Early-maturing, Large-seeded and High-yielding Groundnut Varieties ICGV 96466, ICGV 96468 and ICGV 96469

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Purpose of description

Large-seed size coupled with early-maturity and high-yield potential is a desirable combination in groundnut (*Arachis hypogaea*) as most of the early-maturing groundnut cultivars have small seeds and low yields. Three groundnut varieties (ICGV 96466, ICGV 96468 and ICGV 96469) possessing particularly the above three traits were developed through hybridization at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India, and were released by the Plant Materials Identification Committee of ICRISAT in 2004 for subsequent utilization in research and/or the development of groundnut.

Origin and development

ICGV 96466, ICGV 96468 and ICGV 96469 were derived from three different crosses. The details of their pedigree and selection history are:

ICGV 96466: (ICGV 87882 × ICGV 87885)-F_2-P_8-P_1-B_1-B_1-B_1-B_1-B_1-B_1-B_1-B_1

ICGV 96468: (ICGV 87885 × LI)-F_2-P_4-P_1-B_1-B_1-B_1

ICGV 96469: (ICGV 87885 × LI Duchoa)-F_2-P_5-B_2-B_1-B_1-B_1

(P refers to plant selection and B to bulk.)

The parental lines used in the above three crosses were: ICGV 87882, derived from a cross of ICGS 30 × Var. 28-206; ICGV 87885, derived from a cross of 91176 × TG 2; and ICGS 30, derived from a cross of Ah 2105 × Chico.

Ah 2105 is a Viginia type (*A. hypogaea* subsp *hypogaea* var *hypogaea*) of Indian origin. It is of medium growth duration and has 100-seed mass of 40 g. Chico is an early-maturing, Spanish type (*A. hypogaea* subsp *fastigiata* var *vulgaris*) of germplasm from USA. Var. 28-206 is a Virginia type from Mali. It is of medium growth duration and has 100-seed mass of 45 g. Accession 91176 is an early-maturing Spanish type and has 100-seed mass of 38 g. Accession LI is a Spanish, erect type from Vietnam. It is of medium growth duration with 100-seed mass of 35 g.

Agronomic performance

Yield trials including the three groundnut breeding lines, ICGV 96466, ICGV 96468 and ICGV 96469 and two control cultivars, JL 24 (early-maturing) and Somnath (medium-maturing with large seed) were conducted at ICRISAT, Patancheru research farm during 1997–2001 in both rainy and postrainy seasons. Sowing was done on Alfisol fields, in triple lattice design, in 6 m^2 plots under broad-bed and furrow system. A fertilizer dose of 60 kg P_2O_5 and 400 kg gypsum ha^{-1} were applied and the crops were raised under full irrigation and plant protection care.

Four trials (three in rainy season and one in postrainy season) were harvested when the crop had accumulated 1470°Cd (equivalent to 90 days after planting in rainy season at ICRISAT, Patancheru). The other three trials conducted in postrainy seasons were harvested when the crop had accumulated 1605°Cd (equivalent to 100 days after planting in the rainy season at ICRISAT, Patancheru). At 1470°Cd harvest, the 100-seed mass was 46 g for ICGV 96466, 56 g for ICGV 96468 and 51 g for ICGV 96469 compared to 41 g for JL 24 and 54 g for Somnath (Table 1). At 1605°Cd, the 100-seed mass was 54 g for ICGV 96466, 62 g for ICGV 96468 and 49 g for ICGV 96469 compared to 45 g for JL 24 and 62 g for Somnath. These three varieties had 12 to 37% greater 100-seed mass at 1470°Cd and 9 to 38% greater 100-seed mass at 1605°Cd compared to JL 24 (Table 1).

On comparing the pod yields at 1470°Cd harvests, the three new varieties out-yielded both the control cultivars and the gain was maximum in ICGV 96469, which showed 18.8 and 33.3% increase over the controls, JL 24 and Somnath, respectively (Table 2). At 1605°Cd harvests, the mean yields of the three new varieties were 3.36 (ICGV 96466), 3.67 (ICGV 96468) and 4.31 t ha^{-1} (ICGV 96469). ICGV 96469 out-yielded both the controls by 26.4% (JL 24) and 10.2% (Somnath) (Table 3).

The increase in pod yields of the three new varieties at 1470 to 1605°Cd ranged from 35.5 to 58.5% compared to 48.9% increase in JL 24 and 91.7% in Somnath. JL 24 is a representative early-maturing variety and therefore, the three new varieties could be considered of similar maturity duration.

Table 1. Comparison of 100-seed mass (g) of groundnut varieties ICGV 96466, ICGV 96468 and ICGV 96469 with control cultivar JL 24 at 1470°Cd and 1605°Cd harvests during 1996–2001 at ICRISAT, Patancheru, India.

				Control	
Environment[1]	ICGV 96466	ICGV 96468	ICGV 96469	JL 24	Somnath
1470°Cd harvest					
PR 1996/97	55	72	68	53	72
R 1997	50	56	50	43	49
R 1998	33	40	34	28	41
Mean	46	56	51	41	54
Increase (%) over JL 24	12	37	24		
1605°Cd harvest					
PR 1997/98	68	75	59	53	70
PR 1998/99	56	70	53	51	73
PR 1999/2000	48	52	41	42	55
PR 2000/01	42	51	41	35	50
Mean	54	62	49	45	62
Increase (%) over JL 24	20	38	9		

1. PR = Postrainy season; R = Rainy season.

Table 2. Pod yield of early-maturing large-seeded groundnut varieties at 1470°Cd in the rainy season (R) and postrainy season (PR) during 1996–99 at ICRISAT, Patancheru, India.

	Pod yield (t ha^{-1})					Increase (%) over control	
Variety	R 1997	R 1998	R 1999	PR 1996/97	Mean	JL 24	Somnath
ICGV 96466	2.41	1.55	2.00	3.94	2.48	8.3	21.6
ICGV 96468	2.17	1.80	1.47	4.08	2.38	3.9	16.7
ICGV 96469	2.66	2.07	2.39	3.76	2.72	18.8	33.3
JL 24 (control)	2.02	1.78	1.48	3.89	2.29		
Somnath (control)	1.81	1.67	1.37	3.33	2.04		
SE±	0.062	0.087	0.263	0.112			
Trial mean	2.12	1.71	1.23	3.79			
CV (%)	4.1	7.0	2.8	5.1			

Table 3. Pod yield of early-maturing large-seeded groundnut varieties at 1605°Cd in the postrainy season during 1997–2000 at ICRISAT, Patancheru, India.

	Pod yield (t ha^{-1})				Increase (%) over control	
Variety	1997/98	1998/99	1999/2000	Mean	JL 24	Somnath
ICGV 96466	3.83	3.55	2.71	3.36	–1.5	–14.1
ICGV 96468	4.01	4.21	2.79	3.67	7.6	–6.1
ICGV 96469	4.77	4.33	3.84	4.31	26.4	10.2
JL 24 (control)	4.06	3.30	2.87	3.41		
Somnath (control)	4.33	3.79	3.61	3.91		
SE±	0.084	0.120	0.177			
Trial mean	4.21	3.73	3.07			
CV (%)	2.8	4.5	5.7			

Table 4. Morphological, agronomical and seed quality traits of three high-yielding groundnut varieties.

Characteristics	ICGV 96466	ICGV 96468	ICGV 96469
Cultivar group	Spanish	Spanish	Spanish
Growth habit	Erect	Erect	Erect
Branching pattern	Sequential	Sequential	Sequential
Stem pigmentation	Absent	Absent	Absent
No. of primary branches[1]	4	5	6
No. of secondary branches[1]	0	0	0
Plant height and breadth[1] (cm)	19.8, 35.4	20.8, 38.6	23.0, 42.8
Leaf characters			
Size	Medium	Medium	Medium
Shape	Elliptic	Elliptic	Elliptic
Color	Light green	Light green	Light green
Flower color			
Standard	Orange	Orange	Orange
Crescent	Garnet	Garnet	Garnet
Crescent mark	Orange	Orange	Orange
Wing petal	Yellow	Yellow	Yellow
Pod characters			
Pod beak	Slight–moderate	Moderate–prominent	Absent
Pod constriction	Slight	Slight–moderate	Absent–slight
Pod reticulation	Moderate	Moderate	Slight
Pod ridge	Moderate	Moderate	Moderate
Pod length[2] (cm)	2.24	2.69	2.06
Pod breadth[2] (cm)	0.99	1.23	1.10
Seeds per pod	2-1	2-1	2-1
Shelling outturn[3] (%)	74	69	71
Seed characters			
Seed length[2] (cm)	1.11	1.31	1.09
Seed breadth[2] (cm)	0.62	0.68	0.72
100-seed mass[3] (g)	54	62	49
Seed color	Tan	Tan	Tan
Quality characters			
Oil[4] (%)	48.5	47.8	48.6
Protein[4] (%)	26.3	26.4	22.4
Maturity[5] (days)	100	100	100

1. Recorded on the postrainy season crop 2000/01 at 90 days after sowing at ICRISAT, Patancheru, India.
2. Recorded on the postrainy season crop 2000/01 at ICRISAT, Patancheru; average of 20 pods/seeds.
3. Average of four seasons at 1605°Cd.
4. Recorded in the postrainy season crop 2000/01.
5. Recorded on the rainy season crop at ICRISAT, Patancheru.

Plant characters

The groundnut varieties ICGV 96466, ICGV 96468 and ICGV 96469 are distinct from each other. A detailed description of these varieties is given in Table 4.

Prospects

ICGV 96466, ICGV 96468 and ICGV 96469 are large-seeded, early-maturing and high-yielding varieties. These can be used as parents in groundnut breeding. The varieties can also be evaluated for direct use as commercial cultivars, particularly in short groundnut cropping environments. Small quantity of seeds of these varieties for research purpose can be obtained from the genebank at ICRISAT, Patancheru.