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Impact of demonstration on weed control technology in soybean

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ABSTRACT

Sixty field demonstrations on herbicidal weed control technology were laid out during *kharif* of 2003 to 2005 in soybean at randomly selected three villages (Surai, Natwara, Belkharu) of Sahapura block, Jabalpur with an objective to show the performance and profitability of provon herbicides, *viz.* chlorimuron ethyl (10 g/ha), chlorimuron ethyl (10 g/ha) + fenoxaprop-p-ethyl at (75 g/ha) and imazethapyr at (750 g/ha) on weed growth and productivity of soybean at farmers' fields. Fields were found infested with mixed weed flora. The herbicides under demonstration were found very effective in increasing grain yield of soybean by 53-98 per cent over farmer's practice depending upon the intensity and growth of weeds. Benefit over the farmers' practice were varied from Rs. 11,275/- to Rs. 12,600/- per hectare.

Key words: Impact of demonstration, Weed, Soybean

Soybean, the number one oil seed crop in the world has recently occupied an important place in the edible oil and agricultural economy of the country. Its inclusion in the cropping system of the country in general and in the states of MP, Maharastra and Rajsthan in particular has resulted in improvement of socio-economic status of the farmer and provided employment in village as well as in adjoining cities where soya based industries are located.

One of the most important constraints of its low productivity is the weed infestation. Due to slow initial crop growth, appropriate soil moisture and congenial temperature, soybean is highly susceptible to weeds which reduce the yield to a tune of 41-84% (Kibey *et al*. 2004). The conventional method of weed control (manual weeding) is expensive, time taking and tedious. At the same time, because of the continuous rains during *kharif* season, manual weeding becomes less effective, problematic and uneconomic (Rajput 2005). Therefore, different tested herbicides being used for controlling weed in soybean were demonstrated at farmers' field to show the practicability and profitability with higher yield and income over farmer's practices.

MATERIALS AND METHODS

The demonstrations were conducted during *kharif* of seasons of 2003 to 2005 in soybean with some proven chemical weed control technology at randomly selected three villages (Surai, Natwara and Belkharu) of Sahapura block, Jabalpur district of Madhya Pradesh. Total 60 adopted farmers were selected who had actually undertaken the demonstration on their fields and data were collocated with the help of personal contact and observation. Most of the farmers' of demonstration area were small and marginal and they do weeding operation manually using their traditional implements. The yield and benefit due to treatments of each demonstration was recorded in a systematic manner and the yield under farmers' practices was also recorded at the same time for comparison purpose. The data were calculated and analysed to draw the inferences.

RESULTS AND DISCUSSION

Performance and profitability of proven herbicides , *viz.,* chlorimuron ethyl 10 g/ha (Kloben), chlorimuron ethyl 10 g/ha + fenoxaprop-p-ethyl at 75 g/ha (Kloben + Whipsuper) and imazethapyr (Persuit) at 750 g/ha were under taken as demonstration at farmers' field to show the effectiveness of herbicides against weed growth and productivity of soybean. Fields under demonstrations were commonly infested with *Echinochloa colona, Cyperus iria, Phyllanthus niruri, Euphorbia geniculata, Digera arvensis* and *Parthenium hysterophorus*.

It is obvious from Table 1 that all the herbicides under demonstration were found most effective in reducing weed growth. Higher weed control efficiency was observed in all demonstrated plots compared to farmers' practice adopted for weed control. The weed control efficiency varied from 71 to 93 percent depending upon the density and growth of weeds at different locations. Farmers' practice gave higher weed count and dry weight of weeds as compared to the treated plots at all the locations. All the herbicides under taken for the demonstrations resulted an increase of 53 to 98 percent yield over farmers' practice depending upon the intensity and growth of weeds.

Among different herbicides undertaken for demonstration, the average highest grain yield of 1700 kg/ha was obtained with the treatment of imezethapyr 100 g/ha followed by chlorimuron + fenoxaprop (1626 kg/ha) with the additional benefit of Rs. 12,600/- and 11,275/-, respectively over farmer's practices which yielded 850 kg/ha only. It indicates that the grain yield and benefit due to treatment was higher than farmer's practice similar finding was also reported by (Tiwari *et al.* 2001). The additional cost of treatment were varied from Rs. 600 to 1500 which gave additional yield of 400-905 kg/ha. Thus this study indicated that, adoption of improved practice of weed control was better than farmers' practice of weed control.

Table 1. Impact of weed control technology in soybean at farmers' field (average data of the year 2003 to 2005)

Location/ No of Demo./ farmers practice	Treatment (name of chemical with dose / HW)	Weed count (no./m^2)		Weed dry matter (g/m^2)		WCE (%)	Grain yield (kg/ha)		Increase in yield over F P (%)	Cost of treatment (Rs/ha)	Benefit over farmers practice (Rs/ha)
		Initial	30 DAT/DAS	Initial	30 DAT/DAS		F.P.	Treated			
20 demo at three location	Chlorimuron ethyl 10 g/ha	146	72	78	21	71	-	1150	53	600	5800
Farmers' practice	One HW	150	95	87	22	68	750	-	-	1800	-
20 demo at three location	Imazethapyr ethyl 100 g/ha	260	19	238	17	93	-	1700	98	1550	12600
Farmers' practice	One HW	257	135	231	55	76	855	-	-	1800	-
20 demo at three location	Chlorimuron ethyl 10 g/ha + Fenoxa prop-p ethyl 75 g/ha	284	73	234	37	84	-	1626	94	1300	11275
Farmers' practice	One HW	290	150	240	65	73	840	-	-	1800	-

FP – Farmers' practice of weed control, DAT – Days after treatment, DAS – Days after sowing, HW – Hand weeding

The demonstration at farmers' field plays a very important role to disseminate recommended technologies because it is only tool to test the potential of technologies at farmers' level. Under demonstration some specific technologies related to weed management like use of proper herbicides, dose, time and method of application were undertaken in a scientific way. The findings of demonstration study were found to be the reason for good results and increase in the yield and benefit, thus it can be said that demonstration was the most successful tool for transfer of technology.

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Effect of mechanical weeding on weed infestation and yield of irrigated black gram and green gram

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ABSTRACT

A field experiment was conducted to study the effect of mechanical weeding on weed infestation and yield of black gram cv *VBN 4* and green gram cv *VBN 2* under irrigated condition. The treatments consisted of mechanical weeding (60 x 5 cm and 60 x 10 cm), manually operated weeder (30 x 10 cm), hand weeding twice under 30 x 10 cm, weed free plot and an unweeded control. The results revealed that lower weed biomass, lesser weed population, higher weed control efficiency and lower weed index were observed under hand weeding twice 30 x 10 cm followed by mechanical weeding in both green gram and black gram. The effect of mechanical weeding on these weed parameters were on at par and significantly higher than manual operated weeder. Higher number of pods/plant and grains/pod were produced under hand weeding followed by mechanical weeding. The highest grain yields were registered by hand weeding twice under 30 x 10 cm spacing in both the crops.

Key words: Mechanical weeding, Black gram, Green gram

Black gram and green gram are the important pulse crops in Tamil Nadu which are grown under irrigated, rainfed and rice fallow conditions. Weeds compete for water, nutrients and space and cause up to 45 per cent yield loss in blackgram (Yadav *et al.* 1997). The control of weeds during critical period of crop weed competition is very important so as to avoid yield loss. The initial growth being very slow, the crop suffers from severe weed competition up to 35 days after sowing (DAS) which causes yield reduction and, therefore, two hand weeding were essential (Singh 1993). Herbicide use may prove uneconomical due to low yield potential of green gram (Reddy 2004). Mechanical weeding is preferred in crop production because herbiury to crop plants (Pandian and Nalliah Durairaj 2004). The success of mechanical weeding depends upon the kind of implements used and stage of the weed growth whicecide application is expensive, selective and may cause in jury during operation (Gupta 1998). Hence, it is very much essential to select suitable type of weeder for pulses. Therefore, this experiment was carried out to study the suitability of mechanical weeding in green gram and black gram.

MATERIALS AND METHODS

A field experiment was conducted on weed control in irrigated blackgram CV *Vamban 4* and greengram CV *Vamban 2* during late winter (January to April) season of 2008 at Killikulam (Tamil Nadu). Six treatments consisted with T_1 – Sowing in 60 x 5 cm + mechanical weeding, T_2 - Sowing in 60 x 10 cm + mechanical weeding, T_3 - Sowing in 30 x 10 cm + mechanical weeding, T_4 - sowing in 30 x 10 cm + hand weeding, T_5 – Weed free (2 hand weeding at 20 and 35 DAS) and T_6 – unweeded control were tested on both crops in Randomised Block Design with four replications. The soil of the experimental field was clay loam in texture, slightly acidic in reaction (pH 6.2) and analyzing medium in available N and P and low in available K content. Both crops were sown in gross plots of 5.0 x 4.0 m for each treatment. A uniform dose of fertilizers and irrigation were given to all plots. Diesel operated mechanical weeder was used with crops sown in 60 cm rows apart at 20 and 35 days after sowing DAS, while Star make manually operated weeder was used in crop sown in 30 cm rows apart at the same time. Sowing of crops was done in 30 cm rows apart under T_5 and T_6. In weed free plot regular hand weeding was done as and when needed. Observations on weed parameters and yield attributes as well as yield of crops were recorded.

RESULTS AND DISCUSSION

Effect on weeds

The predominant weeds were *Cyperus rotundus, Trianthema portulecastrum,* and *Boerhavia diffusa* besides other grassy weeds in unweeded plots of the experimental plots. The weed dry matter production (DMP) was the lowest with T_4 - hand weeding twice under 30 x 10 cm spacing in both the crops during 30 and 45 days growth stages, but differences were not significant over mechani-cal weeding under either 60 x 5 cm (T_1) or 60 x 10 cm (T_2) (Table 1). Similar weed population with these

treatments may have resulted into comparable DMP. The use of manually operated weeder under 30 x 10 cm spacing had significantly higher DMP due to higher weed population/m^2 in both the crops at both the stages of observation than the former treatments. Higher weed control efficiencies were associated with hand weeding followed by mechanical weeding in both the crops Two hand weedings under 30 x 10 cm spacing recorded weed control efficiency of 85.7 and 83.7 in black gram and 85.8 and 86.0 in green gram during 30 and 45 DAS, respectively but values were at par to those recoreded with mechanical weeding under 60 x 5 cm and 60 x 10 cm at 45 DAS in both the crops. Diesel operated mechanical weeder was useful in controlling weeds in wide spaced field crops like cotton, maize and tapioca (Pandian and Nalliah Durairaj 2004).

With respect to weed index, lower values were observed under hand weeding followed by mechanical weeding indicating minimum yield reduction in these treatments in both the crops. Hand weeding twice with 30 x 10 cm recorded lower weed index of 13.6 and 15.7 in green gram and black gram, respectively. The yield reduction with mechanical weeding under either 60 x 5 cm or 60 x 10 cm was minimum than that of manually operated weeder under 30 x 10 cm in both the crops. This might be due to better weed control efficiencies with lower weed DMP and weed population.

Effect on crops

Different weed control methods exerted their marked influence on yield attributes in black gram and green gram (Table 2). Hand weeding twice with 30 x 10 cm spacing produced higher number of pods/plant and grain/pod than mechanical weeding and manually operated weeder in both the crops, but values of grains/pod were comparable with each other. Superiority in yield attributes under hand weeding and mechanical weeding was attributed to less weed population and weed biomass coupled with higher weed control efficiencies under these treatments.

Among the four weed control methods, significantly maximum grain yield of 980.2 and 1082.2 kg/ha were registered by hand weeding twice under 30 x 10 cm spacing in green gram and black gram, respectively. The grain yields under mechanical weeding with either 60 x 5 cm and 60 x 10 cm were almost similar and these were significantly higher than that of obtained by manually operated weeder. The yield improvements under mechanical weeding than unweeded control were 118.8 and 103.6% with 60 x 5 cm and 60 x 10 cm in green gram and 115.9 and 101.9% in black gram, respectively. Increased grain yields under hand weeding and mechanical weeding was attributed to effective weed control by these treatments which was evident from superiority in yield attributes due to lower weed population and weed biomass.

Table 1. Effect of mechanical weeding on weed characters of black gram and green gram at 30 and 45 days after sowing

Treatments	Blackgram							Greengram						
	Weed population (no./m^2)		Weed DMP (kg/ha)		Weed control efficiency (%)		Weed index (%)	Weed population (no/m^2)		Weed DMP (kg/ha)		Weed control efficiency (%)		Weed index (%)
	30	45	30	45	30	45		30	45	30	45	30	45	
60 x 5 cm + mechanical weeding (T_1)	202.4	173.6	66.4	539.7	74.1	75.1	39.9	195.3	180.5	552.6	540.4	75.4	77.8	37.0
60 x 10 cm + mechanical weeding (T_2)	187.3	171.7	581.8	536.0	70.7	75.2	43.6	186.8	175.8	560.2	541.8	75.1	77.7	42.3
30 x 10 cm + manually operated weeder (T_3)	307.8	289.2	1315.3	1215.5	39.9	43.9	57.3	317.2	302.8	1306.4	1289.9	41.9	46.9	58.3
30 x 10 cm + hand weeding twice (T_4)	124.8	147.3	312.2	352.3	85.7	83.7	15.7	110.6	132.4	320.0	342.7	85.8	86.0	13.6
Weed free (T_5)	-	-	-	-	-	-	-	-	-	-	-	-	-	--
Unweeded control (T_6)	618.5	651.6	2188.2	2165.4	-	-	-	628.7	666.1	2250.5	2430.2	-	-	71.6
LSD (P=0.05)	49.4	55.8	188.5	220.2	10.1	16.3		49.4	55.8	211.5	209.6	13.2	15.9	--

DMP - Dry matter production

Table 2. Effect of mechanical weeding on yield attributes and grain yield of green gram and black gram

Treatments	Green gram			Black gram		
	Pods/ plant (no)	Grains / pod (no)	Grain yield (Kg/ha)	Pods/ plant (no)	Grains / pod (no)	Grain yield (Kg/ha)
60 x 5 cm + mechanical weeding (T_1)	13.8	5.1	617.6	11.2	5.0	652.1
60 x 10 cm + mechanical weeding (T_2)	15.2	6.7	565.9	11.7	6.2	609.8
30 x 10 cm + manually operated weeder (T_3)	10.9	4.8	408.7	7.3	4.4	462.5
30 x 10 cm + hand weeding (T_4)	12.7	7.0	852.3	9.8	6.5	910.4
Weed free (T_5)	18.2	7.2	980.2	13.6	6.8	1082.2
Unweeded control	7.1	4.1	278.3	6.0	3.8	302.5
LSD (P=0.05)	2.5	0.51	58.4	3.1	0.53	54.7

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