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AGRONOMIC EVALUATION OF SEED RATE AND WEED CONTROL METHODS ON PRODUCTIVITY AND PROFITABILITY OF WETLAND RICE UNDER MEDIUM LAND CONDITIONS

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Abstract

A field experiment was conducted at Experimental Farm, Annamalai University during 2018 to find out the effect of seed rate and weed control methods on wet seeded rice under medium land condition. Increasing seed rate from 60 to 120 kg/ha did not influence weed density and weed dry matter at 20 and 40 DAS. Application of pyrazosulfttron 0.02 kg/ha early post-emergence reduced density of all categories of weeds. The mean reduction was 61.9 and 35.3% and 66.7 and 41.9% at 20 and 40 DAS compared to butachlor and 2 hand weeding respectively. Pyrazosulfuron being similar to Almix (chlorimuron + metsulfiiron) 20 g/ha recorded 70.3 and 87.0% reduced weed dry matter compared to weedy check. Application of 80 kg seed/ha being similar to 100 and 120 kg seed/ha recorded 63.0% higher grain (2.70 t/ha) and 70.9% higher straw (3.81 t/ha) yield compared to 60 kg seed/ha.

Key words: Chemical control, Productivity, Rice, Seed rate, Weed dry weight.

Introduction

Invariably seedlings overgrow in the nursery waiting for rains ad-equate to perform puddling operation. As a result over-grown seedlings are planted and the crop starts flowering soon thereafter, leading to reduced yield. Wet seeding can be practiced as an alternative to transplanting as it holds promise for saving labour, time and energy and ensures efficient water use and increased benefit: cost ratio. Seed rate plays an important role which is kept usually high to the minimize weed menace. However, higher seed rate may produce frail and taller rice plant with lower number of panicles per unit area owing to intra-plant competition, while lower seed rate may result in greater weed occur-rence. Present investigation was taken up to study die effect of seed rate and weed control methods on weed dy-namics and productivity and profitability of wet-seeded rice.

Materials and Methods

An experiment was conducted during 2018 at Experimental Farm, Annamalai University. The field was typical medium land, with soil low in organic C (0.41%), available N (185 kg/ha) and K (142 kg/ ha) and medium in available P (15 kg/ha). Treatments com-prised of four seed rates, *viz.,* 60, 80, 100 and 120 kg/ha and five weed management practices, *viz.,* butachlor l.5 kg/ha pre-emergence, pyrazosulfuron 0.02 kg/ha post-emergence, Almix (chlorimuron + metsulfiiron) 4 g/ha post-emergence, two hand weedings at 20 and 40 days after sowing and weedy check. The experiment was con-ducted in a randomized block design replicated thrice.

Before sowing, the field was ploughed with the help of mould board plough followed by puddling by cultiva-tor in standing water of 10 cm depth, foil owed by plank-ing. Seed of rice variety ADT36 as per treatment were weighed and soaked overnight and kept wrapped in wet cloth for sprouting for 24h. The crop was sown on 18 July, 2010 and 23 July, 2011 and harvested on 14 November 2011 and 19 November, 2011. Application of fertilizers 100 kg N, 60 kg P_2O_s and 40 kg K_20/ha were applied in the form of urea, diammonium phosphate and muriate of potash, respectively. Half dose of N and full amount of P and K were applied as basal. Rest half of nitrogen was applied in two equal splits at maximum tillering and panicle primordial initiation stage.

Table 1: Effect of Seed rate and weed control methods on weed density in rice crop.

Treatment	Weed count (no./m²)						Weed dry weight (g/m³)	
	20 DAS			40 DAS				
	Narrow	BLW	Sedges	Narrow	BLW	Sedges	20 DAS	40 DAS
Seed rate (kg/ha)								
60	17	18	3	12	30	12	7.8	11.2
	(305)	(388)	(15.7)	(158)	(967)	(179)	(67.5)	(166)
80	15	16	3.1	11	29	12	7.1	10.3
	(264)	(326)	(13.2)	(120)	(910)	(178)	(53.4)	(137)
100	15	16	2.4	10	29	12	6.8	10.5
	(226)	(311)	(7.68)	(118)	(889)	(175)	(48.3)	(136)
120	13	14	2.2	11	29	12	5.9	10.5
	(174)	(235)	(6.14)	(150)	(867	(175)	(36.4)	(134)
LSD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Weed control method								
Butachlor 0.5 kg/ha	14	18	3.6	12	29	14	6.41	13.8
	(208)	(366)	(13)	(150)	(844)	(213)	(41.7)	(201)
Pyrazosulfuron 0.20 kg/ha	12	7.7	0.8	11	23	6.6	5.2	6.5
	(152)	(71.1)	(0.3)	(141)	(580)	(59)	(27.4)	(46.2)
Almix4 g/ha	14	14	1.9	14	26	9.7	5.9	8.8
	(201)	(262)	(4.6)	(188)	(747)	(123)	(36.4)	(85.1)
Weed-free	17	18	3.5	4.9	34	1 1	7.51	4.9
	(309)	(346)	(16)	(24)	(1201)	(117)	(59)	(24.7)
Weedy cheek	18	23	3.8	13	34	19	9.53	18.9
	(341)	(530)	(19)	(179)	(1170)	(371)	(92.5)	(358)
LSD (P=0.05)	NS	10.2	2.5	5.4	9.6	7.6	2.9	7.6

Data subjected to square root transformation. Original values are in parentheses.

Rssults and Discussion

Weed growth

The experimental field was infested with all three categories of weeds under six families. The total number of species were 12, out of which, *Echinochloa colona, Eleusine indica, Digitaria sanguinalis* and *Paspalum distichum* among grasses, *Ludwigia parviflora, Sphellanthus acmella, Eclipta alba* and *Commelina benghalensis* among Bwad Leaved Weeds and *Cyperus iria, Fimbristylis milliaceae, Cyperus difformis, Kyllinga brevifolia* among sedges were present as major weeds in rice fields. Increasing seed rate from 60 to 120 kg/ha did not influence weed density and weed dry matter

Table 2: Yield attributes and yield of rice as influenced by seed rate and weed control methods.

Treatment	Tillers/m²		Grains/panicle		Yield (t/ha)		Cost of Cultivation (x10³‘ /ha)	Net Returns (x10³‘ /ha)	B:C ratio
	Total	Effective	Filled	Unfilled	Grain	Straw			
Seed rate (kg/ha)									
60	317	262	69	40	1.65	2.22	15.71	7.25	1.11
80	396	337	93	40	2.70	3.80	16.19	21.69	1.97
100	425	306	62	40	2.58	3.17	16.67	18.39	1.72
120	380	283	54	38	2.17	2.80	17.15	12.64	1.33
LSD (P=0.05)	NS	73	NS	NS	1.02	1.45			
Weed control method									
Butachlor 0.5 kg/ha	365	262	61	40	1.99	2.62	15.65	11.84	1.39
Pyrazosulfuron 0.20 kg/ha	480	337	66	44	2.86	3.80	15.46	2.21	24.14
Altnix 4 g/ha	420	306	63	42	2.32	3.20	15.20	17.23	1.79
Weed-free	365	283	61	36	2.82	3.56	20.90	17.65	1.32
Weedy check	267	190	60	36	1.37	1.81	14.90	4.09	0.94
LSD (P=0.05)	131	90	NS	NS	1.02	1.58			

at 20 and 40 DAS. Mahajan *et al.,* (2006) have also found that enhanced seed rate did not influence weed density as well as weed dry matter. Application of herbicides *i.e.* butachlor, pyrazosulfuron, almix (chlorimuron + metsulfuron) as well as 2 hand weeding reduced total density of all categories of weeds compared to weedy check. Among herbicides, application of pyrazosulfuron was similar to almix in controlling broadleaved weeds and sedges at 20 and 40 DAS. The mean reduction in total weed density due to application of pyrazosulfuron was 61.9 and 35.3% and 66.7 and 41.8% at 20 and 40 DAS compared to butachlor and 2 hand weedings, respectively. Application of herbicides significantly reduced weed dry matter at 20 and 40 DAS. Application of pyrazosulfuron was on par with hand weeding at 40 DAS. Pyrazosulfuron being similar to Almix recorded 70.3 and 87.0% reduced weed dry matter at 20 and 40 DAS, respectively compared to weedy check. Similar findings were reported by Chopra *et al.,* (2003). Awan thsta *et al*., 2015; Singh *et al*., 2016 and Khaliq *et al*., 2012.

Yield and Economics

Rice crop sown with 80 kg seed/ha being similar to 100 and 120 kg seed/ha recorded 63.0% higher grain (2.70 t/ha) and 70.9% higher straw (3.81 t/ha) yield compared to 60 kg seed/ha, thereby recorded maximum net returns (21,692/ha) and benefit: cost ratio (1.97). Among weed control methods, application of pyrazosulfuron 0.20 kg/ ha being similar to butachlor 0.5 kg/ha, Almix 4g/ha and hand weeding recorded 107.9% higher grain (2.86 teed/ha) and 110.1% higher straw yield compared to weedy check, thereby registering maximum net returns (24,147/ ha) and B:C ratio (2.21).

It can be concluded that 80 kg seed/ha recorded higher productivity and profitability of rice crop grown as direct seeded under wetland situation. Application of pyrazosulfuron 0.20 kg/ha was most effective in controlling weeds and recording maximum productivity and prof-itability.

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