

New Sources of Early-Maturity Identified in Groundnut Core Collection

Groundnut (*Arachis hypogaea* L.) is an annual legume grown primarily for high quality edible oil (36 to 54 % on dry matter basis) and easily digestible protein (12 to 36 %) in its seeds. It is cultivated in over 100 countries in tropical, sub-tropical and warm temperate regions of the world. The crop is grown on about 23.8 million ha world wide with an estimated total production of 34.5 million t in shell and an average productivity of 1.44 t ha⁻¹ in 2000. About two thirds of production comes from the semi-arid tropics (SAT) regions which are characterized by uncertain rainfall and frequent droughts. Groundnut yields are low and average about 0.8 t ha⁻¹ in the SAT countries compared to more than 2.6 t ha⁻¹ in the developed world.

Early-maturing, high-yielding groundnut cultivars are needed for short growing season, multiple cropping, and to avoid late season droughts. In almost all breeding programs only a few sources of early-maturity (Chico, Gangapuri, JL 24; mainly Chico) have been used. This has resulted in narrowing the genetic base of groundnut cultivars. The aim of our research was to identify new sources of early-maturity through evaluation of core collection developed at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India.

The core collection of groundnut, consisting 1704 accessions (Upadhyaya *et al.*, 2000), was grown in the 1999 rainy season. The 584 Spanish (*A. hypogaea* subsp. *fastigiata* var. *vulgaris*) and 299 Valencia (*A. hypogaea* subsp. *fastigiata* var. *fastigiata*) core collection



entries were evaluated along with early-maturing source Gangapuri (subsp. *fastigiata* var. *fastigiata*) for maturity and other agronomic traits at 90 days after sowing (DAS) in the 1999 rainy season. We selected 15 Spanish and 4 Valencia landraces from 13 countries with maturity similar to Gangapuri and evaluated them in Preliminary trial in the 1999/2000



postrainy season. To overcome the seasonal differences in temperature, thermal time (to base 10 °C) rather than calendar days were used in evaluation. The entries were evaluated at 1240 °Cd (equivalent to 75 DAS in rainy season at ICRISAT Center, Patancheru) and 1470 °Cd (equivalent to 90 DAS in rainy season at ICRISAT Center, Patancheru) along with early maturing controls (Chico, Gangapuri, and JL 24). In the 1999/2000 postrainy season we selected additional 17 Spanish and 5 Valencia early-maturing landraces from 15 countries and evaluated them separately in another trial at 1240 °Cd and 1470 °Cd in the 2000 rainy season. Considering pod yields, shelling percentages, and 100-seed weight at both harvests, 21 (16 Spanish, 5 Valencia) promising lines, 14 from first trial and 7 from the second trial, were selected for further evaluation in the 2000/2001 postrainy season. The pod yield, shelling percentage, and 100-seed weight of selected lines is given in Table 1. The increase in pod yield, shelling percentage, and 100-seed weight from 1240°Cd to 1470 °Cd was lower in these lines compared to the controls (Table 2) indicating their inherent potential for early-maturity. The diversity studies using data on 55 morphological and agronomic traits indicated that these lines were diverse than the known sources of early-maturity (Fig 1). Five of these lines have been involved in hybridization to broaden the genetic base in our breeding program.

Table 1. Performance of some early-maturing groundnut germplasm lines and control cultivars, 1999/2000 postrainy (PR) and 2000 rainy (R) season, ICRISAT Center, Patancheru, India.

Germplasm line	Pod yield (t ha ⁻¹)						Shelling percentage						100-seed weight (g)					
	1240 °Cd ¹			1470 °Cd ¹			1240 °Cd ¹			1470 °Cd ¹			1240 °Cd ¹			1470 °Cd ¹		
	1999/2000 PR	2000 R	Mean	1999/2000 PR	2000 R	Mean	1999/2000 PR	2000 R	Mean	1999/2000 PR	2000 R	Mean	1999/2000 PR	2000 R	Mean	1999/2000 PR	2000 R	Mean
ICG 3540	1.49	0.87	1.18	1.56	0.86	1.21	68	67	68	74	68	71	34	28	31	38	28	33

ICG 4890	1.33	1.06	1.19	0.99	0.95	0.97	67	64	66	72	68	70	34	28	31	43	32	38
ICG 11914	1.19	0.95	1.07	1.41	1.06	1.23	56	55	56	68	65	67	36	26	31	45	31	38
ICG 14788	1.15	1.33	1.24	1.42	1.33	1.37	66	70	68	71	73	72	37	33	35	40	37	39
Control																		
Chico	1.43	0.59	1.01	1.62	0.84	1.23	69	63	66	73	68	71	31	22	27	35	26	31
Gangapuri	1.08	0.43	0.76	1.12	0.55	0.84	65	61	63	70	64	67	41	30	36	44	30	37
JL 24	1.23	0.81	1.02	1.40	0.98	1.19	67	61	64	69	69	69	39	30	35	42	37	40
SE	0.083	0.073		0.155	0.101		1.7	1.31		1.3	1.6		1.2	0.9		1.9	1.2	
CV (%)	20.3	14.9		16.0	19.6		3.7	3.6		2.5	4.3		4.9	5.8		6.4	6.8	
Trial Mean	0.58	0.84		1.37	0.90		65	63		71	67		35	28		41	31	

1 = 1240 ⁰Cd and 1470 ⁰Cd are equivalent to 75 days and 90 days after sowing in the rainy season at ICRISAT, respectively.

Table 2. Increase (%) in pod yield, shelling percentage, and 100-seed weight from 1240 ⁰Cd¹ to 1470 ⁰Cd in the 1999/2000 postrainy (PR) and 2000 rainy (R) seasons, ICRISAT Center, Patancheru, India.

Germplasm line	Pod yield (t ha ⁻¹)		Shelling percentage		100-seed weight (g)	
	1999/2000 PR	2000 R	1999/2000 PR	2000 R	1999/2000 PR	2000 R
ICG 3540	4.7	-1.1	8.8	1.5	11.8	0.0
ICG 4890	-25.6	-10.4	7.5	6.3	26.5	14.3
ICG 11914	18.5	11.6	21.4	18.2	25.0	19.2
ICG 14788	23.5	0.0	7.6	4.3	8.1	12.1
Control						
Chico	13.3	42.4	5.8	7.9	12.9	18.2
Gangapuri	3.7	27.9	7.7	4.9	7.3	0.0
JL 24	13.8	21.0	3.0	13.1	7.7	23.3

1 = 1240 ⁰Cd and 1470 ⁰Cd are equivalent to 75 days and 90 days after sowing in the rainy season at ICRISAT, respectively.

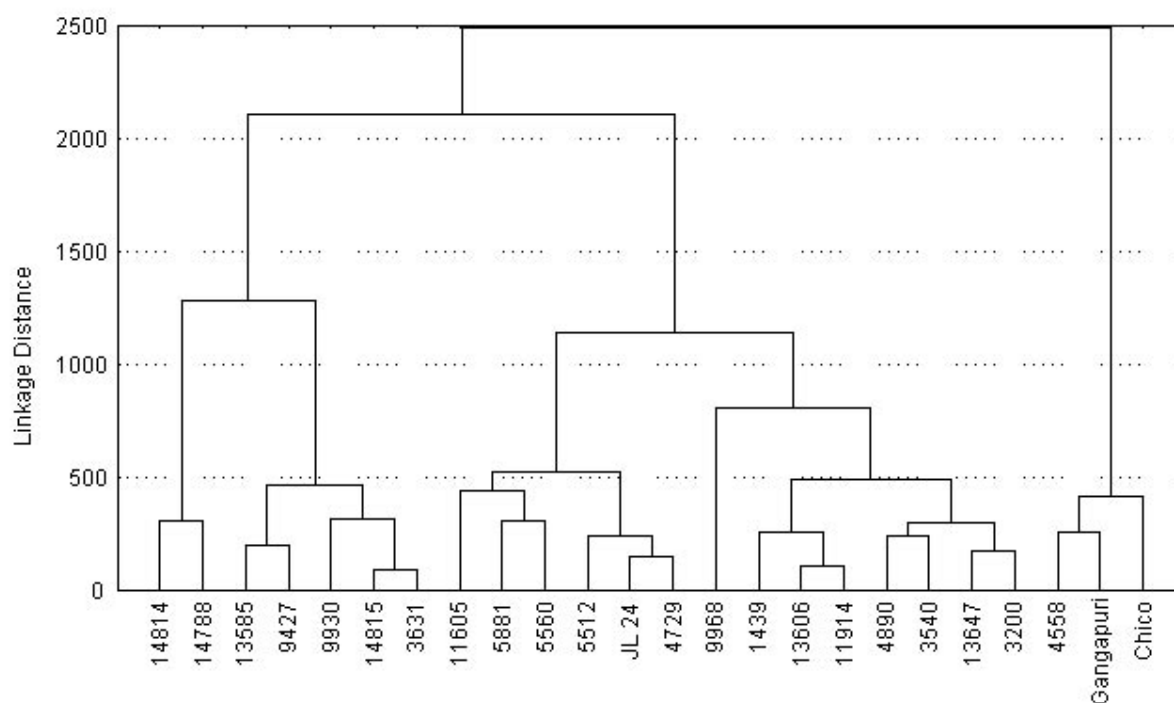


Fig. 1 Dendrogram of 24 early-maturing groundnut germplasm sources and control cultivars obtained by analysis of 55 morphological and agronomic traits

For more information contact:

Dr. H.D. Upadhyaya
ICRISAT-Patancheru
Patancheru 502 324
Andhra Pradesh, India

H.Upadhyaya@cqiir.org



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