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Research Article

Correlation Studies for Nutritional Quality Traits and Yield Related Traits in Confectionary Types of Groundnut (*Arachis hypogaea* L.)

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ABSTRACT

Thirty five diverse genotype of groundnut were raised to measure character association for nutritional quality traits and yield related traits in confectionary genotypes of groundnut. More number of primary branches per plant was recorded by TCGS-2105 (11.6). The highest shelling per cent was registered by TCGS 2125 (68%). TGCS-2109 recorded more 100 pod weight (123.6 g). Highest 100 kernel weight of 63g was registered by TGCS-2111. The mean values of total carbohydrates ranged from 0.050 (g/g) (TCGS 2101) to 0.328 (g/g) (TCGS 2120). The mean values of total free amino acids ranged from 403.2 (ug/g) (TCGS 2131) to 1022.0 (ug/g) (TCGS 2131). The protein content ranged from 23.6% (TCGS 2127) to 26.8 % (TCGS 2111). Highest pod yield per plant of 23.6 g was registered by TCGS 2118. The number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, oil content and kernel yield per plant were highly significant and positive with pod yield per plant and also among themselves, indicating an increase in the magnitude of any of these characters leads to subsequent increase in the magnitude of pod yield. Hence, these characters could be used in the further selection programme for the improvement of pod yield per plant.

Key words: *Correlation, Nutritional quality, Yield, Groundnut.*

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the premier oilseed crops in our country. More than 80% of groundnut production in the country is used for extraction of oil and 1-3% is exported for confectionery purpose. The large seeded confectionery groundnut has a greater demand as snack food in domestic as well as international market and fetches a higher price. However, the groundnut export trade in India is restricted to handpicked selected seeds only. Hybridization, followed by selection has been one of the breeding strategies recommended to increase productivity in groundnut (Norden, 1973). The composition of peanut kernel is oil 47.5%, protein 28.5%, crude fiber 2.8%, and total carbohydrates 13.3%. The groundnut is a good source of all vitamins B except B12.

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Breeding high yielding varieties of crop require information on the nature and magnitude of variation in the available materials, association of the character with yield and among themselves. Pod yield is a complex character, which is largely influenced by environmental and hence a low heritability. Plant Breeders are seldom interested in one character and therefore, there is the need to examine the relationships among various character's especially between pod yield and other characters. Hence, the present study is taken up to assess the genetic variability and relationship between nutritional quality and yield related traits of groundnut.

MATERIALS AND METHODS

Thirty five confectionary groundnut genotypes were studied in a randomized block design with three replications at Regional Agricultural Research Station, Tirupati during kharif, 2018. Each genotype was raised in three rows of five meter length spaced at 30 cm between rows and 10 cm within the row. All the recommended packages of practices were followed to raise a good crop. The observations were recorded in five randomly selected plants, in each entry per replication for twelve characters were recorded for nutritional quality and yield traits *viz.*, Number of primary branches per plant, shelling per cent, 100 pod weight (g), 100 kernel weight (g), dry haulms yield per plant (g), harvest index (%), total carbohydrates (g/g), total free amino acids (ug/g), protein content (%), oil content (%), kernel yield per plant (g) and pod yield per plant (g). The mean values were used for statistical analysis. Phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV) was estimated as per the formula suggested by Burton (1952). While heritability in broad sense and expected genetic advance were calculated by using the formula given by Allard (1960). The correlation coefficients was carried out following the method of Al-Jibouri et al. (1958).

RESULTS AND DISCUSSION

The *per se* performance of 35 confectionary genotypes of groundnut for nutritional quality traits and yield related traits was furnished in Table 1.

The number of primary branches per plant ranged from 4.1 (TCGS-2135) to 11.6 (TCGS-2105) (Fig. 1). The mean values for the shelling per cent ranged from 55.0 % (TCGS 2113) to 68.0 % (TCGS 2125) (Fig. 2). For 100 pod weight, the mean values varied from 86.0 g (TCGS-2127) to 123.6g (TGCS-2109). (Fig.3). For 100-kernel weight, the mean values varied from 35.0 g (TCGS 2113) to 63 g (TGCS-2111) (Fig. 4). The mean values for dry haulms yield per plant ranged from 10.4 g (TCGS 2126) to 36.8 g (TCGS 2109). (Fig.5). The mean of genotypes for harvest index ranged from 11.4 % (TCGS 2126) to 37.8 % (TCGS 2109) (Fig.6). The mean values of total carbohydrates ranged from 0.050 (g/g) (TCGS 2101) to 0.328 (g/g) (TCGS 2120). (Fig.7). The mean values of total free amino acids ranged from 403.2 (ug/g) (TCGS 2131) to 1022.0 (ug/g) (TCGS 2131). (Fig.8). The protein content ranged from 23.6% (TCGS 2127) to 26.8 % (TCGS 2111) (Fig. 9). The mean values were varied from 44.4% (TCGS 2107) to 48.7% (TCGS 2127) (Fig.10). The mean values of genotypes for kernel yield per plant varied from 8.29 g (TCGS-2151) to 21.50 g (TCGS-1897). (Fig.11). For pod yield per plant the mean values ranged from 9.6 g (TCGS 2128) to 23.6 g (TCGS 2118) (Fig.12).

Pod yield is a complex character governed by several contributing traits. Hence, it is important to understand the association of different characters with seed yield for enhancing the usefulness of selection criterion to be followed while developing varieties. In the present investigation the genotypic and phenotypic correlations are on par with each other suggesting the less influence of environment. Hence, in this paper the genotypic correlations only discussed (Table 2). The relationship of number of primary branches per plant was positive and significant association with shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, total carbohydrates, total free amino acids, protein content, oil

content, kernel yield per plant and pod yield per plant. Shelling per cent had shown positive and significant association with number of primary branches per pant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, total carbohydrates, total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant.

100 pod weight had shown positive and significant association with number of pprimary branches per pant, shelling per cent, 100 kernel weight, dry haulms yield per plant, harvest index, total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant but significant positive association with total carbohydrates. Significant positive association of 100-kernel weight and kernel yield per plant with 100-pod weight was reported by Kumar et al. (2019). The relationship of 100 kernel weight was positive and significant association with number of primary branches per pant, shelling per cent, 100 pod weight, dry haulms yield per plant, harvest index, total carbohydrates, total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant. These results were confirmed with the findings of Bhakal and Lal et al. (2017) and Reddy et al. (2017).

Dry haulms yield per plant had shown positive and significant association with of primary branches per pant, shelling per cent, 100 pod weight, 100 kernel weight, harvest index, total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant but significant positive association with total carbohydrates. The relationship of harvest index was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, total carbohydrates, total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant. Total carbohydrates had shown positive and significant association with number of primary branches per plant, shelling per cent, 100 kernel weight, harvest index but significant positive association with total free amino acids, protein content, oil content, kernel yield per plant and pod yield per plant. The relationship of total free amino acids was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, oil content, kernel yield per plant and pod yield per plant but significant positive association with total carbohydrates.

The relationship of protein content was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, oil content, kernel yield per plant and pod yield per plant but significant positive association with total carbohydrates. The relationship of oil content was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, kernel yield per plant and pod yield per plant but significant positive association with total carbohydrates. The relationship of kernel yield per plant was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, oil content and pod yield per plant but significant positive association with total carbohydrates. Rathod and toprope (2018) results were in line with the our present findings.

The relationship of pod yield per plant was positive and significant association with number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, oil content and kernel yield per plant but significant positive association with total carbohydrates. This indicates that selection for the above characters *viz.*, kernel yield per plant, harvest index, number of mature pods per plant, number of primary branches per plant, dry haulms yield per plant, 100-kernel weight, shelling percent, relative water content and 100-pod weight will

simultaneously improves pod yield. Similar kind of results were reported for kernel yield per plant, harvest index and number of primary branches per plant with pod yield per plant was recorded by Wadikar et al. (2018) and Rathord and Toprope (2018). Significant positive correlation of pod yield per plant with 100-pod weight and 100-kernel weight were observed by Kumar et al. (2019), Parameshwarappa et al. (2008), John et al. (2009), Korat et al. (2010), Shoba et al. (2012) and Vasanthi et al. (2015a) . Similarly significant positive correlation of shelling per cent, 100-pod weight with pod yield per plant are in accordance with the reports of Rathord and Toprope (2018).

From the foregoing discussion on character association it is displayed that number of primary branches per plant, shelling per cent, 100 pod weight, 100 kernel weight, dry haulms yield per plant, harvest index, protein content, oil content and kernel yield per plant were highly significant and positive with pod yield per plant and also among themselves, indicating an increase in the magnitude of any of these characters leads to subsequent increase in the magnitude of pod yield. Hence, these characters could be used in the further selection programme for the improvement of pod yield per plant.

Table 1: *Per se* performance of confectionary groundnut genotypes for nutritional quality traits and yield related traits

S.No.	Genotype	No. of primary branches per plant	Shelling per cent	100 pod weight (g)	100 kernel weight (g)	Dry haulms yield per plant (g)	Harvest index (%)	Total carbohydrates (g/g)	Total free amino acids (ug/g)	Protein content (%)	Oil content (%)	Kernel yield per plant (g)	Pod yield per plant (g)
1	TCGS 2101	9.0	59	102.6	46	32.4	33.4	0.050	1035.3	25.4	47.2	8.5	14.4
2	TCGS 2102	6.8	63	89.6	44	20.2	21.2	0.123	415.5	24.9	46.5	12.3	19.6
3	TCGS 2103	10.0	57	105.3	39	30.0	31.0	0.070	702.8	24.9	44.8	9.1	16.0
4	TCGS 2104	4.6	65	99.6	46	10.8	11.8	0.117	473.3	25.6	47.2	8.5	13.0
5	TCGS 2105	11.6	65	121.6	51	33.0	34.0	0.122	552.6	26.3	47.0	9.4	14.4
6	TCGS 2106	5.6	64	105.0	49	21.6	22.6	0.191	478.0	26.5	47.3	12.2	19.0
7	TCGS 2107	5.8	56	105.0	38	26.6	27.6	0.083	798.9	25.1	44.4	8.2	14.6
8	TCGS 2108	4.2	63	101.6	50	18.8	19.8	0.115	623.1	26.3	45.9	10.7	17.0
9	TCGS 2109	11.2	64	123.6	48	36.8	37.8	0.120	637.7	24.8	46.9	10.9	17.0
10	TCGS 2110	10.8	61	100.6	42	31.4	32.4	0.168	764.9	25.4	45.8	9.6	15.8
11	TCGS 2111	4.2	63	116.3	63	18.6	19.6	0.236	442.1	26.8	46.8	12.3	19.6
12	TCGS 2112	5.6	62	104.3	47	15.6	16.6	0.126	550.6	26.5	47.5	7.3	11.8
13	TCGS 2113	10.4	55	103.6	35	31.6	32.6	0.088	654.7	25.1	45.5	8.6	15.6
14	TCGS 2114	7.2	60	85.3	40	17.6	18.6	0.110	403.8	24.2	45.7	7.7	12.8
15	TCGS 2115	6.0	63	93.3	46	27.0	28.0	0.116	483.6	25.4	47.8	12.3	19.6
16	TCGS 2116	6.0	62	99.6	49	16.0	17.0	0.110	483.9	26.4	47.6	8.3	13.4
17	TCGS 2117	7.4	66	111.3	50	16.2	17.2	0.245	356.9	26.5	46.7	9.4	14.2
18	TCGS 2118	8.8	64	105.0	46	24.8	25.8	0.105	590.1	25.6	47.1	15.1	23.6
19	TCGS 2119	6.6	66	107.0	45	23.8	24.8	0.290	525.0	25.0	45.7	10.4	15.8
20	TCGS 2120	7.6	65	100.3	44	36.0	37.0	0.328	598.1	24.6	45.9	8.6	13.2
21	TCGS 2121	8.8	63	104.3	45	20.4	21.4	0.083	948.3	25.1	46.9	9.1	14.4
22	TCGS 2131	11.0	65	100.0	46	20.0	21.0	0.278	1022.0	25.1	46.6	10.4	16.0
23	TCGS 2123	5.2	66	108.0	44	14.0	15.0	0.242	979.3	24.0	45.3	7.3	11.0
24	TCGS 2124	9.2	61	96.6	43	21.0	22.0	0.125	606.9	25.4	46.8	11.6	19.0
25	TCGS 2125	4.0	68	96.6	43	23.6	24.6	0.273	564.7	24.0	48.3	12.4	18.2
26	TCGS 2126	4.0	64	90.0	41	10.4	11.4	0.111	546.6	24.7	48.0	5.5	8.6
27	TCGS 2127	6.2	67	86.0	42	17.2	18.2	0.205	558.2	23.6	48.7	11.5	17.2
28	TCGS 2128	7.6	64	101.3	41	15.4	16.4	0.141	426.5	24.4	45.9	6.1	9.6
29	TCGS 2129	4.2	64	105.6	43	17.8	18.8	0.111	643.6	23.9	46.7	10.0	15.6
30	TCGS 2130	9.0	64	102.3	44	17.5	18.5	0.058	721.4	25.0	46.7	9.7	15.2
31	TCGS 2131	4.2	61	99.6	48	14.8	15.8	0.078	403.2	25.3	47.1	7.4	12.2
32	TCGS 2132	9.0	64	115.3	46	34.4	35.4	0.106	571.1	23.8	46.2	12.7	19.8
33	TCGS 2133	6.8	62	110.0	52	23.4	24.4	0.298	646.4	25.5	47.5	8.4	13.6
34	TCGS 2134	6.4	65	103.0	49	15.2	16.2	0.292	538.4	26.6	47.7	8.3	12.8
35	TCGS 2135	4.1	65	105.3	49	22.2	23.2	0.253	525.7	25.7	47.3	4.3	6.6
	GM	7.1	63.0	103.0	45.3	22.2	23.2	0.2	607.8	25.2	46.7	9.5	15.1
	C.V	14.1	9.3	5.0	6.1		12.6	55.93		0.7	1.47	20.8	16.6
	SE(m)	0.5	4.6	2..9	1.9		3.6	0.49		0.2	0.2	1.69	1.7
	SE(d)	0.7	3.2	4.7	2.6		5.3	0.71		0.8	0.4	2.4	2.5
	C.D	1.6	5.6	8.6	5.5		9.9	1.42		0.4	0.5	4.7	4.2

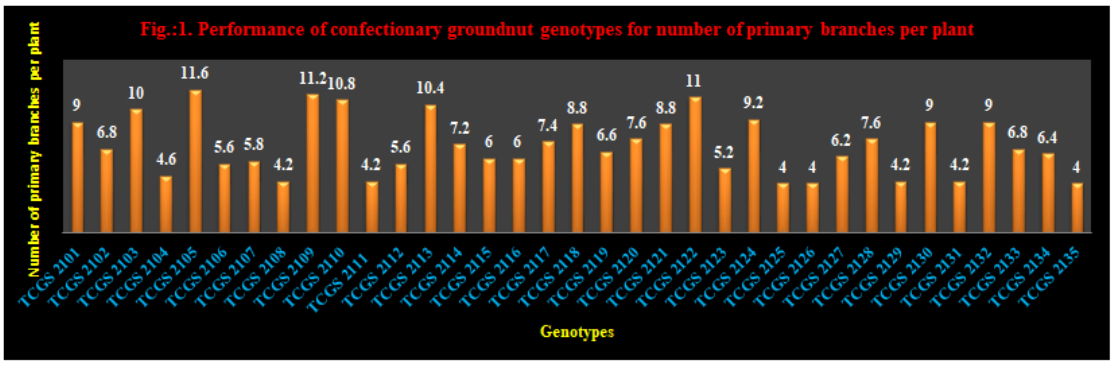
Fig.:1. Performance of confectionary groundnut genotypes for number of primary branches per plant
Number of primary branches per plant
9 6.8 10 4.6 11.6 5.6 5.8 4.2 11.2 10.8 4.2 5.6 10.4 7.2 6 6 7.4 8.8 6.6 7.6 8.8 11 5.2 9.2 4 4 6.2 7.6 4.2 9 4.2 9 6.8 6.4 4
TCGS 2101 TCGS 2102 TCGS 2103 TCGS 2104 TCGS 2105 TCGS 2106 TCGS 2107 TCGS 2108 TCGS 2109 TCGS 2110 TCGS 2111 TCGS 2112 TCGS 2113 TCGS 2114 TCGS 2115 TCGS 2116 TCGS 2117 TCGS 2118 TCGS 2119 TCGS 2120 TCGS 2121 TCGS 2122 TCGS 2123 TCGS 2124 TCGS 2125 TCGS 2126 TCGS 2127 TCGS 2128 TCGS 2129 TCGS 2130 TCGS 2131 TCGS 2132 TCGS 2133 TCGS 2134 TCGS 2135
Genotypes

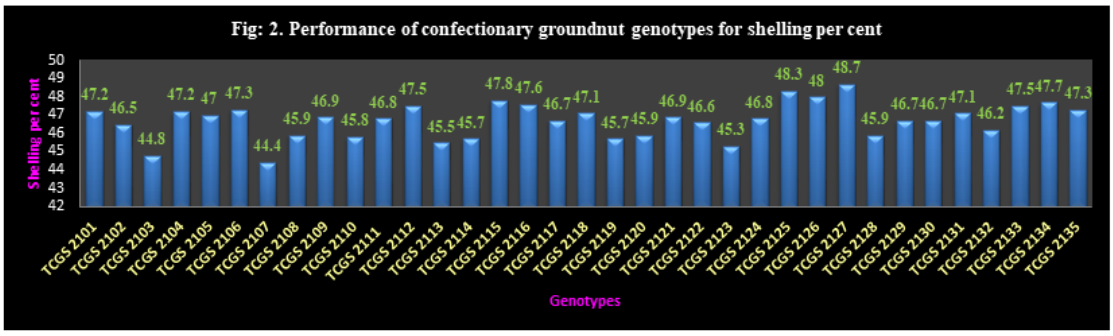
Fig: 2. Performance of confectionary groundnut genotypes for shelling per cent
Shelling per cent
50 49 48 47 46 45 44 43 42
47.2 46.5 44.8 47.2 47 47.3 44.4 45.9 46.9 45.8 46.8 47.5 45.5 45.7 47.8 47.6 46.7 47.1 45.7 45.9 46.9 46.6 45.3 46.8 48.3 48 48.7 45.9 46.7 46.7 47.1 46.2 47.5 47.7 47.3
TCGS 2101 TCGS 2102 TCGS 2103 TCGS 2104 TCGS 2105 TCGS 2106 TCGS 2107 TCGS 2108 TCGS 2109 TCGS 2110 TCGS 2111 TCGS 2112 TCGS 2113 TCGS 2114 TCGS 2115 TCGS 2116 TCGS 2117 TCGS 2118 TCGS 2119 TCGS 2120 TCGS 2121 TCGS 2122 TCGS 2123 TCGS 2124 TCGS 2125 TCGS 2126 TCGS 2127 TCGS 2128 TCGS 2129 TCGS 2130 TCGS 2131 TCGS 2132 TCGS 2133 TCGS 2134 TCGS 2135
Genotypes

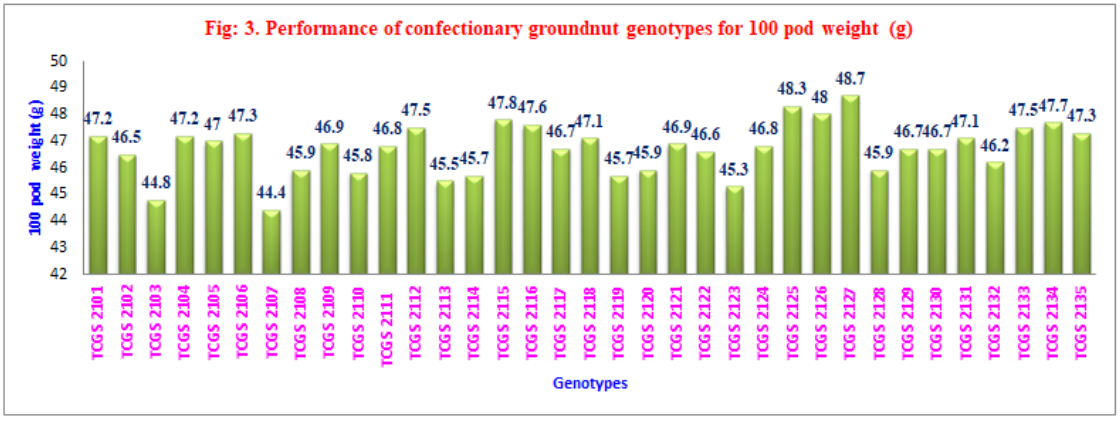
Fig: 3. Performance of confectionary groundnut genotypes for 100 pod weight (g)
100 pod weight (g)
50 49 48 47 46 45 44 43 42
47.2 46.5 44.8 47.2 47 47.3 44.4 45.9 46.9 45.8 46.8 47.5 45.5 45.7 47.8 47.6 46.7 47.1 45.7 45.9 46.9 46.6 45.3 46.8 48.3 48 48.7 45.9 46.7 46.7 47.1 46.2 47.5 47.7 47.3
TCGS 2101 TCGS 2102 TCGS 2103 TCGS 2104 TCGS 2105 TCGS 2106 TCGS 2107 TCGS 2108 TCGS 2109 TCGS 2110 TCGS 2111 TCGS 2112 TCGS 2113 TCGS 2114 TCGS 2115 TCGS 2116 TCGS 2117 TCGS 2118 TCGS 2119 TCGS 2120 TCGS 2121 TCGS 2122 TCGS 2123 TCGS 2124 TCGS 2125 TCGS 2126 TCGS 2127 TCGS 2128 TCGS 2129 TCGS 2130 TCGS 2131 TCGS 2132 TCGS 2133 TCGS 2134 TCGS 2135
Genotypes

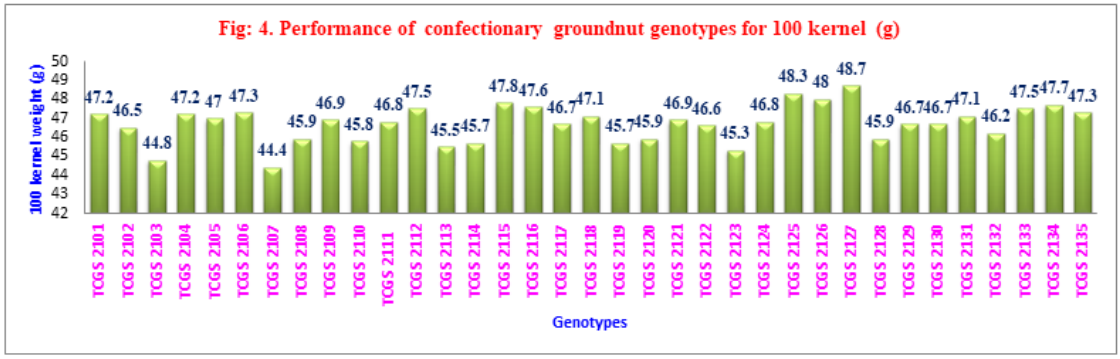
Fig: 4. Performance of confectionary groundnut genotypes for 100 kernel (g)
100 kernel weight (g)
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47.2 46.5 44.8 47.2 47 47.3 44.4 45.9 46.9 45.8 46.8 47.5 45.5 45.7 47.8 47.6 46.7 47.1 45.7 45.9 46.9 46.6 45.3 46.8 48.3 48 48.7 45.9 46.7 46.7 47.1 46.2 47.5 47.7 47.3
TCGS 2101 TCGS 2102 TCGS 2103 TCGS 2104 TCGS 2105 TCGS 2106 TCGS 2107 TCGS 2108 TCGS 2109 TCGS 2110 TCGS 2111 TCGS 2112 TCGS 2113 TCGS 2114 TCGS 2115 TCGS 2116 TCGS 2117 TCGS 2118 TCGS 2119 TCGS 2120 TCGS 2121 TCGS 2122 TCGS 2123 TCGS 2124 TCGS 2125 TCGS 2126 TCGS 2127 TCGS 2128 TCGS 2129 TCGS 2130 TCGS 2131 TCGS 2132 TCGS 2133 TCGS 2134 TCGS 2135
Genotypes

Fig: 5. Performance of confectionary groundnut genotypes for dry haulms yield per plant (g)

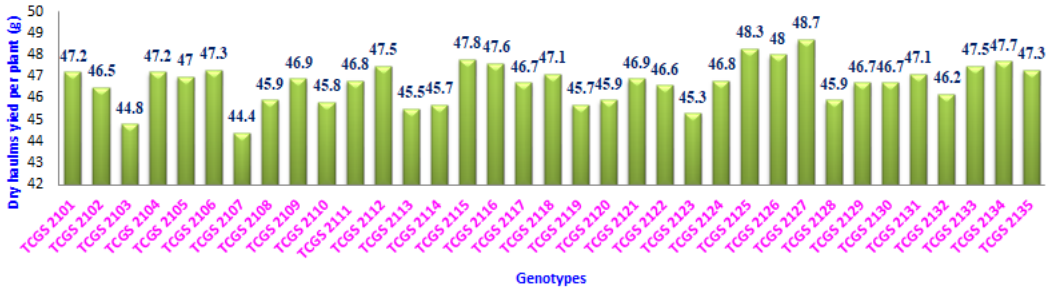


Fig: 6. Performance confectionary groundnut genotypes for harvest index (%)

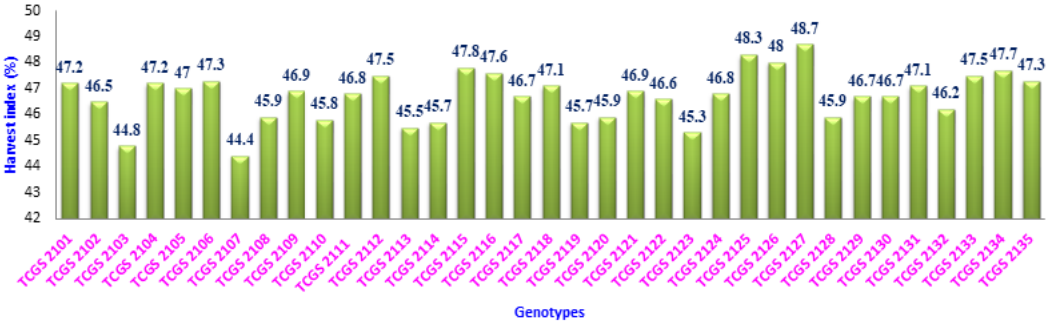


Fig: 7. Performance of confectionary groundnut genotypes for total carbohydrates (g/g)

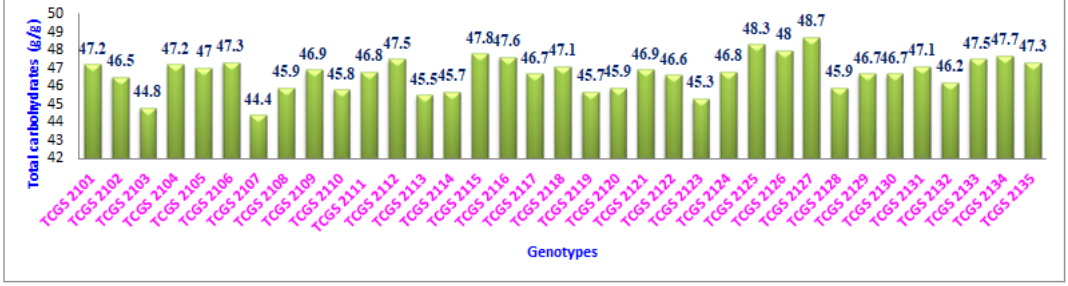
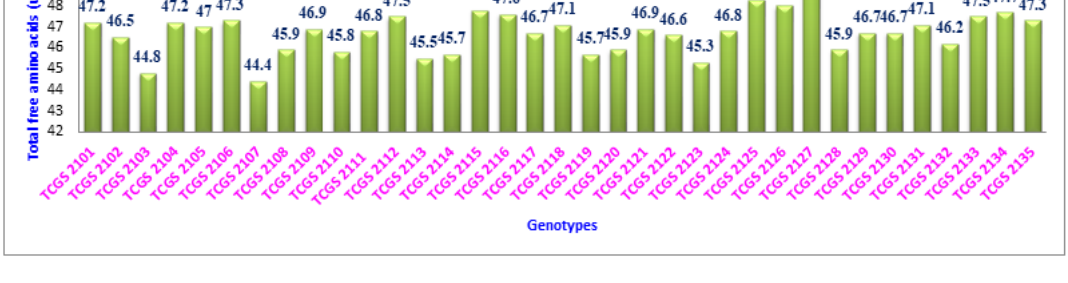


Fig: 8. Performance of confectionary groundnut genotypes for total free amino acids (ug/g)



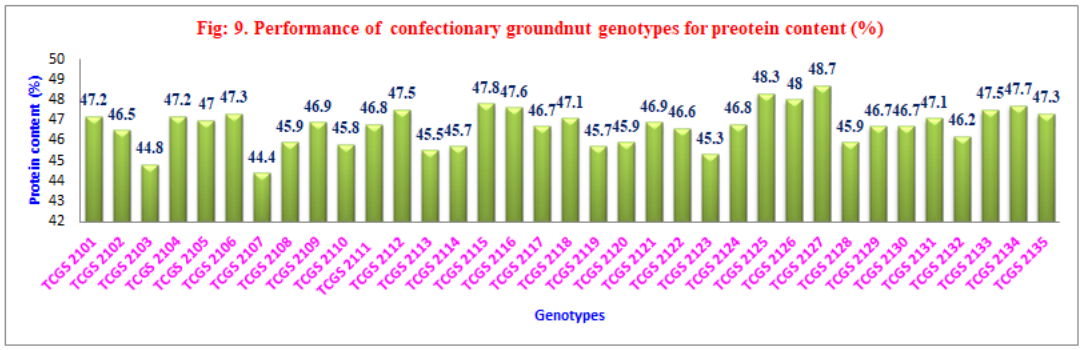


Fig: 9. Performance of confectionary groundnut genotypes for preotein content (%)

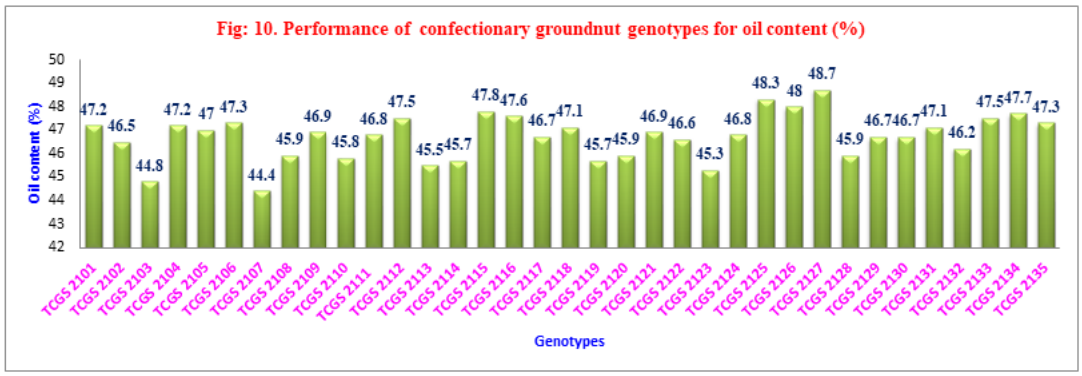


Fig: 10. Performance of confectionary groundnut genotypes for oil content (%)

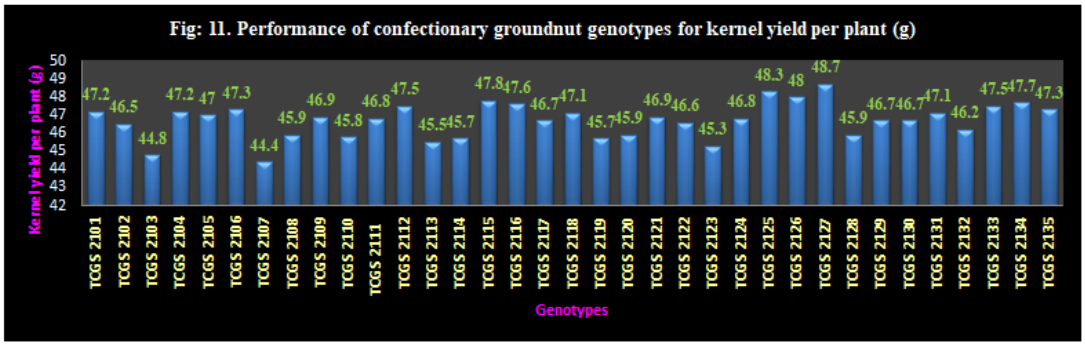


Fig: 11. Performance of confectionary groundnut genotypes for kernel yield per plant (g)

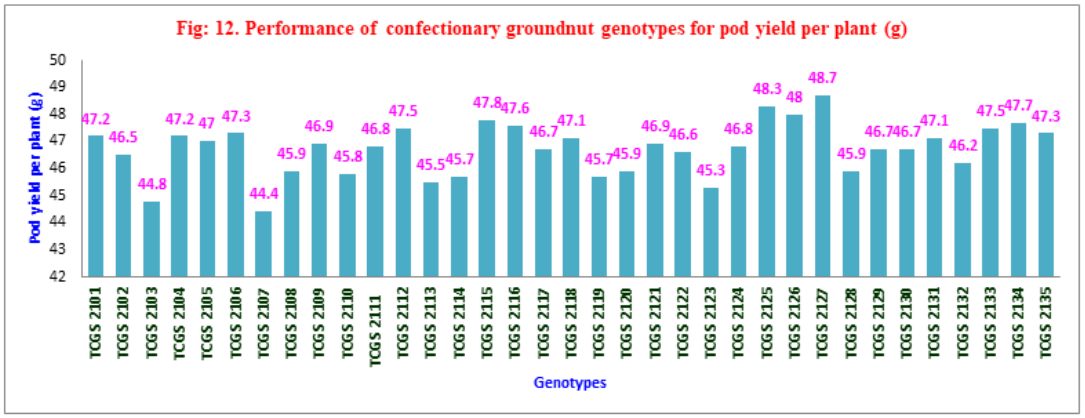


Fig: 12. Performance of confectionary groundnut genotypes for pod yield per plant (g)

Table 2: Genotypic correlation coefficients among twelve characters of confectionary groundnut genotypes for nutritional and yield related traits

Character	No. of primary branches per plant	Shelling per cent	100 pod weight (g)	100 kernel weight (g)	Dry haulms yield per plant (g)	Harvest index (%)	Total carbohydrates (g/g)	Total free amino acids (ug/g)	Protein content (%)	Oil content (%)	Kernel yield per plant (g)	Pod yield per plant (g)
No. of primary branches per plant	1.000	0.467**	0.381**	0.424**	0.352**	0.988**	0.938**	0.354**	0.371**	0.366**	0.338**	0.340**
Shelling per cent	0.467**	1.000	0.990**	0.995**	0.932**	0.356**	0.158**	0.947**	0.992**	0.993**	0.968**	0.968**
100 pod weight (g)	0.381**	0.990**	1.000	0.994**	0.954**	0.265**	0.058NS	0.958**	0.997**	0.996**	0.974**	0.975**
100 kernel weight (g)	0.424**	0.995**	0.994**	1.000	0.935**	0.311**	0.111*	0.946**	0.995**	0.994**	0.972**	0.972**
Dry haulms yield per plant (g)	0.352**	0.932**	0.954**	0.935**	1.000	0.241**	0.020NS	0.931**	0.944**	0.944**	0.946**	0.952**
Harvest index (%)	0.988**	0.356**	0.265**	0.311**	0.241**	1.000	0.975**	0.235**	0.254**	0.249**	0.226**	0.227**
Total carbohydrates	0.938**	0.158**	0.058NS	0.111*	0.020NS	0.975**	1.000	0.032NS	0.050NS	0.045NS	0.019NS	0.019NS
Total free amino acids (ug/g)	0.354**	0.947**	0.958**	0.946**	0.931**	0.235**	0.032NS	1.000	0.955**	0.956**	0.928**	0.933**
Protein content (%)	0.371**	0.992**	0.997**	0.995**	0.944**	0.254**	0.050NS	0.955**	1.000	0.999**	0.975**	0.977**
Oil content (%)	0.366**	0.993**	0.996**	0.994**	0.944**	0.249**	0.045NS	0.956**	0.999**	1.000	0.976**	0.978**
Kernel yield per plant (g)	0.338**	0.968**	0.974**	0.972**	0.946**	0.226**	0.019NS	0.928**	0.975**	0.976**	1.000	0.999**
Pod yield per plant (g)	0.340**	0.968**	0.975**	0.972**	0.952**	0.227**	0.019NS	0.933**	0.977**	0.978**	0.999**	1.000

*Significant at 5% level ** Significant at 1% level

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