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A HIGH YIELDING, EARLY MATURING GROUNDNUT VARIETY SUITABLE FOR BOTH RAINFED AND IRRIGATED CONDITIONS

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ABSTRACT

A study was carried out to identify an early maturing groundnut variety adaptable to Anuradhapura district and Mahaweli 'H' area. Nine genotypes of groundnut along with the check varieties 'Tissa' and 'Indi' were used in a Randomized Complete Block Design with three replications during *maha* 2001/02, *yala* 2002 and *maha* 2002/03 seasons at FCRDI, Mahailluppallama. Results showed that the average pod yield (4.10 mt/ha) of the genotype ICGV93261 over three seasons was 21 and 29% higher than that of the varieties 'Tissa' (3.40 mt/ha) and Indi (3.20 mt/ha) respectively. Trials conducted in farmer's fields during three seasons showed that the genotype ICGV93261 out yielded 'Indi' by 31%. The majority of pods were two-seeded with an average shelling out-turn of 74%. ICGV93261 had bolder seed with pink color and the 100-seed mass of 53g while 46g in 'Tissa'. This new genotype rated a mean score of 3 for rust compared to 9 for 'Tissa' at a 1-9 disease rating scale. The study concluded that the new genotype ICGV93261 is early maturing (90 days) and high yielding, therefore, ICGV93261 is a potential cultivar for both rainfed and irrigated conditions in the Anuradhapura district and Mahaweli 'H' area.

KEYWORDS: Early maturing, Groundnut rainfed and irrigated cultivation.

INTRODUCTION

Groundnut (*Arachis hypogea*) is an oil crop grown in Sri Lanka occupying nearly 11,383 ha that produced only about 6,587 mt with an average yield of about 0.59 mt/ha (Census and Statistics, 2003). A large extent of groundnut cultivation is found in the districts of Hambantota, Kurunegala, Moneragala, Puttlam, and Vanni. (table 1). There is a good scope to increase the extent of groundnut cultivation in Anuradhapura district and Mahaweli 'H' area. More than 50% of the lowland paddy fields in the dry zone are left fallow during the dry

season (March-July) mainly due to water scarcity (Jayawardena *et al.*, 1996). Panabokke (1989) reported that the well-drained reddish brown earths (RBEs) have no limitations for growing other field crops (OFC) during the dry season (*yala*) under irrigation. Further, he recommended that the planting-to-harvest duration of the dry season, non-rice crops should be restricted up to a 110 days period. Further, studies showed that the OFCs such as cowpea, mungbean, blackgram and pigeonpea can be successfully grown in the fallow paddy lands during the dry season (Jayawardena *et al.*, 1996). Therefore, one of the possible approaches to increase groundnut cultivation is to fit the short-duration groundnut (*Arachis hypogea*) crop into the pattern of intensive rotation of rice crop. Groundnut and cowpea are relatively more tolerant to drought than mungbean (Pandey *et al.*, 1984). The Department of Agriculture released three groundnut varieties namely 'Tissa', 'Indi' and 'Walawa' (Recommended Department of Agriculture, 2000), and their special characters are given in table 2. Though variety 'Tissa' is an early maturing, the rust disease causes considerable damage to the crop resulting in heavy crop losses. Among the recommended varieties, 'Indi' is widely cultivated because of high yield, its attractive seed colour (Red or pink colour seed is preferred by consumers) and high tolerance to less favorable conditions. With the availability of short-duration varieties, cultivation of groundnut may become more popular as it could be grown under both rainfed and irrigated conditions. Hence for cultivating groundnut, the *yala* season offers a good opportunity of using the fallow rice fields, which otherwise would remain uncultivated throughout the dry season. Therefore, the objective of this study was to identify an early maturing groundnut variety adaptable to the area.

MATERIALS AND METHODS

The present experiment was carried out for two years during *maha* 2001/02, *yala* 2002 and *maha* 2002/03 seasons at the Field Crops Research and Development Institute, Mahailluppallama. Nine genotypes of groundnut received from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the recommended early maturing (90 days) variety 'Tissa' and medium duration variety 'Indi' (90-105 days) popular among farmers were raised in a Randomized Complete Block Design with three replications. The experiment was conducted on reddish brown soil with pH range of 6.5-7.5 containing 1.5 percent of organic matter. Each genotype was grown in four rows, each of 4m length, with a spacing of 45 cm between rows and 15cm within rows. The cultivation practices were in accordance with the recommendation of the Department of Agriculture. Before sowing, seeds were treated with Captan (at 3g. kg^{-1} seed) to prevent seedling diseases. The crop was irrigated as and when needed during *yala*

season while the crop was grown completely under rainfall during *maha* season. Data were obtained for days to 50% flowering, plant height at maturity, number of pods per plant, 100 seed mass, shelling percentage and pod yield. Five randomly selected plants from each plot were tested for plant height and number of pods per plant. Net plot was harvested and the pod yield per hectare was calculated. Diseases were rated on a 1-9 disease rating scale where 1= no disease and 9= 80-100% disease incidence. MSTAT Statistical package was used for the analysis of data. Means were compared by Duncan's Multiple Range Test at $P \leq 0.05$ level.

Promising lines (table 4) selected from the station trials along with the check variety Indi were further subjected to adaptive research trials in farmers fields in Anuradhapura area during *yala* 2002 season (at 2 sites, both in uplands and in fallow rice fields), *maha* 2002/03 (at 2 sites, in uplands) and *yala* 2003 (at 2 sites, both in uplands and in fallow rice fields).

Table 1. The area under cultivation and productivity of groundnut in different districts during 2003.

District	*Yala 2002*		*Maha 2002/03*	
	Area (ha)	*Production (mt)*	*Area (ha)*	*Production (mt)*
Hambantota	62	28	796	373
Kurunegala	335	132	395	177
Moneragala	129	107	2133	2284
Puttlam	319	157	524	168
Vanni	339	169	1917	305
Anuradhapura	61	54	405	214

Source: Department of Census and Statistics

Table 2. Important characteristics of the recommended groundnut varieties.

Character	*Varieties*		
	Tissa	*Indi*	*Walawa*
Days to mature (days)	90-100	100-105	125-135
Seed colour	Tan	Pink	Tan
100 seed weight (g.)	33-40	55-58	69-71
Potential yield (mt/ha)	3.8	3.9	3.5

Source: Recommended Field Crop Varieties, DOA, January 2000

RESULTS AND DISCUSSION

Pod yield

(a). Rainfed seasons (*maha* 2001/02 and *maha* 2002/03)

The yield potential of 11 genotypes was tested under rainfed condition during *maha* 2001/02 and *maha* 2002/03 at the FCRDI, Mahailluppallama. The yield performance of the tested genotypes was poor in *maha* 2002/03 due to heavy rainfall received during the flowering stage of the crop. The total rainfall received during the season was 1,448 mm (Meteorology Records, MI). Genotypes showed highly significant differences for pod yield (table 3). The genotype ICGV93261 recorded the highest yield during both seasons. The mean yield of ICGV93261 was 3.63 mt/ha in both *maha* seasons as compared to 2.72 and 2.88 mt/ha for the check varieties 'Tissa' and 'Indi' respectively (table 3). It was significantly better than 'Tissa' and 'Indi' with 33% and 26% respectively superiority in pod yields. This clearly brings out the superiority of the genotype ICGV93261.

Table 3. Yield performance of the tested groundnut genotypes at the FCRDI, MI.

Genotype	*Pod Yield (mt/ha)*					
	Maha 2001/02	*Yala 2002*	*Maha 2002/2003*	*Mean*	*Yield increase over (%)*	
					Tissa	*Indi*
ICGV92113	4.28 bcd	4.54 abcd	1.69 abc	3.50	+2	+9
ICGV92116	3.83 d	4.15 cde	1.83 ab	3.27	-4	+2
ICGV92121	4.00 cd	3.27 efg	0.84 f	2.70	-21	-16
ICGV92126	3.12 e	3.14 fg	1.06 ef	2.44	-21	-24
ICGV93255	3.98 cd	4.09 cde	1.72 abc	3.26	-5	+2
ICGV93260	4.44 bc	2.73 g	1.25 cdef	2.81	-18	-12
ICGV93261	5.19 a	5.17 a	2.07 a	4.14	+21	+29
ICGV93277	4.29 bcd	5.11 ab	1.82 ab	3.74	+10	+17
ICGV86015	4.67 b	4.26 bcd	1.63 abcd	3.52	+3	+10
Tissa (check)	4.30 bcd	4.80 abc	1.15 def	3.42	-	+7
Indi (check)	433 bcd	3.84 bef	1.44 bcde	3.20	-6	-
Mean	4.01	4.19	1.50			
CV %	7.63	12.48	20.63			

Mean values followed by a common letter in a column are not significantly different.

(b). Irrigated season (*yala* 2002)

The performance of the tested genotypes was also evaluated under irrigated condition during *yala* 2002 in well-drained fallow paddy fields. An

average yield of 5.17 mt/ha was recorded by the genotype ICGV93261 as compared to 4.80 mt/ha in 'Tissa' and 3.84 mt/ha in 'Indi' (table 3). The yield increases were 7 and 35% over 'Tissa' and 'Indi' respectively.

Farmer field trials

The yield potential of promising genotypes selected from the station trial was tested in farmer fields in Anuradhapura district both in paddy fields and uplands (table 4) during three consecutive seasons. Yield performance of the tested genotypes at Nelubewa site during *yala* 2002 was low due to poor irrigation facilities. An average yield of 3.02 mt/ha was recorded by ICGV93261 as compared to 2 32 mt/ha for 'Indi', which is popular variety among the farmers and recorded 30% yield increase. Farmer preference was high for the genotype ICGV93261.

The results showed that the genotype ICGV93261 recorded higher yields than the check varieties both under rainfed and irrigated conditions. Due to its consistent higher yields over seasons and locations, the genotype ICGV93261 could be introduced to cultivate in both rainfed and irrigated condition. Seed shape and seed size of the genotype ICGV 93277 was not uniform. Thus, farmers showed poor preference to the ICGV 93277.

Plant and seed characters

The seeds characters of the genotype ICGV93261 and the check varieties are given in Table 5. ICGV93261 was comparable to the check variety 'Tissa' in 50% flowering, plant height at maturity, number of pods per plant and 100 seed mass but its shelling out-turn (75%) was significantly inferior to the variety 'Tissa'. Moreover ICGV93261 was comparable to the check variety 'Indi' in plant height at maturity, number of pods per plant and shelling out-turn, but it's 50% flowering and 100 seed mass were significantly inferior to the variety 'Indi'. The genotype 93261 was comparable to 'Tissa' in maturity that matured almost at the same time (90 days).

Reaction to rust disease

Rust disease becomes most serious in warm-humid weather condition and records heavy yield losses. The genotypes were tested for rust disease and ICGV93261 was rated a mean score of 3 for rust compared to 9 for 'Tissa' and 7 for 'Indi' on the 1-9 disease rating scale (table 5). It showed that the genotype

ICGV 93261 had high tolerance to the rust disease compared to the check varieties.

Table 4. Yield performance of promising groundnut genotypes at farmer fields.

Season & Location	*Pod Yield (mt/ha)*			
	ICGV93261	*ICGV93277*	*Indi*	*Mean*
Yala 2002				
Nelubewa	1.86	1.88	1.56	1.77
Alankulama	5.60	4.14	4.46	4.73
Mean	3.73	3.02	3.01	
Maha 2002/03				
Perimeankulam	2.35	2.19	1.46	2.00
Alankulama	2.71	2.85	2.25	2.60
Mean	2.53	2.52	1.85	
Yala 2003				
Nelubewa	2.38	2.10	1.89	2.13
Hidogama	3.24	2.37	2.30	2.64
Mean	2.81	2.23	2.10	

Table 5. Important growth attributes and yield components of the tested groundnut genotypes during *maha* 2001/02.

Genotype	*50% flowering (days)*	*Plant height at maturity (cm)*	*Number of pods per plant*	*100 seed mass (g)*	*Shelling Out-turn (%)*	*Rust disease score*
ICGV92113	33 b	48 bc	25.8 de	53.4 c	76 bc	5
ICGV92116	33 b	48 bc	22.3 fg	58.9 b	75 cd	3
ICGV92121	34 a	47 c	23.6 ef	63.3 a	78 a	0
ICGV92126	34 a	57 a	19.4 gh	58.8 b	75 cd	7
ICGV93255	34 a	49 bc	17.0 h	51.6 cd	77 ab	0
ICGV93260	29 e	45 c	25.8 de	52.3 cd	74 d	3
ICGV93261	29 e	47 c	30.6 ab	48.9 de	75 cd	3
ICGV93277	33 b	53 ab	26.6 cde	48.6 de	77 ab	0
ICGV86015	33 b	47 c	26.6 cde	50.9 cd	76 bc	7
Tissa (check)	32 c	45 c	32.0 a	46.0 e	78 a	9
Indi (check)	30 d	49 bc	28.6 bcd	57.4 b	74 d	7
Mean	32.2	49.6	25.9	53.9	75.8	
CV %	0.7	5.9	7.1	4.2	1.0	

Mean values followed by a common letter in a column are not significantly different.

CONCLUSION

The studies revealed that the ICRISAT groundnut genotype ICGV93261 performed well in both rainfed and irrigated conditions and highly preferred by the farmers. Further, the genotype ICGV 93261 was early maturing (90 days) and showed high tolerance to the rust disease. In shelling out-turn, it was inferior with 75% as compared to 78% of the check variety Tissa and comparable with the variety Indi (74%). ICGV93261 could be identified as a potential candidate to introduce into farming systems in Anuradhapura and Mahaweli 'H' area. Even though ICGV 93277 ranked second in pod yield, farmer preference was poor due to its irregular seed shape and size.

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