

Effect of chemical weed control on nutrient uptake and economics of direct seeded puddled rice (*Oryza sativa* L.)

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ABSTRACT

Field experiment was carried out on effect of chemical weed control nutrient uptake and economics of direct seeded puddled rice at Zonal Agricultural Research Station, V.C. Farm, Mandya, Karnataka. Results revealed that pre-emergent application of Butachlor @ 1.0 kg ai ha⁻¹ + Safener recorded maximum net returns (Rs. 13,962 ha⁻¹) and B:C ratio (2.15) closely followed by Pretilachlor @ 0.4 kg ai ha⁻¹ + Safener (Rs.13,768 ha⁻¹) and B:C ratio (2.04). However, hand weeding twice at 20 + 40 DAS has registered highest net returns (Rs. 14,770 ha⁻¹). Higher uptake of nitrogen was noticed with Butachlor @ 1.0 kg ai ha⁻¹ + Safener (196.3 kg ha⁻¹) followed by Pretilachlor @ 0.4 kg ai ha⁻¹ + Safener (183.1 kg ha⁻¹) compared to other treatments.

Key words : Rice, Nitrogen, Uptake, Economics, Net returns, Herbicides, Anilphos, Pendimethalin, Butachlor, Pretilachlor

INTRODUCTION

Rice is an important staple food crop of the world and India. It is grown under different ecosystems viz., irrigated, rainfed lowland, rainfed upland and flooded conditions by small and poor farmers with labour intensive methods of production. In most of the Asian countries rice is established through transplantation, which is time consuming, laborious and costly. Whereas, the direct seeding methods are easy, time and labour saving and low cost methods with grain yield equivalent or even higher than transplantation method (IRRI, 1969 and De Datta, 1988). Broadcasting of pre-germinated seeds on the puddled soil is one of the methods of direct seeding. In direct seeded rice weed infestation and competition is very severe, because the crop and the weed seeds germinate simultaneously and compete for same pool of resources. In recent years several herbicides have been made available to manage the weeds in varied situations. Therefore, the present study was conducted to know the effect of chemical weed control on nutrient uptake and economics of direct seeded puddled rice.

MATERIALS AND METHODS

Field experiment was conducted during *Kharif* 2005 at Zonal Agricultural Research Station, V.C. Farm, Mandya (Karnataka) to study the bio-efficacy of pre-emergent herbicides to control weeds and their effect on growth and yield of rice. The soil of the experimental site was sandy loam in texture, neutral in reaction and medium in soil fertility. The experiment consisted of 14 treatments, which include herbicides like Anilphos 30 EC,

Pendimethalin 30 EC, Butachlor 50 EC and Pretilachlor 50 EC. All tried alone at different concentrations and in combination with 2,4-D 36 EC. The experiment was replicated thrice and laid out in RCBD. The pre-germinated seeds of Rasi (IET-1444) were broadcasted uniformly on the puddle soil. The herbicides were applied uniformly as per the treatments at 4 days after sowing. The spray solution was used at the rate of 700 litres per hectare. The experimental data were analyzed statistically at 5 per cent level of probability. The weed count and the weed dry weight data were subjected to square root transformation and analyzed statistically (Sundar *et al.*, 1972). Available nitrogen was estimated by using standard procedure of Walkely and Blacks wet oxidation method (Piper, 1996).

RESULTS AND DISCUSSION

The results obtained from the present study as well as relevant discussion have been presented under following heads:

Effect on nitrogen uptake:

The maximum uptake of nitrogen by crop varied significantly due to weed control methods (Table 1). Higher amount of nitrogen uptake among herbicidal treatments was noticed with Butachlor + Safener @ 1.0 kg ai ha⁻¹ (196.3 kg ha⁻¹) followed by Pretilachlor + Safener @ 0.4 kg ai ha⁻¹ (183.1 kg ha⁻¹). Higher yield (Grain and straw) as a result of better plant stand and weed control resulted in increased absorption and transport of higher amount of nutrients. The difference in uptake of nutrients

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Table 1 : Nitrogen uptake by crop and weeds as influenced by weed control treatments in direct seeded rice under puddled condition

Treatments	Concentration Kg a.i ha ⁻¹	No. of total weeds/m ²	Total weeds dry weight g 0.25m ⁻²	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Nitrogen uptake (kg ha ⁻¹)	
						Rice	Weeds
T ₁ Anilophos (30 EC)	0.4	5.0 (25.4)	8.8 (78.6)	3705	2543	103.1	12.3
T ₂ Anilophos (30 EC)	0.3	5.2 (26.9)	8.6 (74.4)	3666	2114	101.7	11.5
T ₃ Anilophos + 2,4-D (30 +36 EC)	0.3+0.4	4.9 (23.6)	8.3 (68.6)	3695	2629	107.1	11.9
T ₄ Pendimethalin (30 EC)	1.0	4.7 (22.4)	7.1 (51.0)	4000	4246	158.9	9.0
T ₅ Pendimethalin (30 EC)	0.5	4.7 (22.3)	7.0 (48.8)	4541	4271	160.0	8.9
T ₆ Pendimethalin+2,4-D(30 + 36EC)	0.5+0.5	4.6 (21.3)	6.7 (44.8)	4543	4229	160.6	9.1
T ₇ Butachlor (50 EC)	1.5	4.4 (19.0)	6.2 (38.1)	4643	5257	174.9	8.1
T ₈ Butachlor+Safener(50 EC)	1.0	4.3 (18.3)	5.9 (34.5)	5334	5613	196.3	7.6
T ₉ Butachlor+Safener+2,4-D(50+ 36EC)	0.5+0.5	4.2 (17.3)	5.7 (32.9)	4565	4886	180.1	7.9
T ₁₀ Pretilachlor (50 EC)	0.5	4.2 (17.4)	6.7 (45.3)	4577	4914	176.4	8.3
T ₁₁ Pretilachlor+Safener (30 EC)	0.4	4.3 (18.0)	6.5 (42.5)	5100	5986	183.1	7.2
T ₁₂ Pretilachlor+Safener+2,4-D (30+36EC)	0.3+0.4	4.0 (15.7)	6.3 (40.1)	4734	4686	180.9	8.8
T ₁₃ Hand weeding at 20 & 40 DAS		5.4 (29.4)	5.0 (24.9)	5562	6400	218.9	6.8
T ₁₄ Un-weeded control		12.4 (154.0)	9.6 (92.6)	3452	4214	140.1	18.9
S.E. ±		0.41	0.31	1.349	0.018	0.342	0.313
C.D. (P=0.05)		1.22	1.08	4.047	0.053	1.066	0.938

Values in parenthesis represent original values

by weeds is more a function of total biomass production attained by the weeds under any particular treatments. Similar findings were noticed by Muthukrishnan *et al.* (1997). Maximum depletion of nitrogen by weeds was observed when weedy condition was maintained through out the crop growth period (18.9 kg ha⁻¹). Higher depletion was mainly due to maximum weed population (154 per m⁻²) and their dry weight (92.6 g 0.25 m⁻²). Among herbicidal treatments nitrogen deletion by weeds reduced significantly as result of reduced weed population and their dry weight.

Effect on the economics:

Among the herbicidal treatments pre-emergent

application of Butachlor + Safener @ 1.0 kg ai ha⁻¹ obtained maximum net returns (Rs. 13,962 ha⁻¹) closely followed by Pretilachlor + Safener @ 0.4 kg ai ha⁻¹ (Rs. 13,768 ha⁻¹). However, hand weeding twice at 20 + 40 DAS was registered highest net returns of Rs. 14,770 ha⁻¹ (Table 2). Higher net returns among these treatments was primarily due to better plant stand as result of low toxicity and effective weed control which resulted in higher grain yield and further the cost of weed control was low as against manual hand weeding. Maximum B:C ratio was achieved with Butachlor + Safener @ 1.0 kg ai ha⁻¹ (2.15) followed by Pretilachlor + Safener @ 0.4 kg ai ha⁻¹ (2.04). In spite of higher net returns with hand weeding twice at 20 + 40 DAS, the B:C ratio was

Table 2 : Economics of direct seeded rice as influenced by weed control treatments under puddled condition

Treatments	Concentration kg a.i ha ⁻¹	Cost of cultivation (Rs ha ⁻¹)	Cost of weed control (Rs ha ⁻¹)	Gross returns (Rs ha ⁻¹)	Net returns (Rs.ha ⁻¹)	B:C ratio
T ₁ Anilophos (30 EC)	0.4	6720	540	13238	6518	0.97
T ₂ Anilophos (30 EC)	0.3	6695	515	13560	6865	1.03
T ₃ Anilophos + 2,4-D (30 +36 EC)	0.3+0.4	6530	350	13578	7048	1.08
T ₄ Pendimethalin (30 EC)	1.0	7015	835	18184	11169	1.59
T ₅ Pendimethalin (30 EC)	0.5	6989	809	17877	10888	1.56
T ₆ Pendimethalin+2,4-D (30 + 36EC)	0.5+0.5	6676	596	17144	10468	1.57
T ₇ Butachlor (50 EC)	1.5	6408	228	18136	11728	1.83
T ₈ Butachlor+Safener (50 EC)	1.0	6490	310	20452	13962	2.15
T ₉ Butachlor+Safener+2,4-D (50+ 36EC)	0.5+0.5	6602	422	17981	11379	1.72
T ₁₀ Pretilachlor (50 EC)	0.5	6830	650	17733	10903	1.60
T ₁₁ Pretilachlor+Safener (30EC)	0.4	6740	560	20508	13768	2.04
T ₁₂ Pretilachlor+Safener+2,4D (30+36EC)	0.3+0.4	6665	485	16079	9414	1.41
T ₁₃ Hand weeding at 20 & 40 DAS		7400	1220	22170	14770	2.00
T ₁₄ Weedy check		6180	-	13508	7328	1.19

low (2.0) due to higher cost of weed control. Similar findings were noticed by Henrich *et al.* (1983), Bajpai and Singh (1992) and Prakash *et al.* (1995).

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