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RESEARCH ARTICLE

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Weed management practices in *Zaid* urdbean under different sowing dates

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ABSTRACT : An experiment was conducted during two consecutive years of *Zaid* 2008 and 2009 at Agricultural Research Station, Borwat Farm, Banswara to find out optimum sowing date and suitable herbicide for weed management in *Zaid* urdbean under Humid Southern Plain Zone of Rajasthan. Results revealed that the maximum seed yield (961 kg/ha), net return (Rs. 23848/- ha^{-1}) and B: C (1.45) was observed under sowing of urdbean on 15th March over sowing of urdbean on 5thand 15th April, respectively. However, it was found at par withsowing of urdbean on 25th March seed yield (924 kg/ha), net return (Rs. 22769/- ha^{-1}) and B: C (1.42). In weed management, application of Fluchloralin @ 0.75 kg a.i./ha PPI gave significantly higher seed yield (918 kg/ha) net return (Rs. 21888/- ha^{-1}) and B:C (1.33) over weedy check (control), but it was found at par with application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free in the pooled analysis. Sowing of urdbean under different dates, the weed population m^{-2}, weed dry matter accumulation (g m^{-2}) and weed control efficiency at 30 DAS were found not significant with each other during both the years as well as in the pooled analysis. Application of Fluchloralin @ 0.75 kg a.i. /ha PPI gave significantly higher weed control efficiency (51.80 %), lowest weed population (13.40 m^{-2}) and weed dry matter accumulation (15.57 g m^{-2}) at 30 DAS over weedy check (control), but it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free in the pooled analysis.

KEY WORDS : Urdbean, *Zaid*, Weed management, Sowing date

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INTRODUCTION

Pulses form an integral part of vegetarian diet in the Indian subcontinent. Besides being a rich source of protein, they enrich soil through symbiotic nitrogen fixation and play a vital role in low input sustainable agriculture. Pulses are energy rich crops but are cultivated largely under starved conditions. Urdbean is grown all over the world, mostly in tropical and sub-tropical countries for grains, green manuring, fodder and forage as sole crop, intercrop, mixed crop and in sequential cropping systems. The low levels of availability of legume grains in India could be mitigated not only by increasing the production

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but also by minimizing the quantitative and qualitative losses of grain by weeds through their control. As the crop itself getting less attention, weed control is more neglected and further reduces the production.

The optimum time of sowing ensures the complete harmony between the vegetative and reproductive phases on one hand, and the climatic rhythm on the other hand and helps in realizing the potential yield. Temperature is the prime weather variable which affects plant life. Heat unit concept is the agronomic application of temperature effect on plant, which has been employed to correlate phenological development in crops and to predict maturity dates (Modak *et al*., 1995). Weeds infestation is not checked after 20 days of sowing, severe yield reduction to the extent of 38 per cent was recorded in contrast to 20 per cent yield reduction with unchecked weed infestation till 20 DAS. Weeds are plants which grow where they are not desired and they compete with crops for water, soil nutrients, light and space and thus reduce crop yields. Various research workers have tried oxyflourfen 23.5 EC and pendimethalin 30 EC in different pulse crops and reported positive results on grassy and non-grassy weeds. The chemical method of weed control is easier, less time consuming and less costly than weeding by hired labourers. A great advantage of this method lies in killing weeds in the crop rows and weeds in the immediate vicinity of crop plants. The integrated use of herbicides and manual weeding has been reported more effective, safer and less effective, thus plays an important role for controlling weeds in field crops.

EXPERIMENTAL METHODS

A field experiment was conducted during two consecutive years of *Zaid* 2008 and 2009 at Agricultural Research Station, Borwat Farm, Banswara. The experiment was laid out in split plot design with three replications having sixteen treatment combinations *i.e.* four date of sowing 15th March, 25th March, 05th April and 15th April and four weed management practices *i.e.* weedy check, weed free, Fluchloralin @ 0.75 kg a.i./ha PPI and Pendimethalin@ 0.75 kg a.i./ha PE. The experimental field was well prepared by two ploughing followed by harrowing and cultivator and one planking for uniform levelling were performed for sowing of urdbean. The bulk density, pH and cation exchange capacity of these soils varies between 1.35-1.56 Mg/m^3, 7.0-7.8 and 32- 40 Cmol/kg, respectively. The soils of the region are medium in organic carbon (0.50±0.08), available nitrogen (273±5 kg/ha), available P_2O_5 (25.1± 1.0 kg/ha) and high in available K_2O (294 ± 8 kg/ha). Full dose of recommended nitrogen, phosphorus and potash were drilled before sowing.All production and protection measures were applied as per package and practices of the Humid Southern plain Zone of Rajasthan.

EXPERIMENTAL RESULTS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Growth:

It is evident from two years pooled data shows that (Table 1) the significantly influence growth parameter of urdbean under sowing on different dates. The maximum plant height (45.33 cm) was obtained where sowing of urdbean on 15th March over sowing of urdbean on 5thand 15thApril (35.93 and 32.90 cm), respectively. However, it was found at par with sowing of urdbean on 25th March (43.36 cm) in the pooled analysis. In weed management practices, application of Fluchloralin @ 0.75 kg a.i./ha PPI gave higher plant height (41.20 cm) over weedy check (29.45 cm), but it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free check (39.76 and 43.03 cm) in the pooled analysis, similar results observed by Buttar and Singh (2006).

Yield attributes:

An examination of two years pooled data shows that (Table 1) the significantly influence yield attributes of urdbean under sowing on different dates. Results revealed that the maximum pods $plant^{-1}$ (10.72 and 10.17), seeds pod^{-1} (7.01 and 6.59) and seed index (3.0 and 2.98 g) were recorded under sowing of urdbean on 15th and 25th March over sowing of urdbean on 5th and 15th April pods $plant^{-1}$ (7.08 and 5.56) , seeds pod^{-1} (4.03 and 3.65) and seed index (2.80 and 2.70 g), respectively. In weed management practices, application of Fluchloralin @ 0.75 kg a.i./ha PPI gave higher pods $plant^{-1}$ (9.80), seeds pod^{-1} (6.76) and seed index (3.05 g) over weedy check (5.12, 4.28 and 2.38 g), but it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free in the pooled analysis. These yield attributes

were favoured due to better crop growth which is evidenced by the observations recorded on crop dry matter production per plant, number of branches plant^{-1}, leaf area index and root nodules plant^{-1}. It may be ascribed because, lesser crop-weed competition in these treatments as they control weeds more effectively than other treatments. These results are in conformity to the findings of Ramanathan and Chandrashekharan (1998); Ramesh Chand *et al*. (2003) and Singh *et al*. (2006).

Seed yield:

Pooled data of two years shows that (Table 2) the significantly influence seed yield of urdbean under sowing on different dates. Results revealed that the maximum seed yield (961 and 924 kg/ha) were recorded under sowing of urdbean on 15th and 25th March over sowing of urdbean on 5th and 15th April (700 and 625 kg/ha), respectively. In weed management practices, application of Fluchloralin @ 0.75 kg a.i. /ha PPI gave higher seed yield (918 kg/ha) over weedy check (599 kg/ha). However, it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free (903 and 951 kg/ha) during both the years as well as in pooled analysis. The seed yield increase due to these treatments

Table 1 : Effect of sowing dates and weed management practices on growth and yield attributes of *Zaid* urdbean

Treatments	Plant height (cm)			Pods/plant			Seeds/ pod		
	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled
Sowing dates									
15th March	46.00	44.65	45.33	11.26	10.17	10.72	7.12	6.90	7.01
25th March	43.62	43.10	43.36	10.59	9.75	10.17	6.86	6.32	6.59
05th April	36.85	35.00	35.93	7.15	7.00	7.08	4.25	3.80	4.03
15th April	33.19	32.6	32.90	5.64	5.47	5.56	3.72	3.57	3.65
S.E.$\pm$	1.76	1.56	1.53	0.86	0.74	0.73	0.55	0.59	0.52
C.D. (P=0.05)	5.10	4.92	4.58	2.65	2.36	2.21	1.69	1.81	1.58
Weed management									
Weedy check	31.45	27.45	29.45	05.22	5.02	5.12	4.40	4.15	4.28
Weed free	44.75	41.30	43.03	10.63	10.23	10.43	7.65	7.23	7.44
Fluchloralin	42.64	39.76	41.20	9.90	9.70	9.80	6.89	6.62	6.76
Pendimethalin	41.02	38.49	39.76	9.15	9.04	9.10	6.72	6.40	6.56
S.E.$\pm$	1.68	1.52	1.47	0.70	0.65	0.62	0.75	0.70	0.67
C.D. (P=0.05)	4.90	4.79	4.42	2.15	2.08	1.87	2.36	2.12	2.10

Table 2 : Effect of sowing dates and weed management practices on yield and economics of *Zaid* urdbean

Treatments	100 seed weight (g)			Seed yield (kg/ha)		
	2008	2009	Pooled	2008	2009	Pooled
Sowing dates						
15th March	3.01	2.98	3.00	975	947	961
25th March	3.00	2.95	2.98	942	905	924
05th April	2.81	2.78	2.80	706	694	700
15th April	2.70	2.69	2.70	635	615	625
S.E.$\pm$	0.05	0.05	0.04	56	57	52
C.D. (P=0.05)	0.16	0.15	0.14	170	168	154
Weed management						
Weedy check	2.40	2.36	2.38	602	596	599
Weed free	3.12	3.08	3.10	960	942	951
Fluchloralin	3.08	3.02	3.05	922	914	918
Pendimethalin	3.05	2.99	3.02	907	898	903
S.E.$\pm$	0.07	0.06	0.06	68	65	61
C.D. (P=0.05)	0.20	0.18	0.18	214	202	184

can be better explained with their effectiveness in weed control in comparison to weedy check treatment, because it improved the tilth by making soil more vulnerable for the plants to utilize water and air. The increase in seed yield of urdbean was also largely due to higher harvest indices reflecting greater partitioning of assimilates towards sink under weed free environment. In the presence of weeds, although the vegetative growth of the crop attained a level but sink was not sufficient enough to accumulate the meaningful food assimilates translocation towards grain formation (Chand *et al.*, 2003 and Chand *et al.*, 2004).

Weed population:

It is evident from pooled data of two years shows that (Table 3) the weed population at 30 DAS was not significant under different sowing dates in *Zaid* urdbean during both the years as well as in pooled analysis. The application of Fluchloralin @ 0.75 kg a.i./ha PPI gave lowest weed population at 30 DAS (13.40 m^{-2}) as compared to weedy check control (39.11 m^{-2}), but it was found at par with the application of Pendimethalin @

Table 3 : Effect of sowing dates and weeds management practices on weed population weed dry matter and weed control efficiency in *Zaid* urdbean

Treatments	Weed population (m^{-2}) at 30 DAS			Weed dry matter (g m^{-2}) at 30 DAS			WCE (%)		
	2008	2009	Pooled	2008	2009	Pooled	2008	2009	Pooled
Sowing dates									
15th March	16.25	16.39	16.32	18.24	18.44	18.34	54.70	54.60	54.65
25th March	16.60	16.95	16.78	19.03	19.22	19.13	53.10	54.85	53.98
05th April	16.15	16.34	16.25	18.92	19.01	18.97	52.92	54.01	53.47
15th April	16.01	16.75	16.38	18.55	18.63	18.59	51.24	51.40	51.32
S.E.±	2.01	2.04	1.86	1.75	1.81	1.64	5.05	5.12	4.70
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Weed management									
Weedy check	39.02	39.20	39.11	43.15	46.01	44.58	0.00	0.00	0.00
Weed free	7.55	7.78	7.67	9.98	10.15	10.07	62.58	63.18	62.88
Fluchloralin	13.05	13.75	13.40	15.50	15.63	15.57	51.45	52.15	51.80
Pendimethalin	16.13	16.70	16.42	16.64	16.69	16.67	47.22	46.08	46.65
S.E.±	1.60	1.69	1.51	1.30	1.42	1.25	2.66	2.78	2.50
C.D. (P=0.05)	5.04	5.07	4.55	4.05	4.39	3.76	8.10	8.41	7.51

NS=Non-significant

Table 4: Effect of sowing dates and weed management practices on economics of *Zaid* urdbean

Treatments	Net return (Rs. ha^{-1})			B:C		
	2008	2009	Pooled	2008	2009	Pooled
Sowing dates						
15th March	23475	24221	23848	1.42	1.47	1.45
25th March	22622	22915	22769	1.41	1.43	1.42
05th April	13446	14342	13894	0.87	0.93	0.90
15th April	11035	11445	11240	0.74	0.76	0.75
S.E.±	2455	2385	2226	0.07	0.06	0.06
C.D. (P=0.05)	7402	7200	6684	0.20	0.19	0.18
Weed management						
Weedy check	9682	10628	10155	0.65	0.71	0.68
Weed free	21360	22506	21933	1.19	1.25	1.22
Fluchloralin	20974	22802	21888	1.27	1.38	1.33
Pendimethalin	20687	22114	21401	1.25	1.34	1.30
S.E.±	2813	2741	2554	0.08	0.07	0.07
C.D. (P=0.05)	8500	8256	7665	0.24	022	0.21

0.75 kg a.i./ha PE and weed free (16.42 and 7.67 m^{-2}), respectively. Similar results were reported by Srinivasan and Venkatesan (2002).

Weed dry matter accumulation:

Pooled data of two years shows that (Table 3) the weed dry matter accumulation at 30 DAS was found not significant under different sowing dates in *Zaid* urdbean during both the years. Results revealed that the application of Fluchloralin @ 0.75 kg a.i./ha PPI gave lowest weed dry matter accumulation (15.57 g m^{-2}) as compared to weedy check control (44.58 g m^{-2}), but it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ ha PE and weed free (16.67 and 10.07 g m^{-2}) in the pooled analysis. These treatments had lower density and dry weight of weeds right from 40 DAS till harvest stage which facilitated good growth of crop plants particularly in reproductive phase and weeds were not allowed. These results are in accordance Bhowmick and Gupta (2005) and Shweta and Singh (2005).

Weed control efficiency:

An examination of two years pooled data shows that (Table 3) the weed control efficiency at 30 DAS was not influence under different sowing dates in *Zaid* urdbean during both the years as well as in pooled analysis. Results revealed that the application of Fluchloralin @ 0.75 kg a.i./ha PPI gave higher weed control efficiency (51.80 %) as compared to weedy check control, but it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free (46.65 and 62.88 %) in the pooled analysis. The higher WCE is attributed lower dry weight of weeds (Deshpande *et al*., 2006).

Economics:

Two years pooled data shows that (Table 4) the results revealed that the maximum net return (Rs. 23848/ - ha^{-1}) and B: C (1.45) were observed under sowing of urdbean on 15th March over sowing of urdbean on 5thand 15th April (Rs. 13894 and 11240/- ha^{-1}), respectively, but it was found at par with sowing of urdbean on 25th March in the pooled analysis. In weed management practices, application of Fluchloralin @ 0.75 kg a.i./ha PPI gave higher net return (Rs. 21888/- ha^{-1}) and B : C (1.33) over weedy check. However, it was found at par with the application of Pendimethalin @ 0.75 kg a.i./ha PE and weed free net return (Rs. 21401 and 21933/- ha^{-1}) and B: C ratio (1.30 and 1.22) during both the years as well as in pooled analysis. The present findings corroborate with those of other workers as reported earlier in case of productivity parameters. Because of variable yields from different treatments, the variable net income was eventual.

Conclusion:

It could be concluded that the sowing of *Zaid* urdbean from 15th to 25th March gave optimum seed yield and monetary return and application of Fluchloralin @ 0.75 kg a.i. /ha PPI and Pendimethalin @ 0.75 kg a.i./ha PE gave significantly higher seed yield and monetary return. Application of Fluchloralin @ 0.75 kg a.i. /ha PPI and Pendimethalin @ 0.75 kg a.i./ha PE gave significantly higher weed control efficiency, lowest weed population and lowest weed dry matter accumulation at 30 DAS.

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