utilized in both formulations. The peanuts served three main functions: (a) furnish the necessary fat system, (b) impart a desirable flavor component and (c) contribute to the nutritional quality of the product. The two products were formulated into a convenient complete dry mix so that the manufacturer of the finished product would only need to add water. After hydration, the dessert fluid mixture can be pasteurized, homogenized and frozen similar to ice cream. The pasteurized and homogenized beverage can be packaged and treated similar to refrigerated milk. Taste panel results indicated that both the beverage and ice cream dessert were highly acceptable.

Two types of dairy protein sources were used in the formulations. These were (a) non-fat dry milk solids and (b) a sodium caseinate-sweet whey blend adjusted to 36.6% protein. There appeared to be relatively little difference in the organoleptic quality of the two systems. They did require a slightly different adjustment in the freezing equipment to obtain the desired overrun.

#### INTRODUCTION

There is a need for increasing the utilization of peanuts. However, in order to use peanuts in sufficient quantities that will contribute significantly to the industry, they should be in foods that are consumed in rather large quantities. The use of peanuts in products that have only a limited sales volume will not influence the expansion of the peanut market.

One of the most promising areas available for expanding peanut usage appears to be in dairy ice cream and beverage type food products.

Peanuts have many attributes that are needed in dairy type food products. Their pleasing and compatible flavors can contribute much to flavor enhancement and nutritional quality needed in any food product. Peanuts can also contribute to the fat system which is very important in these products.

The use of powdered peanut butter from roasted peanuts is emphasized in this paper. However, full and partially defatted peanut flour made from unroasted peanuts have also been used successfully in our laboratory for these products. When defatted or partially defatted peanut flour is used, additional fat is needed for good quality ice cream dessert type products.

#### MATERIALS AND METHODS

Peanuts used in this study were from spin blanched stock of the Florunner variety. The blanched peanuts were roasted, treated with 0.02% Tertiary Butylhydroquinone (TBHQ) based on the oil content and then ground into peanut butter in a Urschel Comitrol Colloid Mill. The peanut butter was then made into a powder as shown in Table 1.

Table 1. Procedure for making powdered peanut butter

1. Blend four parts of peanut butter containing 0.01% TBHQ antioxidant and one part low density dairy whey, by weight, in a ribbon blender or other suitable type mixer.
2. Commminute the powdered blend of peanut butter and whey at a slow speed through a 0.75 inch screen or screenless pin mill to break up small particles.
3. Package in a suitable container.

In making the finished products the dry ingredients were blended together prior to hydration and pasteurization. The frozen imitation ice cream was made by the procedure normally used in making ice cream by commercial dairies. As an example, 37.8 pounds of dry mix were added to 62.2 pounds of tap water with agitation in a steam jacketed kettle. The mixture was pasteurized at 160°F for 30 minutes. The pasteurized product was then homogenized in a two stage homogenizer set at 500 psi on the second stage and 2500 psi on the first. The homogenized material was cooled to 40°F prior to freezing in a continuous commercial size scrape surface freezer set to give an 85-90% overrun. After soft freezing, the product was packaged and moved into a low temperature hardening room.

The beverages were made by blending together 20 pounds of dry mix shown in Tables 3, 4 and 5 with 80 pounds of water using continuous agitation. They were then pasteurized in a steam jacketed kettle at 145°F for 30 minutes and homogenized in a two stage homogenizer similar to that shown for ice cream. The homogenized beverage was cooled to 40°F, packaged and refrigerated similar to milk products in dairy cases.

#### RESULTS AND DISCUSSION

It should be emphasized that the formulations shown in Tables 2, 3, 4 and 5 are designed for use in commercial type dairy equipment. They should be considered as starting points to be modified to suit the individual processor's needs. The imitation ice cream formulation (Table 2) would not be suitable for use in home type freezers without making major formulation changes. Home freezers do not have the means for controlling the overrun like commercial units.

Table 2. Dry formulation for a frozen peanut dessert, (imitation ice cream).

Percent	Ingredients
42.33	Powdered peanut butter
26.45	Caseinate - whey blend (36.8% protein)*
29.63	Sucrose
0.40	Carboxymethyl cellulose (CMC)
0.40	Vanilla flavor (4 - fold)
0.27	Calcium carrageenan
0.26	Mono and diglycerides (40% mono)
0.26	Salt

\*NFD milk may be substituted for caseinate - whey blend.

Table 3. Dry formulation for a peanut chocolate beverage

Percent	Ingredients
39.6	Powdered peanut butter
26.0	Caseinate - whey blend (36.8% protein)*
25.0	Sucrose
5.0	Cocoa powder
1.5	Mono and diglycerides (40% mono)
1.2	Vanilla flavor (4 - fold)
1.0	Dipotassium phosphate
0.3	Calcium carrageenan
0.4	Salt

\*NFD milk may be substituted for caseinate - whey blend.

Table 4. Dry formulation for a peanut vanilla beverage

Percent	Ingredients
43.4	Powdered peanut butter
26.0	Caseinate - whey blend (36.8% protein)*
25.0	Sucrose
2.4	Vanilla flavor (4 - fold)
1.5	Mono and diglyceride (40% mono)
1.0	Dipotassium phosphate
0.4	Salt
0.3	Calcium carrageenan

\*NFD milk may be substituted for caseinate - whey blend.

Table 5. Dry formulation for a peanut strawberry beverage

Percent	Ingredients
42.49	Powdered peanut butter
26.00	Caseinate - whey blend (36.8% protein)*
25.00	Sucrose
3.30	Strawberry flavor
1.50	Mono and diglycerides (40% mono)
1.00	Dipotassium phosphate
0.40	Salt
0.30	Calcium carrageenan
0.01	Strawberry color

\*NFD milk may be substituted for caseinate - whey blend.

Powdered peanut butter used in the products reported in this paper has a relatively short shelflife unless an antioxidant such as TBHQ is used. Several methods for making powdered peanut butter were tried including the use of different types of dairy whey and caseinates. One type of dairy whey that worked well was a low density sweet whey. The addition of magnesium dioxide also seemed to work well, but it has certain obvious drawbacks such as its lack of nutritional contributions and Food and Drug Administration approval for this purpose.

As mentioned earlier, peanut powder made from full fat and partially defatted peanuts were used successfully in place of powdered peanut butter. However, in both instances it was necessary to wet grind the pasteurized blend through a colloid mill in order to eliminate the grainy texture associated with these products. In the case of the partially defatted peanut flour, additional fat was needed for making imitation ice cream in order to obtain the desired overrun and good mouth feel.

In almost all instances the taste panel preferred the samples made from lightly roasted peanuts in the quantities used compared to those with a dark or heavy roast. When smaller quantities of peanuts were used in the formulations, particularly in ice cream, it was necessary to use additional fat in order to get the proper overrun and mouth feel.



# AUTHOR INDEX

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APREA BOARD OF DIRECTORS MEETING

Grove Park Inn, Asheville, North Carolina

12 July 1977

The meeting was called to order by President Leland Tripp at 8:20 P.M. The following board members were present: Allen H. Allison, John Currier, J. W. Dickens, William Koretke, J. Frank McGill, Astor Perry, D. H. Smith and Leland Tripp. Ray O. Hammons was also present.

A. H. Allison moved that the minutes of the 1976 Board Meetings (13 and 15 July 1976) be approved. Seconded by J. W. Dickens. Motion passed.

J. W. Dickens moved that the remaining copies of PEANUTS-CULTURE AND USES be transferred from C. T. Wilson to A. H. Allison. Seconded by Astor Perry. Motion passed.

J. Frank McGill moved that E. Broadus Browne be appointed as Unofficial Administrative Advisor to the APREA Board of Directors. Seconded by A. H. Allison. Motion passed.

After some discussion about increasing the registration fee at the annual meeting, Astor Perry moved that this item of business be tabled until the meeting on 14 July 1977. Seconded by J. Frank McGill. Motion passed

Astor Perry moved that the meeting be adjourned. Seconded by J. Frank McGill. The meeting was adjourned at 9:15 P.M.

APREA BOARD OF DIRECTORS MEETING  
Grove Park Inn, Asheville, North Carolina  
14 July 1977

President Leland Tripp called the meeting to order at 8:10 P.M. The following board members were present: A. H. Allison, John Currier, J. W. Dickens, William Koretke, J. Frank McGill, Astor Perry, D. H. Smith and Leland Tripp. Others present were: E. Broadus Browne, W. G. Duncan, Ray O. Hammons, Ron Henning, A. J. Norden, Harold Pattee, Olin Smith, Joe S. Sugg, E. B. Whitty and Clyde T. Young.

J. Frank McGill presented the report of the Nominating Committee. A. H. Allison moved that the report be approved. Seconded by J. W. Dickens. Motion passed. The complete report is published as an Appendix in Volume 9 of APREA PROCEEDINGS.

A. J. Norden presented the report on the meeting site for 1978. A. H. Allison moved that we accept the recommendation of A. J. Norden, i.e., to meet at the Hilton Inn of Gainesville, Florida on 12, 13 and 14 July 1978. Seconded by Astor Perry. Motion passed.

Joe S. Sugg reported on the activities of the Publications and Editorial Committee. He suggested that the New Research Needs Committee be disbanded. Ray O. Hammons reported on PEANUT RESEARCH, and Harold Pattee reported on the status of PEANUT SCIENCE. J. W. Dickens moved that the reports of the Publications and Editorial Committee be accepted. Seconded by A. H. Allison. Motion passed. The complete report will be published as an Appendix in Volume 9 of APREA PROCEEDINGS.

Ron Henning presented the recommendations of the Finance Committee. The Finance Committee Report will be published as an Appendix in Volume 9 of APREA PROCEEDINGS.

J. W. Dickens moved that Item No. 1 in the Finance Committee Report be approved. Seconded by Astor Perry. Motion passed.

A. H. Allison moved that Item No. 2 in the Finance Committee Report be approved. Seconded by William Koretke. Motion passed.

William Koretke moved that Item No. 3 in the Finance Committee Report be approved. Seconded by J. Frank McGill. Motion passed.

William Koretke moved that Item No. 4 in the Finance Committee Report be accepted. Seconded by J. W. Dickens. Motion passed.

J. Frank McGill moved that Item No. 5 in the Finance Committee Report be approved. Seconded by J. W. Dickens. Motion passed.

A. H. Allison moved that Item No. 6 in the Finance Committee Report be approved. Seconded by J. Frank McGill. Motion passed.

J. Frank McGill moved that Item No. 7 in the Finance Committee Report be approved. Seconded by A. H. Allison. Motion passed.

A. H. Allison moved that Item No. 8 in the Finance Committee Report be approved. Seconded by J. Frank McGill. Motion passed.

A. H. Allison moved that Item No. 9 in the Finance Committee Report be approved. Seconded by J. Frank McGill. Motion passed.

The report of the Public Relations Committee was read by Leland Tripp. J. W. Dickens moved that the report be accepted. Seconded by A. H. Allison. Motion passed.

Clyde T. Young presented the report of the Peanut Quality Committee. Astor Perry moved that the report be accepted. Seconded by J. W. Dickens. Motion passed.

D. H. Smith presented the annual report of the Executive Secretary-Treasurer. William Koretke moved that the report be approved. Seconded by J. W. Dickens. Motion passed.

After some discussion on the question of increasing APREA membership dues, J. W. Dickens moved that APREA membership dues should not be increased at this time. Seconded by Astor Perry. Motion passed.

Astor Perry moved that the New Research Needs Committee, consisting of four subcommittees, be terminated. Seconded by William Koretke. Motion passed.

A. H. Allison moved that Astor Perry appoint an Ad Hoc Committee to study the feasibility of revising PEANUTS-CULTURE AND USES. Seconded by William Koretke. Motion passed.

President Leland Tripp adjourned the meeting at 10:50 P.M.

Minutes of the Regular Business Meeting of the  
AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION  
Grove Park Inn, Asheville, North Carolina, July 15, 1977

The meeting was called to order by President Leland Tripp at 8:05 A.M.

The invocation was given by Gene Sullivan.

Astor Perry, Chairman of the Program Committee, thanked the members of the Local Arrangements Committee and the Technical Program Committee for their help in planning a successful meeting.

The Finance Committee report was presented by Ron Henning, Chairman. The complete report will be published as an Appendix in Volume 9 of APREA PROCEEDINGS.

A report on the activities of the Publications and Editorial Committee was presented by Joe S. Sugg, Chairman. Ray Hammons presented a report on the status of PEANUT RESEARCH, and Harold Pattee reported on PEANUT SCIENCE. The complete report of the Publications and Editorial Committee will be published as an Appendix in Volume 9 of APREA PROCEEDINGS. John French moved that the reports of the Finance Committee and the Publications and Editorial Committee be approved. Seconded by Terry Coffelt. Motion passed.

Charles A. Dunn presented the report of the Public Relations Committee. Olin Smith moved that the report be accepted. Seconded by Robert Ory. Motion passed. The report will appear as an Appendix in Volume 9 of APREA PROCEEDINGS.

Clyde T. Young presented the report of the Peanut Quality Committee. Charles E. Simpson moved that the report be accepted. Seconded by Olin Smith. Motion passed. The report will be published as an Appendix in Volume 9 of APREA PROCEEDINGS.

President Tripp presented the Bailey Award to Johnny C. Wynne for his paper entitled "Use of Accelerated Generation Increase Programs in Peanut Breeding".

J. Frank McGill presented the report of the Nominating Committee. John French moved that the report be approved. Seconded by Joe S. Sugg. Motion passed. The report will appear as an Appendix in Volume 9 of APREA PROCEEDINGS.

President Tripp indicated that proposed changes in APREA By-Laws will be mailed to APREA members, and that all ballots should be returned promptly to D. H. Smith, Executive Secretary-Treasurer.

President Tripp delivered the Presidential Address. The complete text appears as an Appendix in Volume 9 of APREA PROCEEDINGS.

President Tripp presented the Past President's Award to J. Frank McGill.

The tenth annual meeting of APREA will be held at the Hilton Inn of Gainesville, Florida on 11, 12 and 13 July 1978.

J. Frank McGill moved that the President of APREA write a letter of appreciation to Dr. Coyt T. Wilson for his long and

dedicated service as Unofficial Administrative Advisor to the APREA Board of Directors. Seconded by Joe Sugg. Motion passed.

Dr. E. Broadus Browne was recognized as the new Unofficial Administrative Advisor.

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

## PRESIDENT'S REPORT

Leland D. Tripp

It has been an honor and a privilege for me to serve as your President for the last year.

I suppose this is a time when you are to report progress made in the Association. Sometimes progress is hard to measure. I feel that certainly the Association has made progress, we are still growing and are operating in an efficient manner. However, while counting our blessings we should also be looking to the future. I have served this group as Executive Secretary-Treasurer, as President-elect and as President. I have enjoyed it all, but while in these positions I have made some observations that I would like to relate to you.

If we go back to our parent organization, the Peanut Improvement Working Group and look at the minutes, we see many of the same names that occurred in the minutes of the earlier years of APREA. This was good. Now when we look at recent minutes of APREA, we see many of the same names appearing either as serving on the Board of Directors or in various committees. I feel this is not good for the organization. We need new ideas, new blood, and new leadership. It is very easy to go to members with a proven record and ask them to serve again. But I would propose that we give new members an opportunity to serve. This could come about by new members asking to serve in various capacities. At the same time, it is going to be necessary for the old members to step aside and make way for the younger members. I firmly believe that if new blood is not infused into leadership positions, we will see a slow demise of the organization. I am convinced that only a few of our members do not have a corner on the abilities necessary to formulate and steer this organization.

Secondly, I feel that APREA has progressed to the point that it needs a permanent Executive Secretary-Treasurer at least on a part-time basis. We now have in excess of 500 members. The volume of correspondence is increasing at a rapid rate and the time required to properly expedite business for APREA is of such a volume to approach full-time magnitude. Furthermore, Don Smith, our present Secretary-Treasurer, has accepted this position for the last year. This means that we must spend time in trying to find a member that is willing to accept these responsibilities. He will in turn be kept busy trying to answer letters that were originally sent to me at Oklahoma State University, then to Don, and finally to himself. What I'm saying is we desperately need a permanent repository for extra copies of our various publications, as well as all of the documents we are accumulating. I hope I see this problem resolved as soon as possible.

This past year has been a pleasurable experience and as my last official act in this capacity, I would like to present your President for the 1977-78 year--a person who has never said no to APREA. I ask that you give him the same support and cooperation you have shown me for the past year - Astor Perry.

PROGRAM  
for the  
Ninth Annual Meeting  
of the  
American Peanut Research and Education  
Association, Inc.

Tuesday, July 12

- 1:00 - 5:00 Registration - Lobby
- 8:00 Board meeting - Grotto Room

Wednesday, July 13

- 8:00 - 5:00 Registration - Lobby

## GENERAL SESSION - Leland Tripp, presiding - Ballroom

- 8:00 President's Welcome - Leland Tripp
- 8:15 Some Dimensions of Research and Educational Programs in Peanuts  
- J. E. Legates
- 8:45 A Manufacturer Views the Current Peanut Situation - Robert P.  
Gardner

## BREAK

- 9:55 - 11:45 Two concurrent sessions

## SESSION 1. PLANT PATHOLOGY AND NEMATOLOGY - Green Room

- 9:55 Opening remarks - D. F. Wadsworth, presiding
- 10:00 Efficacy of sulfur formulations as tank mixes with fungicides  
for disease control in peanuts - P. A. Backman and J. M. Hammond
- 10:15 Problems to evaluating resistance of peanut to Cercospora arach-  
idicola - M. K. Beute and N. Hassan
- 10:30 Screening for resistance of peanut genotypes to Cercospora leaf-  
spot by a detached leaf technique - H. A. Melouk and D. J. Banks
- 10:45 The use of aerial infrared photography to determine severity of  
sclerotinia blight of peanuts - D. M. Porter and N. L. Powell
- 11:00 Peanut peg strength and anatomy as related to disease resistance  
- R. J. Thomas, R. A. Taber, B. L. Jones, and R. E. Pettit
- 11:15 Effectiveness of nematicides in combination with the fungicide  
carboxin for control of root-knot nematodes and southern blight  
of Florunner peanuts - R. Rodriguez-Kabana, E. G. Ingram, and  
P. S. King
- 11:30 Spray-disk applications of DBCP for control of root-knot nema-  
todes in Florunner peanuts - R. Rodriguez-Kabana, P. S. King and  
E. G. Ingram

## SESSION 2. PROCESSING AND UTILIZATION - Laurel Room

- 9:55 Opening remarks - K. Rhee, presiding



- 10:00 Air flotation velocities and physical properties of peanuts and foreign materials - P. D. Blankenship and E. J. Williams
- 10:15 Observed effects of chemicultural practices on the processing and product quality of peanuts - S. R. Cecil and E. W. Hauser
- 10:30 Probability distributions of peanut seed size - J. I. Davidson, P. D. Blankenship, and V. Chew
- 10:45 The effect of linoleic acid, phospholipid and tocopherol concentration of the autooxidative stability of peanut oil - J. Hokes, R. E. Worthington, and R. O. Hammons
- 11:00 A method for analysis of interactions between lipid peroxides and amino acids as related to peanut quality - J. C. Kuck, A. J. St. Angelo, and R. L. Ory.
- 11:15 Chemical induction of urease in Arachis hypogaea - T. A. Lindheimer and J. L. Heinis
- 11:30 Changes in tannin-like compounds of peanut fruit parts during maturation - T. H. Sanders

#### POSTER SESSION - Sunset Room

- 12:45 Detection by remote sensing of Cylindro-cladium black rot in peanut fields during 1974 and 1976 - J. S. Lewis, N. L. Powell, K. H. Garren, G. J. Griffin, and P. R. Cobb

1:10 - 5:00 Two concurrent sessions and related discussion groups

#### SESSION 1. BREEDING - Green Room

- 1:25 Opening remarks - A. Norden, presiding
- 1:30 A colchicine method which achieves fertility in interspecific peanut hybrids - D. J. Banks
- 1:45 Evidence for epistasis in peanuts - T. G. Isleib
- 2:00 Organization of peanut documentation. 1. Preliminary list of terms and a world register of cultivars - R. J. Varnell
- 2:15 Reaction of 45 peanut (Arachis hypogaea L.) lines to 5 fungal and insect pathogens - T. A. Coffelt, D. M. Porter, M. K. Beute, J. C. Smith, K. H. Garren, and J. C. Wynne
- 2:30 Cercospora resistance of interspecific Arachis hybrids - J. P. Moss
- 2:45 Arginine maturity index: Relationship with other traits in peanuts - R. O. Hammons, P. Y. P. Tai, and C. T. Young
- 3:00 Genotype-environment interaction effects in peanut variety evaluations - P. Y. P. Tai and R. O. Hammons
- 3:15 BREAK
- 3:45 Discussion Group on Breeding

#### SESSION 2. PHYSIOLOGY AND SEED - Laurel Room

- 1:10 Opening remarks - Ron Henning, presiding
- 1:15 Genotypic differences in rate and duration of peanut fruit growth - K. J. Boote

- 1:30 The partitioning factor and peanut yield - W. G. Duncan, D. E. McCloud, and R. L. McGraw
- 1:45 Cell and tissue culture of Arachis hypogaea - J. L. Heinis and A. L. Guy
- 2:00 Growing season and location effects on seedling vigor and ethylene production by seeds of three peanut varieties - D. L. Ketting, C. E. Simpson, and O. D. Smith
- 2:15 Environmental variations of fruit and seed characters in 5 peanut varieties - B. Mazzani
- 2:30 Peanut seed production management - D. E. McLean Lawson and G. A. Sullivan
- 2:45 Electrophoretic analysis of seed protein degradation during germination of the peanut seed - C. A. Lindheimer and C. F. Savoy
- 3:00 Comparative performance of peanut seeds under laboratory and field conditions - G. A. Sullivan and J. C. Wynne
- 3:15 BREAK
- 3:45 Discussion Group

POSTER SESSION - Sunset Room

- 4:30 Adsorption of direct dye on carbon from peanut hulls - A. W. Stelson, W. R. Ernst, and P. Bagherzadeh
- 7:30 - 9:00 Committee meetings (committee meetings are open to all APREA members)
- Finance - Ron Henning, Chairman - Grotto Room
- Peanut Quality - Clyde Young, Chairman - Sunset Room
- Public Relations - J. R. Bone, Chairman - Green Room
- Publications & Editorial - Joe Sugg, Chairman - Pine Room

Thursday, July 14

- 7:55 - 11:30 Two concurrent sessions and related discussion groups

SESSION 1. PLANT PATHOLOGY AND NEMATOTOLOGY - Green Room

- 7:55 Opening remarks - R. Rodriguez-Kabana, presiding
- 8:00 Monitoring cylindrocladium black rot development in two peanut fields by remote sensing - K. H. Garren, N. L. Powell, G. J. Griffin, and P. R. Cobb
- 8:15 Pathogen variability of Cylindrocladium crotalariae in response to resistance host plant selection pressure - B. A. Hadley, M. K. Beute, and P. M. Phipps
- 8:30 Relationship of inoculum density and time to incidence of cylindrocladium black rot of peanut in naturally-infested fields - P. M. Phipps, M. K. Beute, and B. A. Hadley
- 8:45 A method for delivery of liquid fungicides for post emergence control of soil-borne diseases - J. M. Hammond, P. A. Backman, and R. Rodriguez-Kabana

- 9:00 Effect of selected land preparation practices on peanut yield, grade, and incidence of Sclerotium rolfsii - 1975-76 - E. J. Williams
- 9:15 Effect of two strains of peanut mottle virus on protein total amino acids and free amino acids of six peanut lines - A. R. Hovis, C. T. Young, and C. W. Kuhn
- 9:30 Spectral signature of peanut plants infected with Cylindrocium crotalariae - N. L. Powell and D. M. Porter
- 9:45 BREAK
- 10:15 Discussion

#### SESSION 2. PROCESSING AND UTILIZATION - Laurel Room

- 7:55 Opening remarks - J. Ayres, presiding
- 8:00 Sensory and nutritional quality of protein and fiber fortified corn muffins - E. M. Ahmed and P. E. Araujo
- 8:15 The effect of curing conditions on flavor quality and volatiles profiles of peanuts - M. L. Brown, J. I. Wadsworth, and H. P. Dupuy
- 8:30 Evaluation of five white testa peanuts for potential use as food supplements - E. J. Conkerton, E. D. Blanchet, R. L. Ory, and R. O. Hammons
- 8:45 Some solubility properties of peanut (Arachis hypogaea L.) seed protein and the individual components - M. Felder and C. F. Savoy
- 9:00 Effect of blending plant materials on protein quality. I. Peanut and citrus seed flours - R. L. Ory, E. J. Conkerton, and A. A. Sekul
- 9:15 Effects of packaging material, atmosphere, moisture, temperature and time on peanut quality and germination - J. L. Pearson, W. O. Slay, and C. E. Holaday
- 9:30 Direct extraction process for the production of a white de-fatted, food-grade bland peanut flour. II. Heat and moisture treatment - J. Pominski, H. M. Pearce, Jr., and J. J. Spadaro
- 9:45 BREAK
- 10:15 Discussion group

#### POSTER SESSION - Sunset Room

- 12:15 The effect of phase of development on the sensitivity of groundnuts to environmental conditions - J. H. Williams and G. L. Hildebrand
- 12:55 - 4:30 Two concurrent sessions and related discussion groups

#### SESSION 1. ENTOMOLOGY AND GENERAL - Green Room

- 12:55 Opening remarks - J. French, presiding
- 1:00 Control of an insect complex with a resistance variety, 'NC6' - W. V. Campbell, J. C. Wynne, and D. A. Emery

- 1:15 Populations of pests and their natural enemies in Florida peanuts - J. R. Mangold, D. A. Nickle, and S. L. Poe
- 1:30 Problems affecting peanut pest management in Texas - D. S. Moore and C. E. Hoelscher
- 1:45 Insecticidal control of southern corn rootworm larvae in Florunner and Tifrun peanuts in Georgia - L. W. Morgan and J. W. Todd
- 2:00 Effects of controlled mechanical defoliations on yield, quality, and quantity of Florunner peanuts in north-central Florida - D. A. Nickle
- 2:15 IR-4 label registrations for peanuts - C. E. Hoelscher
- 2:30 Influence of row spacing on competitiveness and yield of peanuts - G. A. Buchanan and E. W. Hauser
- 2:45 BREAK
- 3:15 Discussion group

#### SESSION 2. AGRONOMY - Laurel Room

- 12:55 Opening remarks - B. Whitty, presiding
- 1:00 Effect of harvest date on dry matter, arginine maturity index (AMI) and yield of eight varieties of peanuts - C. T. Young and R. H. Brown
- 1:15 The influence of soil groups and growing seasons on market quality of Valencia peanuts - D. C. H. Hsi and M. D. Finkner
- 1:30 Tracking the elemental content of peanut leaves from plants under intensive irrigated culture - J. B. Jones, Jr., J. R. Stansell, and J. E. Pallas, Jr.
- 1:45 Effect of age of bahiagrass sod on succeeding peanut crops - A. J. Norden, V. G. Perry, F. G. Martin, and J. NeSmith
- 2:00 Plant soil water relations of Florunner peanuts under droughty conditions - J. E. Pallas, Jr., J. R. Stansell, and T. J. Koske
- 2:15 Response to Florunner (*Arachis hypogaea* L.) peanuts to sources of limestone and rates of magnesium - M. E. Walker and B. G. Mullinix
- 2:30 Effect of water stress at different stages of growth on peanut yields - C. K. Martin and F. R. Cox
- 2:45 BREAK
- 3:15 Discussion group on Agronomy

#### POSTER SESSION - Sunset Room

- 4:30 Survey of Sclerotinia blight disease losses in peanut fields by remote sensing - P. R. Cobb, N. L. Powell, and D. M. Porter
- 8:00 Board meeting - Grotto Room

#### Friday, July 15

- 7:15 Breakfast - Ballroom
- 8:00 President's Address and Business Meeting

9:30 BREAK

GENERAL SESSION - Laurel Room

9:55 Opening remarks - F. McGill, presiding

10:00 Effect of host plant, rhizobial strain, temperature, and the time of inoculation on nitrogen fixation in peanuts - T. Schneeweis, J. C. Wynne, G. H. Elkan, and T. G. Isleib

10:15 An international approach to peanut improvement - R. W. Gibbons

10:30 Exploration of Arachis (peanuts) in South America - W. C. Gregory, A. Krapovickas, D. J. Banks, C. E. Simpson, and J. Pietra-relli

10:45 Structural features of leafspot tolerant and susceptible peanut genotypes - R. A. Taber, D. H. Smith, and R. E. Pettit

11:00 Solar drying of peanuts in Georgia - J. M. Troeger and J. L. Butler

11:15 Frozen dessert and beverage from roasted peanuts - M. W. Hoover

11:30 Adjourn

FINANCE COMMITTEE REPORT

R. J. Henning, Chairman  
Charles Simpson  
Wayne Eaves  
Kelly Sears

The finance committee met at 7:30 P.M. July 13, 1977. A limited audit of the financial statements submitted by the Secretary-Treasurer and Peanut Science editor was conducted, the Bailey Award Fund was examined, and all were found to be in order. A copy of the Peanut Science financial statement is attached to this report, and is reflected in the Secretary-Treasurer's report.

The following recommendations were submitted by the Finance Committee and adopted by the Board of Directors and at the general business meeting:

1. The the Secretary-Treasurer be authorized to place money in excess of operational requirements in certificate deposits and/or pass book savings in such amounts and duration as deemed appropriate by him to earn maximum interest.
2. That the restriction be removed or changed to allow the Secretary-Treasurer to issue checks greater than \$3,000.00 in amount, provided the request is within the budget and properly documented.
3. That \$4.00 per membership be allocated to Peanut Science.
4. That page charges for Peanut Science articles be increased to \$60.00 per page for the first four pages to cover increased printing costs.
5. That secretarial services to the Peanut Science editor be called editorial assistant to more properly reflect duties and responsibilities. Additionally, the position be paid a set fee of \$700.00 per issue.
6. That an allocation for secretarial assistance to the Secretary-Treasurer be increased to \$1,500.00 and expenses incurred at the Annual APREA meeting be reimbursed.
7. That the financial statement submitted by the Secretary-Treasurer be accepted.
8. That the proposed budget for July 1, 1977 to June 30, 1978 be adopted.

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The Finance Committee commends the Secretary-Treasurer for continued outstanding performance in conducting the business affairs of APREA.

# AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION

## Financial Statement

July 1, 1976 to June 30, 1977

### ASSETS AND INCOME

#### I

##### Item

A. Balance - July 1, 1976	\$16,717.63
B. Membership & Registration (Annual Meeting)	12,574.69
C. Proceedings & Reprint Sales	795.30
D. Special Contributions	-
E. The Peanut	1,713.69
F. Peanut Science Page Charges & Reprints	- 4,946.48
G. Institutional Membership	655.00
H. Differential Postage Assessment-foreign members	487.42
Total	<u>\$37,890.21</u>

### LIABILITIES AND EXPENDITURES

#### II

##### Item

1. Proceedings - Printing & Reprints	\$ 4,062.62
2. Annual Meeting - Printing, Catering & Misc.	2,105.18
3. Secretarial	1,192.50
4. Postage	700.00
5. Office Supplies	242.96
6. Position Bond for \$5,000 (Exec.Sec.Treas.)	-
7. Travel - President	-
8. Travel - Executive Sec.Treas.	-
9. Registration - State of Georgia	5.00
10. Miscellaneous	107.82
11. Peanut Science	7,604.84
12. The Peanut	100.00
13. Bank Charges	28.00
14. Peanut Research	2,262.61
Total	<u>\$18,411.53</u>

## APREA

## BUDGET

July 1, 1977 - June 30, 1978

ASSETS AND INCOME

Balance	\$19,478.68
Membership and registration	4,000.00
Proceeding and reprint charges	750.00
Peanut Science page and reprint charge	14,400.00
<u>The Peanut - 322 copies @ \$11.33</u>	<u>3,648.26</u>
 TOTAL	 <u>\$42,276.94</u>

EXPENDITURES

Peanut research	\$ 1,250.00
Proceedings, Printing, Etc.	4,000.00
Annual meeting	1,500.00
Secretarial services	1,500.00
Postage	1,000.00
Office supplies	500.00
Travel - President	400.00
Secretary-Treasurer	400.00
Registration (State of Georgia)	5.00
Peanut Science	16,000.00
Miscellaneous	<u>100.00</u>
 TOTAL	 \$26,555.00
Reserve	\$15,721.94
TOTAL	\$42,276.94



REPORT OF THE PUBLICATION AND EDITORIAL COMMITTEE

By

Joe S. Sugg, Chairman

The Publication and Editorial Committee continued to function through the Sub-Committee Chairmen and its committee members.

The APREA Peanut Research was published by the co-editors, Ray O. Hammons and J. E. Cheek, and a report of their activities is attached hereto.

The publication, Peanut Science, was continued during the year and the transition from the former chairman, Preston Reid, to the new chairman, Harold Pattee, went off smoothly with the publications being made in a timely and proper manner. The report of Editor Harold Pattee is attached hereto. It should be noted in connection with the recommended increase in page cost that Editor Pattee is constantly on the alert checking with various publishing concerns in order that the lowest maximum cost for publishing Peanut Science might prevail.

The sales of the book, The Peanut - Culture and Uses, were reported by Astor Perry. The available copies are in the hands of the Secretary, Don Smith, and people desiring copies of the book may procure them from Don. The question of revising the book was discussed and postponed, pending further developments.

Respectfully submitted,

Joe S. Sugg, Chairman

# APREA PEANUT RESEARCH

Report of Co-editors

RAY O. HAMMONS and J. E. CHEEK

to the

American Peanut Research and Education Association, Inc.,  
annual meeting, Asheville, NC, July 1977

Six issues of *APREA PEANUT RESEARCH* (volume 14, numbers 1 through 6, issues 56-61) were compiled, edited, published and mailed to the membership during the fiscal year, July 1, 1976 - June 30, 1977. The combined newsletter totaled 39 pages. Circulation was to about 516 individual members or institutions in the United States and abroad.

*PEANUT RESEARCH* is sent to libraries at all land-grant institutions in the southern United States, to the USDA National Agricultural Library, to various abstracting services and to several agricultural periodicals.

All informational issuances from APREA officers were published. 229 selected references and 27 theses or dissertations were documented. *PEANUT RESEARCH* continued to keep APREA membership up-to-date on the spread of Rust.

The technical program brochure was combined with Volume 14, No. 6 of *PEANUT RESEARCH* to carry all information re the 9th annual meeting to the membership in one mailing with a minimum of expense.

The editors invite APREA members to send us information of general interest, personnel changes, achievements, new funding, and interpretive summaries of major publications. Address: *APREA PEANUT RESEARCH*, Box 748, Tifton, GA 31794.

# REPORT OF PEANUT SCIENCE

by

Harold Pattee, Editor

## General Comments:

Three new Associate Editors were appointed during the year to vacancies which occurred on the Editorial Board. Those appointed were: Thurman E. Boswell, Kay McWatters and Khee-Choon Rhee. A Guidelines to the Authors for PEANUT SCIENCE has been prepared and after approval will be published in the Fall 1977 Issue of PEANUT SCIENCE. It will be effective upon publication.

## Financial Statement, July 1, 1976 - June 30, 1977:

Balance, July 1, 1976	\$	123.62
Received from APREA		7,604.84
<u>Expenditures</u>		
Printing		3,682.84
Postage		
Domestic		201.58
Foreign		152.87
Office Expense		391.56
Post Office Box and Bulk Mailing Permit		97.00
Salary, Secretary		540.51
Travel and Miscellaneous		<u>225.04</u>
Total	\$	5,291.40
Balance on Hand		2,437.06
Total Expense	\$	7,728.46
Budget	\$	7,500.00
Income from Peanut Science	\$	4,946.48
Outstanding Invoice for Page Charges		180.00
Budget	\$	5,000.00

Manuscripts Submitted July 1, 1976 - June 30, 1977 25

Fall 1976 Issue - 10 Articles - 46 pages printed

Spring 1977 Issue - 10 Articles - approximately 55 pages printed

Fall 1977 Issue - 4 Articles accepted - 5 Articles returned to authors for revision

Printing cost, per page, including free reprints \$ 51.45

Average length of article 5.0 pages

Total cost per page \$115.03

Proposed Budget 1977-78:

Number of Issues 3 (Spring 77; Fall 77; Spring 78)

Estimates

Pages 150  
Cost per page \$57.00  
Reprint cost per page/100 \$2.75  
1,000 copies, average 5 pages per issue

Printing Costs \$ 12,675.  
Editorial Assistant 1,700.  
Office Supplies 250.  
Postage  
    Domestic 600.  
    Foreign 527.

Total \$ 15,750.

INCOME - Reprint Charges \$ 4,500.  
Page Charges 9,900.  
APREA Member Subscriptions  
    (450 x \$2.00) 900.  
Foreign Mailing Fees 330.  
Library Subscriptions (31) 372.  
Total \$ 16,002.

Recommendations:

Page charges for the first four pages be increased to \$60.00 per page to cover increasing printing costs.

The secretarial services to the Editor be called Editorial Assistant to more properly reflect duties and responsibilities. The position be paid a set fee to cover all time and travel expenses. Recommended fee \$700.00 per issue (Fee for Spring 1977 issue to be published in July - \$300.00).

## REPORT OF THE PUBLIC RELATIONS COMMITTEE

During 1977 the Public Relations Committee promoted the activities of the American Peanut Research and Education Association through mailings to and personal contact with perspective members and interest groups. News media contacts were maintained and invitations extended for media representatives to attend our annual meeting.

Respectfully submitted,

J. R. Bone, Chairman  
T. E. Boswell  
Charles Bruce  
Charles Dunn  
Robert Pender  
Ross Wilson

## RESOLUTION

Be it resolved, that the American Peanut Research and Education Association does with upmost regret hereby recognize the passing of Dr. Karl M. Cater. Widely known and respected for his efforts at Texas A & M University in advancing technology in use of oil seed protein for human consumption, Dr. Cater was an outstanding servant of his country and fellow man. Long a member of the APREA, having served since 1973 as associate editor of Peanut Science, Dr. Cater's contribution to APREA and fellowship with its members will be deeply missed.

## RESOLUTION

Be it resolved, the death of Dr. Ralph S. Matlock is recognized by the American Peanut Research and Education Association as a profound loss to our association and Southwestern Agriculture; our deepest sympathy to Mrs. Matlock and family. Serving in a capacity as Head, Agronomy Department, Oklahoma State University, at the time of his passing, Dr. Matlock's guiding hand will long be missed by those attending Oklahoma State University and his many friends. A charter member of APREA, Dr. Matlock's leadership and participation in our activities will be remembered by the association and his many friends.

## EXHIBIT VI

### REPORT OF THE 1976-1977 PEANUT QUALITY COMMITTEE

Last year during the 1976 APREA Meeting, plans were formulated to accumulate the testing methods and procedures that are used for peanuts and peanut products. Over 30 methods were received. A meeting was held on May 16, 1977 in Raleigh, North Carolina to organize these materials and decide upon the format. This May meeting was attended by E. M. Ahmed, Russ Baxley, W. M. Birdsong, Jr., Charles E. Holaday, W. A. Parker, L. H. Wiederman, James Young, and Clyde Young.

How to implement this very important undertaking was planned at the 1977 APREA Peanut Quality Committee Meeting and was attended by E. M. Ahmed, Russ Baxley, W. M. Birdsong, Jr., Paul Blankenship, Sam Cecil, James Davidson, Harold Dupuy, David Hsi, Jack Pearson, and Clyde Young. Details and request for participation of other APREA members will be presented in a future issue of Peanut Research.

Respectfully submitted,

Clyde T. Young (Chairman)

## PRESENTATION OF THIRD ANNUAL

## BAILEY AWARD

9th Annual Meeting of the  
American Peanut Research & Education Assn.

Grove Park Inn, Asheville, North Carolina  
July 13-15, 1977

by

Leland D. Tripp, President - APREA  
Business Session - July 15, 1977

The Bailey Award was established in honor of Wallace K. Bailey, a peanut scientist and one of the small group of people interested in furthering peanut research and education who formed the Peanut Improvement Working Group and later the American Peanut Research and Education Association.

Each paper presented at the 1976 meeting in Dallas was considered for the Bailey Award. They were judged for merit, originality, clarity and their contribution to peanut scientific knowledge. Papers based on oral presentation were obtained from the authors for evaluation by the awards committee.

It is now my privilege as President of APREA to present the Bailey Award to Johnny Wynne for his excellent paper entitled "Use of Accelerated Generation Increase Programs in Peanut Breeding". Dr. Wynne is in the Crop Science Department at North Carolina State University, Raleigh.

## BAILEY AWARD COMMITTEE

Coyt Wilson	(1977)	Pete Bloome	(1979)
Clyde Young	(1978)	Morris Porter	(1980)

## NEW FOOD USE DEVELOPMENT GROUP

Maurice W. Hoover, Chairman  
Food Science Department  
North Carolina State University  
Raleigh, North Carolina

1. Investigate ways to increase the use of defatted peanut flours prepared from white skin peanuts.
2. Study ways to increase the uses of partially hydrolyzed peanut protein prepared by enzymatic hydrolysis in such things as soups, sauces, and dry prepared mixes.
3. A large proportion of edible peanut products depend heavily upon the characteristic and unique roasted flavor. Yet the nature and control of desirable flavor is not well understood. Further research could elucidate the flavor components and also the precursors that give rise to these components. Flavor development other than by the traditional roasting of the kernels should be explored i.e. with meal, flour, isolate, etc.
4. More detailed characterization of the skins is needed since substantial quantities are available from blanching operations. Analyses of the skins should include something on the nature and recovery of the main pigments.
5. More information may be needed on the effect of treating the kernels (following or during skin removal) with hot water. Sealing off the kernel surface changes the oxygen permeability and possibly the enzyme activity. The effects of such treatments on enhancing stability and quality may need to be understood more fully.
6. More definitive comparisons of peanut protein characteristics with those from soybean and other sources are needed. Such comparisons should include details of variability, composition, and costs.
7. Factors influencing the functional behavior of peanut flours and meals in food systems requires increased research attention. Modification of meals and flours by chemical and physical means and the changes in protein solubility, foaming capacity, emulsion capacity and stability, viscosity, and organoleptic characteristics need to be studied.
8. Development and promotion of peanut products in breads, meats, beverages, convenience and snack foods should be undertaken.
9. Nutritional value of peanuts and peanut components requires attention. Special peanut components may be present but yet not discovered which have nutritional or medicinal significance.
10. Investigate ways for increasing the use of cold pressed peanut oil.
11. Some claims have been made for peanuts in the medical field. This should be studied further.
12. The use of peanut oil in the cosmetic area should be investigated.
13. Peanut chips that taste more like roasted peanuts should be developed.
14. Fermentation studies with peanuts and peanut flour should be made. New and improved food products should be developed by fermentation.
15. New uses of peanuts and peanut flour in combination with dairy products should be explored.



BY-LAWS  
of  
AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION, INC.

Article I. Name

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

Article II. Purpose

Section 1. The purpose of the Association shall be to provide a continuing means for the exchange of information, cooperative planning, and periodic review of all phases of peanut research and extension being carried on by State Research Divisions, Cooperative State Extension Services, the United States Department of Agriculture, the Commercial Peanut Industry and supporting service businesses, and to conduct said Association in such manner as to comply with Section 501 (c)(3) of the United States Internal Revenue Code of 1954 and Acts amendatory thereto. Upon the dissolution of the Association, all of the assets of the Association shall be transferred to an organization whose purposes are similar to those of this Association or to such other charitable or educational organization exempt from Federal income tax under the provisions of Section 501 (c)(3) of the United States Internal Revenue Code of 1954 and Acts amendatory thereto as the directors may appoint provided that no director, officer or member of this organization may in any way benefit from the proceeds of dissolution.

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. Organizational memberships: Industrial or educational groups that pay dues as fixed by the Board of Directors. Organizational members may designate one representative who shall have individual member rights.
- c. 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 Association financially to an extent beyond minimum requirements as set forth in Section 1b, 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.
- d. Student memberships: Full-time students that 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 membership.

Section 2. Any member, participant, or representative duly serving on the Board of Directors or a Committee of this Association 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 Association.

#### 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 four classes of membership shall be:

- a. Individual memberships: \$5.00
- b. Organizational memberships: \$25.00
- c. Sustaining memberships: \$100.00
- d. Student memberships: \$2.00

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

Section 3. A \$5.00 registration fee will be assessed at all regular meetings of this Association. 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 Association 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 memberships.

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 Association. Except for certain papers specifically invited by the Association president or program chairman with the approval of the president, at least one author of any paper presented shall be a member of this Association.

Section 4. Special meetings or projects by a portion of the Association membership, either alone or jointly with other groups, must be approved by the Board of Directors. Any request for the Association to underwrite obligations in connection with a proposed special meeting or project shall be submitted to the Board of Directors, who may obligate the Association 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 association reaches 200 voting members, 20% of the voting members of this Association 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

Section 2. The president and president-elect shall serve from the close of the annual general meeting of this Association 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 (previously PIWG chairman) shall serve as president until the Board of Directors can make such appointment. The president shall serve without monetary compensation.

Section 3. The officers and directors shall be elected by the members in attendance at the annual general meeting from nominees selected by the Nominating Committee or members nominated for this office from the floor. The president-elect shall serve without monetary compensation.

Section 4. 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.

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

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

Section 7. (a) The executive secretary-treasurer shall countersign all deeds, leases and conveyances executed by the Association and affix the seal of the Association 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 Association, 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 Association, 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 Association activities.

## Article VIII. Board of Directors

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

- a. The president
- b. The most immediate past president able to serve
- c. The president-elect (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 or full-time salary stipulated by the Board of Directors in consultation with 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 Association 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 Association when necessary and, as such, shall administer Association properties 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 Association 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 Association 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 Association and for promoting sound fiscal policies within the Association. They shall direct the audit of all financial records of the Association 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 Association 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 Association 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 Association, 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 peanut - (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 Association in the following areas:

- (1) Membership: Development and implementation of mechanisms to create interest in the Association and increase its membership.
- (2) Cooperation: Advise the Board of Directors relative to the extent and type of cooperation and/or affiliation this Association should pursue and/or support with other organizations.
- (3) Necrology: Proper recognition of deceased members.
- (4) Resolutions: Proper recognition of special services provided by members and friends of the Association.

#### Article X. Divisions

Section 1. A Division within the Association 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 Association, 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 Association.

## Article XI. Amendments

- Section 1. Proposed amendments to these By-laws must be submitted to the Board of Directors whose recommendation will then be considered at the next regular annual meeting of the Association except as provided in Section 2.
- Section 2. Amendments shall be adopted only when a majority of those holding individual membership rights vote and then only by the vote of two-thirds of those voting. If a majority of the individual members are not in attendance at the first regular annual meeting following announcement of proposed amendments, the executive secretary-treasurer shall mail to all such members of the Association ballots concerning such amendments. Members shall be allowed thirty days to return mailed ballots after which the vote of those returning such ballots shall be binding subject to the regulations above. Failure of a majority of the members to return their ballots within the allotted time denotes rejection of the proposed amendment.
- Section 3. Proposed amendments slated for adoption or rejection may be presented in writing to the Board of Directors which shall discuss the proposal and, at its choice, present the proposal to the annual meeting for adoption or rejection. Proposed amendments not presented to the Board of Directors must be brought to the attention of members either by letter or through Association publications at least thirty days prior to consideration for final adoption.

Adopted at the Annual Business Meeting  
of the American Peanut Research and  
Education Association, Inc., July 18,  
1972, Albany, Georgia; and amended at  
the annual meeting held in Dothan,  
Alabama, July 18, 1975.

MEMBERSHIP LIST  
AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION

SUSTAINING MEMBERS

Alabama Peanut Producers Assn.  
James Earl Mobley  
PO Box 1282  
Dothan, AL 36301

Anderson's Peanuts  
James B. Anderson  
PO Box 619  
Opp, AL 36467

Best Foods Division  
CPC International  
J. Akerboom  
PO Box 1534  
Union, NJ 07083

The Blakely Peanut Co.  
265 North Main Street  
Blakely, GA 31723

Diamond Shamrock Corp.  
G. Donald Munger  
1100 Superior Avenue  
Cleveland, OH 44114

Dothan Oil Mill Company  
J. B. Roberts  
PO Box 458  
Dothan, AL 36301  
205-792-4104

Elanco Products Co.  
Jim Nicholson  
1526 Argonne Dr.  
Albany, GA 31707  
912-883-5608

Fisher Nut Company  
2327 Wycliff Street  
St. Paul, MN 55114

Georgia Agricultural Commodity  
Commission for Peanuts  
T. Spearman  
110 East Fourth Street  
Tifton, GA 31794  
912-382-4134

Gold Kist Peanuts, Inc.  
H. E. Anderson  
3348 Peachtree Rd. NE  
PO Box 2210  
Atlanta, GA 30301

Paul Hattaway Company  
R. F. Hudgins, Sec. Treas.  
PO Box 669  
Cordele, GA 31015

ICI United States Inc.  
R. A. Herrett  
PO Box 208  
Goldsboro, NC 27530  
919-736-3030

International Minerals &  
Chemical Corp.  
Sam Kincheloe  
Agronomic Services  
IMC Plaza  
Libertyville, IL 60048  
312-362-8100

Keel Peanut Company, Inc.  
Rufus Keel  
PO Box 878  
Greenville, NC 27834

Lilliston Corporation  
William T. Mills  
Box 3930  
Albany, GA 31706

M & M Mars - Albany Plant  
Elisabeth Lycke  
PO Box 3289  
Albany, GA 31706  
912-883-4000

Mid Florida Peanuts, Inc.  
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