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Effect of sowing dates and weed-control methods on yield attributes and yield of groundnut (*Arachis hypogaea*)

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ABSTRACT

A field experiment was conducted during the rainy season (*kharif*) seasons of 1997 and 1998 at Agricultural Research Station, Durgapura, Jaipur, to assess impact of advance sowing on groundnut (*Arachis hypogaea* L.) productivity and to evolve efficient weed-control system involving cultural, herbicidal and cultural+herbicidal methods under each sowing time. Amongst yield components, sowing dates failed to bring about perceptible variation in pods setting index, kernel pod, shelling per cent and seed index, but number of pods and their weight/plant were significantly improved under advance planting on 1 June over the rest. The crop sown on 1 June recorded significantly higher productivity in terms of pod, kernel and haulm yield (30.81, 20.38 and 48.78 q/ha), representing increase of 21.58, 25.88 and 21.50% and 40.23, 49.85 and 48.20% over 16 June and 1 July sowing respectively. Among the weed-control methods, the adoption of cultural methods, i.e. 2 hoeings each at 21 and 45 days after sowing (DAS) as well as integrated method (pendimethalin + hoeing) significantly improved the yield components over rest of the methods and weedy check. Two hoeings and pendimethalin + hoeing recorded pod and kernel yield of 32.53, 32.14 and 21.62, 23.03 q/ha compared to 12.53 and 7.28 q/ha under unweeded conditions.

Key words : Sowing dates, Weed control, Yield attributes, Yield, Groundnut

Amongst oilseed crops, groundnut occupies a predominant position in terms of acreage and total production. Under assured irrigation conditions, advance planting (prior to onset of monsoon) enhances productivity of this crop owing to least exposure to adverse situation in many parts of the country (Gill and Kumar, 1995). Thus there is need to assess feasibility of advance planting and its impact on productivity under prevailing agro-climatic conditions of eastern Rajasthan. Weeds are generally controlled with cultural manipulation either through hand-weeding or hoeing. But most of the times due to continuous rains, scarcity of labours and financial limitations, these operations are not being carried out at most critical stages. Thus, there is need to evolve efficient and economical viable system for managing weeds. In this paper, an attempt was made to analyse the approriate and economically viable method of weed control in groundnut grown under different dates.

MATERIALS AND METHODS

A field experiment was conducted during the rainy season (*kharif*) of 1997 and 1998 at Agricultural Research Station, Durgapura, Jaipur (Rajasthan), on irrigated coarse-textured soil, having pH 8.2, organic carbon 0.265%, available N 134.8 kg/ha, available phosphorus 29.0 kg/ha, available potash 169.0 kg/ha. The experiment consisted 27 treatments comprising combinations of 3 sowing dates (1 and 16 June and 1 July) and 9 weed-control methods (weedy check, 1 hoeing at 21 DAS, 2 hoeings each at 21 and 45 DAS, fluchloralin 1.0 kg/ha, oxyflourfen 0.2 kg/ha and pendimethalin 1.0 kg/ha as sole herbicides and in combination with 1 hoeing). These were evaluated under split-plot design, allocating sowing dates in main plots and weed-control methods in subplots and replicated 4 times. The sowing was carried out as per stipulated dates mentioned in the treatment, using seed rate of 80 kg/ha with 40 cm spacing. The crop was fertilized with uniform dose of 15 kg N and 60 kg P_2O_5/ha through urea and single superphosphate along with 250 kg gypsum/ha. The pod setting index was computed using following formula:

$$\text{Pod setting index} = \frac{\text{Pods/plant}}{\text{Flowers/plant}} \times 100$$

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RESULTS AND DISCUSSION

Prominent weed species in the experimental field consisted of *Cyperus rotundus* L., *Cenchrus barbatus* Schum., *Cynodon dactylon* Pers., *Saccharum spontaneum* L., *Amaranthus viridis* L., *Solanum nigrum* L. and *Commelina benghalensis* L.

Effect of sowing date

The advance planting significantly improved number of pods and their weight/pod. But pod setting index, kernels/pod, shelling per cent did not show significant variation between planting dates. The crop sown on 1 June (earlier period) recorded higher productivity of pod, kernel and haulm yield (30.81, 20.38 and 48.70 q/ha), showing increase 21.58, 25.88 and 21.50% and 40.23, 49.85 and 48.20% over 16 June and 1 July sowings. These findings are in agreement with those reported by Gill and Kumar (1995).

The significant improvement in yield parameters as well as productivity of the crop sown on 1 June could be ascribed to effectiveness of the crop to exploit favourable environment conditions towards yield formation. Due to its indeterminate growth characteristics it has been widely assumed that at later stages both vegetative and reproductive structures compete with each other for nutrients and metabolites. Thus, higher availability of these to sink might have reduced competition between developing structures, which consequently resulted in improved pods/plant under advance planting.

Effect of weed-control method

The weed-control methods significantly enhanced yield components, viz. pods/plant and pod weight/plant, shelling (%) and seed index, with concomitant increase in pod, haulm and kernel yields. Among the methods, 2 hoeings and pendimethalin + hoeing recorded pod and kernel yield of 32.53, 32.14 and 21.62, 23.03 q/ha compared to 12.53 and 7.28 q/ha produced under unweeded conditions. While increase in haulm yield under aforesaid methods was by 26.44 and 25.47 q/ha over weedy check. It is an established fact that least weed competition during critical phase of crop growth exerts an important regulative function on complex process of yield formation due to better availability of water, space and nutrients to the crop plant which are pre-requisite for higher metabolic activity in plants. Earlier it was well emphasized that reduced crop-weed competition under weed-control methods, markedly influenced source by virtue of higher photosynthetic and metabolic activities. It is an established fact that balanced source–sink relationship helps crop to achieve higher productivity. Thus, higher pod yield under least weed competition through adoption of either 2

Table 1. Effect of sowing dates and weed-control methods on yield attributes of groundnut

Treatment	Pod setting index (%)		Pods/plant		Pod weight (g/plant)		Kernels/pod		Shelling (%)		Seed index (g)	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
Sowing date												
1 Jun	13.41	14.33	14.83	15.28	20.11	20.09	1.84	1.85	66.27	65.41	67.72	68.32
16 June	13.42	14.46	13.46	13.39	18.61	18.77	1.84	1.86	61.32	63.20	65.50	65.87
1 July	13.45	14.35	12.06	12.19	17.36	17.50	1.82	1.85	61.44	61.45	63.54	63.93
CD (P=0.05)	NS	NS	1.51	1.07	0.76	0.79	NS	NS	NS	NS	NS	NS
Weed-control method												
Weedy check	13.49	14.51	5.71	5.79	8.10	8.21	1.82	1.84	57.35	57.49	59.57	60.07
1 hoeing	13.42	14.22	12.67	12.75	17.17	17.20	1.84	1.86	63.76	63.72	64.33	64.90
2 hoeings	13.43	14.32	16.20	16.03	22.26	22.40	1.85	1.88	66.58	66.00	69.01	69.47
Fluchloralin	13.42	14.43	13.45	13.76	18.32	18.28	1.83	1.85	63.69	63.08	64.37	64.73
Fluchloralin + 1 hoeing	13.45	14.33	15.37	15.58	21.69	21.77	1.82	1.84	65.18	64.57	6.47	69.15
Oxyfluorfen	13.33	14.48	12.76	12.91	18.03	18.18	1.83	1.85	61.53	61.47	62.29	63.15
Oxyfluorfen + 1 hoeing	13.39	14.36	14.93	15.55	20.63	20.62	1.83	1.85	59.54	65.15	66.02	66.10
Pendimethalin	13.46	14.36	13.51	13.75	19.02	19.25	1.85	1.87	64.06	63.80	65.36	65.50
Pendimethalin + 1 hoeing	13.47	14.43	16.43	16.45	23.02	23.17	1.82	1.85	65.43	64.93	70.87	71.31
CD (P=0.05)	NS	NS	0.62	0.62	0.87	0.79	NS	NS	5.24	1.89	2.08	2.28

Table 2. Effect of sowing dates and weed-control methods on yield and harvest index of groundnut (pooled data of 1997 and 1998)

Treatment	Pod yield (q/ha)	Kernel yield (q/ha)	Haulm yield (q/ha)	Harvest index (%)
Sowing date				
1 June	30.81	20.38	48.70	38.61
16 June	25.34	16.19	40.08	38.54
1 July	21.97	13.60	32.86	39.73
CD (P=0.05)	1.20	1.46	3.26	NS
Weed-control method				
Weedy check	12.53	7.28	22.44	36.25
1 hoeing	24.14	15.47	35.86	38.25
2 hoeing	32.53	21.62	48.88	40.00
Fluchloralin	24.95	15.85	40.36	38.39
Fluchloralin + 1 hoeing	30.34	19.74	45.29	40.17
Oxyfluorfen	23.01	14.20	37.54	38.16
Oxyfluofen + 1 hoeing	27.90	18.18	41.99	39.91
Pendimethalin	26.79	17.14	41.67	39.23
Pendimethalin+1 hoeing	32.14	21.03	47.91	40.19
CD (P=0.05)	1.57	1.53	3.34	1.62

hoeings or pendimethalin + hoeing seem to be on account of their influence on both these aspects of yield formation, i.e. source (dry-matter accumulation) and sink development (yield attributes). Better efficiency of 2 hoeings and pendimethalin + hoeing for managing weeds in groundnut crop was also observed by Guggari *et al.* (1995), Singh *et al.* (1996) and Mohanty *et al.* (1997).

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