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Effect of Nitrogen Levels and Weed Management Practices on Yield and Yield Attributes of Drum Seeded *rabi* Rice

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ABSTRACT: With increasing cost of labour and water shortage the farmers are forced to look substitute to present existing system of cultivation from transplanting to drum seeded rice where labour need is reduced by more than 20 % but, weed infestation and low nitrogen use efficiency are the major problems. By keeping in view of above problems a field experiment was conducted at College Farm, Agricultural College, Rajendranagar, Hyderabad during *Rabi* 2020-21 and 2021-22 to study the effect of nitrogen levels and weed management practices of drum seeded rice. Field trial consisted of 16 treatments having four weed management practices and four nitrogen levels laid out in factorial randomized block design. Out of all weed practices, yield attributes and yield were found higher with pre emergence application of Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS (W_4) followed by Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE (W_2). Among nitrogen levels, 125 % RDN (N_4) which was statistically comparable with 100 % RDN (N_3) had registered higher yield and yield parameters. Interaction of Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS with 125 % RDN [W_4N_4] had shown higher yield attributes and yield which was comparable to Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE with 125 % RDN [W_2N_4].

Keywords: Drum seeded rice, Yield attributes, Grain and straw yield, Harvest Index.

INTRODUCTION

More than half of the world's population relies on rice (*Oryza sativa* L.) as a staple food and source of livelihood, particularly in Asia, where 90 percent of the world's rice is produced and consumed. In India rice is grown in 44 M ha with production of 118.43 Mt (Agriculture statistics at glance, 2020). Traditionally rice is grown as an irrigated puddled transplanted crop involving raising nursery and manual transplanting which is quite cumbersome, tedious and needs lot of labour inputs. Contrarily, wet-direct seeded rice through drum seeder is an alternative way of faster and easier planting evading drudgery in raising seedlings and transplanting. It reduces labour need (>25%), increases yield (8-11%) and reduces water requirement (31%) hence making many farmers to shift from transplanting to drum seeded rice (Naseeruddin and Subramanyam 2013).

Production potentiality of rice can be fully exploited with suitable nitrogen levels and weed management practices. Weeds are major biotic constraints for sustainability of drum-seeded rice. Any delay in weeding leads to uncontrolled weeds in drum seeded rice, reducing yield by 53% (Raghavendra *et al.*, 2015). Hand weeding is easy and environment friendly but tedious, labour intensive and unavailable at peak period. Similarity between grassy weeds and rice seedlings make hand weeding difficult at early stages of growth. Therefore, use of selective herbicides controls weeds from beginning, giving good crop growth and competitive superiority over weeds. But, continuous use of same herbicides makes weed flora as persistent perennials, builds up herbicide resistance and herbicide residues in soil and consumable products. This can be overcome by use of herbicide mixtures with broad spectrum herbicidal action or by integrated weed

management practices for effective and economical weed control.

Nitrogen is important and most expansively used nutrient in rice where 60 % of loss occurs under field conditions due to volatilization, denitrification, leaching, runoff etc. Many farmers use low/high amount of nitrogen which are detrimental to crop growth and development. Many studies have reflected that rice yields increase with increasing N levels up to a particular range (Jehangir *et al*., 2021). However, decrease in yield at higher rates of nitrogen has also been witnessed in many studies. With increasing cost of N fertilizer, an efficient N management strategy for wet seeded rice is highly imperative.

Management of weeds along with fertilizers decreases crop-weed competition and increase net income by reducing losses due to weeds, increasing fertilizer use efficiency and grain yield. Hence, it is essential to identify an effective method of controlling weeds with appropriate level of nitrogen fertilizer especially for the drum seeder method where not much research information is available in the literature. Hence present experiment was undertaken to identify the most suitable combination of nitrogen level and weed management for better weed control and higher yield of drum seeded rice.

MATERIAL AND METHODS

During *Rabi* 2020-21 and 2021-22 at College farm, Agriculture College, Rajendranagar an experiment was taken on loamy sand soil, which is slightly alkaline in reaction and non-saline, with low in organic carbon and available N, medium in phosphorus and high in potassium. The experiment treatments consists of four weed management practices as Factor I (F_1) *viz.*, W_1: Unweeded (control), W_2: Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE, W_3: Pyrazosulfuron-ethyl 70 % WDG 21 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE, W_4: Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS and four nitrogen levels as Factor II (F2) *viz.*, N_1-No nitrogen (control), N_2-75 % RDN (112.5 kg N ha^{-1}), N_3-100 % RDN (150 kg N ha^{-1}), N_4-125 % RDN (187.5 kg N ha^{-1}) replicated thrice in FRBD design.

JGL-24423 variety was used for sowing with drum seeder having spacing of 20 × 8-10 cm after soaking in water for 24 hrs and incubating for 48 hrs. Recommended full dose of P_2O_5 @ 60 kg ha^{-1} and half of K_2O @ 20 kg ha^{-1} was applied basally; remaining half dose of K_2O @ 20 kg ha^{-1} was applied at panicle initiation stage. Nitrogen was incorporated in three equal splits at sowing time, tillering and panicle initiation stages. At 3DAS, pre-emergence and at 2-3 leaf stage of weeds, post emergence herbicides were applied, while mechanical weeding was done at 25 and 50 DAS with conoweeder. The number productive tillers from all the five labelled hills were counted and averaged which was multiplied by number of hills in one square meter area and expressed as productive tillers m^{-2}. Ten panicles were selected randomly from the net plot area for recording the panicle length, panicle weight, total and filled grains. Test weight was measured by drawing dried seed samples randomly from each treatment plot and 1000 grains were counted and weighed. Grain and straw yields were estimated from net plot excluding border plants in the plot. Data was analyzed statistically applying analysis of variance technique for FRBD design. The significance was tested by 'F' test (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Yield attributes. All yield attributes were significantly influenced by nitrogen levels and weed management practices but treatmental interaction was found non-significant except for total and filled grains $panicle^{-1}$ in both the years presented in Table 1.

Maximum productive tillers m^{-2}, panicle length (cm), panicle weight (g), test weight (g), Number of total and filled grains $panicle^{-1}$were found higher with Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS (W4) (268.8, 22.7, 3.2, 22.52, 117.6 and 104.7) and (280.1, 23.8, 3.57, 22.64, 130.1 and 116.2) during 2020-21 and 2021-22followed by Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE[W_2] (260.8, 22.4, 3.08, 22.45, 112.7 and 100.4) and (271.7, 23.4, 3.47, 22.51, 125.4 and 111.4). While lower values were recorded with unweeded [W_1] (191.3, 19.1, 2.29, 21.7, 59.6 and 43.8) and (203.9, 20.5, 2.5, 21.79, 72.6 and 55.3) during two years

W_4 and W_2 produced more number of yield attributes than unweeded control, which might be due to weed free conditions at early stage, without any crop weed competition thus leading to vigorous seedling growth and sustained nutrient availability with optimum NPK uptake. Similar results were stated by Kumar *et al.* (2018); Kokilam *et al.* (2020).

Among nitrogen levels, 125% RDN [N_4] produced higher effective tillers m^{-2}, panicle length (cm), panicle weight (g), test weight (g), No. of total and filled grains $panicle^{-1}$ (270.2, 22.9, 3.23, 22.55,119.1 and 105.8) and (281.5, 24.1, 3.61, 22.67, 131.8 and 116.3) during both the years which was on par with 100 % RDN [N_3] (261.5, 22.4, 3.12 and 22.44) and (272.7, 23.5, 3.47 and 22.47) whereas lowest was recorded with no nitrogen [N_1] (191.3, 19.1, 2.29, 21.7, 112.7 and 100.4) and (203.9, 20.5, 2.5, 21.79, 125.4 and 111.4) in 2020 and 2021.

Table 1: Yield attributes of drum seeded *Rabi* rice as influenced by weed management practices and nitrogen levels.

Treatments	Productive tillers (No. m^{-2})		Panicle length (cm)		Panicle weight (g)		Test weight (g)	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
Weed management								
W_1	191.3	203.9	19.1	20.5	2.29	2.50	21.70	21.79
W_2	260.8	271.7	22.4	23.4	3.08	3.47	22.45	22.51
W_3	245.3	256.5	21.2	22.5	2.86	3.19	22.29	22.43
W_4	268.8	280.1	22.7	23.8	3.20	3.57	22.52	22.64
SEm±	4.7	3.8	0.4	0.3	0.06	0.08	0.24	0.25
CD(P=0.05)	13.7	11.1	1.0	0.8	0.16	0.22	NS	NS
Nitrogen Levels								
N_1	188.3	201.9	19.1	20.3	2.20	2.47	21.75	21.92
N_2	246.2	256.1	21.1	22.4	2.89	3.19	22.22	22.29
N_3	261.5	272.7	22.4	23.5	3.12	3.47	22.44	22.47
N_4	270.2	281.5	22.9	24.1	3.23	3.61	22.55	22.67
SEm±	4.7	3.8	0.4	0.3	0.06	0.08	0.24	0.25
CD(P=0.05)	13.7	11.1	1.0	0.8	0.16	0.22	NS	NS
Interaction								
SEm±	9.5	7.7	0.7	0.6	0.11	0.15	0.48	0.51
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Weed management (F_1)
W_1 : Unweeded
W2 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W3 : Pyrazosulfuron – ethyl 70 % WDG 21 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W4 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb mechanical weeding 25 and 50 DAS

Nitrogen levels (F_2)
N1 : No nitrogen
N2 : 75 % RDN (112.5 kg N ha^{-1})
N3 : 100 % RDN (150 kg N ha^{-1})
N4 : 125 % RDN (187.5 kg N ha^{-1})

Increase in nitrogen level might have increased nutrient availability to the crop which converted larger proportion of tillers in to productive tillers due to better translocation of photosynthates and there by producing higher number of panicles m^{-2}, panicle length and grain development. Similar findings were reported by Mude *et al*. (2021).

Among the interaction treatment combinations, during both the years (Table 2 and 3), it was found that Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS coupled with 125 % RDN [W_4N_4] resulted in higher number of total and filled grains (143.7 and 156.2) and (130.3 and 141.3) followed by combination of Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE with 125 % RDN [W_2N_4] (136.3 and 148.8) and (125 and 135) and lowest number was recorded in unweeded with no nitrogen [W_1N_1] (37.3 and 50.3) and (22 and 32.7). This might be due to frequent elimination of weeds that resulted in reduced weed competition, better nutrient availability to crop contributed to higher number of filled grains.

These results are similar to those of Ajmal (2020).

Grain yield (kg ha^{-1}). During two years of field trial, weed management practices and nitrogen levels had pronounced and significant effect on grain yield (Table 4). Among weed control treatments, significantly higher grain yield was obtained with Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS [W_4] (5830 and 6024 kg ha^{-1}) significantly on par with Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE [W_2] (5606 and 5773 kg ha^{-1}). While lowest grain yield was observed with unweeded [W_1] (2178 and 2326 kg ha^{-1}) during both the years.

The higher grain yield obtained under W_4 and W_2 might be due to their significant control over a broad spectrum of weeds, offering minimum crop-weed competition leading to better growth, development and higher yield of crop. Severe crop weed competition in unweeded control plots due to uncontrolled growth of weeds resulted in the lowest grain yield. These results were in accordance with Arunbabu and Jena (2018); Yadav *et al.* (2018); Anay *et al.* (2021).

Table 2: Total number of grains panicle^{-1} of drum seeded *Rabi* rice as influenced by weed management practices and nitrogen levels.

Treatments	*Rabi*, 2020-21					*Rabi*, 2021-22				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
W_1	37.3	59.3	69.4	72.3	59.6	50.3	72.3	82.4	85.3	72.6
W_2	62.1	121.2	131.3	136.3	112.7	74.6	133.7	144.5	148.8	125.4
W_3	59.1	109.7	119.7	124.0	103.1	72.1	122.0	132.7	137.0	115.9
W_4	67.2	123.8	135.7	143.7	117.6	79.7	136.3	148.2	156.2	130.1
Mean	56.4	103.5	114.0	119.1		69.2	116.1	126.9	131.8	
		W	N	W x N			W	N	W x N	
SEm±		1.9	1.9	3.8			2.0	2.0	4.0	
CD(P=0.05)		5.4	5.4	10.9			5.8	5.8	11.6	

Weed management (F_1)
W_1 : Unweeded
W2 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W3 : Pyrazosulfuron – ethyl 70 % WDG 21 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W4 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb mechanical weeding 25 and 50 DAS

Nitrogen levels (F_2)
N1 : No nitrogen
N2 : 75 % RDN (112.5 kg N ha^{-1})
N3 : 100 % RDN (150 kg N ha^{-1})
N4 : 125 % RDN (187.5 kg N ha^{-1})

Table 3: Number of filled grains panicle^{-1} of drum seeded *Rabi* rice as influenced by weed management practices and nitrogen levels.

Treatments	*Rabi*, 2020-21					*Rabi*, 2021-22				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
W_1	22.0	43.0	53.7	56.3	43.8	32.7	54.7	65.7	68.0	55.3
W_2	48.8	108.5	119.3	125.0	100.4	62.4	118.9	129.3	135.0	111.4
W_3	46.7	95.5	106.0	111.7	90.0	60.7	105.2	116.7	121.0	100.9
W_4	49.6	114.8	124.3.0	130.3	104.73	63.3	125.4	134.7	141.3	116.2
Mean	41.8	90.5	100.8	105.8		54.8	101.0	111.6	116.3	
		W	N	W × N			W	N	W x N	
SEm±		2.1	2.1	4.3			2.0	2.1	4.0	
CD(P=0.05)		6.2	6.2	12.4			5.7	5.7	11.4	

Weed management (F_1)
W_1 : Unweeded
W2 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W3 : Pyrazosulfuron – ethyl 70 % WDG 21 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W4 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb mechanical weeding 25 and 50 DAS

Nitrogen levels (F_2)
N1 : No nitrogen
N2 : 75 % RDN (112.5 kg N ha^{-1})
N3 : 100 % RDN (150 kg N ha^{-1})
N4 : 125 % RDN (187.5 kg N ha^{-1})

Table 4: Grain yield of drum seeded *Rabi* rice as influenced by weed management practices and nitrogen levels.

Treatments	*Rabi*, 2020-21					*Rabi*, 2021-22				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
W_1	1100	2116	2633	2862	2178	1064	2249	2849	3142	2326
W_2	2509	5753	6849	7312	5606	2709	5750	7112	7522	5773
W_3	2283	4913	6021	6477	4924	2517	5047	6181	6677	5105
W_4	2609	5917	7186	7608	5830	2809	6317	7286	7685	6024
Mean	2125	4675	5672	6065		2275	4841	5857	6256	

	W	N	W x N	W	N	W x N
SEm±	140	140	280	142	142	284
CD(P=0.05)	404	404	808	410	410	820

Weed management (F_1)
W_1 : Unweeded
W2 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W3 : Pyrazosulfuron – ethyl 70 % WDG 21 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W4 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb mechanical weeding 25 and 50 DAS

Nitrogen levels (F_2)
N1 : No nitrogen
N2 : 75 % RDN (112.5 kg N ha^{-1})
N3 : 100 % RDN (150 kg N ha^{-1})
N4 : 125 % RDN (187.5 kg N ha^{-1})

Among nitrogen levels, 125 % RDN [N_4] yielded highest grain yield (6065 and 6256 kg ha^{-1}) which was comparable with 100 % RDN [N_3] (5672 and 5857 kg ha^{-1}) and lowest was yielded by no nitrogen [N_1] (2125 and 2275 kg ha^{-1}) during study period. The grain yield increased with increasing nitrogen level might be due to higher growth and yield attributes because of efficient translocation of photosynthates from source to sink. Results are in line with Ajmal (2020).

Among the interaction treatment combinations, Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS with 125 % RDN [W_4N_4] resulted in higher yield of 7608 and 7685 kg ha^{-1} followed by Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} as POE with 125 % RDN [W_2N_4] (7312 and 7522 kg ha^{-1}) and lowest grain yield was recorded in unweeded with no nitrogen [W_1N_1] (1100 and 1064 kg ha^{-1}) during both the years.

Straw yield (kg ha^{-1}). Effect of nitrogen levels and weed management practices on straw yield had significant effect but their interaction was found to be non significant (Table 5). Among weed treatments, Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS (W_4) had shown higher straw yield of 7807 and 8097 kg ha^{-1}, while lowest straw yield was observed with unweeded [W_1] (4218 and 4426 kg ha^{-1}) during both the years of study. Maintenance of weed free environment at critical stages of crop growth, led to complete utilization of nutrients and other resources by crop plants, resulting in vigorous growth and greater dry matter production by crop. The results are in accordance to the findings of Nayak (2014).

During both years, 125 % RDN (N_4) has recorded highest straw yield of (8094 and 8375 kg ha^{-1}) and lowest was yielded by control [N_1] (4101 and 4282 kg ha^{-1}). Higher straw yield might be due to increased plant height, profuse tillering and higher dry matter production at higher nitrogen levels. The results are in agreement with Malik *et al.* (2014); Ali *et al*. (2015).

Table 5: Straw yield and Harvest Index of drum seeded *Rabi* rice as influenced by weed management practices and nitrogen levels.

Treatments	Straw yield (kg ha^{-1})		Harvest Index (%)	
	2020-21	2021-22	2020-21	2021-22
Weed management				
W_1	4218	4426	33.24	33.43
W_2	7584	7818	41.52	41.64
W_3	6934	7258	40.43	40.61
W_4	7807	8097	41.83	41.70
SEm±	189	164	0.77	0.74
CD(P=0.05)	546	474	2.22	2.14
Nitrogen levels				
N_1	4101	4282	33.32	33.86
N_2	6683	6962	40.06	40.01
N_3	7666	7980	41.68	41.51
N_4	8094	8375	41.96	42.00
SEm±	189	164	0.77	0.74
CD(P=0.05)	546	474	2.22	2.14
Interaction				
SEm±	378	328	1.53	1.48
CD(P=0.05)	NS	NS	NS	NS

Weed management (F_1)
W_1 : Unweeded
W2 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W3 : Pyrazosulfuron – ethyl 70 % WDG 21 g ha^{-1} PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} POE
W4 : Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} PE fb mechanical weeding 25 and 50 DAS

Nitrogen levels (F_2)
N1 : No nitrogen
N2 : 75 % RDN (112.5 kg N ha^{-1})
N3 : 100 % RDN (150 kg N ha^{-1})
N4 : 125 % RDN (187.5 kg N ha^{-1})

Harvest Index (%). Harvest Index was significantly influenced by nitrogen levels and weed management practices (Table 5). Among weed treatments, Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS [W_4] had recorded highest harvest index of 41.83 and 41.70 % while lowest value was observed in unweeded [W_1] (33.24 and 33.43 %) during both the years of study. Good control of weed population reduced competition for nutrients, space and water resulting in higher dry matter accumulation, grain yield and thus harvest index.

Among nitrogen levels, 125 % RDN [N_4] has recorded highest harvest index (41.96 and 42.00 %) and lowest was recorded in control treatment (33.32 and 33.86 %) during both years. The increase in harvest index with increasing levels of nitrogen might be due to better translocation of assimilates from shoot to grain. Results are in accordance with Ajmal (2020).

CONCLUSION

From the two years of study, it can be concluded that, pre emergence application of Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb mechanical weeding at 25 and 50 DAS [W_4] or Pretilachlor 6 % + Pyrazosulfuron-ethyl 0.15 % GR 615 g ha^{-1} as PE fb Penoxsulam 1.02 % + Cyhalofop butyl 5.1 % OD 120 g ha^{-1} [W_2] with 125 % RDN [N_4] helps in attaining higher yield attributes and yield for drum seeded *Rabi* rice.

FUTURE SCOPE

The research work done on nitrogen levels, further can be studied on split application of nitrogen in drum seeded rice to reduce weed growth. Integrated nutrient management by intercropping with green manures and IWM practices can be studied in drum seeder rice.

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Conflict of Interest. None.

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