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# Studies on efficacy of herbicide combinations in soybean (*Glycine max* (L.) Merrill)

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**Abstract**
The investigation was conducted at experimental farm of Department of Agronomy, College of Agriculture, V.N.M.K.V., Parbhani (M.S), India during *Kharif* season of 2017-18 to evaluate performance herbicides in soybean. The experiment was laid down in randomized block design. The weed management treatments consisted of $T_1$- Propaquizafop + Imazethapyr PoE @ 75+100 g a.i /ha, $T_2$- Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha, $T_3$- Imazethapyr + Quizalofop ethyl PoE @ 100+75 g a.i/ha. (Tank mix), $T_4$- Imazethapyr + Imazamox PoE @ 70 g a.i/ha, $T_5$- Diclosulam PE @ 22 g a.i/ha, $T_6$ - Haloxyfop + Imazethapyr PoE @ 50+100 g a.i/ha. (Tank mix), $T_7$- Haloxyfop PoE @ 75 g a.i /ha, $T_8$- Cultural practices (1HW + 1Hoeing), $T_9$- Weed free, $T_{10}$– Weedy check with the objectives to study the comparative performance of herbicide combinations in soybean. Among the different herbicides used, treatment Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha recorded seed yield at par with weed free and recorded significantly higher seed yield over rest of treatments except it was statistically at par with cultural practices i.e. one Hand Weeding + one Hoeing and treatment Imazethapyr + Imazomox PoE @ 70 g a.i/ha. In weed studies, the lowest dry weight of monocot and dicot weeds was recorded with weed free and was at par with PoE application of Fluazifop-p-butyl + Fomesafen @ 250 g a.i /ha.

**Keywords:** Weed control, soybean, herbicide combinations

## Introduction
Among the various factors responsible for the low yield of soybean, weeds have been considered to be of prime importance. Thus, intense weed competition is one of the main constraints in increasing soybean productivity. Weeds compete with crops for natural and applied resources besides being responsible for reducing quantity and quality of agricultural productivity (Rao *et al.* 2015) [2], harvesting difficulties as well as act as hosts for pests and pathogens. Application of weedicide is one of the best option for timely weed control. Most of herbicides available are either pre-emergence or pre-plant incorporated and have a narrow spectrum of weed control. Further, if farmers skip application of these pre-emergence or pre-incorporated herbicides due to one or the other reason, require alternative post-emergence herbicides for managing weeds. Keeping these facts in view, the present investigation was undertaken during *Kharif* 2017 to find out performance of herbicide combinations in soybean crop at experimental farm, Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani with an objectives to study the comparative performance of herbicide combinations for controlling monocot and dicot weeds in soybean. (*Glycine max* (L.) Merrill.)

## Materials and methods
The field experiment was conducted during *kharif* season of 2017-18 at Department of Agronomy, V.N.M.K.V., Parbhani with a view to assess the effect of herbicide combinations on weed control and productivity of soybean. The experiment was laid out in randomized block design with ten treatments. Each experimental unit was of 5.4 m x 4.5 m and 4.5 m x 4.2 m in gross and net plot size, respectively. The treatments were $T_1$- Propaquizafop + ImazethapyrPoE @ 75+100 g a.i /ha, $T_2$- Fluazifop-p-butyl + FomesafenPoE @ 250 g a.i /ha, $T_3$- Imazethapyr + Quizalofop ethyl PoE @ 100+75 g a.i/ha.(Tank mix), $T_4$- Imazethapyr + ImazamoxPoE @ 70 g a.i/ha, $T_5$- Diclosulam PE @ 22 g a.i/ha, $T_6$- Haloxyfop + ImazethapyrPoE @ 50+100 g a.i/ha.(Tank mix), $T_7$- HaloxyfopPoE @ 75 g a.i /ha, $T_8$- Cultural practices (1HW + 1Hoeing), $T_9$- Weed free, $T_{10}$–Weedy check. The recommended dose of nutrients and plant protection schedule was followed. In each experimental plot, observations on monocot, dicot, and total weed population and dry matter of weeds were recorded at 30, 45, 60, 75, 90 DAS and at harvest stage with a quadrate of 1m X 1m. Was also recorded at the same stages.

## Results and discussion

### Effect of herbicides on weed dry weight (g)

Dry weight of monocot, dicot weeds at 15, 30, 45, 60 DAS and at harvest (g) was influenced significantly by weed control treatments (Table 2). At 15 DAS lowest weed dry matter of monocot, dicot weeds recorded by weed free treatment and was at par with Diclosulam PE @ 22 g a.i /ha. The results are in line with those reported by reported by Singh *et al*. (2009) [4].

At 30 DAS lowest total weed dry matter of monocot and dicot weeds was recorded by weed free treatment and Fluazifop-p-butyl + FomesafenPoE @ 250 g a.i/ha and both these treatments recorded significantly lowest total weed dry matter compared to rest of the treatments. Similar trend noticed at 45 and 60 DAS.

At harvest all weed management treatments recorded significantly lower total weed dry matter compared to weedy check. Among weed management treatments the significantly lowest weed dry matter of monocot and dicot weeds was recorded by weed free treatment and it was closely followed by Fluazifop-p-butyl + Fomesafen*PoE* @ 250 g a.i/ha. The results are in line with those put forth by Prachand *et al.* (2015) [1], Thakare *et al.* (2015) [5]. Singh *et al.* (2014) [3] also reported that effective control of grasses and non-grassy weeds with application of PoE herbicide Fluazifop-p-butyl + Fomesafen.

### Effect of herbicides on seed yield of soybean

Data on yield indicated that seed yield, significantly influenced by different herbicidal treatments. It was observed from the data that among the different herbicides used, treatment Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha recorded seed yield at par with weed free and recorded significantly higher seed yield over rest of treatments except it was statistically at par with Cultural practices 1 Hand Weeding + 1 Hoeing and treatment Imazethapyr + Imazomox PoE @ 70 g a.i/ha. The lowest seed yield was recorded by weedy check. This might be due to reduced competition by weeds and higher seed yield plant$^{-1}$ which occurred from increased number of pods, number of seeds plant$^{-1}$ while heavy weed infestation resulted in lowest seed yield recorded in weedy check.

### Effect of herbicides on straw and biological yield of soybean

The treatment differences in straw and biological yield of soybean due to different treatments were found significant. (Table: 1)

Data on straw and biological yield of soybean revealed that treatment weed free recorded significantly more straw and biological yield over rest of treatments but it was statistically at par with Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha and treatment cultural practices 1 Hand Weeding + 1 Hoeing. The straw and biological yield recorded with treatment Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha was further at par with treatment Imazethapyr + Imazomox PoE @ 70 g a.i/ha. The lowest straw and biological yield was recorded with treatment weedy check.

### Harvest index

The data on harvest index (Table 1) as influenced by weed management indicated that highest harvest index (41.82) was observed in treatment weed free followed by Fluazifop-p-butyl + Fomesafen PoE @ 250 g a.i /ha and treatment cultural practices i.e. 1 Hand Weeding + 1 Hoeing. The lowest harvest index was recorded with treatment weedy check.

**Table 1:** Mean Seed, Straw, Biological yield (kg ha$^{-1}$) and Harvest index (%) of soybean as influenced by different treatments.

| T. No. | Treatments | Yield (kg ha-1 ) | | | Harvest index |
|---|---|---|---|---|---|
| | | Seed | Straw | Biological | |
| $T_1$ | Propaquizafop + ImazethapyrPoE@ 75+100 g a.i /ha | 1719 | 2639 | 4358 | 39.44 |
| $T_2$ | Fluazifop-p-butyl + FomesafenPoE @ 250 g a.i /ha | 2418 | 3523 | 5941 | 40.70 |
| $T_3$ | Imazethapyr + Quizalofop ethyl PoE @ 100+75 g a.i/ha.(Tank mix) | 2025 | 3055 | 5080 | 39.86 |
| $T_4$ | Imazethapyr + ImazomoxPoE @ 70 g a.i/ha | 2294 | 3367 | 5661 | 40.52 |
| $T_5$ | Diclosulam PE @ 22 g a.i/ha | 1617 | 2509 | 4126 | 39.19 |
| $T_6$ | Haloxyfop + ImazethapyrPoE @ 50+100 g a.i/ha.(Tank mix) | 2144 | 3186 | 5330 | 40.22 |
| $T_7$ | HaloxyfopPoE @ 75 g a.i /ha | 1512 | 2379 | 3891 | 38.85 |
| $T_8$ | Cultural practices (1HW + 1Hoeing) | 2338 | 3419 | 5757 | 40.61 |
| $T_9$ | Weed free | 2579 | 3732 | 6311 | 41.82 |
| $T_{10}$ | Weedy check | 1220 | 2007 | 3227 | 37.80 |
| SE + | | 87.23 | 121.08 | 219.97 | -- |
| C.D. at 5% | | 259.20 | 359.77 | 623.89 | -- |
| General mean | | 1996.83 | 2981.6 | 4968.2 | 39.90 |

**Table 2:** Dry weight of weeds as influenced by different treatments at different stages

| T. No | Treatments | 15 DAS | | 30 DAS | | 45 DAS | | 60 DAS | | At harvest | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monocot | Dicot | Monocot | Dicot | Monocot | Dicot | Monocot | Dicot | Monocot | Dicot |
| $T_1$ | Propaquizafop + ImazethapyrPoE @ 75+100 g a.i /ha | 12.12 | 7.89 | 9.90 | 7.12 | 11.03 | 9.56 | 15.61 | 14.04 | 25.01 | 19.88 |
| $T_2$ | Fluazifop-p-butyl +FomesafenPoE @ 250 g a.i /ha | 11.84 | 7.87 | 2.07 | 1.27 | 2.94 | 1.84 | 6.38 | 4.79 | 13.82 | 10.62 |
| $T_3$ | Imazethapyr + Quizalofop ethyl PoE @ 100+75 g a.i/ha.(Tank mix) | 11.66 | 8.10 | 8.49 | 6.35 | 10.35 | 9.37 | 13.96 | 13.55 | 23.37 | 17.98 |
| $T_4$ | Imazethapyr + ImazomoxPoE @ 70 ga.i/ha | 11.63 | 7.85 | 6.71 | 4.93 | 8.52 | 8.27 | 12.45 | 11.52 | 18.89 | 15.70 |
| $T_5$ | Diclosulam PE @ 22 ga.i/ha | 4.76 | 4.42 | 10.42 | 9.48 | 13.56 | 12.71 | 17.32 | 13.91 | 26.92 | 20.27 |
| $T_6$ | Haloxyfop + ImazethapyrPoE @ 50+100 g a.i/ha.(Tank mix) | 12.04 | 7.66 | 7.84 | 6.20 | 9.64 | 8.51 | 13.74 | 12.64 | 21.45 | 16.97 |
| $T_7$ | HaloxyfopPoE @ 75 g a.i /ha | 12.04 | 7.89 | 9.87 | 7.90 | 11.21 | 10.39 | 17.19 | 14.71 | 22.05 | 25.86 |
| $T_8$ | Cultural practices (1HW + 1Hoeing) | 11.96 | 7.64 | 2.22 | 1.45 | 3.12 | 1.99 | 9.75 | 7.33 | 16.66 | 13.12 |
| $T_9$ | Weed free | 0.00 | 0.00 | 0.71 | 0.36 | 1.40 | 0.84 | 3.48 | 1.86 | 8.48 | 2.99 |
| $T_{10}$ | Weedy check | 12.44 | 8.33 | 17.76 | 16.30 | 29.38 | 39.19 | 46.31 | 40.01 | 58.93 | 51.09 |
| SE ± | | 0.41 | 0.33 | 0.51 | 0.31 | 0.64 | 0.47 | 0.61 | 0.57 | 0.95 | 0.80 |
| C.D. at 5% | | 1.24 | 1.00 | 1.52 | 0.93 | 1.92 | 1.42 | 1.81 | 1.72 | 2.83 | 2.38 |
| General mean | | 10.06 | 6.76 | 7.60 | 6.13 | 10.11 | 10.26 | 15.61 | 13.43 | 23.55 | 19.34 |

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