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EFFECT OF NITROGEN LEVELS AND LOPPING INTERVALS ON GROWTH AND YIELD OF BASMATI RICE (*ORYZA SATIVA* L.) IN N-W REGION OF PUNJAB, INDIA

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ABSTRACT

The field experiment on "Effect of different levels of nitrogen and lopping intervals on growth and yield of basmati rice (*Oryza sativa* L.)" was carried out at the research farm of Guru Kashi University, Talwandi Sabo, Bathinda (Punjab) during *kharif* season 2021.The experiment comprising total 10 treatment combinations; viz. T_1-control,T_2- N 20 kg per ha +LP at 25 DAT, T_3 -N 30 kg per ha + LP at 25DAT, T_4 –N 40 kg per ha + LP at 25 DAT, T_5 -N 20 kg per ha + LP at 35 DAT, T_6-N 30 kg per ha + LP at 35 DAT, T_7-N 40 kg per ha + LP at 35 DAT, . T_8-N 20 kg per ha + LP at 45 DAT, T_9-N 30 kg per ha + LP at 45 DAT and T_{10}-N 40 kg per ha +LP at 45 DAT. Experiment was carried out in randomized block design with three replications. Results revealed that growth, yield and economics of maize influenced significantly due to application of nitrogen and lopping practices. Results showed that application nitrogen 40 kg per ha + Lopping at 45 Days After Sowing at par with nitrogen 40 kg per ha + Lopping at 25 Days After Transplanting, nitrogen 40 kg per ha + Lopping at 35 Days After Transplanting and nitrogen 30 kg per ha + Lopping at 45 Days After Transplanting and recorded significantly higher dry matter accumulation, number of total tillers, number of panicles, number of grains per panicle, test weight, grain yield, straw yield, biological yield, nitrogen, phosphorus content and uptake, net returns and B:C ratio.

KEYWORDS : Nitrogen levels, Lopping intervals, Growth, Yield and basmati rice.

INTRODUCTION

Rice (*Oryza sativa* L.) is principal food crop of South and South Eastern Asian countries and supports nearly one half of the world population. Rice is the second most important staple food crop after wheat in the world but in India it has first position among the staple food crops. About 90 per cent of world's area under rice is in Asia and also 90 per cent of worlds rice is produced and consumed in Asia. It is mainly a staple food for the Eastern and Southern parts of the country.

India is the second-largest producer of rice (24 percent) in the world after China (30 percent), with greater than 11 percent of the world production. Rice is the staple food crop of India where it is grown in an area of 43.86 ha with a total production of 104.80 million tonnes and with an average productivity of 23.90 q per ha (Anonymous, 2020). Uttar Pradesh ranks second after West Bengal where the total production is 14.41 million tonnes with a share of 13.80% to total rice production in the country (Anonymous, 2020).

The productivity and quality of rice depends on environmental conditions and agronomic management practices (Singh *et al.* 2006). Among the

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management practices, judicious use of nitrogen fertilizer is of prime significance. Yoshida (1981) reported that nitrogen is a pivotal nutrient element for rice plants as 75 per cent of leaf nitrogen is associated with chloroplasts, which physiologically helps in biomass production through photosynthesis. Apart from promoting vegetative growth and crop yield, it also influences protein content in grains. The imbalanced application of nitrogen fertilizer either in excess or at less than optimum rate affects both yield and quality of rice to a remarkable extent. Inadequate nitrogen results in reduced leaf area, thereby, limiting light interception, photosynthesis and finally biomass production and grain yield (Sinclair, 1990). While, excess nitrogen application makes the crop more susceptible to lodging and insect pest incidence, which results in poor productivity and grain quality. Lodging is a major limiting factor for tall cultivars of basmati rice as it reduces 30-35 per cent production, which may be due to the high rates of nitrogen fertilization (Bhiah *et al.,* 2010). It is more prevalent with heavy rains and strong winds at the beginning of the grain-filling period and results in significant yield losses (Pablico *et al.,* 2003). The adverse effect of lodging during grain filling is mainly because of incomplete light interception due to bending of shoot from vertical stance and mutual shading of leaves and panicles (Setter *et al.,* 1997). It also interferes with nutrient and water uptake, reduces light interception and translocation of photosynthates from lower leaves of plant to grains, increases the harvesting cost and decreases grain yield. It is therefore important to work out the optimum nitrogen dose of tall cultivars for higher productivity, while, minimizing/avoiding lodging

MATERIALS AND METHODS

The field experiment on rice cropentitled,**"Effect of nitrogen levels and lopping intervals on growth and yield of rice (*Oryza sativa* L.)"** was conducted at research farm of Guru Kashi University, Talwandi Sobo (Punjab) during *Kharif* season 2020-21Geographically the experimental site of research farm of Guru Kashi University; Talwandi Sabo (Bathinda) during *Kharif* 2021.The farm is located at $29^{0}57'$N latitude and $75^{0}7'$E longitude at an elevation of about 213 meter above mean sea level. The experiment comprising total 10 treatment combinations; viz. T_1-control, T_2- N 20 kg per ha +LP at 25 DAT, T_3 -N 30 kg per ha + LP at 25DAT, T_4 –N 40 kg per ha+ LP at 25 DAT, T_5 -N 20 kg per ha + LP at 35 DAT, T_6-N 30 kg per ha + LP at 35 DAT, T_7-N 40 kg per ha + LP at 35 DAT, . T_8-N 20 kg per ha + LP at 45 DAT, T_9-N 30 kg per ha + LP at 45 DAT and T_{10}-N 40 kg per ha +LP at 45 DAT. Experiment was carried out in randomized block design with three replications. Results revealed that growth, yield and economics of maize influenced significantly due to application of nitrogen and lopping practices. Results showed that application of nitrogen 40 kg per ha + Lopping at 45 Days After Sowing at par with nitrogen 40 kg per ha + Lopping at 25 Days After Transplanting, nitrogen 40 kg per ha + Lopping at 35 Days After Transplanting and nitrogen 30 kg per ha + Lopping at 45 Days After Transplanting and recorded significantly higher dry matter accumulation, number of total tillers, number of panicles, number of grains per panicle, test weight, grain yield, straw yield, biological yield, nitrogen, phosphorus content and uptake, net returns and B:C ratio.

RESULTS AND DISCUSSION

Application of nitrogen 40 kg per ha + lopping at 45DAT recorded significantly higher plant height (58.54 cm) at 30 DAT but it was at par with nitrogen 30 kg per ha + lopping at 35 DAT, nitrogen 40 kg per ha + lopping at 35 DAT and nitrogen 30 kg per ha + lopping at 45 DAT. At 60, 90 DAT and at harvest higher plant height (78.25, 97.68 and 111.02 cm at 60, 90 DAT and at harvest, respectively) as recorded with nitrogen 40 kg per ha + lopping at 45 DAT. Significantly higher dry matter accumulation (130.11g per m^2) at 30 DAT was recorded with the application of nitrogen 40 kg per ha + lopping at 45 DAT, but it was at par with nitrogen 30 kg per ha + lopping at 35 DAT, nitrogen 40 kg per ha + lopping at 35 DAT and nitrogen 30 kg per ha + lopping at 45 DAT. At 60 DAT higher dry matter accumulation (312.71 g per m^2) was recorded with nitrogen 40 kg per ha + lopping at 25 DAT, it was at par with nitrogen 30 kg per ha + lopping at 25 DAT and proved superior over rest of treatments. At 90 DAT and at harvest, application of nitrogen 40 kg per ha + lopping at 45 DAT at par with application of nitrogen 40 kg per ha + lopping at 25DAT, application of nitrogen 40 kg per ha + lopping at 35 DAT and nitrogen 30 kg per ha + lopping at 45 DAT. Significantly maximum number of panicles per m^2 (266.06) was recorded with the application of nitrogen 40 kg per ha + lopping at 45 DAT, but it was at par nitrogen 40 kg per ha + lopping at 25DAT, nitrogen 40 kg per ha + lopping at 35DAT and nitrogen 30 kg per ha + lopping at 45DAT.

Maximum grain yield (38.21 q per ha) was obtained with the application of nitrogen 40 kg per ha + lopping at 45DAT, but it was at par with application

Effect of Nitrogen Levels and Lopping intervals on Plant height, Dry matter and Number of Tillers on Basmati Rice

Sr. No.	Treatments	Plant height		Dry Matter		Number of Tillers
		Initial	Final	Initial	Final	Final
T_1	Control	39.39	84.65	92.45	280.75	189.64
T_2	N 20 kg per ha + LP at 25 DAT	41.39	104.13	96.39	329.01	221.30
T_3	N 30 kg per ha + LP at 25 DAT	45.99	110.53	105.43	391.14	264.71
T_4	N 40 kg per ha + LP at 25 DAT	50.49	99.31	114.29	418.17	286.14
T_5	N 20 kg per ha + LP at 35 DAT	45.44	96.70	104.35	341.73	228.57
T_6	N 30 kg per ha + LP at 35 DAT	55.13	100.54	123.41	391.82	266.21
T_7	N 40 kg per ha + LP at 35 DAT	58.18	100.72	129.40	422.15	290.21
T_8	N 20 kg per ha + LP at 45 DAT	43.11	90.96	99.78	350.22	233.99
T_9	N 30 kg per ha + LP at 45 DAT	55.54	96.98	124.21	408.60	275.64
T_{10}	N 40 kg per ha + LP at 45 DAT	58.54	111.02	130.11	428.30	290.41
	SEm±	1.77	2.92	2.47	7.09	6.08
	C.D. at 5 %	5.27	8.68	7.34	21.06	18.05

*N- Nitrogen; *LP- Lopping; *DAT- Days after Transplanting

Effect of nitrogen levels and lopping interval on yields of basmati rice

Sr. No.	Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)
T_1	Control	24.41	42.08	66.49
T_2	N 20 kg per ha + LP at 25 DAT	32.47	48.93	81.40
T_3	N 30 kg per ha + LP at 25 DAT	35.65	54.13	89.78
T_4	N 40 kg per ha + LP at 25 DAT	36.90	56.16	93.06
T_5	N 20 kg per ha + LP at 35 DAT	33.59	50.57	84.16
T_6	N 30 kg per ha + LP at 35 DAT	35.83	55.74	91.58
T_7	N 40 kg per ha + LP at 35 DAT	37.35	57.26	94.61
T_8	N 20 kg per ha + LP at 45 DAT	33.76	51.16	84.92
T_9	N 30 kg per ha + LP at 45 DAT	36.37	56.04	92.40
T_{10}	N 40 kg per ha + LP at 45 DAT	38.21	58.03	96.25
	SEm±	0.62	0.89	1.07
	C.D. at 5 %	1.85	2.65	3.19

*N- Nitrogen, *LP- Lopping, *DAT- Days after Transplanting

Effect of nitrogen levels and lopping interval on economics of basmati rice

Sr. No.	Treatments	Cost of cultivation (Rs per ha)	Gross returns (Rs per ha)	Net returns (Rs per ha)	B:C ratio
T_1	Control	22000	47353	25353	2.15
T_2	N 20 kg per ha + LP at 25 DAT	27258	62985	35727	2.31
T_3	N 30 kg per ha + LP at 25 DAT	27387	69167	41780	2.53
T_4	N 40 kg per ha + LP at 25 DAT	27516	71592	44076	2.60
T_5	N 20 kg per ha + LP at 35 DAT	27258	65163	37905	2.39
T_6	N 30 kg per ha + LP at 35 DAT	27387	69517	42130	2.54
T_7	N 40 kg per ha + LP at 35 DAT	27516	72454	44938	2.63
T_8	N 20 kg per ha + LP at 45 DAT	27258	65496	38238	2.40
T_9	N 30 kg per ha + LP at 45 DAT	27387	70553	43166	2.58
T_{10}	N 40 kg per ha + LP at 45 DAT	27516	74130	46614	2.69
	SEm±	-	1211	1211	0.04
	C.D. at 5 %	-	3598	3598	0.13

*N- Nitrogen, *LP- Lopping, *DAT- Days after Transplanting of nitrogen 40 kg per ha + lopping at 25DAT (36.90 q per ha), nitrogen 40 kg per ha + lopping at 35DAT (35.8 q per ha), nitrogen 40 kg per ha + lopping at 35DAT (37.4 q per ha) and nitrogen 30 kg per ha + lopping at 45DAT (36.4 q per ha)

CONCLUSION

Keeping in view the objectives framed for undertaking study and the results obtained after experimental period, under mentioned conclusions may be drawn. The maximum grain, straw and biological yield of basmati rice obtained with application of nitrogen 40 kg per ha + lopping at 45 DAT, but it was at par with nitrogen 40 kg per ha + lopping at 25 DAT, nitrogen 40 kg per ha + lopping at 35 DAT and nitrogen 30 kg per ha + lopping at 45 DAT.

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