EFFICACY OF METAMIFOP 10 EC AGAINST GRASSY WEEDS OF DIRECT SEEDED RICE AND ITS RESIDUAL EFFECT ON SUBSEQUENT CROP OF WHEAT

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INTRODUCTION

Weeds are the foremost biotic barriers in enhancing rice production and weed management is considered as a positive factor in trapping the production potential. Weed infestation continues to be a serious problem and is a limiting factor in realizing the yield potential (Rao et al., 2007). The extent of yield reduction of rice due to weeds has been estimated from 15-95% (Gogoi et al., 1996, Naresh et al., 2011). Rice grain production in India suffers a yearly loss of 15 million tones due to weed competition (Kathiresan, 2002). In Chhattisgarh, about 70% of the rice crop is direct seeded. The risk of crop yield loss due to competition from weeds by direct seeded rice is higher than for transplanted rice because of the absence of the size differential between the crop and weeds and the suppressive effect of standing water on weed growth at crop establishment (Singh, S., 2007).

Manual weeding, though, is considered to be the best; the undependable labour availability associated with escalating wages and at time unfavourable soil and climatic conditions in many cases has given impetus to the development of new herbicides. Chemical control is most commonly used and reliable method for controlling weeds in rice. It has been observed that some of the weeds amongst the predominant weed flora usually found in direct seeded rice are not controlled by the traditional herbicides and mostly regenerate after hand weeding. Herbicides have increasingly become a key component of weed management in India (Mallikarjun et al., 2014). It appears as quick, easy, economical and effective control of weeds in DSR (Bhurer et al., 2013). With the changing scenario of weed management, farmers need herbicides having high efficacy, no phytotoxicity to rice and cost effective as well as no residual effect on succeeding crop. Line sowing coupled with application of new post emergence herbicide may prove to be very promising on farmer’s field.

Considering above facts, a field experiment was carried out to find out the effectiveness of Metamifop 10 EC for controlling grass weeds in direct seeded rice and its effect on productivity of rice and subsequent wheat crop.

MATERIALS AND METHODS

A field experiment was carried out at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur during 2008-09 and 2009-10. The experimental farm is located between 21°4’ N Latitude and 81°39’ E Longitude at an altitude of 298 meters above the mean sea level. The experimental soil was inceptisols low in organic carbon, low in available nitrogen, medium in phosphorus and high in potassium with neutral soil reaction. Eleven treatments comprised of four doses (50, 75, 100 and 125 g/ha) with two time of application (2-3 and 5-6 leaf stage i.e. at around 10-12 and 18 to 20 DAS, respectively) of metamifop,
cyhalofop-butyl 100 g/ha, two hand weedings and untreated control (Table 1). The experiment was laid out in randomized block design replicated thrice. The gross plot size was 5 m x 5 m and net plot size was 4 m x 4 m. Medium duration rice cultivar MTU 1010 was taken as test crop. The observations viz; weed flora, weed density weed biomass and their effect on yield characters and yield of rice and the residual effect of metamifop applied to rice on crop stand and grain yield of wheat were registered and analysed as per the standard procedure.

The sowing of rice was done in the last week of June with the help of seed cum fertilizer drill with a seed rate of 80 kg/ha and recommended dose of fertilizer i.e. 100:50:30 kg/ha N:P:K. Full dose of phosphorus and potash along with one third of nitrogen was applied as basal. Rest of the nitrogen was applied in two splits at tillering and panicle initiation. The crop did not suffer with any kind of incidence like drought, insect, disease etc. during its entire growth period. Wheat cultivar kanchan as subsequent crop was sown in second week of November during both the years with 100 kg/ha seed rate. Fertilizer and other recommended package for wheat was followed. Both rice and wheat were sown at 20 cm row to row distance with recommended dose of fertilizer i.e. 100:50:30 kg/ha N: P: K.

RESULTS AND DISCUSSION

Floristic composition

_Echinochloa colona, Ischaemum rugosum_ among grasses, _Aeschynomene indica, Cyperus iria, Echinochloa colona, Alternanthera triandra, Ischaemum rugosum_ among broadleaf weeds and _Cynotis axillaries, Croton bonplandianum, Aeschynomene indica_ and _Cyperus iria_ as sedge were the predominant weeds observed in the experimental field during both the years in rice. Singh et al. (2005) also reported the similar weed flora in direct seeded rice. Whereas, in wheat, _Medicago denticulata, Chenopodium album, Rumex dentatus, Melilotus indica_ were the dominant weeds.

Effect on weeds

Weed population

Data on weed population at 30, 60 DAS and at harvest indicate (Table 2-4) that metamifop, a new aryloxy phenoxy propionate (AOPP) grassy herbicide, drastically reduced the population of _Echinochloa colona_ and this reduction increased with increase in the doses of metamifop from 50 to 125 g ha⁻¹ applied at 2-3 or 5-6 leaf stage. The effect of each dose of metamifop on grassy weeds was equally effective at both the stages of application, but, coverage of _Echinochloa colona_ population was more pronounced at 5-6 leaf stage than 2-3 leaf stage because at 2-3 leaf stage germination of first flush of _Echinochloa colona_ was only controlled. Further, that heavy infestation of _Echinochloa colona_ was occurred as second and third flush after application of metamifop at 2-3 leaf stage. Hence, metamifop applied at 5-6 leaf stage covered large number of _Echinochloa colona_ more effectively than at 2-3 leaf stage as the _E. colona_ germinated after 12 days could not be controlled by the application of metamifop at 2-3 leaf stage. Application of metamifop @ 100 and 125 g ha⁻¹ at 5-6 leaf stage allowed the lowest count of weeds as compared to lower doses applied at the same stage. This might be due to the fact that _Echinochloa colona_ must have completed emergence by first three important flushes, and germination of next flush thereafter became almost negligible. Kim et al. (2003) studied the reason for selectivity of metamifop and examined acetyl-CoA carboxylase (ACCase) sensitivity, absorption and translocation of (14C) metamifop in both rice (tolerant) and barnyard grass (_Echinochloa_ spp. - susceptible). The _I₅₀_ value for inhibition of ACCase by metamifop was > 10 micro M in rice and 0.5 micro M in _Echinochloa_ spp. More metamifop was absorbed through leaf surface of _Echinochloa_ spp than rice. Broad leaf weeds like _Alternanthera triandra, Cynotis axillaries_ along with _Croton bonplandianum, Aeschynomene indica_ and _Cyperus iria_ as sedge dominated the weed flora in all the treatments except hand weeding and remained unaffected due to application of metamifop. Therefore, natural growth of these weeds was observed and dominance at 30, 60 DAS and at harvest was noted. Weedy check showed the highest weed population/m². While, hand weeding twice allowed minimum weed count. It was also better than the standard check Cyhalofop 10 EC applied @ 100 g ha⁻¹ (Table 2-4). Similar findings have also been reported by Doroh et al. (2011).

Total weed dry weight

At 60 DAS and at harvest, maximum dry matter of weeds was recorded in weedy check which was significantly higher over rest of the treatments. Whereas, minimum dry matter of weeds was observed under hand weeding twice carried out at 20 and 40 DAS (Mohan et al., 2005). Among the herbicides, application of Metamifop @125 and 100 g ha⁻¹ at 5-6 leaf stage allowed the minimum dry matter of weeds which was significantly lower than metamifop applied at 2-3 leaf stage.

![Table 1: Treatment details](image)

* 2-3 leaf stage roughly coincide with 10-12 DAS and 5-6 leaf stage with 15-18 DAS
with similar doses which was due to better control of grassy weeds emerged up to third flush which was otherwise skipped in case of metamifop applied at early stage (Table 6). Singh et al. (2014) have also reported significant reduction in density and biomass of weeds in direct seeded rice due to application of herbicides.

**Weed control efficiency (WCE %)**

Highest weed control efficiency was recorded under weed free check. Among herbicide treatment, higher weed control efficiency was observed under application of all the doses of Metamifop 10 EC at 5-6 leaf stage than 2-3 leaf stage. The WCE was the maximum at Metamifop @ 125 g ha\(^{-1}\) at 5-6 leaf stage followed by next level i.e. 100 g ha\(^{-1}\) (Table 6).

**Yield attributes**

**Grain and straw yield and weed index**

Grain yield of direct seeded rice was influenced significantly due to various weed management treatments. Maximum seed yield was obtained with weed free check. However, among the different herbicide treatments, application of Metamifop @ 125 g ha\(^{-1}\) at 5-6 leaf stage produced the highest seed yield of rice which was closely followed by Metamifop @ 100 g a.i. ha\(^{-1}\) at 5-6 leaf stage and they were statistically at par to each other. It was also observed that application of Metamifop at 5-6 leaf stage were found superior over the similar doses applied at 2-3 leaf stage mainly due to delayed and continued flushes of germination of grassy weed mainly *Echinochloa colona*. Straw yield showed almost similar trend to that of grain yield of rice. Weed index was found minimum (11.0 %) under Metamifop @ 125 g ha\(^{-1}\) at 5-6 leaf closely followed by Metamifop @ 100 g a.i. ha\(^{-1}\) at 5-6 leaf (17.0 %). Grain yield loss to the tune of 62% was observed due to weed competition under untreated control (Table 7). These results are in conformity with Nithya et al., 2012.

**Effect on succeeding crop of wheat**

**Plant population at 15 DAS**

Residual effect of different treatments of weed management did not show any significant variation on plant population at 15 DAS of wheat crop sown after the harvest of rice during both the years (Table 8).

**Plant height at 60 DAS**

It is clear from the data that there was no significant difference in height of wheat plants due to different weed management treatments applied to previous crop of rice during both the years (Table 8).

**Grain and straw yield of wheat**

Grain yield of wheat was not influenced significantly due to various weed management treatments applied to previous crop of paddy, during rainy season. This indicated that herbicide treatments of Metamifop applied during previous crop (i.e., Direct Seeded Rice) had no adverse effect on succeeding crop which was wheat. Similar trend was observed for straw yield of wheat during both the years (Table 8).

Hence, it may be concluded that excellent control of *Echinochloa colona* could be obtained by the application of Metamifop @ 100- 125 g ha\(^{-1}\)either at 5-6 leaf stage or where ever, maximum number of *Echinochloa colona* occurs (up to the completion of 2-3 flushes of *Echinochloa colona*). Application of metamifop at higher doses does not cause any phytotoxicity to rice plant as well as the subsequent crop of wheat.

**REFERENCES**


