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VARIABILITY AND GENETIC PARAMETERS IN YIELD AND ITS ATTRIBUTES AMONG SOME GROUNDNUT (*Arachis hypogaea* L.) LINES

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ABSTRACT

Nine peanut lines and a commercial groundnut cultivar (Giza6) were evaluated in a randomized complete block design with three replications at the Experiment Station of the Agricultural Research Center (ARC), Ismailia during 2018 and 2019 seasons to study variability, heritability and genetic advance under selection. Results indicated that line 6 had the highest pod yield pl^{-1}, seed yield pl^{-1}, pod yield fad^{-1}, 100 pod weight and seedling dry weight. Line11 was the highest significantly in No. of pods pl^{-1}, No. of seed pl^{-1},100 seed weight, pod length, seed length, radical length and seedling vigor index. Germination% ranged from 86.8 for line 9 to 93.9 for line 12. Line 15 recorded the highest value of shoot length. The crude oil varied from 46.1 to 48.1%. The line 12 had the greatest crude oil value. The crude protein ranged between 28.0 for line 9 to 31.5 for line 11 with a general mean of 30.2. The genotypic variance was greater than that of environmental variance for all studied traits. Moderate heritability coupled with high genetic advance was obtained for plant height, number of pods pl^{-1} and number of seeds pl^{-1}, and pod yield fad^{-1}. Broad sense heritability was moderate for radical length, seedling vigor index, stander germination %, crude protein (%) and crude oil (%). Meanwhile, shoot length, seedling dry weight and total carbohydrates (%) had lower magnitude of heritability.

Key Words: Groundnut, (*Arachis hypogaea* L.) Genetic Variability heritability, Seed vigor, Yield, Yield Components, Chemical Traits.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of oil seed crops in the world. Its kernel has been used as a source of edible oil as well as protein. Groundnuts are generally grown in tropics and semi- dry tropic regions. Groundnuts or peanuts haulms are excellent feed for animals. It contains about 8-15% protein, 1-3% oil, 9-11% minerals and 38-45% carbohydrates in addition releases energy up to 2.34 call Kg of dry matter. It has to play a major role in bridging the vegetable oil gap in our country. It is considered one of the most important cash for Egyptian farmer. Knowledge on natural and magnitude of genetic variability are the basic requirement for selecting groundnut lines to be used in hybridization programs. The study on genetic variability is very useful for breeders to know the heritability of the agronomic characters to increase the seed production both locally and globally. **Falconer and Mackay (1996)** reported that heritability is defined as the measure of the correspondence between breeding value and phenotypic value. So that, heritability plays a predictive role in breeding, expressing the reliability of phenotype as a guide to its breeding value. There is a direct relationship between heritability and response to selection, which is referred to as genetic advance. High genetic advance with high heritability estimates offer the most effective condition for selection. The utility of heritability therefore increase when it is used to calculate of genetic advance, which indicates the degree of gain in a character, obtained under a particular selection pressure. Thus genetic advance is another important selection parameter that aids breeder in a selection program. **Zaman *et al.*, (2011)** found that the highest genetic coefficient of variation was observed for kernel yield per hectare, followed by kernel yield per plant, branches per plant, immature and mature nuts per plant, 100 kernel weight and plant height. The genotypic variance was greater than that of environmental variance for all studied characters **Naguib *et al.*, (2011) ; Hassanein and Ahmed (2015). Vishnuvardhan *et al.*, (2012) ; Abd El-Rahman *et al.*, (2013) and Vasanthi *et al.*, (2015)** found that low differences between phenotypic coefficient of variance (PCV) and genotypic coefficient of variance (GCV) in certain cases indicated that greater role of genetic component and less influenced by the environments. The high heritability coupled with high genetic advance were for pod yield, seed yield pl^{-1} and shelling percentage indicated that these traits governed by additive gene effects and selection would be effective even in the early generation **Tirkey *et al.*, (2018) ; Mahmudul *et al.*, (2020) ; Fatih and Tahsin (2022)**. In other hand, **Narendra *et al.*, (2019)** reported that days to maturity, shelling outturn and specific leaf area at 45 days after sowing had moderate heritability accompanied with low genotypic coefficient of variation and genetic advance indicating these traits were governed by non-additive gene effects. Selection may be practiced in later generations for improving these traits.

Cultivar identification is generally accomplished by evaluating several morphological characteristics such as seed, seedling and plant morphology traits. Determining the content of selected chemical constituents, such as protein pattern, fatty acids and isozymes, is one of the most useful data for identification of the different variation and keep the royalties and their utilization in the future in another breeding programs. **Bunting (1955)** reported that the peanut cultivars classified based on some morphological characters such as breeding pattern, growth habit, seed dormancy, flower characters, flowering habit, characters of pod (length, diameter, shape, and thickness of shell), and kernels colour. The morphological characterization based on 60 morphological descriptors demonstrated that variation exists. Numerical taxonomic techniques were used to rank the importance of these descriptors **Mass *et al.*, (1993).** Seed traits (shape, size and weight of seed) and seed tests (seed germination test, normal seedlings, classification test, seedling measurement, accelerant ageing test) and chemical analysis for twenty peanut genotypes were studied by **Abd-Alla and Sorour (2004)**. They found that peanut genotypes varied significantly concerning of seed traits and tests. In China, **Asibuo *et al.*, (2008)** found that oil content ranged from 33.6 to 54.9 %. The major fatty acids were oleic and linoleic which accounted for 77.9 % of total acids. **Naguib *et al.*, (2011)** found that the crude oil was ranged from 44.4 to 48.2%. The crude protein ranged between 30.1 to 32.8.**Nautiyal (2009)** reported wide genetic variations in some seed parameters such as germination rate, germination speed, vigor index, respiration rate and number of secondary roots. Genetic variations were observed in germ inability and root hypocotyls and epicotyls length, opening of cotyledons and growth of secondary roots in germplasm accessions. **Naguib *et al.*, (2011)** reported that broad sense heritability was high for seed vigor index, accelerated ageing germination %, electrical conductivity $\mu Scm^{-1}g^{-1}$, radical length, shoot length and seedling dry weight.

The present investigation was amid to estimate genetic variability parameters, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), ability in broad sense(h^2b), genetic advance (GA), peanut seed quality by using some vigor and viability tests and to determine the major chemical compositions of seed to estimate the genetic purity of eight promising peanut lines and a commercial cultivar, in order to obtain reliable information for recommending desired genotypes and making decisions concerning the proper breeding methods for improving yield and yield components.

MATERIALS AND METHODS

Field experiment:

This investigation was carried out in Ismailia Agricultural Research Station, Agricultural Research Center (ARC) during two successive seasons 2018 and 2019. The material for this study was comprised of the commercial cultivar Giza 6 and nine peanut lines, namely:,line16,line12,line7,line9,line8,line15,line6,line17,and line11. The lines used in the present study and their pedigree are shown in Table (1).

Table 1: Name and pedigree of groundnut lines under study.

Genotypes	Origin	Pedigree
Giza 6	Egypt	Commercial cultivars(selected from line 262 x Giza 5)
Line 16	India	Introduced
Line 12	China	Introduced
Line 7	China	Introduced
Line 9	Egypt	Selected from(line 245 x Geregory)
Line 8	Egypt	Selected from(line 446 x Giza6)
Line 15	China	Introduced
Line6	Egypt	Selected from((Giza6 x line 623)
Line17	Icrisat	Introduced
Line 11	Egypt	Selected from (line 103 x Giza 6)

The materials were conducted in a randomized complete block. Each entry was grown in a plot area of 10 m^2 (4.0 × 2.5 m). Sowing dates were 15^{th} May 2018 and 2019, the cultural practices were done according to recommendations methods. The observations were recorded on ten randomly selected plants per plot for the following characters:

1. Agronomic traits: days to 50% flowering, plant height (cm), number of branches pl^{-1}., number of pods pl^{-1}., number of seeds $pl^{-1,}$
2. Yield traits: at harvest, pods yield pl^{-1}. (g), seed yield pl^{-1}.(g), pods yield fad^{-1}(ard.), and shelling % were recorded and or estimated.
3. Pod and seed traits: pod length (cm), seed length (cm), 100 pods weight (g), and 100- seed weight (g) were recorded at harvest**.**

Seedling traits:

twenty five pure seeds of each peanut genotype and three replications were placed in petri dishes containing filter paper soaked with distilled water. The sowing between paper and the petri dishes were placed in an incubator at 25 ± 1°C for 5 days to first count and 10 days to final count. Normal seedlings were counted according to the international rules of **ISTA (1993)** and expressed as germination percentage

$$\text{Germination (\%)} = \frac{\text{Number of normal seedlings}}{\text{Number of seed tested}} \times 100$$

Seed vigor index was calculated using the following formula **(Copeland 1976):**

$$\text{Seed vigor index} = \frac{\text{Number of seeds germinated (1st count)}}{\text{Number of days to first count}} + \frac{\text{Number of seeds germinated (last count)}}{\text{Number of days to final count}}$$

Evaluation of seedlings: Normal seedlings obtained from the germination test were used for seedling evaluated according to the rules of the Association of Official Seed Analysis **(AOSA 1983).** Seedling shoot and root length were measured after 10 days of germination test. Twenty seedlings from each Petri dish were randomly selected and shoot and root length of individual seedlings was recorded. The shoots and roots were also dried at 70°C for 72h. Seedling vigor index was calculated using data recorded on germination percentage and seedling growth according to **(ISTA 1985)** by the formula:

Seedling vigor index = Seedling length (cm) × Germination percentage

Chemical composition:

Samples of 50g of air dried seeds of each genotype were randomly chosen from two replications and fine grind for estimating chemical composition. Total nitrogen was determined using Kjeldahl method **(AOAC 2000),** crude protein was calculated by multiplying the total nitrogen by factor of 6.25. Total carbohydrates were estimated according to **AOAC (2000).** Crude oil percentage was determined using Soxhlet apparatus and hexane as solvent according to **AOAC (2000).**

Statistical Analysis:

Analysis of variance was calculated for each season separately according to **Mather and Jinks (1982).** According to homogeneity test, the results of 2018 and 2019 did not differ significantly, so the combined analyses of the two seasons were conducted. The variation components, phenotypic and genotypic variance were calculated according **Singh and Choudhary (1985).**

RESULTS AND DISCUSSION

Mean performance of agronomic traits:

Table 2 shows the mean performance of days to 50% flowering, plant height (cm), number of branches pl^{-1}., number of pods pl^{-1}., number of seeds pl.$^{-1}$. The data revealed that the wide range of variability were observed for studied traits. Significant differences were found among groundnut lines for studied traits. These data are in agreement with **Mohamed and Bissati (2017) ; Adama *et al.,* (2017) and Oluwaseyi *et***

***al.*, (2021).** Days to 50% flowering ranged from 27 days for line 9 and line 6 to 29.7 days for line 16 with mean 28.3 days. The range for plant height was from 31.5 cm for line17 to 40.8 for line 12. Regarding to number of branches pl^{-1}ranged from 3.77 for line 7 to 5.13 for line 16 with mean 4.60. With regard number of pods $p.l^{-1}$ the line 11 produced greatest number of pods $pl.^{-1}$ (38.3).Meanwhile the line 7 recorded the lowest number of pods pl^{-1} (23.3). The number of seeds $pl.^{-1}$ was ranged from 37.2 to 66.0. The line11had the greatest value of number of seed pl^{-1}, while, Giza 6 (commercial cultivar) had the lowest number of seed pl^{-1}

Table 2: Mean performance for agronomic traits of ten groundnut genotypes (data were combined)

Genotypes	Days to 50%flowering	Plant height(g)	No. of branches $pl.^{-1}$	No. of pods $pl.^{-1}$	No. of seeds $pl.^{-1}$.
Giza 6	28	39.4	4.28	25.1	37.2
Line 16	29.7	33.4	5.13	31.3	56.6
Line 12	28.7	40.8	4.73	29.8	46.1
Line 7	28.3	39.1	3.77	23.3	47.2
Line 9	27	37.4	4.71	33.7	52.8
Line 8	28	39.2	4.80	27.0	44.3
Line 15	28	33.9	4.38	25.0	49.8
Line 6	27	37.4	4.58	33.9	64.9
Line 17	28	31.5	4.45	25.8	45.0
Line 11	29	35.3	5.0	38.3	66.0
L.S.D.	0.5	7.9	0.8	4.2	3.0
Mean	28.3	36.4	4.60	29.3	51.0
C.V	11.5	9.9	11.9	8.3	13.5

Mean performance of yield component:

Mean performance, for pods yield $pl.^{-1}$., seed yield $pl.^{-1}$, pods yield fad $^{-1}$(ard.) and shelling % for ten groundnuts are presented in Table (3). Data revealed that the range for pod yield $pl.^{-1}$ was 52.1 to 97.4 g. Line 6 was higher yielding than commercial cultivar by 74.23%. With respect seed yield $pl.^{-1}$, it different significant over two seasons. It ranged from 41.5 to 73.9 g. with mean 55.9 g. The pod yield fad^{-1} are showed in Table 3. It obvious that line11 recorded the highest pod yield $fad.^{-1}$ (28.8 ard) followed by line 6 (26 ard). They were higher than commercial cultivar by 32.1% and 19.3%, respectively. Shelling percentage varied significantly over the two seasons. It ranged from 70.2% to 81.5%. The line 9 gave the highest value (81.5%), followed by the line 11 (80.9%).Meanwhile, the line17 gave the lowest value (70.2%).

Table 3: Mean performance of yield traits for ten groundnut genotypes (dates were combined).

Genotypes	Pod yield pl.$^{-1}$ (g)	Seed yield pl^{-1}. (g)	pods yield fad $^{-1}$ (ard.)	Shelling (%)
Giza 6	55.9	41.6	21.8	71.5
Line 16	72.6	52.6	17.6	72.9
Line 12	74.4	56.2	25.1	75.6
Line 7	52.1	41.5	22.1	79.4
Line 9	80.7	66.2	23.7	81.5
Line 8	66.6	48.4	21.0	72.3
Line 15	64.4	51.4	19.4	79.0
Line 6	97.4	73.9	26.0	75.7
Line 17	78.7	54.2	24.3	70.2
Line 11	90.4	72.8	28.8	80.9
L.S.D.	0.08	1.6	0.9	2.8
Mean	73.3	55.9	23.00	69.6
C.V	13.4	11.8	12.7	12.2

Mean performance of pod seed traits:

Table (4) shows 100- pod weight, 100- seed weight, pod length and seed length for ten groundnut lines. Data revealed that the line 6 had the greatest significant 100- pod weight (269.1g). Meanwhile, Giza 6 had the lowest 100- pod weight (220.5 g). The greatest value of 100- seed weight (210.8) was recorded for line 6. In contrast, Giza6 recorded the lowest 100-seed weight (95.3). Data in Table (4) indicated that range for pod length was 4.0 – 4.7cm with mean 4.3cm.Line 16 and line 17 showed the greatest significant pod length. Significant differences among ten groundnut lines were also obtained in seed length Table (4). Range was 1.9 – 2.2cm over the two seasons with mean 2.0 cm. Line 11 recorded significantly the greatest seed length value (2.2cm). Meanwhile, Giza 6 and line17 showed the lowest value (1.9 cm).

Table 4: Mean performance for 100- pod weight, 100- seed weight, pod length and seed length for ten groundnut genotypes (dates were combined).

Genotypes	100-pod weight (g)	100-seed weight (g)	Pod length (cm)	Seed length (cm)
Giza 6	220.5	95.3	4.0	1.9
Line 16	225.9	98.9	4.7	2.1
Line 12	245.7	108.7	4.1	2.0
Line 7	227.1	108.4	4.1	2.1
Line 9	231.6	109.9	4.2	1.9
Line 8	251.7	105.4	4.0	2.0
Line 15	266.7	112.1	4.0	2.0
Line 6	296.1	105.1	4.3	2.1
Line 17	281.2	116.6	4.7	1.9
Line 11	238.9	210.8	4.2	2.2
L.S.D.	8.0	3.8	0.3	0.1
Mean	248.5	117.1	4.3	2.0
C.V	12.1	12.1	12.1	14.8

Mean performance of seedling traits:

Data in Table (5) illustrates that radical length ranged from 6.3 to 8.2 cm with a mean of 7.0 cm across the two seasons. The longest radical was recorded for line11. Meanwhile, Giza 6 and line16 had the shortest radical length (6.3cm). The line 9 had the longest shoot length with a mean of (3.8 cm). Whereas, line16 recorded the shortest shoot length (2.6cm) and the differences were significant. The range of seedling dry weight was from 262.2 to 359.4 mg with a mean of (307.5 mg). Line 6 had the greatest seedling dry weight (359.4mg). Meanwhile, line16 recorded the lowest values of seedling dry weight (262.2 mg). With respect to seedling vigor index, it ranged from776.6 in Giza 6 to 1039.7 in line11. Range for stander germination% was from 86.8 to 93.9 % with a mean of 89.2%. The line 12 recorded the highest germination%. These results are accordance with those obtained by **Nautiyal (2009) ; Nautiyal *et al.*, (2010) ; Mohamed *et al.*, (2010) ; Naguib *et al.*, (2011) ; Vasanthi *et al.*, (2015) ; Mohamed and Bissati (2017) and Oluwaseyi *et al.*, (2021).**

Table 5: Mean performance of seedling traits for ten groundnut genotypes (dates were combined).

Genotypes	Radical length (cm)	Shoot length (cm)	Seedling dry weight (mg)	Seedling vigor Index	Stander germination %
Giza 6	6.3	2.7	265.2	776.6	87.2
Line 16	6.3	2.6	262.2	867.1	88.8
Line 12	6.7	3.1	294.2	933.5	93.9
Line 7	7.5	3.1	262.5	845.9	87.2
Line 9	6.7	3.8	314.4	897.0	86.8
Line 8	6.6	2.9	323.9	916.8	89.8
Line 15	7.4	3.5	285.0	913.9	87.3
Line 6	7.0	3.4	359.4	961.3	90.9
Line 17	7.2	2.8	354.7	970.5	88.5
Line 11	8.2	3.3	353.8	1039.7	92.0
L.S.D.	8.0	0.2	2.8	8.4	3.8
Mean	7.0	3.1	307.5	912.2	89.2
C.V	7.2	13.6	16.8	5.6	7.3

Mean performance of chemical composition:

The results in Table (6) show that chemical composition of ten groundnut seeds was significant affected by genetic makeup. Range for total carbohydrates was 9.9 – 11.6%. Line 16 recoded the highest total carbohydrates% a mean of (11.6%). Meanwhile, line 12 had the lowest value (9.9%). The crude protein% ranged from 28.0% in line9 to 31.6% in line 12. With respect to crude oil%, it ranged from 46.1 to 49.1%. Line

12 followed by line 8 had the greatest crude oil %. Whereas, line 17 had the lowest crude oil (46.1%) across the two seasons. These results are in agreement with those obtained by **Mohamed *et al.*, (2010); Sarvamangala (2011) ; Naguib *et al.*, (2011) ; Patil *et al.*, (2014) ; Vasanthi *et al.*, 2015 ; Hassanein and Ahmed (2015) ; Mohamed and Bissati (2017) ; Ali *et al.*, (2020) ; Oluwaseyi *et al.*, (2021) and Fatih and Tahsin (2022).**

Table 6: Mean performance of chemical composition for ten groundnut genotypes (dates were combined).

Genotypes	Total Carbohydrates (%)	Crude protein (%)	Crude oil (%)
Giza 6	10.6	30.9	48.5
Line 16	11.6	30.8	47.6
Line 12	9.9	31.6	49.1
Line 7	11.4	29.5	47.3
Line 9	11.1	28.0	48.7
Line 8	11.1	30.5	48.6
Line 15	11.3	29.0	48.3
Line 6	11.4	29.9	46.6
Line 17	11.3	30.1	46.1
Line 11	10.5	31.3	48.3
L.S.D.	0.8	0.6	1.2
Mean	11.0	30.2	47.9
C.V	4.5	1.2	1.5

Genetic parameters for agronomic traits:

Table (7) shows the estimation of component of variance genetic (∂^2_g), phenotypic (∂^2_{ph}) and environmental (∂^2_e) variance, genotypic (GCV) and phenotypic (PCV) coefficient of variability, broad sense heritability and (h_b) expected genetic advance (G.s %) under 5% selection on intensity as percentage of the men. Data revealed that the genotypic variance was greater than environmental variance for all studied traits. The phenotypic and genotypic variances for number of pods pl^{-1} and numbers of seeds pl^{-1} were high over the two seasons. Similar results were obtained by **Mohamed *et al.*, (2010) ; Sarvamangala (2011) ; Naguib *et al.*, (2011) ; Patil *et al.*, (2014) ; Vasanthi *et al.*, 2015 ; Hassanein and Ahmed (2015) ; Mohamed and Bissati (2017) ; Ali *et al.*, (2020) ; Oluwaseyi *et al.*, (2021) and Fatih and Tahsin (2022).** Partitioning of total variance into its components revealed that the magnitude of PVC was higher than GVC for all the traits, indicating the influence of environment upon these traits. The genotypic and phenotypic coefficients of variance were low in magnitude for days to 50% flowering and number of branches pl^{-1}. These data are in accordance with **Vasanthi *et al.*, (2015) ; Mohamed and Bissati (2017) ; HajHussein *et al.*, (2018) ; Narendra *et al.*, (2019) ; Ali *et al.*, (2020) ; Oluwaseyi *et al.*, (2021) ; Fatih and Tahsin (2022)**. Plant height recorded moderate value of GCV and PCV. **Shinde *et al.*, *(*2010) ; Naguib *et al.*, (2011) ; Hassanein and Ahmed (2015)** also reported moderate magnitude of GCV and PCV for plant height. High GCV and PCV were observed for number of pods pl^{-1} and**,** number of seeds pl^{-1}, suggesting wide spectrum of genotypic variation for these trait. These present finding are in accordance with those obtained by **Shinde *et al.*, *(*2010) ; Naguib *et al.*, (2011), Zaman *et al.*, (2011),Hassanein and Ahmed (2015) ; Ali *et al.*, (2020) ; Oluwaseyi *et al.*, (2021) ; Fatih and Tahsin (2022)**. With respect broad sense heritability, it was high (more than 80%) for days to 50% flowering. **HajHussein *et al* (2018)** also reported high heritability for days to 50% flowering. Whereas, moderate was reported by **Naguib *et al* (2011).** Meanwhile, plant height, number of branches pl^{-1}, and number of branches pl^{-1}, number of pods pl^{-1} and number of seeds pl-1had moderately high estimates of heritability (more than 50%). These data are harmony with those obtained by **Ali *et al* (2020) ; Oluwaseyi *et al.*, (2021) ; Fatih and Tahsin (2022)**. It is known that expected genetic advance from selection is commonly predicted as the product of heritability ratio and the selection differential. Days to 50% flowering had the highest estimates of genetic advance coupled with high broad-sense heritability. Meanwhile, there were not much differences between PCV and GCV, thus, This trait showing to be highly heritable, points to the predominance of additive gene effect, easily fixable and can be taken as unite traits for effective selection. Similar results were obtained by **Vasanthi *et al*(2015) ; HajHussein *et al* (2018) ; Ali *et al* (2020) ; Oluwaseyi *et al.*, (2021) ; Fatih and Tahsin (2022)**. Moderate heritability coupled with high genetic advance was obtained for plant height, number of pods pl^{-1} and number of seeds pl^{-1}. **Vasanthi *et al* (2015)** also reported Moderate heritability coupled with high genetic advance was obtained for number of fully expanded leaves, weight of immature pod per plant and pod yield per plant. Improvement can be brought about in these traits through simple pedigree method of breeding and phenotypic selection would be effective. The magnitude of heritability in broad sense was moderate coupled with low genetic advance for number of branches pl^{-1}. Moderate heritability with low genetic advance GCV was largely under the control of non- additive gene action and selection for this trait would be ineffective. These results are in harmony with that obtained by **Shinde *et al* (2010) , Naguib *et al* (2011) and HajHussein *et al* (2018)**.

Table 7: Estimates of component of variance, Genetic variability broad sense heritability estimates (h_b) and genetic advance as percentage of means (G.s%) for some agronomic traits for ten groundnut genotypes (combined across two season).

Traits	Component of variance			Genetic variability		h_b	G.s%
	∂^2_g	∂^2_{ph}	∂^2_e	GCV	PCV		
Days to 50%flowering	2.06	2.98	0.92	3.38	6.09	80.87	33.87
Plant height(g)	80.5	99.3	18.8	11.7	25.7	65.5	24.01
No. of branches pl^{-1}	0.7	0.71	0.01	6.73	18.3	56.7	13.84
No. of pods pl^{-1}.	102.35	147.41	45.06	22.53	40.74	50.56	25.64
No. of seeds p^{l-1}.	333.49	498.17	164.08	26.3	45.90	52.90	31.12

Genetic parameters for yield, pod and seed traits:

Data in Table (8) raveled that genotypic variance was prominent than that of environmental variance for all studied. The extent of coefficient of variation indicated that high estimates of (PCV) and (GCV) were exhibited for pod yield pl^{-1} and seed yield pl^{-1}. Meanwhile, PCV estimates were larger than the GCV for pod yield pl^{-1}, seed yield pl^{-1}, pod yield fad^{-1}, shelling% and pods yield fad^{-1}. Broad sense was moderate for seed yield pl^{-1}, pods yield $fad^{-1,}$ pods length**,** seed length and100 pods weight. In other hand, pod yield pl^{-1} exhibited low heritability. The high heritability associated with low genetic advance expressed as percentage of mean were shown in 100-seed weight. Suggested that this trait was conditioned by high genotype-environmental interaction. In such a situation, selection would not be rewarding. Pod length, seed length and 100 pod weight expressed moderate heritability and low genetic advance, indicating the role of non- fixable genetic variance in the expression of these traits. Moderate heritability coupled with high genetic advance was obtained for seed yield pl^{-1} and pod yield fad^{-1}. Improvement can be brought about in this trait through simple pedigree method of breeding and phenotypic selection would be effective. The low magnitude of heritability and low magnitude of genetic advance was observed for pod yield pl^{-1}. This indicated that there was narrow genetic variability within peanut varieties for oil and protein content. Due to the narrow genetic diversity, the success of these varieties in peanut breeding (selection or hybridization) for oil and protein ratio will be low. Similar results reported by **Shinde *et al* (2010) ; Jogloy *et al* (2011) ; Vasanthi *et al*(2015) ; HajHussein *et al* (2018) ; Ali *et al* (2020) ; Oluwaseyi (2021) ; Fatih and Tahsin (2022).**

Table 8: Estimates of component of variance, genetic variability, broad sense heritability estimates (h_b) and genetic advance as percentage of means (G.s%) of yield, pod and seed traits for ten groundnut genotypes (combined across two season).

Traits	Component of variance			Genetic variability		h_b	G.s%
	∂^2_g	∂^2_{ph}	∂^2_e	GCV	PCV		
Pod yield pl^{-1}. (g)	295.38	441.57	146.21	21.18	36.99	43.11	12.22
Seed yield $pl.^{-1}$ (g)	271.7	406.68	134.98	23.41	40.64	63.19	27.78
Pod yield fad^{-1} (ard)	36.78	54.72	17.94	18.74	32.50	72.78	24.98
Shelling (%)	52.03	75.19	23.16	6.30	11.35	80.80	27.02
Pod length (cm)	0.20	0.23	0.03	4.12	11.41	63.04	13.07
Seed length (cm)	0.059	0.060	0.0004	9.5	11.66	67.0	13.16
100-pod weight (g)	2083.0	3102.6	1019.6	14.48	25.26	52.88	16.71
100-seed weight (g)	174.71	302.15	127.44	10.97	16.89	82.14	14.67

Genetic parameters for seedling and chemical traits:

Estimation of component of variance, GCV and PCV, H^2_b and G.A% for germination, seedling and chemical traits are showed in Table (9). The data indicated that the genotypic variance was higher than that of environmental variance in all traits. The phenotypic coefficient of variance (PCV) estimates were larger than the genotypic coefficient of variance (GCV) all studied traits. Broad sense heritability was moderate for radical length, seedling vigor Index, stander germination %, crude protein (%) and crude oil (%). Meanwhile, shoot length, seedling dry weight and total carbohydrates (%) had lower magnitude of heritability. The expected genetic advance ranged from 18.63% for seedling vigor index to 42.68% for total carbohydrate% total carbohydrate%. These results are confirmatory with those **Naguib *et al* (2011) ; Vasanthi *et al*(2015) ; HajHussein *et al* (2018) ; Ali *et al* (2020) ; Oluwaseyi *et al.*, (2021) ; Fatih and Tahsin (2022).**

Table 9: Estimates of component of variance, genotypic (GCV) and phenotypic (PCV) coefficients of variation, broad sense heritability estimates (h_b) and genetic advance as percentage of means (G.s %) for seedling and chemical traits for ten groundnut genotypes (combined across two seasons).

Traits	Component of variance			Genetic variability		h_b	G.s%
	∂^2g	∂^2ep	∂^2e	GCV	PCV		
Radical length	1.29	1.60	0.31	7.66	17.33	69.56	21.98
Shoot length	0.31	0.44	00.13	12.01	22.10	40.61	19.38
Seedling dry weight	3566.4	4916.8	1350.4	12.02	22.94	47.46	20.97
Seedling vigor Index	17634.67	23794	6159.33	8.52	16.75	55.88	18.63
Stander germination %	21.01	26.54	5.53	2.62	5.74	60.83	22.39
Total Carbohydrates (%)	1.45	1.94	0.49	3.89	12.79	44.94	42.68
Crude protein (%)	4.57	5.65	1.80	4.42	7.85	51.75	19.13
Crude oil (%)	3.47	4.64	1.17	2.27	4.52	65.21	29.34

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التباين و والقياسات الوراثيه للمحصول ومساهماته بين بعض سلالات الفول السودانى

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1– قسم بحوث المحاصيل الزيتية 2– قسم بحوث تكنولوجيا البذور

معهد بحوث المحاصيل الحقلية– مركز البحوث الزراعية– الجيزة

قيمت تسع سلالات والصنف التجاري جيزة 6 من الفول السودانى فى موسمين 2018–و2019 فى قطاعات كامله العشوائيه بمحطه بحوث الاسماعليه مركز البحوث الزراعيه بهدف تحديد الثوابت الوراثيه لبعض الصفات الانتاجيه و المحصول المحصوليه وصفات الجودة فى بذور بعض سلالات الفول السودانى. وقد اظهرت النتائج وجود تباينات بين السلالات فى بعض الصفات المورفولوجية والفسيولوجية والمحصولية . اظهرت السلاله 6 تفوقا فى محصول القرون/ النبات و محصول بذور/ النبات و محصول القرون/ للفدان ووزن 100 بذره والوزن الجاف للبادره. و قد اظهرت السلاله 11 اعلى قيم لصفات عدد القرون للنبات و عدد البذور للنبات و وزن 100 بذره و طول القرن و طول البذره وطول الجذير و دليل قوه البادره . تراوحت نسبه الانبات من 86.8% للسلاله 9 الى 93% للسلاله 12 . وقد سجلت السلاله 15 اعلى قيمه لطول الريشة. تراوحت نسبه

الزيت فى البذور من 46.1 الى 48.1 %. وقد سجلت السلاله 12 اعلى نسبه زيت. كما تراوحت نسبة البروتين من 28% للسلاله 9 الى 31.3% للسلاله 11 بمتوسط عام 30.2% . اشارت النتائج الى ان التباين الوراثى كان اكبر من التباين البئيى لجميع الصفات المدروسه. واظهرت كفاءة التوريث فى معناها الواسع قيم متوسطه و مرتفعه النسبه المئويه للتحسين الوراثي المتوقع بالانتخاب لصفات عدد القرون للنبات و عدد البذور للنبات و محصول القرون للفدان. بينما كان معامل الاختلاف الظاهرى اعلى من معامل الاختلاف الوراثى لجميع الصفات المدروسه. سجلت كفاءه التوريث فى معناها الواسع قيم متوسطه لصفات طول الجذير و دليل قوه البادره و نسبه الانبات و نسبه البروتين و نسبه الزيت. وهذه النتائج يمكن الاستفادة منها فى برامج تربية الفول السودانى .