Indian Journal of Agronomy **44** (4) : 773–777 (December 1999)

Effect of non-monetary inputs on sustained productivity of urdbean (*Phaseolus mungo*)

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Received: June 1998

ABSTRACT

A field experiement was conducted during rainy seasons of 1993–95 at Pantnagar, to assess the contribution of sowing time, variety, method of sowing and time of weed removal on productivity of urdbean (*Phaseolus mungo* L.) and sustainability of treatments. Pooled seed yield reduced significantly due to late sowing, local variety, broadcast method of sowing and weed removal 6 weeks after sowing in comparison to the normal sowing, 'Pant U 35', line sowing and weed removal 3 weeks after sowing respectively. Maximum sustainability yield index (0.81) was recorded when 'Type 9' was sown late in rows in comparison to weed removal 3 weeks after sowing.

Key words : Urdbean, Non-monetary inputs, Productivity, Sustainability

Urdbean is an efficient crop of *tarai* region. Inherited yield potential of crop can be realized by adopting input intensive management practices. The monetary constraint of farmers limits the proper use of modern technology (Srivastava and Srivastava, 1996). It is, thus, obvious to enrich farmers with such an alternate technology that can give comparable yield at minimum expenditure. Suitable sowing time, variety and plant population are important non-cash inputs to achieve synchronous maturity and higher productivity of urdbean (Ali, 1987). Optimum plant stand may be ensured by sowing seeds in line which may help efficient utilization of abundant solar energy available during rainy season. Moreover, the momentum of yield increase can further be achieved by deciding a suitable time of weed removal. The information on the effective exploitation of non-monetary inputs to sustain the yield of urdbean during *kharif* season is meagre. The present investigation was, therefore, undertaken to assess the contribution of non-monetary inputs on the productivity of uredbean.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* seasons of 1993–95 at Crop Research Centre of G.B. Pant University of

Agriculture and Technology, Pantnagar. The soil of the experimental site was sandy loam with neutral soil reaction (pH 7.3) and, having medium organic carbon (0.69%), available phosphorus (19.01 kg P/ha) and available potassium (204.51 kg P/ha). Sixteen treatment combinations of 2 levels of each factor, viz. sowing time (normal and 3 weeks late), variety (local, 'Type 9' and improved 'Pant U 35'), method of sowing (broadcast and line sowing 30 cm × 10 cm) and time of weed removal (3 weeks after sowing and 6 weeks after sowing) were allocated in randomized block design with 4 replications. The normal sowing of crop was done on 3 August, 24 July and 25 July during the 3 respective years, whereas late sowing was done 3 weeks later of normal sowing. A basal dressing of 50 kg DAP/ha, was applied to the crop. During rainy season of 1993, 1994 and 1995, the site experienced 1,404, 683 and 1,222 mm rainfall respectively. The sustainable yield index (SYI) of different treatments was computed by the formula described by Pandey *et al.* (1992).

RESULTS AND DISCUSSION

Yield attributes

Normal sowing significantly resulted in increased number of pods/plant during 1994 and 1995; seeds/pod during 1995 and 100-grain weight during 1993 over late sowing. No significant effect of sowing time and variety on pods/plant, sowing method on 100-seed/weight, time of weed removal on seeds/pod during 1993 and variation in all the factors of treatments, viz. sowing date, variety, sowing method and time of weed removal, on seeds/pod and 100-seed weight during 1994 was observed (Table 1). During 1994, variety 'Pant U 35' significantly yielded more number of pods/plant than 'Type 9'. Line sowing in 1993 and broadcast in 1994 recorded significantly higher pods/plant over their respective counterparts. Removal of weeds, 3 weeks after sowing, produced significantly higher number of pods/plant during all the seasons and 100– seed/weight during 1993 and 1995 over weed removal 6 weeks after sowing. Mean data on yield attributes indicated that time of weed removal and time of sowing were more important than other components of non-monetary inputs.

Seed yield

Normal sowing outyielded late sowing during 1994 and 1995, however, in 1993, late sowing was superior to normal one. Differences in yield due to variations in variety during 1994, sowing method during 1994 and 1995 were non-significant. Variety 'Pant U 35' and line sowing increased yield significantly over 'Type 9' and broadcast during 1993. In all the seasons, weed removal 3 weeks after sowing outyielded weed removal 6 weeks after sowing. Pooled analysis (Table 1) revealed that among different non-monetary inputs, time of weed removal was the most important, followed by sowing time. Delayed sowing (3 weeks after normal), use of local variety 'Type 9', broadcast method of sowing and weed removal 6 weeks after sowing caused significant reduction in seed yield to the tune of 13.3, 10.1,7.6 and 32.9% in comparison to normal sowing, improved variety ('Pant U 35'), line sowing and weed

Table 1. Yield attributes and yield of *kharif* urdbean as influenced by different treatments

Treatment	Number of pods/plant			Number of seeds/plant			100-seed weight (g)			Seed yield (kg/ha)				Reduction from improved practice
	1993	1994	1995	1993	1994	1995	1993	1994	1995	1993	1994	1995	Pooled	
Sowing time														
Normal	28.3	24.8	32.5	5.9	5.4	6.1	3.42	3.01	3.69	510	1,108	1,357	990	
Late : (3 weeks after normal)	28.9	21.6	22.4	6.0	5.5	5.7	3.36	2.89	3.76	1,009	856	715	858	13.3
CD (P = 0.05)	NS	1.7	1.9	NS	NS	0.3	0.05	NS	NS	62	107	75	48	
Variety														
Improved ('Pant U 35')	28.8	24.7	28.3	6.3	5.5	6.2	3.44	2.92	3.81	809	1,002	1,115	973	
Local ('Type 9')	28.5	21.7	26.6	5.7	5.4	5.6	3.34	2.99	3.64	710	693	957	875	10.1
CD (P = 0.05)	NS	1.7	NS	0.3	NS	0.3	0.05	NS	0.12	62	NS	75	48	
Sowing method														
Line sowing (30 cm × 10 cm)	29.7	20.5	27.6	6.2	5.5	5.9	3.40	2.96	3.71	800	1,015	1,070	961	
Broadcast	27.6	25.9	27.2	5.8	5.4	5.9	3.38	2.94	3.74	719	950	1,002	888	7.6
CD (P = 0.05)	1.8	1.7	NS	0.3	NS	NS	NS	NS	NS	62	NS	NS	48	
Time of weed removal														
3 weeks after sowing	31.9	28.0	31.8	6.0	5.6	6.1	3.42	2.95	3.4	916	1,053	1,360	1,107	
6 weeks after sowing	25.4	18.4	23.0	5.9	5.3	5.8	3.36	2.94	3.81	603	912	714	742	32.9
CD (P = 0.05)	1.8	1.7	1.9	NS	NS	NS	0.05	NS	0.12	62	107	75	48	

Table 2. Mean yield and sustainable yield index as affected by treatment combinations

Treatment		Line sowing		Broadcast	
		Weed removal 3 WAS	Weed removal 6 WAS	Weed removal 3 WAS	Weed removal 6 WAS
Normal sowing	'Pant U 35'	1,312 (0.42)	833 (0.52)	1,292 (0.44)	770 (0.450
	'Type 9'	1,197 (0.52)	713 (0.43)	1,080 (0.44)	737 (0.39)
Late sowing	'Pant U 35'	1026 (0.65)	844 (0.60)	961 (0.78)	763 (0.52)
	'Type 9'	1,107 (0.81)	663 (0.62)	895 (0.74)	622 (0.58)

Figures in parentheses denote sustainable yield index
WAS, Weeds after sowing

removal 3 weeks after sowing respectively. Plant population is the key factor to maintain the rhythm of yield stability. High rainfall (287 mm) just after normal sowing during 1993 and late sowing during 1994 and 1995 (154 and 33.5 mm respectively) affected germination and reduced plant population which ultimately led to poor grain yield in respective sowings. Overall yield reduction in late sowing might be attributed to poor pod setting due to less number of sunshine hours and high relative humidity which led to continuous growth. Saharia (1998) and Venkateswarlu and Rajan (1991) also observed reduced yield of urdbean with late sowing. Inherent high yield potential in 'Pant U 35' and maintenance of optimum plant population under line sowing might have increased yield over 'Type 9' and broadcast method of sowing. One hand-weeding done 3 weeks after sowing reduced crop–weed competition and weed population in early stage and provided good crop canopy. Response of all the yield attributes were also positive to early weeding which might have resulted in higher seed yield.

Yield and sustainability of treatment

The maximum yield (1,312 kg/ha) was obtained when seeds of 'Pant U 35' were sown in line at normal sowing time and weeded once, 3 weeks after sowing. However, late sowing of variety 'Type 9' in rows, 30 cm apart, gave the maximum yield stability (SYI = 0.89) when weeded 3 weeks after sowing. Relatively low rainfall during the late sowing in region and higher tolerability of 'Type 9' to higher rainfall might have led to least variation in yields during different years which resulted in higher sustainable yield index (Table 2).

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