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Abhinandan Singh NRM, CEDA, BUAT, Banda, Uttar Pradesh, India Effect of integrated weed management practices on growth of upland rice

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Abstract

In the present experiment was carried out during *Kharif* season of 2016 at the Agronomy Farm, College of B.F.I.T, Suddhuwala, Dehradun to impact of integrated weed management practices on growth of upland rice. The experiment was laid out in randomized bock design was experiment with three replications and nine treatments. The growth of rice measured in terms of height, number of functional leaves, leaf area plant⁻¹ and dry mater accumulation per plant was favorably influenced by weed free check and 20 and 40 DAS at two hand weedings. It was followed by application pre-emergence of butachlor 50% EC @ 1.25 kg a.i. per ha + hand wedding at 40 DAS. Similarly trend was observed in contributory character namely respect of yield, Number of panicles per m, sq.Number of grains per panicles, Grain weight per plant and 1000 grain weight i.e. test weight (g). Weed population at 60 DAS and at harvest to dry matter were significantly lower in weed free check followed by two hand weedings at 20 and 40 DAS, respectively.

Keywords: Weed management, pre-emergence application, post-emergence application, dry matter production

Introduction

Rice is the most consumed cereal grain in the world, constituting the dietary staple food for more than half of the planet's human population. In world, rice has occupied an area of 156.7 million hectares, with a total production of 650.2 million tonnes in 2007 (FAO, 2008). In Asian countries, rice is the main major staple crop covering about ninety per cent of rice grown in the world, with two countries, China and India, growing more than half of the total crop.

India the second largest producer after China has an area of over 43.77million hectare under rice and production 96.43 million tonnes of rice in 2008 (Viraktamath and Shobharani, 2009). Rice being the main source of livelihood for more than 120 - 150 million rural household is the backbone of the Indian Agriculture. It occupies about 23.3 per cent of the food grain production and 55 per cent of cereal production.

Rice is the major *Kharif* crop of India covering 43.38 million ha area and amounting to 93.88 million tonnes of production (Anonymous, 2016-17). Rice is cultivated in India in a very wide range of ecosystems from irrigated to shallow low lands, mid-deep lowlands, deep water to uplands. Direct-seeding constitutes both wet- and dry seeding and it does away with the need for seedlings, nursery preparation, uprooting of seedlings and transplanting. Upland rice, which is mostly dry-seeded, is found in parts of Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Kerala, Karnataka, Uttrakhand, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal. The upland rice area is about 5.5 million hectares which accounts to 12.33% of the total rice area of the country. The agricultural growth rate has slowed down (2013-2014 reported less than 2%) in India (Government of India, 2010) ^[10] Therefore it is needed to produce additional rice production to meet the demand of growing population. Thus weed management would continue to play a key role to meet the growing food demands of increasing population in India.

Material and Method

A field experiment was carried out during *Kharif* season of 2016 at the Agronomy Farm, College of B.F.I.T, Suddhuwala, Dehradun investigate study the efficacy of different weed control methods and to evaluate the most suitable and economical weed management practice for controlling weeds in upland rice adopted to achieve different agronomic practices"

The soil was vertisol (medium black) in nature and about one meter deep with good drainage. The topography of experimental field was fairly uniform and levelled. The collected Soil samples from 0-15 cm depth and 15 randomly selected spots in the experimental area.

Corresponding Author: Kundan Kumar Doon Institute of Management and Research, Shyampur, Rishikesh, Uttarakhand, India Climatic study in suddhuwala, dehradun shivalik is classified as slightly moist cool zone. college Suddhuwala, Dehradun lies in the *Tarai* region to the south of foot hills of the Shivalik Himalayas at 29* N latitude, 79.23*E longitude and at an altitude of 243.8 m above mean sea level. The average annual rainfall of Dehradun is 1057mm out of which 80 per cent receive from south west monsoon in June to September while rest of rainfall receive in the month of October and November from north west monsoon.

The rainfall distribution was normal up to first week of September In general, the climatic conditions were quite favorable for the growth of paddy crop.

Field preparation was made by cross ploughing of tractordrawn cultivator followed by planking. After this, the experiment layout was done.

Treatment Details

T1: Weedy check

T2: Pendimethalin @ 1.0 kg a.i. per ha as pre emergence + Hand weeding at 40 DAS

T3: Butachlor 50 % EC @ 1.25 Kg a.i. per ha as preemergence + Hand weeding at 40 DAS

T4: Pendimethalin @ 1.0 Kg a.i.per ha as preemergence + 2,4 D (Sodium salt) @ 1.0 kg a.i. per ha. at 30 DAS

T5: Hand weeding at 20 DAS + 2, 4-D (Sodium salt) @1.0Kg a.i. per ha at 30 DAS

T6: Hoeing at 20 DAS + hand weeding at 30 DAS

T7: Hand weeding at 20 DAS + Hoeing at 40 DAS

T8: Two hand weedings at 20 DAS & 40 DAS respectively

T9: Weed Free check (3 weedings at 20,40 and 60 DAS)

Note: Where as

The experiment was laid out in Randomized Block Design with three replications and nine treatments. In Replications - Three, Treatment – Nine, Season – Kharif, Design - Randomized Block Design (RBD), Plot size -Gross: 4.0 m \times 3.15 m. Net: 3.50 m \times 2.60 m.

Spacing - 2.5 cm row to row (line sowing), Variety - Pant Dhan 4, Date of sowing - 15.06.2016, Fertilizer application - $110 \text{ kg N} + 60 \text{ kg P}_2\text{O}_5 + 50 \text{ kg K}_2\text{O}$ per ha.

In prepary tillage in field was ploughed with tractor drawn mould board plough. The harrowing was carried out with tractor drawn harrow and stubbles were removed. The experiment was lay out in Randomized Block Design with three replication. the treatment consist of nine weed management in sub plot treatment Small bunds were raised around each plot.

In seeds and sowing in Paddy seed use variety '*Pant Dhan 4*' were treated with carbendazim @ 2 g kg⁻¹ seed. This variety matures within 128 to 130 days and yields about 55-60 q per ha. Sowing was performed on 15th June, 2016 by manually (line sowing) after basal application of fertilizer using seed rate of 100 kg ha-¹. The seed was sown 2 to 3 cm deep by manual labours and was covered with soil.

The recomanded doses of fertilizer application in paddy crop N, P_2O_5 and K_2O *i.e.* 110:60:50 kg ha⁻¹ was applied through urea, single super-phosphate and muriate of potash, respectively. The desired plant population per plot was maintained by gap filing at 7 DAS.

In application of herbicide in The required quantity of spraying of pre-emergence herbicides viz, Pendimetalin @ 1.0 kg a.i. per ha in T2 treatments and butachlor 50% EC @ 1.25 kg a.i. per +ha in T3 treatment were done three DAS i.e. Pendimethalin @ 3.33 lit. per ha and butachlor @ 2.5 lit. per ha were dissolved in 500 lit. of water and sprayed by using knapsack sprayer with flat fan nozzle on soil surface. The

spraying of post-emergence herbicide 2,4-D (Sodium salt) @ 1.0kg a.i. per ha was done 30 DAS in treatment T4 and T5.The spray solution was made by dissolving 1.25 kg per ha 2,4-D (Sodium salt) in 500 lit. water and sprayed by using knapsack sprayer with flat fan nozzle.

Hand hoeing was done 20 DAS in T7 treatment and 40 DAS in T8 treatment. Hand weeding was done at 20, 40 and 60 DAS as per in hand weeding treatments. Biometric observation use in the effect of various treatments on plant characters of Paddy, periodical biometric observations were recorded at 20, 40, 60, 80, 100 DAS and at harvest. Functional leaves per plant was periodically recorded from five randomly selected the no of functional leaves and marked plants and averages of five plants were worked out at each observation for comparing treatment effects. Dry matter of three plants samples were taken at 20, 40, 60, and 80 DAS and at harvest. The plants were kept in oven at 60°C for 36-48 hours to obtain the constant dry biomass. Leaf area per plant was recorded from the five plants which were selected for dry matter studies, all the leaves of these five plants used for measuring leaf area with the help of leaf area meter at 20, 40, 60 and 80 DAS of crop growth.

The crop from each plot was harvested separately. The grains were separated from straw by threshing. The weight of grains was recorded and expressed in q ha⁻¹ and the straw weight was worked out by subtracting the weight of grains from the bundle weight of the produce it was expressed in q ha⁻¹. Harvest index was computed as the ratio of economic yield *i.e.* grain yield to the total biomass *i.e.* biological yield (grain and straw) from same area and expressed in percent.

Result and Discussion

To presented the data in revealed that at 20 DAS weed density of total weed count reduced in treatment butachlor 50% EC @ 1.25 Kg a.i per ha pre- emergence + hand weeding at 40 DAS, Pendimethalin @ 1.0 Kg a.i. per ha as pre-emergence + hand weeding at 40 DAS, Pendamethalin @ 1.0 Kg a.i. per ha as pre-emergence + 2,4-D (Sodium salt) @ 1.0 Kg a.i. per ha at 30 DAS which were superior in reducing weed population over remaining all weed control measures. Presented the data in 40,60,80 and 100 DAS respectively, revealed that weed density of grasses, sedges and BLW's was maximum in weedy check, while in the treatment where weed control measures were adopted, the weed density was appreciably reduced. However, Weed free check and two hand weeding at 20 DAS & 40 DAS respectively recorded lower number of weeds of all kinds than rest of the weed control measures, followed by Butachlor 50% EC @ 1.25 Kg a.i. per ha preemergence + hand weeding at 40 DAS.

Thus the observed of lowest weed intensity in weed free check and two hand weddings at 20 and 40 DAS, respectively. It was followed by butachlor 50% EC @ 1.25 Kg a.i. per ha as pre-emergence + hand weeding at 40 DAS. Because of lower weed intensity, weed crop competition was minimum. In weedy check there was highest weed population resulted in high weed crop competition for nutrient, sunlight, space and water which was hampered crop growth resulted in low yield.

The growth and yield of crop is mostly governed by the genotype, agro-management techniques and the environment to which the crop as exposed. Among the environmental factors, the prevailing weather condition such as rainfall, relative humidity, temperature, evaporation, solar radiation etc. play crucial role in the performance of crop under a particular farming situation.

Table 1: Plant height of upland rice as affected periodically by different weed control measures

				Plant height (cm)						
	Treatment	20	40	60	80	100	At			
		DAS	DAS	DAS	DAS	DAS	harvest			
T1	Weedy check	17.560	29.54	46.36	67.96	81.43	75.43			
T2	Pendimethalin @ 1.0 kg a.i. per ha as pre emergence +Hand weeding at 40 DAS	20.633	30.87	49.63	71.13	75.13	79.80			
T3	Butachlor 50 % EC @ 1.25 Kg a.i. per ha as preemergence+ Hand weeding at 40 DAS	18.920	29.84	50.50	71.83	81.06	81.83			
T4	Pendimethalin @ 1.0 Kg a.i. per ha as pre emergence + 2,4-D (Sodium salt) @ 1.0 kg a.i.per ha. at 30 DAS	19.867	30.83	49.43	73.33	81.63	80.90			
T5	Hand weeding at 20 DAS +2, 4-D (Sodium salt)@1.0Kg a.i. per ha at 30 DAS	17.110	31.83	50.36	72.33	77.90	77.80			
T6	Hoeing at 20 DAS + hand weeding at 30 DAS	19.087	29.63	48.36	74.16	81.63	84.00			
T7	Hand Weeding at 20 DAS + Hoeing at 40 DAS	17.933	31.40	50.10	72.93	75.83	76.60			
T8	Two hand weeding's at 20DAS & 40 DAS respectively	18.580	32.40	50.13	73.93	81.53	81.26			
T9	Weed Free check (3 weedings at 20,40 and 60 DAS)	18.337	32.72	53.23	75.40	84.30	85.56			
	'F' test	N.S.	Sig	Sig	Sig	Sig	Sig			
	S.E. ±	0.0539	0.30	0.87	0.75	0.60	0.61			
	CD at 5 %	-	0.90	2.61	2.26	1.81	1.83			
	G.M.	18.78	31.19	49.79	72.09	79.18	79.74			

Table 2: Dry matter production per plant of upland rice as affected periodically by different weed control measures

				Dry matter production (g)						
	Treatment	20	40	60	80	100	At			
		DAS	DAS	DAS	DAS	DAS	Harvest			
T1	Weedy check	0.31	2.78	7.63	10.59	12.56	14.52			
T2	Pendimethalin @ 1.0 kg a.i. per ha as pre emergence + Hand weeding at 40 DAS	0.32	3.56	9.35	13.98	18.00	21.20			
T3	Butachlor 50 % EC @ 1.25 Kg a.i. per ha as pre emergence + Hand weeding at 40 DAS	0.34	3.45	9.28	14.99	20.84	22.29			
T4	Pendimethalin @ 1.0 Kg a.i. per ha as pre-emergence + 2,4-D (Sodium salt) @ 1.0 kg a.i. per ha. at 30 DAS	0.33	3.90	8.52	11.50	19.21	20.15			
T5	Hand weeding at 20 DAS +2, 4-D (Sodium salt) @1.0Kg a.i. per ha at 30 DAS	0.33	3.60	8.72	11.79	19.01	23.08			
T6	Hoeing at 20 DAS + hand weeding at 30 DAS	0.34	3.51	8.96	11.85	18.82	20.17			
T7	Hand Weeding at 20 DAS + Hoeing at 40 DAS	0.32	3.62	9.04	12.17	23.26	20.21			
T8	Two hand weedings at 20 DAS & 40 DAS respectively	0.33	4.22	9.20	14.04	18.11	24.86			
T9	Weed Free check (3 weedings at 20,40 and 60 DAS)	0.36	4.50	10.60	16.20	24.22	25.81			
	'F' test	N.S.	Sig.	Sig.	Sig.	Sig.	Sig.			
	S.E. ±	0.01	0.03	0.12	0.12	0.13	0.05			
	CD at 5 %	-	0.10	0.37	0.36	0.39	0.15			
	G.M.	0.33	3.68	9.03	13.01	19.34	21.36			

Table 3: Initial and final plant count of upland rice as influenced by different weed control measures

Treatment		Plant count (m ⁻²)			
		Harvest			
Weedy check	223.67	102.66			
Pendimethalin @ 1.0 kg a.i.per ha as pre-emergence + hand weeding at 40 DAS	280.33	184.66			
Butachlor 50% EC @ 1.25 Kg a.i. per ha as preemergence + Hand weeding at 40 DAS	289.67	180.66			
Pendimethalin @ 1.0 kg a.i. per ha as pre-emergence +2,4-D (Sodium salt) @ 1.0 Kg a.i. per ha at 30 DAS	250.30	134.00			
weeding @ 20 DAS + 2,4-D (Sodium salt) @1.0 Kg a.i. per ha at 30 DAS	272.33	165.00			
Hoeing at 20 DAS + hand weeding at 30 DAS	241.00	130.66			
Hand weeding at 20 DAS+ Hoeing at 40 DAS	262.33	163.66			
Two hand-weeding at 20 DAS & 40 DAS, respectively	233.67	100.66			
Weed free check (3 weeding at 20, 40 & 60 DAS)	255.67	169.00			
'F' test	N.S.	Sig.			
S.E. ±	15.42	9.53			
C.D. 5 %	-	34.94			
G.M.	256.56	147.88			

Conclusion

Rice is major crop of Uttarakhand and about 40-50 per cent of rice crop is grown under direct seeded condition. In direct seeded rice, weeds play the vital role in reducing the crop yield and there by resulting in high economic losses of farmers It is therefore imperative to manage weeds from early crop growth period so that the crop can make efficient utilization of applied and native input.

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