International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 1199-1201

Received: 19-05-2019
Accepted: 21-06-2019

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# Weed dynamics in soybean as affected by early-post: Emergence herbicides

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**Abstract**
A field experiment was conducted during *kharif* season of 2017 at the Research Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, and Jabalpur (M.P.). The ten weed control treatments comprising of four doses of fomesafen + fluazifop-p-butyl mixture (90+90, 110+110, 130+130 and 220+220 g/ha), alone application of imazethapyr (100 g/ha), market check – fomesafen + fluazifop-P-Butyl (110 + 110 g/ha), combined application of imazethapyr + imazamox (35 + 35 g/ha) as early post emergence, hand weeding twice at 15 and 30 DAS, weed free and weedy check, were laid out in randomized complete block design with 3 replications. The results indicated that among herbicides, application of premix fluazifop-p-butyl + fomesafen 130+130 g/ha as early-post-emergence recorded lower dry weight of monocot and dicot weeds (0.82 and 0.16 g/m$^2$), respectively, with 99.21% WCE being statistically at par with the highest dose of premix 220+220 g/ha, Hand weeding twice and weed free plots. Higher seed yield (20.12 q/ha) was recorded with application of fomesafen + fluazifop-p-butyl at 130+130 g/ha being at par with hand weeding twice (19.90 q/ha) and weed free plots (20.38 q/ha). The highest dose of fomesafen + fluazifop-p-butyl 220+220 g/ha was found effective against monocot and dicot weeds but caused phytotoxicity on crop and reduced seed yield marginally (19.81 q/ha).

**Keywords:** Weed flora, Fomesafen + fluazifop-p-butyl, Soybean, Weed management

## Introduction
Soybean is an important oilseed crop of Legumenaceae family and played a major role in sustaining the oilseed production in India. Madhya Pradesh is the leading state contributing 65-70 % to the total soybean production in India. Weeds have been one of the major limiting factors in soybean production as these compete with crop for light, moisture and nutrients during critical period of crop-weed competition. Soybean being a rainy season crop is heavily infested with many grasses and broad leaf weeds. Weed species like *Cyperus rotundus* (25.8%) followed by *Echinochloa colona* (23.1%) and *Commelina benghalensis* (15.6%) are predominant weeds in soybean. Beside these, dicot weeds *Eclipta Alba* (19.1%) and *Alternanthera philoxeroides* (16.4%) are also associated with soybean ecosystem (Sandil *et al.*, 2015) [7]. If weeds are not controlled in time, they cause yield reduction of soybean to the tune of 58 to 85 per cent, depending upon the types and intensity of weeds (Kewat *et al.*, 2000) [5]. However, extend of loss may go higher (78.50%) in seed yield of soybean depending upon weed intensity and types of weeds (Gidesa and Kebede, 2018) [3]. The diversified weed flora in soybean is, in general, controlled by pre and post emergence herbicides. Mostly farmers are using pre-plant incorporated or pre-emergence herbicides for weed control in soybean, but their efficacy is reduced by various climatic, edaphic and managerial factors. Hand weeding is a traditional and effective method of weed control, but untimely and continuous rains as well as unavailability of labour at peak period of demand are main limitations of manual weeding (Bineet *et al*., 2001) [2]. Proper contact of herbicide with weeds is very difficult in case of post emergence application in soybean due to quick cover of ground and attaining the proper height of crop. The only alternative that needs to be explored is the use of early-post-emergence herbicides. Fomesafen + fluazifop-p-butyl is one of the early-post-emergence herbicides for broad spectrum weed control in soybean. Study of Singh *et al*. (2014) [8] that fomesafen + fluazifop-p-butyl pre-mix at 250+250 g a.i/ ha controlled grasses and non-grassy weeds effectively and had lower weeds (29.3/m$^2$) against in untreated check (171.17/m$^2$). Since the information on efficacy of fomesafen + fluazifop-p-butyl is not available for KY more Plateau and Satpura Hill Zone of Madhya Pradesh, therefore, a comprehensive study was under taken.

## Materials and Methods

A field experiment was conducted during *kharif* season of 2017 at the Research Farm, Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, and Jabalpur (M.P.). The ten weed control treatments comprising of four doses of fomesafen 11.1% + fluazifop-p-butyl 11.1% SL mixture (90+90, 110+110, 130+130 and 220+220 g a.i/ha), alone application of imazethapyr 10% SL (100 g a.i/ha), market check – fomesafen 11.1% + fluazifop-P-Butyl 11.1% SL (110 + 110 g a.i/ha), combined application imazethapyr 35% + imazamox 35% WG (35 + 35 g a.i/ha) as early post emergence (10 DAS), hand weeding twice at 15 and 30 DAS, weed free and weedy check, were laid out in randomized complete block design with 3 replications. Sowing of soybean variety JS 20-69 was done manually using the rate of 80 kg/ha and normal package of practice was followed as per the recommendation for the crop. The observations on weeds under different treatment were made at 15 days after application (DAA) of herbicidal treatments and mechanical weed control by using quadrat of 0.25 square meters (0.5 m x 0.5 m) and the same was placed at four places in each plot. The seed yield of soybean was recorded at harvest after eliminating the border effect in each plot and then net plot yield was converted into yield per hectare by multiplying with suitable factor.

## Results and discussion

The experimental field cropped with soybean was infested with rampant weeds like *Echinochloa colona* (35.37%) and *Mollugo pentaphylla* (25.00%). However, other weeds like *Cyperus iria*, *Cichorium intybus*, *Phyllanthus urinaria*, *Eclipta Alba* were also present in less numbers. Lodha (2018) [6] also reported the predominance of *Echinochloa colona* (37.12%) and *Mollugo pentaphylla* (24.69%) but other weeds like *Cyperus rotundas*, *Commelina benghalensis* and *Dine bra retroflexum*, *Alternanthera philoxeroides* and *Phyllanthus niruri* also present in lesser numbers (9.53, 7.94 and 7.09; 7.75 and 5.88%, respectively) in soybean. Bhan and Kewat (2003) [1] also endorsed the similar finding.

Data on dry weight of weeds, weed control efficiency and yield of soybean are presented in Table 1. It is obvious from the data that all the herbicidal treatments had lowered the dry weight of weeds at 15 days after application (DAA) as compared to weedy check plots. Maximum dry weight of monocot and dicot weeds (106.18 and 18.16 g/m$^2$) was recorded under control plot, where weeds were not controlled by any means. But, there was identical reduction in the dry weight of weeds, when weed control treatments were adopted. Early post-emergence application of the lowest dose of pre-mixture fomesafen + fluazifop-p-butyl (90+90 g/ha) caused appreciable reduction in dry weight of monocot (14.08 g/m$^2$) as well as dicot weeds (1.69 g/m$^2$). However, the dry weight of weeds was further arrested with corresponding increase in dose being lower (monocot 0.82 g/m$^2$ and dicot 0.16 g/m$^2$) when it was applied at 130+130 g/ha or higher rate 220+220 g/ha and proved significantly superior over market sample of fomesafen + fluazifop-p-butyl mixture applied at 110+110 g/ha, imazethapyr alone at 100 g/ha and mixture of imazethapyr + imazamox 35+35 g/ha being at par to weed free and hand weeded plots. The weed control efficiency (99.21%) recorded higher when fomesafen + fluazifop-p-butyl was applied at 130+130 g/ha being similar to 220+220 g/ha, weed free and hand weeded plots but proved better over to the lowest dose (90+90 g/ha). Excellent reduction in dry matter production of monocot and dicot weeds under former treatments could be assigned the reason for higher weed control efficiency under the former treatments. But reverse was true in case of latter treatments.

**Table 1:** Effect of weed control treatments on dry weight of weeds, weed control efficiency and yield of soybean

| Treatments | Dose (g/ha) | *Dry weight of weeds (g/m$^2$) at 15 DAA | | | Total WCE (%) | Yield (q/ha) |
|---|---|---|---|---|---|---|
| | | Monocot | Dicot | Total | | |
| 1. Fomesafen + Fluazifop-p-butyl | 90+90 | 3.86 (14.08) | 1.63 (1.69) | 4.07 (15.77) | 87.37 | 12.11 |
| 2. Fomesafen + Fluazifop-p-butyl | 110+110 | 2.22 (3.98) | 1.28 (0.66) | 2.37 (4.64) | 96.28 | 17.07 |
| 3. Fomesafen + Fluazifop-p-butyl | 130+130 | 1.34 (0.82) | 1.08 (0.16) | 1.40 (0.98) | 99.21 | 20.12 |
| 4. Fomesafen + Fluazifop-p-butyl | 220+220 | 1.13 (0.28) | 1.07 (0.14) | 1.19 (0.42) | 99.66 | 19.81 |
| 5. Imazethapyr | 100 | 3.83 (13.80) | 2.28 (4.38) | 4.35 (18.18) | 85.44 | 10.39 |
| 6. Market check (Fomesafen + Fluazifop-p-butyl | 110+110 | 2.57 (5.61) | 1.37 (0.87) | 2.73 (6.48) | 94.81 | 16.21 |
| 7. Imazethapyr + Imazamox | 35 + 35 | 2.52 (5.41) | 1.88 (2.55) | 2.98 (7.96) | 93.63 | 14.64 |
| 8. Hand weeding | 15 & 30 DAS | 1.08 (0.17) | 1.10 (0.20) | 1.17 (0.37) | 99.70 | 19.90 |
| 9. Weed free | - | 1.00 (0.00) | 1.00 (0.00) | 1.00 (0.00) | 100 | 20.38 |
| 10. Weedy check (Control) | - | 10.34 (106.18) | 4.36 (18.66) | 11.21 (124.84) | - | 6.82 |
| CD (p=0.05) | - | 0.59 | 0.60 | 0.53 | - | 3.06 |

The seed yield was minimum (6.82 q/ha) in the plots receiving no weed control measure but it was increased markedly in the plots receiving fomesafen + fluazifop-p-butyl mixture at the 90+90 g/ha (12.11 q/ha). However, the yield was further improved with corresponding increase in dose of fomesafen + fluazifop-p-butyl mixture being identical when it was applied at 130+130 g/ha (20.12 q/ha) and proved significantly superior over check herbicides imazethapyr 100 g/ha, market sample of fomesafen + fluazifop-p-butyl mixture 110+110 g/ha, imazethapyr + imazamox 35+35 g/ha, but found at par to the highest dose of fomesafen + fluazifop-p-butyl mixture 220+220 g/ha (19.81 q/ha), hand weeding twice (19.90 q/ha) and weed free (20.38 q/ha). Kadam *et al*. (2018) [4] also recorded statistically at par yield under fomesafen + fluazifop-p-butyl at 125+125 g/ha to that of weed free plots.

## Conclusion

It may be concluded that application of premix fomesafen + fluazifop-p-butyl at 130+130 g/ha as early-post-emergence gave effective control of diverse weed flora and found more productive without any phytotoxicity on soybean crop plants.

## Acknowledgement

Authors greatly acknowledge, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, and Madhya Pradesh, India to provide all necessary facilities for conduction of research trial.

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