GERM PLASM EVALUATION AND INHERITANCE STUDIES IN PEANUTS, <u>ARACHIS HYPOGAEA</u> L.

By

LELAND DERRELL TRIPP

Bachelor of Science
Oklahoma State University
Stillwater, Oklahoma
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Master of Science
Oklahoma State University
Stillwater, Oklahoma
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GERM PLASM EVALUATION AND INHERITANCE STUDIES

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Thesis Approved:

Ralph S. Matlock
Thesis Adviser

[illegible signature]

[illegible signature]

Michael E. Mason

Glenn W. Todd

N Durham
Dean of the Graduate College

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CHAPTER I

INTRODUCTION

The search for germ plasm with single characters that may be incorporated into the present peanut varieties is a never ending goal. New improved varieties have been developed in recent years, yet a surplus of poor quality peanuts exists in our government warehouses. The need for new or previously unrecognized characters to further improve the peanut quality is urgent.

The purpose of this study was to evaluate 29 peanut accessions as a possible source of germ plasm which may be utilized to improve or replace present commercial varieties. Another purpose was to study the inheritance of certain characters in field hybrids and mutations.

CHAPTER II

LITERATURE REVIEW

The net worth of the peanut, Arachis hypogaea L., in the world trade channels is fairly well known, but the origin of this fabulous species is not. According to Higgins (15) in 1933, Chevalier wrote, "The problem of the origin of the peanut has made floods of ink flow." However, Waldron (34) reported that there was no evidence to contradict the view that the peanut was a native of Brazil. The earliest mentions in any existing literature are those pertaining to Brazil and Peru, and they antedate any found in European works.

Many years of improving the peanut have been expended through the efforts of several dedicated workers. Reports of successes in many areas were followed by requests for higher quality, insect and disease resistance, and the improvement of several agronomic factors. Gregory et al. (8) noted that the problem of improving peanuts through selection is not a simple one. The peanut is, for all practical purposes, 100 percent inbred, it is difficult to cross, and it produces so few seed per plant that the recovery of improved segregates is highly improbable. Consequently, today's peanut breeder must not only increase the precision of estimating genetic differences within segregating populations but also must overcome the interspecific sterility barriers, gather fundamental biological information on the structure and physiology of the peanut and its wild relatives, and relate these to the problem of improvement.

According to Stokes and Hull (32), botanists have described 12 species of the genus <u>Arachis</u>, which are found in South America and primarily in Brazil. Only the common species, <u>Arachis hypogaea</u>, is found elsewhere. Seven of the 12 species are perennials. Darlington (6) reported that the cultivated forms of groundnut were mostly tetraploid and that diploid species available offer a ready means of protecting the peanut industry from disease by hybridizing them with the new wild species. Husted (20) believed the species was partially allopolyploid, since two pairs of chromosomes distinctly deviate from the others. One pair of short chromosomes, called A, have a median centromere; and one pair of satellite chromosomes, called B, are characterized in the mitotic metaphase by unusually long secondary constrictions. Husted (20) also pointed out that aberrant chromosome configurations did not appear to occur in equal frequency in the cultivars studied. In one strain, anaphase separation was 20-20 in six out of eight cases and in the other two cases it was 21-19 and 22-18, respectively. Another deviating plant was observed by Husted to have 2N = 40 plus one extra chromosome and a small fragment. Gustafsson and Gadd (9) reported that the evidence indicated <u>Arachis hypogaea</u> behaves like an amphidiploid species, resulting from a cross of diploid species, not too distantly related chromosomally, and with a subsequent chromosome doubling. The multivalent, as well as the trivalent and univalent formation in meiosis, should influence population dynamics and mutation frequency. In addition, translocations and inversions have probably played a role in the cytogenetic structure of the species, according to Husted (20).

Hammons (11) used the "krinkle" mutant as one parent in several crosses and determined its dominant nature. The availability of this dominant marker has been valuable for qualitative inheritance and natural-crossing frequency investigations. Hayes (13) reported 150 non-crinkled and eight crinkled F_2 plants in the cross of normal x Sine (crinkled). It appeared to be due to complementary genes and behaved as a two-factor difference between crinkled and normal.

Hammons (12) reported that even though the pedigreed natural crossing method of breeding has many uses, its chief disadvantage may be that the marker stock must have in its genetic makeup those characteristics desirable for variety improvement or genetic study. Syakudo and Syutaro (33) studied the combining value of Spanish, Virginia, and Valencia types and found that crosses between varieties were successful both within each type and among the three types. The F_1 plants between Virginia and Spanish or Valencia type showed a threefold increase in top weights over either parent. However, hybrid vigor did not occur in F_1 plants between varieties within each type and between Spanish and Valencia types. Higgins et al. (16) indicated that hybrid vigor usually disappeared by the fourth generation and that high oil content and low protein were correlated.

John et al. (21) in their classification of the peanut found that the size of fruit was influenced to a certain extent by soil and environmental conditions, but fruit size still provided a distinguishing characteristic. The length of the fruit usually depended on the number of seed in the fruit and the length of the seed. Beavers (3) found non-irrigated peanuts, without prolonged drouth stress, had heavier kernels and a longer, wider, and thicker fruit than the irrigated peanut. He also concluded that pericarp thickness could be determined by measuring the ventral basal suture and the dorsal distal suture. The basal end of the peanut fruit was wider than the distal end in most instances. John et al. (21) reported that fruit shape was cylindrical with oblique ends. The pericarp followed the contour of the seeds within the pods. The constriction between seed varied from deep to very shallow even for fruit obtained from a pure line, but the majority conformed to a varietal pattern. Small fruits usually have thinner pericarps and consequently higher shelling percentage than the larger fruit. Redcorn and Matlock (28) evaluated 33 introductions and reported that certain accessions had one to three unusual attributes, but none were outstanding for several characteristics.

Only in recent years has there been a determined search for the "quality factor" in peanuts. Stokes and Hull (32) found Spanish peanuts had a higher oil content in the meats than runners. They indicated that the pericarp of Spanish peanuts was thin compared with the runners and that the kernels more completely filled the fruit. John et al. (21) indicated that low and deficient rainfall at the time of maturity reduced the oil content of the kernels. Collins and Matlock (4) postulated that immature peanuts were present in any bulk sample and until a procedure was developed to eliminate them the whole sample should be handled as if it were immature. Morris and Freeman (25) prepared peanut butter from peanuts with various degrees of roast and evaluated it periodically to determine the effect of roast on flavor characteristics during two years of storage. In the opinion of the panel, peanut butter made from medium-roasted peanuts exhibited the most desirable flavor and flavor retention. Mason, Eager, and Waller (24) described a procedure which allowed the simultaneous quantitative determination of glycerol as well as fatty acids of fats and oils by gas liquid chromotography. In so doing, glycerol and fatty acid values were expressed on an absolute rather than related basis.

The inheritance of testa color has been studied extensively. Stokes and Hull (32) found red seed dominant to russet or tan. Higgins (14) reported there are various shades of flesh in Spanish peanuts but all appear to segregate similarly when crossed with cultivars with red or white testa.

Hammons (10) and Higgins (14) concluded that the flesh factor for testa color must be present for red to be expressed. Crossing results also increased the number of known white testa genotypes from two to four and provided new genetic stocks for use in peanut inheritance studies (10). Higgins (14) believed that the principal seed coat colors in the peanut were due to water soluble pigment or pigments and that the colors fade rapidly from mature peanuts left in moist soil and more slowly from those in dry storage. Two strains with white seed coats were found to differ in their genetic constitution. Apparently Pearl carried factors for both red and flesh pigment but lacked factors for expression of color, while the Philippine white had neither pigment but did carry factors for the development of color. The genotypic constitution proposed for the testa color of Pearl was RR $F_1F_1F_2F_2$ $d_1d_1d_2d_2$ while that for Philippine white was rr $f_1f_1f_2f_2$ $D_1D_1D_2D_2$.

Higgins and Bailey (17) found the testa of the mature seed was a very thin pliable membrane of dead collapsed cells, which contained about seven percent tannoid pigments and most of the thiamine of the seed. Cook and Wilson (5) used tannic acid to inhibit different species of Endothia toxicity and found in those areas which were sown with spores of the fungi that in no case was growth made, although the spores remained viable.

Mutations have probably occurred in cultivated peanuts ever since their origin. According to Stadler (30) maize genes had different mutation rates; some were fairly frequent (500 per million gametes) while others rarely, if ever, mutated. The probability of mutations occurring and surviving is small.

Patil and Bora (27) noted virescent mutants in Spanish peanuts which had been irradiated with X-rays at an intensity of 2,400 r per minute. Progeny of a mutant plant produced 10 out of 44 plants deficient in the development of chlorophyll in the leaf. Usually the top 3 to 5 leaves exhibited chlorophyll deficiency. The deficiency was characterized by the yellowish, light-green young leaflets with somewhat albino rachides and midribs, while the corresponding parts in the normal sibs and controls had dark- and light-green leaflets. The development of chlorophyll in the mutant increased progressively with the growth of the seedling and was normal in the fourth leaf from the top and lower leaves. It was also observed that the mutant seedlings, when grown under the shade (in diffused light), developed chlorophyll in the rachides and midribs. When transferring plants to sunlight the fresh leaves, however, showed the typical mutant character. Normal chlorophyll reappeared in new leaves on subsequent removal to shade, indicating that this peculiar phenomenon was dependent on sunlight.

Patil and Bora (27) reasoned that since the groundnut was a tetraploid, the 3:1 ratio suggested that the crop was either a segmental polyploid with a single pair of genes or an allotetraploid with three recessive alleles or an autotetraploid with a simplex constitution for this locus. On the basis of monohybrid segregation, the expected genotypic ratio in X_4 was 1:2:1 with the heterozygotes further segregating the same way in X_5. Although the first expectation was fulfilled, the heterozygotes showed phenotypic ratios ranging from 1:1 to 15:1.

Badami (2) reported triplicate gene inheritance with the triple dominant resulting in dark green and the triple recessive in albino. This suggests that double and single dominants were lighter colored than the triple. Patel et al. (26) found albinos in a ratio of 15:1 in F_2 generations of bunch and runner types. Hull (19) observed young seedlings that were distinctly yellow rather than albino and suggested they were probably controlled by duplicate genes with green fully dominant and yellow plants sometimes showing faint traces of green. This evidence strongly suggested duplicate gene inheritance with green being dominant and also that the genotypes $L_1L_1l_2l_2$, $L_1l_1l_2l_2$, and $L_1L_1L_2L_2$ could belong to the Spanish, runner, and Valencia types, respectively. The yellow seedlings did not appear in the F_1, only in low frequency in the F_2, but with greater frequencies in the F_3.

Ashri and Goldin (1) induced mutations by soaking the peanut seed in a saturated solution of diethyl sulfate and found that most of the mutations induced proved to be monogenic, and all but one were recessive or partially dominant. Of the 101 mutations induced in "Virginia Sihit Meshubahat," 66 affected one trait, while 35 were pleiotropic, and in "Dixie Anak" 12 of the 13 induced mutations were pleiotropic. The proportion of chlorophyll mutants was not high, with more xantha type in "Dixie Anak" and more viridis in "Virginia Sihit Meshubahat."

Most mutations are recessive; however, Hammons (11) found that the "krinkle" mutant character was dominant to normal.

Lindstrom (23) studied the virescent seedling condition in corn. He found the virescent-white type usually begins as a pure white seedling, but under favorable conditions it gradually assumes a yellowish green color within a week, especially at the tips of the newer leaves. Gradually the color becomes a deeper green, and eventually the plant may become normally green, although it is usually much smaller than a normal plant.

Karper and Conner (22) described and reported the mode of inheritance of the various chlorophyll seedling characters in sorghum and found these characters may be lethal in their effect upon the homozygote or affect only a reduction of the chlorophyll with a consequent retarded development of the plant. They also found that the virescent factor was usually lethal in the field, but occasionally a few of the plants survive to maturity. Five out of 34 homozygous recessive plants survived and produced seed, two were very weak, while three attained about three fourths of normal development and seed production.

Stadler (31), in considering a hypothetical polyploid species such as the peanut, predicted the mutant type probably would be distinguishable when the mutation is dominant or partially dominant, but not when the mutation is wholly recessive. These mutations would not be expected to show their effect in the presence of an unmutated duplicate gene.

Stadler (31) further stated that the chromosome complement of existing polyploid species was not made up of duplicate groups of chromosomes.

CHAPTER III

MATERIALS AND METHODS

Germ Plasm Evaluation

The peanuts for this study were grown on the agronomy research station near Perkins, Oklahoma, in 1960 and 1961. In 1962 they were grown on the Paradise station located five and one-half miles northeast of Coyle, Oklahoma. The soil type in the plot area near Perkins is a Norge loam and that at Paradise station is a Norge fine sandy loam. One hundred and fifty pounds per acre of 13-39-0 were plowed down approximately one month prior to seeding at the Perkins station, while at the Paradise station 150 pounds per acre of 6-24-24 fertilizer were applied prior to moldboarding under the rye cover crop. A randomized block design was used at both locations, with three replications. Plantings were made at the rate of five seed per foot of row and approximately one and one-half to two inches deep. The rows were spaced 40 inches apart. Each plot consisted of two rows 19 feet long, with three feet of alley between ranges.

The two-row plots were trimmed 1.5 feet on each end, leaving 16 feet of plot that was mechanically dug, hand shaken, and allowed to field cure. The samples were picked with a stationary picker modified for nursery work and after curing in mesh bags at ambient temperatures the peanuts were cleaned and weighed. Fruit yields were converted to pounds per acre.

The leaflet size was determined with an area-photometer. A micro-ammeter reading was recorded and the area in cm^2 was determined from a previously constructed calibration curve. The upper left terminal leaflet from mature-appearing leaves was measured, utilizing ten randomly selected plants from the first replication of each entry.

Twenty-five randomly selected, fully developed fruit from the first replication of each entry were measured in six specific locations on the fruit. A caliper was used to measure the fruit length and the fruit width at the basal end, the constriction, and the distal end. A micrometer was used to measure the pericarp thickness at the ventral basal suture and the dorsal distal suture.

Samples of shelled peanuts from the first replication of each entry were prepared for chemical analysis according to procedures outlined in paragraph 25.2 b of the A. O. A. C. (18).

Moisture determination was made according to paragraph 22.8 of the A. O. A. C. (18).

Crude fat analysis were obtained by extracting 16 hours on a Soxhlet Extractor using purified, redistilled n-hexane.

The fatty acid analyses were performed by personnel of the Department of Biochemistry using the procedure described by Mason, Eager, and Waller (24).

The peanut butter samples that were to be organoleptically classified in this study were prepared in the following manner:

1. Two hundred grams of number one shelled raw peanuts were selected from the first replication of each entry.

2. Each sample of whole raw peanuts was roasted to a golden brown color at 400° F. in a rotisserie equipped with a rotating basket made of one-quarter-inch hardware cloth.

3. After cooling, the roasted peanuts were blanched and split in a small laboratory splitter to facilitate the easy removal of the testa and embryo.

4. The testa and cotyledon were separated with an aspirator, and the embryos were removed using appropriate sieves. Some hand picking was necessary to remove damaged cotyledons, embryos, and occasional testa adhering to the cotyledons.

5. The roasted, blanched, and degermed cotyledons were weighed, 0.5 percent salt was added and ground into peanut butter, using a Laboratory Quaker Mill, Model 4-E grinder with a worm feed adapted for oily products.

6. The peanut butter was placed in a glass jar, and an aluminum lined cap was used to seal the jar for storage and organoleptic evaluation. The peanut butter samples were stored in a freezer at approximately 10^{o} F. until they were evaluated.

The samples were rated as superior to, equal to, or inferior to the standard reference sample in odor and flavor by each of five panel members. The standard reference peanut butter was prepared from the Argentine variety. The mean preference rank for the peanut butter samples was obtained using the ranking assigned by the five panel members. Each sample was evaluated according to different degrees of odor, flavor, taste, roast, and dryness in 1962.

There were 29 entries and the Argentine variety in this study (Table I). Twenty-two were plant introductions and seven were experimental lines, selections, or cultivars. Ten of the plant introductions were from Taiwan, three from Uruguay, two each from Argentina, Madagascar, and South Africa, and one each from India, Israel, and Peru. Three of the lines were developed by the Texas Agricultural Experiment Station and the "krinkle" mutant came from a farm near Sidney, Texas. The P-29 selection originated as a white-seeded off-type seed in the Argentine variety. P-20 was a selection from plant introduction number 121070, the accession from which the Argentine variety originated; the NC2 cultivar (P-36) was obtained from North Carolina.

The entries were of the Spanish type with the exception of the runner, P-25, Valencia, P-26 and P-27, and Virginia bunch, P-36.

TABLE I

PLANT INTRODUCTION OR SELECTION NUMBER, OKLAHOMA P-NUMBER, ORIGIN, TESTA COLOR, PLANT TYPE AND FRUIT TYPE OF PEANUT ENTRIES STUDIED IN 1960, 1961, AND 1962

P. I. or Selection	Okla. P-No.	Origin	Testa Color	Plant Type	Fruit Type
Argentine	2	Argentina	Flesh	Spanish	Spanish
162524	14	Argentina	Flesh	Bunch	Spanish
161312	15	Argentina	Flesh	Bunch	Spanish
162538	16	Uruguay	Flesh	Bunch	Spanish
161300	17	Uruguay	Flesh	Bunch	Spanish
162659	18	Uruguay	Purple	Bunch	Spanish
163279	19	India	Flesh	Bunch	Spanish
121070-1	20	Argentine Selection	Flesh	Bunch	Spanish
T-400-1	21	Texas Selection	Flesh	Spanish	Spanish
T-437	22	Texas Selection	Flesh	Spanish	Spanish
226249	23	South Africa	Flesh	Spanish	Spanish
229656	24	Madagascar	Flesh	Improved Spanish	Spanish
229553	25	South Africa	Flesh	Runner	Spanish
229658	26	Madagascar	Pink	Spanish-Virginia	Spanish-Virginia
230328-B	27	Peru	Buff	Valencia	Valencia
234375	28	Taiwan, China	Flesh	Spanish	Spanish
White Seeded Argentine	29	Gold Kist, Anadarko, Oklahoma	Flesh	Spanish	Spanish
234416	30	Taiwan, China	Flesh	Improved Spanish	Spanish
234418	31	Taiwan, China	Flesh	Improved Spanish	Spanish
234422	32	Taiwan, China	Flesh	Improved Spanish	Spanish
237337	33	Israel	Flesh	Spanish	Spanish
242101	34	Taiwan, China	Flesh	Improved Spanish	Spanish
242100	35	Taiwan, China	Flesh	Improved Spanish	Spanish
NC_2	36	North Carolina	Pink	Virginia Bunch	Virginia
234419	39	Taiwan, China	Flesh	Spanish	Spanish
234420	40	Taiwan, China	Flesh	Improved Spanish	Spanish
234421	41	Taiwan, China	Flesh	Improved Spanish	Spanish
237507	43	Taiwan, China	Flesh	Improved Spanish	Spanish
Krinkle-leaf	151	Sidney, Texas	Flesh	Bunch	Spanish
T-206-6-1	176	Texas Selection	Flesh	Spanish	Spanish

Information concerning the germ plasm used in this study is presented in Table I.

The data were analyzed using the IBM 7040 computer system. The F and t values were used as presented by Snedecor (29). The means for individual years of each significant treatment main effect were analyzed according to Duncan's multiple range test (7).

The fruit in entry in years error mean square was obtained from the computer output by pooling the sum of squares of fruit, fruit x entry, fruit x year, and fruit x entry x year. The fruit x position in entry in years error mean square was obtained from the computer output by pooling the sum of squares of fruit x position, fruit x position x entry, fruit x position x year, and fruit x position x year x entry.

Inheritance Study

Testa Reticulation

The materials utilized in this genetic study were selected from plant introductions grown on the agronomy research station near Perkins, Oklahoma, in 1959. Testa color was used as a basis for locating possible hybrids for study.

The seed from these selections were planted on the Perkins station in 1960 and 1961. The seed were space planted in a 19-foot plot with rows 40 inches apart. At harvest individual plants were hand pulled, shaken, tied in bundles, and allowed to cure. After curing, the testa color and other unusual phenotypic characters for each plant were determined. During this determination it was noted that the testa on some plants had rather deep reticulation, while on the others it was smooth. Single plant selections of these two types were made in 1960 and grown out in 1961 to determine the mode of inheritance.

The known background for the material in this study is given for each of the four lines in Tables VIII and XI.

Virescent Seedling

A single crinkled-leaf off-type plant appeared in the peanut introduction nursery located on the Perkins agronomy research farm in 1960. This off-type plant occurred in a plot of P. I. number 234422 (P-32) an accession obtained from Taiwan in September 1956. The seed from this plant were planted May 13, 1961, near Perkins. Twenty virescent crinkle-leaf seedlings were found out of a total of 56 crinkle-leafed plants.

Several notes concerning the appearance and mortality of the 20 virescent seedlings were taken as the season progressed. They are as follows:

June 19: Most of the seedlings lacking chlorophyll were very weak, and three of them were dead.

June 30: Seven more seedlings were dead, five appeared very weak, and five appeared capable of surviving.

July 8: Six more plants were dead, two were very weak, and two appeared capable of surviving, but they were still in the rosette stage and had not started blooming.

July 15: Two plants were still alive. One had brown-edged leaflets, but the other appeared to be accumulating chlorophyll.

July 22: Only one plant remained alive. This plant lived throughout the growing season but attained a height of only two inches, while those having normal-appearing chlorophyll grew to a height of 26 inches.

At harvest the single plant was transplanted to a pot and placed in the greenhouse. The plant grew some and by January 10, 1962, it had started to bloom. In February a new employee in the greenhouse observed the lacking chlorophyll plant and thinking it dead or dying discarded it.

The 36 normal-appearing plants were harvested as single plants. Four subsequent generations were planted in the greenhouse. Seed from the 36 plants with normal chlorophyll were planted in shallow flats. After emergence the seedlings were transplanted into six-inch pots filled with a mixture of sand, peat moss, and perlite, where they were maintained until maturity. Notes were taken on the foliar coloration, growth, blooming, and fruiting habits, as well as the mortality and phenotypic distribution.

CHAPTER IV

RESULTS AND DISCUSSION

Germ Plasm Evaluation

Data on agronomic, physical, organoleptic, and chemical aspects of 29 plant introductions and other entries tested during 1960, 1961, and 1962 were obtained and analyzed statistically.

The agronomic factors studied included fruit yield, shelling percent, kernel yield, and seed size.

Physical measurements were obtained and analyzed for plant height, leaflet area, fruit length, fruit thickness, and pericarp thickness.

The organoleptic phase of the study included the preparation of peanut butter samples for each entry and the organoleptic comparison with a known and coded standard reference sample for entries grown in 1961 and 1962.

In the chemical phase of the study, the oil content of the raw peanut and the fatty acid distribution were determined for 1961 and 1962.

Agronomic

Mean fruit yield, shelling percent, kernel yield, and seed size data are summarized in Table II for the three-year period, 1960, 1961, and 1962.

Fruit Yields. Mean squares for fruit yields in 1960, 1961, and 1962 and their combined analysis are shown in Table III. The multiple

TABLE II

SUMMARY FOR THE MEAN PEANUT FRUIT YIELDS, SHELLING PERCENT, TOTAL KERNELS AND SEED SIZE FOR THE THREE-YEAR PERIOD 1960-1962

Okla. P-No.	Fruit Yield (lbs./A.)	Shelling (%)	Kernel Yield (lbs./A.)	Seed Size[1] (gms/100)
14	2313	73.00	1694	39.23
15	2530	74.72	1898	40.26
16	2608	73.76	1942	41.74
17	2307	73.93	1716	35.94
18	2560	71.41	1836	45.84
19	2330	74.08	1731	51.01
20	2455	71.32	1765	39.17
21	2443	76.06	1864	36.53
22	2496	75.31	1891	34.22
23	2308	74.39	1725	40.42
24	2289	73.13	1678	56.59
25	2097	70.47	1494	38.62
26	1671	71.64	1207	52.84
27	1701	66.28	1140	40.76
28	2035	74.52	1523	54.01
29	1892	75.68	1432	42.54
30	1986	75.38	1497	52.17
31	1887	72.61	1374	58.82
32	2035	73.33	1497	55.86
33	2508	75.74	1903	43.09
34	2089	74.72	1564	52.96
35	2198	74.46	1644	52.89
36	2172	67.46	1490	81.70
39	2152	75.63	1632	51.19
40	2399	73.19	1763	53.37
41	1946	75.17	1466	52.85
43	2129	73.29	1559	51.75
151	2144	75.91	1633	33.94
176	2433	75.23	1838	50.38
2	2398	76.06	1826	36.72
Mean	2217	73.59	1640	47.25
LSD .05	501	2.14	373	2.16
CV (%)	14.2	1.81	14.2	2.86

[1]Seed weight determined from those kernels riding a 15/64-inch slotted sieve.

TABLE III

MEAN SQUARES FOR PEANUT FRUIT YIELD AND SHELLING PERCENT FOR 1960, 1961, 1962, AND THEIR COMBINED ANALYSIS

Source of Variation	DF	Fruit Yield 1960	Fruit Yield 1961	Fruit Yield 1962	Shelling Percent 1960	Shelling Percent 1961	Shelling Percent 1962
Rep	2	656785.34	506130.70**	339263.48**	3.991*	67.160**	3.301
Entry	29	438833.39*	59564.95	361354.38**	9.371**	19.881**	44.870**
Error	58	226715.09	38293.42	28669.43	1.111	2.529	1.719
CV (%)		16.41	11.39	8.33	1.39	2.18	1.81

Source of Variation	DF	Combined Analysis	
Rep	2	1418605.30	37.692
Entry	29	563903.81**	50.780**
Year	2	33948124.50**	316.112*
Rep x Entry	58	103348.40	1.907
Rep x Year	4	41787.11	18.512
Entry x Year	58	147924.45*	11.680**
Rep x Entry x Year	116	95164.77	1.721
LSD		500.74	2.14
CV (%)		14.16	1.81

*Indicates significance at the five percent level.
**Indicates significance at the one percent level.

range tests for fruit yield in each of the three years are shown in Table XII. Mean yields ranged from 3393 pounds per acre for P-40 in 1960 to 1282 pounds per acre for P-27 in 1962. The variances for years and entries were significant at the one percent level in the combined analysis. There were significant differences among entries in 1960 and 1962, but not in 1961 (Table III). P-18 yielded significantly more fruit than P-26 in 1961, and its yield was also high in 1962. P-16 was the highest yielding entry in 1960. P-2 (Argentine) ranked sixteenth in 1960, sixth in 1961, and sixth in 1962, and ranked tenth for mean fruit yield for the three years combined. However, none of the entries yielded significantly more than Argentine for the three-year period. P-26, P-27, P-31 and P-29 had significantly lower mean yields than Argentine in the combined analysis.

Shelling Percent. Mean squares for shelling percent in 1960, 1961, and 1962 and their combined analysis are shown in Table III. The multiple range test of shelling percent for each of the three years is shown in Table XIII. The mean shelling percentages ranged from 78.27 for P-151 in 1960 to 60.80 for P-36 in 1962. In the combined analysis there was a significant difference among years. There was also a significant difference among entries. P-21 ranked first in 1962 with a shelling percent of 78.70. P-2 was first in shelling percent in 1961 with 76.67, second in 1960, and fourteenth in 1962. P-21 and Argentine had the highest shelling percent with 76.06 for the three years combined. Thirteen entries had significantly lower shelling percent than P-21 and Argentine.

Kernel Yield. The kernel yields were derived by multiplying the fruit yield by the shelling percent. Mean squares for kernel yield in

1960, 1961, and 1962 and their combined analysis are shown in Table IV. The multiple range tests of kernel yields for each of the three years are shown in Table XIV. Mean kernel yields ranged from 2794 pounds per acre for P-16 in 1960 to 795 for P-27 in 1962. There were significant differences among entries for kernel yield in 1960 and 1962, but not in 1961. The variances for year, entry, and entry x year were highly significant in the combined analysis. The high entry for total kernels was P-16 in 1960 with 2994 pounds, P-176 in 1961 with 1432 pounds, and P-15 in 1962 with 1973 pounds. P-2 (Argentine) was twelfth in 1960, third in 1961, and seventh in 1962 for total kernels and ranked eighth when the three years were combined. None of the entries yielded significantly more total kernels than P-2, but P-27, P-26, P-31, P-29, and P-36 yielded significantly fewer total kernels when the data were combined.

Seed Size. Seed size in this study was measured in grams per 100 seed. Mean squares for seed size in 1960, 1961, and 1962 and their combined analysis are shown in Table IV. The multiple range test of seed size for each of the three years is shown in Table XV. Seed size ranged from 87.08 grams per 100 seed for P-36, NC2 the Virginia bunch cultivar from North Carolina, to 32.51 for P-151, the "krinkle" mutant. Variances for entry, years, and entry x years were highly significant in the combined analysis. There were highly significant differences among entries within each year. There was considerable genetic diversity in seed size for the germ plasm in this study.

Physical

Data for mean plant height, leaflet area, fruit length, fruit width and pericarp thickness are presented in Tables XVI, XVII, XVIII and XIX.

TABLE IV

MEAN SQUARES FOR PEANUT KERNEL YIELD AND GRAMS PER HUNDRED SEED FOR 1960, 1961, 1962, AND THEIR COMBINED ANALYSIS

Source of Variation	DF	Kernel Yield			Grams Per 100 Seed		
		1960	1961	1962	1960	1961	1962
Rep	2	347742.02	175383.53**	154045.69**	2.696	5.659	0.645
Entry	29	280404.34**	37193.58	255950.78**	334.995**	379.262**	208.401**
Error	58	129414.11	18016.17	15528.10	2.527	2.304	0.650
CV (%)		16.36	10.74	8.46	3.27	3.10	1.83

Source of Variation	DF	Combined Analysis	
Rep	2	600998.99	1.632
Entry	29	372547.34**	897.046**
Year	2	22193376.50**	646.142**
Rep x Entry	58	56192.15	1.676
Rep x Year	4	38162.43	3.752
Entry x Year	58	100505.94**	12.811**
Rep x Entry x Year	116	53380.48	1.900
LSD		372.99	2.16
CV (%)		14.20	2.86

**Indicates significance at the one percent level.

Plant Height. Mean squares for plant heights obtained in 1960, 1961, and 1962 and their combined analysis are shown in Table V. The multiple range tests of plant height for the individual years are shown in Table XVI. The plants ranged from 23.5 inches tall for P-27 to 12.6 inches for P-25. P-27 was a large-stemmed Valencia peanut from Peru, and P-25 was reported as being the runner variety "Basse" from South Africa. Significant differences among entries for mean plant height occurred in 1960, 1961, and 1962. In the combined analysis, year, entry, and year x entry interaction had highly significant variances. The slightly taller plants were obtained during the very favorable 1960 growing season in contrast to shorter plants obtained in 1961 and 1962. A mean difference in plant height of 10.5 inches between P-27 and P-25 suggests that there is sufficient genetic diversity among the entries to study inheritance or to hybridize and select for a desired plant height.

Leaflet Area. Mean squares for leaflet area in 1960, 1961, and 1962 and their combined analysis are shown in Table V. The multiple range tests of leaflet areas for individual years are shown in Table XVII. The mean leaflet areas for 10 leaflets ranged from 29.4 for P-24 to 10.0 cm^2 for P-151, the krinkle-leaf mutant. Highly significant differences among entries for mean leaflet area were obtained in 1960, 1961, and 1962. In the combined analysis years, entry, and the year x entry interaction had highly significant variances. As was the case for plant height, the more favorable rainfall distribution in 1960 apparently contributed to the larger leaflet size obtained. The mean difference of 16 cm^2 between P-24 and P-25 suggests that there is sufficient diversity in the germ plasm for some very interesting studies. The data obtained suggest that leaflet size is not necessarily

TABLE V

MEAN SQUARES FOR PEANUT PLANT HEIGHT AND LEAFLET SIZE OF ENTRIES TESTED IN 1960, 1961, 1962, AND THEIR COMBINED ANALYSIS

Source of Variation	DF	Plant Height (inches)			Leaflet Area (cm^2)		
		1960	1961	1962	1960	1961	1962
Rep	9	0.79	0.79	1.98	1.38**	0.53	0.67
Entry	28	42.52**	42.52**	28.91**	178.66**	127.93**	152.83**
Error	252	0.95	0.95	0.98	0.55	0.71	0.77
CV (%)		5.12	5.33	5.56	3.32	4.32	4.47

Source of Variation	DF	Combined Analysis	
Year	2	170.67**	723.75
Rep	9	2.37	2.08
Entry	28	87.70**	408.59**
Year x Rep	18	1.11	0.25
Year x Entry	56	6.36**	25.41**
Rep x Entry	252	1.47	0.68
Year x Rep x Entry	504	0.68	0.67
LSD		0.85	0.72
CV (%)		5.33	4.01

**Indicates significance at the one percent level.

related to the yield of fruit. Information is needed concerning the relationship between yield and leaf area index.

Fruit Length. Mean squares for fruit length in 1961 and 1962 and their combined analysis are shown in Table VI. The multiple range tests of fruit length (millimeters) are shown for each of the two years in Table XVIII. The fruit length ranged from 39.2 mm. for P-36, NC2, to 21.1 mm. for P-22, a small-seeded Texas selection. Significant differences among entries were obtained for fruit length in 1961 and 1962. In the combined analysis, entry and entry x year interation had significant variances. With a difference in fruit length of 17.8 mm. between the mean length of P-36 and P-22, considerable genetic diversity is possible for further study.

Fruit Width. Mean squares for fruit width in 1961 and 1962 and the combined analysis are shown in Table VII. The multiple range tests for fruit width are shown for measurements made at each of three positions and combined for two years in Table XIX. Mean fruit width ranged from 16.9 mm. for P-36 to 10.0 mm. for P-22 at the basal end or position one. At the constriction or position two the mean fruit width ranged from 14.0 mm. for P-27 to 8.61 mm. for P-22. The distal end or position three ranged from 15.20 mm. for P-36 to 9.41 mm. for P-22. Entry, position, and the entry x position interaction were significant in 1961 and 1962. In the combined analysis, entry, position, and the interactions of year x position, year x entry, entry x position, and year x entry x position were highly significant.

The mean differences in fruit width between P-36 and P-22 were 6.9, 5.4, and 5.8 mm., respectively, for the basal, constriction, and distal positions on the fruit. The position where the fruit widths were

TABLE VI

MEAN SQUARES FOR PEANUT FRUIT LENGTH OF ENTRIES TESTED FOR 1961, 1962, AND THEIR COMBINED ANALYSIS

Source of Variation	DF	Fruit Length 1961	Fruit Length 1962
Fruit	24	2.68	4.16**
Entry	28	441.53**	474.32**
Error	672	2.56	1.90
CV (%)		5.87	5.03

Source of Variation	DF	Combined Analysis
Fruit	24	3.38
Entry	28	912.18**
Year	1	2.10
Fruit x Entry	672	2.30
Fruit x Year	24	2.47
Entry x Year	28	3.68*
Fruit x Entry x Year	672	2.15
LSD		0.60
CV (%)		5.60

*Indicates significance at the five percent level.
**Indicates significance at the one percent level.

TABLE VII

MEAN SQUARES FOR PEANUT FRUIT WIDTH (MILLIMETERS) AND HULL THICKNESS (INCHES) FOR ENTRIES TESTED IN 1961 AND 1962 AND THEIR COMBINED ANALYSIS

Source of Variation	Fruit Width			Pericarp Thickness		
	DF	1961	1962	DF	1961	1962
Fruit	24	1.02	1.65	24	0.0058	0.0089
Entry	28	139.05**	173.04**	28	0.4722**	0.3503**
Position	2	906.83**	783.71**	1	1.3842**	1.2416**
Fruit x Entry	672	1.416	1.25	672	0.0089	0.0067
Fruit x Position	48	0.34	0.42	24	0.0046	0.0008
Entry x Position	56	7.71**	5.77**	28	0.0612**	0.0526**
Fruit x Entry x Position	1344	0.36	0.26	672	0.0032	0.0013
CV (%)		10.09	9.55		19.10	17.03

Source of Variation	Combined Analysis			
	DF	Fruit Width	DF	Pericarp Thickness
Year	1	4.97	1	0.0209
Fruit	24	1.19	24	0.0063
Entry	28	308.91**	28	0.8062**
Position	2	1689.24**	1	2.6238**
Year x Fruit	24	1.49	24	0.0083
Year x Entry	28	3.19**	28	0.0163**
Year x Position	2	2.24**	1	0.0019
Fruit x Entry	672	1.35	672	0.0077
Fruit x Position	48	0.34	24	0.0697
Entry x Position	56	0.82**	28	0.1095**
Year x Fruit x Entry	672	1.35	672	0.0078
Year x Fruit x Position	48	0.38	24	0.0024
Year x Entry x Position	56	0.82**	28	0.0042**
Fruit x Entry x Position	1344	0.32	672	0.0023
Year x Fruit x Entry x Pos.	1344	0.30	672	0.0022
LSD		0.45		0.0035
CV (%)		9.82		18.11

**Indicates significance at the one percent level.

measured differed significantly, since the basal end was the widest, followed by the distal end, and the constricted area between the two ends was generally narrow. However, for some entries positions two and three were very similar, indicating that considerable tapering occurred on the distal end. This condition also contributed to the significant entry x position interaction obtained in 1961 and 1962.

The differences in the width obtained at the three positions for the various entries suggest that measurements are necessary for at least three positions to describe adequately the width of the peanut fruit.

Pericarp Thickness. Mean squares for pericarp thickness in 1961 and 1962 and their combined analysis are shown in Table VII. The multiple range tests of pericarp thickness for measurements made at each of two positions in 1961 and 1962 are shown in Table XVIII. Mean pericarp thickness at the ventral basal suture or position one ranged from 0.070 inch for P-31 to 0.028 for P-21. Measurements for the dorsal distal suture ranged from 0.074 inch for P-41 to 0.032 for P-21. As was the case with fruit width, the analysis of variance for pericarp thickness indicated significant differences for entry, position, and entry x position.

In the combined analysis, significant differences were indicated for entry, position, year x position, entry x position, and fruit x entry x position. P-21, P-22, P-151, and P-17 not only had the thinnest pericarp but also ranked high in shelling percent and had relatively small kernels (Table II). Position two, the ventral basal suture, was usually thicker than position one, the dorsal distal suture. However, this was not evident in P-26, P-31, and P-36. Mean pericarp thicknesses were higher in 1961 than 1962 for both positions measured.

Organoleptic

The mean percentages of panel members scoring peanut butter samples as superior to, equal to, or inferior to a standard, the mean preference rank, and peanut butter turn-out are summarized in Tables XX and XXI for 1961 and 1962, respectively.

in 1961, P-26, P-22, and P-28 were rated superior to the standard in odor by approximately 30 percent of the panel members (Table XX). Entries rated inferior to the standard in odor by less than five percent of the panel members include P-15, P-24, and P-29. P-24 had 50, and P-32 had 29 percent of the panel members rating them superior to the standard in flavor, and none of the panel members rated P-15 inferior to the standard. The peanut butter samples made from kernels of P-19 were consistently rated inferior to the standard in odor, flavor, and intensity of flavor.

In 1962, 40 to 60 percent of the panel members rated the peanut butter samples of P-14, P-22, and P-24 superior to the standard in odor. None of the panel members rated samples of P-20, P-21, P-30, P-33, and P-41 inferior to the standard in odor. Flavor was rated superior to the standard by 60 percent of the panel members for samples of P-17, P-41, P-43, and P-151.

P-22 and P-24 were rated high both years with respect to odor. None of the entries were consistently rated superior to the standard with respect to flavor for both years. The organoleptic quality of peanut butter is influenced by environment, but the possibility of genetic diversity in the germ plasm with respect to organoleptic quality was evident as P-22 had consistently good and P-19 consistently poor organoleptic ratings. Continued refinement in organoleptic evaluation is necessary to distinguish the genetics of quality.

The most desirable mean preference ranks included P-15, P-22, P-32, and P-20 in 1961 and P-22, P-17, P-33, and P-41 in 1962. For the two years, P-22 had the most desirable mean preference rank. It was interesting that P-19 mentioned as receiving a low rating for odor and flavor also had an undesirable mean preference rank.

The mean percentages of peanut butter recovered after roasting, blanching, and degerming the peanuts did not differ greatly for the various entries. The peanut butter turn-out was generally higher in 1961 than for the 1962-grown peanuts. P-24, P-29, and P-43 tended to have high peanut butter turn-out for the two years. It was interesting to note that the highest peanut butter turn-out in 1961 was P-29 (white testa) with 88.7 percent and P-18 (purple testa) with 88.5 percent.

Chemical

Oil Content and Fatty Acid Distribution. The percentages of oil and fatty acid distribution are shown in Table XXII for 1961 and Table XXIII for 1962. The oleic to linoleic ratios are presented in Table XXIV. During the two years the amount of oleic ranged from 38.13 to 50.46 percent of the total fatty acids. The amount of linoleic ranged from 24.62 to 40.74 and palmitic from 10.75 to 19.02 percent.

Some samples contained fairly sizeable amounts of lignoceric (P-19 and P-20), arachidic (P-18, P-41, P-39, and P-28) and behenic acids (P-14, P-17, and P-18). P-43 was notably different in that it contained only a trace of lignoceric acid in 1961 and 0.92 percent in 1962. P-40 contained no detectable lignoceric acid in 1961 and only 0.89 percent in 1962. The fatty acid values in P-25 were about average for the entries analyzed in 1961, but in 1962 it was low in palmitic (14.11), stearic (1.68), and linoleic (33.35) and high in oleic (44.59) and lignoceric (1.54) acids. Crosses involving P-25 and P-15 with other entries of the Spanish and Valencia types should provide genetic diversity for studying the fatty acids in peanuts.

It has been proposed that a high oleic to linoleic ratio is related to long peanut butter shelf life. Cultivars of runner and bunch types usually have a high oleic to linoleic ratio as did P-25 and P-36 in this study. P-15, a Spanish type, had an oleic to linoleic ratio of 2.05 in 1961 and 1.18 in 1962. This was one of the highest ratios ever reported in germ plasm of the Spanish and Valencia types.

Inheritance Study

Testa Reticulation

The rough testa trait was discovered by inspecting kernels, showing reticulation on the cotyledons. The reticulations were also visible on the testa adhering to the cotyledons. Thus the trait made the testa appear rough. The trait would be undesirable to peanut butter manufacturers, since blanching would be very difficult. Small pieces of testa adhering to the cotyledons would be mixed with the peanut butter, causing an unsightly product with a reduced market value. The tight adherence of the testa to the cotyledon would be valuable to the sheller if it resulted in fewer splits and kernels without the testa.

An important difference was noted in the seedling growth and vigor between plots planted with seed having smooth and rough testa. The seedlings emerging from the seed with rough testa were more vigorous, and after 30 days the plants were approximately one third taller than those from the smooth testa. It is possible that the strong adherence of the testa to the cotyledons may have provided added protection from disease organisms during this very vulnerable stage of growth. At maturity no differences were observed in the height of the plant produced from smooth and rough seed for any of the four genetic lines.

It was interesting that the rough trait occurred only in seed with flesh testa.

Plants with kernels possessing the mutant character were found in the germ plasm of P-7, P-12, P-15, and P-178. Apparently the plants studied resulted from field hybrids, hence the paternal parents could not be established. A summary of the phenotypes of the seed planted and the number of plants with smooth and rough seed resulting from classifying segregating progeny are shown in Table VIII.

The statistical results are shown in Table IX. The rough mutant appeared to be dominant to smooth testa for three lines. Chi-square values of 0.784 and 0.183 for progeny of P-15-1-4 and P-178-4 provided probability values that gave a good fit to a ratio of 9 rough : 7 smooth. The mode of inheritance may be explained on the basis of duplicate recessive epistasis. Regardless of the maternal plant studied, those with smooth seed gave only smooth-seeded progeny. It would appear that the rough testa was expressed when two dominant genes were present. Two lines were evidently heterozygous for two factor pairs.

In order to explain the results obtained for P-12-2-B it was assumed that the genotype of the parent was AaBB. The expected 3 rough : 1 smooth is a good fit to the 16 rough : 3 smooth obtained in this study.

TABLE VIII

TESTA RETICULATION PHENOTYPES AND DISTRIBUTION OF FOUR PEANUT PARENTS AND THEIR RESPECTIVE PROGENY

Parental Line	Parental Testa Phenotype	Phenotype of Segregates
P-7-1-3	Smooth	41 Smooth
P-7-1-4	Rough	12 Rough 25 Smooth
P-12-2-A	Smooth	79 Smooth
P-12-2-B	Rough	16 Rough 3 Smooth
P-15-1-3	Smooth	92 Smooth
P-15-1-4	Rough	53 Rough 34 Smooth
P-178-3	Smooth	78 Smooth
P-178-4	Rough	40 Rough 28 Smooth

TABLE IX

NUMBER OF PEANUT PLANTS, CHI SQUARES, AND P VALUES FOR FOUR DIFFERENT SELECTIONS WITH THE HYPOTHESIS OF A 9:7 RATIO OF ROUGH VS SMOOTH TESTA

Genetic Material	Class	Number of Plants Observed	Number of Plants Calculated	X^2	P-Value
P-7-1-4	Rough	12	20.85	3.756	
	Smooth	25	16.15	4.849	
				8.605	.005
P-12-2-B	Rough	16	10.7	2.625	
	Smooth	3	8.3	3.384	
				6.009	.01 - .05
P-15-1-4	Rough	53	48.9	0.343	
	Smooth	34	38.1	0.441	
				0.784	.30 - .50
P-178-4	Rough	40	38.25	0.080	
	Smooth	28	29.75	0.103	
				0.183	.50 - .70

The results obtained from the P-7-1-4 with rough seed could not be explained on the basis of complementary genes.

Virescent Seedling

The number of normal and virescent seedlings obtained for the parents and the four segregating generations are shown in Table X. The chi-square and P-values are shown in Table XI. The goodness of fit for a 3:1 ratio was acceptable for each generation. The first and third generations had P-values between .30 and .50, while the second generation P-value was .50 to .70 and the fourth generation between .70 and .75.

Numerous observations of the virescent seedling were recorded during this study. A discussion of these follows:

Color. The virescent seedlings emerged with a very slight yellow color in the leaflets but enough to be distinguished from albinos.

Chlorophyll development was very slow in the field and most of the plants died before any appreciable amount of chlorophyll was discernable.

The temperature in the greenhouse was maintained between 70 and 80^{o} F. The glass in the greenhouse was coated so that some of the sunlight was kept out. Under these conditions the virescent seedlings developed some chlorophyll by the end of the first month. The color continued to develop even after a year's growth.

Growth. The tallest plant from virescent chlorophyll seedlings attained a height of 10 inches in the greenhouse, while the average was only 6 inches. The normal green plant measured 20 to 26 inches tall.

The virescent seedlings in the field only grew to a height of two inches in a rosette form but usually died before they reached this height.

TABLE X

DISTRIBUTION OF THE PARENT AND FOUR GENERATIONS OF VIRESCENT PEANUT SEEDLINGS

	Number Seedlings		Lines	
	Normal	Virescent	Planted	Segregating
Parent	36	20		
F_1	22	10	36	6
F_2	129	47	48	11
F_3	238	72	79	29
F_4	87	31	54	7*

*31 parent plants were virescent (homozygous recessive).

TABLE XI

CHI SQUARE AND P VALUES FOR FOUR GENERATIONS OF VIRESCENT PEANUT SEEDLINGS WITH THE HYPOTHESIS BEING A 3:1 RATIO

Generation	Phenotype[1]	Observed	Calculated	Difference	X^2	P-Value
F_1	V	22	24	2	0.167	.30 - .50
	v	10	8	2	0.500	
					0.667	
F_2	V	129	132	3	0.068	.50 - .70
	v	47	44	3	0.204	
					0.272	
F_3	V	238	232.5	5.5	0.130	.30 - .50
	v	72	77.5	5.5	0.390	
F_4	V	87	88.5	1.5	0.025	.70 - .75
	v	31	29.5	1.5	0.076	
					0.101	

[1] V - Normal chlorophyll
v - Virescent chlorophyll

The difference in height was brought about by an internode differential. The virescent plants had as many internodes as the normal plant, but they were much shorter. The virescent seedlings had up to six nodes per inch compared with one internode per inch for normal seedlings.

Flowering. Blossoms were very slow to develop on the virescent plants. The plants started blooming when they were approximately three months old, but this depended on chlorophyll development. Pegs were very slow to develop. This may have been due to sterility, lack of vigor, or perhaps both of these.

Fruit Formation. Very few fruits formed on the virescent plants, the maximum being three, with many never forming a fruit even after eleven months. Most of the fruit had one or two seed with an occasional three-seeded fruit appearing.

Mortality. The mortality rate in the field approached 100 percent. Very few of the virescent plants died in the greenhouse, even though they never produced fruit.

Phenotypic Ratio. The phenotypic ratio of three normal-appearing plants to one virescent was evident in each of the four generations.

Genotypic Ratio. The genotypic ratio does not follow the expected trend. The lines segregating should approach two thirds of the normal-appearing parents. As is shown in Table X, only one sixth to one third of the lines planted were segregating.

Dwarf plants with a normal green color, but growing only as tall as the virescent plants, were observed in several lines. It was first contemplated that these might be the heterozygous plants. The seed from these plants were planted out, but no particular pattern of segregation was obtained.

CHAPTER V

SUMMARY AND CONCLUSIONS

Germ Plasm Evaluation

Twenty-nine plant introductions, selections, lines, and cultivars were evaluated to determine the genetic diversity in the germ plasm. Certain agronomic, physical, organoleptic, and chemical properties were measured in search for genetic characteristics that may be valuable to the peanut industry.

The agronomic factors studied included fruit yield, shelling percent, kernel yield, and kernel size. P-18, a purple-seeded introduction from Uruguay, had the highest mean yield in 1961 and 1962, but its low shelling percent lowered it to seventh place in mean kernel yield. The two small-seeded lines from Texas, P-21 and P-22, were outstanding in mean shelling percentages and mean kernel yields. P-33 from Israel ranked next to the top in mean shelling percent and mean kernel yield. P-15 ranked third in mean fruit and kernel yields.

The physical properties evaluated included plant height, leaflet area, fruit length, fruit width, and pericarp thickness. A mean difference in plant height of 10.5 inches between P-27 and P-25 suggests that there is sufficient genetic diversity among the entries to study inheritance or to hybridize and select for a desired plant height. The data obtained suggest that leaflet area is not necessarily related to the yield of fruit. Information is needed concerning the relationship between yield and leaf area index. With a difference in fruit length of 17.8 mm. between the mean length of P-36 and P-22, considerable genetic diversity is possible for further study. The differences in the width obtained at the three positions for the various entries suggest that measurements are necessary for at least three positions to describe adequately the width of the peanut fruit. In measuring pericarp thickness, position two, the ventral basal suture, was usually thicker than position one, the dorsal distal suture.

The organoleptic quality of peanut butter is influenced by environment, but the possibility of genetic diversity in the germ plasm with respect to organoleptic quality was evident, as P-22 had consistently good and P-19 consistently poor organoleptic ratings. The mean percentages of peanut butter recovered after roasting, blanching, and degerming the peanuts did not differ greatly for the various entries. The peanut butter turn-out was generally higher in 1961 than for the 1962-grown peanuts.

In the chemical phase of this study the percentages of oil and the fatty acid distribution were determined. There was greater variability in the oil content of the 1961 material than in the 1962 material, with a slightly higher mean oil content in the 1961. Cultivars of runner and bunch types usually have a high oleic and linoleic ratio as did P-25 and P-36 in this study. P-15, a Spanish type, had an oleic to linoleic ratio of 2.05 in 1961 and 1.18 in 1962. This was one of the highest ratios ever reported in the germ plasm of the Spanish and Valencia types. Crosses involving P-25 and P-15 with other entries of the Spanish and Valencia types should provide genetic diversity for studying the fatty acids in peanuts.

The data indicate that some of these introductions, selections, and lines have possibilities as a donor of one or more desirable characteristics which could be incorporated into our present cultivars.

Inheritance Study

The rough testa character picked from plant introductions grown on the agronomy research station could have economic value. The chi-square values suggest a good fit to the 9:7 ratio. The genotype of the P-15-1-4 and P-178-4 was proposed as two heterozygous genes. The genotype of P-12-1-4 was heterozygous for only one pair. The explanation of the P-7-1-4 genotype to obtain a ratio of one rough : two smooth was not evident. Controlled crossing trials need to be conducted to determine if the rough testa character is linked to the flesh color.

The virescent seedlings observed on the agronomy farm do not have any apparent agronomic value. The chi-square values obtained indicate a good fit to the 3:1 ratio. Hence, virescent seedling is proposed to be due to a monogenic recessive. Controlled crosses are needed to determine whether the virescent character is linked with the "krinkle" allele.

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APPENDIX

TABLE XII

MULTIPLE RANGE TEST FOR MEAN PEANUT FRUIT YIELD (POUNDS PER ACRE) IN 1960, 1961, AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
16	3638a	18	1996a	18	2643a
40	3393ab	176	1966ab	15	2643a
22	3352abc	40	1936ab	20	2521ab
21	3297abcd	22	1860ab	33	2493abc
19	3284abcd	19	1845ab	14	2411abcd
33	3229abcd	2	1835ab	2	2370abcde
36	3188abcd	16	1830ab	16	2357abcde
15	3147abcd	33	1800ab	22	2275abcdef
23	3134abcd	15	1800ab	21	2261abcdef
20	3133abcd	24	1770ab	17	2247abcdefg
176	3120abcd	21	1770ab	176	2212abcdefg
24	3120abcd	35	1769ab	151	2139abcdefg
18	3038abcd	43	1754ab	23	2112abcdefg
17	3038abcd	39	1739ab	30	2003 bcdefg
35	3011 bcde	41	1724ab	24	1976 bcdefg
2	2988 bcde	20	1709ab	29	1948 bcdefgh
25	2902 bcdef	36	1694ab	43	1921 bcdefgh
39	2861 bcdef	23	1679ab	34	1894 cdefgh
14	2848 bcdefg	14	1679ab	40	1867 defghi
151	2766 cdefg	32	1663ab	41	1866 defghi
34	2725 defgh	28	1663ab	19	1860 defghi
43	2711 defgh	34	1648ab	39	1853 defghi
32	2698 defgh	17	1633ab	35	1812 defghi
28	2684 defgh	25	1603ab	25	1785 efghi
30	2412 efgh	31	1573ab	28	1757 efghi
31	2384 fgh	29	1573ab	32	1744 efghi
26	2316 fgh	27	1573ab	31	1703 fghi
41	2248 gh	30	1542ab	36	1635 ghi
27	2248 gh	151	1527ab	26	1349 hi
29	2153 h	26	1346 b	27	1282 i

Means followed by the same letter are not significantly different at the five percent level.

TABLE XIII

MULTIPLE RANGE TEST OF PEANUT SHELLING PERCENT FOR 1960, 1961, AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
151	78.27a	2	76.67a	21	78.70
2	78.00ab	34	75.87ab	22	75.80a
17	77.67abc	30	75.08ab	33	75.70a
22	77.53abc	41	75.67ab	176	75.50ab
176	77.27abcd	29	75.40abc	29	75.40ab
33	77.17abcde	39	75.13abcd	39	74.90abc
39	76.87abcdef	151	74.77abcde	16	74.90abc
16	76.83abcdef	43	74.67abcde	151	74.70abc
21	76.77abcdef	35	74.60abcde	15	74.60abc
30	76.73abcdef	28	74.60abcde	41	74.40abcd
23	76.67abcdef	33	74.37abcde	19	74.07abcd
15	76.63abcdef	24	73.87 bcde	17	73.90abcde
14	76.60abcdef	32	73.83 bcde	30	73.60abcdef
28	76.57abcdef	40	73.73 bcde	2	73.50abcdefg
35	76.37abcdef	23	73.50 bcde	23	73.00 bcdefgh
29	76.23abcdef	19	72.97 cde	34	72.60 cdefghi
34	75.70abcdefg	176	72.93 cde	35	72.40 cdefghi
41	75.43 bcdefg	15	72.93 cde	28	72.40 cdefghi
19	75.20 cdefg	31	72.87 cde	20	72.40 cdefghi
25	74.83 defg	21	72.70 de	43	71.90 defghij
18	74.83 defg	22	72.60 de	32	71.40 efghij
40	74.77 defg	26	72.40 ef	40	71.07 fghij
32	74.77 defg	14	72.20 efg	24	71.00 ghij
26	74.73 defg	17	70.23 fgh	31	70.60 hij
20	74.73 defg	25	70.07 gh	14	70.20 ij
24	74.53 efg	18	69.70 h	18	69.70 jk
31	74.37 fgh	16	69.53 h	26	67.80 kl
43	73.30 gh	36	69.37 h	25	66.50 l
36	72.20 hi	20	66.83 i	27	61.97 m
27	70.10 i	27	66.77 i	36	60.80 m

Means followed by the same letter are not significantly different at the five percent level.

TABLE XIV

MULTIPLE RANGE TEST FOR MEAN PEANUT KERNEL YIELD (POUNDS PER ACRE) IN 1960, 1961, AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
16	2794a	176	1431a	15	1972a
22	2595ab	40	1427a	33	1882ab
40	2535ab	2	1406a	18	1841abc
21	2533ab	18	1390a	20	1824abcd
33	2491abc	22	1350a	21	1779abcde
19	2469abcd	19	1345a	16	1764abcdef
176	2411abcde	33	1336a	2	1741abcdef
15	2409abcde	35	1321a	22	1726abcdefg
23	2402abcde	15	1311a	14	1691abcdefgh
17	2349 bcde	43	1309a	176	1670abcdefgh
20	2340 bcde	24	1307a	17	1660abcdefghi
2	2330 bcde	39	1306a	151	1595abcdefghij
24	2325 bcde	41	1304a	23	1541abcdefghij
36	2300 bcde	21	1279a	30	1474 bcdefghij
35	2299 bcde	16	1266a	29	1468 bcdefghij
18	2274 bcdef	34	1251a	24	1402 cdefghijk
39	2200 bcdefg	28	1241a	41	1388 cdefghijk
14	2180 bcdefg	23	1230a	39	1387 cdefghijk
25	2172 bcdefg	32	1227a	43	1381 cdefghijk
151	2164 bcdefgh	14	1210a	19	1377 defghijk
34	2065 cdefghi	29	1186a	34	1376 defghijk
28	2055 cdefghi	36	1174a	40	1326 efghijkl
32	2017 defghi	30	1168a	35	1311 fghijkl
43	1986 efghij	31	1146a	28	1273 ghijkl
30	1849 fghij	17	1139a	32	1245 hijkl
31	1773 ghij	151	1138a	31	1202 ijklm
26	1732 hij	20	1129a	25	1186 jklm
41	1705 ij	25	1122a	36	994 klm
29	1641 ij	27	1049a	26	914 lm
27	1575 j	26	974a	27	795 m

Means followed by the same letter are not significantly different at the five percent level.

TABLE XV

MULTIPLE RANGE TEST OF PEANUT SEED SIZE IN GMS. PER HUNDRED SEED FOR 1960, 1961, AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
36	85.62	36	87.08	36	72.41
24	60.88a	31	62.53	31	55.13a
31	58.80ab	24	58.32a	32	53.65a
32	57.30 bc	28	57.93a	24	50.56 b
26	55.24 cd	35	57.63ab	41	49.45 bc
40	54.90 de	26	57.18ab	34	49.35 bc
28	54.79 de	32	56.62ab	28	49.31 bc
34	54.33 de	40	56.41ab	40	48.81 bc
30	54.09 def	41	56.23abc	43	48.03 cd
43	53.86 def	30	55.43 bcd	39	47.90 cd
35	53.69 def	34	55.19 bcd	19	47.61 cd
19	53.62 def	39	53.93 cde	35	47.36 cd
41	52.88 def	43	53.35 de	30	46.98 cde
176	52.65 ef	19	51.79 e	176	46.91 cde
39	51.75 f	176	51.60 e	26	46.10 de
18	46.07 g	18	46.79	18	44.65 e
27	45.30 g	16	43.40 f	29	41.85 f
33	44.31 gh	33	43.29 f	33	41.68 f
29	42.78 hi	23	43.07 f	15	39.66 fg
16	42.56 hi	29	43.00 f	16	39.27 gh
23	41.05 i	15	40.77 g	25	38.37 gh
20	40.76 i	25	40.09 g	27	37.95 gh
15	40.37 ij	14	39.77 g	14	37.58 gh
14	40.33 ij	20	39.70 g	23	37.15 hi
2	38.22 jk	27	39.03 gh	20	37.05 hi
25	37.41 kl	21	37.41 hi	17	35.06 ij
21	37.23 kl	2	37.34 hi	21	34.93 ij
17	36.53 kl	17	36.24 ij	2	34.61 jk
151	35.20 l	22	34.53 j	22	32.96 jk
22	35.16 l	151	34.10 j	151	32.51 k

Means followed by the same letter are not significantly different at the five percent level.

TABLE XVI

MULTIPLE RANGE TEST FOR PEANUT PLANT HEIGHTS (INCHES) OF ENTRIES GROWN IN 1960, 1961 AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
27	24.2	27	23.5	27	23.7
34	21.2a	176	19.6a	16	19.2a
26	21.1ab	151	19.4ab	14	19.1a
14	21.0ab	24	19.0abc	24	18.8ab
23	20.9ab	14	18.8abcd	151	18.7ab
18	20.8ab	35	18.5 bcd	34	18.7abc
15	20.8ab	23	18.4 cde	31	18.5abc
17	20.7abc	26	18.3 cdef	18	18.5abc
176	20.6abc	19	18.1 cdefg	176	18.4abc
35	20.6abc	20	18.1 cdefgh	20	18.4abc
151	20.5abc	43	17.9 defghi	26	18.1 bcd
24	20.2 bc	28	17.9 defghi	23	18.1 bcd
16	19.8 cd	18	17.9 defghi	15	18.1 bcd
32	19.0 de	15	17.8 defghi	33	17.9 bcde
39	18.8 ef	33	17.4 efghij	19	17.9 bcde
30	18.5 ef	16	17.4 efghij	43	17.9 bcdef
33	18.5 ef	34	17.4 efghij	28	17.9 bcdef
19	18.3 efg	39	17.3 fghij	30	17.7 cdefg
31	18.1 efgh	21	17.3 fghij	17	17.2 defgh
20	18.1 efgh	30	17.2 ghij	39	17.2 defgh
28	18.0 fgh	17	17.1 ghijk	36	17.2 defgh
36	17.8 fgh	31	17.1 hijk	32	17.2 defgh
21	17.8 fgh	32	17.0 ijk	29	17.1 defgh
22	17.5 ghi	41	17.0 ijk	41	17.0 efgh
41	17.2 hij	36	17.0 ijk	35	16.9 fgh
40	16.8 ij	40	16.6 jk	21	16.7 gh
43	16.4 jk	22	16.2 k	40	16.4 hi
29	16.8 k	29	15.2	22	15.8 i
25	14.3	25	12.8	25	12.6

Means followed by the same letter are not significantly different at the five percent level.

TABLE XVII

MULTIPLE RANGE TEST FOR PEANUT LEAFLET SIZE (CM^2) FOR ENTRIES GROWN IN 1960, 1961 AND 1962

Okla. P-No.	1960	Okla. P-No.	1961	Okla. P-No.	1962
24	29.4	24	25.4	24	26.0
28	28.4	31	23.5a	27	25.2
32	27.4a	35	23.2ab	30	24.2a
18	27.4a	39	23.0abc	40	24.0ab
23	26.9a	30	22.8abcd	34	24.0ab
19	24.8 b	28	22.5 bcde	19	23.4 b
35	24.5 b	23	22.4 cde	23	23.3 b
29	24.5 b	27	22.3 cde	28	22.5 c
31	24.4 b	40	22.0 def	39	22.2 c
16	24.1 bc	18	21.9 efg	16	22.0 c
40	24.0 bc	19	21.4 fg	43	21.0 d
34	24.0 bc	34	21.3 fg	32	21.0 d
33	23.3 cd	43	21.3 fg	31	21.0 d
14	22.7 de	32	21.1 gh	41	20.4 de
43	22.5 e	16	20.5 h	35	20.0 ef
30	22.5 e	41	19.5 i	18	19.4 fg
27	22.5 e	33	19.0 ij	29	19.2 g
20	22.5 e	20	19.0 ij	26	19.0 g
15	22.4 e	14	19.0 ij	15	18.9 g
176	22.0 e	29	18.5 j	17	18.6 g
41	22.0 e	15	18.4 j	20	17.5 h
39	22.0 e	26	18.4 j	14	17.5 h
22	19.0 f	17	17.0 k	33	17.4 h
17	19.0 f	21	16.6 kl	22	16.0 i
36	18.5 f	176	16.0 l	21	16.0 i
21	17.6 g	22	16.0 l	176	15.5 i
26	17.0 g	36	13.4	36	14.1
151	12.1 h	25	11.9	25	12.0
25	11.5 h	151	10.5	151	10.0

Means followed by the same letter are not significantly different at the five percent level.

TABLE XVIII

MULTIPLE RANGE TESTS FOR PEANUT FRUIT LENGTH (MILLIMETERS) AND PERICARP THICKNESS (INCHES) FOR 1961, 1962 COMBINED

Fruit Length		Pericarp Thickness			
Okla. P-No.		Okla. P-No.	Position 1	Okla. P-No.	Position 2
36	39.022a	31	0.0695	41	0.0736
27	38.604a	26	0.0655	24	0.0663
31	32.074	36	0.0555	27	0.0655
32	30.580	32	0.0543	32	0.0628
26	29.744 b	41	0.0526	30	0.0616
19	29.532 b	30	0.0525	19	0.0597
30	29.370 bc	34	0.0519	34	0.0594
28	28.848 cd	19	0.0516	26	0.0591
40	28.800 cd	35	0.0495	31	0.0564
24	28.744 cd	27	0.0485	16	0.0556
34	28.262 de	24	0.0484	36	0.0549
41	28.050 e	29	0.0482	35	0.0539
43	28.026 e	40	0.0462	28	0.0517
29	27.850 e	28	0.0455	40	0.0513
35	27.788 e	39	0.0441	39	0.0501a
176	26.780 f	20	0.0440	20	0.0501a
39	26.680 f	43	0.0439	43	0.0499
18	26.482 f	16	0.0436	29	0.0498
25	26.148 f	18	0.0415a	18	0.0497
16	24.490 g	176	0.0415a	33	0.0481
20	24.346 g	23	0.0414	25	0.0480
33	24.204 gh	14	0.0409	23	0.0478
15	23.700 hi	33	0.0403	14	0.0465
23	23.594 hi	15	0.0386	176	0.0448
14	23.226 ij	25	0.0372	15	0.0441
17	22.758 jk	17	0.0340	151	0.0370
21	22.284 k	151	0.0328	17	0.0347
151	21.528 l	22	0.0315	22	0.0331
22	21.270 l	21	0.0282	21	0.0325

Means followed by the same letter are not significantly different at the five percent level.

TABLE XIX

MULTIPLE RANGE TESTS FOR PEANUT FRUIT WIDTH (MILLIMETERS) AT EACH OF THREE POSITIONS SUMMARIZED FOR ENTRIES GROWN IN 1961 AND 1962

Okla. P-No.	Basal End Position 1	Okla. P-No.	Constriction Position 2	Okla. P-No.	Distal End Position 3
36	16.8	27	13.9a	36	15.2
24	16.2	36	13.9a	27	14.0a
26	15.0a	24	12.4 b	41	13.6a
41	14.8ab	41	12.1 bc	26	13.0 b
27	14.8ab	26	11.9 cd	19	13.0 b
31	14.5 bc	34	11.7 cd	24	12.7 bc
30	14.4 bc	35	11.7 cd	31	12.6 bc
35	14.0 cd	30	11.4 de	30	12.3 cd
34	13.7 de	39	11.4 de	35	12.0 de
40	13.6 de	32	11.1 ef	16	11.7 ef
19	13.5 de	43	11.1 ef	40	11.7 ef
32	13.2 ef	31	11.0 ef	43	11.6 efg
28	13.0 fg	40	10.9 efg	28	11.5 efg
39	13.0 fg	20	10.7 fgh	39	11.5 efg
43	12.9 fg	28	10.5 ghi	32	11.4 fgh
16	12.5 gh	23	10.4 hij	20	11.3 fghi
20	12.3 hi	16	10.4 hij	34	11.2 ghi
176	12.2 hi	14	10.3 hij	18	11.1 ghi
29	12.0 hij	15	10.3 hij	33	10.9 hij
18	11.9 ijk	29	10.2 hij	29	10.9 hij
23	11.8 ijk	176	10.1 ij	176	10.8 ijk
33	11.7 jk	19	10.0 j	15	10.5 jk
15	11.6 jk	33	10.0 j	14	10.4 kl
25	11.5 k	25	9.9 j	23	10.3 kl
14	11.5 k	18	9.9 j	151	10.0 lm
151	10.5 l	151	8.9 k	25	9.8 mn
17	10.4 lm	17	8.8 k	17	9.8 mn
21	10.4 lm	21	8.8 k	21	9.6 mn
22	9.9 m	22	8.6 k	22	9.4 n

Means followed by the same letter are not significantly different at the five percent level.

TABLE XX

THE MEAN PERCENTAGES OF PANEL MEMBERS SCORING PEANUT BUTTER SAMPLES SUPERIOR TO, EQUAL TO, OR INFERIOR TO THE STANDARD IN ODOR, FLAVOR, AND INTENSITY OF FLAVOR, MEAN PREFERENCE RANK, AND PEANUT BUTTER TURN-OUT, 1961[1]

Okla. P-No.	Superior to Standard			Equal to Standard			Inferior to Standard			Mean Pref. Rank	Peanut Butter Turn-Out (%)
	A[2]	B[2]	C[2]	A	B	C	A	B	C		
14	10	0	40	80	50	60	10	50	0	3.9	85.0
15	10	10	70	90	90	30	0	0	0	1.7	88.0
16	10	0	20	60	30	70	30	70	10	4.2	88.0
17	20	10	50	70	50	40	10	40	10	3.7	87.0
18	0	10	50	80	60	40	20	30	10	4.1	88.5
19	0	0	0	10	0	0	90	100	100	6.2	75.0
20	0	10	60	50	60	40	50	30	0	2.7	87.5
21	0	0	30	60	40	50	40	60	20	4.6	86.5
22	30	10	47	67	64	54	9	27	0	2.4	87.0
23	10	0	0	20	20	30	70	80	70	5.5	87.5
24	25	29	55	75	44	45	0	29	0	3.0	87.5
25	19	0	39	9	40	35	74	60	27	4.8	81.0
26	37	17	35	27	27	49	37	52	17	4.1	88.0
27	8	4	19	42	22	40	50	76	42	4.8	87.0
28	30	10	30	60	50	60	10	40	10	2.8	84.5
29	23	13	54	74	73	41	4	14	5	2.9	88.7
30	20	19	45	64	62	45	17	20	10	2.9	88.5
31	29	0	27	55	29	47	17	72	27	4.2	85.5
32	17	50	59	67	34	42	17	17	0	2.5	87.5
33	9	0	34	67	67	59	25	33	9	3.8	81.8
34	9	25	50	67	59	42	25	17	9	3.4	80.5
35	17	17	34	58	67	58	25	33	17	3.3	81.0
36	0	10	20	80	30	60	20	60	20	3.6	84.5
39	17	9	33	59	67	50	25	25	17	3.9	82.5
40	9	9	9	42	34	67	50	58	25	4.8	80.5
41	17	9	25	50	33	50	34	59	25	4.0	77.5
43	17	25	42	50	67	50	33	9	9	3.0	86.0
151	17	0	17	42	67	67	42	33	17	4.0	87.5
176	9	17	33	34	33	33	59	50	33	4.2	80.5

[1]Each organoleptic percentage represents the mean of two experiments.

[2] A = Odor; B = Flavor; C = Intensity of Flavor

TABLE XXI

MEAN PERCENTAGES OF PANEL MEMBERS SCORING PEANUT BUTTER SAMPLES SUPERIOR TO, EQUAL TO, OR INFERIOR TO THE STANDARD IN ODOR AND FLAVOR, PREFERENCE RANK AND PEANUT BUTTER TURN-OUT FOR PEANUT ACCESSIONS, PARADISE, 1962[1]

Okla. P-No.	Superior to Standard		Equal to Standard		Inferior to Standard		Mean Pref. Rank	Peanut Butter Turn-Out (%)
	Odor	Flavor	Odor	Flavor	Odor	Flavor		
14	40	0	40	60	20	40	3.2	77.3
15	20	20	40	40	40	40	4.6	78.7
16	0	0	60	20	40	80	4.8	80.0
17	0	60	0	0	100	40	2.8	75.3
18	0	20	0	20	100	60	5.4	*
19	20	40	40	40	40	20	4.6	80.0
20	0	20	100	40	0	40	4.6	80.0
21	20	20	80	60	0	20	3.6	78.7
22	60	40	20	40	20	20	2.6	76.7
23	20	40	40	40	40	20	4.0	80.7
24	60	40	20	0	20	60	3.8	82.0
26	0	40	40	20	60	40	4.8	76.3
28	0	0	60	60	40	40	3.4	80.0
29	0	20	60	60	40	20	3.8	82.0
30	20	0	80	80	0	20	3.6	80.0
31	0	20	0	0	100	80	5.0	80.7
32	0	40	60	40	40	20	3.8	81.3
33	25	25	75	75	0	0	2.8	84.0
34	0	0	0	60	100	40	4.0	85.3
35	20	40	40	20	40	40	3.3	82.7
40	20	40	20	20	60	40	4.8	78.7
41	20	60	80	0	0	40	2.8	84.7
43	20	60	0	0	80	40	3.2	82.0
151	0	60	60	40	40	0	3.2	76.7
176	0	0	40	60	60	60	4.8	80.7

[1]Each organoleptic percentage and rank and rating scores represents one experiment.
*Handpicked to remove overroasted cotyledons.

TABLE XXII

PERCENTAGES OF OIL AND FATTY ACID DISTRIBUTION FOR PEANUT SEED OF 29 ENTRIES, PERKINS, 1961

Okla. P-No.	Oil	Palmitic	Stearic	Oleic	Linoleic	Linolenic[1]	Arachidic	Behenic
14	51.64	15.08	4.10	44.34	30.54	0.46	0.13	4.20
15	53.09	17.40	3.96	50.46	24.62	0.67	1.34	1.55
16	52.78	12.81	3.13	42.65	37.89	0.40	0.57	2.60
17	54.29	17.44	4.16	44.73	27.95	0.97	0.75	4.01
18	53.47	13.15	3.83	43.29	33.88	0.81	1.65	3.39
19	52.94	18.25	2.65	38.13	35.49	2.74	0.86	1.79
20	53.16	19.02	2.27	39.31	33.19	2.26	0.99	2.96
23	51.49	14.18	4.20	41.04	35.82	0.70	1.36	2.76
24	50.53	11.63	2.64	41.58	40.74	0.54	0.78	2.10
25	52.52	14.77	2.16	46.23	32.98	0.14	0.11	2.37
26	53.24	14.52	3.65	39.41	38.20	0.86	0.98	2.37
27	51.61	13.34	2.37	40.17	39.99	0.91	0.42	2.79
28	50.72	13.75	3.98	39.74	37.68	0.41	1.51	2.94
29	54.17	15.29	3.81	44.83	31.98	0.70	1.24	0.22
30	49.40	16.54	3.51	44.36	31.34	0.74	1.46	2.05
31	51.23	12.42	4.10	44.43	35.20	0.42	1.00	2.44
32	48.85	14.13	3.53	42.35	35.35	0.44	1.32	2.88
33	52.04	14.53	3.59	42.61	35.78	0.73	0.11	1.65
34	50.35	12.85	4.19	46.36	33.25	0.39	0.84	1.26
35	49.90	13.48	3.00	41.34	37.94	0.35	1.30	2.60
39	52.71	14.09	3.90	46.52	30.63	0.78	1.54	2.54
40	55.93	12.69	3.85	44.60	36.55	0.00	0.77	1.54
41	52.87	17.65	2.35	44.97	30.80	0.41	1.57	2.26
43	51.78	14.64	5.78	45.91	30.56	tr.	1.33	1.78
151	52.12	13.89	3.49	46.27	33.84	0.47	0.85	1.19
36	51.72	12.50	2.66	48.21	33.36	0.61	1.15	1.50
21	51.61	12.65	3.08	45.52	34.33	0.80	1.16	2.47
22	53.21	11.66	4.59	47.98	32.98	0.50	0.90	1.40
176	53.22	15.86	2.63	49.08	31.17	tr.	1.25	tr.

[1]Later identified as Eicosenoic.

TABLE XXIII

PERCENTAGES OF OIL AND FATTY ACID DISTRIBUTION FOR PEANUT SEED OF 29 ENTRIES, PARADISE, 1962

Okla. P-No.	Oil	Palmitic	Stearic	Oleic	Linoleic	Linolenic[1]	Arachidic	Behenic	Lignoceric
14	50.92	16.38	3.50	39.03	35.33	0.80	1.28	2.60	1.09
15	51.45	16.48	2.81	40.83	34.70	0.54	1.17	2.29	1.20
16	50.91	16.57	3.18	39.61	34.89	0.79	1.11	2.73	1.12
17	52.23	17.22	2.86	39.54	34.91	0.73	1.16	2.69	0.88
18	51.89	16.26	3.49	39.49	34.91	0.70	1.15	2.85	1.15
19	51.99	17.14	2.87	39.48	35.73	0.63	1.30	2.43	0.42
20	51.69	16.78	3.13	39.44	34.37	0.67	1.18	2.52	1.92
21	52.21	17.20	2.62	40.14	34.78	1.18	1.16	2.32	0.59
22	51.95	16.96	3.30	39.96	33.84	1.00	1.19	2.35	1.39
23	50.55	16.27	3.36	39.43	35.38	0.55	1.00	2.93	1.06
24	49.90	16.08	3.10	38.22	36.89	0.82	1.13	2.59	1.18
25	52.89	14.11	1.68	44.59	33.35	1.54	0.95	2.47	1.31
26	53.58	16.85	3.32	36.74	38.02	0.69	1.16	2.35	0.88
27	50.37	16.93	1.73	37.83	38.46	1.25	0.59	2.23	0.97
28	49.94	16.10	3.10	38.34	36.51	1.06	1.28	2.40	1.21
29	50.56	15.54	3.77	38.51	36.25	0.80	1.18	2.66	1.27
30	50.64	16.11	3.17	38.64	37.62	0.52	1.27	2.18	0.48
31	50.23	15.96	3.15	38.35	36.77	1.39	0.65	2.47	1.25
32	50.33	15.94	2.92	38.13	36.77	0.96	1.15	2.87	1.26
33	49.98	17.00	2.59	38.02	36.80	0.84	1.01	2.59	1.15
34	50.94	16.33	2.76	39.68	36.05	0.89	1.03	2.74	0.53
35	50.09	16.26	3.26	39.26	35.98	0.82	1.23	2.17	1.01
39	50.81	16.09	2.90	39.10	36.39	0.96	1.11	2.59	0.88
40	50.28	14.86	3.36	39.14	36.75	0.89	1.25	2.24	1.51
41	50.84	16.55	2.94	39.32	35.07	0.97	1.23	2.51	1.40
43	50.42	14.69	2.77	39.16	37.90	0.92	1.02	2.21	1.34
151	51.54	17.15	3.07	39.80	34.56	0.90	0.89	2.34	1.28
176	51.39	16.78	2.75	39.52	35.96	0.81	0.97	2.11	1.09

[1]Later identified as Eicosenoic.

TABLE XXIV

RATIO OF OLEIC TO LINOLEIC FATTY ACID IN PEANUT SEED FOR 29 ENTRIES (O/L)

Okla. P-No.	1961	1962
14	1.452	1.105
15	2.050	1.177
16	1.126	1.135
17	1.600	1.133
18	1.278	1.131
19	1.074	1.105
20	1.184	1.134
21	1.326	1.154
22	1.455	1.181
23	1.145	1.114
24	1.021	1.036
25	1.402	1.337
26	1.032	0.966
27	1.005	0.984
28	1.055	1.050
29	1.402	1.062
30	1.415	1.027
31	1.262	1.043
32	1.198	1.037
33	1.191	1.033
34	1.394	1.100
35	1.090	1.091
36	1.445	1.352
39	1.519	1.074
40	1.220	1.065
41	1.460	1.121
43	1.502	1.033
151	1.367	1.152
176	1.575	1.099

VITA

Leland Derrell Tripp

Candidate for the Degree of

Doctor of Philosophy

Thesis: GERM PLASM EVALUATION AND INHERITANCE STUDIES IN PEANUTS, *ARACHIS HYPOGAEA* L.

Major Field: Plant Breeding and Genetics

Biographical:

Personal Data: Born near Grady, Oklahoma, July 30, 1928, the son of Lora B. and Roy E. Tripp.

Education: Attended grade school at Grady, Oklahoma; Capitol Hill Jr. High and Classen Senior High Schools in Oklahoma City and Ringling High School at Ringling, Oklahoma; received an Associate of Science degree from Murray Junior College, Tishomingo, in June of 1949; received a Bachelor of Science degree from Oklahoma State University, with a major in Agronomy in May 1954; received the Master of Science degree from Oklahoma State University, with a major in Rural Adult Education in August 1960; completed the requirements for the Doctor of Philosophy degree in September 1967.

Professional Experience: Employed as Assistant County Agent by the Oklahoma Extension Service, 1954 to 1957; Radio and Television Specialist 1957 to 1959; Extension Crop Specialist 1961 to present.

Member of: American Society of Agronomy and Crops Science Society of America.