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Nutritional Variability Studies in Groundnut (*Arachis hypogaea* L.)

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A B S T R A C T

Genetic diversity is the basis of any crop improvement programme. Nutritional quality analysis of seed samples of 100 groundnut genotypes were evaluated for nutritional traits and showed that total carbohydrates, total amino acids, protein content and oil content ranged from 0.12 (g/g) (ICGV-99083) to 0.70 (g/g) (ISK-01-08-21), 205.80 (µg/g) (AIS-2010-9) to 541.60 (µg/g) (ICG-4726), 23.40% (TCGS-740) to 26.80 % (ICG-9657) and 46.20 % (TCGS-740) to 50.60 % (AIS-2010-7) respectively. Groundnut genotypes with high total carbohydrates (15 accessions), amino acids (14 accessions), protein content (18 accessions) and oil content (13 accessions) were identified. In the present study, it is clear that it is possible to develop high yielding lines with high quality traits with superior nutritional features. The parameters have indicated sufficient variability for different nutritional characters, so that it would enable the breeder to utilize appropriate genetic resources in the crossing programme to improve the particular character.

Introduction

Genetic diversity is the basis of any crop improvement programme. In classical breeding, such improvement has been brought about by using promising germplasm identified donors involving the steps "selection – crossing – segregation selection in the cycle". In the present study variation available in the genotypes for different characters was estimated for total carbohydrates, total free amino acids, protein content and oil content. Thus, to meet the growing demand and also to reduce the burden on the state exchequer, it is important to boost production of edible oil in the country. As the scope for expansion of arable area in the country is limited, the increased edible oil production has to come largely from increased crop productivity and high oil content in

seeds/kernels. Newer groundnut varieties with oil content higher than that of the varieties currently cultivated by farmers are needed to boost the edible oil production and correspondingly increase the income levels of the poor groundnut farmers in India.

Materials and Methods

The experimental material consisted of 100 groundnut genotypes and they were grown in three rows of 5 meter length by adopting a spacing of 30 x 10 cm during rainy season 2011 at Regional Agricultural Research Station, Tirupati. Data were recorded for total carbohydrates (g/g), total free amino acids (µg/g), protein content (%) and oil content (%) through HPLC.

Results and Discussion

The quantitative characters for 100 genotypes of groundnut subjected to statistical analysis showed that all the characters *viz*., total carbohydrates, total free amino acids, protein content and oil content with greater nutritional variability. The parameters of variation have induced sufficient variability in the genotypes for nutritional quality traits and also showed considerable variability to total carbohydrates and total free amino acids as indicated by coefficient of variability, which is required to for the step up breeding strategy in crop enhancement programme of the traits as indicated by coefficient of variation.

Total carbohydrates and total free amino acids have the highest variability (Table-1). The lowest was observed for oil percent. On the basis of coefficient of variation the highest coefficient of variation (C.V) was recorded for the total carbohydrates 33.08 % followed by total free amino acids (21.81 %). However lowest coefficient of variation was recorded for protein content (2.35 %) and oil content (1.48%).

The total carbohydrates ranged from 0.12 (g/g) (ICGV-99083) to 0.70 (g/g) (ISK-01-08-21), total amino acids from 205-80 (µg/g) (ICGV-00920 and ISK-06-5) to 541.60 (µg/g) (ISK-08-12), protein content from 23.40 % (ICGV-07045) to 26.80% (TCGS-751) and oil content from 46.20 % (ICGV-13916) to 50.60 % (IVK-07-16) to 50-60 % (IVK-07-16) reported similar results in groundnut.

Table.1 Variability for different nutritional quality traits in groundnut genotypes

S. No	Character	Mean	Range		SD	SE	CV %
			Minimum	Maximum			
1	Total carbohydrates (g/g)	0.37	0.12	0.70	0.12	0.01	33.08
2	Total free amino acids (µg/g)	309.21	205.8	541.6	67.43	6.74	21.81
3	Protein per cent	25.71	23.4	26.80	0.60	0.37	2.35
4	Oil per cent	48.11	46.20	50.6	0.71	0.07	1.48

Table.2 The following genotypes were identified for specific nutritional quality traits in groundnut.

S.No.	Character	No. of accessions identified
1	Total carbohydrates (g/g)	ICGV-06065, ISK-01-08-21, ISK-1-08-2, TCGS-1070, ICG-4726,TIR-34, IVK-07-10, ISK-08-12, ISK-01-08-2, ICGV-93261, ICG-5498, TCGS-898, TCGS-731 and TCGS-965
2	Total free amino acids (µg/g)	ISK-08-12, MLTG-43, TCGS-111, TCGS-740, ICG-4726, ISK-01-08-21, AIS-2010-9, ICGV-00380, TCGS-750, TCGS-898, TIR-48, TCGS-331, TIR-6 and MLTG-07-12
3	Protein per cent	ICGV-92040, TCGS-751, ICG-5794, AIS-2010-7, MLTG-43, AIS-2010-9, ICGV-00380, TCGS-898, TCGS-331, TIR-6, MLTG-07-12, TCGS-864, ICGV-06040, ICGV-05062, ISK-02-8, TCGS-10, JUG-25 and ISK-06-5
4	Oil per cent	TIR-9, ISK-01-08-2, ICGV-07101, ICGV-07022, ICGV-99083, ICG-5794, ICGV-07053, ICGV-05062, ICGV-07070, JAL-44, ICGV-07230, AIS-2010-7 and ICG-7872

Table.3 Character association among nutritional quality traits in groundnut genotypes

Character	Total carbohydrates (g/g)	Total free amino acids (µg/g)	Protein content (%)	Oil content (%)
Total carbohydrates (g/g)	1.0000	0.1716	-0.1493	-0.0509
Total free amino acids (µg/g)	0.1716	1.0000	0.0841	-0.0236
Protein per cent	-0.1493	0.0841	1.0000	-0.1109
Oil per cent	-0.0514	-0.0236	-0.1109	1.0000

Fig.1 Promising genotypes for total carbohydrate in groundnut

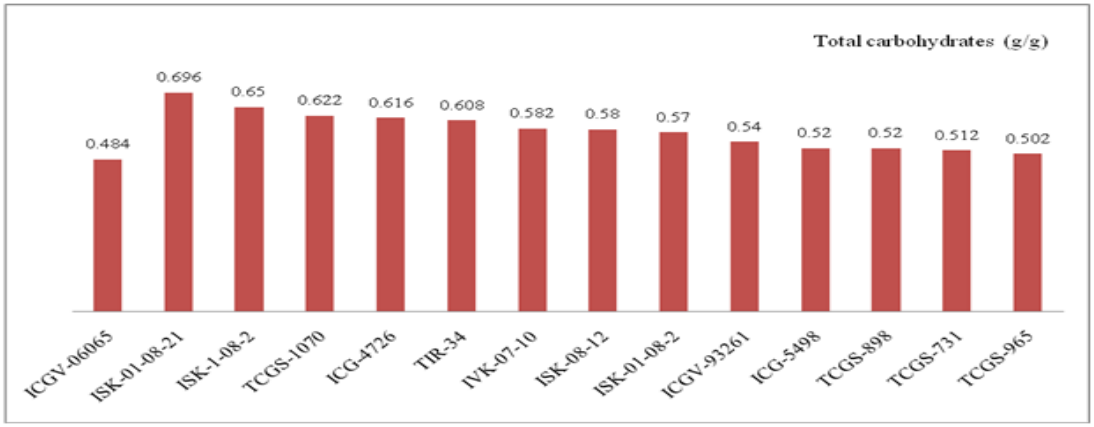


Fig.2 Promising genotypes for total amino acid content in groundnut

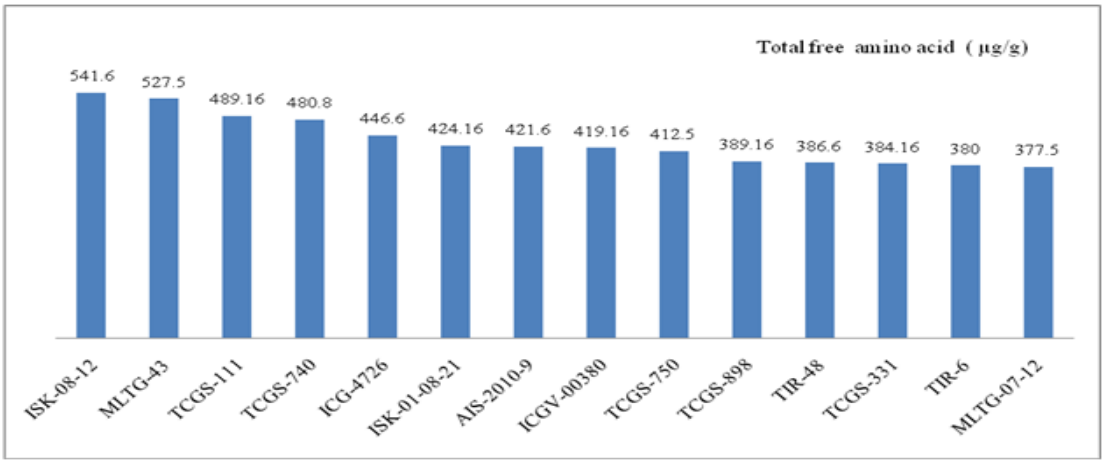


Fig.3 Promising genotypes for protein content in groundnut

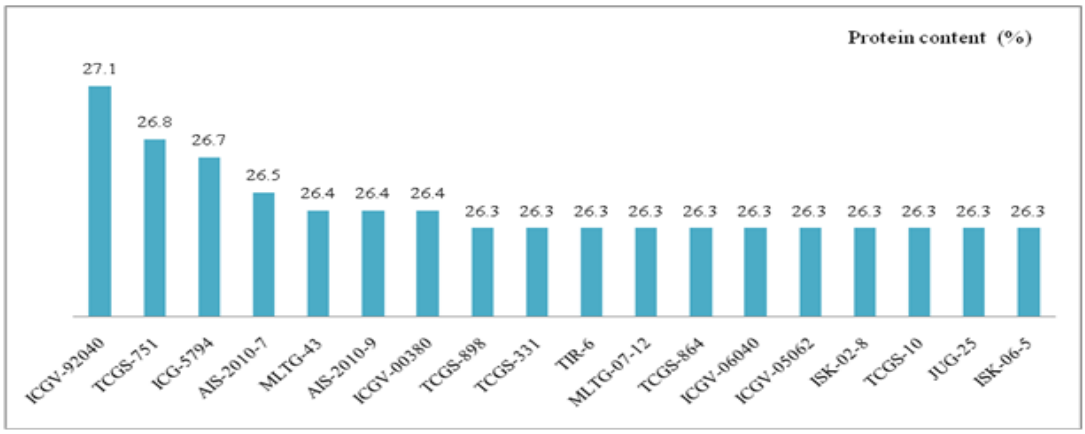
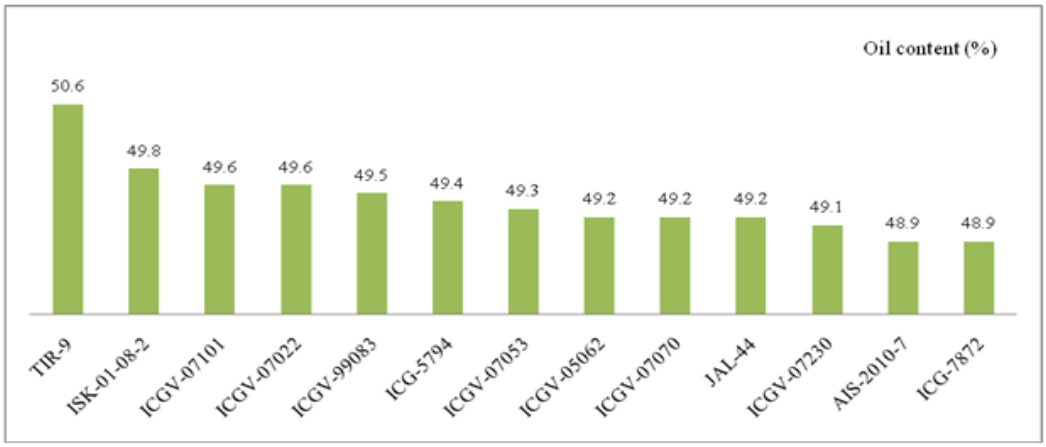


Fig.4 Promising genotypes for oil content in groundnut



Based on mean values, some of the promising genotypes were identified as 15 genotypes for high total carbohydrates, 14 genotypes for high total amino acids, 18 accessions for high content and 13 genotypes for high oil content (Table - 2 and Fig. 1 - 4). Similar results were reported by Chuan Tang Wang *et al.,* (2011) and Dwivedi *et al.,* (1990). Table 3 shows the correlation coefficients among quality traits in 100 groundnut genotypes. Total carbohydrates had positive association with total free amino acids but negatively correlated with protein content and oil content. Protein content was positive association with total free amino acids but negative correlation with total carbohydrates and oil content. Oil content had negative correlation with total carbohydrates, total free amino acids and oil content. Earlier Parmar *et al.,* (2000) reported that oil and protein content showed a strong negative relationship indicating that selection for low oil content should result in higher protein content.

From the present study, it is clear that it is possible to develop high yielding lines with high quality traits with superior agronomic features. The parameters have indicated sufficient variability for different nutritional characters, so that it would enable the breeder to utilize appropriate genetic resources in the crossing programme to improve the particular character.

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