Effect of ready mix herbicides for weed control in Soybean under Vindhyan Plateau of Madhya Pradesh

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ABSTRACT : Soybean is one of the most important oil-yielding rainy-season *kharif* crop of Madhya Pradesh having multiple uses. Being a kharifseason crop, soybean is heavily infested by different weed flora, which is responsible for poor yield in soybean crop. The control of weeds during critical period is very important to reduce the yield loss. Keeping this in view, the present experiment was conducted on farmer's field during *kharif* season of 2014, 2015and 2016 in villages Chainpura,Mainpani, Baroda and Paatan of district Sagar, Madhya Pradesh. Under this experiment,ready mix application of three weed control treatment executed viz.T_1-farmers practices,T_2-spray of Fenoxaprop-p-ethyl 1000 ml+ Chlorimuron ethyl 37gm/ha at 20-25 days after sowing as post emergence and T_3-spray of Imazethapyr + Imazamox @ 1000 ml/ha at 20-25days after sowing as post emergence were used at ten farmers fieldduring three crop seasons for control of broad and narrow leaved weeds.The highest weed control efficiency and the lowest weed biomass were recorded with the ready-mix application of Imazethapyr + Imazamox followed by Fenoxprop-p-ethyl + Chlorimuron ethyl for effectively control the grassy and non-grassy weeds in soybean crop.

Soybean is one of the most important grainlegume cropsin the world in terms of total production and International trade. Being leguminous crop, it can fix 50to 200 kg/ha atmospheric nitrogen per season (Roughly, 1980). In the far east, the soybean is utilized in liquid, powder and curd form for human food. Immature green beans and sprouts are considered highly nutritious and consumed in great quantities.The two primary products of soybean are oil and meal. Soybean seeds contain from20 to 23 percent oil and from 39 to 45 percentmeal (Smith and Circle, 1972).

Weeds are the major constraints for successful production. Weeds reduce the yield up to 27-70 percent depending upon the type of weed infestation in densityand time of occurrence (Muniyappa *et al.,* 1986, Mishra *et al.,* 2016). They compete with crops for nutrient,light, water and space as well as cause of several adversities like harbouring of insect-pest and diseases, difficulties in harvesting and threshing and deteriorate the quality of crop produce by mixing of weed seeds (Lembi and Rose,1999).Soybean crop is more prone to severe competition with the weeds for nutrients, light, water and space resultingheavy reduction in yield (Mishra *et al.*2016).Thedegree of weed infestation may vary from field to field and season to season due to differences in climate, cropping pattern, soil fertility and water management practices etc.

Weeds,if not controlled in time can cause huge losses in yield as well as quality of grain.Soybean productivity in India is very low about 1.07 t/ha as compared to 2t/haglobally (AICRP soybean,2009) due to poor crop establishment, higher infestation of weeds etc. Reduction in the yield of soybean due to weeds varied from 30 to 50 percent, depending on weed species their intensity and critical duration of crop weed competition (Chandel and Saxena,1988).

Unavailability of agricultural labours during peak period of weeding creates problem for effective control of weeds in soybeancrop.Therefore, weed management through the herbicidal application remains the only viable option under these situations. In Madhya Pradesh soybean crop is mostly sown immediately after receiving of first rains,resulting huge emergence of seasonal weeds in higher density.Control of weeds during the critical period is very important to avoid yield losses. Yield losses are also high due tolack of appropriate dose of herbicide and solution of effective herbicide to control the weeds in broad spectrum. In view of above facts, an experiment was conducted to evaluate the degree of weeds infestation and to minimized the losses caused by the weeds.

MATERIALS AND METHODS

An on farms trial was conducted for three consecutive

years during *kharif* 2014-2016 in four villages i.e. Chainpura, Mainpani, Baroda and Paatan in Sagar district of Madhya Pradesh. The soil of experimental fieldswas medium black in all the villages. The soybean variety JS-93-05 was used for sowing in the trial. Three methods of weed control were tested viz.T_1-farmers practices (use of Imazethapyr with improper dose and time of application),T_2-spray of Fenoxaprop-p-ethyl 1000 ml+ Chlorimuron ethyl 37gm/ha at 20-25 days after sowing as post emergence and T_3-spray of Imazethapyr + Imazamox@ 1000 ml/ha at 20-25days after sowing as post emergence were used at ten farmers fieldduring three crop seasons for control of broad and narrow leaved weeds. Recommended package and practices was followed to grow the experimental crop. Thinning to maintain the optimum plant population (i.e. 0.4million plants/ha) was completed at 20 days after sowing in all the three years. Observations were recorded as weeds/m^2, number of pods/plants, grain yield (q/ha)and economics of the crop. Herbicide were sprayed with flat fan nozzle. Yield attributing characters were recorded on five plants per plot.

RESULTS AND DISCUSSION

Weed density

Before the application of herbicide plot was mainly mixed flora of weed viz. *Echinochloaspp, Dactylocteniuma egypticum*, *Cyperus rotundus*, *Celosia argentea*, *Portulaca oleracea*, *Phyllanthus niruri*, *Parthenium histerophorus* etc. Their occurrence and intensity varied in different treatments of different herbicides and farmers practices at different growth stages. The highest weed infestation was recorded in the plots where farmers itself adopt the practice as weed control.

The weed intensity of all species significantly reducedby the application of different herbicides during all the years applied as post emergence (table 1).Application of ready mix herbicide i.e. Imazethapyr +Imazamox@1000ml/ha at 20-25 DAS recorded significantlythe lowest weed populationof grassy as well non-grassy weeds followed by application of Fenoxaprop -p-ethyl + Chloromuron ethyl. Similar result was also reported byGirothia and Thakur (2006) and Kushwah and Vyas (2005). Tiwari *et al.* (2007) also reported that application of post emergence herbicide in soybean gave effective control over the grassy weeds.

Effect on yield

All the herbicidal treatments produced significantly higher pods/plant and seed yield than the practice followed by farmers due to use of ready mix herbicide with appropriate time.The maximum number of pods /plants were recordedunder application of Imazethapyr + Imazamox @ 1000 ml/ha followed by Fenoxprop –p-ethyl (1000 ml)+ Chlorimuron ethyl (37 gm/ha). Pooled average of three years revealed that the weed control

Table 1: Effect of weed control treatments on weeds and grain yield

Particulars	Weed Density (No./m^2)			Pods/plant (No.)			Seed Yield (q/ha)			Mean Yield (q/ha)	Yield Increase over FP (%)
Year	2014	2015	2016	2014	2015	2016	2014	2015	2016		
T_1 FP	130	123	136	26	23	24	6.18	4.72	5.19	5.36	-
T_2 Fenoxaprop-p-ethyl+Chlorimuron ethyl (1000 ml+37 gm/ha)	76	94	112	34	30	34	7.39	6.55	6.82	6.82	27.24
T_3 Imazethapyr+ Imezamox 100gm ai.1000 ml/ha	62	76	73	37	35	37	7.76	7.02	7.00	7.26	35.45

Table 2: Economic performance of the On-Farm Trial

Particulars	Cost of cultivation (Rs)			Gross Returns (Rs)			Net Returns (Rs)			B:C ratio		
Year	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016
T_1 FP	11000	12000	10500	21630	18880	15570	10630	6880	5070	1.97	1.57	1.48
T_2Fenoxaprop-p-ethyl+ Chlorimuron ethyl (1000 ml+37 gm/ha)	12800	13800	12000	25865	26200	19560	13065	12400	7560	2.02	1.89	1.63
T_3Imazethapyr+ Imezamox 100gm ai.1000 ml/ha	13100	13300	12250	27160	28082	21000	14060	14780	8750	2.07	2.11	1.71

practices increase the yield 27.24 percent to 35.45 percent over control. The significantly higher yield was recorded with ready mix application of Imazethapyr +Imazamox in every year followed by fenoxaprop-p-ethyl + chlorimuron ethyl (Table 1). These results are in confirmation with the result of Kushwah and Vyas (2005) and Girothia and Thakur (2006) . However, the yield was very low due to erratic rainfall during the crop growth period in every year. Yield is the result of interaction between various growth factors and yield attributes. Higher level of these parameters could be attributed to low competition stress of crops with weed plants. Tiwari and Kurchania (1990) also reported that weed infestation in soybean field may reduce yield upto 77 percent depending upon the intensity, nature and duration of weed competition. The lowest seed yield was recorded with weedy plots.Therefore,effective weed control in early stage of crop growth resulted in increase in number of pods/plant as well as yield and less attack of insect-pest.

Economics

Economic evaluations of each treatmentwere carried out and highest income and cost: benefit ratio was recorded with the treatment of Imazethapyr + Imazamox@1000 ml/ha followed by fenoxaprop-p-ethyl + chlorimuron ethyl during all the three years (Table 2).

On the basis of results of three years,it could be concluded that the application of Imazethapyr + Imazamox@1000 ml/ha provides effective control of grassy and non-grassy weeds applied as post-emergence at 20-25 days after sowing and significantly increased seed yield of soybean withmaximum net returns.

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