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Productivity of Aerobic Rice and Weed Control Efficiency as Influenced by Smothering Crops and Inter Cultivation

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Abstract

A field experiment was conducted on farmers field in Uddebonehalli, Chikkamangalore district of Karnataka, during rainy season 2007-08 to study the performance of aerobic rice as influenced by smother crops. Significantly higher grain yield, straw yield and total rice equivalent yield were observed with weed free throughout followed by (4,925 kg/ha, 5,750 kg/ha and 4,925 kg/ha, respectively) aerobic rice + coriander with intercultivation at 30 and 50 DAS (4,696 kg/ha, 5,580 kg/ha and 6,582.0 kg/ha, respectively) and aerobic rice + butachlor at 1 kg a.i. /ha with intercultivation at 30 and 50 DAS (4,561 kg/ha, 5,390 kg/ha and 4,561 kg/ha, respectively). Smother crops like amaranthus, Indian dill were found to be much effective in reducing the weed growth without affecting the productivity of aerobic rice.
Key words : Aerobic rice, Smother crops, Weed control efficiency, Butachlor.

Rice is a major staple food crop in world and in India. Farmers are under the impression that rice is grown only under standing water and increase in yield is due to only increase in application of water. Rice grown with standing water uses only 40% of total water applied, remaining water is lost through seepage, runoff, leaching and evopotranspiration. Survey conducted at different sections of the distributory revealed that an unsustainable yield was attributed to uneven distribution of water. Therefore, there is a need to develop alternate systems that require less water; result of it is development of aerobic rice concept. Aerobic rice cultivation is a production system, which involves the growing of specially developed, input responsive rice varieties in well drained, non-puddled and unsaturated soils without ponded water. However, major constraint in aerobic soil condition to achieve higher yield is the problem of weed infestation. To achieve maximum yield by proper management practice, though conventional method of weeding is widely practiced, but it is costly and difficult to differentiate and remove grassy weeds in early stage. Present lines of investigation elsewhere is utilization of pre-mergent herbicide, but continuous use of herbicide result in residual toxicity and make the soil unproductive. In the present study, an effort was made to manage the weed through smothering crops and integrated weed management practices. Smothering crops are those which suppress the weed growth in early stage of the crop growth by spreading canopy coverage and manage the weed in eco-friendly means.

Methods

A field experiment was conducted in farmer's field at Uddebonehalli, Chikkamangalore district of Karnataka, during rainy season 2007-08. The soil was red sandy loamy soil with available NPK 249.87, 29.67 221.45 kg/ha, respectively; pH is 6.86 and EC is 0.18 ds/m. The treatments consisted of T_1—Aerobic rice + amaranthus, T_2—Aerobic rice + coriander, T_3—Aerobic rice + Indian dill, T_4—Aerobic rice+ butachlor at 1 kg a.i./ha, T_5—Aerobic rice + hand weeding at 20 and 40 DAS, T_6—Aerobic rice + amaranthus with intercultivation at 30 and 50 DAS, T_7—Aerobic rice + coriander with intercultivation at 30 and 50 DAS, T_8—Aerobic rice + Indian dill with intercultivation at 30 and 50 DAS, T_9—Aerobic rice + butachlor at 1 kg a. i./ha with intercultivation at 30 and 50 DAS, T_{10}—Aerobic rice+hand weeding at 20 and 40 DAS with intercultivation at 30 and 50 DAS, T_{11}—Weed free throughout and T_{12}—weedy check. The experiment was laid out in randomized block design with three replications. The varieties used were for paddy is MAS 946-1, amaranthus is arka suguna, coriander is DWD-3 and for Indian dill local varieties. The spacing adapted was 30 ×30 cm for paddy crops and smother crops seeds were broadcasted before sowing of

Table 1. Total weed population, weed dry weight and weed control efficiency as influenced by smother crop and integrated weed management practices in aerobic rice. Values in the parenthesis indicate the original values. Data was subjected to square root transformation.

Treatments	Total weed population (No./m^2)	Total weed dry weight (g/m^2)	Weed control efficiency (%)
T_1	8.85 (78.00)	7.31 (53.58)	40.65
T_2	8.93 (79.33)	7.14 (50.60)	48.29
T_3	8.64 (74.33)	7.88 (57.33)	41.02
T_4	9.00 (80.66)	7.68 (58.82)	36.84
T_5	8.80 (77.00)	6.75 (45.13)	52.73
T_6	5.90 (34.33)	3.15 (9.65)	90.87
T_7	4.45 (19.33)	2.27 (4.69)	96.38
T_8	5.70 (32.00)	2.832 (7.49)	91.40
T_9	5.10 (25.66)	2.78 (7.26)	93.00
T_{10}	6.41 (40.66)	3.11 (9.07)	90.02
T_{11}	0.70 (0.00)	0.70 (0.00)	100.00
T_{12}	14.69 (255.66)	9.64 (92.95)	0.0
SE	0.16	0.11	
CD (*P=0.05)*	0.47	0.34	

Table 2. Grain yield, straw yield and total rice equivalent as influenced by smother crops and integrated weed management practices in aerobic rice.

Treatments	Grain yield of rice (kg/ha)	Smother crops yield (kg/ha)	Rice equivalent yield (kg/ha)	Straw yield (q/ha)
T_1	3432	1065.00	4171	4640
T_2	3509	2352.00	5469	4650
T_3	3503	2135.00	4985	4600
T_4	3478	–	3478	4670
T_5	3786	–	3770	4920
T_6	4336	1045.00	5060	5080
T_7	4696	2263.00	6582	5580
T_8	4401	2233.00	5951	5270
T_9	4561	–	4561	5390
T_{10}	4406	–	4406	5300
T_{11}	4925	–	4925	5750
T_{12}	2121	–	2118	3210
SE±	107		103	120
CD (*P*=0.05)	314		302	360

paddy crop. Seed rate used for paddy is 5 kg/ha, amaranthus 5 kg/ha, coriander 20 kg/ha and indian dill 18 kg/ha. Recommended dose of NPK (100 : 50 : 50 kg/ha), entire quantity of P and K and 50% of N were applied at the time sowing and remaining 50% was applied two equal split once at 30 DAS and other at 45 DAS in the farm of urea. The butachlor was applied at 1 days after sowing (DAS) when moisture was available adequately. The data on weed number and weed dry weight were recorded at harvest. Yield data on smother crops and rice was recorded and rice equivalent yield was worked out. Data were statistical analyzed using MSTAT-C software.

Result and Discussion

Effect of Weeds

The important weed flora observed in the experimental field were *Cynadon dactylon. Dactyloctenium aegypticum, Digitaria sanguinalis, Echinochloa colonum, Panicum scrobiculatum, Cyperus difformis, Cyperus iria, Cyperus rotundus, Scirpus articulatus, Eclipta alba, Amaranthus viridis, Aeschynomene indica, Bidens pilosa, Celosia argentia, Mimosa pudica,Parthenium hysteroporus, Phyllanthus niruri, Portulaca oleraceae and Tridax procumbens.* Similar weeds were observed by Tripathi et al. (1).

Significant decrease in total weed population from 30 DAS to harvest was observed under weed free throughout followed by aerobic rice + coriander with intercultivation at 30 and 50 DAS and aerobic rice + butachlor at 1 kg a.i/ha with intercultivation at 30 and 50 DAS (Table 1). Significant decrease in the total weed dry weight from 30 DAS to harvest was observed under weed free throughout followed by aerobic rice + coriander with intercultivation at 30 and 50 DAS and aerobic rice + butachlor at 1 kg a.i./ha with intercultivation at 30 and 50 DAS (Table 1). Similar results were also reported by Moorthy (2) Thakur (3) and Laskar et al. (4). Higher weed control efficiency was recorded in weed free treatment compared to rest of the treatments followed by aerobic rice + coriander with intercultivation at 30 and 50 DAS and aerobic rice + butachlor at 1 kg a.i./ha with intercultivation at 30 and 50 DAS (Table 1). It might be due better weed control in these treatments. Less weed population, less weed dry weight and higher weed control efficiency were due to effect of smothering crops on weed during early stage of crop growth and butachlor application. Later stage intercultivation at 30 and 50 DAS resulted less weed population ultimately reflected on lower weed dry weight and also crop will suppress weed.

Effect on Grain Yield

Significantly higher grain yield and straw yield were observed in weed free treatment followed by aerobic rice + coriander with intercultivation at 30 and 50 DAS and aerobic rice + butachlor at 1 kg a. i. /ha with intercultivation at 30 and 50 DAS (Table 2). Significantly higher total rice equivalent yield observed with aerobic rice + coriander with intercultivation at 30 and 50 DAS followed by aerobic rice + coriander. The present findings are in conformity with the findings of Annie and Rao (5). Higher grain and straw yield were due to effective weed control treatments resulting less competetion of weed with rice for nutrient, moisture, light and space and it will create better environment for plant growth and development, ultimately it reflects on higher grain yield and straw yield.

Conclusion

Based on this study it can be concluded that smother crops like amaranthus, coriander and Indian dill can be effectively used during the early stages of aerobic rice to control weeds without affecting the productivity of main crop. Apart from this, growing of smother crops also gives an additional income for the farming community.

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