Effect of Integrated Weed Management Practices on Total Weed Dry Weight, Nutrient Removal of Weeds in Rice-Rice Wet Seeded System

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Abstract: Intercropping of green manure significantly reduced the total weed dry weight, nutrient removal by weeds as compared to non-green manured plots. When comparing the fallow with intercropping, summer ploughing with intercropping recorded least. Regarding the weed management practices, presowing application of glyphosate @ 1.6 kg a.i ha⁻¹, pre-emergence application of butachlor @ 1.25 kg a.i ha⁻¹ followed by (fb) 1 and 2 hand weeding (HW) are being at par with each other and significantly superior to all other treatments. At 35 days after sowing, hand-weeding treatment recorded lowest dry weight and nutrient removal by weeds, however, this treatment was on par with above treatments during kharif season and some variations are observed in rabi season. At 55 days after sowing, similar trend of results as like that of 35 days after sowing except in two occasions.

Key words: Wet seeded rice-rice system, intercropping, weed dry weight, nutrient removal

INTRODUCTION

Rice is a major crop in the world, it feeds one third of the world population to whom it supplies almost two thirds of the food requirements [1]. From an area of 42.13 million ha, India is producing about 40% of the world rice production. Among the different types of rice cultivation, wet seeding is gaining momentum and importance due to its higher yield potential even than the transplanted rice [2]. In spite of all advantages, the spread of wet seeded rice is not so great as problem of controlling weeds is more severe than the transplanted rice. One of the main reasons is alternate wetting and drying during initial period's which favours simultaneous germination of weeds with the crop and cause greater weed problem. Weed competition is greatest in wet seeded rice than transplanted rice due to the similarities of age and morphological characteristics of grass weeds and rice seedlings [3,4]. The existing practice of recommending pre emergence herbicide is found to be inadequate in controlling above weed menace. Hence, present study was designed to attain a greater level of weed control right from the off-season. The off-season weed management practices such as summer ploughing and spraying of systemic and contact herbicide can offer better control of perennials and sedges by the destruction of tubers and rhizomes.

MATERIALS AND METHODS

Field experiments were conducted in wet seeded rice system during kharif and rabi seasons of 1999 and 2000 at Agricultural college and Research Institute, Madurai, Tamil Nadu. The experiment was laid out in split plot design with three replications. Preseason land management practices constituted the main plot treatments viz.,

M₁- Rice-Rice-Fallow,
M₂- Rice-Rice-Summer ploughing,
M₃- Rice (GM)-Rice (GM)-Fallow,
M₄- Rice (GM)-Rice (GM)-Summer ploughing.

Weed management practices accommodated as sub plot treatments

S₁- Preemergence application of butachlor @ 1.25 kg ha⁻¹ fb one HW on 35 DAS,
S₂- Preemergence application of butachlor @ 1.25 kg ha⁻¹ fb one HW on 35 and 55 DAS,

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S1- Presowing application of Glyphosate @ 1 kg ha⁻¹ + Preemergence application of butachlor @ 1.25 kg ha⁻¹ fb one HW on 35 DAS,
S2- Presowing application of Glyphosate @ 1 kg ha⁻¹ + Preemergence application of butachlor @ 1.25 kg ha⁻¹ fb one HW on 35 and 55 DAS,
S3- Three hand weedicides on 20, 35 and 55 DAS
S4- Unweeded check up to 55 DAS

The treatments involving sole cropping (M1) and (M4), the sprouted seeds sown uniformly using padda cum dhanicha seeder with a spacing 25 cm between rows. In the treatment involving intercropping (M2 and M3), pregerminated rice seeds and dhaniccha seeds (unsoaked) were sown using same seed drill in alternate rows with 12.5 cm interrow spacing. For presowing application, the required quantity of glyphosate was mixed with water @ 500 L ha⁻¹ and sprayed uniformly over the entire plot using knapsack sprayer on 10 days prior to sowing. For pre-emergent application, the required quantity of butachlor was mixed with sand at the rate of 50 kg ha⁻¹ and applied on 5 DAS at drained soil (immediately after the draining of water). In green manured plots, addition of biomass 4.28 to 4.96 t ha⁻¹ which contributes 19.02 to 22.42 kg ha⁻¹ nitrogen to the various treatments. The green manure incorporated in situ at 35 DAS using conoweeded. The weed dry weight was estimated at 20, 35 and 55 DAS. Weed found with in the two quadrates in each plot was removed, sun dried then oven dried at 60±5°C for 72 h or till a constant weight was achieved. The dry weights of weeds were expressed in kg ha⁻¹. The plant samples of weed drawn for dry weight estimation at different growth stages were grounded in the fine powder in millily mill and used for chemical analysis of nutrient content. The following procedures were followed to estimate different nutrient content viz., micro kjeldhal method for nitrogen, Calorimetry triple acid digestion for phosphorous and Flame photometry-triple acid digestion. The nutrient uptake by weeds was computed from nutrient concentration and dry weight produced at 30, 60 DAS and at harvest and expressed as kg ha⁻¹.

RESULTS AND DISCUSSION

The major weeds observed in experimental plots were Echinocloa colonum, E. crusgalli, in grasses, Cyperus iria, Cyperus difformis, Scirpus spp. and Pimbristylis milicaceae in sedges, Ammania bacicifera, Eclipta alba, Ludwigia parviflora and Marsilia quadrifoliata in broad leaved weeds.

Effect of integrated weed management practices nutrient removal of weeds on total weed dry weight: The total dry weight in general was markedly reduced by pre-season land management practices with or without intercropping of green manures and also by other weed management practices during all the period of study (Table 1). At 20 DAS, summer ploughing with or without intercropping of green manure (M1 and M4) being at par with each other and these treatments were significantly superior to other non-summer ploughing treatments (M2 and M3). The highest dry weights at all the four crops were registered in fallow without intercropping of green manure (M1) and this was at par with fallow with intercropping of green manure (M2). Similar trend of results were observed at all the four crops. The summer ploughing reduced weed dry weight to the tune of 48.71 to 50.09 during kharif and 20.92-21.28% during rabi seasons as compared to fallow plots. Similar findings reported by Patel and Mehta where they observed 54.6% reduction in dry weight due to summer ploughing. Among the weed management practices, the lowest total dry weight was recorded with application of glyphosate + pre-emergence application of butachlor fb 1 and 2 HW (S1 and S4) and these treatments were significantly superior to all the other treatments. Pre-emergence application of butachlor fb 1 and 2 HW (S1 and S4) follows the above treatment.

At 35 DAS, the lowest dry weights for all the four crops studied were recorded under summer ploughing along with intercropping of green manure (M4) (Table 1). This was followed by fallow without intercropping of green manure (M3). The reason might be synergistic effect of summer ploughing plots when combined with green manure intercropping which is having weed smothering effect could have resulted in lowest nutrient removal by weeds. Angadi has also noticed similar findings. At all the four crops, the highest total weed weight was recorded in fallow without intercropping of green manure (M2). With respect to weed management practices, during rabi season of 1999-2000, the hand weeding treatment (S4) recorded the lowest total dry weight, whereas, during kharif season of both the years and rabi crop of 2000-2001, the hand weeding treatment (S4) was at par with application of glyphosate + pre-emergence application of butachlor fb 1 and 2 HW (S1 and S4). The reason might be due to comparative weed free situation from the initial periods onwards in the glyphosate applied plots when compared hand weeding treatment which faced severe weed competition in the initial periods. The unweeded check treatment recorded the highest total weed dry weight at all the four crops studied.

At 55 DAS, the similar results were observed as that at 35 DAS.

Effect of integrated weed management practices nutrient removal of weeds: Preseason land management practices with or without intercropping of green manures
Table 1: Effect of weed control treatments on total weed dry weight (kg ha⁻¹)

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<td>159.91</td>
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Table 2: Nitrogen removal by weeds (kg ha⁻¹)

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and other weed management practices significantly influenced the nutrient removal viz., nitrogen, phosphorous and potassium removal of weeds (Table 2-4).

Summer ploughing with intercropping of green manure (M₃) recorded the lowest nutrient removal by weeds at all stages of observation however it was on par with summer ploughing without green manuring (M₂) at 20 DAS. The reduction in weed dry weight and the consequently low nutrient removal could be due to the exposure of weed seeds and rhizomes and uprooting of weed seedlings during summer ploughing coupled with the smothering of weed seedlings by green manure intercropping. Further during intercropping of green manure using conoweed, which simultaneously chopped, pulverized and incorporated the existing weeds in to the soil. Thus it provided weed free situation in the intercropped area. This finding corroborates with the findings of Mathew and Alexander[11].

Weed management practice had a profound influence on the nutrient removal by weeds. At 20 DAS, preseas application of butachlor fb 1 and 2 HW (S₃ and S₄)
Table 3: Phosphorous removal by weeds (kg ha⁻¹)

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<th>Treatments</th>
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<th>Rabi</th>
<th>Kharif'</th>
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<td>2000-2001</td>
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<td>0.08</td>
<td>0.06</td>
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Table 4: Potassium removal by weeds (kg ha⁻¹)

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recorded lesser nutrient removal by weeds. However, at 35 DAS, hand weeding (S₁) registered lowest nutrient removal by weeds, but it was comparable with S₂ and S₃ at all the crops, except in rabi crop of 1999-2000 where it was significantly superior to all other treatments. The reason might be that, glyphosate being highly translocated herbicide effectively helped in the destruction of weed vegetation even under fallow condition. Butachlor application as pre-emergence, which is also having post emergence activity, when combined with pre sowing application glyphosate fb 2 HW on 35 and 55 DAS, resulted with the least weed dry matter ultimately resulted in low nutrient removal. The result is accordance with the findings of Vijayabaskaran [30]. The highest nutrient uptake registered in unweeded check treatment (S₀).

REFERENCES


