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Effect of chemical weed management in yield and economics of soybean (*Glycine max*. L.)

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Abstract
An on farm trail conducted during *kharif* 2017 at farmer's field of Kabirdham district of Chhattisgarh to evaluate the effect of chemical weed management in soybean. There are several constraints in the soybean one of them is weeds which often poses serious problem. Labour saving and eco-friendly weed management technology in soybean, which includes herbicides, can prove more economical and beneficial. Weed management by Imazethapyr 35% + Imazamox 35% WG 100g a.i. /ha at 15 DAS found superior for Yield, Weed control efficiency, Gross return, Net return and benefit: cost ratio over the other treatments.

Keywords: Soybean, weed management, imazethapyr, imazamox

Introduction
Oilseed crops have been the backbone of agricultural economy of India from time immemorial. Soybean is a wonder crop of the twentieth century. It is an excellent source of protein and oil. Soybean is mainly grown during *kharif* season in sandy loam to clay loam soils in Chhattisgarh. In India it is grown an area of 108.834 lakh ha with an annual production of 104.366 million tonnes (SOPA, 2014) [5]. In Chhattisgarh Soybean is cultivated in 153000 ha area with average productivity of 1250kg/ha. Soybean occupies 49750 ha in *kharif* season with the average productivity of 1356 kg/ha In the Kabirdham district of Chhattisgarh. Weed competes with crop plants for moisture, nutrients, light and space. In addition, they are also serving as an alternate host for several insect pests and pathogens. Being a rainy season crop soybean faces severe weed competition during early stages of crop growth, resulting in a loss of about 40-60 per cent of the potential yield, depending on the weed intensity, nature, environmental condition and duration of weed competition (Kachroo *et al*., 2003) [3]. In soybean crop, first 20 to 45 days after the sowing is considered the most critical period for weed control for optimum yield (Sharma *et al*., 2007).

Materials and Methods
The experiment was conducted during *kharif* season of 2017 in the field of four farmers of Kabirdham district of Chhattisgarh. The experiment was conducted on *Vertisols*. *Vertisol* is fine and belongs to the sub-group *chromustert*. Experimental soil, locally known as *kanhar*, was clayey. It is dark in colour, heavy clay (50-55%) whose colour ranges from light to dark brown in the surface layer and brown to brownish black in the deeper layer. Lime concretions are usually present. Soil is neutral in reaction. Experiment consists of four replication and four treatments. Treatment first (T_1) was farmers practice i.e. delayed manual weeding, treatment second (T_2) was Spray of Imazethapyr 10% S.L. (Pursuit) @75 g a.i. /ha, at 15 DAS, treatment third (T_3) was spray of Imazethapyr 35% + Imazamox 35% WG (Odyssey) @ 100 g a. i. /ha at 15 DAS and treatment Fourth (T_4) was spray of Chlorimuron 9g/ha + Quazalofop 60g/ha at 25DAS.
The weed counting was done at randomly selected spots by using the quadrate. The crop from each plot was harvested separately. The seeds were separated from straw by threshing. The weight of seeds was recorded and expressed in q ha^{-1}. Cost of production for all treatments was worked out on the basis of the prevailing input and market price of the produce. The net return ha^{-1} was calculated by deducting the cost of production ha^{-1} from the gross return ha^{-1}. Ultimately, net return per rupees (cost: benefit ratio) invested was calculated treatment wise to assess the economic impact of the treatments by dividing the net return $ha^{-1}$by the cost of production.

Result and Discussion
The recorded data are presented in table-1. The maximum seed yield (16.50 q/ha^{-1})

was obtained under treatment weed management by Imazethapyr 35% + Imazamox 35% WG @ 100g a.i./ha. The lowest seed yield was recorded under treatment no use of herbicide with Delayed manual weeding. The increase in yield under Imazethapyr 35% + Imazamox 35% WG Imazethapyr 35@ 100g a.i./ha was due to better weed management which resulted in greater translocation of food materials to the reproductive parts and reflected in superiority of yield attributing characters and ultimately to higher yield. Similar results were also noted by Thakur (2008) [4] & Dhane *et al*., (2009) [2]. The lower seed yield (12.40q/ha^{-1}) with No use of herbicide with Delayed manual weeding might be also due to higher weed interference. The lower weed population and higher weed control efficiency also resulted in higher grain yield. Similar findings were reported by Chandel and Saxena (2001) [1].

Echinochloa colonum, Echinochloa crusgalli, Cyperus rotundus, Commelina benghalensis, Cyanotis axillaris. Euphorbia spp., Cynodon dactylon were major weeds in the experimental field. Maximum weed density of these weeds was observed throughout the period of investigation under No use of herbicide with Delayed manual weed. Imazethapyr 35% + Imazamox 35% WG @ 100 g a.i./ha was found more effective in reducing weed density of weeds than other treatments.

Economics of soybean production in terms of net return and benefit cost ratio was calculated for as presented in table-1.The data reveals that the maximum net return (Rs.28500ha^{-1}) and benefit: cost ratio (2.81) was obtained under Imazethapyr 35% + Imazamox 35% WG@100g a.i/ha.

Table 1: The recorded data are presented

Treatment	Yield (q ha^{-1})	% change in Yield	Parameter* (No. of weed/m$^{2)}$	Net income Rs/ha	B:C Ratio
No use of herbicide, Delayed manual weeding	12.40	-	27.55	22100.00	2.46
Imazethapyr 10% S.L.	14.20	14.52	14.9	26500.00	2.64
Imazethapyr 35% +Imazamox 35% WG	16.50	33.06	9.97	28500.00	2.81
Chlorimuron 9g/ha +Quazalofop 60g/ha	14.35	15.72	13.75	26750.00	2.70

Conclusion

The treatment Use of Imazethapyr 35% + Imazamox 35% WG @100 g a.i./ha at 15 DAS for weed management in soybean showed promising effect on minimum weed density, highest weed control efficiency, highest yield, economical return in terms of net return and benefit: cost ratio.

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