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RESPONSE OF GROUNDNUT (*ARACHIS HYPOGAEA* L.) VARIETIES TO SOWING DATES AND NP FERTILIZERS UNDER WESTERN DRY ZONE OF INDIA

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Abstract

An experiment was conducted during *Kharif* seasons of 2009 and 2010 on groundnut (*Arachis hypogaea* L.) under western dry zone of India following a split-plot design with four dates of sowing (April 20, May 15, June 9 and July 4) and two varieties (HNG 10 and TG 37A) in main- plot and four fertility levels (0, 20 N : 40 P_2O_5, 30 N : 60 P_2O_5 and 40 N : 80 P_2O_5 kg /ha) in sub-plot. Yield component of semi-spreading variety 'HNG 10' i.e. pods/plant, number of kernel/pod, seed index, shelling percentage and yields i.e. pod, kernel, haulm and biological yield were statistically at par with each other from April 20 to June 9 sowing and minimum yield was observed in July 4 sowing, while days to maturity reduced significantly with delay sowing. Variety 'TG 37A' sown at July 4 had significantly higher yield attributes and yields than earlier sowing. Harvest index in both the varieties was observed significantly higher in July 4 sowing. Significantly higher yield components and yields were recorded in 30 kg N-60 kg P_2O_5/ha which was statistically at par with 40 kg N-80 kg P_2O_5 /ha. On the basis of economics, June 9 sowing variety 'HNG 10' of groundnut recorded significantly higher net return.

Introduction

In the agricultural economy of India, oilseeds are important next only to food grains in terms of area, production and value. The diverse agro-ecological conditions in the country are favourable for growing all the nine annual oilseeds, which include seven edible oilseeds, *viz.* soybean, groundnut, rapeseed-mustard, sunflower, sesame, safflower, niger, and two non-edible oilseeds, *viz*. castor and linseed. Groundnut shall continue to be an important oil seed crop for the semi-arid regions if the projected demand of oils and fats has to be mat with sustainability. In dry land agriculture, farmers have limited choice for sowing time, but in irrigated situation sowing time is one of the most important non-monetary inputs affecting yield of crops (Sardana and Kandhol 2007). Several workers (Kabadagi and Setty 2010, Bala *et al.* 2011) recommended a starter dose of nitrogen until the crop starts nitrogen fixation at about 30 days stage. In the arid region of Rajasthan some workers (Hossain *et al.* 2007, Pareek and Poonia 2011) reported 60 kg N/ha along with equal level of phosphorus as the appropriate fertilizer level while others recommended 20 kg N and 32 kg P_2O_5/ha for groundnut. Kabadagi and Bala (2010) worked together in different climatic conditions including present one and sowing time and genotypes responds very well to variant climatic conditions. Considering these point in view, a study was conducted with an objective to evaluate its important agronomic traits like suitable cultivar with appropriate sowing time and optimum fertilizers for groundnut.

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Materials and Methods

Experimental trail was conducted during *kharif* season of 2009 and 2010 at Agronomy Research Farm, College of Agriculture, Bikaner (Rajasthan) under hyper arid condition. The experiment was laid out in split-plot design with three replications, assigning 32 treatments consisting of four date of sowing (April 20, May 15, June 9 and July 4) and two varieties ('HNG 10' and 'TG 37A') as main plot treatments and four levels of nitrogen and phosphorus (0, 20 N: 40 P_2O_5, 30 N: 60 P_2O_5 and 40 N: 80 P_2O_5 kg /ha) as sub-plots. Nitrogen and phosphorus were applied as per treatment through urea and SSP basally in the furrows just before sowing at a depth of 8-10 cm by "*pora*" (with the help of indigenous plough) method. The seed treated with chloropyriphos at the rate of 2.5 ml/kg before sowing. 'HNG 10' and 'TG 37A' seed were sown at the rate of 80 and 70 kg/ha, respectively. Row spacing of 'HNG 10' and 'TG 37A' was 25 and 30 cm with 5 cm depth. Gap filling and thinning was also done at appropriate stage. In addition to rainfall received during the both crop seasons 22.5, 19.5, 16.5 and 12.5 number of life saving sprinkler irrigations in 'HNG 10' and 16.5, 14.5, 13.4 and 11.5 irrigations in 'TG 37A' were given in 20 April, 15 May, 9 June and 4 July sowing, respectively. Hand weeding was done to keep the field weed free. At the time of second weeding earthing up along the rows was also done for improvement in pegging. Days to maturity was observed from sowing date to at harvested of both the varieties 'HNG 10' and 'TG 37A'. At harvest five plants were selected from net plot. Cost benefit ratio was calculated. Data were statistically analyzed using the F test (Gomez and Gomez 1984). Critical difference (CD) values at $p = 0.05$ were used for determine the significance of differences between mean values of treatments.

Results and Discussion

The results in Table 1 revealed that TG 37 A matured earlier than HNG 10. The variety 'HNG 10' being of semi-spreading type, relatively of longer duration and indeterminate growth habit and mutant variety 'TG 37A' being a bunch type short duration and determinate growth habit. These results are also in close agreement with the findings of Gouri *et al*. (2005).

The results in Table 2 indicated that long duration semi spreading variety HNG 10 was better than short duration bunch type of variety TG 37A in pods/plant and seed index. However, shelling percentage was better in TG 37 A. Yield attributes like pods/plant, seed index and consequently pod yield/ha was statistically similar when groundnut HNG 10 was sown between April 20 to June 9, and decreased thereafter significantly in July 4. However, trend was just reverse in case of TG 37 A, where July 4 sowing was significantly better in the yield attributing characters and consequently pod yield/ha than all other earlier sowing dates. This may due to variety TG 37 A has bunch type characteristic and short duration cultivar while HNG 10 was semi spreading and long duration characteristics which were fit in this sandy tract of Thar desert (Gochar 2011).

The results in Table 3 indicated that long duration semi spreading variety HNG 10 was better than short duration bunch type of variety TG 37A in pod yield, kernel yield, haulm yield, biological yield, net return and benefit cost ratio. However, harvest index was better in TG 37 A. Yields of pod yield and kernel were statistically similar when HNG 10 was sown between April 20 to June 9, and decreased thereafter significantly in July 4. The trend was just reverse in case of TG 37 A, where July 4 sowing was significantly better in the yield attributing characters, however consequently pod yield and kernel yield /ha than all other earlier sowing dates. Delay in sowing up to 4 July led to significantly lower haulm in both the varieties. Maximum haulm yield and biological yield were observed in April 20 sowing irrespective of varieties and years 'HNG 10' variety might produced higher to biomass compared to 'TG 37A', the variety being of semi-spreading type, relatively of longer duration and indeterminate growth habit and took for maturity

periods up to 190 days. On the contrary, the spanish bunch variety 'TG 37A' seem to be of determinate growth habit recorded and took for maturity around 120 days. Harvest index in both the varieties was observed significantly higher in July 4 sowing. This difference brought out in growth characters by yield attributing characters and ultimately haulm and pod yields. Economics

Table 1. Effect of sowing time and fertilizers on yield attributes, yields, harvest index and economics of groundnut (Pooled data of two years).

Treatment	No. of pods (/plant)	No. of kernel (/pod)	Shelling (%)	Seed index (g)	Pod yield (q/ha)	Kernel yield (q/ha)	Haulm yield (q/ha)	Harvest index (%)	B: C ratio
Date of sowing									
20 April	29.66	1.68	63.81	38.76	29.71	18.91	62.27	32.53	1.68
15 May	30.63	1.66	63.59	39.94	30.84	19.62	53.32	38.00	1.83
09 June	31.72	1.66	65.04	42.73	32.31	21.00	49.42	40.86	2.05
04 July	32.98	1.68	63.48	41.04	33.44	21.25	40.90	45.53	2.24
CD (p = 0.05)	1.61	NS	0.59	2.03	1.62	1.07	1.81	1.57	0.08
Varieties									
'HNG 10'	36.60	1.56	62.90	50.54	36.87	23.27	63.26	37.64	2.15
TG37-A	25.90	1.78	65.06	30.69	26.28	17.12	39.69	40.82	1.75
CD (p = 0.05)	1.14	0.06	0.42	1.44	1.15	0.76	1.28	1.11	0.05
Fertilizers (kg/ha)									
Control	27.61	1.54	62.28	37.49	28.04	17.42	47.11	38.35	1.79
20 N-40 P_2O_5 /ha	31.52	1.68	63.71	41.44	32.00	20.35	50.00	40.22	1.97
30 N-60 P_2O_5 /ha	33.73	1.74	64.78	42.07	33.53	21.70	53.65	39.78	2.05
40N-80 P_2O_5 /ha	32.13	1.72	65.15	41.47	32.74	21.31	55.15	38.57	2.00
CD (p = 0.05)	1.04	0.06	0.51	1.31	1.05	0.70	1.58	1.14	0.05

NS= Non significant.

Table 2. Interaction effect of sowing time and fertilizers on yield attributes of groundnut (Pooled data of two years).

Treatment	Days to maturity		No. of pods /plant		Seed index (g)	
	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'
Date of sowing						
20 April	190.50	121.50	37.90	21.42	51.61	25.90
15 May	165.00	111.00	37.42	23.84	50.83	29.05
09 June	141.00	109.00	37.12	26.32	52.81	32.65
04 July	116.50	107.50	33.95	32.00	46.91	35.18
Mean	153.25	112.25	36.60	25.90	50.54	30.69
CD (p = 0.05)		NS		2.27		2.88

NS= Non significant.

was calculated based on market price of dry pod @ ₹2100, 2400/q and haulm @ ₹ 350, 400/q in the year 2009 and 2010, respectively. The net returns and B: C ratios were numerically higher on 9 June sowing (₹61843/ha and 2.34) in variety 'HNG 10' and 4 July sowing (₹46365/ha and 2.18) in variety 'TG 37A'. Minimum net returns was observed in 4 July sowing (₹53291/ha) and B:C ratio (1.95) on 20 April sowing in variety 'HNG 10'. However, the variety 'TG 37A' registered

minimum net return (₹ 20354/ha) and B: C ratio (1.45) on 20 April sowing during both the years. This confirms the finding of Subrahmaniyan *et al.* (2008); Ravisankar *et al.* (2010).

Table 3. Interaction effect of sowing time and fertilizers on yields of groundnut (Pooled data of two years).

Treat-ment	Pod yield (q /ha)		Kernel yield (q /ha)		Haulm yield (q /ha)		Biological yield (q /ha)		Harvest index (%)		B : C ratio	
	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'	'HNG 10'	'TG 37A'
Date of sowing												
20 April	37.73	21.70	23.65	14.16	78.30	46.23	116.03	67.93	32.60	32.45	1.92	1.45
15 May	37.43	24.26	23.46	15.78	65.63	41.01	103.05	65.27	37.02	38.99	2.05	1.62
09 June	37.89	26.73	24.44	17.56	62.38	36.46	100.27	63.19	38.61	43.12	2.34	1.77
04 July	34.44	32.44	21.51	20.99	46.74	35.06	81.18	67.51	42.33	48.73	2.30	2.18
Mean	36.87	26.28	23.27	17.12	63.26	39.69	100.13	65.97	37.64	40.82	2.15	1.75
CD (p = 0.05)		2.30		1.52		2.56		2.73		2.22		0.11

Fertility levels of nitrogen and phosphorus upto 30 kg N-60 kg P_2O_5 /ha significantly registered pods /plant, number of kernel/pod seed index, shelling percentage and yields i.e. pod yield, kernel yield, haulm yield biological yield (Table 1) over control and 20 kg N-40 kg P_2O_5 /ha. Further increase the fertility level up 40 kg N-80 kg P_2O_5 /ha was statistically at par with 30 kg N-60 kg P_2O_5 /ha. Days to maturity were not influenced by applied fertilizers. Early and plentiful availability of nitrogen and phosphorus to plants favourably influenced the kernel development and kernel size, which ultimately resulted in, increased pod and seed index and shelling percentage (Bala *et al.* 2011).

References

Bala HMB, Ogunlela VB, Kuchinda NC and Tanimu B.2011. Response of two groundnut (*Arachis hypogaea*) varieties to sowing date and NPK fertilizer rate in a sami-arid environment: yield and yield attributes. Asian J. Crop Sci. **3**(3):130-134.

Gochar R.2011. Effect of cultivars and weed management on late sown groundnut (*Arachis hypogaea* L.) in north western Rajasthan. M.Sc. (Ag.) Thesis submitted to SKRAU, Bikaner pp. 54.

Gomez KA and Gomaz AA.1984. Statistical Procedures for Agricultural Research. John Wiley & Sons, Singapore.Pp 693.

Gouri V, Reddy R, Narayansimha SBS, and Rao YA. 2005. Thermal requirement of *Rabi* groundnut in Southern Telangana Zone of Andhra Pradesh. J. Agromet. **7**(1): 09-94.

Hossain MA, Hamid A and Nasreen S. 2007. Effect of nitrogen and phosphorus fertilizer on N/P uptake and yield performance of groundnut (*Arachis hypogaea* L.). J. Agri. Res. **45**(2):119-127.

Kabadagi CB and Setty RA. 2010. Growth characters and yield of groundnut genotypes as influenced by levels of NPK and growth regulators. Res. on Crops. **11**(3):697-700.

Pareek NK and Poonia BL 2011. Effect of FYM, nitrogen and foliar spray of iron on productivity and economics of irrigated groundnut in an arid region of India. Arch. of Agron. and Soil Sci. **57**(5):523-531.

Ravisankar N, Balakrishnan M, Ghoshal S, Chaudhuri, Ambast SK, Srivastava RC, Subramani T and Bommayasamy N 2010. Evaluation of time, method of sowing and varieties for table-purpose groundnut under Island ecosystem. Indian J. Agric. Sci. **80**(4):293-7.

Sardana V and Kandhola SS .2007. Productivity of semi-spreading and bunch type varieties of groundnut as influenced by sowing dates. An Op. Acc. J. **5**:1-3.

Subrahmaniyan K, Kalaiselvan P and Balasubramanian TN. 2008. Microclimate variations in relation to different types of polyethylene-film mulch on growth and yield of groundnut (*Arachis hypogaea*). Indian J. Agron. **53** (3): 184-8.

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