

from each plot was recorded after each cut and samples of 500 g were taken and dried at 80°C for 24 hr for dry-fodder estimation. The nitrogen content was estimated by Kjeldahl's method and crude protein (%) was worked out on dry-weight basis.

The difference due to genotypes for green- and dry-fodder production was significant during both the years (Table 1). During 1991, 'Collabar' gave significantly 21.2, 28.4 and 29.3% higher green-fodder yields than 'OX 261-27-1-2-2', 'OGP 7605' and 'OX 391-16-1-4-7' respectively, but was on a par with 'Blacknip', 'Cobar' and 'Kent' genotypes. However, during 1992 'Collabar' was only at par with 'Blacknip' and outyielded 'Kent', 'Cobar', 'OX 391-16-1-4-7', 'OGP 7605' and 'OX 261-27-1-2-2' by 11.8, 14.5, 17.2, 23.3 and 24.5% respectively. Crude protein content did not show significant variation due to different oat genotypes. Rana *et al.* (1990) also re-

corded similar crude protein content in different oat genotypes.

Different cutting managements gave similar green- and dry-fodder yields during both the years (Table 1). Two cuttings showed higher crude protein (%) than single cutting. Similar observations were also made by Joon (1984).

Thus 'Collabar' and 'Blacknip' oat can be grown for higher green-fodder yield and if harvested for 2 cuts, can provide green fodder during lean periods under Kashmir conditions.

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Effect of planting date, irrigation and phosphorus on chickpea (*Cicer arietinum*) grown on clay-loam soil

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An introduction of gram or chickpea (*Cicer arietinum* L.) in rice fallows of eastern Madhya Pradesh is a good practice to increase the per unit area productivity of pre-

vailing monocropped system. The crop growth and development and its nutrient and irrigation needs are greatly governed by the planting time of the crop. Keeping this

Table 1. Effect of planting date, irrigation schedule and phosphorus level on yield-attributing characters of chickpea

Treatment	Pods/plant		Seeds/pod		100-seed weight (g)		Seed yield (q/ha)		MUE (kg/ha-cm)	
	1988-89	1989-90	1988-89	1989-90	1988-89	1989-90	1988-89	1989-90	1988-89	1989-90
<i>Date of planting</i>										
1 week Nov.	30.60	29.01	1.48	1.07	15.40	14.52	9.43	0.61	9.52	45.37
IV 4 week Nov.	30.10	23.70	1.49	1.05	15.21	14.90	8.41	7.38	7.89	33.87
II week Dec.	21.84	21.11	1.51	1.51	14.61	14.54	5.78	5.42	5.80	24.57
CD (P = 0.05)	1.55	5.84	NS	0.04	0.35	0.32	0.82	1.19		
<i>Irrigation schedule</i>										
At 35 DAS	23.10	24.13	2.54	1.06	15.37	14.85	5.90	7.22	6.56	35.60
At 75 DAS	21.97	21.63	1.45	1.03	14.4	14.23	6.47	5.30	6.38	32.21
At 35, 75 DAS	37.47	28.07	1.49	1.04	15.52	14.87	0.24	8.89	9.56	35.28
CD (P = 0.05)	1.05	NS	NS	NS	0.35	0.39	0.82	1.19		
<i>Phosphorus (kg/ha)</i>										
0	20.54	20.06	1.50	1.05	15.00	14.37	6.78	5.85	6.31	35.90
40	28.23	24.46	1.49	1.04	15.15	14.75	8.03	7.52	7.78	43.70
80	33.76	29.30	1.49	1.04	15.21	14.82	8.81	9.04	8.92	48.87
CD (P = 0.05)	1.65	1.24	NS	NS	NS	0.18	0.40	0.39		

DAS, Days after sowing; MUE, moisture-use efficiency

in view, an experiment was conducted during the winter season of 1988–89 and 1989–90 at college of Agriculture Farm, Raipur, to find out the optimum date of planting, irrigation schedule and phosphorus level for chickpea under clay-loam soil.

The experimental soil had 188, 8.1 and 212 kg/ha available N, P_2O_5 and K_2O respectively, with 7.2 pH. The available moisture capacity of the soil was 13.14%. The experiment was laid out in split-plot design with 3 replications, having combination of 3 planting dates and 3 irrigation schedules as main-plot treatments and 3 phosphorus levels in subplot treatment (Table 1). Chickpea variety used was 'JG 74'. A common irrigation of 60 mm² was given just after sowing to germinate and establish the crop properly in addition to irrigation treatments. A common dose of 20 kg N/ha was applied at sowing.

Grain yield decreased significantly with delay in sowing during both the years (Table 1). Maximum grain yield and water-use efficiency were observed when the crop was sown during first week of November due to better yield attributes compared with later planting dates. Late sowing during the second week of December put the crop under high evaporative demand period at podding and grain-filling stages, resulting in relatively low magnitude of all the yield attributes coupled with shortening of crop life and forced maturity. Sharma (1984) also reported that growth-attributing characters were adversely affected due to delay in sowing.

Two irrigations, applied at branching and

pod-formation (35 and 75 days after sowing) stages, registered significantly higher grain yield than 1 irrigation at either of the stages. Irrigations applied either at branching or at pod-filling stage were found comparable to each other. In case of 1 irrigation at branching, crop suffered due to moisture stress during podding and grain filling, whereas 1 irrigation at pod formation seems to late for proper initial growth of the crop, as also reported by Poonia (1984). Two irrigations applied at branching and pod-formation stages also showed the maximum water-use efficiency.

Increasing levels of phosphorus from 0 to 40 kg and 40 to 80 kg/ha resulted in significant increase in grain yield (Table 1). A significant response of phosphorus was observed up to 80 kg P_2O_5 /ha due to increase in yield attributes. Beneficial effect of phosphorus is well established on the root development, nodulation, and yield attributes (Prihar, 1990). Water-use efficiency also increased with increasing levels of phosphorus during both the years.

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