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Growth and Yield of Drum Seeded Rice as Influenced by Different Weed Management Practices

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Abstract

A field experiment was conducted during summer season of 2002-03 to identify the effective and economic weed management practices on the control of weeds in drum seeded rice. Pre-emergence application of sofit at 0.45 kg a.i. per/ha + cono weeder at 30 DAS + hand weeding at 30 DAS provided a broad spectrum weed control throughout the crop season in drum seeded rice, with a weed control efficiency of 98.0% at 60 DAS. Application of sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS recorded highest grain and straw yield (64.70 q/ha and 8.30 t/ha, respectively) followed by sofit at 0.45 kg a.i./ha + hand weeding at 30 DAS (59.35 q/ha and 8.10 t/ha, respectively). The lowest yield was observed with weedy check (21.17 q/ha and 3.50 t/ha, respectively).
Key words : Drum seeded rice, Weeds, Herbicides, Mechanical weeder, Grain yield.

In India, rice (*Oryza sativa* L.) is the major food crop for more than 65% of population and it accounts 55% of total cereal production in the country. Yield losses due to weeds are greater in drum seeded rice. Expansion of irrigated areas, availability of short duration rice cultivars, availability of labor, efficient herbicides, increasing transplantation costs and declining profitability of rice production under transplanted condition have forced many farmers in developing countries to shift from transplanting to drum seeding. Sowing of rice through drum seeder is cheaper and can be harvested by 7 to 10 days earlier than transplanted rice (1). This saving of time has great significance in intensive cropping system. Poduled seeding with sprouted seed resulted in similar or higher grain yield than that of transplanted. Early emergence of weeds along with crop seedlings and their rapid growth result in a severe crop weed competition for light, nutrients, moisture and space in drum seeded rice. Research results from various locations showed that herbicides alone do not solve the problem in direct seeded rice culture unless it is supplemented with manual weeding or cultural methods. Continuous use of same herbicide or herbicides having the same mode of action may lead to the evolution of resistance in weeds (2). The extent of weed intensity caused a yield loss of 72.6% in drum seed rice (3). Pre-emergence herbicides mainly control weeds in the earlier stages and weeds emerging at later stages of rice growth were not controlled effectively. In view of these reasons, the present study was undertaken to find out the relative efficiency of different herbicides alone and in combination with other methods of weed control.

Methods

Field experiment was conducted during summer season of 2002-03 at ZARS, Navile, Shimoga. The soil of the experimental plot was loamy with a pH of 5.4, low available nitrogen, phosphorus and potassium (180.0, 47.0 and 245.0 kg/ha, respectively).

The experiment comprising 12 weed control treatments were tested in randomized block design with three replications. The treatments comprised three pre-emergence herbicides viz. sofit (pretilachlor + safener 0.45 kg/ha, butachlor at 0.5 kg a.i./ha and anilophos at 0.3 kg a.i./ha applied at 3 DAS in combination with either hand weeding or cono weeder or hand weeding alone at 30 DAS compared with weedy check. Weed density, dry weight and yield of rice were re-

Table 1. Effect of weed control treatments on weed biomass and weed control efficiency at harvest in drum seeded rice. HW = hand weeding, DAS = Days after sowing, CW = Cono weeder. Values in parantheses indicate original values.

Treatments (kg a.i./ha)	Weed biomass (g 0.25/m^2) Grasses	Sedges	Borad leaved	Total weed	Weed control efficiency (%)
T_1 - Sofit 0.45	1.31 (1.23)	1.15 (0.82)	1.17 (0.87)	1.85 (2.92)	94.0
T_2 - Sofit 0.45 + HW at 30 DAS	1.21 (0.98)	0.94 (0.20)	1.83 (0.20)	1.43 (1.57)	97.0
T_3 - Sofit 0.45 + CW at 30 DAS + HW at 30 DAS	1.10 (0.72)	0.87 (0.27)	0.70 (0.00)	1.22 (0.99)	98.0
T_4 - Butachlor 0.5	2.24 (4.53)	0.80 (2.76)	1.57 (1.98)	3.12 (9.07)	67.0
T_5 - Butachlor 0.5 + HW at 30 DAS	1.30 (1.21)	1.14 (0.82)	1.26 (1.10)	1.90 (3.13)	92.0
T_6 - Butachlor 0.5 + CW at 30 DAS + HW at 30 DAS	1.22 (1.00)	0.95 (0.41)	1.00 (0.50)	1.55 (1.91)	95.0
T_7 - Anilophos 0.3	2.30 (4.01)	1.87 (3.01)	1.82 (2.99)	3.24 (10.01)	56.0
T_8 - Anilophos 0.3 + HW at 30 DAS	1.64 (2.22)	1.48 (1.71)	1.51 (1.81)	2.49 (5.74)	83.0
T_9 - Anilophos 0.3 + CW AT 30 DAS + HW at 30 DAS	1.32 (1.25)	1.17 (0.89)	1.23 (1.03)	1.91 (3.17)	90.0
T_{10} - Hand weeding at 30 DAS	1.72 (2.47)	1.52 (1.83)	1.41 (1.49)	2.50 (5.79)	86.0
T_{11} - Cono weeder at 30 DAS + HW at 30 DAS	1.32 (1.26)	1.21 (0.97)	1.24 (1.05)	1.94 (3.28)	89.0
T_{12} - Weedy check	5.13 (25.83)	4.22 (17.33)	2.87 (7.79)	7.17 (50.94)	-
SE ±	0.09	0.07	0.05	0.15	-
CD at 5%	0.26	0.21	0.15	0.45	-

corded. The crop was irrigated as and when required.

Before sowing, excess water was drained out from the field and pre-germinated paddy seeds were line sown using manually operated drum seeder uniformly on the puddle leveled land. Half of the recommended dose (125 kg/ha) of N nitrogen and full dose of 62.5 kg P_2O_5 and 62.5 kg P_2O_5 K_2O/ha were applied before leveling. The remaining nitrogen was top dressed in three equal splits such as active tillering, panicle interaction and flowering stage, in drum seeded rice. Herbicides were broadcasted uniformity in drained field mixing with sand at 75 kg/ha. The field was maintained with saturated moisture condition before and upto five days after herbicide application.

Results and Discussion

Application of sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS found to be more effective in controlling grasses, sedges and broad leaved weeds biomass (1.10, 0.87 and 0.79, respectively at g 0.25/m^2) followed by sofit at 0.45 kg a.i./ha + hand weeding at 30 DAS (1.21, 0.94 and 0.83, respectively at g 0.25/m^2) and butachlor at 0.5 kg a.i. / ha + cono weeder at 30 DAS + hand weeding at 30 DAS (1.22, 0.95 and 1.00 to respectively at g 0.25/m^2) over weedy check (5.13, 4.22 and 2.87, respectively at g 0.25/m^2) (Table 1). Similar trend was noticed with respect to total weed biomass. This might be due to effective control of grasses, sedges and broad leaved weeds because of better absorption of these chemicals thereby less growth at early stages and their after remaining weeds removed by hand weeding and cono weeder and longer persistence of herbicide in soil. The results of the present study are supported by earlier (2, 4, 5).

Weed control efficiency was highest (98%) in sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS, followed by sofit at 0.46 kg a.i../ha + hand weeding at 30 DAS (97%) as compared to all other treatments. This might be due to control of weeds at early stage by herbicide and supplemented with hand weeding at 30 DAS helped in the better control of weeds during later part of crop growth resulted in creating weed free environment and their by lower weed dry weight. However, relatively lower weed control efficiency of anilophos at 0.3 kg a.i./ha (56%) was due to ingressive weed control as evidenced from higher dry weight of weeds resulting in poor weed control efficiency. These results are in agreement with earlier findings of Raju et al. (1) and Moorthy and Sanjay Saha (6).

Use of sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS recorded highest grain and straw yield (64.70 q/ha and 8.30 t/ha, respectively) followed by sofit at 0.45 kg a.i./ha + hand weeding at 30 DAS (59.35 q/ha and 8.10 t/ha, respectively). The lowest yield was observed with weedy

Table 2. Effect of weed management practices on growth parameters, grain yield, straw yield and harvest index in drum seeded rice. HW = Hand weeing, DAS = Days after sowing, CW = Cono weeder. Values in parantheses indicate original values.

Treatments (kg a.i./ha)	Plant height 60 DAS	Dry weight of panicle (g 0.25/m^2)	No. productive tillers (g 0.25/m^2)	Grain yield (q/ha)	Straw yield (t/ha)	Harvest index
T_1 - Sofit 0.45	55.9	63.77	96.15	55.67	7.80	0.416
T_2 - Sofit 0.45 + HW at 30 DAS	69.4	69.31	100.73	59.35	8.10	0.422
T_3 - Sofit 0.45 + CW at 30 DAS + HW at 30 DAS	67.9	71.63	109.41	64.70	8.30	0.438
T_4 - Butachlor 0.5	51.6	54.47	88.02	43.63	7.10	0.380
T_5 - Butachlor 0.5 + HW at 30 DAS	55.5	61.29	96.83	55.65	7.40	0.429
T_6 - Butachlor 0.5 + CW at 30 DAS + HW at 30 DAS	60.7	65.27	99.77	59.05	7.70	0.436
T_7 - Anilophos 0.3	43.3	46.39	78.34	37.54	6.30	0.373
T_8 - Anilophos 0.3 + HW at 30 DAS	50.1	51.07	86.63	43.08	6.80	0.387
T_9 - Anilophos 0.3 + CW at 30 DAS + HW at 30 DAS	54.7	59.33	93.80	51.98	7.20	0.422
T_{10} - Hand weeding at 30 DAS	45.0	53.29	83.32	42.79	6.72	0.389
T_{11} - Cono weeder at 30 DAS + HW AT 30 DAS	51.1	57.35	90.03	44.90	6.90	0.393
T_{12} - Weedy check	37.2	26.11	49.08	21.17	3.50	0.376
SE ±	2.38	4.10	5.37	2.25	0.742	0.031
CD at 5%	7.14	12.03	15.75	6.62	2.180	0.093

check (21.17 q/ha and 3.50/ha, respectively). The increase in the grain with sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS was 39 per cent over hand weeding at 30 DAS, 58 and 205 per cent over anilophos at 0.3 kg a.i./ha alone and weedy check, respectively. It is due to favorable conditions to the rice at early stages created by these treatment by control the weeds efficiently and selective nature of the herbicide during early stage of the crop. Due to their higher weed control efficiency (98%), competition between crop and weeds was minimized and crop plants utilized available resources such as nutrients, moisture and light more efficiently throughout the crop growth. All these have resulted in better photosynthesis and distribution of photosynthates to the economic part as evident from higher leaf area and higher total dry matter accumulation.

It is also due to higher yield components in same treatments (Table 1). Sofit at 0.45 kg a.i./ha + cono weeder at 30 DAS + hand weeding at 30 DAS recorded the maximum plant height (69.4 cm), dry weight of panicle (71.63 g), number of productive tillers 109.41 0.25/m^2 followed by sofit at 0.45 kg a.i./ha + hand weeding at 30 DAS (67.9, 69.31 g and 100.73, respectively) as compared weedy check (37.2, 26.11 g and 49.08, respectively). This may be attributed to minimum competition of rice plant with the weeds for nutrients as indicated by lower nutrient uptake and light, as a result increase was due to better availability of photosynthates for better grain filling as a consequence of increased leaf area. The results confirm the findings of Choudhary and Thakuria (7), and Bayan (8) and Moorthy and Saha (6). It may be for sofit that contains safener which protected the crop from phytotoxicity and also inhibited the germination of weed seed which resulted in the growth and yield of rice. The degree of crop weed competition mostly depends on rainfall, variety soil type, nutrient resources, nature of weeds, stage and duration of weed competition. It emphasized that weeds did not affect crop productivity upto 45 DAS but there after affected the yield due to severe crop weed competition. Weedy check resulted in the lowest grain yield due to heavy infestation of weeds, which reduced the uptake of nutrients and lowered the photosynthesis by shading the crop plants (5, 9–11). Therefore maintaining weed free period for the first 30 DAS was found to be essential.

References

1. Raju M., B. K. Pandian and S. Avudaithai. 2002. Integrated weed management in wet seeded rice. Madras Agric. J. 89 : 445—447.
2. Anonymous. 1992. All India Co-ordinated research Project on weed control. Ann. Prog. Rep. Coimbatore, India, pp 63—76.
3. Kolhe S. S. and R. S. Tripathi. 1998. Integrated weed management in direct seeded rice. Indian J. Weed Sci. 30 : 51—53.

4. Bharathi T. 1996. Management options for seeding and weeding in wet seeded rice. M. Sc. thesis, Tamil Nadu Agric. Univ., Coimbatore, India.
5. Gnanasambandan S. and P. Balakrishna Murthy. 2001. Effect of tillage practices and pre-emergence herbicides application for weed control in wet seeded rice. Madras Agric. J. 88 : 590—593.
6. Moorthy B. T. S. and Sanjay Saha. 2002. Evaluation of pre and post emergence herbicides for their effects on weeds and upland direct seeded rice. Indian J. Weed Sci. 34 : 197—200.
7. Choudhary J. K. and R. K. Thakuria. 1998. Evaluation of herbicides in wet seeded broadcast, transplanted and drilled rice in medium land. Orissa J. Agric. Sci. 3 : 57—60.
8. Bayan H. C. 2000. Studies on integrated weed management under split application of nitrogen in seeded rice. Doctoral thesis, Tamil Nadu, Agric. Univ., Coimbatore, India.
9. Subbaiah S. V. and B. Sreedevi. 2000. Efficacy of herbicide mixtures on weed control in direct seeded rice under puddled condition. Indian J. Weed Sci. 32 : 199—200.
10. Vaishya R. D. and S. K. Tomar. 2000. Weed control in puddled seeded rice *(Oryza sativa)* with herbicides. Indian J. Weed Sci. 33 : 62—69.
11. Ravichandra V. K. 1991. Integrated management is necessary to check weeds in seeded late Sali (winter) *Oryaza sativa*) rice in Assam. Indian J. Agron. 43 : 291.