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ADDRESS

PAPERS

ABSTRACTS

MINUTES

BY-LAWS

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The members will be selected, contacted as to willingness to serve and announced in an issue of Peanut Research.

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ADDRESS

by

D. W. Sands, Group Vice President-Marketing, Gold Kist, Inc.,
Atlanta, Georgia

It is indeed a pleasure for me to have the opportunity to address the membership of the American Peanut Research and Education Association here at Williamsburg, Virginia. I say this for several reasons; first, it always makes an individual feel honored to be invited back after having appeared on a program in the past; also, I don't know of a more delightful place to hold a meeting than here in Williamsburg, Virginia. It makes it difficult for a speaker, however, to talk about the present and the future in this environment. The nostalgia here for the past almost overwhelms you. It makes you want to forget about worrying and projecting the future and yearn for the more simplistic environment of the past which is represented here.

Still another reason I enjoy coming to this area is the fact that I learned, while attending a convention many years ago, my family was an "FFV" or a "First Family of Virginia". While visiting in nearby Jamestown, I learned they have a museum honoring the first settlers of Jamestown. On this plaque is listed a Thomas Sands, which much to my surprise after a family tree check, revealed that our family existence in the United States started with that individual. It was interesting to note that nearly all the other individuals listed had after each name - carpenter, glass blower, candle maker, blacksmith, and so on. Listed following the name of Thomas Sands was gentleman. I don't know whether that meant he was a nice fellow or whether it was a polite name for a loafer or con-artist, but in any event I am proud to have the Sands name so handsomely displayed.

Mr. Frank McGill gave me a very broad and challenging topic to cover when you try to look at the U. S. demand and the competitive position in a protein deficient world. You could put together a book on this subject, but I am going to attempt to be rather brief and specific today. But before I launch into the subject matter, I think we should get the background of conditions as we find them today. There was a quotation made, "This is the best of times and the worst of times", and I feel this is an apropos statement for today. We have world peace, but unrest in just about every section of the globe. We have an export balance of payment, but at the expense of a devalued dollar. We have an adequate food supply, but only a 30 day surplus. We have energy on which to operate, but we recognize the limitation of our energy sources. We have had good climatic conditions in the U. S., but in some parts of the world we have had extreme drought. Our Executive Branch of government has gone from a high in popularity to an extreme low. So you could go on and on listing the good and the bad, and we are living in many cases under the best conditions, but also in many cases we are witnessing some of the worst of conditions.

But to me agriculture is one of the brightest spots of all areas of endeavor. In many ways agriculture in the past has been in a depressive type existence and has not been able to share completely in the affluence that has been generating not only in this country but around the world. U. S. agriculture has improved its efficiency by an average of 8% per year for the past twenty years while industry's record is about 2½%. If industry had kept up with agriculture, you wouldn't have to worry about inflation - they would have lowered prices. Well, that has changed and I like to refer to 1973 in the terms of the "year that was" for agriculture. It was the year that we have spoken of many times at meetings like this. It was the year we dreamed about - planned for. It was a year that many said just never would happen. Many said we would never see the day U. S. food prices would reach the level that came to pass, not in our wildest imagination could we predict what happened to U. S. agriculture in 1973. We witnessed frustration by the U. S. consumers who found their food prices increasing and started yelling long and loud, without justification and with erroneous facts. For some unexplained reason the American consumer felt he should be fed cheaper than any other country in the world and he should not be compelled to compete with world food prices. After all our agriculture efficiency had been

spoiling them for decades. Washington reacted, I might say, very short-sightedly, with disastrous price controls, disastrous embargos on shipments, disastrous consequences of cutting across contracts that were written and on the books. They simply could not understand the complexities of our agriculture economy and simply turned their head away from an economy by supply and demand. We are still feeling the results of some of these decisions especially in the red meats, which are suffering from conditions that were brought about by some of these very acts. It was hard for the government to visualize that, when you make one change, it leads to many, many others and the results can be far from what was expected. Therefore, much more thought should be given to decisions of the magnitude that have affected our economy and action should be taken cautiously.

Even with all this misjudgment we witnessed realized farm income reaching \$25 billion, the highest ever recorded in history. We saw our wheat jump to \$5 and more per bushel. We watched fed cattle prices climb as high as \$60 per hundred weight. We saw soybeans go over \$10 per bushel, and most importantly was the change in demand for U. S. peanuts. For the first time we witnessed the export market being as high or higher for edible requirements as our U. S. manufacturers were having to pay. This was a year that couldn't happen, but it did, and for peanuts I feel the demand is just beginning - that is, if we can stay reasonably competitive in price with other proteins. I don't have to sell this group on the flavor, the nutrition, and the many merits of the peanut and peanut products - you know them as well as I do. But frankly there is a great deal of the population of this world that is not familiar with what a good food the peanut represents. There is not enough research being done on the utilization of the peanut in its many, many forms. There is not enough promotion being given to its nutritional value. I guess you can say that, if there is any word that could sum up the peanut situation, as it exists today, it is simply the word "opportunity". Opportunity as we have never seen it before, if we will simply take advantage of this opportunity through research, through promotion, and production. When you discuss peanuts you have to divide the opportunity into two directions: one in the edible form as we know, such as salted peanuts, peanut butter, candies; and the other into the oil-protein category. You can also break this down into both domestic and foreign categories. But let's first look at the peanut as an edible product. We have witnessed our peanut butter become one of the cheapest forms of available protein for a person to consume today; in fact, on a U.S.D.A. listing early this year, it was shown that peanut butter per unit of protein was cheaper than even dried beans. As far as I know, this is the first time such a situation existed. Just think of the potential demand, if the American and Canadian public fully understood that the peanut is the cheapest source of edible protein and fully as nourishing as eating beef steak, pork, and other protein sources. This without animal fat content - only vegetable oil. What could our consumption volume reach if we really hammered the point home that the peanut represents a source of protein which could lower the family food bill considerably, if it was utilized to the extent possible. Even with our limited activity of promotion in the peanut industry, we have witnessed a dramatic increase in the consumption of peanut butter this last year due to the high meat costs. So the message is getting across but not nearly fast enough. This same thing applies in foreign countries. The potential is enormous, if we could point out and educate the people to the value of eating peanuts and peanut products.

I was in Japan recently and during my visit I was making every effort to promote the consumption of peanut butter, because their consumption of shelled peanuts and peanuts in confectionery approaches ours. Their use of peanut butter is practically nil. I was visiting one of the large trade companies telling them of the opportunity that exists in merchandising peanut butter and in advertising its nutritional merits. I received very courteous responses but I think a very negative attitude as to the ability of the Japanese to adjust his taste to peanut butter. They admitted that the Japanese had adopted many of the other foods of foreign countries, but for some reason felt peanut butter wasn't a type food that would go over in Japan, and that their children simply would not have the taste for it. I pointed out to them that a child is not born with a specific taste for a commodity, it is developed by their environment and that unless they are exposed to the product, they have no chance to acquire the taste.

But there was one thing that happened which pointed out clearly to me that with proper promotion and proper education, the consumption of peanut butter could be dramatically increased almost beyond comprehension throughout the world. While I was making my presentation to the executives of this large trading company, they had a young interpreter repeating everything in Japanese so there was no misunderstanding. I explained to these people all the values I could think of about peanuts, the various usages, and the reasons their children should have this nutritional product. I did not know I was making an impression on this young Japanese businessman. He had just started with this trading company and was, as he stated it, a "freshman" in the organization. I had a chance to be with him that evening in a taxi going to a restaurant to join the executives for dinner. He told me that he listened to all I had said that day and he did not realize peanuts offered protein similar to beef. He stated his income was not large and that he needed a product of this type so he could nourish his body and at the same time protect his pocketbook. He told me he had purchased some peanut butter that day and planned to use some of it on toast in the morning and was also going to try the peanut butter and jelly sandwich, hoping that he could develop a taste for it, thereby reducing the cost of living for himself.

Now to me this shows that, if a person who has already graduated from college, but after hearing a nutritional story on peanuts is willing to change his habits and make an effort to utilize peanuts, then you know the mothers of any nation can create a desire on the part of their children to eat such a nutritional product. The key to increasing edible consumption in foreign countries is getting the nutritional message across. This costs money and time; thus far, we have not developed the programs or provided the funds to do it. When you compare the export funds spent on other commodities versus peanuts during the period July 1972 through June 1973, you can readily see the minimal effort that has been made. For example:

American Soybean Association	\$ 2,100,000
Almond Industry	\$ 359,000
Raisin Industry	\$ 575,000
California-Arizona Citrus	\$ 1,200,000
Florida Citrus	\$ 1,300,000
Great Plains Wheat Association	\$ 1,100,000
Western Wheat Association	\$ 1,600,000
Rice Council	\$ 1,300,000
Poultry and Egg Institute	\$ 800,000
National Dry Bean Council	\$ 150,000
National Peanut Council	\$ 8,000

So until we develop a greater commitment to peanut exports and are willing to back such a commitment up with promotional funds, we will never see the peanut reach its consumption potential. Both domestic and abroad, I think the usage of peanut butter, raw peanuts, roasted peanuts, peanuts in foods of all types, can be increased dramatically with proper support. In the area of edible protein, peanuts have a long way to go but the opportunity is tremendous. The main ingredient for the expansion of edible peanut protein around the world is that it be competitive with other edible protein sources.

The need for vegetable protein and oil is increasing at an ever rapid rate. And, if for economic and humanitarian reasons only - policies and legislation governing peanuts of this country could be changed, we would see the peanut become a major world supplier of protein; and I think in the long run without having an appreciable effect on the price of the peanuts being utilized in their present forms. Peanut protein can be handled in many diverse ways. It can be a low-fat peanut flour produced with wet heat, or low-fat peanut flour produced with no heat. It can be developed into concentrates, into isolates, into textured vegetable protein, into hydrolized vegetable protein, into cereal peanut flour blends, and even into high-fat flours for certain uses. I could comment on the opportunities in each one of these areas, but I would prolong this meeting tremendously, but believe me there is consumption available in each one of them. The peanut oil itself offers opportunity around the world. It is a very good and highly stable form of vegetable oil, and it too offers promotional opportunities far beyond imagination. So in summary, I would sum up the U. S. market demand as

being extraordinarily good in comparison with the past, but when you look to the future, the opportunity is far beyond what we are currently doing. It requires educating the people, the consumers, to the value of peanut butter or peanut products utilized daily in the diet for some of their protein requirements. I think the current domestic market for edible vegetable protein, which can include peanut vegetable protein, if we become competitive, is in its infancy and will grow at an astounding rate in the future. So the future of the peanut in this country is extremely bright and I can see no way for consumption to go but up unless we price it out of the market or fail to let the public know of its merit.

In regard to the export opportunities, they are vast and almost without limit. We have the same problem, but with even more opportunity, in getting the consumers of the world to understand the value of a peanut in their daily diet. Also, the edible protein side offers even more promise since it is usually a cheaper form of protein substitution than any other. So I think this group here in A.P.R.E.A. have their work cut out for them in many areas of research. I think the utilization of the protein in peanuts can be developed far beyond its present usage. I feel peanut research for consumer usage falls into two categories: non-peanut flavored and peanut flavor usage. In the non-peanut flavor side functionality, color, flavor, and shelf-life are important factors, but the roasted peanut flavor is not. The second area makes use of the roasted peanut flavor. There are many opportunities to promote the usage of peanuts in conjunction with other foods in new concepts and in forms which we are not aware of today. Also, I think an important area for research is in the detoxification and bleaching of peanut protein. Further work needs to be initiated by the government for biological testing of both the hypochlorite and hydrogen peroxide detoxification methods in peanuts. Bleaching methods for peanut flour should determine its effects on color, functionality, and flavor. If an acceptable bleached method gives reduced aflatoxin levels and has other desirable characteristics, it could further reduce toxin levels substantially below actionable levels and also provide an economic way of using an otherwise devalued product.

Gentlemen, it has been a pleasure speaking to you today. I know what I have said is not new. You have heard of this or you have thought of it often, but I think it bears repeating, "We are still not bringing forth the action that is necessary in research and promotion to get the job done that will place peanuts in its rightful position among foods".

PEANUT INSECT PEST MANAGEMENT IN GEORGIA

by

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ABSTRACT AND PAPER

ABSTRACT

Six peanut insect pest management demonstrations were conducted in 1972 and 1973 in Georgia. Only one of the six demonstration fields developed an insect infestation that justified control measures. Nine different species of foliage feeding caterpillars were identified. As a result of these demonstrations, a pilot insect pest management program was initiated this year on 2441 acres of peanuts using two scouts.

PAPER

In 1972 and 1973 six peanut insect pest management demonstrations were conducted in Georgia in an effort to combine experience with experimental data and develop practical techniques for scouting peanuts. Another primary aim of this work was to reduce the number of foliar applications of insecticide.

Each demonstration field was checked weekly for damaging populations of insects and each farmer advised of the existing situation. Four foliage feeding caterpillars per foot of row, was selected as the infestation level at which insecticidal control would be used.

RESULTS AND DISCUSSION

A detailed paper (French, 1973) on the four demonstrations conducted in 1972 is presented in the 1973 Journal of APREA. A brief summary of the results of each of the 1972 demonstrations is being repeated here:

1972 Summaries

Peanut Insect Pest Management

<u>Worth County</u>	<u>Tift County</u>
No insecticide	No insecticide
Yield: 2325 Lbs/A	Yield: 2950 Lbs/A
Grade: 76	Grade: 75-76
<u>Cook County</u>	<u>Crisp County</u>
No insecticide	1 insecticide appl.
Yield: 3205 Lbs/A	Yield: 3567 Lbs/A
Grade: 76-77	Grade: 73-75

Details of observations made in the two demonstrations conducted in 1973 are presented in Tables I and II.

Table I.

Tift County Demonstration

1973

Peanut Insect Pest Management

<u>Date</u>	<u>Observations</u>
5/28	Thrips damage very light.
6/7	Thrips damage very light.
6/13	0.05 foliage feeding caterpillars/row ft; thrips very light.
6/20	Thrips damage moderate; light foliage damage, no caterpillars.
6/27	0.05 foliage feeding caterpillars/row ft.

7/4	Light foliage damage, no caterpillars.
7/11	0.15 foliage feeding caterpillars/row ft.
7/18	No damaging insects.
7/25	0.10 foliage feeding caterpillars/row ft.
8/1	No damaging insects.
8/8	0.40 foliage feeding caterpillars/row ft.; very light southern corn rootworm infestation and damage.
8/23	1.00 foliage feeding caterpillars/row ft.; very light southern corn rootworm damage, no rootworms.
8/29	No damaging insects nor fresh damage.
9/5	0.70 foliage feeding caterpillars/row ft.; light damage.
9/12	0.50 foliage feeding caterpillars/row foot; light damage.

Summary

No insecticide
Yield: 4111 Lbs/A
Grade: 73-74

Table II. Crisp County Demonstration
1973
Peanut Insect Pest Management

<u>Date</u>	<u>Observations</u>
5/21	No insect damage.
5/28	0.20 foliage feeding caterpillars/row ft.
6/4	0.10 foliage feeding caterpillars/row ft.; moderate thrips damage.
6/11	0.15 foliage feeding caterpillars/row ft.; moderate thrips damage.
6/18	0.05 foliage feeding caterpillars/row ft.; light thrips damage.
6/25	0.05 foliage feeding caterpillars/row ft.; SCR worm adults feed in terminals.
7/1	Very light foliage damage.
7/9	Soil wet; SCR worm adults very common on soil surface.
7/16	0.10 foliage feeding caterpillars/row ft.
7/23	0.10 foliage feeding caterpillars/row ft.
7/30	0.50 foliage feeding caterpillars/row ft.
8/6	0.60 foliage feeding caterpillars/row ft.; SCR worm pod damage light.
8/13	0.60 foliage feeding caterpillars/row ft.
8/20	0.60 foliage feeding caterpillars/row ft.
8/27	1.00 foliage feeding caterpillars/row ft.; moths numerous.

Summary

No insecticide
Yield: 3640 Lbs/A
Grade: 71

During a two year period six insect pest management demonstrations have been conducted in Georgia. These demonstrations rather conclusively show that the estimated number of two applications of insecticide (Annual County Agent Survey) on all peanuts each year to control foliage feeding caterpillars, is far in excess of the actual need. Only one of the six fields used in these demonstrations developed an infestation of foliage feeding caterpillars that was considered to be of economic importance. This field was treated with an insecticide one time and none of the other fields was treated.

Yields on all demonstrations were well above the state average except the one conducted in Worth County in 1972. These peanuts were planted on a light sandy soil and were under drought stress a con-

siderable part of the growing season. Insect infestations were very low for the entire growing season and at no time caused any apparent damage.

A list of the foliage feeding caterpillars and the total numbers of each found in checking these demonstrations is presented in Table III.

Table III. Species of foliage feeding caterpillars found in checking six insect pest management demonstrations in Georgia in 1972 and 1973.

Common Name	Scientific Name	Total No. Counted
Granulate cutworm	<u>Feltia subterranea</u> (F.)	256
Corn earworm	<u>Heliothis zea</u> (Boddie)	133
Fall armyworm	<u>Spodoptera frugiperda</u> (J. E. Smith)	100
Beet armyworm	<u>Spodoptera exigua</u> (Hubner)	52
Loopers	<u>Pseudoplusia includens</u> (Walker)	
	<u>Trichoplusia ni</u> (Hubner)	51
Velvetbean caterpillar	<u>Anticarsia gemmatalis</u> (Hubner)	16
Yellow striped armyworm	<u>Prodenia ornithogalli</u> (Guenee)	6
Green cloverworm	<u>Plathypena scabra</u> (F.)	5
Undetermined species		19

As a result of these demonstrations, a pilot insect pest management program has been initiated in Terrell County. This program includes 13 farmers, 2441 acres of peanuts, 115 fields and two peanut scouts. Scouts were trained to use the same techniques of checking a field that were used for these demonstrations. Each scout has been visited weekly in order to answer any questions he has and to make sure he is doing a good job of checking. The entire program is under the direct supervision of the county extension chairman.

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THE EFFECT OF ROASTING METHODS ON THE FLAVOR AND COMPOSITION OF PEANUT BUTTER¹

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ABSTRACT AND PAPER

ABSTRACT

Comparisons were made of the effects of microwave, dry and oil roasting of peanuts on the flavor and composition of processed peanut butter. The resulting peanut butter samples were subjected to taste panel evaluations and to color and texture measurements. Individual preferences varied but dry roasted peanuts usually scored lower for flavor. Electrophoretic patterns of the proteins in samples of raw, blanched, roasted peanuts, and peanut butter were compared. Changes in protein patterns of peanuts roasted by these different methods were readily distinguished by gel electrophoresis. No further changes in the proteins were detected when the roasted peanuts were processed into peanut butter. The possible relationships of free amino acids and proteins to flavor and flavor precursors are discussed.

INTRODUCTION

Peanut butter consumption is presently increasing primarily due to increasing meat cost, and also because it is an excellent protein supplement and a versatile food with a unique and desirable flavor.

Recent research by Oklahoma State University scientists (Newell, 1967; Mason, et al., 1969; Koehler and Odell, 1970) has indicated that the unique nutty flavor of roasted peanuts results largely from reactions of glucose and fructose with free amino acids. The glucose and fructose occur in peanuts as a result of hydrolysis of sucrose. More recently, differences in the free amino acid content of peanuts due to harvest date, maturity and variety have been examined using an improved extraction method (Young, et al., 1974a). Furthermore Young, et al. (1974b) reported differences in free amino acid content in peanuts grown in Georgia and Oklahoma under irrigated versus nonirrigated treatments. At present, only limited information (Newell, 1967; Mason, et al., 1969) is available on the effect of roasting on the changes of free amino acids during roasting. Moreover, Neucere (1972) has suggested that the nutritive quality of heat-treated peanut proteins may depend on temperature, moisture and roasting time indicating that the potential effect of roasting should also be more thoroughly evaluated.

Commercial roasting of peanuts normally uses a dry roasting process for preparation of peanut butter and an oil and/or dry roasting process for other peanut products such as salty peanuts and candies. An earlier science project study by the second author (unpublished data) had indicated that several individuals preferred peanut butter made from microwave roasted peanuts.

In this study, the objectives were to compare changes in flavor, soluble protein, polyacrylamide gel electrophoresis protein patterns, and free amino acid content of dry, microwave, and oil roasted peanuts and their resulting samples of peanut butter.

MATERIALS AND METHODS

Eighteen pounds of Florunner peanuts (1973 crop) stored at -18 C soon after

¹Most of this research was completed by T. G. Young (Student of Griffin High School, Griffin, Georgia) under the direction of Clyde Young and John Cherry as part of a local and state science project.

harvest were shelled in December on a Federal-State Inspection Service sheller and screened over a 16/64 x 3/4 slotted screen. These peanuts were heated 10 min at 300 F in a Preedit Electric Roaster, Model No. 37, and blanched in an Ashton Blancher. Some of the hearts (about 25%) were removed at this time with the remainder going into the peanut butter. Unblanched, discolored and other undesirable peanuts were removed.

Roasting. Duplicate roasted samples were prepared by each roasting method. For dry roasting, two 400 gm batches were each roasted at 400 F for approximately 21-22 minutes in a General Electric Oven. Coconut oil heated to 320 F in a Wells Autofry deepfat cooker was used to roast 800 gm samples to a golden brown similar to that obtained with the dry roast method. Lastly, the microwave roasted peanuts were prepared in a Westinghouse Microwave Oven until a fairly satisfactory roast was obtained. It was necessary to stop and stir the peanuts several times in order to obtain a more uniform roast. An average of 10 min were required for each 400 gm batch. Samples of peanuts from each duplicated roasting method were retained for chemical analyses.

Preparation of Peanut Butter. To each duplicate sample of 610 gm, salt (1%) and Fix X (1.5%), for stabilizing the peanut butter, were added. These samples were ground in a pilot-scale stone mill (Morehouse-Cowles, Inc., Los Angeles, CA) to give a smooth uniform product. The mill was set at a clearance of 0.004 in. Two commercial brands of peanut butter were purchased and evaluated along with these test samples.

Taste Panels. Individuals (15) varying from 6 to 60 years of age with no taste panel training were used as a "consumer" taste panel. The panelists were asked to use the following scale of 1-9: 1, Really Bad; 3, Pretty Bad; 5, So-So; 7, Pretty Good; and 9, Great. Scores of 2, 4, 6, and 8 were allowed. Personnel of the Food Science Department (experienced panelists) scored the peanut butters for appearance, color, aroma, texture and flavor using the nine-point hedonic scale ranging from 9 (excellent) to 1 (extremely poor). These panelists are referred to as "experienced" since they frequently score peanut butter and other peanut products.

Color and Texture. Color measurements were made on a Gardner Color Difference Meter, Model C-4, using a white chromatic reflectance standard ($L = 89.3$, $a = -0.9$, $b = -0.9$) to standardize the instrument. Readings were taken of the L , a , and b values and the total color ($T.C. = L^2 + a^2 + b^2$) calculated. Texture (shear resistance) was determined on duplicate 20 g samples of peanut butter using a Food Technology Corp. Shear Press, Model TP-1, equipped with a universal cell and a 300 lb transducer ring. Data were reported in pounds of force per 20 g sample.

Protein Solubilization and Polyacrylamide Gel Electrophoresis. Samples of soluble protein were prepared by grinding peanuts (3 seeds/4.5 ml) or peanut butter (1.62 gm dry roast, 1.53 gm microwave roast, and 1.56 gm oil roast/4.5 ml; based on average weights of 3 seeds after each treatment) in phosphate buffer (pH 7.8; $I = 0.01$) with a mortar and pestle and centrifuging this mixture at 43,500 x g to remove insoluble debris. The soluble protein in the supernatant was then measured by the method of Lowry et al. (1951). Polyacrylamide gel electrophoresis of samples containing 200-600 μ g of protein was performed on 10% gels according to the procedures outlined by Canalco (1973) and Cherry et al. (1970).

Free Amino Acids. The method of Young et al. (1974a) for extraction and preparation of samples for analysis was modified in this study. Five grams of each sample were thoroughly extracted with diethyl ether to remove the oil. The oil free residue was ground in 50 ml of methanol, chloroform, and water mixture (MCW) (60:25:15; v:v:v) for 1 minute using a Brinkman polytron at full speed. Ground samples were centrifuged and 20 ml aliquots transferred to a 100 ml beaker and allowed to partially evaporate overnight under a hood to remove the methanol and chloroform. The samples were taken to dryness in a vacuum desiccator. The dried extracts were resuspended in 2 ml pH 2.2 citrate buffer, centrifuged and the supernatants frozen (-18 C) until analyzed.

Free amino acid analyses were performed by the ion-exchange chromatography technique of Spackman et al. (1958), with a Durrum Model D-500 Amino Acid Analyzer

using a 1.75 mm I.D. x 48 cm length column packed with the Durrum high resolution cation exchanger; bead diameter 8 ± 2 microns. Running time was 94 min including a 20 min regeneration of column.

RESULTS AND DISCUSSION

Observations from the earlier science project. Earlier tests showed that with the "consumer" panel, the average scores on freshly prepared peanut butters were 6.8 for oil roasted peanuts, 6.3 for microwave roasted peanuts, and 6.0 for dry roasted peanuts. Many commented that these peanut butters were preferred over commercially available products. The ratings varied considerably among panelists indicating that preferences were highly variable.

Consumer Taste Panel Results. Two commercial peanut butters were included as a fourth treatment because of comments made by several panelists in the preliminary study. These results are recorded in Table I. The peanut butter from oil roasted

Table I. Distribution of Scores Among Consumer Panelist of Peanut Butter Samples.

Scores	Roasting Method			Commercial	
	Dry	Microwave	Oil	I	II
1	3	2	0	0	0
2	0	0	0	0	0
3	5	5	1	1	1
4	1	1	0	0	0
5	4	4	4	3	1
6	0	0	1	0	0
7	1	2	9	7	9
8	0	1	0	0	0
9	1	0	0	4	4
Average	3.9	4.2	6.1	6.9	7.1

peanuts scored slightly lower than for the earlier study and was probably due to a delay of about one week before scoring as compared to the next day in the first study. The commercial samples scored slightly higher than those from the oil roasted peanuts. The dry and microwave roasted samples scored much lower because the products were overroasted. Comments were made often to this effect by the panelists. One panelist preferred this overroasted peanut butter and other variations were found. There was a strong indication that peanut butter preference really depends on the individual and there might well be a market for light and heavy roasted peanut butters. It should be noted that these are subjective scores that depend heavily on the complex responses of the panelists.

Experienced Taste Panel Results. The data presented in Table II give the average values for duplicate samples presented to the experienced panel members. No significant differences between duplicates were found except for texture of the two commercial peanut butters.

In general, scores for appearance, color and aroma of peanut butter made from oil roasted peanuts and the commercial peanut butters were similar and significantly higher than those of dry and microwave peanut butters. The texture of the commercial peanut butters was more acceptable than that of the research samples. The flavor of the commercial peanut butters was higher than for the peanut butter made from oil roasted peanuts. Flavor of the dry and microwave samples were poorest.

In general, about one-half of the variation for appearance, color, aroma,

Table II. Average of Scores Among Experienced Panelists of Peanut Butter Samples

Treatment	Appearance	Color	Aroma	Texture	Flavor
Dry I	5.70	5.00	5.26	6.74	4.39
Dry II	5.65	4.73	5.17	6.91	4.39
Microwave I	5.74	5.39	5.52	7.00	4.78
Microwave II	5.30	4.91	5.22	7.13	4.13
Oil I	7.49	7.78	6.65	7.34	5.87
Oil II	7.22	7.70	6.61	7.34	6.04
Commercial I	6.61	6.87	6.61	6.74	7.04
Commercial II	7.78	7.61	7.04	7.48	6.96

texture and flavor was among scorers with 20% being due to treatment and another 20% due to a treatment-scorer interaction.

Statistical correlations of the panelists' scores are shown in Table

Table III. Correlations Among Scores of Experienced Panelists of the Peanut Butter Samples

Interaction	Dry	Microwave	Oil	Commercial
Appearance X Color	.812**	.263NS	.778**	.607**
Appearance x Aroma	.554**	.259NS	.613**	.456*
Appearance X Texture	.320NS	.445*	.387NS	.733**
Appearance X Flavor	.370NS	.361NS	.429*	.539**
Color x Aroma	.550**	.294NS	.533**	.464*
Color X Texture	.369NS	.481*	.463*	.465*
Color X Flavor	.428*	.436*	.438*	.421*
Aroma X Texture	.175NS	.128NS	.242NS	.520*
Aroma X Flavor	.769**	.704**	.673**	.424*
Texture X Flavor	.102NS	.453*	.264NS	.625**

* Significant at the 5% level

** Significant at the 1% level

NS Nonsignificant

III. The patterns were variable for each of the four types of peanut butters. Thus, further studies are needed before these results can be explained satisfactorily. As expected appearance x color showed a high degree of correlation as did aroma x flavor.

Flavor scores including average and standard deviation for each panelist are shown in Table IV. Each panelist has a different pattern of ranking the butters from the highest to lowest. For example, panelist #6 scored all of the samples high whereas panelist #10 scored them low. These variations indicate the need to consider several types of peanut butter in order to satisfy a larger number of consumers.

Color and Texture Tests. Color of peanuts and peanut butter was calculated using the L, a and b values from a Gardner Color Meter and recorded in Table V. The higher the value, the lighter the color. Also the average color scores and standard deviations of the twenty-three panelists are recorded for comparison. The peanut butter samples from dry and microwave roast had the lowest color scores

Table IV. Flavor Scores of Experienced Panelists
of the Peanut Butter Samples

Scorer #	Dry	Microwave	Oil	Commercial	Average of 4 Treatments	Standard Deviation
1	5.00	6.50	6.50	7.50	6.375	+1.061
2	4.00	4.50	7.50	8.00	6.000	+2.000
3	7.00	6.00	4.00	7.50	6.125	+1.727
4	7.50	4.00	8.00	6.00	6.375	+1.923
5	6.00	7.00	9.00	6.50	7.125	+1.458
6	7.00	7.00	9.00	9.00	8.000	+1.069
7	2.00	2.00	3.50	8.00	3.875	+2.748
8	1.00	1.00	3.00	9.00	3.500	+3.505
9	6.00	6.00	8.00	8.00	7.000	+1.069
10	1.00	1.00	1.00	2.50	1.375	+1.061
11	6.00	4.50	5.00	8.50	6.000	+1.690
12	2.00	2.00	5.00	6.00	3.750	+1.982
13	5.00	5.00	6.00	6.50	5.625	+0.916
14	1.50	2.00	6.50	7.00	4.250	+3.019
15	4.00	4.00	5.50	6.50	5.000	+1.195
16	5.00	5.50	7.00	8.00	6.375	+1.302
17	6.50	6.50	7.50	7.50	7.000	+1.069
18	6.00	6.50	7.50	8.00	7.000	+0.926
19	6.50	7.00	8.00	8.00	7.375	+0.744
20	5.00	5.00	7.50	7.00	6.125	+1.246
21	2.00	3.00	2.50	1.50	2.250	+0.707
22	2.00	4.00	4.00	7.00	4.250	+2.604
23	3.00	2.50	5.50	7.50	4.625	+2.200
All	4.39	4.46	5.96	7.00	5.451	
Standard Deviation	+2.17	+2.15	+2.22	+1.92	+2.367	

Table V. Color and Texture of Peanuts and Peanut Butter

Treatment	Color		Texture	
	Panelists	Reflectance	Panelists	FTC Texture- Test System (lbs. of force)
Peanuts				
Raw	-	28.16	-	-
Raw and Blanched	-	56.50	-	-
Dry	-	35.47	-	-
Microwave	-	47.67	-	-
Oil	-	42.38	-	-
Peanut Butters				
Dry	4.87 + 2.09	32.85	6.83 + 1.32	2.9
Microwave	5.15 + 1.93	34.79	7.07 + 1.36	2.9
Oil	7.74 + 0.93	45.17	7.35 + 1.25	1.9
Commercial #1	6.87	47.39	6.74	2.5
Commercial #2	7.61	47.20	7.48	5.8
Commercial (Both)	7.24 + 1.32	47.29	7.11 + 1.37	4.2

and were also darker based on color reflectance values. The commercial peanut butters and peanut butter made from oil roasted peanuts gave similar color scores and reflectance values.

Texture as measured by a FTC Texture-Test System (lbs. of force) was compared with the panelists' results (Table V). The commercial sample #2 showed a higher force (stiffer) when measured by the texture meter. The panel had a slight but non-significant preference for this latter peanut butter.

Protein Solubilization and Polyacrylamide Gel Electrophoresis. The effect of roasting on protein soluble in dilute phosphate buffer are shown in Table VI.

Table VI. Effect of Roasting on Soluble Protein* of Peanuts and Peanut Butter

Treatment	Peanuts	Peanut Butter
	mg/ml	
Raw	57.0	
Blanched	41.9	
Dry Roasted	7.0	6.6
Microwave Roasted	8.4	7.3
Oil Roasted	6.1	5.9
Commercial #1		7.4
#2		8.4

*Average of triplicate analyses on each of two replications.

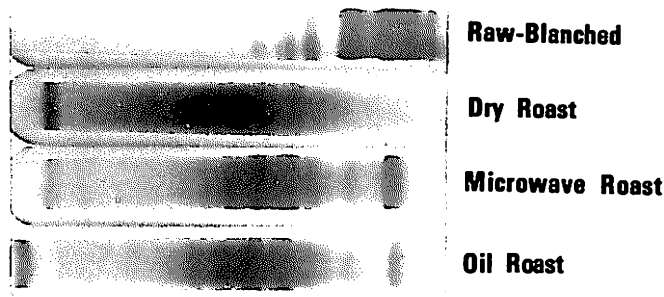
Blanching reduced the amount (26.5%) of protein which could be solubilized when compared with the value of raw peanuts. After roasting, protein solubility was drastically reduced. Protein solubility decreased only slightly during the preparation of peanut butter samples prepared from these roasted peanuts. The solubility of the proteins of the commercial samples was slightly higher than for the experimental samples. This was attributed in part to the lighter roast.

The gel electrophoretic patterns of soluble proteins of raw peanuts is shown in Fig. 1. Blanching peanuts to assist in the removal of testae did not produce any apparent changes in these gel patterns. However, dry, microwave and oil roasting of peanuts altered the protein content of the soluble fraction as shown by the gel pattern.

The large molecular weight globulins (including arachin) or bands in region 0 - 5.0 cm of the untreated peanuts were absent or drastically reduced in quantity. This change was more clearly shown for the dry roast than the microwave and oil roasts; one band still remained in region 1.0 cm of the latter two roasts which was completely absent in the former. The bands in region 2.0 - 4.5 cm were diffuse as compared to the protein in this same area of the gel of the untreated peanuts. Moreover, some light staining protein material and a distinct band were noted in regions 4.5 - 6.5 and 6.5 - 7.0 cm, respectively, and were present in the gels of roasted peanuts and not clearly shown in the raw seeds. These regions of the gel may contain protein fragments or polypeptide subunits of larger molecular weight components resulting from the heating process. Further treatment of these roasted peanuts to produce peanut butters did not alter these gel patterns (Fig. 1). Although microwave roasted peanuts had the heaviest degree of roast in this experiment, the resulting protein gel patterns indicated less changes as compared to those of oil and dry roasted products and might be due to lack of uniformity of the microwave roast. Moreover, the commercial peanut butters produced gel patterns resembling the microwave roast.

Free Amino Acids. The free amino acid content of the extracts from raw, blanched, roasted peanuts, and peanut butters are shown in Table VII. Newell

PEANUTS



PEANUT BUTTERS

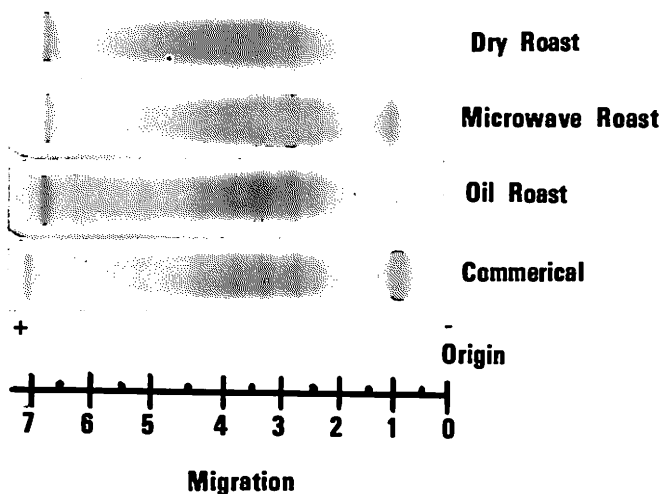


Figure. 1. A Comparison of Gel Electrophoretic Patterns of Raw and Roasted Peanuts and Peanut Butter.

(1967) indicated that aspartic acid, glutamic acid, glutamine, asparagine, histidine and phenylalanine were associated with the production of typical peanut flavor: threonine, tyrosine, lysine and an unknown (shown to be a peptide by Mason, et al., 1969 but associated with typical peanut flavor) were considered to be precursors of atypical flavor. Later high arginine was shown to be associated with a lack of maturity by Young and Mason (1972) and is also believed to be correlated with atypical flavor. Since these are the first data available on free amino acid content of Florunner peanuts, it is not known if these are typical compositional values. When compared to the values on Spanish type peanuts (Young, et al., 1974b), they are similar except for the two-fold higher values of valine and somewhat lower values for isoleucine, leucine, tyrosine, phenylalanine, histidine and ammonia.

In general, roasting decreased the measurable free amino acid content by

Table VII. Effects of Roasting Methods Upon the Free Amino Acid Composition* of Peanuts and Peanut Butter

Amino Acid	Raw	Blanched	Peanut Butters							
			Roasted Peanuts			Research			Commercial	
			Dry	Micro	Oil	Dry	Micro	Oil	I	II
μMoles/g										
Unknown #1	0.44	0.36	.10	.16	0.22	0.11	0.17	0.20	0.36	0.24
Aspartic Acid ^t	1.30	1.22	.22	.48	0.60	0.20	0.42	0.52	0.69	0.90
Threonine ^a	0.06	0.06	.02	.02	0.05	0.02	0.03	0.03	0.14	0.10
Serine	1.14	1.46	.14	.24	0.32	0.13	0.30	0.34	0.76	1.12
Glutamic Acid ^t	4.60	4.42	.33	.78	1.02	0.29	0.81	0.88	2.20	2.69
Proline	0.56	0.56	.13	.22	0.36	0.15	0.31	0.26	0.78	0.48
Glycine	0.54	0.53	.09	.16	0.34	0.10	0.18	0.24	0.27	0.18
Alanine	0.85	0.82	.18	.30	0.50	0.18	0.37	0.48	0.96	0.83
Valine	1.28	1.25	.05	.14	0.20	0.05	0.16	0.17	0.68	0.66
Unknown #2	0.15	0.16	.07	.08	0.10	0.08	0.09	0.09	0.14	0.15
Methionine	0.01	0.01	.02	.02	0.03	0.02	0.02	0.04	0.06	0.02
Isoleucine	0.08	0.10	.03	.06	0.10	0.04	0.07	0.08	0.20	0.22
Leucine	0.05	0.06	.04	.06	0.09	0.05	0.06	0.08	0.16	0.10
Tyrosine ^a	0.10	0.12	.04	.08	0.14	0.03	0.09	0.13	0.18	0.12
Phenylalanine ^t	0.32	0.52	.72	1.04	1.32	0.75	0.96	0.18	1.38	1.95
Histidine ^t	0.14	0.18	.05	.06	0.07	0.08	0.09	0.08	0.34	0.22
Lysine ^a	0.02	0.03	.01	.01	0.02	0.01	0.03	0.04	0.12	0.14
Ammonia	0.63	0.68	.60	.56	0.63	1.11	1.08	0.90	0.98	0.82
Arginine ^a	0.38	0.52	.04	.13	0.13	0.12	0.31	0.38	1.26	1.14
Total	12.65	13.00	2.88	4.60	6.24	3.52	5.55	5.12	11.66	12.08

*Average of single analysis on two replications

^tPrecursor of typical peanut flavor

^aPrecursor of atypical peanut flavor

77.8% (dry), 64.6% (microwave), and 52.0% (oil). Preparation of peanut butter from these roasted peanuts further decreased the amino acid content of dry and microwave samples and increased the amount of total free amino acids of oil roasted peanut butter. A similar comparison cannot be made on the commercial samples since raw peanuts were not available. The ratio of precursors of typical peanut flavor (total of 6.36 $\mu\text{Moles/g}$) to that of the precursors of atypical flavor (0.56 $\mu\text{Moles/g}$) would appear to be favorable but further studies in this area are needed.

Because of the many changes occurring in free amino acid content due to roasting, it appears that the relationship of these flavor precursors and flavor scores are very complex. Further experimentation is needed to elucidate this relationship. For example, the amounts of aspartic acid and glutamic acid decrease considerably during roasting whereas phenylalanine (another precursor of typical roasted flavor) increases. Factors such as variety, curing, storage, moisture, method of roasting, degree of roast, and procedure for grinding into peanut butter must be considered as factors in this complex system.

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GENETIC VULNERABILITY IN PEANUTS: A SECOND LOOK

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ABSTRACT AND PAPER

ABSTRACT

In 1973, Florunner, Starr, and Florigiant cultivars were grown on an estimated 78% of the 1.5 million acres (607,288 ha) of commercial U. S. peanuts, 98% of which are grown in seven states. Florunner, the predominant variety, accounted for 43.4%; Starr for 22%; and Florigiant for 12.5% of the acreage. All present U. S. cultivars are susceptible in varying degrees to the main diseases, insect pests, nematodes, and spider mites that cut yields, impair biochemical quality, diminish nutritional value, and thereby increase production costs. The impressive genetic uniformity and vulnerability stems mainly from the increased profit response to producing improved varieties. Yet, the complexity of breeding background for these economically dominant cultivars provides greater genetic diversity than the old pure line varieties. Further widening of the genetic base will require the continued cooperation of breeders and variety release boards and more support from the peanut industry.

PAPER

Successful peanut-breeding programs produce plant populations that are better adapted in a given environment. However, as adaptation is maximized, variability is reduced. Local varieties give way to pure lines and genetic heterogeneity is replaced with a biologically uniform host plant. As a result, one variety or a few varieties become widely distributed throughout a state, a growing region, or the peanut belt.

Large research inputs have been made on genetic improvement, control of pests, and mechanization of crop production, harvesting, drying, and storage. The resulting technology helps farmers capitalize on the biological efficiency of the peanut (5). For example, guaranteed price supports, acreage allotment controls, and reduced labor requirements made peanuts the crop of highest farm value in Georgia, where more than 3/8 of all U. S. peanuts are grown.

When improved varieties of peanuts became available in the late 1950's and early 1960's farmers shifted to fewer cultivars. Several factors contributed directly to the narrow genetic base for the crop. The peanut is highly self-pollinated (2). Peanut varieties must be uniform, yet morphologically distinct and stable. Standard breeding procedures enhance homogeneity in self-pollinators. Other factors are (a) the near-zero tolerance for off-type variants in seed multiplication generations, (b) a penalty for marketing mixed varieties, (c) warehouse segregation space requirements, (d) sheller pressure, (e) traditional choices by consumers and end-use processors, and (f) resistance to change (3).

Growers are currently paid for their peanut crop on the basis of pounds of sound and mature kernels. Therefore, they prefer to produce the variety that returns the highest yield at the lowest cost per unit of production. By 1970, nine varieties accounted for more than 95% of our peanut acreage, with three of these varieties grown on 7 of every 10 acres. The dangers of this monocultural agriculture were assessed (3): the genetic vulnerability of peanuts increases as fewer varieties are grown. The narrow gene base, plus large contiguous areas of uniform peanut plants, favors the buildup of catastrophic populations of some pests.

The appearance of the Florunner variety in 1969 speeded the shift to monocultural production because it was superior in yielding ability and shelling outturn when grown with specific cultural and mechanized systems. As fast as seed became available, a profit-taking society polarized toward its monocultural production.

For example, Florunner was grown on an estimated 5% of Georgia's 507,000 acres in 1970. Its area expanded 10-fold to 51.6% in 1971, jumped to 68% in 1972, and rose to 77% of the 512,000 acres harvested last year. Percentage shifts were even more rapid in Florida and Alabama. By 1973, 98% and 96%, respectively, of the harvested acreage was grown with the Florunner variety.

Of the Georgia-Florida-Alabama area's 766,000 acres, 83% was in Florunner in 1973. Other small acreages in Texas, North Carolina, South Carolina and Oklahoma combined with acreage in the Southeast to bring the Florunner area to 43.4% of our entire peanut acreage. Thousands of acres in Texas that formerly grew Spanish-type varieties were switched to Florunner in 1974, increasing the predominant position of this cultivar in the national market.

But the Southeast is not alone in single-variety dominance. The high biological productivity of Florigiant has led to its culture on an estimated 55.7% of the 268,000 acres harvested in the Virginia-North Carolina belt last year. Although its acreage in the Southeast has dropped below 30,000, Florigiant is the only Virginia-type peanut produced there. Its combined acreage in the Virginia-Carolina and Southeast belts accounts for about 1/8 of our entire crop.

These two varieties, Florunner and Florigiant, comprise about 56% of all acreage.

The narrow germplasm structure of the peanut crop is further evident with Spanish-type cultivars. Starr covered about 35% of our acreage in 1970, but only about 22% in 1973. But no other Spanish-type peanut covered more than 1/4 of that area, and the five other varieties, with 10,000 acres or more, occupied only about 12% of the national acreage.

Five varieties in the Runner and Virginia market types were each grown in 1973 on more than 1% of our peanut acreage: Florunner with 43.4%, Florigiant with 12.5%, NC 2 and NC 17 with about 1.9% each, and NC 5 with 2.2%. The first 4 of these trace to lines derived from a cross made by Higgins in Georgia in the early 1930's. In our previous report (3), this fact was interpreted mainly to show a restricted genetic base.

A second look at the complexity of breeding background for these economically dominant commercial types shows greater genetic diversity than was first noted.

Besides the Higgins cross (GA 207 = Basse X Spanish 18-38), Florunner, Florigiant, NC 17, and the recently released NC-FLA 14 also share a common descent from Hull and Carver's cross, F 230 (= Fla. Sm. Wh. Span. 3x-2 X Dixie Giant). Both crosses are infraspecific hybridizations between the two different subspecies *Arachis hypogaea hypogaea* L. and *A. hypogaea fastigiata* Waldron. Later hybridizations in Florida combined these lines together or with other complex hybrids.

Hybrid lines of naturally self-fertilizing species do not have intrinsic advantages in uniformity of behavior, such as have contributed to the success of F_1 hybrids in outbreeding species of crop plants. For example, each Florida variety when released, was a "composite of from 4 to 10 sister lines selected in the F_4 to F_8 generation, and the individual lines are still maintained separately by the breeder" (6).

This selection method represents a broadening of the genetic base over that of the several varieties of different pure line genetic constitution which were grown 25 years ago. Their stability in production over a wide area, an important attribute in a peanut variety, appears to have derived from the diverse intersubspecific genic heritage followed by conscious selection to avoid depleting the variety of its genetic versatility (6).

Cultivated peanuts appear to be of amphidiploid origin (4). Many qualitative characteristics, especially in crosses between subspecies, are complexly inherited, with interacting systems of duplicate genes (2, 4). Such genetic systems promote a higher degree of heterogeneity among sibs in advanced breeding lines. One striking example is that of resistance reaction in peanuts to *Diplodia gossypina* Cooke. Two advanced breeding lines similar in phenotype had been selected many years earlier for yield and seed uniformity from the Florida F 334A (= Ga. 207 X

F 230) hybrid material. Both were inoculated with a virulent strain of *D. gossypina* under conditions known to favor disease development. One line developed 50% morbidity but the other remained free of infection 60 days after inoculation (7).

Peanut breeders know that all varieties now cultivated in the U. S. are susceptible in varying degrees to the insect pests, nematodes, and pathogens that attack the crop. The samples of *A. hypogaea* tested and re-tested by peanut scientists have not shown enough resistance to diseases and insects to reduce significantly the cost of chemical control or to prevent serious economic losses in the absence of treatment.

Recent experience by breeders at different U.S. and foreign institutions shows that *A. hypogaea* has more host plant resistance to disease and insect pests than the scarcity of genetic information suggests. As more diverse samples of germplasm, representing wider geographical areas, are screened, the number of reports of tolerance, resistance, and near-immunity increase.

Furthermore, work has been underway for more than a decade to use the wild species of *Arachis* to broaden the genetic base in cultivated peanuts beyond present visualized limits. This work, mainly by Dr. W. C. Gregory and Dr. M. P. Gregory, will take several years before commercial varieties can be produced (1).

The genetic method offers significant possibilities to reduce genetic vulnerability in the peanut crop. Breeders are working to present many excellent varieties from which growers may choose. But the seedsman, the sheller-warehouseman, and the end-use processor insist on uniformity. To meet the threat of wipe-out by insects and diseases, genotypic diversity in varieties will require collaboration among breeders and variety release boards of the interested states. We may need to change our certified seed laws. To meet the challenge we need the support of the peanut industry.

What I have said is not new to peanut breeders. We are concerned. We hope that the severity of the problem will stimulate shifts in the allocation of present resources or the allocation of more resources.

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EFFECT OF MASS SELECTION ON THE STABILIZATION OF GENES FOR YIELD
AND OTHER DESIRABLE CHARACTERS IN PEANUTS

by

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ABSTRACT AND PAPER

ABSTRACT

A previous report showed that early-generation yield trials may be an acceptable breeding method for peanuts. The success of this method, which uses mass selection, depends in part on the stabilization in early generations of desirable characters such as yield. Five breeding lines, developed from reciprocal intraspecific crosses between the cultivars Argentine and Early Runner, and five commercial varieties were used in this experiment. The breeding lines in the F_5 and F_6 generations were compared with the commercial varieties, to determine if genes for yield and other desirable characters had stabilized in early generations. Results showed that yield genes had not completely stabilized by the F_6 generation, whereas genes for pod and seed size, shelling percentage, and grade characteristics had stabilized by the F_6 generation. We concluded that continuous mass selection in early generations of intraspecific cross populations may not be as efficient in stabilizing genes for yield and other desirable characters as are other breeding methods.

PAPER

In a previous report (4), we concluded that early-generation yield trials may be an acceptable breeding procedure for peanuts (*Arachis hypogaea* L.). The success of this procedure, which uses mass selection, depends in part on the stabilization in early generations of desirable traits such as yield. This paper reports the effects of using mass selection in early generations on the stabilization of genes in the F_5 and F_6 generations for yield, pod and seed size, shelling percentage, and grade characteristics.

MATERIALS AND METHODS

Reciprocal intraspecific crosses were made in 1967 between the widely adapted cultivars 'Argentine' and 'Early Runner'. These cultivars were described previously (2, 4, 7).

Selection and planting procedures for the F_1 through the F_6 generations were the same as those described in an earlier paper¹ (4). Three breeding lines and three commercial checks ('Tifspan', 'Spancross', and Argentine) were used in the Spanish-type tests. Two breeding lines and two commercial checks ('Florunner' and Early Runner) were used in the Runner type tests.

The following characters were studied in this experiment: (1) yield; (2) pod size—small, less than 9.92 mm (25/64 in.) in diameter, medium, pods greater than 9.92 mm (25/64 in.) and less than 11.48 mm (29/64 in.) in diameter, and large, pods greater than 11.48 mm (29/64 in.) in diameter; (3) seed size or grams/100 seed; (4) shelling % or % meat, all kernels in the shelling sample; (5) % ride, kernels that ride a 5.95 x 19.05 mm (15/64- x 3/4-in.) screen in Spanish and a 6.35 x 19.05 mm (16/64- x 3/4-in.) screen in Runner tests; (6) % other kernels (% OK), kernels that pass through the above screens; (7) % sound splits (% SS), undamaged split or broken kernels; (8) % damaged kernels (% DK), any kernels that are moldy or decayed or have been affected by insects, weather conditions, or skin and flesh discoloration; (9) % sound mature kernels (% SMK), the whole kernels that ride the appropriate screen (see % ride), and are not damaged; and (10) % total sound kernels (% TSK), sound splits plus sound mature kernels.

To determine the effect of mass selection on the stabilization of genes for the characters studied, two observations were made: (a) An unpaired t-test (10) was calculated for the breeding lines and commercial varieties in the F_5 and F_6 generation yield trials, to determine if there was a significant change in the traits studied between generations; (b) An orthogonal comparison (10) was made between the commercial checks and the breeding lines, to determine if there was a significant change between test sites or in the relationship between the breeding lines and commercial checks.

RESULTS AND DISCUSSION

Results from the early generation tests have been discussed (4). They showed that, although hybrid vigor was not evident in the F_1 generation for any character except plant diameter, lines yielding more than the parental cultivars were present in later generations. Similar findings were reported by Stokes and Hull (12). On the other hand, Seshadri (9) and Norden (8) reported marked hybrid vigor in infra-specific crosses.

The F_5 and F_6 generation Spanish and Runner results are presented in Table 1. The t-values for all comparisons between the entries in the F_5 and F_6 generation tests were nonsignificant at the 5% probability level, except for yield of the Tifspan check in the Spanish tests. The only significant changes in the orthogonal comparisons of the commercial checks with the breeding lines were in the yields of both the Spanish and Runner tests. In the F_5 Spanish test, the breeding lines significantly outyielded the commercial varieties, whereas in the F_6 Spanish test, the commercial varieties significantly outyielded the breeding lines. The breeding lines significantly outyielded the commercial varieties in the F_5 Runner test; however, no significant differences occurred for yield in the F_6 Runner test. These results show that the genes for the characters studied, except yield, had stabilized. Steinbauer *et al.* (11) reported similar results using mass selection for shelling characteristics of pure line varieties. In contrast, working with early-generation yield trials in soybeans, Boerma (1) concluded that yield genes stabilized in early generations. Steinbauer *et al.* (11) found that yield of pure line peanut varieties did not vary over a four year period of mass selection.

Gregory *et al.* (6) pointed out that pure lines of peanuts tend to break down if selection pressure is relaxed. They noted that the instability may be caused by accidental seed mixture, natural outcrossing, or chromosomal instability. On the other hand, Norden (8) observed that when continued intensive selection for uniformity or other characteristics was practiced into the late generations of a cross, the resulting lines had poor seasonal stability and lower average yields than the less highly selected material. Stability in production over a wide area is an important attribute of a peanut variety to be used for commercial production (8).

Working with peanuts, Norden (8) stated that mass selection is of more value when the variation is mainly for simply inherited traits that are highly heritable. Our results support this theory. In an earlier report (3), we stated that the characters seed size and pod size were highly heritable and that yield had a low heritability estimate. These results were reflected in this experiment, because pod and seed size (grams/100 seed) were the least affected by mass selection, but yield was affected by mass selection. We agree with Norden (8) that for less heritable traits such as yield, the pure-line method of breeding is probably more effective.

Norden (8) discussed the advantages and disadvantages of using various breeding methods with peanuts. When natural or artificial selection pressures eliminate large proportions of undesirable plants, and the breeder desires a high level of homozygosity, then the bulk method should be used (8). However, if the plant breeder is trying to get the most out of a few crosses in the shortest possible time, the pedigree method is the best choice. The main objection to the use of this method is the amount of time required to make each selection, reducing the number of lines that can be effectively evaluated by the breeder.

The early-generation yield trial method of breeding was proposed as a possible way to include the advantages of both the bulk and the pedigree methods of breeding. The advantages are (a) the elimination of large numbers of undesirable plants in

the early generations, (b) the obtaining of a high level of homozygosity, (c) the evaluation of selections based on several years' data, (d) a greater opportunity for early-generation testing, and (e) an easier method of handling and evaluating large numbers of breeding lines. The main disadvantage is that this method depends on the stabilization in early generations of genes for yield and other desirable characters.

Increased yield is one of the most important factors in developing new breeding lines and varieties. Our results show that genes for yield are not stabilized in the early generations of infraspecific peanut hybrids when the early-generation yield trial method is used. Therefore, this disadvantage outweighs the value gained from the advantages of this method.

However, this method may still be desirable to use with different types of hybrid populations. Elliot (5) has pointed out that hybrid stability of a phenotypic norm over a series of variable microclimates in a given environment not only is caused by obscure features of heterosis, but is more directly related to the genic contents of the hybrid. Thus, noninfraspecific populations or different infraspecific populations may respond differently to the use of the early-generation yield trial method of breeding.

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Table 1. Yield, pod- and seed-size, and shelling-grade characteristics for F₅ and F₆ Spanish and Runner peanut tests.

Entry	Yield		Seed size		Pod size*						% Meat	
	kg/ha		g/100 seed		Small		Medium		Large			
Spanish	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆
Tifspan	2797	4736	36.18	37.48	30.85	30.58	59.45	55.10	9.75	14.33	77.68	79.58
Spancross	3740	4651	36.08	36.80	24.05	25.13	57.18	52.88	18.78	21.95	78.13	78.55
Argentine	3707	4378	35.73	36.65	27.83	27.25	56.83	54.93	15.35	17.93	78.78	78.93
C201-4	3870	4378	30.40	30.38	76.23	77.25	21.80	22.40	1.98	0.38	78.40	80.30
C201-32	3805	4150	43.00	42.35	20.35	16.13	39.95	40.30	39.70	43.60	79.10	76.98
C201-21	3630	3838	39.40	39.45	54.33	52.10	41.73	43.83	3.95	4.08	80.40	80.73
Runner												
Florunner	4846	5171	63.28	63.93	3.83	4.25	14.83	13.45	81.40	82.30	82.30	82.65
Early Runner	5171	4996	58.53	58.50	7.93	8.43	38.48	37.35	53.60	54.28	80.03	80.10
C201-22	5594	4749	56.53	58.40	11.00	9.08	41.10	36.40	47.88	54.53	81.28	81.20
C201-19	5659	5061	58.85	55.80	9.15	12.00	34.15	38.63	56.73	49.38	79.00	78.58

Entry	Shelling grade characters											
	% Ride		% OK		% SS		% DK		% SMK		% TSK	
Spanish	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆	F ₅	F ₆
Tifspan	70.83	72.83	5.38	6.28	3.85	4.43	2.45	5.00	65.98	63.90	69.83	68.30
Spancross	72.28	72.73	5.45	5.25	4.15	5.08	2.70	4.95	65.80	63.28	69.98	68.38
Argentine	71.63	73.15	6.53	5.33	3.68	4.95	2.88	5.43	65.70	63.25	69.40	68.18
C201-4	60.85	61.88	16.98	17.98	5.63	5.45	1.90	1.48	54.00	55.40	59.60	60.88
C201-32	70.58	68.28	7.93	8.25	6.10	6.00	5.90	5.58	59.23	57.18	65.30	63.18
C201-21	67.75	68.88	12.45	11.55	8.75	8.20	2.70	3.75	56.60	57.15	65.33	65.40
Runner												
Florunner	79.00	79.85	2.95	2.18	10.88	12.63	5.18	6.25	63.35	61.53	74.23	74.20
Early Runner	75.70	76.65	3.78	3.08	8.78	8.73	1.98	2.23	65.60	66.13	74.30	74.88
C201-22	76.55	78.25	4.35	2.65	10.85	13.58	2.03	5.38	64.00	59.60	74.88	73.18
C201-19	73.63	74.88	4.78	3.28	11.60	8.80	2.43	6.00	60.18	60.58	71.78	69.33

*Abbreviations are defined in the text. Values are means expressed as a percentage for 1,000 g fruit samples from each of four replications.

EFFECT OF KYLAR ON YIELD, GRADE FACTORS, AND
GERMINATION OF "FLORIGIANT" PEANUTS (*ARACHIS HYPOGAEA* L.)

by

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ABSTRACT

Kylar, succinic acid 2,2-dimethylhydrazide, was applied at the rate of 1122, 2244, and 4488 g/ha on June 15, July 1, and July 15 to "Florissant" peanuts at 3 locations in 1971. Data were obtained on pod yield, sound mature kernels (SMK), extra large kernels (ELK), and fancy size pods (FS). There was no consistent effect on pod yield at two locations while yields were depressed with all treatments at the third location. The effects on SMK's, ELK's, and FS pods were inconsistent between locations but tended to decrease slightly as the rate was decreased.

Seed from one of the locations was checked for Kylar residue, dormant seed, germination, field emergence, and pod yield the following year. There were no effects on field emergence, or pod yield but differences were found in germination and dormant seed percentages where the 2244 and 4488 g/ha rates were used on July 1 and July 15. This appeared to be correlated with the treatments producing seed with more than 5 ppm of Kylar residue.

INTRODUCTION

Kylar (succinic acid 2,2-dimethylhydrazide) has been reported to retard vegetative growth (2), induce an increase in the number of leaves and pods (4), increase pod yields under certain conditions (2,3,5), have variable effects on seed germination (1), and have little or no effect on sound mature kernels, extra large kernels or fancy size pods (2,5) in peanuts (*Arachis hypogaea* L.). Except for some of the early work (2) there have been no reports on the effects of varying the rate and date of application.

The research reported here was designed to measure the effect on pod yield, market quality, and seed germination when Kylar was used at three rates and applied at three dates. The "Florissant" variety, a Virginia type with runner growth habit, was used in all tests.

MATERIALS AND METHODS

The experiments were conducted on farms located in Chowan, Edgecombe, and Gates County, North Carolina, on Norfolk sandy loam soils with cooperators having a history of high peanut yields during the past 5 years. Management practices were those employed by the cooperator and followed those outlined by Perry et al (6). All test sites were planted between May 3-7, 1971 with 112 kg/ha of Certified "Florissant" seed in 92 cm rows, 7.5 cm in the drill.

The experimental design at each location consisted of a randomized complete block with 4 replications. Plot size was two 92 cm rows, 15 m long. A 4.5 m alley separated the replications. Kylar was applied at the rate of 1122, 2244, and 4488 g/ha in 187 l of water with a backpack compression sprayer equipped with a boom with 4 nozzles which sprayed two rows at one time.

Harvesting equipment owned by the cooperators was used to dig, windrow and combine the peanuts at each test site. In combining, a U-shaped duct made of sheet metal was placed over the elevator duct to divert the peanuts into mesh bags attached at the end. The combine continued running for one minute at the end of each plot to clear the peanuts from the elevator duct.

The peanuts from each plot were weighed in the field. A 500 g sample was taken from each treatment and sealed in a plastic bag for moisture determination on a Steinlite moisture meter. Pod yields were adjusted to 8% moisture and zero foreign material. A composite 2 kg sample was taken from each treatment and cured by placing on top of bulk peanuts in a curing bin. Market grade factors were determined by the Federal-State Inspection Service from these samples.

A 10 kg sample was drawn from each treatment in the Gates County test and stored in a commercial seed facility. These were processed for seed in March, 1972. These were germinated using AOSA standard germination procedures for peanuts. Dormant seed were not counted in determining germination percentages. Kylar residues were determined by Uniroyal Chemical Company.

Treated seed were hand dropped at an on-farm test site in Martin County, N. C. on May 4, 1972. Plot size was 2 rows, 15 m long with a 15 cm spacing in the row. The experimental design, a randomized complete block, had 4 replications. Emergence counts were made weekly for 4 weeks.

The peanuts were dug on October 17 and combined on October 26 using the same procedure as with the Kylar treated plots. Data were obtained on pod yield adjusted to 8% moisture. Market grades were not obtained.

RESULTS AND DISCUSSIONS

Pod Yields

The Edgecombe County test was dug on September 21 and combined on September 28 under ideal harvest conditions. All applications reduced yields slightly but the differences due to treatment were not significant, Table 1. The Chowan and Gates County tests were dug on September 28, two days before the arrival of Hurricane Ginger. It was not possible to combine these tests until October 8. The test sites were well drained, however, and combining losses were no more than normally experienced. Yields were variable at both these sites and showed no significant differences between treatments.

Table 1. Effects of Kylar rate and date of application on pod yield at three locations.

Treatment		Edgecombe	Chowan	Gates
Date	Rate-(g/ha)	Yield (kg/ha)		
Control	--	4306	5582	3402
June 15	1122	4069	5233	3200
	2244	3981	6140	3894
	4488	4105	5582	3356
July 1	1122	3976	5372	3759
	2244	4069	5164	3692
	4488	3702	6280	2841
July 15	1122	4233	6070	3110
	2244	3830	5651	3177
	4488	3573	5093	2886
LSD(.05)		NS	NS	NS

Market Quality

Market quality, as measured by sound mature kernels (SMK), extra large kernels (ELK), and fancy size pods (FS), is shown in Table 2.

Table 2. Effect of Kylar rate and date of application on peanut market quality at three locations.

Treatment		Edgecombe			Chowan			Gates		
Date	Rate-g/ha	SMK ^{1/}	ELK ^{2/}	FS ^{3/}	SMK	ELK	FS	SMK	ELK	FS
Control		68	40	79	74	46	85	75	25	47
June 15	1122	66	30	83	73	42	83	75	30	55
	2244	66	32	85	70	37	78	74	27	49
	4488	61	27	83	69	42	80	74	25	44
July 1	1122	66	36	80	73	43	79	76	28	41
	2244	67	36	87	70	40	74	73	25	47
	4488	68	38	84	72	37	68	73	25	49
July 15	1122	67	32	82	72	48	80	74	28	46
	2244	69	35	77	73	44	73	75	29	45
	4488	71	43	70	74	47	71	76	30	41

^{1/} - SMK = Sound mature kernels
^{2/} - ELK = Extra large kernels
^{3/} - FS = Fancy size pods

For the Edgecombe test SMK,s were lower than expected for the Florigiant variety which generally has 70% or more SMK when fully mature. The other grade factors ELK and FS vary considerably due to soil type and weather conditions. The Edgecombe County test, in which all but one treatment had less than 70% SMK, apparently was dug before full maturity was reached. This may account in part for the Kylar treated plots yielding less than the control plots. In all Kylar treated plots except one, the percentage of ELK was lower by 4-13 percentage points. This also indicates that the peanuts were dug before full maturity was reached. In the Chowan and Gates County tests the percentage of SMK was well above 70%. Kylar treatments tended to decrease SMK in the Chowan test but had little effect in the Gates County test. Extra large kernels were reduced slightly by the Kylar treatments in the Chowan County test while there was a tendency for a slight increase in the Gates County test. The percentage of fancy size pods was decreased slightly by the Kylar treatments in the Chowan and Gates County tests and increased slightly in the Edgecombe County test.

Germination, dormant seed, and Kylar residue

The results of the germination test are shown in Table 3. Highly significant differences were found between the Control and the 2244 and 4488 g/ha rates applied on both July 1 and July 15. The difference between these and the other treatments was a highly significant increase in the number of dormant seed (Table 3). Germination of seed from the 2244 and 4488 g/ha rates on July 17 was 17 and 15 points less than the same treatments on July 1. Germination appears to be closely associated with Kylar residue (Table 3) except for the 2244 g/ha rate applied on July 1. The assay method used was not sensitive below 5 ppm and it is likely that seed from this treatment approached this level. Kylar residues of 5 ppm or more may lower the germination percentage due to an increase in dormant seed.

Table 8. Residual effect of Kylar treatments on residue level, germination, dormancy, field emergence, and yield of "Florigiant" Peanuts in 1972.

Date	Rate-g/ha	Kylar Residue (PPM)	Germination Test		Field Emergence	Yield kg/ha
			Germination %	Dormant Seed %	%	
Control	-	0	91	9	86.0	3743
June 15, 1971	1122	> 5.0	92	8	88.6	3805
	2244	> 5.0	91	9	90.3	4496
	4488	> 5.0	89	11	85.0	3866
July 1, 1971	1122	> 5.0	90	10	86.9	3642
	2244	8.6	84**	16**	90.5	4171
	4488	14.0	81**	19**	89.1	3642
July 15, 1971	1122	> 5.0	91	9	85.5	3581
	2244	18.7	67**	33**	89.4	3764
	4488	28.9	66**	34**	86.9	3479
LSD (.01)		NS	4	4	NS	NS

** Significant at 1% level

Field emergence and yield

Emergence counts were made on a weekly basis beginning on May 16. Emergence was extremely slow due to the cold, wet weather at the test site throughout the month of May. An accurate estimate of treatment effects could not be made until the final counts were made. Counts are shown in Table 3. There were no significant effects due to treatments. It was expected that the seed with 5 ppm or more of Kylar would emerge slower than the others. Within treatment variation was so large however, that this could not be determined on the first emergence count on May 16. Whatever the short term effect of the Kylar residue, it had disappeared before the May 30 emergence counts were made. No attempt was made to estimate the vigor of the emerged seedlings as visual observations showed little variation.

Due to the lateness of the 1972 growing season, this test was not dug until October 17. It was field cured and combined by the method previously described. This data is included in Table 3. Analysis of variance showed no significant differences in yield.

Conclusions

Results from these tests indicate that "Florigiant" peanuts treated with Kylar at 1122 g/ha, the rate suggested by the manufacturer, may be used for seed purposes without showing any effects on germination, field emergence, or yield of the following crop. Kylar treatments at higher rates may result in lower germination (if dormant seed are not counted as germinative) and possibly slower emergence, but have no effect on final pod yield.

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DIMENSIONAL CHANGES OF VIRGINIA-TYPE PEANUT PODS AND SEEDS DURING DRYING

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Summary

Va. 61R and Florigiant peanut pods and seeds were handpicked from freshly dug peanut plants on three harvest dates. Eight pods, eight basal seeds and eight apical seeds from each harvest were profiled with a light beam from orthogonal directions. The pods and seeds were placed in a constant temperature and humidity chamber and profiled again after 1, 2, 4, 8 and 16 days of chamber exposure. The weight and moisture content (m.c.) of each pod and seed were determined for each profile. Length, diameter and projected area relationships were presented. For both pods and seeds the dimensional and projected area changes during drying were related to corresponding changes in m.c. The seed size required at various m.c. to yield seeds 15/64, 18/64 and 21.5/64 inch in diameter after drying to 6% w.b. m.c. was estimated from these relationships.

Introduction

Research on changes in grade factors of farmer stock peanuts during storage was reported recently (1, 2, 3).^{1/} Each study was conducted in different peanut growing areas with similar objectives. In the Virginia-North Carolina study, 25-30% of the quality and quantity losses as reported by the shellers was explained by the gradual deterioration of grade factors and kernel moisture loss. To further understand the relationships between dimensional changes and changes in m.c., a laboratory study was conducted to supplement the Virginia-North Carolina observations. The objective of this study was to relate selected dimensional changes of individual peanut pods and seeds to changes in m.c. The study was conducted in the USDA-ARS Peanut Drying and Curing Research Laboratory, in cooperation with the Virginia Polytechnic Institute and State University, Tidewater Research and Continuing Education Center, Suffolk, Va.

Procedure and Equipment

On Sept. 12, Oct. 3 and Oct. 25, 1972, eight peanut pods, eight basal seeds and eight apical seeds were obtained from freshly dug Va. 61R and Florigiant peanut plants. Within hours of harvest each pod and seed was profiled for dimensional measurements, weighed and placed in a constant temperature and humidity chamber. After 1, 2, 4, 8 and 16 days of chamber exposure, each pod and seed was removed from the chamber, profiled, weighed and returned to the chamber for further exposure and drying. The chamber temperature was controlled at 87°F and approximately 75% relative humidity.

Pod and seed profiles were recorded with a light sensing device. A phototube, a light source, a constant speed drive unit and a dynograph were used for the profile measurements. Each pod and seed was moved through the light beam at a constant speed. Profiles perpendicular (\perp) and parallel (\parallel) to the pod suture or seed cotyledon interface were recorded on chart paper. Typical pod and seed profiles are illustrated in Figures 1 and 2.

To insure that each pod and seed was profiled from the same direction after each chamber exposure period, two sewing needles were placed in each pod or seed--one parallel and the other perpendicular to the suture or cotyledon interface. The pods and seeds were suspended in the light beam by the needles. A V-notch and a side position reference was used to accurately position the pins before each profile was recorded.

Pod and seed weights were determined with an analytical balance.

^{1/} Numbers in parentheses refer to the appended references.

After the last observations, each pod and seed was placed in an oven at 180°F for 3 days for final m.c. and dry weight determination.

Recorder pen deflections that corresponded to the selected dimensional properties (Fig. 1 and 2) were read from the recorder charts for each pod and seed profile. The pen deflections were converted to the actual dimensions of the pod or seed by the calibration constants of the light sensing device. The area of each recorded profile was determined with a planimeter, tabulated and converted to actual projected area by conversion and calibration constants.

Results

Length (L), diameters (A, M and B) and projected area (AR) measurements were selected from the perpendicular and parallel pod profiles (Fig. 1). The converted data from the eight individual pods from each harvest were averaged for the six exposure periods. These average dimensional measurements, pod weight and m.c. are shown in Table 1 for the Va. 61R variety. Similar data are presented in Table 2 for the Florigiant variety.

From these averaged pod data, the percentage of decrease in each of the dimensional properties was computed and plotted (Fig. 3 and 4) for both varieties and each harvest date as a function of the decrease or change in moisture content (for symbols, see Tables 1 and 2). In several instances, the dimensional properties of the pods increased from the initial observation. These unexpected observations occurred primarily in the data for pods of both varieties from the second harvest and for dimensions A, M and B, both parallel and perpendicular. Since all observations are independent and these did not conform to the general trend, they were not plotted in Figures 3 and 4 and were omitted from a regression analysis.

For the regression analysis, the data for both varieties were combined and the linear regression lines (with intercept) were drawn for each dimensional property (Fig. 3 and 4). The regression coefficients and R^2 values for each averaged dimensional property are presented in Table 3. The regression equations are $P = a + b(\Delta M)$ and $P = b(\Delta M)$, where P equals dimensional decrease (percent), ΔM equals the dry basis decrease in pod m.c. (decimal) and a and b are the regression coefficients.

Length (L), maximum diameters (D) and projected area (AR) measurements were selected from the basal and apical seed profiles (Fig. 2). The average dimensional measurements, weight and m.c. of eight Va. 61R basal and apical seeds from each harvest were computed (Table 4). The data were tabulated for chamber exposure periods of 0, 1, 2, 4, 8 and 16 days. Similar data were computed for the Florigiant variety (Table 5).

From these averaged seed data, the percentage of decrease in each of the dimensional measurements was computed and plotted (Fig. 5 and 6) as a function of the decrease or change in m.c. (for symbols, see Tables 4 and 5). The data for both varieties were combined for regression analysis and the linear regression lines (with intercept) were drawn for each dimensional property. The regression coefficients and R^2 values are presented in Table 6 for each averaged dimensional property. The form of the regression equations and units are the same as those for the pods.

Discussion

For the first harvest date, the pods and seeds were immature. On July 27, 1972 pegs which were about to enter the soil surface were field tagged for this study. Due to insufficient development of tagged fruit, tagged pods and seeds could not be used for the second and third harvest dates. Consequently the pods and seeds used in this study did not include the intermediate range of maturity to the extent intended.

As the table averages show, the dimensional values quite often decreased and then increased as chamber exposure time increased. Occasionally this reversal occurred before the sixteenth day of exposure and was more evident in the pod dimensional data. In most instances m.c. continued to decrease. Instrumentation or technique error was considered unlikely to produce a pattern this consistent for three

Table 1. Average pod dimensional data, weight and m.c. for the Va. 61R variety

Chamber Exposure Time (days)	L (mm)	Pod Profile*								Pod Wt. (gm)	Dry Basis M.C. (decimal)
		Perpendicular				Parallel					
		A (mm)	M (mm)	B (mm)	AR (mm ²)	A (mm)	M (mm)	B (mm)	AR (mm ²)		
<u>Harvest Date - 9/12/72 (○)</u>											
0	34.4	15.7	13.0	15.4	418.0	14.5	14.4	15.1	404.6	4.453	2.524
1	33.8	14.6	12.4	15.0	400.9	13.9	13.6	14.3	387.6	3.363	1.669
2	33.6	14.8	12.3	14.8	392.0	13.5	13.7	14.6	371.6	2.582	1.033
4	33.3	14.7	12.1	15.1	391.4	13.3	13.6	14.6	376.7	1.925	0.505
8	33.3	14.5	12.1	14.8	381.0	13.2	13.3	13.9	360.4	1.501	0.166
16	33.6	15.3	12.8	15.7	399.3	14.3	14.2	15.2	388.5	1.425	0.105
<u>Harvest Date - 10/3/72 (□)</u>											
0	33.8	14.6	12.6	13.9	383.4	13.9	14.4	13.1	378.8	3.963	1.202
1	33.5	14.5	12.7	14.1	379.1	13.8	14.4	13.2	374.9	2.911	0.619
2	33.6	14.4	12.7	14.1	377.1	13.7	14.3	13.1	366.6	2.494	0.389
4	33.4	14.6	12.7	13.8	376.5	13.4	13.9	13.2	365.6	2.271	0.267
8	33.3	14.7	13.1	14.5	379.9	13.8	14.4	13.2	369.6	2.215	0.236
16	33.4	14.3	12.8	14.4	374.7	13.6	14.3	13.4	366.7	2.215	0.236
<u>Harvest Date - 10/25/72 (△)</u>											
0	35.8	15.2	12.8	15.0	414.6	14.4	14.1	14.0	409.0	4.290	1.711
1	35.8	15.0	12.6	14.9	409.9	14.1	13.9	13.9	400.2	3.223	1.017
2	35.5	14.7	12.4	14.8	399.3	13.4	13.8	14.2	394.4	2.655	0.631
4	35.4	14.7	12.4	14.9	403.2	13.7	13.5	13.8	390.9	2.294	0.391
8	35.4	15.0	12.6	15.0	406.8	14.1	13.9	14.0	393.4	2.173	0.304
16	35.3	15.0	12.6	15.0	407.4	14.0	13.8	13.9	393.3	2.122	0.266

* For dimensional definitions, see Fig. 1.

Table 2. Average pod dimensional data, weight and m.c. for the Florigiant variety

Chamber Exposure Time (days)	L (mm)	Pod Profile*								Pod Wt. (gm)	Dry Basis M.C. (decimal)
		Perpendicular				Parallel					
		A (mm)	M (mm)	B (mm)	AR (mm ²)	A (mm)	M (mm)	B (mm)	AR (mm ²)		
Harvest Date - 9/12/72 (●)											
0	35.4	14.3	12.4	14.6	408.2	14.3	13.4	14.2	404.6	4.165	2.398
1	34.7	14.3	12.0	14.1	386.1	13.5	12.8	13.6	375.9	2.806	1.279
2	34.7	14.1	11.9	14.3	382.5	13.0	13.1	13.6	372.1	2.113	0.706
4	34.6	14.0	11.8	14.2	377.4	13.1	12.5	13.2	369.8	1.582	0.280
8	34.5	13.7	11.4	13.9	371.5	12.8	12.2	13.2	358.1	1.388	0.117
16	34.9	13.9	11.5	14.0	372.9	12.8	12.2	13.2	355.5	1.368	0.099

Harvest Date - 10/3/72 (■)

0	34.1	13.0	11.5	12.9	349.7	13.6	13.4	13.0	369.8	3.521	1.113
1	33.9	12.9	11.5	13.1	345.8	13.3	13.2	12.5	361.5	2.731	0.635
2	34.1	12.9	11.4	13.2	344.1	13.4	13.3	12.7	362.5	2.325	0.389
4	33.7	12.7	11.3	12.9	337.1	13.2	13.0	12.6	350.5	2.122	0.264
8	33.9	13.2	11.7	13.5	347.5	13.8	13.5	13.2	365.8	2.074	0.236
16	33.8	13.2	11.7	13.2	351.2	13.4	13.3	12.8	361.6	2.074	0.236

Harvest Date - 10/25/72 (▲)

0	33.4	14.0	11.6	14.5	362.6	13.5	12.0	13.9	351.6	3.317	1.176
1	33.3	13.6	11.2	14.1	347.7	13.0	11.5	13.4	335.2	2.554	0.661
2	33.3	13.4	11.2	13.9	348.2	12.8	11.6	13.4	336.0	2.195	0.419
4	33.2	13.7	11.3	14.2	356.4	13.0	11.8	13.6	343.2	1.995	0.290
8	33.2	13.7	11.3	14.2	355.1	13.1	11.7	13.5	342.0	1.953	0.263
16	33.2	13.7	11.3	14.2	351.3	13.1	11.7	13.6	332.9	1.929	0.248

* For dimensional definitions, see Fig. 1.

Table 3. Regression coefficients for Va. 61R and Florigiant peanut pod dimensional properties with change in m.c. [$P = a + b(\Delta M)$ and $P = b(\Delta M)$]

Dimensional* Property (P) (%)	Linear Regression Coefficients			
	With Intercept		R ²	Zero Intercept
	a (%)	b (%/ΔM d.b.)		b (%/ΔM d.b.)
ΔL/L ₀	-0.090	1.135	0.76	1.075
(ΔA/A ₀) _L	0.431	1.697	0.36	1.976
(ΔM/M ₀) _L	0.196	2.457	0.64	2.578
(ΔB/B ₀) _L	0.281	1.372	0.42	1.550
(AR/AR ₀) _L	-0.228	3.234	0.73	3.084
(ΔA/A ₀) _H	0.044	3.526	0.62	3.554
(ΔM/M ₀) _H	-0.095	2.683	0.55	2.620
(ΔB/B ₀) _H	0.177	2.508	0.58	2.623
(ΔAR/AR ₀) _H	-0.022	3.975	0.73	3.960

* For definitions, see Fig. 1.

Table 4. Average seed dimensional data, weight and m.c. for the Va. 61R variety

Chamber Exposure Time (days)	Basal Seed							Apical Seed								
	Profile*						Seed Wt. (gm)	Dry Basis M.G. (decimal)	Profile*						Seed Wt. (gm)	Dry Basis M.G. (decimal)
	Perpendicular			Parallel					Perpendicular			Parallel				
	L (mm)	D (mm)	AR (mm ²)	D (mm)	AR (mm ²)	L (mm)			D (mm)	AR (mm ²)	D (mm)	AR (mm ²)				
<u>Harvest Date - 9/12/72 (○)</u>																
0	19.5	09.8	133.9	09.7	133.6	1.045	1.790	18.5	08.8	123.7	08.5	113.5	0.897	2.843		
1	17.3	08.0	097.2	08.3	099.4	0.635	0.657	16.2	07.1	086.5	07.0	082.0	0.522	0.789		
2	15.8	07.2	076.5	07.3	080.5	0.456	0.179	14.6	05.8	064.2	05.9	061.2	0.347	0.233		
4	15.5	07.0	071.3	06.8	076.0	0.426	0.108	14.3	05.2	057.3	05.3	058.3	0.310	0.116		
8	15.6	06.6	067.5	07.0	073.0	0.418	0.085	14.3	05.4	058.0	05.3	053.7	0.305	0.102		
16	15.9	06.9	066.4	07.0	070.4	0.418	0.083	14.9	05.4	059.8	05.4	058.8	0.303	0.097		
<u>Harvest Date - 10/3/72 (□)</u>																
0	19.0	10.8	137.0	09.5	123.4	1.181	1.263	19.4	10.6	141.3	09.3	126.0	1.175	1.393		
1	17.1	09.8	108.0	08.2	096.1	0.851	0.624	17.2	09.6	112.9	08.4	099.7	0.853	0.700		
2	17.0	09.7	108.3	08.0	094.7	0.802	0.531	17.4	09.3	107.5	08.2	093.0	0.800	0.586		
4	16.8	09.7	106.4	08.1	093.6	0.788	0.505	17.1	09.3	109.1	08.1	094.3	0.784	0.554		
16	17.1	09.9	109.8	08.2	096.4	0.788	0.503	17.3	09.4	109.8	08.2	094.1	0.784	0.556		
<u>Harvest Date - 10/25/72 (Δ)</u>																
0	20.5	11.1	155.3	10.2	150.3	1.312	0.992	19.8	10.6	141.8	09.9	135.8	1.191	1.115		
1	18.9	10.1	128.1	09.3	120.1	1.007	0.532	18.3	09.8	117.6	08.9	111.7	0.921	0.621		
2	18.8	09.9	126.3	09.1	118.1	0.959	0.460	18.1	09.5	115.4	08.6	105.5	0.882	0.553		
4	18.5	10.0	125.1	09.2	117.6	0.941	0.432	17.8	09.9	115.9	08.7	104.8	0.866	0.525		
16	18.6	10.3	126.7	09.4	119.0	0.933	0.421	17.8	10.0	119.2	08.8	108.1	0.861	0.515		

* For dimensional definitions, see Fig. 2.

Table 5. Average seed dimensional data, weight and m.c. for the Florigiant variety

Chamber Exposure Time (days)	Basal Seed							Apical Seed								
	Profile*						Seed Wt. (gm)	Dry Basis M.C. (decimal)	Profile*						Seed Wt. (gm)	Dry Basis M.C. (decimal)
	Perpendicular			Parallel					Perpendicular			Parallel				
	L (mm)	D (mm)	AR (mm ²)	D (mm)	AR (mm ²)	L (mm)			D (mm)	AR (mm ²)	D (mm)	AR (mm ²)				
<u>Harvest Date - 9/12/72 (●)</u>																
0	17.1	09.7	118.5	09.4	110.1	0.913	1.935	18.1	09.1	114.8	09.0	116.6	0.854	2.449		
1	14.1	07.4	069.6	07.2	070.1	0.487	0.380	15.1	06.6	066.3	06.6	070.5	0.417	0.527		
2	13.6	07.0	065.4	06.8	060.7	0.411	0.116	13.9	05.9	059.6	05.9	059.8	0.335	0.142		
4	13.4	06.6	065.5	06.5	061.7	0.397	0.079	13.9	05.9	058.3	05.8	057.2	0.322	0.098		
8	13.4	06.8	061.9	06.6	059.3	0.393	0.071	13.7	05.7	049.8	05.6	054.3	0.319	0.090		
16	15.0	06.7	067.1	06.6	063.5	0.392	0.063	14.1	05.7	056.6	05.6	055.9	0.317	0.080		
<u>Harvest Date - 10/3/72 (■)</u>																
0	18.8	11.1	140.4	09.9	125.1	1.181	1.038	20.8	10.0	144.1	08.8	125.9	1.134	1.045		
1	17.2	10.2	116.6	09.0	105.0	0.909	0.565	18.7	08.9	117.1	08.0	107.0	0.870	0.570		
2	17.1	10.1	114.7	08.9	100.3	0.861	0.482	18.9	09.0	117.0	08.0	106.3	0.830	0.498		
4	17.3	10.0	114.9	08.7	095.3	0.846	0.457	18.8	08.9	115.8	07.8	103.0	0.819	0.478		
16	17.1	10.4	117.1	08.9	101.8	0.845	0.455	18.8	09.1	117.6	07.9	102.8	0.819	0.478		
<u>Harvest Date - 10/25/72 (▲)</u>																
0	19.7	11.0	148.7	10.4	138.9	1.196	1.204	20.7	10.5	150.1	08.8	128.0	1.100	1.551		
1	18.0	09.7	117.5	08.8	108.5	0.897	0.645	18.7	09.1	114.4	07.5	096.8	0.789	0.797		
2	17.8	09.8	114.9	08.7	103.0	0.840	0.540	18.0	08.8	110.0	07.2	090.0	0.734	0.665		
4	17.9	09.8	117.5	08.6	103.1	0.823	0.510	18.0	08.9	111.0	07.2	090.3	0.721	0.636		
16	17.5	09.7	114.4	08.4	100.6	0.816	0.496	18.1	08.8	108.9	07.0	089.2	0.714	0.620		

* For dimensional definitions, see Fig. 2.

harvest dates. This pattern was also evident in data not included in this report.

Pod moisture loss with chamber exposure time appeared typical. Seed moisture loss was more rapid than expected for the chamber conditions. For pods m.c. decreased by one-half in approximately 1-1/2 days and for seeds in less than 1/2 day. The insertion of two pins in each seed probably contributed to the accelerated drying rate.

Dimensional changes relative to m.c. changes was considered the best way to present the data reported in this study, although many other relationships were examined graphically. For example, the dimensional data and moisture content data were examined as a function of chamber exposure time. These relationships contain constant and falling rate phases which are inherently more complicated mathematical expressions. Although many other possible relationships exist in these data, some deviate from the intended objective of this study. The average data were presented in Tables 1, 2, 4 and 5 for those who may wish to examine the other relationships.

The relationships presented were determined from data collected during one harvest season. They represent the average change in dimensional properties of a limited number of pods and seeds. Individual pod or seed changes may depart significantly from the average. With caution, the relationships may be used as a guide for estimating dimensional changes.

As an example of the potential use of these relationships, the diameter of seeds at various m.c. was computed for 15/64, 18/64 and 21.5/64 inch diameter seeds at a m.c. of 6% w.b. m.c. (Table 7). These values were computed using the equation $(\Delta D/D_0)_d = 16.44 (\Delta M_d.b.)$. (Note that $(\Delta D/D_0)$ is percent dimensional decrease based on the dimension at the highest m.c.) The equation indicates a 0.77 percentage decrease in this dimensional property when seed moisture content decreases from 10 to 6% w.b. (11.1 to 6.4% d.b.). According to these results, seeds that ride a 21.5/64 inch screen at 6% m.c. should ride a 21.7/64 inch screen at 10% m.c. These results also indicate that seed dried to 6% m.c. should ride a 21.3/64 inch screen if they rode a 21.5/64 inch screen at 10% m.c.

In conclusion, the results indicated pod and seed size decreased as m.c. decreased. Some exceptions to this were observed. Pod dimensional changes were more variable than seed dimensional changes and not as well correlated to m.c. change. Basal seeds were usually larger than apical seeds. Although based on a larger seed size, the percentage of dimensional change with m.c. change was greater for the basal than for the apical seed.

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Table 6. Regression coefficients for averaged Va. 61R and Florigiant peanut seed dimensional properties with change in m.c. [$P = a + b(\Delta M)$ and $P = b(\Delta M)$]

Dimensional* Property (P) (%)	Linear Regression Coefficients							
	Basal Seed				Apical Seed			
	With Intercept		R ²	Zero Intercept	With Intercept		R ²	Zero Intercept
	a	b		b	a	b		b
	(%)	(%/ΔM d.b.)		(%/ΔM d.b.)	(%)	(%/ΔM d.b.)		(%/ΔM d.b.)
ΔL/L ₀	2.03	10.07	0.90	11.62	3.46	7.50	0.87	09.32
(ΔD/D ₀) _L	-0.37	16.73	0.98	16.44	0.83	14.04	0.96	14.48
(ΔAR/AR ₀) _L	2.86	24.92	0.97	27.10	5.58	18.25	0.94	21.18
(ΔD/D ₀) _H	1.98	15.31	0.94	16.82	2.36	13.08	0.93	14.31
(ΔAR/AR ₀) _H	5.10	22.77	0.93	26.67	6.90	17.27	0.90	20.89

* For dimensional definitions, see Fig. 2.

Table 7. Estimated maximum seed diameter (64ths of an inch) with m.c. for selected sizes of Va. 61R or Florigiant peanut seeds at 6% w.b. m.c.

M.C. % w.b.	Seed Size at 6% w.b. M.C.		
	15/64	18/64	21.5/64
8	15.1	18.1	21.6
10	15.1	18.1	21.7
15	15.3	18.3	21.9
20	15.5	18.6	22.2
30	16.0	19.1	22.9
40	16.6	20.0	23.9
50	17.7	21.3	25.4

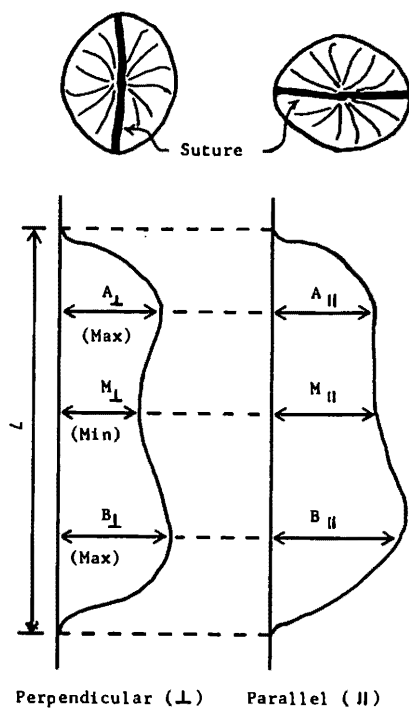


Figure 1. Typical pod profiles and selected dimensions.

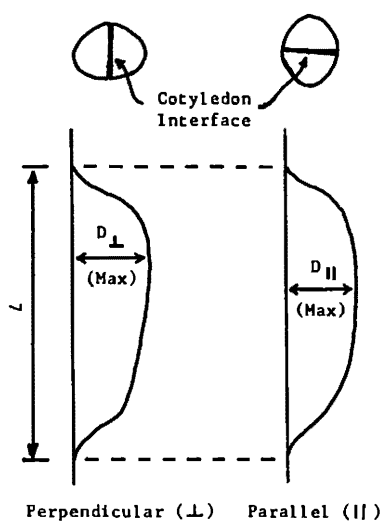


Figure 2. Typical seed profiles and selected dimensions.

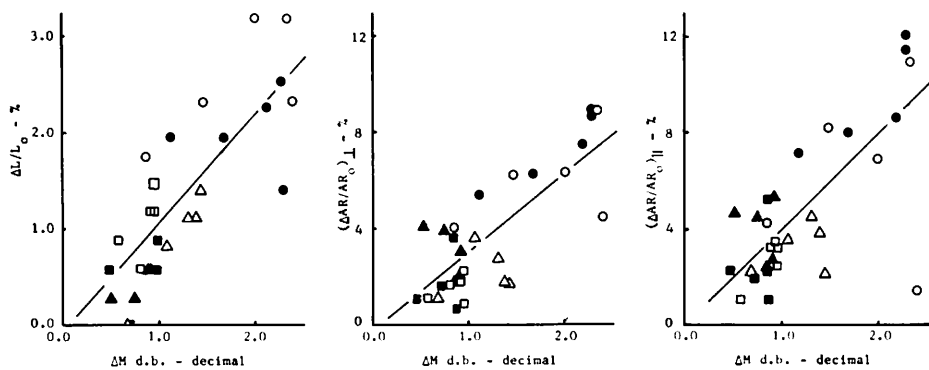


Figure 3. Pod length and projected area changes with change in moisture content.

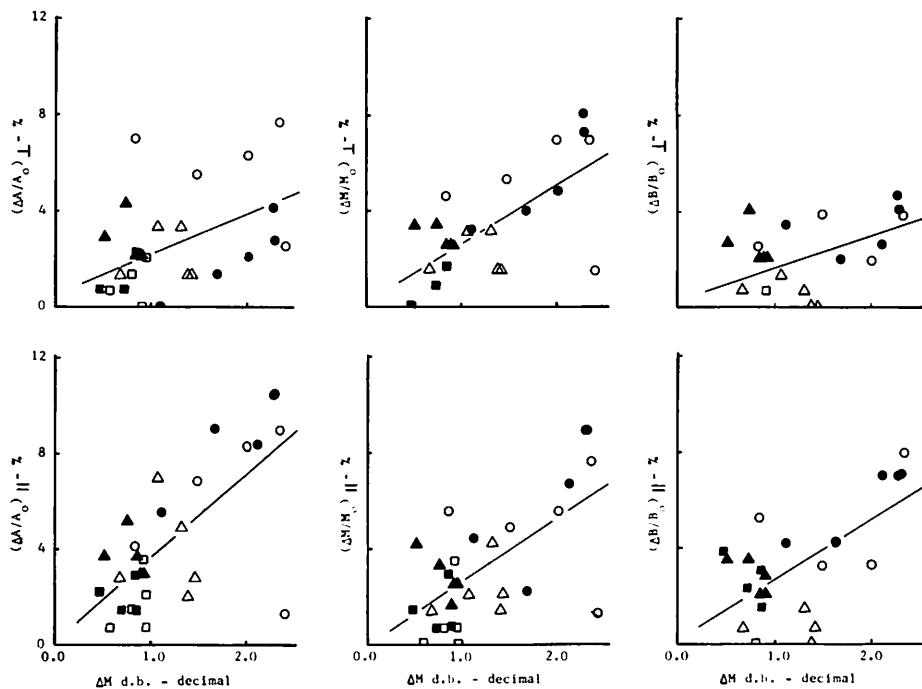


Figure 4. Pod diameter changes with change in moisture content.

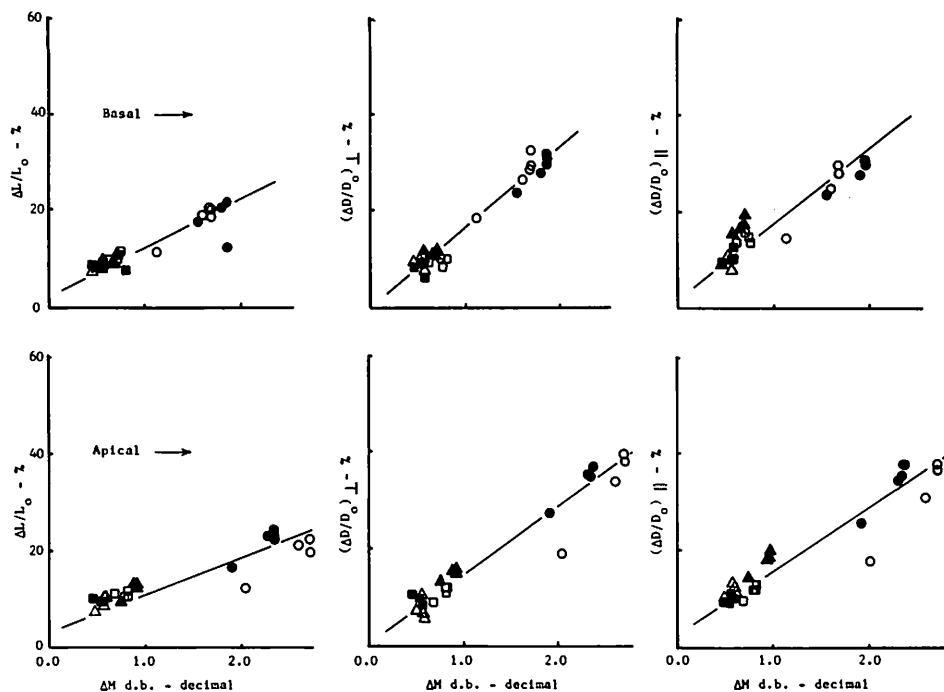


Figure 5. Seed length and maximum diameter changes with change in moisture content.

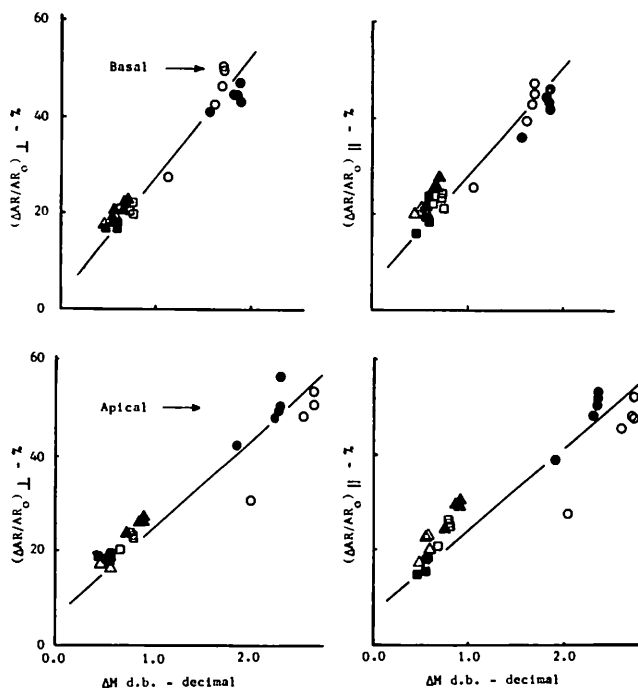


Figure 6. Seed projected area changes with change in moisture content.

COMPARISONS OF LOW TEMPERATURE WITH COMMERCIAL CURING OF PEANUTS

by

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ABSTRACT

Fourteen wagon load comparisons were run at five commercial curing plants located in Oklahoma and Texas. Low temperature curing conditions were controlled to less than 35°C (95°F) and greater than 50% R.H. Low temperature curing resulted in a 3% decrease in sound splits (significant), a 3% increase in sound mature kernels (significant), and no change in grade. A second grading of samples taken in four tests indicated a continued increase in sound splits for commercially cured peanuts as moisture moved from kernels to hulls.

INTRODUCTION

Most farmers' stock peanuts grown in the Southwest are bulk cured at commercial curing plants. Curing units commonly include high capacity heaters. Plenum temperatures are limited to 35°C (95°F) by high-limit thermostats. Most curing units add heat at a constant rate, though modulating valves are used with some gas-fired units to maintain 35°C plenum temperature over a range of outside temperature. At night the heaters may add 20°C or more of heat to the curing air, sometimes driving relative humidity below 20 percent. These curing units achieve rapid moisture removal, particularly during night hours, but are suspect in their effect on quality.

Dickens and Pattee (1972) give a comprehensive review and bibliography of the effects of current drying practices on final product quality. They report rapid removal of moisture and curing temperatures above 35-38°C seem to be the most important factors associated with loss of quality and impairment of flavor. Use of a humidistat set for the addition of heat only when outside relative humidity exceeds 65 or 70 percent has been proposed. However, attempts to control relative humidity by using a humidistat in the heated air stream in conjunction with an off-on type heater have not proven satisfactory.

Adding 1°C of heat will lower relative humidity about 2.2 to 3.6 percent in the normal range of outside air conditions during harvest. It is possible to affect reasonable control of relative humidity if heater output and air flow rate are known. For example, a heater capable of adding 8.3°C will lower relative humidity by 20 to 30 percent. If curing relative humidities below 50 percent are to be avoided, a humidistat may operate the heater only when outside relative humidity exceeds 75 percent. If the humidistat is used in series with a high-limit thermostat set at 35°C, both rapid curing and high curing temperatures could be avoided.

The research reported here was undertaken to compare low temperature curing with commercial curing as it is currently practiced.

MATERIALS AND METHODS

Curing units consisted of 7½ Hp fan, 41 kilowatt electric resistance heater, plenum for attaching two wagon loads of peanuts and thermostat and humidistat wired in series. The heater provided an 8.3°C (15°F) temperature rise for fan delivery at 2.0 inches of static pressure. Controls were mounted on the power pole adjacent to the curing unit and shielded from rain and sun. The high-limit thermostat was set at 26.7°C (80°F) and the low limit humidistat at 80 percent.

Each test involved two loads of freshly combined peanuts obtained from the same field by alternating dumps from the combine hopper. One load was delivered to the commercial curing plant and the other was cured using a low temperature unit as described above. Each curing unit was served by a kilowatt-hour meter. After curing, grades of the two loads were compared.

A total of 14 tests were run, making comparisons with commercial curing as practiced at five different plants. In four tests, additional samples were reserved during grading for a later second grading and in two tests samples were drawn after curing for taste-panel flavor studies.

RESULTS AND DISCUSSION

Table 1 lists grade differences determined in the tests. Only the differences in sound mature kernels and sound splits are statistically significant at the .01 level using the one-tail t statistic and paired comparisons.

Mean curing time was 33.2 hours for commercial curing and 66.3 hours for low temperature curing. Mean power use for low temperature curing was 572 kilowatt-hours. Considering all tests, the mean load contained approximately 5 tons when wet and 4 tons after curing. On this basis the mean power use was 114 kilowatt-hours per wet ton.

Table 2 shows the effect of time of grading on the difference in sound splits resulting from the two drying methods. In the four tests in which samples were graded twice, a mean difference of 2 percent in sound splits was determined immediately after curing. After the time intervals indicated in Table 2, the mean difference in sound splits had increased to 3.25 percent. While these results are not statistically significant, they may indicate the difference in sound splits will increase in storage. Percentage sound splits have been shown to be a function of kernel moisture content. The results given in Table 2 may be due to greater migration of moisture from kernels to hulls for the more rapidly cured peanuts after curing was completed. Further studies in this area appear justified.

Table 1. Grade differences between low temperature and commercial curing

Test	Curing Plant	Initial Moisture % w.b.	Sound Mature Kernels %	USDA Grade Factors ¹			Total Kernels %	Loose Shelled Kernels %
				Sound Splits %	Grade %	Other Kernels %		
1	A	20	2	-4	-2	-1	-2	2
2	B	30	-1	-1	-2	1	-2	3
3	C	14	0	-3	-3	1	-2	0
4	A	23	2	0	2	-1	1	0
5	A	21	2	-2	0	0	1	1
6	D	20	3	-2	1	-2	-1	0
7	E	25	7	-6	1	-1	0	2
8	E	19	11	-11	0	0	0	0
9	E	26	4	-3	1	0	1	0
10	E	20	3	-1	2	0	2	1
11	E	18	-1	-2	-3	0	-3	0
12	E	26	6	-6	0	-1	-1	0
13	E	13	3	-3	0	0	0	0
14	E	16	0	-2	-2	-1	-3	-1
Mean difference =				2.93*	-3.29*	-0.36	0.36	-0.64
							0.57	

¹ All values are the grade factor of low temperature curing minus the grade factor of commercial curing.

*Statistically significant at the .01 level.

Table 2. Effect of time of grading on sound splits

Test	Curing Plant	Sound Splits						
		First Grading ¹			Time Lag	Second Grading		
		Low Temp. %	Com. %	Diff. %		Low Temp. %	Com. %	Diff. %
1	A	2	6	-4	11 days	4	11	-7
4	A	3	3	0	8 days	3	4	-1
5	A	1	3	-2	4 days	1	4	-3
6	D	2	4	-2	2 days	2	4	-2
Mean difference =								-2.00
								-3.25

¹First grading occurred immediately after curing.

Samples were drawn in tests 5 and 6 for taste-panel flavor studies. The panel was unable to detect any flavor differences between the samples in these tests.

A 7½ Hp motor operating at full load for 66 hours may be expected to consume 450 to 500 kilowatt-hours of energy. Since mean power use for low temperature curing was 572 kilowatt-hours, it is apparent that the heaters operated only a few hours. The chief disadvantage of low temperature drying is the longer time required. Relative humidities rarely exceed 80 percent during harvest. An 8.3°C temperature rise causes a large reduction in relative humidity.

Lower capacity heaters, heaters with automatic staging controls, or low capacity gas-fired heaters with humidistatically controlled modulating valves might be used to reduce curing time somewhat while maintaining quality. Table 3 gives suggested outside air control settings for various temperature rises used for curing peanuts.

Table 3. Suggested outside air control settings for various temperature rises

Temperature Rise °C	Thermostat Setting, high limit °C	Humidistat Setting, low limit %
2	33	57
4	31	63
6	29	69
8	27	75

ACKNOWLEDGEMENTS

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DEVELOPMENT OF A FIELD MODEL PEANUT SALVAGER
by
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Introduction

Peanut harvesting begins with the digging operation that uproots the plants, conveys them upward and rearward to separate soil, and discharges them into a wind-row. Field losses at digging consist of detached peanuts, those that shed from the plants before they are dug, and those separated from the plants by the digger.

Peanut digging investigations were conducted at the Tidewater Research and Continuing Education Center (TRACEC), Suffolk, Virginia, to determine the magnitude of losses from a conventional peanut digger and to find a method for reducing losses.

The initial study of conventional digger losses was made in 1967, 1968, and 1969. The 3-year averages of the digger losses plus combine header pickup losses for the three digging dates at 2-week intervals were 356, 667, and 1,229 lb/a, representing about 10, 16, and 28 percent of the total yield (1).

No conventional peanut digger will save any of the detached peanuts. If they are to be saved, they must be picked up and sifted from the soil.

1970 Model Peanut Digger-Salvager

In 1970 a machine was designed and constructed to dig two peanut rows and to salvage detached peanuts in one operation. A description of this peanut digger-salvager and results from its operation and that of a conventional peanut digger for the years 1970 and 1971 are described in previous publications (2, 3).

1973 Model Peanut Digger-Salvager

Construction of an improved two-row peanut digger-salvager was begun in 1972 and completed in 1973. The 1973 model was equipped with: (1) conventional peanut digger blades to uproot the plants, (2) flexible wire mesh belts for conveying materials through the machine and for separating soil from the detached peanuts, and (3) conveyors to collect and elevate detached peanuts to a bagging attachment.

Acknowledgments: Appreciation is expressed to the following cooperators.

1. Dr. C. Y. Kramer, Dept. of Statistics, Virginia Polytechnic Institute and State University, Blacksburg, Va., for analysis of yield data.
2. Mr. C. E. Holland and staff, Federal-State Inspection Service, Suffolk, Va., for determining farmers' stock grade.
3. Messrs. H. L. Smith and W. E. Walls, Virginia Department of Agriculture, Richmond, Va., for making germination studies.
4. Commercial equipment manufacturer, for loan of a peanut digger-inverter.
5. Commercial sheller for pricing farmers' stock grade peanuts.
6. Commercial laboratory for CLER flavor evaluations.
7. Messrs. C. E. Holaday and J. Pearson, National Peanut Research Laboratory, Dawson, Ga., for determinations of mold, aflatoxin, rancidity, and fat acidity.

Operation of the 1973 model peanut digger-salvager is as follows:

Two peanut rows spaced 36 inches apart are uprooted by the digger blades. The plants, with peanuts attached and with some soil containing detached peanuts, are lifted and conveyed upward and rearward and discharged from the upper end of the inclined conveyor. They are then transferred over two conveyors and dropped onto the ground in a random windrow. The detached peanuts and soil are transferred over three wire mesh conveyors to separate soil from the peanuts. A fourth conveyor transfers the detached peanuts to one side of the machine where, at the discharge end of the conveyor, air from a suction fan lifts out lightweight foreign material.

The detached peanuts are then elevated on a belt conveyor and collected in a bag. This model recovers from each peanut row the detached peanuts that are contained within a band of soil approximately 18 inches wide by 2-1/2 to 3-1/2 inches deep. A photograph and cross-sectional view of the 1973 model peanut digger-salvager are shown in Figures 1 and 2, respectively.

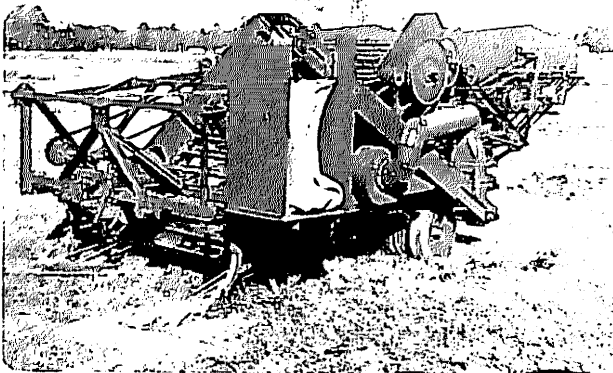


Figure 1. Left side view of USDA 1973 model peanut digger-salvager.

Peanut Digging Tests = 1973

Three cultivars of peanuts were grown in 1973 in a loamy fine sand for test purposes--Va. 61R and Florigiant, both of which are runner types, and NC-17, which is a bunch type. Each plot consisted of two 36-inch-spaced rows that were 50.8 feet long, with three replications. One-half of each cultivar was dug with a conventional digger and the other half with the 1973 model USDA digger-salvager. Digging dates were September 20 and October 1, 18, and 25.

Peanut-plot yield data were acquired from each digger type, cultivar, and digging date. Peanut plants dug with both digger types were left in a windrow 4 to 6 days after digging, and then the peanuts were harvested from the plants with a peanut combine. Thirty-six plots were dug with the conventional digger and 36 with the digger-salvager. For those dug with the conventional digger, the plot yield consisted only of the peanuts harvested from the plants with a peanut combine. For those dug with the digger-salvager, the plot yield consisted of: (1) The detached peanuts that were salvaged while digging the plants with the digger-salvager plus (2) those that were harvested from the plants with the peanut combine. Peanuts from both harvesting methods were artificially cured to approximately 8 percent moisture before they were weighed and graded. Yield data results are summarized in Table 1.

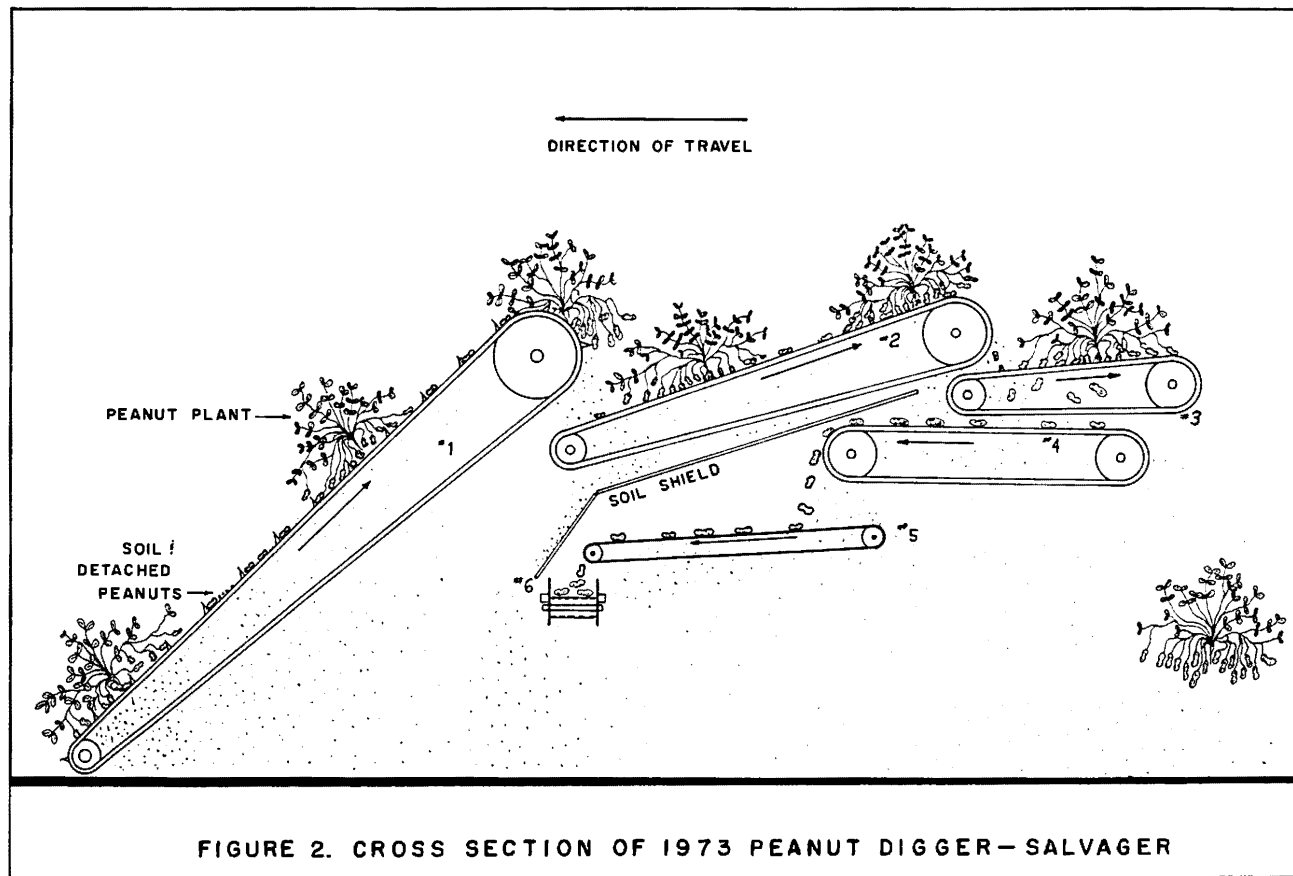


Table 1. Conventional peanut digger vine yield vs. USDA peanut digger-salvager vine and salvage yield, lb/a. Suffolk, Va. 1973

USDA Digger-Salvager					
	Conventional digger	Salvage yield while digging	Vine ^{1/} yield	Salvage yield plus vine yield	Yield increase over conventional
Digging Date	Vine ^{1/} yield				
<u>Va. 61R</u>					
Sept 20	2875	228	2786	3014	+139
Oct 1	2871	376	3065	3441	+570
Oct 18	2048	1265	1680	2945	+897
Oct 25	1858	1412	1755	3167	+1309
Av	2413	820	2321	3141	+728
<u>Florigiant</u>					
Sept 20	3212	125	3213	3338	+126
Oct 1	3202	169	3191	3360	+158
Oct 18	2885	699	2969	3668	+783
Oct 25	2610	998	2737	3735	+1125
Av	2977	497	3027	3525	+548
<u>NC-17</u>					
Sept 20	3553	208	3466	3674	+121
Oct 1	3289	210	3827	4037	+748
Oct 18	3533	826	2952	3778	+245
Oct 25	3091	1000	2824	3824	+733
Av	3366	561	3267	3828	+461
<hr/>					
Overall average	2918	626	2871	3498	+579

^{1/} Vine yield = quantity of peanuts harvested from the vines with a combine.

The peanut yield recovered with the digger-salvager (the detached peanuts salvaged while digging the plants, plus the combine harvested peanuts) was greater than that recovered with the combine only, after the plants were dug with the conventional digger. Tabular data show the quantity of detached peanuts for each cultivar and digging date. Those collected while digging on September 20 ranged between 125 and 228 lb/a. The quantity from late digging (October 25) ranged between 998 and 1,412 lb/a. A comparison of the averages for the four digging dates and the three cultivars shows that the use of the digger-salvager provided an average yield increase of 728 lb/a with the Va. 61R cultivar, 548 lb/a with the Florigiant cultivar, and 461 lb/a with the NC-17 cultivar, for an overall average increase of 579 lb/a. Statistical analysis of data from the September 20 and October 1 digging dates showed no significant yield difference between the results from the two digger types. A significant yield difference occurred at the 0.05 level of probability between the results from the two digger types for the October 18 digging date; and a highly significant difference occurred at the 0.01 level of probability, between the results from the two digger types for the October 25 digging date. In both instances, the difference favored the digger-salvager. An analysis of the combined results from the four digging dates and three cultivars showed a highly significant yield difference at the 0.01 level of probability between the results from the two digger types.

Peanut Quality

The detached peanuts were evaluated to determine their quality and to compare it with that of the combine-harvested peanuts. A total of 108 plot samples were collected. In order to minimize the number of samples to be analyzed for peanut quality, composite samples were made up from the harvested peanuts recovered by each of the two harvesting systems. Each composite represented a combination of one of the four digging dates and one of the three cultivars, and consisted of three replicated samples. Thus, there were 12 composite samples of the salvaged peanuts and 12 composite samples of the combine-harvested peanuts. Peanut quality results shown below are summaries; none of these data were statistically analyzed. All samples delivered for quality analysis, except those used to determine farmers' stock grade and price, were shelled with the Federal-State Inspection Service sheller. Those used to determine farmers' stock grade and price were delivered in the shell.

Farmers' stock grade: The percentage of fancy peanuts in the detached samples exceeded that in the combine-harvested samples for each cultivar. However, other grade factors and price per pound were not appreciably different.

Germination, CLER score, and iodine values: Values from analyses for germination, CLER score, and iodine values are summarized in Table 2.

Table 2. Peanut germination, CLER score, and iodine values, Suffolk, Va. 1973

Harvesting method and analysis	Cultivar		
	Va. 61R	Florigiant	NC-17
Combine:			
Germination, %	71.2	74.2	82.5
CLER score	22.3	26.2	40.7
Iodine value	98.0	96.5	100.3
Digger-salvager:			
Germination, %	97.0	94.7	95.5
CLER score	23.2	14.7	27.0
Iodine value	97.1	96.7	100.3

Molds, rancidity, and fat acidity: No appreciable differences in molds, rancidity, and fat acidity occurred between the detached samples and the combine-harvested samples.

Aflatoxin contamination: Two of the Va. 61R combine-harvested samples were negative and two were contaminated--one with 25 ppb and the other with 20 ppb. All four of the Va. 61R salvaged samples were negative. All Florigiant combine-harvested and salvaged samples (a total of eight) were negative. Two of the NC-17 combine-harvested samples were negative and two were contaminated--one with 15 ppb and the other with 18 ppb. Three of the salvaged samples were negative, and one was contaminated with 10 ppb.

Peanut Digger-Salvager Tests on a Peanut Grower's Farm

On October 17 and November 19, detached peanuts were recovered with the digger-salvager from a peanut grower's field after the plants were dug and combined. Peanut vines were removed from the soil surface with a side delivery rake ahead of the salvaging operation. The soil type was Sassafra fine sand and was effectively separated from the peanuts while the machine traveled at an average ground speed of 137 ft/min. The quantity of detached peanuts averaged 487 lb/a. Their value was established at 15 cents/lb, germination at 95.5 percent, their CLER

score at 26.5, and their iodine value at 97.0.

Summary and Conclusions

Farm machinery research was conducted to determine peanut recovery yield from a conventional peanut digger and to develop equipment to minimize peanut field losses. A field machine was developed that combines the digging and the salvaging of detached peanuts into one operation. Under the conditions of this study, the recovery yield from using the digger-salvager (detached peanuts plus combine-harvested peanuts) was an average of 579 lb/a more than that from using the conventional digger plus combine harvesting. The peanut digger-salvager may be used to save detached peanuts at the time of digging or to recover detached peanuts from the field after the crop has been dug and combined with conventional equipment. The digger-salvager may be operated at a ground speed of 100 to 175 ft/min under favorable soil conditions.

The 1973 model digger-salvager operates satisfactorily in well drained fine sand soils, but collects an excessive quantity of soil when it is operated in wet soil or loamy fine sand. The quality of the detached peanuts continues to look good.

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EFFECT OF FUNGICIDES AND INSECTICIDES ON
SPIDER MITE BUILDUP AND SUPPRESSION ON PEANUTS

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ABSTRACT

Insecticides, miticides, fungicides, and combinations of fungicides and insecticides were evaluated in field experiments for effect on buildup and suppression of the two-spotted spider mite Tetranychus urticae Koch on peanuts.

The miticides Carzol, Plictran, Omite, Monitor, and Chlordimeform were more effective than Azodrin (monocrotophos) for control of the two-spotted spider mite.

The fungicides Du-Ter and Du-Ter Sulfur suppressed mites while mites increased on peanuts treated with other fungicides or insecticides. Mite outbreaks occurred when insecticides were used in combination with fungicides.

Mite populations failed to develop on peanuts that were not treated with pesticides following repeated releases of mites. These data suggest mite outbreaks are due to the interaction effect of pesticides on beneficial organisms that normally hold mites in check.

DOSAGE-MORTALITY RESPONSE OF THE SOUTHERN CORN
ROOTWORM TO SEVERAL INSECTICIDES IN VIRGINIA

by
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ABSTRACT

Cyclodiene-resistant southern corn rootworm adults were laboratory reared and subjected to topical applications of the insecticides, aldrin, diazinon, phorate, parathion, carbofuran, Landrin[®], and Dyfonate[®]. LD₅₀ values in micrograms of insecticide per insect in descending order of toxicity to mixed-sex populations were: carbofuran .0738, parathion .1413, phorate .4807, diazinon .7431, Landrin 1.0305, Dyfonate 1.4886, and aldrin 6.8306. The smaller size of adult males treated with diazinon was reflected in the LD₅₀ of .3386 compared to 1.0358 for females. Selection of survivors of the diazinon treatment at the 50% mortality level has shown no increase in resistance in 21 generations.

EVALUATION OF MULTIPLE PEST CONTROL ON PEANUTS TREATED
WITH SYSTEMIC AND NONSYSTEMIC CHEMICALS

by
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ABSTRACT

Carbofuran, Nemacur[®], disulfoton, oxamyl, fensulfothion, AC 64,475, and AC 64,475 plus phorate consistently controlled thrips on peanuts. Damage by lesser cornstalk borers was not reduced by any treatment. Carbofuran gave complete control of

leafhoppers in one experiment while no other material significantly controlled them. None of the materials tested were effective against corn earworm or rednecked peanutworm. All chemicals gave some measure of nematode control. Significant nematode control usually resulted in increased yields.

PEANUT PEST MANAGEMENT RESEARCH

by

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ABSTRACT

Results of pest management studies on control of peanut insects indicated no significant differences in yield of treated and non-treated spanish peanuts. All treatments, including insecticides alone, fungicides alone and combinations of these pesticides gave significant yield increases above the check in runner-type peanuts. In the Virginia-type (Florigiant), significant yield increases were obtained by combinations of insecticides and fungicides, and by each alone. The insecticide-only treatment, while significantly higher than the check, was significantly lower than the pesticide combinations and the fungicide-only treatment.

VARIABILITY OF AFLATOXIN TEST RESULTS

by

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ABSTRACT

Using 12-pound samples, 280-g subsamples, the Waliking method of analysis, and densitometric procedures, the sampling, subsampling, and analytical variances associated with aflatoxin test procedures were estimated. Regression analysis indicated that each of the above variance components is a function of the concentration of aflatoxin in the population being tested. Results, for the test procedures given above, showed that sampling constitutes the greatest single source of error, followed by subsampling and analysis. Functional relationships are presented to determine the sampling, subsampling, and analytical variance for any size sample, subsample, and number of analyses.

LOW AFLATOXIN LEVELS IN WINDROWED PEANUTS AND POPULATION CHANGES OF THE *ASPERGILLUS FLAVUS* GROUP IN SOIL, PODS AND KERNELS BEFORE AND AFTER HARVEST

by

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ABSTRACT

Soil population levels of the *Aspergillus flavus* group gradually increased in 2 peanut fields during the 1973 growing season. The population levels were monitored on M3S1B medium using a soil dilution technique. The medium was prepared as described by Griffin and Garren, (Phytopathology 64:322, 1974). In one field, populations

increased from approximately 50 propagules/gm of dry soil in June to about 225 propagules/gm in October; In another field the increase was from 10 in June to 25 in October. Less than 0.1% of the peanut kernels in windrows contained A. flavus when collected daily from digging to combining (0-7 days). However, the day after combining and drying to 10-12% moisture A. flavus was recovered from 15-25% of the kernels. Recovery of A. flavus from pods by washing with sterile water demonstrated that there were enough propagules on the pod surface to allow this infestation. The numbers of propagules on the surface did not increase from digging to combining in either field. Even though there was a low A. flavus kernel infection at harvest, from 2 to 15 ppb aflatoxins were recovered from 21 of the 37 samples collected from digging to combining (0-7 days). The aflatoxins must have been produced by early infestations by the A. flavus group that did not persist or were not isolated by our technique. This is an area that needs further study before definite conclusions can be made.

AN IMPROVED MILLICOLUMN PROCEDURE FOR DETECTING AFLATOXIN IN PEANUT BUTTER AND OTHER AGRICULTURAL COMMODITIES

by

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ABSTRACT

An improved procedure for detecting aflatoxin in peanut butter and other agricultural commodities has been developed. Heretofore, considerable difficulty was encountered using the millicolumn on peanut butter. This new procedure overcomes the difficulty by using alumina and florisil as packing materials in the column and by salting out highly fluorescent pigments in the extract before it is placed on the column. Time for an analysis is about 8 - 9 minutes. Sensitivity as low as 2 - 3 ppb is possible.

BIOELECTRICAL DISCHARGE PATTERNS OF MOLD AND AFLATOXIN DAMAGED PEANUT KERNELS

by

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ABSTRACT

Bioelectrical discharge patterns from peanut kernels with varying degrees of mold damage appear to be related to damage severity. Excitation voltage of low amperage was generated by an oscillator coupled to a capacitor discharge system. The output voltage was applied across each kernel and film placed below the kernels to record the discharge pattern. Differences in the emission patterns from kernels with specific types of damage were recorded on color film as a result of an excitation of different chromophores within the film emulsion. Emissions appeared to be more intense at intermediate stages of kernel decay. Intensity of the emissions and the color spectrum recorded on film appears to reveal differences in the bioelectrical properties of each kernel. Attempts to interpret the patterns observed suggest that they may be related to vital energy forces associated with biochemical processes which have and are occurring within the tissues.

FUNGAL FERMENTATION OF PEANUT MEAL: ELECTROPHORETIC AND
COMPOSITIONAL ANALYSES OF PROTEINS AND QUANTITATION
OF INTESTINAL GAS-FORMING OLIGOSACCHARIDES

by

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ABSTRACT

Increased world population has created a demand for high quality non-animal protein sources for staple and supplement foods. Ideally, such foods would exhibit unique functional properties and be free of toxic or other antimetabolic constituents, in addition to having high nutritional value.

With these objectives in mind, a study was designed to evaluate changes in composition and solubility of amino acids and protein as a result of fungal fermentation of partially defatted Florunner peanut meal. Neurospora sitophila and Rhizopus oligosporus, the two fungi which are used in the preparation of fermented peanut press cake (ontjom) in Indonesia, were of greatest interest in the study. In addition, Aspergillus niger, Aspergillus oryzae, Rhizopus arrhizus, Rhizopus delemar, Monascus purpureus, Mucor hiemalis and Actinomyces elegans were also included in the investigation. Analyses were made on peanut meal after fermentation at 29°C for various lengths of time ranging to 98 hours. Evaluation of qualitative changes in proteins solubilized from fermented peanut meal was accomplished by gel electrophoretic techniques. During fermentation the large molecular weight globulins observed in the gel patterns of untreated samples were denatured to insoluble forms or decomposed to smaller components. The extent of peptone formation in the final product varied according to the fungal strain used for fermentation. Total amino acid composition was unchanged, however free amino acids increased significantly during fermentation. Fungal strains varied greatly with respect to their ability to degrade peanut proteins to free amino acids.

Raffinose and stachyose, two oligosaccharides partially responsible for gastrointestinal distress and flatulence in man, were quantitated along with sucrose in unfermented and fermented peanut meal. Trimethylsilyl ethers were derived from sugar extracts and analyzed by gas liquid chromatography, using gentiobiose as an internal standard. Five fungal strains, including N. sitophila, decreased the raffinose and stachyose content during the fermentation process. R. oligosporus and three other strains did not utilize these sugars or utilized them only slowly.

COST ESTIMATES FOR AQUEOUS PROCESSING OF PEANUTS FOR THE
PRODUCTION OF FOOD GRADE PROTEIN CONCENTRATES AND OIL

by

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ABSTRACT

Cost estimates for the construction and operation of a small scale aqueous processing plant designed for the production of food grade peanut protein concentrates and oil were made. The estimates were based on material balance data from over 30 pilot plant trials, equipment specifications and their current costs, working capital and necessary local costs which include election of building and utilities connections. Operating costs consisted of the current prices of raw

material and packaging materials, full plant costs which include direct and indirect plant costs, and overhead and administration. The possible selling price of protein product was calculated from the sales revenue obtained from operating costs.

In making this economic analysis, several assumptions were made. They are: 1) the plant would operate 24 hours per day for 250 days per year; 2) the plant capacity is fixed to process 25 metric tons of raw material per day or 6,250 metric tons per year; 3) the oil content of raw material is 47.5% and the protein 27.5%; 4) the recovery of oil as free oil and protein as concentrate is 90% each; and 5) the protein content of the concentrate is 70% on a moisture free basis. Under these assumptions, this size of plant would produce 2,813 metric tons of oil and 2,575 metric tons of protein concentrates annually.

It is estimated that total plant costs would be \$1,050,800. This estimates consisted of \$230,300 of major equipment costs, \$60,500 of other supporting equipment and \$760,000 of local costs. In estimating the total capital required to construct and operate a plant, another category of costs is involved in addition to plant cost itself. This is the working capital and amounts to \$560,000. Items included in the working capital are: 1) one month's supply of raw material which costs \$233,408; 2) cost of one month's oil receivables which amounts to \$157,248; 3) cost of one month's protein receivables in the amount of \$144,480; and 4) cost for supplies, packing materials and spare parts which costs \$20,000. This gives the total capital requirement of approximately 1.6 million dollars.

In order to estimate the selling price of protein concentrate information regarding the total operating cost of the plant is needed. Items included in this category are: 1) 2.8 million dollars of raw material; 2) \$28,840 of packaging materials; 3) \$487,005 of full plant costs which consists of \$216,600 of indirect plant costs and \$270,405 of direct plant costs; and 4) \$361,016 of overhead and administration expenses. This gives the overall operating costs of \$3,676,861.

Theoretically, total operating costs or total expenses should be equal to or less than total sales revenue to make calculated profits and to stay in business. Since the sale of 2,813 metric tons of oil at a price of \$672 per metric tons would yield a revenue of \$1,890,336 annually, 2,575 metric tons of protein concentrate should produce a sales revenue of at least \$1,786,525. Therefore the possible selling price of protein concentrates becomes \$0.69 per kilogram or \$0.31 per pound. This price compares favorably to any other existing protein products including soy proteins and milk products such as nonfat dry milk or casein.

APPLICATIONS OF THE THIOBARBITURIC ACID METHOD FOR KEEPING TIME OF PEANUT PRODUCTS

by

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Peanut products which include peanut oil, peanut butter and whole peanuts were stored in constant temperature waterbath and TBA method were used to follow the rancidity of the peanut products. Keeping times were determined from the curves of TBA values versus days of oxidation.

Both distillation and solvent extraction methods were used to extract TBA reactive materials and the results indicated the distillation TBA method is more

efficient than the solvent extraction method in releasing oxidation products. Further, the solvent extraction method tend to extract more yellow pigment from peanut butter. The average recovery of 1,1,3,3, tetraethoxypropane (malonaldehyde) standard in peanut products from distillation method was 75%. The usual range was from 72% to 77%.

The keeping time of four varieties of peanuts and peanut oil from two locations of the 1972 crop were studied and the data revealed that under a storage temperature of 140°F, roasted peanut kernels have a longer keeping time than raw kernels and no significant differences were found in keeping times of the Comet, Florunner, Argentine varieties grown in Oklahoma and Georgia.

Keeping times of the oil pressed from raw and roasted kernels with various antioxidants were also investigated and it was found ascorhyl palmitate was the most effective compound in the increase of keeping time of peanut oil.

CHARACTERIZATION OF PROTEIN AND AMINO ACID CHANGES IN ASPERGILLUS CONTAMINATED FLORUNNER PEANUTS

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ABSTRACT

The biochemical interrelationships of Aspergillus parasiticus and A. oryzae with peanuts of the cultivar, Florunner, were examined. Qualitative and quantitative changes of proteins and amino acids were determined for uncontaminated peanuts and peanuts contaminated with these fungi under moist conditions at 30°C for periods of two to eleven days. The techniques include polyacrylamide gel electrophoresis, Durrum amino acid analysis, and Kjeldahl and Lowry evaluations. During the contamination period, the quantity of extractable protein in peanuts with A. parasiticus decreased while most of the large molecular weight globulins on electrophoretic gels were decomposed to smaller components or altered to insoluble forms or both; the latter was suggested by the increase of protein in the insoluble fraction. Initially, the concentration of soluble and insoluble proteins of peanuts inoculated with A. oryzae decreased and increased, respectively, similar to those treated with A. parasiticus, but the former increased while the latter decreased rapidly during the later stages of the contamination period. Coinciding with these changes in quantity of proteins, the gels showed that the large globulins were decomposed to two major forms of proteins which considerably increased in the gels. The composition of free amino acids and total amino acids of soluble and insoluble fractions of peanuts inoculated with A. oryzae or A. parasiticus was distinct for each fungus and differed from that of the control suggesting (as did the gel patterns) that peanut proteins were converted to other forms of polypeptides. These observations suggest that the peanut-Aspergillus interrelationship is complex and involves much more than mere degradation processes.

DEVELOPMENT OF LIPID PEROXIDATION DURING LONG TERM STORAGE OF RAW AND ROASTED PEANUTS

by

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ABSTRACT

The development of peroxidation in several different peanut cultivars stored over a 12-month period at 4° C was measured by a spectrophotometric method. Stored raw and roasted peanuts were extracted with two different solvent systems: hexane and chloroform/methanol. Proteins in the meals were further extracted with buffered sodium chloride and the protein recoveries, solubilities, physical characteristics,

and electrophoretic mobilities were compared. Results showed that intact raw peanuts can be stored for at least 5 months at 4° C without any appreciable peroxidation, but, thereafter, peroxidation proceeds at a rate 1/8 as fast as that found in roasted peanuts. Applications of these results for storing peanuts prior to processing will be discussed.

FREE AMINO ACID CONTENTS OF PEANUT CULTIVARS GROWN IN DIFFERENT AREAS

by

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ABSTRACT

Free amino acids, important but often ignored constituents of plant materials, may be involved as flavor precursors and as chemotherapeutic agents against fungal infections. Free amino acids have also been used as indicators of maturity in plants and as tools for classification of species.

For this survey of free amino acids, seeds from Spanish and Runner peanuts grown in Georgia, Oklahoma, Texas, and Virginia were selected. The non-protein nitrogen fractions of de-oiled peanut flours were extracted with 70% ethanol and purified by ion-exchange chromatography. The amino acid compositions were determined and results compared with respect to varietal differences and geographical areas of growth.

Correlation of Volatile Components of Peanut Products with Flavor Score. I. Shelf-life Studies on Peanut Butter

by

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ABSTRACT

Changes in flavor scores and volatiles profiles of commercial samples of peanut butter during storage at room temperature in the dark for one year are described. Some of the simple and multivariate correlation coefficients for flavor scores with volatiles profiles were significant at the 1% level.

INFLUENCE OF GENOTYPE AND KERNEL SIZE ON THE PROCESSING CHARACTERISTICS OF PEANUTS

by

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ABSTRACT

Milling properties as percent shells and screen-pass, damaged, and edible kernels, and processing characteristics as heating requirements, heating, blanching and discard losses, and product recoveries as oil cooked or dry roasted peanuts, were determined for 231 seasonal samples of 110 peanut genotypes from refrigerated storage. Milling and processing data were compared with kernel sizes as average milligrams per kernel in the shelled edible samples, and with estimated stability index as calculated from literature data for linoleic and oleic acid contents and oil keeping time at 63°C.

Predominant differences in kernel size, estimated stability, and milling and processing characteristics were associated with basic peanut types, but significant differences were also observed within types. Comparable milling data were obtained from 85 non-dormant, 78 dormant, and 22 dormant jumbo samples, although the dormant

and jumbo types averaged 80% and 270% greater kernel size and 20% greater estimated stability. Other jumbo strains (46 samples), however, averaged 16% less edible recovery with 43% greater estimated stability. Process variables had similar patterns, with differences somewhat less pronounced. Seasonal differences were generally small and variable, with the exception that 1970 higher-recovery dormant and jumbo types averaged 11%, and lower-recovery dormants and jumbos 23% greater estimated stability than that of 1968, 1969, 1971 or 1972 samples. Non-dormant pods cured in windrows in 1971 averaged ca 2.5% higher process recoveries than those cured in stacks, but windrowing resulted in 5% lower recoveries of dormant and jumbo types.

COMPARATIVE FIELD PERFORMANCE OF PLANTS DEVELOPING
FROM NORMAL AND ABNORMAL SEEDLINGS OF PEANUTS

by

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ABSTRACT

Peanut seedlings were classified and marked as normal or abnormal 3-4 weeks after planting at 12 locations. Abnormal seedlings were identified as those emerging on the day the seedlings were classified. A normal seedling within 50 cm of each abnormal seedling was marked so that paired observations could be made. Seedlings within 10 cm of each marked seedling were removed so that each plant developed in a similar competitive situation. Each plant was dug, removed from the field, and permitted to dry until the peanuts were near 10 percent moisture. Pods were removed from the plants by hand. Each plant developing from an abnormal seedling was compared with an adjacent plant developing from a normal seedling.

The percentage of abnormal seedlings was variable among locations and ranged from 5 to 30 percent. Plants developing from abnormal seedlings yielded (pods and vine dry weight) less than one-half, on the average, than plants developing from normal seedlings. Yields of the plants from abnormal seedlings varied from zero to normal. SMK percentages were significantly different at only three of the 12 locations. Approximately 95 percent of the plants developing from abnormal seedlings exhibited abnormal root systems. The most common root abnormalities were twisted hypocotyls and/or missing taproots. The abnormal seedlings are believed to result from seed subjected to mechanical impacts during processing.

INHERITANCE OF PROTEINS AND OILS IN PEANUTS

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ABSTRACT

Inheritance of proteins and oils of peanuts have been examined using six varieties (Apaxuc-370, Argentine, Tennessee Red, F334, Florunner, and Florida Jumbo) and F₂'s of hybrids of these varieties. Results showed that both percent protein and percent oil were controlled by quantitative genes. Heritability estimates were relatively high (0-72) for percent protein but low (0-47) for oil content. Correlation coefficients between protein and oil content were negative, but varied among varieties (-.412 to -.822) and among F₂ populations (-.184 to -.736).

EFFECTS OF MEAN TEMPERATURE AND GROWTH PERIOD
UPON OIL COMPOSITION IN PEANUTS

by

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ABSTRACT

Three genotypes from each of the three major market types of peanuts were evaluated for genetic and environmental effects on more than forty parameters of market quality. Test samples were from the National-Regional Peanut Variety Trials for the 1970 and 71 growing years and were grown in six widely-separated locations per market type. Genotype-location-year identities were duplicated, with each duplicate composited from a different trio of field plots. Samples were restricted to large, sound mature kernels to minimize the influence of variable maturity levels and mold damage.

This report deals with the influences of peanut growth stage and mean daily growth temperature on the major fatty acids composition of oils from the different market types of peanuts.

Daily maximum and minimum temperatures were averages for each growth location and each market type for the growth periods 0-4 weeks after pegging (8 weeks after planting), 4-8 weeks after pegging, 0-8 weeks after pegging, and 0-4 weeks before harvesting. Percentages of major fatty acids at harvest time were related to the mean temperatures at each location for each growth period.

This study demonstrated some highly significant correlations between mean temperatures for some apparently critical growth periods and various fatty acid levels for runner and Virginia type peanuts. Various highly significant correlations among the major fatty acid levels were also observed in the runner and Virginia peanuts. Patterns of oil composition and temperature effects appeared much less predictable for Spanish peanuts.

CYTOGENETIC INVESTIGATIONS OF ARACHIS HYPOGAEA L.
I. FASTIGIATA (WALDRON) VULGARIS (HARZ.)¹

by

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ABSTRACT

Cytogenetic investigations were conducted on "Starr" and "Tamm 74" Spanish peanuts (Arachis hypogaea L. ss. fastigiata (Waldron) var. vulgaris (Harz.).)

Megaspore-mother-cell initiation and development showed no unusual characteristics and development of the egg nucleus appeared normal. The development of the nucellar tissue did show an unusually high incidence of "active" cells after degeneration of the three non-functional nuclei of the tetrad.

Microsporogenesis showed characteristics atypical of normal diploid segregation. A relatively high incidence of quadrivalent formation was noted in most materials with two quadrivalents not uncommon. The frequency of quadrivalent formation appeared to vary with the time of collection and the season of plant growth. Cells with quadrivalent formation apparently produced viable gametes. This feature could help explain why a self-pollinated variety could produce high numbers of off-types in the absence of out-crossing and/or mechanical mixture.

¹/Approved as TA No. 11223, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas.

COMBINING ABILITY ESTIMATES IN ARACHIS HYPOGAEA L. III.
F₂ GENERATION OF INTRASPECIFIC CROSSES

by
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ABSTRACT

An intraspecific hybridization program was initiated to investigate the breeding potential of crosses among diverse peanut (Arachis hypogaea L.) lines. Fifteen crosses in F₂ generation generated by crossing in diallel without reciprocals six peanut lines representing Valencia, Virginia, and Spanish botanical varieties were used to estimate combining ability in drilled and space-planted tests.

Estimates of both general (GCA) and specific (SCA) combining ability were significant for the five characters measured in the drilled test. GCA was also significant for all characters measured in the space-planted test, while SCA was significant for five of the six characters. GCA was of greater magnitude than SCA for all characters except one.

Most F₂ cross means were less than the midparent value. The depression of F₂ means probably resulted from the recombination of genes responsible for the adaptation of the three botanical varieties.

Comparison of results from the space-planted and drilled tests indicates that data from space-planted tests can provide useful information on the performance of crosses in early generation.

ESTIMATION AND UTILIZATION OF INTER-CULTIVAR COMPETITION
IN ARACHIS HYPOGAEA L.

by
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ABSTRACT

Competition among three peanut cultivars--NC 5, NC 17 and Florigiant--was measured in replicated hill and row plot field designs. The three cultivars are adapted to the Virginia-North Carolina peanut belt but differ in maturity and growth habit. The hill plot design allowed evaluations of cultivar test plants exposed to increasing intensities of competition from 0 to 4 competitor plants of another cultivar. Similarly, the response of test rows was assessed while increasing competitor rows of another cultivar from 0 to 2.

Competition was determined by calculating the coefficients of regression for mean plant, fruit and seed characters on numbers of competing plants or rows. Competition effects were described as neutral, complementary, under-compensatory and over-compensatory depending upon the statistical significance and sign of the regression coefficients. Three-year trials provided evidence of strong inter-cultivar competition. Fruit yield, fruit number and plant weight of NC 5 and NC 17 were found to increase significantly over that of pure stands when either were grown in competition with Florigiant. NC 5 and NC 17 tended to have reduced fruit and seed expressions when grown in competition with each other.

Seed blends of cultivars whose components were predicated by competition tests did not perform as expected. Suggestions for improving competition tests and the utilization of data from the same are discussed.

DIFFERENTIAL RESPONSE AMONG PEANUT GENOTYPES TO LESION NEMATODES

by

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ABSTRACT

Differences in the extent of visual pod damage from lesion nematodes (*Pratylenchus brachyurus*) were noted in 1971 and 1972 peanut (*Arachis hypogaea*) nurseries in Texas. Eight genotypes with a range in pod damage symptoms were selected for study. These comprised the entries in a replicated field planting during 1973 on fumigated and non-fumigated plots in an area known to be heavily infested with *Pratylenchus brachyurus*. Counts were made of nematodes recovered from random pod samples collected from each variety and plot at 107, 121 and 135 days after emergence.

Nematodes were controlled effectively in all genotypes from plots with pre-plant injections of 1.96 g dibromochloropropine (DBCP) per m of row. In non-fumigated plots, the average number of nematodes recovered per 30 g sample of pods ranged among genotypes from an average of 7893 for Starr to 158 for the most resistant introduction tested. Additional studies are in progress.

EVIDENCE FOR THE ROLE OF SOILBORNE MITES IN PEANUT POD ROT DISEASE USING A NEW EXTRACTION TECHNIQUE

by

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ABSTRACT

Greenhouse and field tests conducted over several years indicate that certain of the newly developed nematicide-insecticide chemicals contribute to pod rot control in North Carolina. Although these pesticides are not effective as fungicides, application to soil in replicated tests significantly reduced pod rot caused by *Pythium myriotylum* and *Rhizoctonia solani*.

Using a rapid soil-fauna extraction technique, we were able to show a correlation between efficacy of selected acaricides in inhibiting the development of pod rot and the elimination of certain soil animals, i. e. mites and springtails. Mites were also removed from naturally infested field soil by sieving. When sieved and nonseived soils were added to fumigated soils in which peanuts were growing, pod rot was less severe in the soils receiving the sieved amendment. Simultaneous addition of soil mites and *P. myriotylum* to soil in which peanuts were growing resulted in a greater incidence of pod rot than in treatments in which the fungus or soil mites were added alone.

PCNB and PCNB Plus Fensulfothion as Related to *Sclerotium rolfsii*
Control and Lesion Nematode Damage in Peanuts

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ABSTRACT

Previous test with PCNB for control of soil-borne peanut diseases in Georgia have usually not increased peanut yields. In 1972 and 1973 tests were conducted using PCNB and PCNB plus a nematicide, fensulfothion. All treatments of PCNB plus fensulfothion significantly increased yields over the untreated control. PCNB alone or fensulfothion alone did not significantly increase yields. Results from the 1973 tests indicate that PCNB does reduce loss from *Sclerotium rolfsii*, but use of this chemical increases lesion nematode damage. Previous poor results with PCNB are probably due to an increase in lesion nematode damage which off-sets control of *S. rolfsii* and other soil-borne diseases. A disease complex between lesion nematodes and soil-borne fungi may be involved.

RHIZOCTONIA FOLIAR BLIGHT OF PEANUT

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ABSTRACT

A previously undescribed foliar disease of peanut was observed in several fields in Miller County, Georgia in 1973. Diseased foliage was confined to the lower one-third of the plant and caused 50-70% defoliation of this portion. *Rhizoctonia solani* was consistently isolated from all diseased tissue and large sclerotia over 5 mm in diam were observed on necrotic tissue. Pathogenicity tests in the greenhouse using 'Florunner' demonstrated isolates of the fungus were highly virulent to peanut foliage and caused symptoms similar to those found in the field. In 1972 Bell et al. (Plant Dis. Repr. 57:549-550) reported an aerial blight of sorghum was caused by *R. solani*. Based on hyphal morphology, cultural characteristics and nuclear condition of hyphal tips both the peanut and sorghum isolates were classified in anastomosis group 1 according to scheme developed by R. T. Sherwood (Phytopathology 59:1924-1929). Pathogenicity to foliage of 'Florunner' peanut and Ga 615 sorghum indicated both isolates were extremely virulent. However, when isolates of fungi from decayed peanut pods were used no symptoms on foliage were observed. Greenhouse studies in which soil was artificially infested with isolates from foliage of peanut and sorghum indicated isolates were non-virulent to peanut seed and seedlings but were highly virulent to seed and seedlings of 'Tendergreen' beans, 'Pepino' cucumber, and moderately virulent to 'Coker 310' cotton and common rye grass. Optimum temperature on Difco potato dextrose agar for both aerial *Rhizoctonia* isolates was 28-30 C.

THE EFFECTS OF PEANUT LEAFSPOT FUNGICIDES ON
FIELD LEVELS OF SCLEROTIUM ROLFSSII

by

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ABSTRACT

During the 1972 and 1973 seasons, levels of Sclerotium rolfsii (white mold) were visually assessed in florumer peanut plots treated with fungicides for leafspot control. Treatments included the fungicides Benlate, Bravo, Kocide, and Topsin-M plus and an untreated control. All fungicides gave similar levels of leafspot control, but significant differences in S. rolfsii levels were detected between treatments. Control plots consistently had lowest levels of white mold, while Benlate consistently had highest white mold levels. Plots on which leaves were mechanically removed had lower white mold than plots allowed to retain their leaves. Data from laboratory tests indicated that the differences between treatments may be attributed either to a direct effect of the fungicide to S. rolfsii, or indirectly by affecting the antagonist to S. rolfsii, Trichoderma harzianum. Benlate displayed no toxicity to S. rolfsii in laboratory tests, but was very toxic to T. harzianum. The combination of no toxicity to the pathogen, and high toxicity to the antagonist is probably responsible for the high level of white mold. Topsin-M, a Benlate relative, was also non-toxic to S. rolfsii, but was less toxic to T. harzianum; white mold levels were significantly lower than for Benlate. Bravo was toxic to S. rolfsii but only retarded T. harzianum growth. Again, white mold levels were significantly lower than for Benlate. These data indicate that leaf retention (i.e. fungicide-treated plots) increases white mold by creating a more favorable sub-canopy environment for mold growth. Different white mold levels are found between fungicides because of the differing actions of the fungicides on pathogen and antagonist.

DISPERSAL MECHANISMS OF CYLINDROCLADIUM CROTALARIAE (LOOS)
BELL & SOBERS, CAUSE OF CYLINDROCLADIUM BLACK ROT (CBR) OF PEANUTS

by

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ABSTRACT

Ascospores of Calonectria crotalariae (Loos) Bell & Sobers, the perfect stage of Cylindrocladium crotalariae (Loos) Bell & Sobers, are forcibly discharged from perithecia beginning 1 week after perithecial initials are visible. Active discharge from single perithecia may continue for up to 2 weeks at which time the remaining ascospores are exuded through the ostiole in a viscous ooze. The fungus is thus adapted for both air-borne and rain-splashed dispersal of these propagules. Ascospores discharged by both methods are viable and infective but, to date, have only been demonstrated to be implicated in short-distance, within-field spread of CBR in North Carolina.

Microsclerotia of the pathogen are formed abundantly within infected peanut roots from mid-summer through harvest. Peanut root fragments containing microsclerotia have been recovered from plant debris expelled from combines operating in CBR-infested fields. During harvest, these propagules can become airborne in combine dust and may be blown several miles, facilitating regional spread of the disease.

OCURRENCE AND CONTROL OF CYLINDROCLADIUM CROTALARIAE
IN PEANUT FIELDS IN ALABAMA

by
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ABSTRACT

Cylindrocladium crotalariae was found in Alabama attacking runner peanuts in 8 locations during the 1972 and 1973 seasons. Field experiments for control of this pathogen during 1973 were located in an area with a severe black rot problem. Several standard and experimental fungicides, nematicides, biocides, and combinations were tested for effectiveness against this disease. No control was obtained using the soil fungicide PCNB, the nematicides carbofuran and ethoprop, or combinations of these nematicides and PCNB. The mixture PCNB-Terrazole (Terraclor Super X) was also ineffective. The use of chloroneb alone or in combination with DBCP did not result in any reduction in disease. Applications of DBCP or of the fumigant terricide-15 (40% EDB + 15% chloropicrin) resulted in no control. Broadcast pre-plant incorporation followed by cultipacking of vapam at 327 l/ha or sodium azide (NaN₃) at rates of 40 and 67 kg/ha significantly reduced the number of infection foci in the treated plots counted one week before harvest; only NaN₃ treatments showed highly significant ($p < .01$) reductions. Application of 13 kg/ha of NaN₃ at early blooming time also significantly reduced ($p < .05$) the number of infection foci. The most effective control was obtained with a pre-plant application of 40 kg/ha of NaN₃ followed by 13 kg/ha of this material at blooming time. This combination virtually eliminated the disease in the treated plots. The effectiveness of post-emergence applications of NaN₃ indicate that dissemination of C. crotalariae in peanut fields is an important factor for secondary infection of the pathogen. Successful control should combine pre-plant and post-emergence applications of effective materials.

OCURRENCE OF THERMOPHILIC MICROORGANISMS
IN PEANUTS AND PEANUT SOILS

by
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ABSTRACT

The temperatures in Texas during the peanut growing season are conducive to the growth of heat-loving fungi, which have a maximum temperature for growth at or above 50°C. Temperatures on the soil surface in direct sunlight may reach 132°F (56°C). In view of these temperatures, peanut kernels and soils were examined for the incidence of thermophiles. Both kernels and soils were plated on potato dextrose agar, V-8 agar, yeast-glucose agar, and yeast-starch agar and incubated at 48°C. A variety of thermophilic fungi were found to be associated with both substrates. Mucor pusillus was the most common thermophilic fungus isolated. Thermascus aurantiacus, Malbranchea pulchella var. sulfurea, Humicola lanuginosa, Thielavia albomyces, Talaromyces dupontii, Chaetomium sp. and Sporotrichum sp. were also isolated. Thermotolerant Aspergillus fumigatus, actinomycetes, and bacteria were common in some samples. The ecological and economical significance of these thermophiles in peanut kernels and soils is as yet undetermined.

OCURRENCE OF ASCOCHYTA WEB-BLOTCH IN TEXAS

by

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ABSTRACT

Web-blotch is a foliar disease of peanuts caused by an Ascochyta sp. Symptoms on leaves in Texas are identical with those previously reported on peanuts in Brazil, Argentina and Rhodesia. Incipient blotches are light brown with a silvery margin but enlarge and turn black with age. In addition, a netting pattern has also been observed. Older blotches often reach 15 mm in diameter and may show necrosis on the abaxial leaf surface. Heavy infection may result in the entire leaf being covered with a combination of coalescing blotches and netting. Abundant pycnidia are produced in moist, dead tissue, and this generally occurs after abscission when the leaf comes in contact with the soil. The disease was widespread in Texas in 1972, occurring progressively from South Texas to the North-central peanut area. It was observed in 1973 in all peanut growing areas but was less severe than in 1972. Incidence and subsequent defoliation were greater in irrigated fields. The fungus overwintered on peanut residue left on the soil surface in South Texas. All peanut varieties observed are susceptible but some varieties such as Florunner show some degree of resistance.

SOME EFFECTS OF PEANUT SHELLER (COMMERCIAL-TYPE) DESIGN AND OPERATION ON SEED GERMINATION

by

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ABSTRACT

Investigations were conducted with commercial-type peanut shellers to determine the effects of several variables of mechanical shelling on seed germination. The investigated variables were types of shellers, grate design, cylinder design, direction of cylinder rotation, radial distance between cylinder and grates, cylinder speed, and techniques of feeding peanuts into the sheller. The shelled peanuts were treated immediately after shelling with a widely used fungicide mixture. Statistical analysis of the data indicated that only the effects of cylinder speed were statistically significant. Although the effects of feed techniques were not statistically significant, it appeared that some feed techniques lowered the germination by several percentage points. Operating commercial-type shellers so as to obtain a maximum whole kernel outturn and treating the shelled peanuts with the fungicide immediately after shelling minimized the detrimental effects of mechanical shelling on germination.

LABORATORY DEVICE FOR PEANUT SKIN REMOVAL

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ABSTRACT

A laboratory device for peanut skin removal was designed and constructed to give maximum blanchability with a minimum of split kernels. Skin removal was accomplished by directing a stream of air into a 250 g. mass of peanuts held in an inclined-screen container rotating inside a plexiglass cylinder. The mechanical, electrical, and pneumatic components which make up the sample blancher were described in detail.

The operational features were discussed and results were presented relative to the blanching factors, split kernels, unblanched kernels, whole blanched kernels, blanching loss, and moisture loss.

The effects of air pressure, blanching time, and preheat time on the blanching factors provided a basis for selecting the proper pressure and time to give maximum blanchability with a minimum of split kernels. Virginia-type peanut breeding lines were evaluated for blanchability with this device. The blanchability of large lots of peanuts may be evaluated using the same procedure prior to processing.

NOISE REDUCTION IN PNEUMATIC DUCTS CONVEYING PEANUT HULLS

by

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ABSTRACT

Measurements in peanut shelling plants revealed that pneumatic hull ducts are a major source of noise pollution. Noise was found to increase with air velocity and turbulence, and decrease with increased pipe thickness. Numerous treatments were evaluated for effectiveness in reducing noise. Covering the ducts with commonly available thermal insulation was the most effective treatment considering cost and convenience. However, coating the ducts with a mastic compound offered advantages and should be considered in some instances. Special acoustical materials were generally considered too costly.

EFFECT OF MATURITY OF PEANUTS ON THE QUANTITY, AMINO ACID PROFILE AND ELECTROPHORETIC PATTERNS OF PEANUT PROTEINS

by

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ABSTRACT

Starr variety of Spanish peanuts were grown at two locations in Texas and were harvested at 10 day intervals beginning 80-85 days after planting. Each harvest was fractionated according to size with standard grading screen. The effect of

peanut maturity as measured by the harvesting date and seed size on the quantity, amino acid profile and electrophoretic patterns of the peanut proteins was determined.

There are significant differences in the protein content of peanuts as related to both length of growing period and seed size. The difference is more pronounced for small size seed than larger ones. However the differences in protein content become smaller as the length of growing period increases and the amount of protein reaches around 28% at about 110-120 days after planting.

When peanut protein is fractionated into arachin and conarachin, arachin-to-conarachin ratios range from 0.8 to 4.6. In general larger seed show higher arachin-to-conarachin ratios than smaller ones. Arachin-to-conarachin ratios of medium and small size seed increase as the days after planting increase and reach a constant level after about 110-120 days. For large and regular size seed, the arachin-to-conarachin ratio remains the same without regard to harvest date.

Amino acid analysis showed that smaller peanuts and seed harvested at earlier dates which have lower arachin-to-conarachin ratios contained larger amounts of lysine and methionine than larger peanuts harvested at later dates. The differences, however, become smaller as the growing period gets longer. Lysine content ranges from 4.2 grams per 100 gram protein for sub-small sample harvested 80 days after planting to about 3.0 grams for later harvested ones. The range of methionine content over the same period is from 2.0 to 1.3 grams.

Polyacrylamide gel electrophoresis of peanut proteins revealed that there is a considerable difference in banding behavior depending upon the size of peanuts and the length of growing period. Larger size peanuts show clear separation of each band whereas smaller size peanuts even though they were all harvested at the same age show more diffused patterns. However, these differences in banding pattern become less clearer at later harvest dates. At the later dates, even smaller size seed show clear band separation.

The results obtained from this study suggest that it is possible that, if the primary consideration was total protein and amino acid content, harvesting peanuts as early as 110-120 days after planting could materially enhance the nutritional quality of peanut protein for human food.

MATURITY EVALUATION OF VIRGINIA TYPE PEANUTS BY ARGININE MATURITY INDEX

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ABSTRACT

Four commercial cultivars of peanuts were hand dug weekly for eight weeks from two test plots, one in Chowan County, N. C. and the other in Nansemond County, Virginia. The collected samples were evaluated for maturity by arginine maturity index (AMI) method. These analyses were performed on green, cured and shelled peanuts, with the latter two being from only two harvest dates. The tabulated and statistical results for the green peanuts showed that most variation was due to harvest date, with cultivar and location being less significant. Some significant interactions among location, harvest date and cultivar will be dis-

cussed. Comparisons of the AMI values of cured, green and market grades (ELK, medium, No. 1) with yield, % other kernels and % ELK for Florigiant peanuts from 1972 and 1973 seasons at two locations are discussed. Market grade was highly significant with variety and location significant to a lesser degree in the shelled peanuts. The results indicate that AMI is a potentially valuable objective method of evaluating Virginia type peanuts for maturity.

THE EFFECT OF GROWTH REGULATORS ON PEANUT YIELD, FAT, AND PROTEIN CONTENT

by

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ABSTRACT

In 1973, three growth regulators were studied in Marianna, Florida. These included Kylar, DPX 2801 and TD 6266.

They were applied in various combinations. Yield data were taken, and analyses were made in the laboratory for oil and protein concentrations. Average values were: yield 3516 lbs/acre, oil 46.7%, protein 23.0%. The oil concentration was inversely proportional to protein concentration. DPX 2801 and TD 6266 had slightly higher protein concentrations than Kylar and the check. There was no significant change in yield (lbs/A) due to growth regulators used. Also, there was no correlation between yield and protein concentrations.

EFFECT OF TEMPERATURE ON TIME TO FLOWERING OF VIRGINIA TYPE PEANUTS

by

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ABSTRACT

Planting date field studies were utilized to determine the relation between time to flowering of NC2, NC5, and Florigiant peanuts and minimum and maximum daily temperatures. Two basic types of curvilinear response functions were compared with two heat unit systems which used linear functions. The best mathematical expression of the data was given by the fraction of time to flowering being the sum of quadratic functions for daily minimum temperature and for daily maximum temperature. The rate of slope change was greater at the higher end of the temperature range. The relation between time to flowering and minimum temperature was more curvilinear than that for maximum temperature except at higher temperatures. Minimum temperatures below 43 F lengthened the time to flowering for the three varieties. Varietal differences appeared to be expressed more by the relation with daily maximum temperatures than with daily minimums. The expressions calculated should be more accurate for prediction purposes than a linear heat unit system, plus they tend to describe the individual responses to changes in minimum and maximum temperatures. A certain lack of fit for the relations still exists, though, indicating perhaps some measure of radiation should also be included.

VARIETAL DIFFERENCES IN IRON ABSORPTION EFFICIENCY OF
PEANUT CULTIVARS CULTIVATED ON CALCAREOUS SOILS

by

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ABSTRACT

Irrigated peanuts grown on calcareous and basic soils have shown severe signs of a disorder, the so-called "lime-induced iron chlorosis". Affected fields of peanuts are being treated with costly iron chelates to correct the deficiency of available iron. It is a well-known fact, that plant species and even cultivars differ in their susceptibility to lime-induced chlorosis. Iron absorption efficient varieties are suggested for commercial use in affected areas. Experiments at Lakhish Regional Experiment Station, where iron deficiency has been observed in recent years, have proved that some of the Virginia-type peanut cultivars isolated and multiplied from the collection of the Volcani Center can be successfully grown on these soils without the need of the application of iron-chelates. Yields of pod and hay are comparable to iron chelate-treated plots of the standard "Shulamit" variety and the quality of the pod seems suitable for export.

VARIATION IN CONTENTS OF EIGHT NUTRIENTS IN CENTRAL
STEM LEAF SEGMENTS OF TEN PEANUT CULTIVARS AND LINES

by

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ABSTRACT

Portions of 10 Virginia variety peanut cultivars and lines were analyzed for contents of 8 nutrients in 1972 and 1973. These peanuts were grown in Woodstown loamy fine sand fertilized and limed to preclude nutrient deficiencies. This work was part of a project to denote possible nutrient requirement variance among established cultivars and lines being considered for release in the Virginia-Carolina area.

Average (2-year) P, B, Mn, Zn, or Cu contents of petiole or blade portions of central stem leaves of mature plants did not vary significantly among cultivars and lines. Potassium, Ca, or Mg contents of petioles were highest in Florigiant or Avoca 11, Va. 61R or NC 5, and Florunner, respectively. Blade content of K, Ca, or Mg were highest in Avoca 11, Va. 61R or Va. 72R, and Florunner or Florigiant, respectively. Leaf portions of Va. 68 Composite, Va. 70 Composite, and NC Fla. 14 were intermediate or lowest in K, Ca, and Mg contents. The petioles generally, were higher in K and Mg, whereas the blades were highest in P, Ca, B, Mn, Zn and Cu.

In Virginia, Florigiant, particularly, and Va. 72R, and NC Fla. 14 produce highest yields, generally, of the runner and bunch cultivars planted regularly, respectively. Leaf Portions of these cultivars were not markedly higher or lower in any of the nutrients considered.

PEANUT RESPONSES TO SOIL WATER LEVELS

by

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ABSTRACT

Three varieties of peanuts, Florigiant, Florunner and Tifspan were grown in plots protected from rainfall and subsurface water. Highest pod production for all 3 varieties was obtained when plots were irrigated when the soil moisture tension in the surface 12 inches reached 0.2 bar. Sufficient water was applied to wet the 0 - 24 profile to field capacity. The mean yield (4 years) was 5241, 5227 and 4285 lbs/ac for the Florigiant, Florunner and Tifspan, respectively. Average water added was 24, 22 and 20 inches for the 3 varieties.

Yields from plots irrigated when the 0-12 inch soil depth reached a tension of 15 bars were reduced to 2797, 3319 and 2886 lbs/ac with 12, 10 and 11 inches of irrigation for the Florigiant, Florunner and Tifspan, respectively.

Soil water extraction data were obtained for the profile zones 0-6, 6-12, 12-18, 18-24, 24-36 and 36-48 inches. There is evidence that peanuts in the drier treatments utilized soil moisture from depths as great as 42 inches. The driest treatment in each variety received approximately 7 inches of irrigation, but utilized about 4 additional inches of profile water during the season.

Quality as reflected by percent SMK was reduced for all 3 varieties in treatments receiving less than 17 inches of irrigation.

STUDIES ON FLOWERING AND YIELD OF STARR VARIETY SPANISH-TYPE PEANUT PLANTS^{1/}

by

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ABSTRACT

A delay in reaching the maximum cumulative flowering rate occurred for plants grown at 16 hr compared to 14, 12 or 8 hr photoperiods. There were 24.6, 24.3, 20.6 and 21.9 flowers produced per plant during the first 40 days of flowering at 16, 14, 12 and 8 hr photoperiods. These flowers are the ones most likely to contribute to yield. There were 25.8, 12.4, 15.2 and 10.2 seeds produced per plant for 16, 14, 12 and 8 hr photoperiods, respectively. Weight of seeds produced showed a similar trend. An 8 hr photoperiod may become a limiting factor in seed production, but it seems unlikely that light duration was the limiting factor in the 40 to 50% reduction in yield that occurred between 16 and 14 or 12 hr photoperiods. Light intensity was the same for all photoperiods. In a 12 hr light/12 hr dark cycle during which the relative humidity (RH) was held at $40 \pm 10\%$ for the first 18 hr and at $90 \pm 7\%$ for the last 6 hr, there was enhanced flowering (rate and number of flowers at 40 days) compared to the 12/12 cycle in which the entire 12 hr of dark was at high RH. However, the yield of seeds was the same. Analysis of the data for yield potential (total pegs produced $\times 2$, since each peg has a potential for producing one 2-seeded pod) and yield efficiency (actual number of seeds produced divided by the yield potential) indicated the longer photoperiods, 16 and 14 hr, had the highest yield potential and lowest yield efficiency while the opposite was true for the shorter photoperiods and the 6 hr high RH treatment. Comparison of the yield data with field grown plants in 1969 and 1973 showed that yields were similar to those from plants collected in 1969 but lower than that from field plants in 1973. In 1973, the highest yield efficiency of field grown plants was for dry land and lowest for sprinkler irrigated plants. All plants that achieved a high yield efficiency attained their highest cumulative rate of flowering prior to the 40th day of flowering.

1/ Cooperative investigations of the Agricultural Research Service, U.S. Department of Agriculture and the Texas Agricultural Experiment Station.

EFFECT OF PHOSPHORUS AND POTASSIUM FERTILIZERS
ON YIELD AND GRADE OF PEANUTS IN ALABAMA, 1969-1973

by

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ABSTRACT

Fertilizer experiments were located on farms with several different soil types and having a wide range of available soil phosphorus and potassium levels. Dilute-acid extractable phosphorus ranged from 7 pounds per acre (very low) to 145 pounds per acre (very high). Dilute-acid extractable potassium ranged from 17 pounds per acre (very low) to 110 pounds per acre (high). Each experiment consisted of two treatments with four replications, with each plot consisting of four 100-foot rows. The fertilizer treatment consisted of 400 pounds per acre of 0-10-20 broadcast before planting and either turned or disked. Phosphorus and potassium fertilizers failed to increase peanut yields or grades in any of the 36 experiments, regardless of the available phosphorus or potassium level.

HERBICIDE PROGRAMS FOR PEANUTS

by

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ABSTRACT

A three year study was conducted at the University of Florida Research Center at Marianna, Florida on developing systems of herbicide applications for season long weed control in Florunner peanuts.

Herbicides were applied alone in several combinations and sequential treatment up to five different times during the growing season from preplant to late postemergence. The herbicides used at the recommended rates in the various programs included: benefin, alachlor, alachlor + dinoseb, alachlor + naptalam + dinoseb, naptalam + dinoseb, DFX-1840, and 2,4-DB.

Weed populations present included crabgrass (*Digitaria sanguinalis*); Florida pusley (*Richardia scabra*); morning glory (*Ipomea* sp.); spiny amaranth (*Amaranthus spinosus*); Florida beggarweed (*Desmodium tortuosum*); Texas panicum (*Panicum texanum*); and small flower morning glory (*Jaquimontia tamnifolia*). The most consistent program for broadspectrum weed control, including Florida beggarweed, was benefin preplant incorporated followed by a tank mix combination of alachlor + (naptalam + dinoseb) at cracking stage, followed by 2,4-DB postemergence. In addition, one or two cultivations were required.

PENUTZ, A SIMULATION MODEL FOR PREDICTING GROWTH,
DEVELOPMENT, AND YIELD OF A PEANUT PLANT

by

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Abstract

The growth, development, and fruiting of a peanut plant is described by a computerized simulation model that mimics the physiological processes presumed to operate in an actual plant. Input information includes varietal characteristics such as fruit weight, oil and protein analysis, flowering characteristics, and growth habit; daily climatic data of solar radiation, max and min temperatures, and rainfall; and soil moisture and rooting characteristics. With such information as input, the simulator predicts yield and quality of fruit at any harvest date as well as a complete daily description of the growing plant to permit experimental verification.

Since the simulator mimics the physiological processes of the plant, it will predict the quantitative effects of changes in any items of input information. Thus, any variety of peanuts whose characteristics are known can be "grown" in the computer at any location or year for which weather and soil information is available. These simulated "experiments" can include such variables as date of planting, rates and patterns of planting, irrigation practices, and digging dates. Accuracy depends on the physiological hypotheses used and the quality of the input information.

EFFECTS OF SAMPLE SIZE ON ACCURACY OF PEANUT MOISTURE DETERMINATION

by

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ABSTRACT

A collaborative study was conducted on Spanish peanuts at Oklahoma State University and on Virginia peanuts at North Carolina State University regarding the variability in moisture determination using the official AOAC method. The variability among 30 samples was estimated at 5 different moisture levels for each of the two peanut types. No difference could be detected between the two types and thus the data was combined. The standard deviation was found to be linearly related to the mean moisture. Data is presented which provides the necessary information to compute number of samples required for a desired accuracy.

PEANUT PEG STRENGTH MEASUREMENT

by

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ABSTRACT

Instrumentation was developed for measuring the force required to separate the peanut pod from the peg attaching it to the plant. Results of one season's data show:

1. Peg strength can vary by five times among peanuts that appear to have the same characteristics.
2. Spanish type peanuts had peg strengths significantly greater than runner or Virginia types.
3. Green peanuts immediately after digging had peg strengths significantly greater than peanuts dried in the windrow.

DIMENSIONAL CHANGES IN PEANUT PODS, KERNELS, AND HULLS AS MOISTURE IS REMOVED DURING CURING

by

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ABSTRACT

Loss of moisture is the primary cause of changes in peanut grade factors, particularly when peanuts are stored for some period of time. This experiment was designed to determine the effect of moisture loss on dimensional changes in peanut pods, kernels, and hulls, and if the changes vary in relation to moisture content. Lots of Spanish-, Florunner-, and Virginia-type peanuts were each divided into groups of small, medium, and large pods. Pods and kernels were measured in three planes of orientation and hulls were measured for thickness, periodically, as moisture was reduced from above 35 percent to 6 percent. The dimensional changes in peanuts from each group size were compared individually and collectively for each type peanut. The change in size was transposed into official screen sizes to determine the relationship to grade factors. The results indicate that the largest reduction in the peanut dimensions occurs as moisture is reduced from high levels to about 25 percent; peanuts in the group of small pods have the most loss in size; size decreases vary according to peanut type; and kernels decrease in size about five times more than pods.

CHANGE IN GRADE FACTORS OF FARMERS' STOCK PEANUTS STORED IN THE SOUTHWEST

by

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ABSTRACT

The extent and cause of grade reductions of farmers' stock Spanish peanuts harvested in the Southwest are discussed in this paper. This study was based on 184 randomly selected lots of farmers' stock peanuts sampled from 31 buying points throughout the Southwest area.

Results of this research indicate that there was a significant decrease in the grade with storage time and that this decrease occurred within the first 5 days of storage. The grade decreased from an initial average value of 71.3 to 70.3 after the 5-day storage period. There was a continuing decrease in grade with increased storage periods; however, the change after the first 5 days of storage was not found to be significant. These results indicate an annual loss of approximately 2.26 million dollars in the Southwest peanut producing area due to decrease in grade during storage.

It was found that only a small part of the grade loss during storage could be attributed to kernel shrinkage. The principle cause for this reduction was determined to be the shift of the weight ratio of hulls and kernels during storage and was supported by the fact that the method of drying and grading had a significant influence on the decrease in grade. Drying methods which are more conducive to high weight ratio shifts always had high grade losses during storage. For example, mechanically dried peanuts lost 1.8 percentage points in grade during a 90-day storage period compared to only 0.3 percentage points for field dried peanuts.

DIRECT HARVESTING PEANUTS

by

J. L. Butler and E. J. Williams
USDA, ARS, Southern Region
Georgia-South Carolina Area
Georgia Coastal Plain Experiment Station
Tifton, Georgia 31794

ABSTRACT

This paper reports the design, operation and performance of the Tifton Digger-Picker. This machine digs the peanuts and picks the pods from the plant in one operation. The pods, which are picked from an oriented plant, are much less damaged than those from conventional harvesting. Mechanical, or artificial, drying is required. While this increases the drying cost, it reduces the potential for aflatoxin development since the windrow drying and curing is eliminated.

DRYING GREEN PEANUTS IN DEEP BEDS WITH DIFFERENT AIRFLOW RATES

by

Paul D. Blankenship, Agricultural Engineer
and Jack L. Pearson, Research Horticulturist
USDA, ARS, Southern Region
Ga.-S. C. Area
National Peanut Research Laboratory
Dawson, Georgia 31742

ABSTRACT

Green peanuts were dried with several airflow rates ranging from 11 to 60 cfm/ft³ of peanuts. Average drying rates increased with airflow rates through the range of flow rates tested. Milling quality, as determined by a commercial-type sheller, was not significantly affected by different airflow rates. Germination showed no consistent trends. Airflow rates affected some objective food quality factors; however, flavor was not significantly affected.

SOIL AND SEEDLING DISEASES
DISCUSSION GROUP

J. C. Wells, Leader

Extension Plant Pathologist
N. C. State University
Raleigh, N. C.

Each state report was primarily a review of the work being done in the control of black rot, southern stem rot, and pod rot.

Sturgeon from Oklahoma reported on the successful application of PCNB for southern stem rot control through irrigation.

Wells from North Carolina reported on progress made in black rot control with sodium azide. The N. C. report also mentioned that we now have a state label for Podox L, a copper treatment to aid in pod rot control.

Georgia, Alabama, and South Carolina reported very little change in the black rot situation from last year in those states. All states emphasized the need for additional work in the three diseases mentioned above.

STATUS OF ASPERGILLUS FLAVUS,
SOIL-BORNE DISEASE OF PEANUTS
DISCUSSION GROUP

W. Wyatt Osborne, Leader

Extension Specialist, Plant Pathology
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

The Chairman reported on a survey of literature on Aflatoxin research which was conducted by the Aflatoxin Committee of the Peanut Disease Workers Council.

A summary of the study as presented in a letter from Dr. R. V. Sturgeon to Dr. Harlan E. Smith indicates that a practical Aflatoxin control program can be developed by the control of the soil-borne fungus, Aspergillus flavus. Facts that support this proposed program are:

- (1) The soil-borne peanut pathogen, Aspergillus flavus colonizes peanuts from seedling stage to maturity and is capable of producing Aflatoxin in peanut kernels before and after peanut harvest.
- (2) Certain economical and EPA registered fungicides, when properly applied to soil infested with pod-rotting fungi, i.e., Pythium sp., Rhizotonia sp., Fusarium sp., Sclerotium rolfsii, and Aspergillus flavus, have significantly reduced pod rot, improved peanut quality and yield, and eliminated Aflatoxin.

It was also reported that extension plant pathologists are in a position to conduct a coordinated regional program in 1974 on Aflatoxin control, using cultural and chemical controls that have EPA label clearance for use on peanuts.

Representatives from several states reported on participation in the regional program. It was pointed out that this procedure is not yet being recommended as an Aflatoxin control measure in any state until additional information is attained through the regional program.

EVALUATION OF DISEASE CONTROL RECOMMENDATIONS BY STATES
DISCUSSION GROUP

Fred Smith, Leader

Professor of Plant Pathology and Physiology
Clemson University
Clemson, South Carolina

Plant Pathologists were not on hand from all states to make individual reports but the printed recommendations were available. In general, seed treatment recommendations were quite similar for all states. Variations occurred mostly on leaf spot fungicides and on control of Sclerotium rolfsii, with fungicides.

Control of other diseases were discussed. Control of black root rot (Cylindrocladium crotalariae), pod rots and aflatoxins were discussed.

Persons wishing to receive peanut disease control recommendations by states should write the Extension Plant Pathologist in the respective peanut producing state.

PLANT PATHOLOGY AND NEMATOLOGY
DISCUSSION GROUP

R. Rodriguez-Kabana

Alumni Associate Professor
Dept. of Botany and Micro-biology
Auburn University, Auburn, Alabama

and

Ruth Ann Taber

Dept. of Plant Sciences
Texas A & M University, College Station, Texas

The initial part of the discussion hinged on the occurrence of resistant strains of Cercospora arachidicola to benomyl (Benlate). Workers in Alabama and Georgia reported that several isolates of the fungus had been resistant to the fungicide during the 1973 season. Such resistance had not been found in Virginia or North Carolina. Considerable time was spent discussing the feasibility of using combinations of Manzate with Benlate to overcome this resistance. One opinion maintained that such combinations would be either ineffective or probably worse since it would result in selection of/or benomyl-resistant strains.

Another topic of discussion was the appearance of new diseases and specifically Cylindrocladium brown rot. The sudden change in the type fungicides used in the latter part of the 1960's was thought possibly to be involved in the emergence of Cylindrocladium crotalariae as a major pathogen. Depression of antagonistic fungi by new fungicides could give competitive advantage to some potential pathogens or aggravate the occurrence of well-known pathogens such as Sclerotium rolfsii.

The possibility of adding antagonists such as Trichoderma harzianum to control S. rolfsii was discussed by workers from Alabama and Georgia. They discussed their successful results in peanuts and tomatoes.

A final part of the discussion section was devoted to the presentation of disease specimens. Diseased peanuts with Sclerotinia sclerotiorum, aerial Rhizoctonia and Aschochyta web blight were presented and described by various participants.

NON-FOOD USES OF PEANUTS AND PEANUT BY-PRODUCTS
DISCUSSION GROUP

W. M. Birdsong, Jr., Leader

Birdsong Storage Company, Inc.
Franklin, Virginia

There were 40 people present in this discussion group. Mr. W. M. Birdsong, Jr. discussed non-food uses and experimental uses of peanut skins, peanut hearts, peanut oil, peanut meal, and peanut hulls. Uses were as follows:

Peanuts -- could not find any non-food uses. Concentrate efforts on peanut by-products including peanut oil, peanut meal, peanut skins, peanut hearts, and peanut hulls.

Peanut Skins -- animal feed

Peanut Hearts -- bird feed

Peanut Oil -- an attractant in rodent bait control poisons (rats like the smell); cosmetics; pharmaceuticals (carrier for penicillin); paints; industrial oil as a carrier; lubricant; manufacturing of some products; aluminum casting; dye release; aluminum foil; Huntsville, Alabama space lab to cut down on oxidation in outer space capsules; surgeons used to sterilize equipment in peanut oil; suntan oil; finishing solid furniture in Germany.

Peanut Meal -- growing some bacteria in cultures for medical research; experimental work by mushroom growers providing nitrogen in the compost (50% protein produces 8 units of nitrogen); specialized fertilizer preparation where you need slow leaching fertilizer (truck farming on sandy land -- Florida is the largest user of organic fertilizer in the nation)

Peanut Hulls -- largest use -- litter and bedding for all types of fowl and livestock, soil conditioning and mulching (fertilizing value about 1-0-1); dehydrating manure, molasses and other products; as a carrier for pesticides; sweeping compound; as a conditioner in the iron casting business in their molding mixture with sand and coal; production of activated carbon; charcoal; as a filler in plastics; catfish food; compressed hulls for freight advantage, pelletize hulls for freight advantage

Mr. William J. Albrecht, Richard B. Russell Agricultural Research Center, P. O. Box 5677, Athens, Georgia 30604, discussed Goldkist Feeding Trial and absorption characteristics of peanut hulls. Peanut hulls can be fractionated and the light fraction can absorb up to 300% of its weight. This provides good utilization as a carrier and as a dehydrating agent. Also work done manufacturing peanut hull fire logs.

Mr. John D. Woodward, National Peanut Research Laboratory, P. O. Box 110, Dawson, Georgia 31742, discussed his recent preliminary test of providing heat to peanut dryers from burning peanut hulls. Approximate cost: \$200,000 -- too high to be economical at this time. One ton of hulls will produce heat to dry four tons of peanuts.

There were no more non-food uses for peanuts. There was some discussion on extracting protein and its isolates from peanuts for feed and non-food uses.

BREEDING, GENETICS AND NATIONAL VARIETY TESTS
DISCUSSION GROUP

R. O. Hammons, Research Geneticist and Technical Advisor,
ARS, USDA, Coastal Plain Experiment Station, Tifton, Ga.
and

D. W. Gorbet, Asst. Agronomist, Marianna Institute of Food
and Agr. Sciences, University of Florida, Marianna, Fla.

The group of 36 participants included representatives from all commercial peanut producing areas in the United States and international members from Australia, Canada, France, Malawi, South Africa, and Israel.

Informal discussions covered a variety of subject areas including:

1. A report by C. T. Young concerning status of chemical evaluation of seed samples for entries in the 1973 Uniform Peanut Performance Test. Test participants agreed to collect samples from the 1974 test for further analyses. Brief discussions followed on the emphasis in breeding to chemical quality parameters (composition, flavor, aroma, shelf-life, etc.) and nutritive value.
2. A brief discussion, led by Jim Kirby, regarding the definition of "inert" matter in the peanut seed trade. The Association of Official Seed Certifying Agencies (AOSCA), through Peanut Committee Chairman R. S. Matlock, encourages researchers to obtain data concerning the comparative performance of Runner, Virginia, Spanish, and Valencia seed with and without the testa. Several workers showed interest in this problem.
3. A discussion by breeders of the following topics relating to infraspecific (intersubspecific) breeding of peanuts --
 - a) Have we reached a yield plateau when breeding within a type (or subspecies)?
 - b) Do present breeding programs reflect this thinking?
 - c) Are crossing programs oriented more toward intersubspecific hybridizations?
 - d) As the genetic base is broadened, will botanical type terminology no longer fit our varieties?
 - e) What effect might this have on the standard market categories of Virginia, Spanish, Runner, and Valencia?
 - f) Who makes the market class determination for a new peanut variety?
 - g) For variety evaluation, is it not now more feasible to divide the germplasm into maturity groups (as in soybeans) rather than or in addition to commercial (botanical) types?
 - h) What is your concept of the "Model" or "Ideal" peanut?
4. Variety registrations and germplasm releases reported by R. O. Hammons, chairman CSSA subcommittee for Peanut Variety Registration --

NC-FLA 14 released jointly by the North Carolina and Florida Agricultural Experiment Stations, registration No. 17, D. A. Emery, A. J. Norden, J. C. Wynne, and R. Walton Mzingo, Crop Science 14(3): 494, May-June 1974.

ALTIKA, released jointly by the Ministry of Agriculture in Guyana and the Florida Agricultural Experiment Station for production in Guyana, registration No. 18, A. J. Norden and D. W. Gorbet, Crop Science 14(2): 339, Mar-Apr. 1974.

CHICO, early-maturing germplasm released in August 1973 by the Agricultural Research Service, USDA, and the Georgia, Virginia, and Oklahoma Agricultural Experiment Stations.

RUST-resistant germplasm consisting of 14 F₃ lines released in August 1973 by the Agricultural Research Service, USDA, and the Virginia Agricultural Experiment Station.

PI 337394F and PI 337409 germplasm with tolerance to toxin-producing strains of Aspergillus flavus released in June 1974.

Peanut breeders and geneticists expressed an interest in scheduling a half-day seminar in their subject interest area as part of annual meeting of APREA in Dothan in July 1975.

HARVESTING, CURING, STORAGE AND PROCESSING
DISCUSSION GROUP

L. E. Samples, Leader
Agricultural Engineer
Georgia Extension Service
Tifton, Georgia

This discussion group was well attended by representatives of all the major peanut producing states. The subject of digging was pursued for the first twenty minutes. All states agreed that the inverting process in peanut digging used in every state is responsible for a higher retrieval rate of peanuts from the soil and is also conducive to higher quality. Research findings were cited to substantiate the existence of *A-flavus* molds on both mature and immature pods in the soil and attached to the peanut plants prior to harvest date. It was the consensus of opinion from the Virginia, Georgia, and Texas delegates that green harvesting procedures would not be feasible for several years to come. Reasons cited were:

1. Extremely high cost of moisture removal from green peanuts
2. General non-availability of machinery for this procedure

Further discussion relative to both peanut quality and seed substantiates the fact that growers and seedmen will have to depend on total mechanization from this point forward. Research evidence substantiated 95°F temperature maximum, a heat rise not to exceed 20°F, and flow rate 50 CFM/ft² as desirable factors in curing quality peanuts throughout the production areas.

No immediate recommendations for changes are seen at this time. However, the desire of more air flow was cited as beneficial in that the curing time was reduced.

The group further agreed that proper handling, combining, and storage of peanuts are of utmost importance and may prevent the spread of contamination within lots. It was further cited that absolute prevention of aflatoxin mold contamination could not be contained within any single harvesting procedure known to the industry at this time.

ACRONYMY DISCUSSION GROUP

Preston Reid, Leader
Tidewater Research Station
Holland, Virginia

Three topics were discussed which can be summarized as follows:

1. The interaction of fungicides, nematicides, and insecticides with agronomic practices does occur. Great care in adhering to label instructions should be exercised to avoid synergistic and antagonistic effects.
2. Early applications of soluble calcium sources may be lost when leaching rains occur.
3. The practice of reporting "bald heads" as foreign matter in peanut seed should be examined. Experiments in determining the detrimental effects and how to avoid this is needed.

Minutes of the Regular Business Meeting of the
AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION
Hilton 1776, Williamsburg, Virginia, July 16, 1974

The meeting was called to order by President Ed Sexton at 8:10 A.M. The minutes were approved as appears in the 1973 Journal.

President Sexton then gave a report on accomplishments of APREA for the past year and further commented on consumer demands and how they will affect research for the future.

President Sexton then asked for Committee reports:

Finance -- Wayne Eaves -- See Apprnx I. Motion was made and seconded by Bill Birdsong that the report be accepted. Passed.

Publications -- Joe Sugg -- See Apprnx II. Motion was made and seconded by Dean Carter that the report be accepted. Passed.

"The Peanut" -- Astor Perry -- See Appendix III. Motion was made and seconded by Bill Birdsong that the report be accepted. Passed.

Program -- Ken Garren -- See Apprnx IV. Motion was made and seconded by Dan Hallock that the report be accepted. Passed.

Peanut Quality -- Clyde Young -- See Appendix V. Motion was made and seconded by C. M. Cater that the report be accepted. Passed.

Public Relations -- Jim Bone -- See Appendix VI. Motion was made and seconded by Clyde Young that the report be accepted. Passed.

Nominating -- Olin Smith -- See Appendix VII. Motion was made and seconded by John French that the report be accepted. Passed.

Olin Smith then proposed a revision in the by-laws as follows:

In the 1972 revision of the By-laws a clause was deleted which established the terms of office and the rotation system for several members of the Board of Directors. The 1973 and 1974 Nominating Committees have proceeded on the assumption that continuation of the three-year alternating rotation system for the directors was intended. In clarification for future Nominating Committee responsibilities, and to assure the continuance of what I believe is a procedure that should be continued, I propose that Article VIII, Sections 2 through 5 of the By-laws be amended from that printed on page 241 of the 1973 APREA Journal to read as follows:

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

Section 3. Same as previously set forth in Section 2.

Section 4. Same as previously set forth in Section 3.

Section 5. Same as previously set forth in Section 4.

Section 6. Same as previously set forth in Section 5.

Olin then moved that this change be effective. Seconded by Terry Coffelt. Passed.

Ray Hammons introduced the International guests. There were nine, the largest number that we have ever had.

Allen Allison gave a report on local arrangements and plans for the tours.

Joe Sugg made a motion and seconded by Coyt Wilson that Article XI, Section 3 of the By-laws be reviewed by the board and corrected by next year. Passed.

Ken Garren was introduced as the new President of the Association for 1974-1975.

Committee appointments were then made for the coming year. The 1975 meeting will be in Dothan, Alabama, July 16-18, 1975.

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

THE PRESIDENT'S REPORT

E. L. Sexton, President

I would like to take a few minutes of your time this morning to report to you on some of the accomplishments of the American Peanut Research and Education Association over the past year and to share with you some of my concerns regarding the future of peanut research.

The past year has seen the accomplishment of an objective that has made us, at the age of six, come of age in the scientific community -- the establishment of a refereed journal -- PEANUT SCIENCE. The achievement of this goal is in no small part due to the careful planning which preceded the first issue. All of us are deeply indebted to Joe Sugg and his Publications Committee, the Ad Hoc Committee that developed the policy, to Editor Preston Reid and his Editorial Staff, the authors who contributed papers, and all who played a part.

The sales of our first publishing effort, "THE PEANUT", continue through the efforts of Astor Perry and his committee and we have now recovered the major part of our initial investment. We must during the coming year make a special effort to sell the remaining copies so that we can begin to accumulate a modest nest egg for future Association publication activities.

While this has been a landmark year in terms of the accomplishments of our association, there have been developments of another kind whose implications I would like to share with you.

Increasingly, the direction of research for the food industry is passing from the Director of the Experiment Station, the Administrator of the Agricultural Research Service and the Vice President of Research for industrial companies to the consumer and her advocates -- be they governmentally appointed or self-appointed.

Increasingly, the consumer is better educated and more sophisticated in her selection of food products. The addition of comprehensive nutritional information, readable dates before which the product should be purchased, the cost per pound and complete ingredient declarations on the label, give her better tools for intelligent buying decisions. The introduction of nutrition in consumer education courses into more schools means that the consumer of 15 years from now will be even more skilled and more demanding in the market place. All of these developments have important implications in terms of our individual research programs. The consumer demands that the products she buys be wholesome and free of any toxic or extraneous material. This must, in turn, be translated into a top priority of our overall research program for the entire peanut industry.

Based on the avalanche of letters to the Editor that followed the publication of the allowable defect levels in food products by the Food and Drug Administration, the consumer made it known that she is not willing to accept as a permanent way of life the presence of even 30 insect fragments or one rodent hair in 100 grams of peanut butter. With the confident assurance that the consumer will continue to ask for smaller and smaller tolerances for defects and potentially toxic materials, it is mandatory that a primary research effort in all branches of the peanut industry be directed to the pinpointing of sources of extraneous and potentially toxic materials and to the development of systems to assure their elimination.

The consumer is more demanding in the level of nutrition in the products which she purchases. The housewife recognizes peanut butter as a nutritious product. A two-tablespoon serving of peanut butter provides a significant contribution to the recommended daily allowance for protein. However, if the quality of the protein in peanut butter could be improved to the level of milk

protein, we would be permitted to indicate to the customer that the same two tablespoons of peanut butter would supply 44% more of the recommended daily allowance of protein. A high priority must be assigned to the development of peanuts which will yield a peanut butter of equivalent flavor and processing characteristics but with a protein quality equal to that of milk protein.

Similarly, foods are increasingly expected to carry their own weight in essential nutrients. A two-tablespoon serving of peanut butter carries 15% of the U. S. Recommended Daily Allowances for protein and niacin but less than 2% of the Recommended Daily Allowance for thiamine and riboflavin.

In our breeding programs of the future, we must strive to develop varieties in which the protein quality is equal to milk protein and the concentration of the major B vitamins is such that a serving provides at least 15% of the Recommended Daily Allowances.

The consumer demands that the food products she buys be processed in the plant with high standards of cleanliness. The peanut butter plant, the shelling plant, the farmer's stock warehouse, and the cold storage warehouse are in every respect food plants in the same way as a dairy, a bakery, or a baby food plant. The Food and Drug Administration, in its Standards of Good Manufacturing Practices, has provided a set of guidelines whereby each manager of a processing plant, a shelling plant or a warehouse should measure his compliance. To the extent that the equipment available falls short of these guidelines, research should be undertaken to change the design. In the design of new equipment and facilities, the compliance with Standards of Good Manufacturing Practices should be a prime consideration.

The consumer is increasingly conscious of cost -- not only absolute cost but also the cost relative to items she considers in terms of substitutes. During the past year, it has worked to the advantage of the peanut industry as the consumer substituted peanut butter and other peanut products for other protein sources she felt to be prohibitively high in price.

However, we must always remember that peanut butter is a sandwich filling and, as such, is viewed by the homemaker as one of a family of sandwich fillings. Therefore, the cost relative to other sandwich fillings must be maintained in a relatively stable relationship.

From a research standpoint, this means that we must have continuing programs designed to develop systems of growing, harvesting and processing peanuts that will enable us to bring about an overall reduction in cost.

The consumer is demanding foods of higher flavor quality and greater uniformity. Psychologists tell us that one of the reasons we remember so fondly Grandma's apple pie is that her successes seemed even greater in the light of her occasional failures. Today's consumer is not willing to accept even occasional substandard peanut products. The uniformity and quality of the peanut products which we present for sale to the public is directly dependent upon the achievement of optimum maturity, careful harvesting and proper low temperature curing, careful shelling, proper storage and shipping conditions, and meticulous control of all processing. As has been repeated so often, the processor cannot bring back the quality lost in the field, the drier, the shelling plant, or the storage warehouse.

The consumer is not mindful of the weather conditions that change from day to day or whether the rain came in the proper period. She only demands that each jar of product she buys is of the same high quality.

Much of our research in the past has been directed toward learning the limits beyond which we will damage the quality of our product -- the maximum drying temperature or the maximum speed of the combine. Our future research programs must give us the answers to the optimum growing, harvesting, and processing conditions. What are the time and temperature conditions for curing that will bring out the very best peanut flavor that is possible? What is the optimum time of digging for the best peanut flavor?

The consumer is insisting on being better informed. As members of the peanut industry, our customers are largely concentrated in urban environments and understandably have little appreciation of farm problems and the value to the consumer of agricultural research. APREA is unique in that it has within one organization people trained in doing research and those who are experts in communication. May I challenge you to extend that talent in communication to devise ways and means of communicating the value of agricultural research to the consumer beyond the farm areas of your own state, to your own urban areas and, still more importantly, to the major urban areas of the country. Increasingly, major decisions influencing food, agriculture and agricultural research at both the state and federal levels are being made by those who understandably may only recently be made aware that there is a relationship between cows and milk. Within the month, an innovative legislator from Missouri invited the Director of Consumer Affairs for New York City to spend time with a farm family in Missouri. Both will come away from this experience with greater appreciation of the other's concerns.

We need innovative means of communicating to the urban family the importance to them of agricultural research. Perhaps it's a sign on a well-traveled highway directing them to a spot where they can see peanuts growing in a nearby demonstration plot or an exchange between farm families and urban families arranged through a church or fraternal group. It may tax your ingenuity but you are the keys to better understanding between the producer and the urban consumer.

Thus far we have talked about the areas of research that are vital to our present consumer goods market. The consumer has also shown an interest in lower-cost protein sources that will enable her to stretch her food budget. The requisite flours, protein concentrates and protein isolates that form the raw materials on which the simulated food industry is based can be made from peanuts but they can also be made commercially from much less costly oilseeds. The peanut industry needs to establish a task force to determine the conditions under which peanuts can be competitive with other sources of protein and oil and the probabilities that, through research, these conditions can be met.

A move in this direction may well call for the development of peanuts which more specifically meet the demands of the protein processor and the oil extractor.

Research in the Agricultural Experiment Stations, the U. S. Department of Agriculture and industry will serve the best interests of the peanut industry as a whole if, in the distribution of available funds among research projects, as well as in the selection of research projects, the voice of the housewife in New York, Chicago and Los Angeles is given at least equal consideration to the immediate pressures of the grower in Frio County, the sheller in Caddo County or the machinery manufacturer in Suffolk.

Those responsible for research administration must learn to tune their ears to the voices of the urban American consumer. Each research project must be measured against the yardstick of its contribution to meeting important consumer needs. The consumer has indeed taken over the direction of research in the food industry and continuing financial success of the peanut industry will depend in large part on the degree to which we realistically accept this fact and meet this challenge.

In conclusion, I wish to thank each and every one of you for the wonderful support you've given me during the past year. I do want to express my deepest appreciation to you for the opportunity you've provided for me to serve as President of the American Peanut Research and Education Association. Thank you.

REPORT OF FINANCE COMMITTEE

Wayne Eaves, Chairman

It is the responsibility of the finance committee to audit on a limited basis the Associations' financial records and report its findings to the Board of Directors. It is further the responsibility of the committee to assist the chairman, directors, and executive secretary in the financial operations of the Association throughout the year.

An audit of the financial records was made on Sunday, July 14, 1974 for fiscal year July 1, 1973 through June 30, 1974 and they are consistent with the records kept by the Executive Secretary. The committee commends Leland Tripp on a very efficient job.

The committee recommends to the Board of Directors that a policy be set relative to capital equipment for secretarial work. We also recommend the same dues structure and registration fee for the ensuing year as the present. We recommend a special "push" be made toward selling more copies of "The Peanut".

AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION

July 1, 1973 - June 30, 1974

INCOME

Balance - July 1, 1973	\$ 2,643.76
Membership and Registration (Annual Meeting)	7,719.25
Proceedings and Reprint Sales	2,660.57
"The Peanut"	<u>4,324.33</u>
TOTAL	\$ 17,347.91

EXPENDITURES

Proceedings - Printing	\$ 3,130.70
Annual Meeting - Printing, Miscellaneous	789.85
Secretarial Services	805.00
Postage	625.20
Office Supplies	56.77
Registration - State of Georgia	5.00
Miscellaneous	69.00
Bank Charges	22.30
Peanut Science	<u>2,454.07</u>
TOTAL	\$ 7,957.89
Balance on Hand, 6/30/74	\$ 9,390.02

AMERICAN PEANUT RESEARCH AND EDUCATION ASSOCIATION

Budget

July 1, 1974 - June 30, 1975

<u>INCOME</u>	<u>BUDGET</u>
Balance - Stillwater First National Bank	\$ 9,390.02
Sales - "The Peanut"	4,000.00
Membership and Registration, Annual Meeting	7,000.00
Proceedings and Reprints	2,600.00
Special Contributions	1,200.00
"The Peanut" (519 on inventory) @ \$11.33	5,880.27
Peanut Science	<u>9,625.00</u>
TOTAL	\$ <u>39,695.29</u>

<u>EXPENDITURES</u>	
Proceedings - Printing	\$ 4,000.00
Annual Meeting (Printing, Miscellaneous)	2,200.00
Secretarial Services	1,000.00
Postage	800.00
Office Supplies	200.00
Travel - President	300.00
Travel - Executive Secretary	300.00
Registration (State of Georgia)	5.00
Miscellaneous	500.00
Peanut Science	<u>9,625.00</u>
TOTAL	\$ 18,930.00
RESERVE	<u>20,765.29</u>
TOTAL	\$ 39,695.29

REPORT OF THE PUBLICATIONS AND EDITORIAL COMMITTEE
TO THE BOARD OF DIRECTORS, 8:00 P.M.,
July 14, 1974

Joe S. Sugg, Chairman
R. O. Hammons
William T. Mills
Preston Reid
Coyt T. Wilson

1. The participants in the 1973 APREA annual meeting are to be commended on the timeliness of submitting their papers and reports, which facilitated the publication of the 1973 Journal within thirty days following the meeting. We experimented using a new binding method, which speeded up the publication of the Journal, but the method was not totally satisfactory. The next Journal will be metal stapled in addition to being bound.

2. PEANUT RESEARCH has been published in a most excellent manner by Co-Editors R. O. Hammons and J. E. Cheek. The following report of that activity is submitted by the Co-Editors:

Six issues of PEANUT RESEARCH (volume 11, numbers 1 through 6, 1973-74) have been compiled, edited and mailed since the previous report. The mailing list has stabilized at around 500 people, including foreign mailings.

The last three issues (January, March, May 1974) were posted with name labels applied directly to the last page, reducing time and cost of folding and handling. APREA's brochure on history, purpose and goals, with a membership application form, was enclosed with one mailing.

In the six issues, reference was given to 22 theses and dissertations. Three hundred seventy-one additional peanut literature references were cited in the selected reference section. Readers were kept posted during the year on the spread of peanut rust. Several books of interest to peanut workers were listed in the bookshelf section.

All APREA information items forwarded to the editor by officers and members were published. Included were announcements of the annual meeting, officers elected, and pertinent information about APREA's new refereed journal, PEANUT SCIENCE.

The editors appreciate action by APREA members who took time to forward items for inclusion in PEANUT RESEARCH. We again invite you to send us news items of general interest, personnel changes, new project approvals, and interpretive summaries of important publications or research achievements.

3. Due to the fact that PEANUT SCIENCE is referred to as "The Journal of APREA", the publication of the activities of the annual meeting of APREA will be entitled "Proceedings" instead of Journal, as in the past.

4. The question has been posed to the Publications and Editorial Committee as to what plans should be pursued concerning a revision of "PEANUTS -- CULTURE AND USES". I have canvassed the Publications and Editorial Committee and find that there is unanimous agreement that this book will be current for a period of five to ten years and that we now have 600 copies, which have not been sold and which should adequately care for the demand for the next three to four years. Inasmuch as it takes approximately two to three years to bring out a copy, it would be the recommendation of this Committee that the matter of revising "PEANUTS -- CULTURE AND USES" be delayed until the annual meeting of APREA, 1977.

5. Preston Reid, Editor, PEANUT SCIENCE, has done an outstanding job in getting PEANUT SCIENCE off the ground and into actual being by the March 1974 deadline. Editor Reid brought a number of points before the Board concerning details in handling the publication of PEANUT SCIENCE. These details, as they affect potential authors, will be published by Editor Reid in instructions to the authors.

6. The Publications and Editorial Committee, in compliance with the direction of the Board, prepared and published for distribution a flyer listing the history, purposes and goals of the American Peanut Research and Editorial Committee, with an application blank on the back. It is hoped that this has been beneficial to those seeking APREA membership.

APPENDIX III

REPORT OF THE PEANUT COMMITTEE

Astor Perry, Chairman

The Peanut Committee wishes to express thanks to all of the members for the excellent job they have done in selling "PEANUT CULTURE AND USES".

As of this date, we have collected \$18,600.00 from sales of the book and still have 509 copies remaining to be sold.

Based on sales last year, we would estimate that 200-250 copies would be sold this year, giving us approximately a two-year supply.

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

Sunday, July 14

- 1 - 5 Registration - West Gallery
- 3 - 5 Committee Meetings
- 6 - 8 Reception - Middle Plantation Room
- 8 - 10 Board of Directors Meeting - Bruton Room

EXTENSION PLANT PATHOLOGY DISCUSSION GROUP - Confederation Room

- 1:30 Soil and seedling diseases, J. C. Wells, presiding
- 2:30 Break
- 2:45 Foliar diseases, Sam Thompson, presiding
- 3:45 Status of Aspergillus flavus, soil-borne disease of peanuts,
Wyatt Osborne, presiding
- 8:00 Nematodes associated with peanuts, Don Dixon, presiding
- 9:00 Evaluation of disease control recommendations by states,
Fred Smith, presiding

Monday, July 15

- 8 - 5 Registration - West Gallery

GENERAL SESSION - Edwin L. Sexton, presiding - Jamestown Room

- 8:45 President's Welcome - Edwin L. Sexton
- 9:00 Address by the Honorable Mills Godwin, Governor of Virginia
- 9:30 U. S. market demand and the competitive position of peanuts in a
protein deficient world, Don Sands
- Break

- 10:45 Two concurrent sessions

SESSION 1. ENTOMOLOGY - L. W. Morgan, presiding - Yorktown Room

- 10:45 Effect of fungicides and insecticides on spider mite buildup and
supression on peanuts, W. V. Campbell and R. W. Batts
- 11:00 Dosage mortality response of the southern corn rootworm to several
insecticides in Virginia, John C. Smith
- 11:15 Evaluation of multiple pest control on peanuts treated with systemic
and nonsystemic chemicals, N. A. Minton and L. W. Morgan
- 11:30 Peanut pest management research, L. W. Morgan

- 11:45 Peanut insect pest management in Georgia, John C. French
- SESSION 2. AFLATOXIN - A. C. Mixon, presiding - Jamestown Room
- 10:45 Variability of aflatoxin test results, T. B. Whitaker, J. W. Dickens, and R. J. Monroe
- 11:00 Low aflatoxin levels in windrowed peanuts and population changes of the Aspergillus flavus group in soil, pods, and kernels before and after harvest, David M. Wilson and Randel A. Flowers
- 11:15 Peanuts as a substrate for mycotoxin production, Jerry W. Kirksey and Richard J. Cole
- 11:30 An improved millicolumn procedure for detecting aflatoxin in agricultural commodities, J. A. Lansden and C. E. Holaday
- 11:45 Bioelectrical discharge patterns of mold and aflatoxin damaged peanuts, R. E. Pettit, F. M. Shokes, and Ruth A. Taber
- 12:00 Lunch
- 1:30 Three concurrent discussion groups
1. Non-food uses of peanuts and peanut by-products, W. M. Birdsong, Jr., presiding - Confederation Room
 2. Moisture stress and its relation to disease and insect problems, John C. French and Paul A. Backman, presiding - Resolution Room
 3. Breeding, Genetics and National Variety Tests, R. O. Hammons and D. W. Gorbet, presiding - Bruton Room
- 2:30 Break
- 2:45 Two concurrent sessions
- SESSION 1. PEANUT PROCESSING - R. L. Ory, presiding - Jamestown Room
- 2:45 Fungal fermentation of peanut meal: Electrophoretic and compositional analyses of proteins and quantitation of intestinal gas-forming oligosaccharides, L. R. Beauchat, R. E. Worthington, J. P. Cherry, and C. T. Young
- 3:00 Cost estimates for aqueous processing of peanuts for the production of food grade protein concentrates and oil, Carl M. Cater, Khee Choon Rhee, and Karl F. Mattil
- 3:15 Applications and limitations of the thiobarbituric acid test for keeping time studies of peanut products, George V. Odell, Peter Tsai, Alice Wu, Lois Hwang, and J. S. Kirby
- 3:30 Characterization of protein and amino acid changes in Aspergillus contaminated Florunner peanuts, John P. Cherry, Clyde T. Young, and Larry R. Beauchat
- 3:45 Development of lipid peroxidation during long term storage of raw and roasted peanuts, Allen J. St. Angelo and Robert L. Ory
- 4:00 Free amino acid contents of peanut cultivars grown in different areas, Edith J. Conkerton and Robert L. Ory
- 4:15 Correlation of volatile components of peanut products with flavor score. 1. Shelf life studies on peanut butter, Sara P. Fore, Harold P. Dupuy, and James I. Wadsworth

- 4:30 Influence of genotype and kernel size on the processing characteristics of peanuts, Sam R. Cecil
- 4:45 The effect of roasting methods on the flavor and composition of peanut butter, Clyde T. Young, Timothy G. Young, and John P. Cherry
- SESSION 2. BREEDING AND GENETICS - J. S. Kirby, presiding - Yorktown Room
- 2:45 Productivity of peanut plants developing from normal and abnormal seedlings, Gene Sullivan
- 3:00 Inheritance of proteins and oils in peanuts, Y. P. Tai and Clyde T. Young
- 3:15 Effects of mean temperature and growth period upon oil composition in peanuts, Jack L. Pearson and Charles E. Holaday
- 3:30 Cytogenetic investigations of Arachis hypogaea L., C. E. Simpson
- 3:45 Genetic vulnerability in peanuts: A second look, Ray O. Hammons
- 4:00 The effect of mass selection on yield in advanced generations, T. A. Coffelt and Ray O. Hammons
- 4:15 Combining ability estimates in Arachis hypogaea L. III. F2 generation of infraspecific crosses, J. C. Wynne, D. A. Emery, and J. O. Rawlings
- 4:30 Estimation and utilization of inter-cultivar competition in Arachis hypogaea L., Aktar Beg, D. A. Emery, and J. C. Wynne
- 4:45 Differential response among peanut genotypes to lesion nematodes, Olin D. Smith, W. H. Thames, and T. E. Boswell
- 8:30 Discussion Session - Jamestown Room
A. flavus and aflatoxin determinations at the buying point - Luther Farrar, presiding
- 8:30 Quality Committee Meeting - C. T. Young, Chairman - Yorktown Room

Tuesday, July 16

- 8 - 12 Registration - West Gallery
- 8:00 President's Address and Business Meeting, Edwin L. Sexton, presiding - Jamestown Room
- Committee Reports
- Election of Officers
- 9:30 Break
- 10:00 Two concurrent sessions
- SESSION 1. PLANT PATHOLOGY - Sam S. Thompson, presiding - Yorktown Room
- 10:00 Evidence for the role of soilborne mites in peanut pod rot disease using a new extraction technique, Marvin K. Beute
- 10:15 PCNB, PCNB plus fensulfothion as related to Sclerotium rolfsii control and lesion nematode damage, S. S. Thompson

- 10:30 Rhizoctonia foliage blight of peanut, R. H. Littrell
- 10:45 The effects of peanut leafspot fungicides on non-target soilborne organisms, P. A. Backman and R. Rodriguez-Kabana
- 11:00 Dispersal mechanisms of Cylindrocladium crotalariae, causal agent of Cylindrocladium black rot of peanuts, Randall C. Rowe
- 11:15 Occurrence and control of Cylindrocladium crotalariae in peanut fields in Alabama, R. Rodriguez-Kabana and P. A. Backman
- 11:30 Thermophilic Fungi in peanuts, Ruth Ann Taber and Robert E. Pettit
- 11:45 Occurrence of Asochyta web blotch in Texas, G. L. Philley, Ruth Ann Taber, D. H. Smith, and R. E. Pettit
- SESSION 2. SHELLING - MATURITY - GROWTH REGULATORS - Robert Pender, presiding - Jamestown Room
- 10:00 Some effects of peanut sheller design and operation on seed germination, James I. Davidson, Jr.
- 10:15 Laboratory device for peanut skin removal, F. S. Wright and R. W. Mozingo
- 10:30 Noise reduction in pneumatic ducts conveying peanut hulls, John D. Woodward
- 10:45 Effect of maturity of peanuts on the quantity, amino acid profile and electrophoretic patterns of peanut proteins, Khee Choon Rhee, Lewis E. Clark, Carl M. Cater, and Karl F. Mattil
- 11:00 Evaluation of maturity in Virginia type peanuts by arginine maturity index, B. R. Johnson, R. W. Mozingo, and C. T. Young
- 11:15 Effect of drying temperature on maturity estimation as measured by optical density at 450 and 480 nm wave lengths, Lawrence J. Janicki and Jack L. Pearson
- 11:30 The effect of growth regulators on peanut yield, fat and protein content, Julius Heinis, D. W. Gorbet, and E. B. Whitty
- 11:45 The effect of Kylar on yield, grade factors and germination of Florigiant peanuts, Astor Perry and L. L. Hodges
- 12:00 Lunch
- 1:30 Five concurrent discussion groups
1. Plant Pathology and Nematology - R. Rodriguez-Kabana and Ruth Ann Taber, presiding - Resolution Room
 2. Entomology - John C. French, presiding - Bruton Room
 3. Harvesting, curing, storage and processing - L. E. Samples, presiding - Yorktown Room
 4. Product Quality - C. T. Young, presiding - Jamestown Room
 5. Agronomy - Preston Reid, presiding - Confederation Room
- 2:30 Break
- 2:45 Two concurrent sessions

SESSION 1. PRODUCTION PRACTICES - Dallas Hartzog, presiding - Yorktown Room

- 2:45 Effect of temperature on time to flowering of Virginia type peanuts, F. R. Cox and C. K. Martin
- 3:00 Varietal differences in iron absorption efficiency of peanut cultivars cultivated on calcareous soils, A. Hartzook, D. Karstadt, M. Naveh, and S. Feldman
- 3:15 Variations in contents of 8 nutrients in central stem leaf segments of 10 peanut cultivars and lines, D. L. Hallock and D. C. Martens
- 3:30 Peanut responses to soil water levels, J. R. Stansell
- 3:45 Studies on flowering and seed formation by Starr variety Spanish-type peanut plants, Darold L. Ketring
- 4:00 The effect of leaf age and stage of plant maturity on photosynthesis rate and photosynthate translocation of Florunner peanut (Arachis hypogea), Ronald J. Henning
- 4:15 Effect of phosphorus and potassium fertilizers on yield and grade of peanuts in Alabama, 1969-1973, Dallas L. Hartzog
- 4:30 Herbicide program for peanuts, W. L. Currey, D. W. Gorbet, and E. B. Whitty
- 4:45 PENUTZ, a physiological model for simulating the development and growth of peanuts, W. G. Duncan

SESSION 2. HARVESTING AND CURING - William T. Mills, presiding - Jamestown Room

- 2:45 Effects of sample size on accuracy of peanut moisture determination, G. H. Brusewitz, T. B. Whitaker, and J. H. Young
- 3:00 Peanut peg strength measurement, J. M. Troeger
- 3:15 Dimensional changes of Virginia-type peanut pods and seeds during drying, J. L. Steele and L. W. Brown
- 3:30 Dimensional changes in peanut pods, kernels and hulls as moisture is removed during curing, Whit O. Slay
- 3:45 Changes in grade factors of farmers' stock peanuts stored in the southwest, Nat K. Person, Jr.
- 4:00 Comparisons of low temperature with commercial curing of peanuts, P. D. Bloome and W. S. Allen
- 4:15 Direct harvesting of peanuts, J. L. Butler and E. J. Williams
- 4:30 The effects of drying green peanuts with different airflow rates, Paul D. Blankenship and Jack L. Pearson
- 4:45 Development of a field model peanut salvager and recleaner, G. B. Duke

Wednesday, July 17

All day field trip - details will be announced

Adjourn

REPORT OF QUALITY COMMITTEE

Clyde T. Young, Chairman, Peanut Quality Committee
J. H. Young, Chairman, Sampling Committee

The Quality Committee is composed of the Peanut Quality Committee (Clyde T. Young, Chairman) and the Subsampling Committee (James Young, Chairman) and meets annually at the APREA meeting to gain direction. The current activities of each group are reported as follows:

A. Peanut Quality Committee

1. Individuals have been contacted who have the capabilities for evaluation of the WIIR method for measuring light filth in peanut butter samples.
2. Ground rules and plans for initiation of the WIIR were made at the 1974 APREA Quality Committee meeting and this program will be started in the near future.
3. Additional information was collected on the value, use, and acceptability of a calculated iodine number for peanut oils.
4. It was noted and encouraged that additional research is needed on free amino acid and sugar content of raw and roasted peanuts to aid in evaluation of roasted flavor potential of peanuts.

B. Subsampling Committee

This committee initiated and completed a collaborative study on the variability in peanut moisture content of peanuts. The study was conducted on Spanish peanuts at Oklahoma State University and Virginia peanuts at North Carolina State University. The results are reported at this meeting in a paper titled "Effects of sample size on accuracy of peanut moisture determination" by C. H. Brusewitz, T. B. Whitaker, and J. H. Young.

REPORT OF THE PUBLIC RELATIONS COMMITTEE

J. R. Bone, Chairman

During 1974 this committee has had two major objectives: development of new memberships and publicity for our 1974 meeting.

To aid in developing new memberships, this committee received, in November 1973, 500 copies of "History, Purposes, and Goals of APREA" and 20 copies of Volume 5, Number 1, 1973 Journal of APREA. This literature was distributed among members of this committee for use during contacts with interested parties. Many favorable comments were received relative "History, Purposes, and Goals of APREA" as well as a number of promises for new memberships. Again, as committees before, we found personal contact more effective in developing interest than mailings.

In February we began compiling a list of individuals representing the news media (newspaper, magazine, radio and television) in peanut growing regions of the United States through whom we hoped to advise the public of the existence of APREA. In May, a mailing was made to farm editors of 16 newspapers, 27 magazines, and 19 radio and television stations. We feel our efforts were well rewarded as shown by notices published relative our 1974 meeting along with promises of complete media coverage of same.

On the recommendation of previous committees, an attempt was made to prepare releases relative APREA activities for Peanut Journal and Nut World. We found preparation of timely releases very difficult due to the informal nature of communications within our organization. We suggest, as an aid to future Public Relations Committees, that a formal channel of communications with other committees as well as the Board of Directors be established.

Respectfully submitted,

J. R. Bone, Chairman
Minton Beach, Jr.
J. Frank McGill
Ross Wilson
Russell C. Schools
G. R. Johnson

R E S O L U T I O N

WHEREAS, Mr. Joe S. Sugg has taken from his time and activities on behalf of the North Carolina Peanut Growers Association, Inc. to prepare and print "History, Purposes, and Goals of APREA" and

WHEREAS, said literature has been of outstanding value in promoting and publicizing APREA;

THEREFORE, BE IT RESOLVED that we, the members of APREA, do hereby recognize and thank Mr. Joe S. Sugg for this fine accomplishment in behalf of our organization.

R E S O L U T I O N

WHEREAS, in addition to serving peanut growers of Oklahoma in his extension capacity, Dr. Leland Tripp has, for the past six years, dedicatedly conducted the many duties of Executive Secretary-Treasurer of APREA and

WHEREAS, has eagerly promoted, in all aspects, the peanut industry including APREA;

THEREFORE, BE IT RESOLVED that we, the members of APREA, do hereby recognize and thank Dr. Leland Tripp for his many services to our industry.

R E S O L U T I O N

BE IT RESOLVED that the American Peanut Research and Education Association (APREA) does hereby recognize the death of Luther H. Turner will be keenly felt by the peanut industry. Mr. Turner was a vibrant force in our industry from 1938 until his death in November of 1973 and will long be remembered for his enthusiastic support of new developments in seed protectants and peanut machinery. Above all, Mr. Turner will be remembered as always having had time to help his many friends, especially APREA.

WE, THEREFORE, recommend that the resolution be included in the official minutes of the 1974 Annual Meeting of the APREA and that a copy of it be forwarded to his widow.

R E S O L U T I O N

BE IT RESOLVED that the American Peanut Research and Education Association (APREA) does hereby recognize the death of Mr. Joe Nickols as a loss to APREA, the peanut industry and his many friends. As a member of the Oklahoma State Department of Agriculture and most recently Goldkist plant manager in Anadarko, Oklahoma, Mr. Nickols actively supported and promoted all aspects of our industry.

WE, THEREFORE, recommend that the resolution be included in the official minutes of the 1974 Annual Meeting of the APREA and that a copy of it be forwarded to his widow.

APPENDIX VII

REPORT OF THE NOMINATING COMMITTEE

Olin D. Smith, Chairman

The Nominating Committee presents for your consideration the following nominees:

President Elect ----- J. Frank McGill
Executive Secretary-Treasurer ----- Don H. Smith
Industry Representative
(manufactured products) ----- Dean M. Carter
Industry Representative
(shelling, marketing and storage) --- J. B. Roberts

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 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.

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