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Agronomic Evaluation of Groundnut Advanced Varietal Entries with Varieties, Varied Fertilizer Levels and Spacing

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ABSTRACT

Field experiment was conducted during *Rabi/Summer* season of 2009-10, 2010-11 and 2011-12, at Coconut Research Station, Aliyarnagar, Tamil Nadu, India, to evaluate the best suited advanced varietal entries for improving pod yield in Pollachi tract of Tamil Nadu. Three factors mainly, Varieties (3), Fertilizer levels (3 viz., 125 %, 100 % and 75 % of Recommended Dose of Fertilizers, 25:50:75 kg ha⁻¹ of NPK) and Spacing (two levels, 30 x 10 cm and 30 x 15 cm) in Factorial Randomized Block Design (FRBD) with three replications. Results of three years of experimentation with AVT entries J 71 (first year), ICGV 95386 (second year), Dh 216 (third year) are as follows, during first year pod yield recorded with VRI-2 (1751 kg ha⁻¹) and J-71 (1877 kg ha⁻¹) were on par with each other followed by ALR-3 (1505 kg ha⁻¹). Among different fertilizer levels application of 125 % (1878 kg ha⁻¹) and 100 % (1831 kg ha⁻¹) RDF recorded highest pod yield followed by 75 % of RDF (1425 kg ha⁻¹). Experimental results of second year revealed that pod yield recorded with medium bold culture ICGV 95386 (3820 kg ha⁻¹) was 57.9 and 75.8 per cent higher over TMV 13 (2420 kg ha⁻¹) and VRI-6 (2173 kg ha⁻¹), respectively. Application of 125 % RDF (3187 kg ha⁻¹) produced 20.9 and 40.7 per cent higher pod yield over RDF 75 % (2034 kg ha⁻¹) and 100 % (2460 kg ha⁻¹) and was comparable with each other. Spacing of 30 x 10 cm recorded higher pod yield of 3015 kg ha⁻¹ over spacing of 30 x 15 cm (2592 kg ha⁻¹). During third year experimentation AVT entry Dh 216 recorded higher pod and kernel yield (3216 kg ha⁻¹, 2189 kg ha⁻¹ respectively) as compared to VRI 6 (2861 kg ha⁻¹, 1757 kg ha⁻¹ respectively) and TMV 13 (2759 kg ha⁻¹, 1982 kg ha⁻¹, respectively). Spacing of 30 x 15 cm recorded significantly higher pod and kernel yield (3221 kg ha⁻¹ and 2098 kg ha⁻¹) as compared to 30 x 10 cm spacing (2670 kg ha⁻¹ and 1725 kg ha⁻¹) and application of 75, 100 and 125 % of RDF recorded no significant difference among treatments. Among three AVT entries J-71, ICGV 95386 and Dh 216, J-71 experimented agronomically for higher yield, J-71 was on par with VRI -2, Medium bold ICGV 95386 and Dh 216 recorded significantly higher yield than the other two high yielding groundnut varieties and were promising for promotion as a high yielding variety.

Keywords

Recommended
Dose of fertilizer,
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Introduction

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop of India. In India, Groundnut is cultivated in 26.4 M ha contributing 37.1 million tonnes out of total world production (Central Statistics Office, 2008). Groundnut is known for its rich source of vegetable fats, protein and also for its use as cattle feed and concentrated organic manure.

It can be grown in tropical, sub-tropical and warm temperate regions (Sogut *et al.*, 2016) with average yield of 1520 kg ha⁻¹ (FAOSTAT, 2011). Choice of the variety plays a significant role in groundnut production. Some of the groundnut varieties have shown that low source and sink relationship resulted in formation of more unfilled pods and lesser seed yield.

Fertility management is another key principle in maximizing groundnut yield. Parasuraman *et al.*, (1998) reported higher availability of plant nutrients consequently had higher growth parameters in the fertilized treatments and higher yield of groundnut. Remunerative responses of groundnut crop to fertilizer application have been observed both under irrigated and rainfed conditions in India (Kanwar *et al.*, 1983). Increase in groundnut yield due to the application of NPK was also reported by Angadi *et al.*, (1990). Plant density is highly associated with yield potential and optimum plant density per unit area is an important non-monetary input to decide the maximum groundnut productivity.

Yield is a function of plant density and there is a considerable scope for increasing the yield by adjusting the plant density to an optimum level (Chaniyara, 2001). Hence, this study was done to evaluate the response of new AVT entries for different spacing and fertilizer levels in comparison with already existing varieties.

Materials and Methods

Field experiments were conducted at Coconut Research Station, Aliyarnagar during Rabi/Summer 2009-10, 2010-11 and 2011-12 with three different AVT entries namely J-71, ICGV 95386 and Dh 216, respectively. The experimental field soil was sandy clay loam with organic carbon content of 0.25 %. The nutrient status of the soil was low in available nitrogen 272 kg ha⁻¹, medium in available phosphorus 20.6 kg ha⁻¹ and high in available potassium 420 kg ha⁻¹ with soil EC of 0.08 dSm⁻¹ and pH of 7.12. The experiment was laid out in Factorial Randomized Block Design with three replications and plot size of 20 m² (4 x 5 m²). For fertilizer levels, 100 %, 125 % and 75% of recommended dose of NPK (17:35:54 kg ha⁻¹) were applied as basal. 12.5 t ha⁻¹ of FYM was applied as basal. Gypsum @ of 400 kg ha⁻¹ was applied in two equal splits of 200 kg ha⁻¹ as basal and 200 kg ha⁻¹ as top dressing at 45 DAS during earthing up.

Two different spacing of 30 x 10 cm and 30 x 15 cm were experimented. During first year AVT entry J-71 was compared with VRI 2 and ALR 3, second year AVT entry ICGV 95386 was compared with VRI-6 and TMV 13 and for third year AVT entry Dh 216 was compared with VRI-6, and TMV 13. The collected data were statistically analyzed using the method Gomez and Gomez (1984) and data interpreted where ever significance observed.

Results and Discussion

AVT Culture – J-71, Varieties – VRI 2 and ALR 3 (Table 1)

The results of field experiment conducted during 2009-10, recorded that 100 seed weight was significantly highest with ALR-3 (40.2) and VRI 2 (38.1) followed by J-71 (32.5). There was no response for different fertilizer levels. The variety VRI-2 (87.53) and AVT

entry J-71 (83.62) recorded significantly higher number of pods followed by ALR-3 (79.65). The fertilizer level 125 % (86.67) and 100 % (83.77) RDF recorded highest number of pods followed by 75 % (80.37) of fertilizer RDF.

The shelling percentage was influenced only by different fertilizer levels. The highest shelling percentage was recorded with 125 (62.82) and 100 (60.42) % RDF followed by 75 (53.42) % RDF. The Pod yield recorded with VRI-2 (1751 kg ha⁻¹) and J-71 (1877 kg ha⁻¹) were on par with each other followed by ALR-3 (1505 kg ha⁻¹).

Among different fertilizer levels the application of 125 % (1878 kg ha⁻¹) and 100 % (1831 kg ha⁻¹) RDF recorded highest pod yield followed by 75 % of RDF (1425).

For haulm yield in kg ha⁻¹ the significantly best treatment was ALR-3 (7937 kg ha⁻¹) followed by VRI-2 (3411 kg ha⁻¹) and J-71 (3288 kg ha⁻¹). Among different fertilizer levels 125 (5376 kg ha⁻¹) % of RDF recorded significantly higher haulm yield followed by 100 (4825 kg ha⁻¹) and 75 (4436 kg ha⁻¹) % of RDF.

The results are in confirmation with the findings of Subrahmaniyan *et al.*, (2000) that increased dose of NPK fertilizers up to 150 per cent of the RDF (26:51:81 kg NPK ha⁻¹) recorded significantly higher plant height, greater number of matured pods per plant, higher 100 kernel weight, shelling percentage, sound matured kernel percentage and pod yield of groundnut.

AVT Culture – ICGV 95386, Varieties – VRI 6 and TMV13 (Table 2)

The results of the field experiment conducted during 2010-2011, revealed that there was significant difference in yield attributes like

Sound matured kernels and shelling percentage.

The varieties VRI 6 (89.1) and TMV 13 (88.8) recorded significantly higher SMK than AVT entry ICGV 95386 (87.2) and were comparable with each other. Application of 125 % RDF registered highest SMK of 92.9 than 100 % (90.0).

Spacing of 60 x 15 cm recorded higher SMK (89.8) than 30 x 15 cm (88.3). Highest shelling percentage was recorded with AVT entry ICGV 95386 (62.62) followed by TMV 13 (60.81) and then by VRI 6 (57.23). 125 % RDF recorded (62.85) higher shelling percentage followed by 100 % RDF (60.24) and 75 % RDF (57.58). The shelling percentage was higher with 30 x 10 cm (62.34) than 30 x 15 cm (58.11).

ICGV 95386 recorded highest pod weight per plant 15.25 g followed by TMV 13 (9.43g) and VRI 6 (8.76 g). Similar trend was observed with kernel yield also. ICGV 95386 recorded 2402 kg ha⁻¹ followed by TMV 13 (1486 kg ha⁻¹) and VRI 6 (1252 kg ha⁻¹). 125 % RDF recorded highest kernel yield (2025 kg ha⁻¹) followed by 100 % (1676 kg ha⁻¹) and 75 % (1439 kg ha⁻¹).

Spacing of 30 x 10 cm recorded higher kernel yield of 1899 kg ha⁻¹ than 30 x 15 cm with 1527 kg ha⁻¹. Pod yield recorded with ICGV 95386 (3820 kg ha⁻¹) was 57.9 and 75.8 per cent higher over cv. TMV 13 (2420 kg ha⁻¹) and VRI-6 (2173 kg ha⁻¹), respectively.

The application of 125 % RDF (3187 kg ha⁻¹) produced 20.9 and 40.7 per cent higher pod yield over RDF 75 % RDF (2034 kg ha⁻¹) and 100 % (2460 kg ha⁻¹) which is comparable with each other. The spacing of 30 x 10 cm recorded higher pod yield of 3015 kg ha⁻¹ over the spacing of 30 x 15 cm (2592 kg ha⁻¹).

Table.1 Effect offertilizer levels and spacing on yield parameters of Groundnut AVT entry J -71 and varieties VRI 2 and ALR 3

Treatments		Shelling percentage	Sound matured kernels (Nos.)	Matured Pods Plant ⁻¹ (Nos.)	100 seed weight (g)	Pod yield (kg ha ⁻¹)	Haulm yield ((kg ha ⁻¹))
V₁ – ALR-3		61.83	79.65	12.47	40.20	1508	7988
V₂ – J-71		55.65	83.62	15.52	32.53	1877	3288
V₃ – VRI-2		59.17	87.53	15.23	38.04	1751	3411
<i>SE d</i>		2.73	3.84	0.72	1.71	82	251
CD (P=0.05)		NS	NS	1.46	3.46	167	511
F₁ – 75 % RDF		53.42	80.37	11.52	35.07	1426	4436
F₂ – 100 % RDF		60.42	83.77	15.22	36.71	1831	4825
F₃ - 125 % RDF		62.82	86.67	16.48	38.99	1878	5376
<i>SE d</i>		2.73	3.84	0.72	1.71	82	251
CD (P=0.05)		5.55	NS	1.46	NS	167	511
S₁ – 30 x 10 cm		58.13	82.96	14.12	36.53	1694	4833
S₂ – 30 x 15 cm		59.64	84.25	14.69	37.32	1728	4924
<i>SE d</i>		2.23	3.14	0.58	1.39	67	205
CD (P=0.05)		NS	NS	NS	NS	NS	NS
<i>VF</i>	<i>SE d</i>	4.73	6.66	1.24	2.95	142	435
	CD (P=0.05)	NS	NS	NS	NS	NS	NS
<i>FS</i>	<i>SE d</i>	3.86	5.43	1.01	2.41	116	355
	CD (P=0.05)	NS	NS	NS	NS	NS	NS
<i>VS</i>	<i>SE d</i>	3.86	5.43	1.01	2.41	116	355
	CD (P=0.05)	NS	NS	NS	NS	NS	NS
<i>VFS</i>	<i>SE d</i>	6.67	9.41	1.75	4.17	201	615
	CD (P=0.05)	NS	NS	NS	NS	NS	NS

Table.2 Effect of fertilizer levels and spacing on yield parameters of Groundnut AVT entry ICGV 95386 and varieties VRI 6 and TMV 13

Treatment		Shelling percentage	Sound matured kernels (Nos.)	Pod weight plant ⁻¹ (g)	Kernel yield (kg ha ⁻¹)	Pod yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
V₁ – VRI 6		57.23	88.8	8.76	1252	2172	3805
V₂ – ICGV 95386		62.62	87.2	15.25	2402	3820	4806
V₃ – TMV 13		60.81	89.1	9.43	1486	2420	4342
SEd		0.62	0.9	0.51	69	107	108
CD (0.05)		1.26	1.7	1.04	141	NS	220
F₁ – 75 % RDF		57.58	84.4	10.01	1439	2473	3660
F₂ – 100 % RDF		60.24	90.0	10.82	1676	2751	4005
F₃ – 125 %RDF		62.85	92.9	12.61	2025	3187	4342
SEd		0.62	0.85	0.51	69	107	108
CD (0.05)		1.26	1.73	1.04	141	217	220
S₁ – 30 x 10 cm		62.34	88.3	12.00	1899	3015	4172
S₂ – 30 x 15 cm		58.11	89.8	10.29	1527	2592	3833
SEd		0.51	0.70	0.42	56	87	88
CD (0.05)		1.03	1.41	0.85	115	177	179
VF	SEd	1.07	1.48	0.89	98	185	187
	CD (0.05)	NS	NS	NS	NS	NS	NS
FS	SEd	0.87	1.21	0.73	120	151	153
	CD (0.05)	NS	NS	NS	NS	NS	NS
VS	SEd	0.874	1.21	0.73	98	151	153
	CD (0.05)	1.78	NS	1.47	NS	307	310
VFS	SEd	1.51	2.09	1.26	170	262	264
	CD (0.05)	NS	NS	NS	NS	NS	NS

Table.3 Effect of fertilizer levels and spacing on yield parameters of Groundnut AVT entry Dh 216 and varieties VRI 6 and TMV 13

Treatment		Shelling percentage	Sound Matured kernels (Nos.)	Pod weight plant ⁻¹ (g)	Pod yield (kg ha ⁻¹)	Kernel yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
V₁ – VRI 6		60.70	93.33	20.40	2862	1757	4258
V₂ – Dh 216		67.99	95.50	24.94	3216	2189	4805
V₃ – TMV 13		64.68	95.61	19.22	2759	1788	4251
SEd		1.17	0.79	0.75	120	88	145
CD (0.05)		2.38	1.62	1.53	243	179	294
F₁ – 75 % RDF		64.04	95.38	18.74	2917	1857	4330
F₂ – 100 % RDF		64.21	95.40	18.89	2852	1895	4487
F₃ – 125 %RDF		64.06	95.33	18.78	3068	1982	4497
SEd		1.17	0.79	0.75	120	88	145
CD (0.05)		NS	NS	NS	NS	NS	NS
S₁ – 30 x 10 cm		63.84	94.78	20.95	2670	1724	4048
S₂ – 30 x 15 cm		65.07	94.85	22.10	3221	2098	4828
SEd		0.95	0.65	0.61	98	72	118
CD (0.05)		NS	NS	NS	199	146	240
VF	SEd	2.02	1.38	1.30	208	152	250
	CD (0.05)	4.12	NS	2.65	NS	NS	NS
FS	SEd	1.65	1.12	1.06	169	124	204
	CD (0.05)	3.36	NS	2.16	NS	253	NS
VS	SEd	1.65	1.12	1.06	169	124	204
	CD (0.05)	NS	NS	NS	344	253	416
VFS	SEd	2.86	1.94	1.84	293	215	354
	CD (0.05)	NS	NS	NS	NS	NS	NS

The reduction in pod yield in 75% plant density (2.5 lakhs plants ha⁻¹) with under rows spacing might be due to the cover plant population per unit areas (Kalra *et al.*, 1984). Closer spacing of 30 x 10 cm (100% plant density) was found to be more economical in groundnut than wider spacing as reported by Ramesh and Sabale, 2001.

AVT Culture – Dh 216, Varieties – VRI 6 and TMV 13 (Table 3)

From the field experiment conducted during 2011-12, the results obtained showed that AVT entry and varieties differed significantly among themselves with pod yield, kernel yield and haulm yield. The shelling percentage recorded with Dh 216 (67.99) was significantly higher than TMV 13 (64.68) and VRI 6 (60.70). Sound matured kernels recorded with TMV 13 (95.61) and Dh 216 (95.50) was higher and comparable with each other followed by VRI 6 (93.33). The pod weight per plant was highest with Dh 216 (24.94 g) followed by TMV 13 (19.22 g) and VRI 6 (20.40 g). The different levels of RDF and spacing recorded no significant difference among themselves for shelling percentage, SMK and pod weight per plant. The AVT entry Dh 216 recorded higher pod and kernel yield (3216 kg ha⁻¹, 2189 kg ha⁻¹, respectively) compared to VRI 6 (2861 kg ha⁻¹, 1757 kg ha⁻¹, respectively) and TMV 13 (2759 kg ha⁻¹, 1982 kg ha⁻¹, 0.42, respectively). Groundnut showed good response to wider spacing and no response to different fertilizer levels. Spacing of 30 x 15 cm recorded significantly higher pod and kernel yield (3221 kg ha⁻¹ and 2098 kg ha⁻¹) as compared to 30 x 10 cm spacing (2670 kg ha⁻¹ and 1725 kg ha⁻¹). Cultivar Dh 216 produced highest dry pod and kernel yield with wider spacing of 30 x 10 cm (3463 kg ha⁻¹ and 2501 kg ha⁻¹, respectively). Similar results of higher pod yield of groundnut due to optimum plant population reported by Agasimani *et al.*, (1984) and

Hameed Ansari *et al.*, (1993) in concomitant to this result. Application of 75, 100 and 125 % of RDF showed no significant difference among themselves.

The AVT entry J-71 when evaluated with varieties VRI 2 and ALR 3, recorded highest pod yield and was comparable with VRI 2. Among different fertilizer levels the application of 125 % and 100 % RDF recorded highest pod yield followed by 75 % of RDF. Pod yield recorded with ICGV 95386 was 57.9 and 75.8 per cent higher over cv. TMV 13 and VRI-6, respectively. Application of 125 % RDF produced 20.9 and 40.7 per cent higher pod yield over RDF 75 % and 100 % which is comparable with each other. The spacing of 30 cm x 10 cm recorded the higher pod yield over the spacing of 30 x 15 cm. The AVT entry Dh 216 recorded higher pod and kernel yield and higher harvest index compared to VRI 6 and TMV 13. Spacing of 30 x 15 cm recorded significantly higher pod and kernel yield as compared to 30 x 10 cm.

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