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Research Paper

Optimization of nitrogen and potassium levels and time of application for productivity enhancement of rice in southern dry zone of Karnataka

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ABSTRACT

A field experiment was conducted on a sandy clay loam soil at College of Agriculture, Vishweshwaraiah Canal Farm, Mandya during *kharif* 2019 and *kharif* 2020 to study the growth and yield of semi dry rice influenced by combination of nitrogen and potassium doses and time of application. The experiment was laid out in split-plot design replicated thrice, the treatments comprised of 2 nutrient doses (100% RDNK and 125% RDNK) assigned to main plots and seven time of application different split application in sub plots. The results of indicated that application of 125% RDNK registered higher number of tillers and panicles (340.60 and 298.31/m^2), filled grains/panicle (86.3), 1,000-grain weight (21.04 g), grain and straw yields (5,515 and 7,408 kg/ha respectively) than the application of 100% RDNK and application of N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI). Application of 125% recommended doses of nitrogen and potassium registered higher number of tillers and panicles (345.42 and 302.17/m^2), filled grains/panicle (133.14), 1,000-grain weight (21.14 g), grain and straw yields (5,567 and 7,541 kg/ha respectively) than the application of 100% RDNK over other splits.

Key words: Semi dry rice, Split application, Yield parameters, Yield

Rice is the basic food product for 2/3 of the world's population (Karki, *et al.* 2023). Rice ranks second among grain crops (after wheat) in area and production yield (Kumar *et al.* 2024). Globally, rice cultivated in 112 countries on the area of 145 million hectares (m ha) with annual grain production about 600 million tonnes (mt). Semi dry system is receiving much attention in command areas where transplanting is delayed due to late on set of monsoons. In this system, rice is sowed in the unpuddled condition till receiving of monsoon rain or filling of canals and once the water is released from the canal crop will convert in to wet by impounding water in to field and keep in wet condition (Ajmal *et al.,* 2024).

Nitrogen plays a vital role in the growth and yield of crops. Apart from being a part of proteins, N is essential component of chlorophyll, crucial for life sustaining process and photosynthesis (Mohapatra *et al.,* 2022). An increase in nitrogen supply increases number of grains per panicle, 1000-grain weight, grain yield, number of tillers per hill, nutritive quality of straw, number of panicle bearing tillers and harvest index. Rice plant uses about half of the nitrogen applied, and the remaining is lost by volatilization, denitrification or leaching resulting in low nitrogen utilization efficiency (Raj *et al.,* 2014). So, the right amount of nitrogen fertilizer is critical for rice crop growth and development. Farmers are dumping more amount of nitrogen to field with the misconception that applying more nitrogen will give more yields. Potassium is involved in many aspects of plant physiology, including photosynthesis, respiration, fat, carbohydrate, nitrogenous chemical metabolism, enzyme activation, cell elongation, and water use efficiency, either directly or indirectly. As a result, knowing the amount and timing of potassium application has become critical. Potassium application in combination with nitrogen had remarkable positive reciprocal effect on crops, and was an important approach in improving potassium use efficiency. In view of these, the present investigation is prioritized and formulated on Optimization of nitrogen doses and time of application in semi dry rice to enhance productivity under southern dry zone of Karnataka.

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MATERIALS AND METHODS

The field experiment was conducted at College of Agriculture Visweshwaraiah Canal Farm (V. C. Farm), Mandya, University of Agricultural Sciences, Bengaluru during *kharif* 2019 and *kharif* 2020, which comes under Southern Dry Zone of Karnataka (Zone-VI). Geographically, located at 12°57' N latitude and 76°82' E longitude and at an altitude of 757.10 m above mean sea level. Soil was alkaline in reaction with pH of 8.97 and low in electrical conductivity (0.33 dS/m). The experimental soil was low in organic carbon (0.35%), available nitrogen (212.53 kg/ha) and available potassium (131.76 kg/ha), however it was high in available phosphorus. The experiment was laid out in split-plot design replicated thrice. The treatments comprised of 2 nutrient doses (100% RDNK and 125% RDNK) assigned to main plots and seven split application (S_1, 3-splits of N (20% sowing (S), 40% tillering (T) and 40% panicle initiation (PI)) and 100% K at basal; S_2, 3 splits of N (20% S, 40% T and 40% PI and 2-splits of K (50% basal and 50% at PI); S_3, 4-splits of N (10% S, 30% each at early tillering (ET), T and PI) and 100% K at basal; S_4- 4-splits of N (10% S, 30% each at ET, T and PI) and 2-splits of K (50% basal and 50% at PI); S_5, 4-splits of N (25% each at S, ET, T and PI and 100% K at basal; S_6, 4-splits of N (25% each at S, ET, T and PI and 2-splits of K (50% basal and 50% at PI); S_7, NPK as per UASB (University of agricultural sciences Bangalore) package (50% at sowing, 25% each at T and PI) were tested in subplots. Random allocation of treatment was done in main plot as well as in sub plot. fertilizer dose of 50 kg/ha P_2O_5 was applied to all the plots as basal dose. Different nitrogen and potassium doses were supplied to the crop at different growth stages in splits based on the treatments. Nitrogen, phosphorous, and potassium were given via urea, single super phosphate, and muriate of potash, respectively. Rice was sown under dry condition with the monsoon rain as rainfed up to 40 days after sowing. After 40 DAS it converted to wet with the availability of canal water and thereafter irrigation was given and 2–5 cm standing water was maintained up to the harvesting stage of the crop as wet seeded rice. Soil samples from all the treatments were taken after the harvest of crop from the surface (0 to 15 cm). The samples collected were shade dried, finely powdered and sieved using 2 mm sieve and used for chemical analysis. Biometric observations on growth parameters at four distinct stages of crop growth, i.e. 30, 60, 90 DAS and at harvest were recorded in the 5 plants from net plot area which were randomly selected and labelled. However, destructive sampling technique was adopted for assessment of dry matter accumulation and leaf area from the randomly selected five hills in the gross plot area at regular intervals. Data on yield and yield attributes were recorded before and after harvesting of crop as per requirement of study.

RESULTS AND DISCUSSION

Growth parameters

The data on growth parameters of semi dry rice as influenced by levels and time of nitrogen and potassium application (Table 1). Non-significant differences were observed in plant height due to the application of different levels of fertilizer. Application of 125% RDNK recorded significantly higher number of tillers/m^2, dry matter production and leaf area index compared to 100% RDNK. Among the different split applications, higher growth attributes was recorded with N at 4 splits as 25% each at sowing, early tillering, tillering and panicle initiation and K at 2 splits (50% at basal and 50% at panicle initiation) and was on par with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation and 100% K at basal, N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, 100% K at basal and N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) and significantly higher compared to rest of the treatments. Shortest plants were recorded in NPK as per UASB package.

Application of 125% RDNK recorded higher growth parameters during growth intervals of the crop as nitrogen plays a dominant role in the meristematic activity and cell division which in turn increased the number of cells leading to improved vegetative growth, whereas potassium boosts enzymes involved in protein synthesis and carbohydrates translocation, resulting in taller plants through rapid root development and growth (Patel *et al*., 2018). The higher nitrogen and potassium levels helped in increasing vegetative growth which led to the better interception of radiation and higher photosynthesis by crop. It is resulting in more plant height, tiller production and leaf area thus increasing dry matter production. Among the different split applications, higher growth parameters were recorded with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation). It was due to the constant supply of nitrogen and potassium in accordance with the growth stage, which fulfil the requirement of the crop at peak stage (Murthy *et al*., 2015; Patel *et al*., 2018 and Rabbani *et al*., 2020). This observation indicated that split application of potassium has increased plant as it enhances the transportation of nitrogen, phosphorous and other nutrients in semi dry rice (Raj *et al.,* 2014; Anusha, 2016; Lampayan *et al.,* 2009). There was non-significant difference observed

Table 1. Growth parameters of semi dry rice as influenced by levels and time of application of nitrogen and potassium (pooled data of 2 years)

Treatment	Plant height (cm)			Tillers/m^2			LAI			Dry matter production (g/hill)			Days to 50% flowering		
	2019	2019	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
Nitrogen and potassium level (M)															
M_1	79.17	85.15	82.16	285.95	303.10	294.52	4.45	4.54	4.50	132.56	140.12	136.34	87	89	88
M_2	85.78	90.97	88.37	322.86	358.33	340.6	5.18	5.27	5.22	153.64	161.06	157.35	89	91	90
SEm±	1.39	1.32	1.20	5.98	7.33	6.54	0.08	0.09	0.09	2.11	2.40	2.08	0.64	0.44	0.38
CD (P=0.05)	NS	NS	NS	36.38	44.62	39.78	0.51	0.55	0.49	12.81	14.60	12.63	NS	NS	NS
Split application of nitrogen and potassium (S)															
S_1	81.29	83.44	82.37	274.17	306.67	290.42	4.43	4.55	4.49	134.90	143.07	138.99	89	90	90
S_2	83.12	85.72	84.42	285	316.67	300.83	4.66	4.73	4.69	138.50	146.90	142.70	89	90	89
S_3	87.21	89.42	88.32	315	339.17	327.08	4.95	5.03	4.99	146.22	152.95	149.59	88	89	89
S_4	89.17	91.61	90.39	328.33	346.67	337.5	5.06	5.19	5.13	150.02	156.97	153.50	88	89	89
S_5	90.16	91.48	90.82	328.33	350	339.17	5.14	5.25	5.20	151.20	156.25	153.73	87	89	88
S_6	91.12	93.38	92.25	332.5	358.33	345.42	5.19	5.32	5.26	153.98	161.28	157.63	87	88	88
S_7	79.75	81.35	80.55	262	292.5	277.25	4.29	4.27	4.28	128.45	136.70	132.58	90	91	91
SEm±	1.80	1.93	1.83	7.73	7.77	7.63	0.12	0.12	0.08	3.18	2.79	3.42	1.44	0.97	0.95
CD (P=0.05)	5.27	5.61	5.33	22.57	22.70	22.27	0.35	0.34	0.32	9.28	8.14	9.97	NS	NS	NS
Interaction (M × S)															
SEm±	2.55	2.72	2.59	10.98	11.04	10.79	0.17	0.16	0.12	4.50	3.94	4.53	2.04	1.37	1.34
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

M_1, 100% RDNK; M_2,125% RDNK; S_1, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), 100% K at basal; S_2, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_3, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_4, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_5, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_6, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI), S_7, NPK as per UASB package

Table 2. Yield parameters of semi dry–rice at harvest as influenced by levels and time of application of nitrogen and potassium (pooled data of 2 years)

Treatment	Panicle/ m^2			Panicle length (cm)			Panicle weight (g)			Number of filled grains/panicle			Test weight (g)		
	2019	2019	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
Nitrogen and potassium level (M)															
M_1	238.86	264.29	251.57	19.52	19.82	19.67	3.19	3.29	3.24	111.90	116.90	114.40	20.65	20.83	20.74
M_2	287.81	308.81	298.31	21.15	21.46	21.31	3.53	3.64	3.59	126.97	131.95	129.46	20.97	21.12	21.04
SEm±	4.99	5.69	5.17	0.25	0.29	0.25	0.04	0.05	0.04	2.08	2.18	2.05	0.09	0.08	0.09
CD (P=0.05)	30.34	34.60	31.44	1.51	NS	1.54	0.25	0.29	0.25	12.68	13.29	12.50	NS	NS	NS
Split application of nitrogen and potassium (S)															
S_1	238.33	256.67	247.5	19.56	19.96	19.76	3.20	3.24	3.24	111.06	116.28	113.67	20.68	20.84	20.76
S_2	250.83	274.17	262.5	19.85	20.25	20.05	3.24	3.31	3.28	114.54	120.17	117.35	20.76	20.91	20.83
S_3	276.67	295.00	285.83	20.64	20.92	20.78	3.45	3.58	3.51	121.22	127	124.11	20.80	20.97	20.89
S_4	282.33	311.67	297	20.91	21.2	21.06	3.48	3.61	3.54	125.67	130.22	127.94	20.86	21.04	20.95
S_5	283.33	308.33	295.83	21.12	21.26	21.19	3.52	3.65	3.59	126.61	131.17	128.89	20.94	21.11	21.02
S_6	287.67	316.67	302.17	21.31	21.59	21.45	3.54	3.70	3.62	130.72	135.56	133.14	21.06	21.21	21.14
S_7	224.17	243.33	233.75	18.94	19.33	19.13	3.10	3.16	3.13	106.22	110.61	108.42	20.54	20.75	20.64
SEm±	6.56	7.44	6.88	0.29	0.27	0.26	0.04	0.05	0.05	2.64	2.92	2.76	0.13	0.12	0.12
CD (P=0.05)	19.14	21.72	20.09	0.85	0.80	0.76	0.12	0.16	0.14	7.72	8.53	8.04	NS	NS	NS
Interaction (M × S)															
SEm±	9.27	11.28	9.74	0.41	0.39	0.37	0.06	0.08	0.07	3.74	4.13	3.90	0.19	0.17	0.17
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

M_1, 100% RDNK; M_2,125% RDNK; S_1, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), 100% K at basal; S_2, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_3, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_4, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_5, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_6, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI), S_7, NPK as per UASB package

among levels of nitrogen and potassium (90 to 88 days), their split application (91 to 88 days) and their interaction effect.

Yield parameters

Application of 125% RDNK recorded significantly higher yield attributes compared to 100% RDNK. Among the different split applications, significantly higher yield attributes were recorded in N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) over rest of the treatments. However it was found on par with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, 100% K at basal followed by N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, 100% K at basal and N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation).

Application of 125% RDNK produced more yield attributes compared to 100% RDNK. Application of higher fertilizer dose might have resulted in optimum levels of nutrients for crop uptake and translocation to sink there by expressing superior crop growth and development which positively reflected in the superior expression of the various yield attributes. Simultaneously, better nutrition at panicle initiation and flowering and efficient translocation of photosynthates from source to sink helped in improved filling of grains. The adequate nitrogen supply during the transition period of vegetative to reproductive growth phase and probably responsible for conversion of the higher number of total tillers to productive tillers due to increased partitioning of assimilates to the reproductive parts of the plant as suggested by Mallareddy and Padmaja (2013) and Gupta *et al*. (2014).

Among the different split applications, N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) produced higher panicles/m^2. Balanced application of nutrient at different crop stages produced increased

Table 3. Grain yield, straw yield and harvest index of semi dry rice as influenced by levels and time of application of nitrogen and potassium (pooled data of 2 years)

Treatment	Grain yield (kg/ha)			Straw yield (kg/ha)			Harvest index (%)		
	2019	2020	Pooled	2019	2020	Pooled	2019	2020	Pooled
Nitrogen and potassium level (M)									
M_1	4,822	5,037	4,930	6,520	6,735	6,627	42.54	42.81	42.68
M_2	5,401	5,628	5,515	7,308	7,508	7,408	42.48	42.85	42.67
SEm±	69	72	70	90	90	88	0.62	0.25	0.34
CD (P=0.05)	422	437	423	551	548	537	NS	NS	NS
Split application of nitrogen and potassium (S)									
S_1	4,808	5,060	4,934	6,502	6,733	6617	42.52	42.96	42.74
S_2	4,972	5,189	5,081	6,691	6,939	6815	42.63	42.80	42.71
S_3	5,213	5,440	5,326	7,067	7,269	7168	42.43	42.79	42.61
S_4	5,308	5,525	5,417	7,179	7,446	7313	42.48	42.60	42.54
S_5	5,376	5,580	5,478	7,290	7,444	7367	42.49	42.83	42.65
S_6	5,453	5,680	5,567	7,445	7,636	7541	42.27	42.66	42.47
S_7	4,649	4,855	4,752	6,229	6,382	6305	42.77	43.18	42.98
SEm±	90	94	90	145	143	143	0.58	0.68	0.33
CD (P=0.05)	263	273	263	424	418	417	NS	NS	NS
Interaction M × S									
SEm±	127	132	127	205	203	202	0.81	0.96	0.47
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

M_1, 100% RDNK; M_2,125% RDNK; S_1, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), 100% K at basal; S_2, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_3, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_4, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_5, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_6, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI), S_7, NPK as per UASB package

tillers and photosynthate translocation from source to sink which converted tillers into panicles. Application of potassium responsible for greater root development, higher nutrient uptake and leaf area development, consequently improved the effective tillers. Further split application of potassium improved panicles/m^2 by reducing the unproductive tillers. Split application of the potassium increases filled grains due to adequate potassium supply which enhances photosynthetic rate as potassium activates starch synthesis and converts soluble sugars into starch in grain filling process ultimately contributing to crop yield, (Sharma *et al*., 2007; Anil *et al*., 2014).

Yield

Application of 125% RDNK recorded significantly higher grain yield and straw yield over 100% RDNK. Among the different split applications, significantly higher grain and straw yield were noticed in N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) over rest of the treatments. However, it was statically on par with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, 100% K at basal, N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, 100% K at basal and N at 4 splits as, 10% at sowing, 30% each at early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation). Interaction between nitrogen, potassium levels and their split application was not found significant. Harvest index was non-significant among levels of nitrogen and potassium (42.67% to 42.68%), their split application (42.47% to 42.98%) and their interaction effect.

Application of 125% RDNK produced a significantly higher grain yield and straw yield compared to 100% RDNK. Application of higher levels of nitrogen and potassium induced enhancement of photosynthetic activity and growth parameters which resulted in the translocation of photosynthates from the leaves and culms to the grain. Therefore, plants at higher fertilizer levels produced more panicles and grains/panicle with increased test weight, resulting in higher yield. Application of more fertilizer creates favourable condition for higher amount of nutrients around the rhizosphere for continuous absorption which leads to the significant increase in the straw yield. The results are in close agreement with the findings of Murthy *et al*. (2015) and Anil *et al*. (2014) in aerobic rice.

Among the different split applications, higher grain and straw yields were recorded with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation). It might be due to the reason that the supply of N in four equal splits matching with the peak physiological needs of semi-dry rice compared to the rest of the nitrogen scheduling treatments (Anusha, 2016). It has resulted in better growth characters, viz. total tillers, LAI and dry matter production and yield attributes. Split application of potassium increases photosynthetic activity during reproductive growth which accounts much for high translocation of photo-assimilates from source to the sink, efficient absorp-

Table 4. Economics of semi dry rice as influenced by levels and time of application of nitrogen and potassium

Treatment	Gross returns (× 10^3 ₹/ha)	Net returns (× 10^3 ₹/ha)	Benefit: cost ratio
Nitrogen and potassium level (M)			
M_1	102,625	62,032	2.53
M_2	114,794	73,410	2.77
Split application of nitrogen and potassium (S)			
S_1	102,685	61,792	2.51
S_2	105,745	64,493	2.56
S_3	110,881	69,088	2.65
S_4	112,809	70,537	2.67
S_5	114,037	71,764	2.70
S_6	115,971	73,219	2.71
S_7	98,795	57,753	2.41

M_1, 100% RDNK; M_2,125% RDNK; S_1, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), 100% K at basal; S_2, N at 3 splits as; 20% at sowing, 40% at tillering (T) and 40% at panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_3, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_4, N at 4 splits as, 10% at sowing, 30% each at early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI); S_5, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), 100% K at basal; S_6, N at 4 splits as, 25% each at sowing, early tillering (ET), tillering (T) and panicle initiation (PI), K at 2 splits (50% at basal and 50% at panicle initiation (PI), S_7, NPK as per UASB package

tion and translocation of nutrients from soils, thereby increasing yield by reducing the sterility percentage (Anusha, 2016).

Economics

Among the levels, significantly higher gross returns, net returns and B: C ratio were recorded with the application of 125% RDNK compared to 100% RDNK (Table 4). Whereas in different split applications, higher economics was recorded with N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) (₹115,971 and 73,219/ha gross and net return, respectively) followed by N at 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, 100% K at basal (₹112,809 and 70537/ha). Higher levels of the fertilizer produced higher economics compared to lower dose this might be attributed to higher grain and straw yield. Split application of nitrogen and potassium has efficiently fulfilled the nutritional demand of the crop throughout the crop period and converted into the higher grain and straw yield coupled with higher market value (Anusha, 2016 and Maheswari *et al.,* 2008).

Thus, it was concluded that the application of 125% RDNK in 4 splits as, 25% each at sowing, early tillering, tillering and panicle initiation, K at 2 splits (50% at basal and 50% at panicle initiation) may be adopted to achieve the higher yield and productivity of rice grown under semi dry condition.

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