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EFFECT OF POST EMERGENCE HERBICIDE APPLICATION ON WEED FLORA IN TRANSPLANTED *BASMATI* RICE

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Abstract

An experiment was conducted in School of Agriculture, Lovely Professional University during June 2015 to November 2015 to study the effect of post emergence herbicides on weed flora in transplanted rice.The treatments include Almix, Azimsulfuron, Bispyribac sodium, Fenox-a-prop-p-ethyl, hand weeding and control. The results showed that grasses were the predominant weed flora followed by broad leaf weeds and sedges. *Echinochloa colonum*, *Cynodon dactylon*, *Cyperus rotundus*, *Eclipta alba*, *Euphorbia hirta* were the main weeds. The best weed control was done by hand weeding but this was cost effective. So, alternatively the post emergence herbicides gave good result to control weeds and they were less costly. In case of weed control Fenox-a-prop-p-ethyl and Almix gave good result and the highest weed control efficiency obtained by Bispyribac sodium. The plant growth factors-plant height, no. of tillers per plant, no. of panicles per plant, no. of filled grains per panicle, panicle length were more in case of hand weeding which was at par with Fenox-a-prop-p-ethyl, Azimsulfuron and Almix. The hand weeded plots resulted in high grain yield and straw yield as compared to control.

Key words : Post emergence, weed flora, predominant, Almix, Azimsulfuron, Bispyribac sodium, Fenox-a-prop-p-ethyl and hand weeding.

Introduction

Rice is one of the main cereal crops in the world and half of the population depends upon this for its dietary needs (Chakravati *et al.*, 2012; Xiahong *et al*, 2017). It is a monocotyledonous angiosperm and belongs to the family Gramineae. Basmati rice is a special varietal group which separates itself from other rice varieties and widely accepted by people all over the world. In India, Punjab, Haryana, U.P, Uttrakhand are major states of basmati production. The area and production in India was 27 lakh hectares and 81 lakh tonnes (Kumar *et al*., 2012). In present scenario, the major problems in rice is infestation of weeds. Weed flora in rice consisted of 37% grasses, 33% sedges and 30% broad leaf weeds (Jay *et al*., 1991). In transplanted rice the main weeds, the field of rice infested with –*Echinochloa colonum*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Eleusine indica* and *Eclipta alba*. Weed infestation results very low yield and quality of product is also affected. If the weeds are not controlled than it leads to 76% reduction in yield in transplanted rice (Singh *et al.,* 2004). Weed spectrum and weed density differ according to the method under which rice is grown.Most of the weeds (60-70%) appeared in rice after 20-30 DAT and starts competing with main crop up to tillering stage. So, weeds are major constrain for transplanted rice and control and timely management is very important (Rao *et al*., 2007). For control of weeds so many methods are there. In hand weeding due to scarcity of labour and high wages, the weed control become difficult (Rao *et al.,* 2007). As compared to mechanical and cultural control chemical control of weeds is suitable. Chemical weed control is becoming popular due to their fast effect and low expenditure. Post emergence herbicides are available which differed in selectivity and mode of action. The selection of herbicides based on the major weed flora and their response to herbicides. Any how many pre emergence herbicides are available for controlling weeds in transplanted rice, but for the efficacy the water should

Fig. 1 : Wrinkle grass.

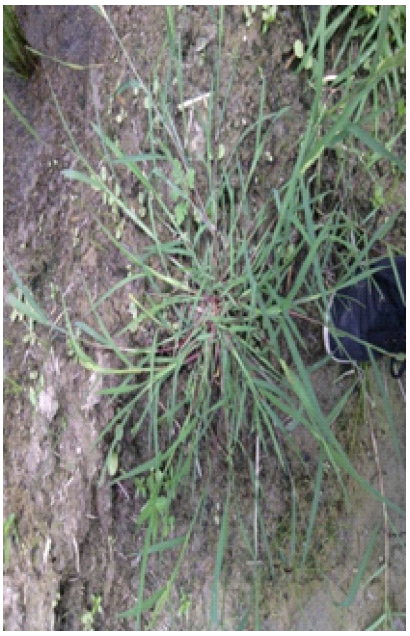


Fig. 2 : Barnyard grass.

Fig. 3 :. *Echinochloa* sp.

Fig. 4 : Ghueen.

Fig. 5 : *Eclipta alba*.

be continuously stagnated. So, there is a need of post emergence herbicides of high efficacy to control weed emerged during the growth stages in transplanted rice. So, keeping this thing in view a field experiment was conducted to study the effect of post emergence herbicides application on weeds of rice crop. The major objectives of the study was to find out the suitable herbicide for the control of weeds in rice, to examine weed flora of rice and weed control efficiency of various post emergent herbicides in rice.

Materials and Methods

A field experiment was conducted during June 2015 to Nov. 2015 at experimental farm of School of Agriculture, Lovely Professional University, Phagwara. The soil was sandy loamy in texture with medium available N high phosphorous and potash.Soil was sufficient with all micronutrients. The experimental site enjoys sub-tropical type of weather. The treatments include four herbicides at different doses, hand weeding and control. The experiment comprised with 13 treatments viz. T1–Bispyribac sodium 10 SC @ 20 g a. i. /ha, T2–Bispyribac sodium 10 SC @ 25 g a. i./ha, T3–Bispyribac sodium 10 SC @ 30 g a. i./ha, T4–Azimsulfuron 50 DF @ 25 g a. i./ ha, T5–Azimsulfuron 50 DF @ 30 g a. i./ ha, T6–Azimsulfuron 50 DF @ 35 g a. i./ha, T7– Almix @ 3 g a. i./ha, T8–Almix @ 4 g a. i./ha, T9–Almix @ 5 g a. i./ha, T10–Fenox-a-prop-p-ethyl @ 56 g a. i./ha, T11–Fenox-

a-prop-p- ethyl @ 60 g a. i./ha, T12–Hand weeding (20 and 40 DAT) and T13–Control. The experiment was laid out in a randomized complete block design with three replications. *Pusa Basmati* 1121 was the variety used for trial and transplanted on 15 July 2015 with aspacing of 20 × 10 cm and harvesting was doneon 22 November 2015.

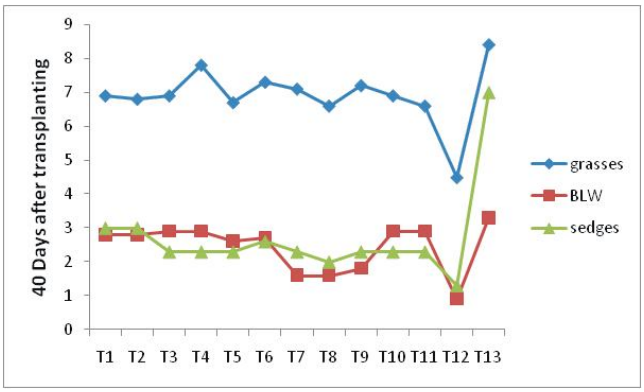
The requirement of N:P:K-43:25:25 kg/ha was fulfilled by the application of urea, SSP and MOP. The full dose of phosphorous and potash applied was applied at the time of sowing and nitrogen was applied in two splits-21 and 42 DAT. The herbicides were sprayed by using a knapsack sprayer in 500 litre water/ha. The herbicides were sprayed after 25DAT.Weed density of major weeds was recorded at 40 DAT, 80 DAT and at harvest by quadrate count method. The quadrate of 0.25m^2 was randomly placed at 3-4 places in each plot and total weed density was recorded according to the species. The data on weed count was subjected to squareroot transformation and expressed in number in per sq.m. The data collected on various parameters were shown in form of graphs /tables and analysis was done by using analysis of variance and treatments were tested by using F-test.

Results and Discussion

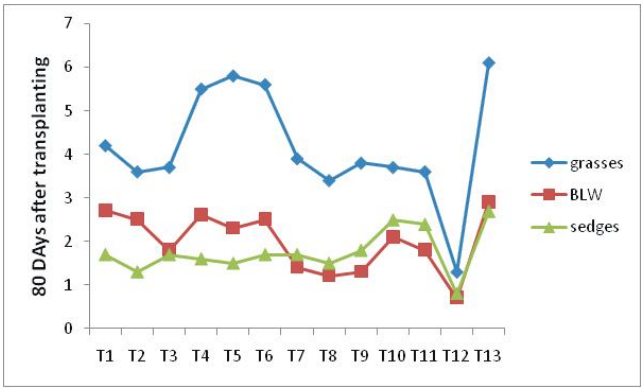
Effect of herbicides on weed population, density Weed control efficiency and dry matter production

The main weed flora was found in experimental plot mainly comprised with grasses, sedges and broad leaf weeds. The main weeds found were - Grasses– *Echinochloa crusgalli* (Swank), *Echinochloa colonum* (Barnyard grass) and *Ischaemum rugosum* (Wrinkle grass). Sedges were *Cyperus iria* (Chatri wala dila), *Cyperus rotundus* (Nut grass), *Cyperus difformis* (Dila motha) and *Cyperus compressus* (Motha). Broadleaf weeds were *Eclipta alba* (Jalbhang grass), *Eleocharis atropuea* (Ghueen), *Euphorbia hirta* (Dhodhak)and *Ludwigia axillaris* (Gharilla) (Sidhu, 2008; Jaswal *et al*., 2017).

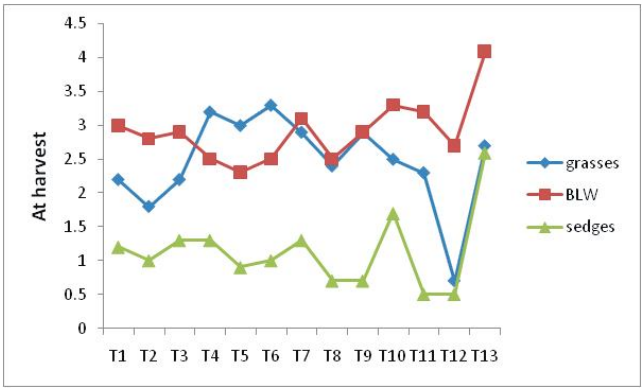
Out of these weed species grasses were the predominant weed sp. Among the grasses, *Echinochloa* sp. was the man weed because it is a crop associated weed, which survives well in flooded situation and also a mimicry weed of rice (Singh and Singh, 2010; Hussain *et al*., 2008). Most of the rice area covered by rice plants about 45 DAT and weed growth reduced. All the herbicides are post emergent in action and were sprayed at 20-25 DAT. So, when the observations on weed population were recorded at 40DAT, 80 DAT and at harvest so reduction in the density of weeds in all



Graph 1 : Weed density at 40 DAT.

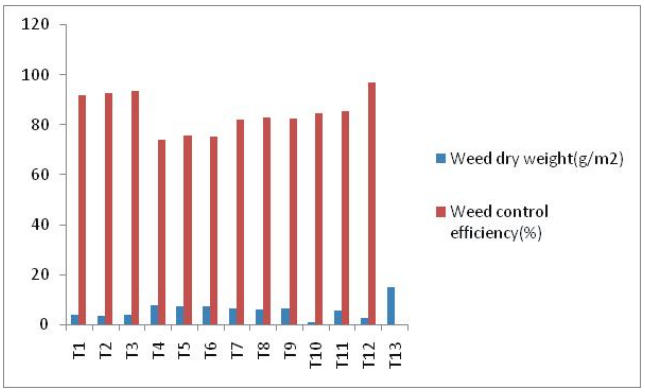


Graph 2 : Weed density at 80 DAT.



Graph 3 : Weed density at harvest.

treatments was recorded (Graph 1). Maximum reduction in the weed density wasrecorded in hand weeding. This practicehelped in eradication of weeds. At crop harvest, hand weeding twice resulted in lower densityof weeds which remained at par with Bispyribac sodium, Almix andFenox-a-prop-p-ethyl. Similarly, Fenox-a-prop-p-ethyl @ 60 g a. i/haalso able to control most of *Echinochloa* species, but ineffective to control the broad leaf weeds. The sedges were completely controlled by Almix and Azimsulfuron at 40, 80 DAT and at harvest (Graph 2). Almix and Azimsulfuron just after one week of its application reduced the density of *Cyperus* sp. due to its broad spectrum nature and its effectiveness in controlling sedges as reported by Yadav *et al*. (2010). After the



Graph 4 : Weed dry weight and weed control Efficiency.

Table 1 : Effect of herbicides on plant growth parameters.

S.no.	Treatments	Plant height (cm)	Tillers (no.)	No.of panicles/ plant	Filled grains/ panicle	Panicle length(cm)	Panicle weight(g)
T1	Bispyribacsodium10 SC	104.0	30.6	46.6	77.3	20.3	2.2
T2	Bispyribac sodium10 SC	110.5	32.0	47.0	84.0	22.8	2.3
T3	Bispyribac sodium10 SC	107.5	30.3	45.3	77.3	21.2	2.2
T4	Azimsulfuron 50 DF	111.5	31.0	45.3	82.6	20.3	2.6
T5	Azimsulfuron 50 DF	111.1	32.6	46.3	86.0	21.1	2.7
T6	Azimsulfuron 50 DF	108.3	30.6	45.6	89.0	20.5	2.5
T7	Almix	107.4	30.3	47.3	76.6	20.6	2.7
T8	Almix	112.5	32.6	46.3	87.3	21.1	2.7
T9	Almix	113.6	30.0	46.6	81.0	21.0	2.7
T10	Fenox-a-prop-p-ethyl	117.2	32.0	45.3	94.4	20.8	2.6
T11	Fenox-a-prop-p-ethyl	118.7	33.0	46.3	97.6	20.8	2.8
T12	Weed free (HW)	143.9	34.6	48.3	114.3	25.8	3.2
T13	Control	103.1	27.0	41.0	65.0	18.6	1.8

application of herbicides, the weeds become inactive and show the symptoms like chlorotic and necrotic spots on leaves and reduction in the weed weight. These observations are similar to the findings of Singh *et al.* (2004) and Yadav *et al.* (2009), who reported better efficacy of Azimsulfuron and Almix on sedges in transplanted rice. The lowest weed density was recorded in Azimsulfuron @30g a.i/ha. Fenox-a-prop-p-ethyl resulted low efficacy to control broad leaf weeds due to its effectiveness to control grasses only. It was found that all the herbicides were effective against *Echinochloa*, the major weed of rice. The highest weed count was registered in control. Fenox-a-prop p-ethyl, registered higher total weed population next to control. Fenoxaprop controlled only grasses and hence the high weed count is attributed to the broad leaved weeds and sedges. At harvest stage, the lowest weed count was recorded in hand weeded control as well as in Almix and Bispyribac sodium sprayed plots showing that Almix and Bispyribac sodium is as effective as hand weeding twice in suppressing weed population (graph 3). Similar results were also reported by Yadav *et al*. (2009). However, at the harvest stage, the number of sedges was lower in Azimsulfuron compared to others showing its effectiveness in controlling sedges as reported by Yadav *et al*. (2010). Weed biomass at 60 DAT and at harvest was significantly higher in unweeded plots. In contrast, hand weeding twice recorded lower weed biomass than rest of the herbicide among the tested herbicides, Bispyribac sodium 10 SC @ 20, 25 and 30 g applied at 22 DAT showed highest weed control efficiency (Graph 4). The highest plant height was recordedin hand weeded plots which was at par with Fenox-a-prop p-ethyl and Almix. The less no. of tillers recorded in un weeded control. The maximum number of panicles per plant (48.3) was recorded in hand weeding which was followed by Bispyribac sodium 10 SC @ 25 g a. i./ha, Fenox-a-prop-p-ethyl @ 60 g a. i./ha. Hand weeding treatments increased the panicle weight, because there was more number of filled grains per panicle, which accounted for more panicle weight, as also reported by Bali *et al.* (2006) (table 1). 1000-grain weight and number of filled grains were recorded maximum in hand weeded plots. Hand weeding treatment resulted in the highest grain and straw yield. Similar results were also recorded by Hasanuzzaman *et al*. (2009). However, in this study, it was observedthat Fenox-a-prop-p ethyl treatment resulted insignificantly higher grain and straw yield which was at par with Azimsulfuron (table 2).

Conclusion

The highest WCE (90%) as well as grain yield (5964kg/ ha) was recorded in hand weeded control.

Table 2 : Effect of herbicides on yield contributing characters.

S.no.	Treatments	1000 grain weight(g)	Grain yield(kg/ha)	Straw yieldKg/ha	Harvest index (%)
T1	Bispyribacsodium10 SC	21.6	3633.3	5323	40.6
T2	Bispyribac sodium10 SC	23.3	4184.0	5562	42.9
T3	Bispyribac sodium10 SC	22.2	3833.0	5664	40.3
T4	Azimsulfuron 50 DF	26.4	4733.3	5881	44.5
T5	Azimsulfuron 50 DF	27.4	4822.3	6125	42.9
T6	Azimsulfuron 50 DF	25.1	4455.3	6068	40.0
T7	Almix	28.2	3893.0	5149	47.2
T8	Almix	27.1	4241.6	5116	45.3
T9	Almix	27.0	3724.0	5130	47.4
T10	Fenox-a-prop-p-ethyl	26.6	5210.6	5725	47.5
T11	Fenox-a-prop-p-ethyl	28.8	5639.6	6057	48.2
T12	Weed free (HW)	32.0	5964.0	6327	48.5
T13	Control	20.8	2697.6	4278	38.6

However, this yield was statistically on par with Almix and Fenox-a-prop p-ethyl and Almix (5.8 Mg ha^{-1}), which recorded a WCE of 88 and 90 percentage. It can also be inferred that if grasses are the dominant weed flora, Fenox-a-prop-p-ethyl without follow up spray of Almix can be recommended for effective weed control.All the herbicides irrespective of mode of application *i.e.* pre- or post-emergence reduced the weed density over control. The best results were obtained by hand weeding, but it proved a costly method. This study showed that post-emergence herbicide was an alternative with respect to yield of *basmati* rice, weed control, as well as benefit:cost ratio to hand weeding.

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