Original Research Article

<https://doi.org/10.20546/ijcmas.2019.812.181>

Study of Genetic Parameters for Water Use Efficiency Traits, Yield and Yield Attributes in Groundnut (*Arachis hypogaea* L.)

K. John*, M. V. Madhavi Santhoshi and P. Rajasekhar

Institute of Frontier Technology, Regional Agricultural Research Station, Acharya N.G. Ranga Agricultural University, Tirupati-517502, Andhra Pradesh, India

*Corresponding author

ABSTRACT

Keywords

Genetic variability,
Water use
efficiency,
Heritability,
Genetic advance

Article Info

Accepted:
12 November 2019
Available Online:
10 December 2019

The mean specific leaf area (SLA) at 60 DAS ranged from 163.2 cm²g⁻¹ (TCGS-1821) to 265.4 (TCGS-1825). SPAD chlorophyll meter reading at 60 DAS ranged from 39.50 (TCGS-1876) to 49.60 (TCGS-1523). Number of well-filled and mature pods per plant ranged from 7.8 (TCGS-1869) to 45.0 (TCGS-1835). 100-pod weight (g) ranged from 62.0g (Dharani) to 104.7 g (TCGS-1807). Shelling percent varied from 61.7% (TCGS-1817) to 74.3% (Dharani). 100-kernel weight ranged from 26.7g (TCGS-1522) to 44.7g (TCGS-1537). The range of variation for mean pod yield per plant was between 4.0g (TCGS-1869) and 31.2 (TCGS-1514). High GCV and PCV values were observed for number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant, dry haulms yield per plant and pod yield per plant. Heritability values ranged from 18.9 per cent (sound mature kernel per cent) to 95.9 per cent (plant height). Genetic advance as per cent of mean values ranged from 1.9 per cent (sound mature kernel per cent) to 186.9 per cent (number of secondary branches per plant). The estimates of high heritability coupled with high genetic advance as per cent of mean were observed for plant height, number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant and pod yield per plant indicating the importance of additive gene effects, selection for such characters may be rewarding.

Introduction

Groundnut (*Arachis hypogaea* L.) is a highly self pollinated crop and can be grown successfully in tropical and subtropical areas. Groundnut is the important oilseed crop of India. Though it leads in area and production in the world its productivity is low due to

various abiotic and biotic stresses. Further, pod yield besides physiological traits in groundnut are quantitatively inherited complex traits and is highly influenced by environment. Drought is the most important factor limiting the yield potential of the rain-fed crop. Although high yield potential is the target of most crop breeding programs, it

might not be compatible with superior drought resistance. On the other hand, high yield potential can contribute to yield in moderate stress environments. The crop has narrow genetic base therefore, it is essential to create more variability in the segregating materials. Genetic variability is the basic requirement for crop improvement as it provides wider scope for selection. Thus, effectiveness of selection is dependent upon the nature, extent and magnitude of genetic variability present in the material and the extent to which it is heritable (Chavadhari *et al.*, 2017). The genetic variability has to be looked into for planning suitable measures for the crop improvement. Crop physiologists have identified a number of traits that would help the breeder in development and identification of moisture stress tolerant genotypes with high yield potential (Basu *et al.*, 2004).

Water use efficiency is one such important trait which is correlated with specific leaf area. SPAD chlorophyll meter reading (SCMR) and photosynthetic rate and these traits have been suggested as surrogate traits in selecting for water use efficiency in groundnut (Nandini *et al.*, 2011). The genetic variability has to be looked into for planning breeding approaches for the crop improvement. This necessitates a thorough knowledge of variability owing to genetic factors, actual genetic variation heritable in the progeny and the genetic advance that can be achieved through selection (Shinde *et al.*, 2010).

The observed variability is a combined measure of genetic and environmental causes (Patel *et al.*, 2009). In genetic studies, characters with high genotypic coefficient of variation indicate the potential for an effective selection (Sadiq *et al.*, 1986). Wadikar *et al.*, (2018) observed high heritability coupled with high genetic advance as per cent of mean for kernel yield per plant, number of pods per plant and pod

yield per plant. Thus, effectiveness of selection is dependent upon the nature, extent and magnitude of genetic variability present in material and the extent to which it is heritable. In the present study, variability and other genetic parameters were studied for yield and yield attributes for efficient selection.

Materials and Methods

Forty three genotypes were sown in a Randomised Block Design (RBD) with two replications during *rabi* 2017-18. Each genotype was sown in 3 rows of 5 m length. All the 43 genotypes were allotted at random to the experimental plots in each replication. Observations were recorded on five random plants in each genotype per replication. The data were recorded for plant height (cm), number of primary branches per plant, number of secondary branches per plant, specific leaf area, SAPD Chlorophyll meter reading, number of well-filled and mature pods per plant, number of immature pods per plant, 100- pod weight (g), 100- kernel weight (g), sound mature kernel per cent, dry haulms yield per plant (g) and pod yield per plant (g). The data was analyzed statistically and genetic parameters *viz.*, Phenotypic and Genotypic coefficients of variation (PCV and GCV) were computed according to the Burton (1952). Heritability in broad sense was estimated using the formula of Allard (1960). Genetic advance (GA) was calculated as per the formula as suggested by Johnson *et al.*, (1955).

Results and Discussion

Mean performance of groundnut genotypes

Mean performance of all the genotypes for the characters *viz.*, plant height, number of primary branches per plant, number of secondary branches per plant, specific leaf area, SAPD Chlorophyll meter reading,

number of well-filled and mature pods per plant, number of immature pods per plant, 100- pod weight (g), 100- kernel weight (g), sound mature kernel per cent, dry haulms yield per plant (g) and pod yield per plant (g). are presented hereunder (Table 1).

The plant height varied from 18.9 cm (TCGS - 1876) to 45.5cm (TCGS-1805). The mean height of the genotypes was 28.5 cm. The genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1520, TCGS-1521, TCGS-1522, TCGS-1523, TCGS-1527, TCGS-TCGS-1805, TCGS-1810, TCGS-1813, TCGS-1814, TCGS-1815, TCGS-1816, TCGS-1817, TCGS-1818, TCGS-1819, TCGS-1820, TCGS-1821, TCGS-1822, TCGS-1824, TCGS-1831, TCGS-1837, TCGS-1838, TCGS-1845, TCGS-1851, TCGS-1855, TCGS-1868, TCGS-1869, Greeshma, Dharani and Narayani recorded higher values for the Plant height than the general mean.

The maximum number of primary branches per plant was recorded in ICGV-07262 (10.4) where as it was the lowest in Greeshma (3.5) with general mean of 5.9 branches per plant. Fifteen genotypes *viz.*, TCGS-1523, TCGS-1527, TCGS-1529, TCGS-1804, TCGS-1814, TCGS-1816, TCGS-1819, TCGS-1837, TCGS-1838, TCGS-1839, TCGS-1845, TCGS-1855, TCGS-1869, TCGS-1876, and ICGV-07262 possessed higher number of primary branches per plant among the genotypes. The maximum number of secondary branches per plant was recorded in TCGS-1527 (7.3) where as it was the lowest in TCGS-1824 (0.1) with general mean of 1.4 branches per plant. Twenty genotypes *viz.*, TCGS-1514, TCGS-1520, TCGS-1523, TCGS-1527, TCGS-1529, TCGS-1805, TCGS-1809, TCGS-1815, TCGS-1816, TCGS-1819, TCGS-1831, TCGS-1838, TCGS-1839, TCGS-1845, TCGS-1851, TCGS-1855, TCGS-1869, TCGS-1872, TCGS-1876 and ICGV-07262 recorded more

number of secondary branches than general mean

The mean specific leaf area (SLA) at 60 DAS ranged from 163.2 cm²g⁻¹ (TCGS-1821) to 265.4 (TCGS-1825). Nineteen genotypes *viz.*, TCGS-1520, TCGS-1522, TCGS-1527, TCGS-1805, TCGS-1813, TCGS-1814, TCGS-1815, TCGS-1816, TCGS-1817, TCGS-1820, TCGS-1824, TCGS-1825, TCGS-1829, TCGS-1831, TCGS-1838, TCGS-1853, TCGS-1868, TCGS-1871 and TCGS-1872 exceeded the general mean of 219. SPAD chlorophyll meter reading (SCMR) at 60 DAS ranged from 39.50 (TCGS-1876) to 49.60 (TCGS-1523) with a general mean of 42. The SPAD chlorophyll meter reading of thirty genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1520, TCGS-1521, TCGS-1522, TCGS-1523, TCGS-1527, TCGS-1529, TCGS-1804, TCGS-1805, TCGS-1807, TCGS-1809, TCGS-1810, TCGS-1813, TCGS-1815, TCGS-1818, TCGS-1819, TCGS-1821, TCGS-1822, TCGS-1824, TCGS-1825, TCGS-1829, TCGS-1831, TCGS-1837, TCGS-1839, TCGS-1851, TCGS-1853, TCGS-1855, TCGS-1871, ICGV-07262 and Greeshma exceeded the general mean.

Number of well-filled and mature pods per plant ranged from 7.8 (TCGS-1869) to 45.0 (TCGS-1835) with a general mean of 13. Thirty nine genotypes recorded high values over the general mean for number of well-filled and mature pods per plant. Number of immature pods per plant ranged from 1.7 (TCGS-1819 and TCGS-1813) to 6.3 (TCGS-1853) with a general mean of 3. Twenty one genotypes *viz.*, TCGS-1520, TCGS-1521, TCGS-1809, TCGS-1813, TCGS-1816, TCGS-1817, TCGS-1818, TCGS-1819, TCGS-1820, TCGS-1822, TCGS-1829, TCGS-1831, TCGS-1837, TCGS-1855, TCGS-1868, TCGS-1869, TCGS-1871, TCGS-1872, Greeshma, Dharani and

Narayani recorded low values than the general mean for recorded low values than the general mean for number of immature pods per plant

Mean 100-pod weight (g) ranged from 62.0g (Dharani) to 104.7 g (TCGS-1807) with a general mean of 81.2g. The genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1520, TCGS-1521, TCGS-1523, TCGS-1804, TCGS-1805, TCGS-1807, TCGS-1814, TCGS-1815, TCGS-1818, TCGS-1819, TCGS-1821, TCGS-1822, TCGS-1824, TCGS-1825, TCGS-1837, TCGS-1838, TCGS-1839, TCGS-1845, TCGS-1868, TCGS-1871, TCGS-1872, TCGS-1876 and Greeshma exceeded the general mean.

Mean shelling percent significantly varied from 61.7% (TCGS-1817) to 74.3% (Dharani) with a general mean of 67.4%. Fourteen genotypes *viz.*, TCGS-1520, TCGS-1522, TCGS-1523, TCGS-1527, TCGS-1829, TCGS-1814, TCGS-1819, TCGS-1824, TCGS-1825, TCGS-1845, TCGS-1868, TCGS-1876, Greeshma and Dharani exceeded the general mean.

Mean 100-kernel weight ranged from 26.7g (TCGS-1522) to 44.7g (TCGS-1537) with the general mean 34.8g. Twenty three genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1520, TCGS-1527, TCGS-1529, TCGS-1804, TCGS-1805, TCGS-1807, TCGS-1809, TCGS-1815, TCGS-1816, TCGS-1817, TCGS-1818, TCGS-1820, TCGS-1824, TCGS-1825, TCGS-1839, TCGS-1845, TCGS-1851, TCGS-1853, TCGS-1868, Greeshma and Dharani recorded more number of 100-kernel weight than general mean.

Mean SMK per cent among ranged from 85.2% (TCGS-1818) to 95.8% (TCGS-1818) with the general mean 90.2%. Twenty one genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1523, TCGS-1805, TCGS-1809, TCGS-1815, TCGS-1818, TCGS-1820,

TCGS-1821, TCGS-1822, TCGS-1831, TCGS-1837, TCGS-1838, TCGS-1839, TCGS-1845, TCGS-1851, TCGS-1855, TCGS-1868, TCGS-1872, Greeshma and Narayani recorded more Sound mature kernel per cent than the general mean.

The range of variation for mean pod yield per plant was between 4.0g (TCGS-1869) and 31.2g (TCGS-1514) and with the general mean 14.3g. The genotypes *viz.*, TCGS-1514, TCGS-1516, TCGS-1521, TCGS-1522, TCGS-1523, TCGS-1527, TCGS-1529, TCGS-1805, TCGS-1807, TCGS-1810, TCGS-1814, TCGS-1815, TCGS-1816, TCGS-1818, TCGS-1819, TCGS-1820, TCGS-1821, TCGS-1822, TCGS-1824, TCGS-1825, TCGS-1831, TCGS-1837, TCGS-1838, TCGS-1839, TCGS-1845, TCGS-1851, TCGS-1853, TCGS-1855 and TCGS-1868 recorded higher values for pod yield per plant than general mean.

Genetic parameters

Genotypic (GCV) and phenotypic (PCV) coefficients of variation

The analysis of variance revealed significant differences were observed for all the traits studied. The results are presented in the Tables 2 and 3.

The estimates of genotypic and phenotypic coefficients of variability indicated that the values of PCV were higher than the GCV suggesting the influence of environmental factors.

Less difference was observed between PCV and GCV in certain cases indicated that these characters were less influenced by the environment. Similar results were reported by. Similar results were reported by John *et al.*, (2006), Korat *et al.*, (2009) and Ladole *et al.*, (2009).

Table.1 Mean performance of groundnut genotypes for water use efficiency traits, yield and yield attributes

S.No.	Genotypes	PH	PB	SB	SLA	SCMR	M P	IM P	100 PWT	S P	100 KWT	SMK %	P Y
1	TCGS-1514	35.7	5.1	2.7	197.6	46.6	16.4	4.1	103.3	64.3	41.0	90.4	31.2
2	TCGS-1516	41.4	4.3	1.2	185.6	48.3	102.7	4.3	96.0	66.3	42.0	91.6	23.6
3	TCGS-1520	29.3	6.2	4.9	230.6	42.9	14.7	2.5	84.3	71.0	36.3	88.0	12.2
4	TCGS-1521	34.5	5.5	1.3	210.4	43.9	21.3	3.4	86.0	67.0	32.3	89.3	22.8
5	TCGS-1522	36.8	4.2	0.6	222.0	44.6	27.1	3.1	66.7	71.7	26.7	89.9	27.8
6	TCGS-1523	39.9	10.3	5.7	193.3	49.6	27.2	4.6	80.0	72.7	34.0	92.8	28
7	TCGS-1527	31.4	10.2	7.3	231.0	45.1	25.3	3.6	77.7	70.7	35.3	88.2	28.4
8	TCGS-1529	27.7	6.4	3.5	206.2	46.8	22.2	3.7	81.0	69.7	35.7	90.0	18
9	TCGS-1804	27.7	6.2	0.4	218.2	46.9	17.7	3.1	93.3	62.3	36.3	88.7	13.4
10	TCGS-1805	45.5	5.6	3.7	254.6	44.5	16.8	3.2	85.7	62.3	37.0	91.0	17.6
11	TCGS-1807	27.8	5.1	0.6	207.5	43.4	14.3	5.3	104.7	66.3	42.7	90.1	15.6
12	TCGS-1809	27.4	5.0	1.7	204.1	44.2	13.6	2.0	80.3	65.0	35.0	91.5	10.0
13	TCGS-1810	30.6	4.6	1.1	231.7	42.1	14.6	3.6	71.0	67.0	30.7	85.9	15.4
14	TCGS-1813	28.7	4.2	0.9	228.4	42.5	13.0	1.7	80.0	62.3	28.3	88.1	7.6
15	TCGS-1814	31.2	7.7	0.9	244.4	40.9	17.9	3.6	84.0	71.0	33.7	85.2	18.2
16	TCGS-1815	40.3	5.6	2.9	239.6	43.9	21.0	3.7	85.3	62.7	37.7	91.6	20.6
17	TCGS-1816	37.0	6.8	1.7	242.4	41.2	17.4	2.9	74.7	65.0	36.0	85.7	17.6
18	TCGS-1817	29.7	4.9	0.5	256.1	40.4	13.7	2.6	71.7	61.7	38.3	88.3	10.6
19	TCGS-1818	35.4	5.3	1.5	218.9	44.8	17.2	2.2	88.7	65.7	36.3	95.8	14.8
20	TCGS-1819	40.3	5.8	1.8	192.6	45.0	15.4	1.7	88.3	70.7	33.7	88.4	19.6
21	TCGS-1820	30.7	4.6	0.9	227.6	41.3	21.5	2.7	79.0	68.3	38.0	91.2	20.8
22	TCGS-1821	34.5	4.4	1.3	163.2	44.8	16.7	3.3	91.0	66.0	32.3	91.6	18.6
23	TCGS-1822	29.2	5.3	0.7	218.8	44.4	18.7	2.7	97.0	68.7	30.0	90.6	22.4
24	TCGS-1824	37.4	5.1	0.1	236.2	43.8	18.3	3.5	83.0	72.0	39.7	90.7	19.8
25	TCGS-1825	27.0	4.9	0.4	265.4	44.8	13.7	3.4	92.0	71.0	40.0	89.5	14.4
26	TCGS-1829	27.4	4.1	0.6	204.1	44.9	10.8	2.7	76.7	68.3	32.7	90.1	10.8
27	TCGS-1831	32.3	5.2	2.1	201.4	44.9	16.9	2.9	78.3	66.0	33.7	91.2	17.4
28	TCGS-1837	37.1	6.2	1.2	188.2	47.5	45.0	2.5	101.3	68.7	44.7	91.0	30.2
29	TCGS-1838	36.7	8.1	3.7	222.4	40.5	24.5	4.2	83.7	64.7	34.7	91.2	26.8
30	TCGS-1839	28.4	7.3	3.2	217.1	48.8	25.4	4.2	102.7	66.0	42.3	90.6	26
31	TCGS-1845	32.7	6.2	2.3	213.4	41.0	21.7	5.2	89.3	70.0	34.7	91.4	26.6
32	TCGS-1851	29.3	5.5	2.5	205.9	43.1	22.4	4.4	76.7	67.3	37.7	90.7	24.0
33	TCGS-1853	28.3	4.7	0.9	223.6	44.5	17.4	6.2	75.0	66.3	35.3	85.2	17.2
34	TCGS-1855	35.3	7.0	4.2	200.4	43.4	24.8	2.9	77.3	65.7	34.0	91.0	29.0
35	TCGS-1868	44.5	4.6	0.6	228.5	41.8	21.8	2.8	85.7	74.3	37.7	91.7	21.6
36	TCGS-1869	30.1	8.7	2.9	217.6	41.7	7.8	2.7	70.0	64.7	29.0	88.8	4.0
37	TCGS-1871	23.2	6.5	0.8	220.8	43.1	9.1	2.1	94.3	64.7	38.0	89.8	10.0
38	TCGS-1872	19.9	5.0	1.4	240.3	41.7	13.5	2.3	86.7	66.3	34.7	92.6	9.2
39	TCGS-1876	18.9	8.1	4.2	235.9	39.5	14.2	2.8	86.3	71.7	33.0	87.3	11.0
40	ICGV-07262	23.7	10.4	4.1	195.8	44.2	14.9	3.8	77.7	64.0	29.7	90.0	10.4
41	Greeshma	29.6	3.5	0.2	204.7	42.0	12.6	2.7	90.3	69.7	40.3	93.9	11.2
42	Dharani	33.9	4.1	0.6	234.6	41.5	15.7	2.6	62.0	69.7	35.0	85.4	13.8
43	Narayani	30.2	4.8	0.2	208.2	41.7	15.1	2.5	74.0	63.3	28.3	91.2	11.6
	General mean	28.5	5.9	1.4	219.0	42.0	13.0	3.0	81.2	67.4	34.8	90.2	14.3

PLHT : Plant height

NPBPP : Number of primary branches per plant

NSBPP: Number of secondary branches per plant

SLA : Specific leaf area

SCMR : SAPD Chlorophyll meter reading

NMPP : Number of well-filled and mature pods per plant

NIPPP : Number of immature pods per plant

100 PWT : 100 pod weight (g),

100 KWT: 100 kernel weight (g)

SMK: Sound mature kernel per cent

DHY: Dry haulms yield per plant (g)

PYPP : Pod yield per plant (g)

Table.2 Estimates of genetic parameters for water use efficiency traits, yield and yield attributes in groundnut

Genetic parameter/Character		PLHT (cm)	NPBPP	NSBPP	Water use efficiency traits		NMPPP	NIMPPP	100 PWT (g)	Shelling per cent	100 KWT (g)	SMK %	DHY (g)	PYPP (g)
					SLA	SCMR								
Variance	Genotypic	34.5	2.7	2.5	631.0	4.6	53.5	9.0	130.4	8.3	9.7	2.1	55.5	776.8
	Phenotypic	36.0	3.4	3.3	1410.9	7.5	507.1	13.2	265.9	14.9	31.9	11.3	127.3	913.3
Coefficient of variation	GCV	18.3	27.7	80.9	11.9	4.9	36.1	75.4	13.9	4.3	8.761	1.6	26.4	53.9
	PCV	18.7	31.2	92.4	17.8	6.3	111.0	91.3	19.9	5.7	15.9	3.7	39.9	58.4
Heritability (Broad Sense)		95.9	78.6	76.6	44.7	60.9	94.8	68.2	49.0	55.3	30.2	18.9	43.6	85.0
Genetic advancement		15.2	3.8	3.6	44.3	4.4	6.3	6.5	21.1	5.7	4.5	1.7	13.0	67.4
Genetic advancement as per cent of mean (GAM)		47.4	64.7	186.9	21.0	10.1	30.9	164.3	25.8	8.4	12.7	1.9	45.9	13.2
Mean		32.1	5.9	1.9	211.1	43.8	20.3	4.0	81.8	67.3	35.5	89.9	28.2	51.1
PLHT : Plant height		NPBPP : Number of primary branches per plant					NSBPP: Number of secondary branches per plant					SLA : Specific leaf area		
SCMR : SAPD Chlorophyll meter reading				NMPP : Number of well-filled and mature pods per plant								NIPPP : Number of immature pods per plant		
100 PWT : 100 pod weight (g),			100 KWT: 100 kernel weight (g)				SMK: Sound mature kernel per cent				DHY: Dry haulms yield per plant (g)			
PYPP : Pod yield per plant (g)														

Table.3 Comparative statement based on estimates of different genetic parameters for water use efficiency traits, yield and yield attributes in groundnut

Character	Genetic parameters	Gene effects	Influence of environment
Plant height	High $h^2(b)$ and high GAM	Additive	Low
Number of primary branches per plant			
Number of secondary branches per plant			
Number of well-filled and mature pods per plant			
Number of immature pods per plant			
100 pod weight	Moderate $h^2(b)$ and high GAM	Additive	Medium
Dry haulms yield per plant			
SPAD chlorophyll meter reading	High $h^2(b)$ and low GAM	Non-additive	Low
Specific leaf area	Moderate $h^2(b)$ and moderate GAM	Both additive and non additive	Medium
100 kernel weight			
Shelling per cent	Moderate $h^2(b)$ and low GAM	Non-additive	Low
Sound mature kernel per cent	Low $h^2(b)$ and low GAM	Non-additive	Low

High GCV and PCV values were observed for number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant, dry haulms yield per plant and pod yield per plant. Moderate GCV and PCV observed for specific leaf area, 100 pod weight and 100 kernel weight. These findings are confirmed by Khote *et al.*, (2009), Gupta *et al.*, (2015) and John *et al.*, (2013). Low GCV and low PCV were noticed for sound mature kernel per cent. Korat *et al.*, (2010) and Patil *et al.*, (2015) were in accordance with the present findings for number of secondary branches per plant and also similar kind of high variability for number of immature pods per plant was reported by Shinde *et al.*, (2010), Patil *et al.*, (2015) and Hampannavar *et al.*, (2018).

Heritability and genetic advance as per cent of mean (GAM)

GCV measure the amount of variation present in a particular character. However, it does not determine the proportion of heritable variation present in the total variation. Therefore, heritability which represents the heritable variation existing in the characters was calculated. Heritability values ranged from 18.9 per cent (sound mature kernel per cent) to 95.9 per cent (plant height). In the present study, high heritability values were recorded for the characters *viz.*, plant height, number of primary branches per plant, number of secondary branches per plant, SPAD chlorophyll meter reading, number of well-filled and mature pods per plant, number of immature pods per plant and pod yield per

plant. Genetic advance as per cent of mean values ranged from 1.9 per cent (sound mature kernel per cent) to 186.9 per cent (number of secondary branches per plant). High GAM was observed for plant height, number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant, 100 pod weight, dry haulms yield per plant, and pod yield per plant. Similar results were reported by Gupta *et al.*, (2015), Bhargavi *et al.*, (2016) and Gupta *et al.*, (2015).

The estimates of high heritability coupled with high genetic advance as per cent of mean were observed for plant height, number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant and pod yield per plant indicating the importance of additive gene effects, selection for such characters may be rewarding. Similar results were reported by Naazar *et al.*, (2000), Padmaja *et al.*, (2015), Sanjeevakumar Patil *et al.*, (2015) and Dewangan *et al.*, (2015). The estimates of moderate heritability coupled with moderate genetic advance as per cent of mean were observed for specific leaf area and 100 kernel weight indicating the importance of additive gene effects, selection for such characters may be rewarding. Similar results were reported by John *et al.*, (2006) and Shinde *et al.*, (2010). High heritability and low GAM was expressed for SPAD chlorophyll meter reading whereas low heritability and low GAM was recorded for sound mature kernel per cent indicating the preponderance of non-additive gene action in inheritance of this character, hence, selection for these characters is not effective. Similar reports were reported by Korat *et al.*, (2009), Yadav *et al.*, (2014) and John and Reddy (2014).

High estimates of GCV, PCV, heritability and genetic advance as per cent of mean were

observe for number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant, number of immature pods per plant, pod yield per plant indicating the importance of additive gene action and selection for such characters may be rewarding. In conclusion, more number of well-filled and mature pods per plant was registered by TCGS-1835. The highest pod yield per plant was recorded by TCGS-1514. High heritability coupled with high genetic advance as per cent of mean were observed for number of primary branches per plant, number of secondary branches per plant, number of well-filled and mature pods per plant and pod yield per plant indicating the importance of additive gene effects, selection for such characters may be rewarding.

Acknowledgement

This research was supported under the DST-SERB to the first author by the Department of Science and Technology – Science and Engineering Research Board, New Delhi is gratefully acknowledged.

References

- Allard R W 1960 Principles of Plant Breeding John Wiley and Sons, Inc., USA Wiley International Edition pp.85.
- Basu, M.S., Chunilal., Prakash C., Nautiyal., 2004. Breeding strategies to increase water use efficiency of groundnut. Groundnut Research in India, Edited by M.S.Basu and N.B. Singh. pp. 38-47.
- Bhargavi, G Rao, S. V., Rao, K. L. N. 2016. Genetic variability, heritability and genetic advance of yield and related traits of Spanish bunch groundnut (*Arachis hypogaea* L.). Agricultural Science Digest. 36(1):60-62.
- Chav Burton G W 1952 Quantitative inheritance in grass. Proceedings of sixth international grassland congress.

- 1: 227-283.
- Chavadhari, R. M., Kachhadia, V. H., Vachhani, J. H., Virani, M. B., 2017. Genetic variability studies in groundnut (*Arachis hypogaea* L.). Electronic Journal of Plant Breeding, 8(4): 1288-1292.
- Dewangan, H., Jaiswal, N. K., Gabrial, M. L., Rai, P. K., 2015. Study on genetic variability in groundnut (*Arachis hypogaea* L.) germplasms International Journal of Science Research 5(1):19-22.
- Gupta, R., P., Vachhani, J. H., Kachhadia, V. H., Vaddoria, M. A., Reddy, P., 2015. Genetic variability and heritability studies in Virginia groundnut (*Arachis hypogaea* L.). Electronic Journal Plant Breeding, 6(1):253-256.
- Hampannavar, M.R., Khan, H., Temburne, B.V., Janila, P., Amaregouda, A., 2018. Genetic variability, correlation and path analysis studies for yield and yield attributes in groundnut (*Arachis hypogaea* L.). Journal of Pharmacognosy and Phytochemistry. 7(1): 870-874.
- John K and Vasanthi R P 2006 Heterosis in six single crosses of groundnut Legume Research 29 (4): 262-265.
- John, K., Vasanthi, R.P., Sireesha, K., Giridhara Krishna, T., 2013. Genetic variability studies in different advanced breeding genotypes of Spanish bunch groundnut (*Arachis hypogaea* L.). International Journal of Applied Bio.Pharma. Tech., 4(2):213-217.
- John, K., Reddy, P.R., 2014. Variability, heritability and genetic advances for water use efficiency traits in groundnut (*Arachis hypogaea* L.). International Journal of Current Science. 13:1-5.
- Johnson H W Robinson H F and Comstock R E 1955 Estimates of genetic and environmental variability in soybean. Agronomy Journal 47: 413-418.
- Khote, A.C., Bendale, V.W., Bhawe, S.G. and Patil, P.P (2009). Genetic variability heritability and genetic advance in some exotic genotypes of groundnut (*Arachis hypogaea* L.). Crop Res., 37 (1,2 &3):186-191.
- Korat, V. P., Pithia, M. S., Savaliya, J. J., Pansuriya, A. G. and Sodavadiya, P. R., 2009. Studies on genetic variability in different genotypes of groundnut (*Arachis hypogaea* L.). Legume Research. 32(3):224-226
- Korat, V.P., Pithia, M.S., Savaliya, J.J., Pansuriya, A.G. Sodavadiya, P.R., 2010. Studies on characters association and path analysis for seed yield and its components in groundnut (*Arachis hypogaea* L.). Legume Research. 33(3): 211-216.
- Ladole, M.Y., Wakode, M.M., and Deshmukh, S.N (2009). Genetic variability and character association studies for yield and yield contributing traits in groundnut (*Arachis hypogaea* L.). J. Oilseeds Res., 26 (special Issue): 123-125.
- Naazar, A., Mallik, S.N., Bashir, K. and Mirza, M.Y. 2000. Genetic variability, heritability and correlation studies in groundnut. *J. Agri.*, 16: 533-536.
- Nandini, C., savithramma, D.L., Naresh Babu, N., 2011. Genetic variability for surrogate traits of water use efficiency in F8 recombinant inbred lines of the cross NRCG 12568 x NRCG-12326 in groundnut (*Arachis hypogaea* L.). Electronic. Journal of Plant Breeding. 2(4): 555-558.
- Padmaja D, Eswari K. B., Brahmeswara Rao M.V, Shiva Prasad G. (2015). Genetic variability studies in F2 population of Groundnut (*Arachis hypogaea* L.). *Helix Vol. 2*: 668-672.
- Patel, J.D., Desai, N.C., Kodappuuiy, V.C., Vaghela, K.O., 2009. Genetic

- variability, correlation and path analysis in moth bean. GAU Research Journal. 34(2): 83-87.
- Patil, S., Shivanna, S., Irappa, B.M., Shweta., 2015. Genetic variability and character association studies for yield and yield attributing components in groundnut. (*Arachis hypogaea* L.). International Journal of Recent Scientific Research. 6(6): 4568-4570.
- Sadiq, S.M., Saleem, M., Iqbal, J., 1986. Genetic variation and selection in hexaploid triticale. Proceedings of the International Triticale Symposium. Darvey, N.L. Edition. Australian institute of agricultural science. 182-185.
- Sanjeevakumar Patil, Shivanna, S., Irappa B. M. and Shweta (2015). Genetic variability and character association studies for yield and yield attributing components in groundnut (*Arachis hypogaea* L.). *International Journal of Recent Scientific Research* 6(6): 4568-4570.
- Shinde, P.P., Khanpara, M.D., Jivani, L.L., Vachhani, J.H and Kachhadia, V.H *al.* (2010). Genetic variability in Virginia bunch groundnut (*Arachis hypogaea* L.). Plant Archives, 10(2): 703-706.
- Wadikar, P.B., Dake, A.D., Chavan, M.V., Thorat, G.S., 2018. Character association and variability studies of yield and its attributing character in groundnut (*Arachis hypogaea* L.). International Journal of Current Microbiology and Applied Sciences. 6: 924-929.
- Yadav, S.R., Rathod, A.H., Sindhe, A.S., Patade, S.S., Patil, C.N., Vaghela, P.O., 2014. Genetic variability and divergence Studies in groundnut (*Arachis hypogaea* L.). International Journal of Agricultural Sciences. 10 (2): 691-694.

How to cite this article:

John, K., M. V. Madhavi Santhoshi and Rajasekhar, P. 2019. Study of Genetic Parameters for Water Use Efficiency Traits, Yield and Yield Attributes in Groundnut (*Arachis hypogaea* L.). *Int.J.Curr.Microbiol.App.Sci.* 8(12): 1511-1520. doi: <https://doi.org/10.20546/ijcmas.2019.812.181>