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# Effect of different herbicides on growth, yield and economics of soybean under Farmers field

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**Abstract**
Weed infestation is the major constraints in soybean growing areas. Farmers are trying many approaches to control the weed to produce maximum yield through soybean crop. Present investigation was designed to resolve the weed problem at farmers' fields. Results of the experiment revealed that the application of Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding at 35-40 DAS was produced maximum grain yield according to present experiment. However, the application of Imazathpyr + Imizamox @ 100 gm/haat 20 DAS and Imezathpyr@1000 ml/ha was found most economical or beneficial in present experiment.

**Keywords:** Farmers field, weed management, imazathpyr, clorimuranethyle and economics

## Introduction
Weeds compete with crop for light moisture and nutrients, with early-season competition being the most critical. 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) [6]. Inadequate weed control is one of the main factors related to decrease in soybean production.

Weeds have traits which confer them great aggressiveness even in adverse environments. High number of seeds, seed dormancy, discontinuous germination, effective dispersal mechanisms and population heterogeneity, are very important for weed establishment during crop development. During this phase, weeds may rapidly capture resources and occupy space; this is often linked to their competitive ability, because rapid growth requires the prompt and efficient conversion of resources into biomass. Thus, the yield is reduced and production costs increase, resulting in a decrease in farmer's income.

India is the fifth largest producer of soybean in the world, which is grown in an area of 118.385 thousand hectares with the production of 104.559 thousand tonnes (SOPA, 2020) [9]. The average productivity of the crop is 1021 kg/ha which is lower as compared to other soybean growing countries of the world. Madhya Pradesh is being "Soya State" accounts for 54.96% of area and 57.62% of production of soybean in the country with an average productivity of 714 kg/ha, Madhya Pradesh coverage of 5.86 million hectare recording production of 4.17 million tonnes (SOPA 2020) [9]. Weed infestation is one of the major constraints that limit the productivity of soybean. Critical period of crop-weed competition for soybean crop ranges between 20 to 45 days after sowing. Crop is highly susceptible to weed infestation, because of its slow growth in the initial stage up to 45 days. Soybean weeds comprise diverse plant species from grasses to broad leaf weeds and sedges and cause substantial yield losses. In India yield losses of soybean due to weeds ranged from 30-80% depending upon the type of weed flora and weed density (Kuruchania *et al.*, 2000) [7]. The incessant rains do not permit timely inter-cultivations and manual control of weeds on account of high cost labour shortage during weed peaks. During the peak period of weed infestation incessant rains do not permit timely inter-cultivation and manual weeding on high cost and shortage of labour.

Besides reducing crop yield, weeds can cause other problems, like reduce grain quality, causeloss and difficulty during harvesting and serve as hosts of pests and diseases.

The role of weeds as alternate hosts for soybean crop pests and diseases and their interference with cultivation operations resulting into higher costs of production must not be over looked. Weeds can also release toxins highly harmful to crop development. However, despite weeds show many negative aspects, they can also show advantages, like: providing food for the wildlife; potential source of germplasm; recycling nutrients and preventing soil erosion.

Keeping the above facts in mind present investigation was undertaken with the objective to observe the effect of various herbicides on soybean crop under farmers field conditions.

**Methodology**

Present investigation was planned and executed during 2017-18 and 2018-19 at 12 farmers field in adopted villages of Krishivigyan Kendra Neemuch. The soybean crop with variety JS-95-60 was taken for the experimentation. The Demonstration of herbicide Imazathpyr + Imizamox @ 100 gm/haat 20 DAS for Weed management ($T_1$), Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding / dora at 35-40 DAS ($T_2$), Imezathpyr@100gm/ha at 20 DAS ($T_3$) and No use of herbicide ($T_4$) treatments were selected for the evaluation in farmers field. The each farmer were treated as the replication for the statistical analysis under the Randomized Block Design (RBD). All the agronomic practices except different weed management practices were remained same for all farmers' fields. Total 1 acre area was finalized at every farmer's field for demonstrating all four treatments at each location or farmer's field. The different agronomic observation as per recommended procedure established by the various research workers was followed during the experiment.

**Results and Discussion**

The experiment was closely observed by the scientists of KVK Neemuch. The data were collected time to time as per the described procedure. The recorded data were statistically analysed with prescribed formulae of RBD Design.

**Growth Parameter**

Different growth parameters namely branch per plant, number of pod per plant, Test weight (g) and Plant Height (cm) at harvest stage were observed and analysed statistically. All the observation was collected from five selected plants in every treatment at every farmers field. The collected data were computed and the average of all five plants were represented the performance of treatment.

**Plant Height (cm)**

Plant height (cm) was clearly affected by the application of various weed management practices. Maximum plant height 84.63 cm was observed in $T_2$Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding / Dora at 35-40 DAS which, was significantly higher over the all other treatment tested in the experiment. However the minimum or significantly lower plant height 76.30 cm was recorded in control or no use of weed management practice.

**Branch per plant**

Branch per plant is a major growth parameter of soybean crop. Maximum number of branch per plant was recorded under the Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding / dora at 35-40 DAS ($T_2$) 4.16 which was followed by application of T1-Imazathpyr + Imizamox @ 100 gm/haat 20 DAS (4.05). However, the minimum numbers of branches were recorded under the control $T_4$ (2.66).

**Number of pod per plant**

The maximum number of pod per plant were recorded under the application of Clorimuranethyle @ 40 gm / hafollowed by the one hand weeding at 35-40 DAS (125.60) while the minimum was recorded under the control or no use of weed control measures (100.10) $T_4$.

**Test weight**

Test weight was also affected by the application of various herbicide or combination of herbicide for weed control in soybean crop. The same trend as per other parameter $T_2$ produced significantly maximum test weight 37.14 g which was followed by the application of Imazathpyr + Imizamox @ 100 gm/ha at 20 DAS (36.20g). However, all the treatment differes significantly to each other and the minimum test weight was produces by the control $T_4$ (35.19).Test weight of grains was also affected significantly under farmers field due to different weed management practices. Jatav *et al*. (2019) [5].

**Weed parameter**

Following weed parameters were recorded under the experiment. The all weed data were collected through described procedure. The collected data were analysed statistically and presented in table-2.

**Number of narrow leaved weed $m^{-2}$**

Total number of narrow leaved weed at 20 and 40 DAS were collected from each treatment. The maximum number of narrow leaved weed at 20 DAS and 40 DAS were recorded in control 229.0 and 228.50 respectively. However the minimum was recorded under $T_2$ – 5.06 and 2.60 respectively. Imazethapyr + Imazamox has been controlled the grassy weeds in green gram (Gupta *et al*. 2017) [3]. This is a selective herbicide and is used as a postemergence to control the late emerging weeds.

**Number of Broad leaved weed $m^{-2}$**

The same trend as per narrow leaved weed was also observed for broad leaved weed also. The minimum broad leaved was observed under $T_2$ 2.19 and 1.31 while maximum was recorded in $T_4$- 60.57 and 75.71 at 20 and 40 DAS stage respectively. Similar result was found Gupta *et al*. 2020 and Rajput and Kasana (2020) [8].

**Grain Yield (q/ha)**

The maximum grain yield was produced under $T_2$ (17.14 q/ha), which was significantly higher over all other treatment during experiment. However, $T_1$and $T_3$wereproduced comparable grain yield; 15.65 and 15.55 q/ha which was also significantly higher over the control ($T_4$) 14.53 q/ha.

**Economic Parameters**

The maximum cost of cultivation Rs. 19900/ ha was recorded in $T_2$ which was followed by $T_1$ (Rs. 19800/ha) and $T_3$ (Rs. 19700/ha). The minimum cost of cultivation was recorded in $T_4$ (control) Rs/ 19600/ha). Accordingly the maximum gross and Net return Rs. 53259/ha and Rs. 38359/ha recorded in $T_2$ respectively. However the minimum was recorded under $T_4$ control Rs. 49387/ha and Rs. 29787/ha respectively. This data was in conformity with the findings of Gupta *et al*. (2019) [4] and Dixit *et al*. (2016) [1].

The benefit cost ratio was recorded superior in treatment $T_1$ (2.98) which was closely followed by $T_3$ (2.97). However, $T_2$ was produced almost at par 2.97 B:C ratio. The minimum was recorded in $T_4$ control 2.87.

**Table 1:** Yield and economics of soybean under chemical weed management practices on Farmer's Field

| Treatment | Technology demonstrated | Yield (q/ha) | Cost of cultivation (Rs/ha) | Gross Return (Rs/Ha) | Average Net Return (Rs/ha) | B:C Ratio |
|---|---|---|---|---|---|---|
| T1 | Imazathpyr + Imizamox @ 100 gm/ha at 20 DAS | 15.65 | 17800 | 53154 | 35354 | 2.98 |
| T2 | Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding at 35-40 DAS | 17.14 | 19900 | 58259 | 38359 | 2.93 |
| T3 | Imezathpyr@100gm/ha at 20 DAS | 15.55 | 17700 | 52685 | 34985 | 2.97 |
| T4 | Control (No use of herbicide) | 14.53 | 17200 | 49387 | 32787 | 2.87 |
| | SEM +_ | 0.325 | - | - | - | - |
| | CD@5% | 0.952 | - | - | - | - |

**Table 2:** growth and yield parameters of soybean under different chemical weed management practices on Farmer's Field

| Treatment | Technology demonstrated | Branch/plant at Harvest | No. of Pod/plant | Test Weight (g) | Plant Height at Harvest (cm) |
|---|---|---|---|---|---|
| T1 | Imazathpyr + Imizamox @ 100 gm/ha at 20 DAS | 4.05 | 126.40 | 36.20 | 84.63 |
| T2 | Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding at 35-40 DAS | 4.16 | 128.60 | 37.14 | 95.44 |
| T3 | Imezathpyr@100gm/ha at 20 DAS | 3.48 | 106.90 | 35.69 | 82.22 |
| T4 | Control (No use of herbicide) | 2.66 | 100.10 | 35.19 | 76.30 |
| | SEM+_ | 0.169 | 4.627 | 0.206 | 0.819 |
| | CD@5% | 0.494 | 13.546 | 0.603 | 2.398 |

**Table 3:** Weed Count per meter square as affected by different chemical weed management practices on Farmer's Field

| Treatment | Technology demonstrated | No. of Narrow Leaved Weed /m2 at 20 DAS | No. of Narrow Leaved Weed /m2 at 40 DAS | No. of Broad Leaved Weed /m2 at 20 DAS | No. of Broad Leaved Weed /m2 at 40 DAS |
|---|---|---|---|---|---|
| T1 | Imazathpyr + Imizamox @ 100 gm/ha at 20 DAS | 12.57 | 5.76 | 6.73 | 6.89 |
| T2 | Application of Clorimuranethyle @ 40 gm / ha for weed management at 15-20 DAS+ one hand weeding at 35-40 DAS | 5.06 | 2.60 | 2.19 | 1.31 |
| T3 | Imezathpyr@100gm/ha at 20 DAS | 22.22 | 14.70 | 12.19 | 12.80 |
| T4 | Control (No use of herbicide) | 229.90 | 228.50 | 60.57 | 75.71 |
| | SEM+_ | 2.152 | 2.502 | 1.154 | 1.400 |
| | CD@5% | 6.300 | 7.325 | 3.378 | 4.099 |

## Conclusion

The application of Application of Clorimuranethyle @ 40 gm/ha for weed management at 15-20 DAS+ one hand weeding at 35-40 DAS was produced maximum grain yield according to present experiment. However, the application of Imazathpyr + Imizamox @ 100 gm/ha at 20 DAS and Imezathpyr@1000 ml/ha was found most economical or beneficial in present experiment.

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