

EFFICACY OF DIFFERENT HERBICIDES ON WEED CONTROL IN SOYBEAN

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ABSTRACT

A field experiment was conducted during *kharif* of 2018-19 at Agronomy Farm, College of Agriculture, Nagpur to study the efficacy of different herbicides on weed control in soybean. The experiment comprised of eleven treatments and three replications. The results revealed that all treatments were significantly superior over weedy check with all weed parameters (total weed population, weed dry matter accumulation, weed control efficiency and weed index), yield parameters (no. of pods plant⁻¹, seed weight plant⁻¹ and test weight) and yield (seed yield and straw yield). Weed free treatment recorded lowest weed density, weed biomass, maximum weed control efficiency and lowest weed index followed by the treatment with One hoeing+One weeding+Imazethapyr+Imazemox @ 70 g a.i.ha⁻¹. Same treatment recorded highest seed yield (21.00 q ha⁻¹), straw yield (34.00 q ha⁻¹) and B:C ratio (2.48) which was significantly superior over the other treatments.

(Key words : Different herbicides, weed control, soybean)

INTRODUCTION

Soybean is a crop of global importance. India is the fifth largest producer of soybean in the world, contributing about 3.3% of global soybean production.

It is called as golden bean or miracle bean of 21st century because of its multiple uses. It is most important oil seed crop of the India and seems to be growing in importance. Soybean is nutrient rich plant protein with all nine essential amino acids, which are lacking in cereal crops. They contain fibre, vitamins and minerals including folate, selenium, potassium and magnesium. The only bean containing omega 3- fatty acids are required for the healthy nutrition. Soybean has vast or tremendous potential in combating the malnutrition in India. The sowing time for soybean in rainy (*kharif*) season is very short and farmers give first priority to sow the crop rather than to use pre emergence herbicides for controlling the weeds. Losses due to weeds have been one of the major limiting factors in soybean production. Problem of weeds is a very severe in soybean crop because of more space between row, slow growth at early stage and warmer season, weeds grow profusely, competing with the crop for water, light and nutrients. This adversely affects the total yield. Little or no reduction in yield occurs if soybean are kept weed free for 4 weeks. This is critical period for weed competition in soybean therefore, weed control at appropriate time using a suitable method is a must for ensuring effective weed control

and obtaining high grain yield. Use of herbicides plays a pivotal role in control of weeds at initial stages of crop growth hence, the search of new herbicides is of utmost importance. Spraying of post emergence herbicides helps to reduce the crop weed competition at critical growth stages resulting higher crop yields. So, crop-weed competition at critical stages is most important for increasing the crop yields.

MATERIALS AND METHODS

A field experiment was conducted during *kharif* of 2018-19 at Agronomy Farm, College of Agriculture, Nagpur, Maharashtra. The experimental field was located at 21°8' north latitude to 79°4' east longitude having an elevation of 321 m above MSL and has subtropical climate. The soil of experimental site was clayey in texture and slightly alkaline reaction. It was high in available nitrogen (208.13) kg ha⁻¹, available phosphorus (11.16) kg ha⁻¹ and fairly rich in potash (305.45) kg ha⁻¹ with moderate organic carbon (0.5). The experiment was laid out in randomized block design with eleven treatments replicated thrice. The treatments comprised of weedy check (T₁), weed free (T₂), One hoeing+One weeding (T₃), Propaquizafop @ 50 a.i ha⁻¹ (T₄), Imazethapyr @ 75 g a.i ha⁻¹ (T₅), Propaquizafop 50 g+Imazethapyr 75 g (T₆), Imazethapyr + Imazemox @ 70 g ha⁻¹ (T₇), One hoeing+One weeding+Propaquizafop @ 50 g a.i ha⁻¹ (T₈), One hoeing+One weeding+Imazethapyr 75 g a.i

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ha⁻¹(T₉), One hoeing + Oneweeding + Propaquizafop 50 g + Imazethapyr @75g (T₁₀), One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g ha⁻¹(T₁₁). The crop (variety –NRC-37) was sown by dibbling at 45 cm × 5 cm spacing. The gross and net plot sizes were 3.60 m × 4.80 m and 2.70 m×4.50 m. Weed parameters viz., total weed population, weed dry matter accumulation, weed control efficiency and weed index were recorded at 30, 60, 90 and at harvest. Yield and yield parameters viz., no.of pods plant⁻¹, seed weight plant⁻¹ and test weight, seed yield (q ha⁻¹) and straw yield (q ha⁻¹) were recorded at harvest.

RESULTS AND DISCUSSION

Weed flora

The dicot weeds *Digeraarvensis*, *Parthenium-hysterophorus*, *Digeraarvensis*, *Euphorbia hirta*, *Celosia argentia*, *Tridexprocumbense*, *Euphorbia geniculata*, *Alternanatheratriandra* were observed in experimental site. The monocot weeds i.e. *Commelinabenghalensis*, *Dinebra Arabica*, *Poaannua*, *Echinocloacrusgalli*, *Cyanodon-dactylon*, *Eragrostis major* were observed in experimental site.

Effect on weed parameters

The results revealed that, among all treatments weed free treatment recorded lowest total weed population, lowest weed index and maximum weed control efficiency. Among the herbicidal treatments, One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g ha⁻¹ treatment recorded significantly reduced total weed population (27.57 m⁻²) and it was at par with remaining all treatments. Similar results were observed by Mishra *et al.* (2013) they observed that lowest density of weeds was recorded with application of imazethapyr @1000 ml ha⁻¹ which was closely followed by chlorimuron –p-ethyl 37.5 g as early post emergence. Sangeetha *et al.* (2013) they observed that early post emergence application of imazethapyr ha⁻¹ or early post emergence application of imazethapyr @100 g ha⁻¹ was found to be effective against both monocot and dicot weeds and which resulted in reduced total weed population. It was at par with two hand weedings.

Lowest weed dry matter accumulation was obtained with treatment One hoeing+One weeding + Imazethapyr + Imazemox @70 g ha⁻¹ (7.69 g) and it was at par with One hoeing + One weeding + Imazethapyr 75 g.a.i. ha⁻¹, One hoeing + One weeding + Propaquizafop 50 g + Imazethapyr @ 75g. Similar findings were observed by Jadhav and Gadade (2012). They observed that lowest weed density and dry weed weight were recorded with two hand weedings at 20 and 40 DAS over weedy check, and it was at par with imazethapyr + imazemox 30g ha⁻¹ and imazethapyr 0.1 kg ha⁻¹ as PoE at 20 DAS. Sangeetha *et al.* (2013) observed that hand weeding twice on 30 DAS was recorded lowest weed density and biomass followed by early post emergence application of imazethapyr at 200 g ha⁻¹. Patil *et al.* (2018) observed lower weed biomass with the application of

pendimethalin @ 0.75 kg ha⁻¹ +1 HW and interculturing at 20 DAS as compared to all other treatments. Due to hand weeding and inter culturing cause a substantial reduction in weed density hence, recorded the lowest dry weight of weeds.

Maximum weed control efficiency (55.17%) recorded under treatment One hoeing+One weeding+ Imazethapyr + Imazemox @ 70 g ha⁻¹ and it was at par with treatment One hoeing + One weeding + Propaquizafop 50 g + Imazethapyr @ 75 g. Similar results were reported by Kushwah and Vyas (2005), they also stated that, application of imazethapyr 10 % at 75 g a.i.ha⁻¹ recorded highest weed control efficiency. Jadhav and Gadade (2012) observed that, 2 HW and hoeing at both 30 DAS and 60 DAS recorded maximum weed control efficiency, among all the treatments, application of imazethapyr + imazemox 30 g ha⁻¹ recorded the maximum WCE during both the years of experiment at 30 DAS as well as 60 DAS. Thakare *et al.* (2015) observed that highest weed control efficiency was recorded under treatment imazethapyr @ 0.100 kg a.i. ha⁻¹ + quizalofop ethyl @ 0.075 kg a.i. ha⁻¹. Patil *et al.* (2018) observed that the combined effect of herbicide pendmethalin @ 0.75 kg ha⁻¹ +h and weeding + inter culturing ultimately resulted in minimum weed dry weight and observed that these treatments liable for higher weed control efficiency.

Lowest weed index (6.66%) recorded under treatment One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g ha⁻¹ and it was at par with treatment One hoeing + One weeding + Propaquizafop 50 g + Imazethapyr @ 75 g. Similar results were reported by Prachand *et al.* (2015), they observed that application of imazethapyr 0.100 kg ha⁻¹ + quizalofop ethyl 0.075 kg ha⁻¹ as PoE recorded lowest weed dry matter, weed index and highest weed control efficiency.

Effect on yield parameters

Among all treatments, weed free treatment recorded highest number of pods plant⁻¹ (52.50). Among herbicidal treatments One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g.ha⁻¹ recorded highest number of pods plant⁻¹ (52.00) which was at par with One hoeing + One weeding + Imazethapyr 75 g.a.i ha⁻¹, One hoeing + One Weeding + Propaquizafop 50 g + Imazethapyr @ 75 g. This might be due to better control of weeds might have favoured higher uptake of nutrients and water, which helped the plant to put optimum growth characters viz., plant height and number of branches plant⁻¹. Further it might have enhanced photosynthetic activity and partitioning of assimilates, resulting in improved number of pods plant⁻¹. Basu and Sengupta (2012) recorded maximum number of pods plant⁻¹ with the application of imazethapyr @ 125 g ha⁻¹. Mishra *et al.* (2013) recorded that highest number of pods plant⁻¹ and seeds pod⁻¹, seed index were recorded under odyssey between 75 g and 100 g ha⁻¹ as early post emergence compared to other treatments. Kulal *et al.* (2017) observed that, highest number of pods plant⁻¹ recorded with weedfree

Table 1. Influence of weed control treatments on weed parameters, yield and yield parameters

Treatment details	Total weeds (m ²)	Weed dry matter plant ⁻¹ (g)	W.C.E (%)	W.I (%)	No.of pods plant ⁻¹	Seed weight plant ⁻¹ (g)	Test weight (g)	Seed yield (q ha ⁻¹)	Straw yield (q ha ⁻¹)
T ₁ -Weedy check	49.15 (7.04)	16.57	0.00	50.00	31.25	9.80	11.56	11.25	18.25
T ₂ -Weed free check	0.00 (0.70)	0.00	100	-	52.50	18.20	15.54	22.50	35.05
T ₃ -One hoeing + One weeding	37.20 (6.14)	12.23	27.81	32.22	37.93	12.16	13.05	15.25	29.25
T ₄ -Propaquizafop @ 50a.i ha ⁻¹	38.90 (6.27)	13.26	16.66	40.00	33.56	10.25	12.46	13.50	25.00
T ₅ -Imazethapyr @ 75 g a.i ha ⁻¹	37.85 (6.19)	12.05	25.74	36.88	35.78	11.33	12.93	14.20	27.35
T ₆ -Propaquizafop 50 g+ Imazethapyr 75g	35.30 (5.98)	11.23	34.65	27.55	39.65	13.12	13.56	16.30	30.25
T ₇ -Imazethapyr+Imazemox @ 70 g ha ⁻¹	34.60 (5.92)	11.10	35.63	24.22	41.60	13.80	13.92	17.05	31.50
T ₈ -(One hoeing+One weeding)+Propaquizafop @ 50 a.i ha ⁻¹	32.16 (5.71)	9.86	44.82	22.40	44.30	14.20	14.23	17.46	32.00
T ₉ -(One hoeing+One weeding)+Imazethapyr 75 g.a.i ha ⁻¹	31.10 (5.62)	8.43	52.87	17.11	48.20	16.40	14.55	18.65	32.70
T ₁₀ -(One hoeing+One weeding)+ (Propaquizafop 50g+ Imazethapyr @ 75 g)	28.68 (5.40)	7.69	54.87	13.77	51.75	17.80	14.90	19.40	33.25
T ₁₁ -(One hoeing+One weeding)+ (Imazethapyr+Imazamox @ 70 g ha ⁻¹)	27.57 (5.29)	0.74	55.17	6.66	52.00	18.00	15.00	21.00	34.00
SE m(±)	0.38	2.20	-	-	2.83	0.94	0.82	1.13	1.97
C D at 5%	1.12	6.40	-	-	8.37	2.79	2.43	3.33	5.82

check (2HW+2 hoeings at 3rd and 5th WAS). It was at par with treatment pendimethalin PE @ 750 g ha⁻¹ + 1 HW at 30 DAS and treatment imazethapyr POE @ . a.i ha⁻¹ at 21DAS.

Among all treatments, weed free treatment recorded highest seeds weight plant⁻¹ (18.20). Among herbicidal treatments One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g ha⁻¹ recorded highest seed weight plant⁻¹ (18.00) which was at par with One hoeing + One weeding + Imazethapyr 75 g a.i ha⁻¹, One hoeing + One weeding + Propaquizafop 50 g+Imazethapyr @ 75 g, it might be due to providing favorable environment for crop with controlling weeds, which reduces the competition of crop with weeds for space, air, sunlight, moisture and nutrients. Significantly higher number of pods and seed weight plant⁻¹ was observed. Similar results were reported by Patel *et al.* (2018), who observed that One hoeing at 15 DAS and 2 HW at 25 and 45 DAS recorded the highest seed weight plant⁻¹ (23.46 g) and it was at par with treatments PE application of pendimethalin 38. 677. 25 g.a.i.ha⁻¹ +1 HW at 30 DAS, metribuzin @ 525 g.a.i.ha⁻¹+1 HW at 30 DAS, metribuzin @ 525 g.a.i.ha⁻¹ followed by imazethapyr + propaquizafopethyl @ (80+60) g a.i.ha⁻¹.

Among all treatments, weed free treatment recorded highest test weight (15.54g). Among herbicidal treatments One hoeing + One weeding + Imazethapyr + Imazemox @ 70 g ha⁻¹ recorded highest test weight (15.00g). This might be due to more availability of nutrients and water.

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