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# Efficacy of fenoxaprop-p-ethyl and penoxsulam for weed management with special emphasis on *Echinochloa* spp. in transplanted summer rice

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**ABSTRACT**

An on-farm experiment was conducted during summer (*boro*) season of 2016-17 at farmer's field (Borah village of Nanoor Block) in Birbhum district, West Bengal to study the efficacy of fenoxaprop-p-ethyl and penoxsulam against composite weed flora with special emphasis on *Echinochloa* spp. in transplanted rice. The experiment comprising of eight treatments was laid out in a randomized block design with three replications. The experimental field was dominated with *Echinochloa glabrescens*, *E. crus-galli*, *Panicum* sp. (grasses), *Cyperus iria* (sedge) and *Jussiaea repens* (broad-leaved) throughout the crop growing period. Of these predominant weeds, there was severe infestation of grassy weeds. Among herbicidal treatments, fenoxaprop-p-ethyl 90 and 100 g/ha at 20 days after transplanting (DAT) and penoxsulam 25 g/ha at 20 DAT effectively controlled the *Echinochloa* spp. at 50 DAT. Application of penoxsulam 25 g/ha at 20 DAT exhibited effective management of composite weed flora as well as higher grain yield in summer rice. Lower values of weed density and weed dry weight along with improved weed control efficiency and higher grain yield were registered with penoxsulam 25 g/ha at 20 DAT, which was statistically at par with two rounds of hand weeding at 20 and 40 DAT in summer rice.

Weed infestation is one of the major factors influencing rice productivity to a large extent. Timely weed management is an essential aspect for realizing desired level of crop productivity. Weed flora under transplanted condition is very much diverse in nature. Major weeds of transplanted summer rice in West Bengal include *Echinochloa crus-galli, E. glabrescens, Panicum* sp. (grasses), *Cyperus difformis, C. iria* (sedges), *Marsilea minuta, Jussiaea repens, Alternanthera sessilis, A. philoxeroides* and *Commelina* sp. (broad-leaved). Of these, the grassy weeds, *viz. E. glabrescens* and *E. crus-galli* are reported to cause severe infestation in rice-rice cropping system, causing considerable yield losses (Duary and Mukherjee 2013, Duary *et al.* 2015b). Because of weed mimicry with rice crop, farmers are often compelled to discard nursery bed with severe infestation of *Echinochloa* spp. Manual removal of weeds is labour-intensive, tedious and does not ensure weed removal at critical stage of crop-weed competition. Thus, application of herbicide is one of the viable and economic options to effectively manage the weeds. A few herbicides have been commonly recommended for the management of *Echinochloa* spp. Therefore, the present investigation was undertaken to find out the effect of fenoxaprop-p-ethyl and penoxsulam on weed growth with special emphasis on *Echinochloa* spp. and productivity of transplanted summer rice.

An on-farm experiment was conducted at farmer's field of Borah village ($87^0$47.582 E longitude and $23^0$42.402 N latitude with an altitude of 34 m above mean sea level) under Nanoor Block in the district of Birbhum, West Bengal, India during summer (*boro*) season of 2016-17. Eight treatments comprising of three doses of fenoxaprop-p-ethyl 80, 90 and 100 g/ha at 20 days after transplanting (DAT), three doses of penoxsulam 20, 22.5 and 25 g/ha at 20 DAT, two hand weeding at 20 and 40 DAT, and weedy check were assigned in a randomised block design with three replications. The rice variety '*PAN 5010*' was fertilized with 120 kg N, 60 kg P and 60 kg K/ha. Full doses of phosphate and potash along with

half dose of total N were applied at final land preparation before transplanting, while remaining half of total N was applied in two splits as first and second top dressing. The crop was raised with all other recommended package of practices. Weed density was recorded by using quadrat of 50 × 50 cm at 50 DAT in all the treatments and then converted into number of weeds/$m^2$. The weeds were dried in oven till a constant weight was recorded and then transformed into g/$m^2$ by using appropriate formula. The data on weed density and weed dry matter were subjected to square root transformation to normalize their distribution. All data were subjected to analysis of variance (ANOVA), and treatment means were separated by Fisher's least significant difference at $\sqrt{x+0.5}$. Weed control efficiency (%) was computed using the dry matter of grasses and total weeds as well. Observations regarding grain and straw yield along with yield components were recorded at crop harvest. Weed indices in respect of different treatments were also worked out.

**Effect on weeds**

The experimental field was infested with nine weed species, of which *Echinochloa glabrescens, E. cruss-galli* and *Panicum* sp. among grasses, *Cyperus iria* among sedges and *Jussiaea repens* among broad-leaved were found dominant. Grassy weeds accounted for 82.08% of total weed density and 78.08% of total weed dry weight at 50 DAT. *Echinochloa glabrescens* was the major weeds among the grasses. Application of fenoxaprop-p-ethyl both at 90 and 100 g/ha and also penoxsulam at higher dose (25 g/ha) effectively reduced grassy weeds in rice. Even application of penoxsulam 25 g/ha at 20 DAT effected significant reduction in dry weight of grassy weeds as well as total weeds, and was found comparable with two hand weeding at 20 and 40 DAT **(Table 1)**. The results were in conformity with those of previous studies where post-emergence application of penoxsulam effectively controlled major weeds in transplanted rice (Mahajan and Chauhan 2008).

**Weed control efficiency and weed index of different treatments**

The weed control efficiency (WCE) was the highest under two hand weeding (20 and 40 DAT), followed by penoxsulam 25 g/ha at 20 DAT (**Table 1**). In case of grassy weeds, fenoxaprop-p-ethyl 90 and 100 g/ha at 20 DAT registered higher WCE due to lower weed density as well as lower weed dry weight. The lowest weed index was recorded in two hand weeding at 20 and 40 DAT, which was followed by penoxsulam 25 g/ha at 20 DAT, fenoxaprop-p-ethyl 100 g/ha at 20 DAT and penoxsulam 22.5 g/ha at 20 DAT (**Table 1**). Among the herbicidal treatments, the higher WCE and lower weed index with penoxsulam 25 g/ha at 20 DAT treatment might be due to the effective weed control resulting in reduced density as well as dry matter accumulation of weeds. Similar results were reported by Duary *et al.* (2015a) and Teja *et al.* (2016).

**Effect on crop**

Penoxsulam 22.5 and 25.0 g/ha at 20 DAT and fenoxaprop-p-ethyl 100 g/ha at 20 DAT were statistically at par with two hand weeding with respect to number of filled grains/panicle (**Table 2**). Similar trend was also recorded in respect of panicle weight. Fenoxaprop-p-ethyl at 90 g/ha at 20 DAT was also found statistically at par with two hand weeding at 20 and 40 DAT. No phytotoxicity was noticed on rice crop due to application of fenoxaprop-p-ethyl or

**Table 1. Effect of treatments on density and dry weight of grasses and total weeds at 50 DAT in summer rice**

| Treatment | Weed density (no./$m^2$) | | Weed dry matter (g/$m^2$) | | WCE (%) | | WI (%) |
|---|---|---|---|---|---|---|---|
| | *Echinochloa* spp. and other grasses | Total weeds | *Echinochloa* spp. and other grasses | Total weeds | *Echinochloa* spp. and other grasses | Total weeds | |
| Fenoxaprop-p-ethyl 80 g/ha at 20 DAT | 2.96(8.33) | 3.57(12.23) | 2.69(6.76) | 3.34(10.66) | 70.37 | 63.50 | 15.99 |
| Fenoxaprop-p-ethyl 90 g/ha at 20 DAT | 0.71(0.00) | 1.70(2.41) | 0.71(0.00) | 1.70(2.41) | 100.00 | 91.76 | 13.79 |
| Fenoxaprop-p-ethyl 100 g/ha at 20 DAT | 0.71(0.00) | 1.55(1.91) | 0.71(0.00) | 1.55(1.91) | 100.00 | 93.47 | 6.51 |
| Penoxsulam 20 g/ha at 20 DAT | 2.27(4.67) | 2.55(6.03) | 1.10(0.71) | 1.61(2.08) | 96.87 | 92.88 | 13.07 |
| Penoxsulam 22.5 g/ha at 20 DAT | 2.11(4.00) | 2.21(4.45) | 1.03(0.56) | 1.22(1.01) | 97.56 | 96.54 | 8.71 |
| Penoxsulam 25 g/ha at 20 DAT | 1.34(1.33) | 1.40(1.49) | 0.79(0.13) | 0.89(0.28) | 99.44 | 99.03 | 0.31 |
| Hand weeding at 20 and 40 DAT | 0.71(0.00) | 0.71(0.00) | 0.71(0.00) | 0.71(0.00) | 100.00 | 100.00 | 0.00 |
| Weedy check | 5.46(29.33) | 6.02(35.73) | 4.82(22.80) | 5.45(29.20) | 0.00 | 0.00 | 20.07 |
| LSD (p=0.05) | 0.31 | 0.32 | 0.20 | 0.19 | - | - | - |

DAT: Days after transplanting, WCE: Weed control efficiency, WI: Weed index; *****Original figures in parentheses were subjected to SQRT ($\sqrt{x+0.5}$) before statistical analysis

**Table 2. Effect of treatments on yield components and yield of summer rice**

| Treatment | Panicle length (cm) | Panicle weight (g) | Filled grains/ panicle | 1000-seed wt. (g) | Grain yield (t/ha) | Straw yield (t/ha) |
|---|---|---|---|---|---|---|
| Fenoxaprop-p-ethyl 80 g/ha at 20 DAT | 22 | 2.36 | 104 | 23.63 | 4.65 | 7.30 |
| Fenoxaprop-p-ethyl 90 g/ha at 20 DAT | 21 | 3.13 | 116 | 24.57 | 5.33 | 7.11 |
| Fenoxaprop-p-ethyl 100 g/ha at 20 DAT | 21 | 3.34 | 138 | 23.67 | 5.78 | 7.82 |
| Penoxsulam 20 g/ha at 20 DAT | 22 | 2.20 | 109 | 23.60 | 4.74 | 7.04 |
| Penoxsulam 22.5 g/ha at 20 DAT | 21 | 3.27 | 128 | 23.73 | 5.65 | 7.74 |
| Penoxsulam 25 g/ha at 20 DAT | 22 | 3.36 | 140 | 25.27 | 6.17 | 8.09 |
| Hand weeding at 20 and 40 DAT | 22 | 3.45 | 141 | 25.10 | 6.19 | 8.177 |
| Weedy check | 21 | 2.02 | 82 | 23.03 | 4.14 | 7.00 |
| LSD (p=0.05) | NS | 0.72 | 8 | NS | 0.55 | 0.41 |

DAT: Days after transplanting, NS: Not significant

penoxsulam at any of the doses applied at 20 DAT. Panicle length and test weight of grains did not vary significantly among different herbicides tested under the study.

Weed competition in weedy check resulted in 49.52 and 49.03% reduction in grain yield than hand weeding twice and penoxsulam 25 g/ha treatments, respectively Both the herbicides with all the doses of application in the present experiment recorded significantly higher grain yield over the untreated control. This was due to effective management of weeds, which facilitated better crop growth and ultimately increased the grain yield. The highest grain yield (6.19 t/ha) was obtained with two rounds of hand weeding at 20 and 40 DAT. Application of penoxsulam 22.5 or 25.0 g/ha at 20 DAT and fenoxaprop-p-ethyl 100 g/ha at 20 DAT were statistically at par with two hand weeding in respect of grain yield. These results were in agreement with those of Singh *et al*. (2004) and Mahajan and Chauhan (2008). Penoxsulam 25 g/ha at 20 DAT and fenoxaprop-p-ethyl 100 g/ha at 20 DAT were statistically at par with hand weeding twice at 20 and 40 DAT with respect to straw yield (**Table 2**).

Thus, it might be concluded that fenoxaprop-p-ethyl 100 g/ha at 20 DAT and penoxsulam 25 g/ha at 20 DAT provided excellent control of *Echinochloa* spp. However, in particular, penoxsulam 25 g/ha at 20 DAT offered promising control of broad-spectrum weeds and registered higher grain yield of transplanted summer rice.

## REFERENCES

Duary B and Mukherjee A. 2013. Distribution pattern of predominant weeds of wet season and their management in West Bengal, India. pp. 191–199. In: *Proceedings 24th Asian-Pacific Weed Science Society Conference,* October 22-25, 2013, Bandung, Indonesia.

Duary B, Mishra MM, Dash R and Teja KC. 2015a. Weed management in lowland rice. *Indian Journal of Weed Science* **47**(3): 224–232.

Duary B, Mukherjee A and Bhowmick MK. 2015b. Phyto-sociological attributes of weed flora in major crops of red and lateritic belt of West Bengal. *Indian Journal of Weed Science* **47**(1): 89–92.

Mahajan G and Chauhan BS 2008. Performance of penoxsulam for weed control in transplanted rice. *Pest Technology* **2**(2): 114–116.

Singh VP, Singh G and Singh M. 2004. Effect of fenoxaprop-p-ethyl on transplanted rice and associated weeds. *Indian Journal of Weed Science* **36**(3&4): 190–192.

Teja KC, Duary B and Dash S. 2016. Sole and combined application of herbicides on composite weed flora of transplanted rice. *Indian Journal of Weed Science* **48**(3): 254–258.