

Influence of Integrated Nutrient Management in Paddy - Lathyrus Cropping System in Eastern Vidarbha Region

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ABSTRACT: Rice is major cereal crop of India which occupies 11 % of Worlds crop area. Presently it is third important legume after chickpea and pigeon pea, predominantly grown in India. Lathyrus is rich in protein (28%) and minerals especially calcium, phosphorus and iron. Rice – lathyrus sequential cropping plays a significant role in total productivity of crops in Vidarbha. The experiment was conducted at College of Agriculture, Gadchiroli in split plot design with 4 main plot treatment to Paddy (N_1 - 100% RDN, N_2 - 75% RDN through fertilizer + 25% N through Vermicompost, N_3 - 75% RDN through fertilizer +25% N through Paddy straw compost, N_4 - 50% RDN through fertilizer + 50 % RDN (Vermicompost + Paddy straw compost) , 3 subplot treatments to Lathyrus (F_1 - 0 % RDN, F_2 - 50 % RDN and F_3 - 100 % RDN) with 3 replications during 2011-12. All ancillary characters viz. plant height, number of tillers plant-1, number of effective tillers plant-1, length of panicle (cm), number of grains panicle-1, grain yield hill-1 and test wt. (g), grain and straw yield of paddy were recorded maximum in treatment N_2 (75 % RDN+ 25 % RDN through vermicompost). Application of 75 % RDN through fertilizer+ 25% RDN through vermicompost to paddy recorded highest grain (4287 kg ha⁻¹) and straw yield (6011 kg ha⁻¹) of paddy. Highest no. of branches plant-1, no. of pods plant-1, grain yield plant-1, grain and straw yield ha⁻¹ of lathyrus was recorded with the application of 75 % RDN+ 25 % RDN through vermicompost to paddy and 100 % RDN to lathyrus. Application of 75 % RDN through fertilizer+ 25% RDN through vermicompost to paddy and 100 % RDN to lathyrus recorded highest GMR (Rs. 68958 ha⁻¹ and Rs. 67143 ha⁻¹). However, highest NMR Rs. 41142 ha⁻¹ and Rs. 29834 ha⁻¹) and B:C ratio (2.48 and 1.92) recorded with application of 100 % RDN to paddy and lathyrus respectively.

Key words: Paddy, Lathyrus, INM

INTRODUCTION

Rice is major cereal crop of India which occupies 11% of Worlds crop area. In India area under rice crop has about 45 million hectares with 95 million tones production. The total area under paddy in the state is 15.13 lakh ha with an annual rice production of 41.71 lakh tonnes production. In Vidarbha, area under this crop is 7.95 lakh ha with production 16.81 lakh tones. Presently Lathyrus is third important legume after chickpea and pigeon pea, predominantly grown in India. *Lathyrus* is rich in protein (28%) and minerals especially calcium, phosphorus and iron. During 2012-13, in Eastern Vidarbha region area under *lathyrus* cultivation is 42000 hector and average productivity is 2.17 q ha⁻¹.

In Eastern Vidarbha region, monocropping of Paddy is followed. So it is necessary to increase the productivity of farmers in this region by growing

another crop followed by paddy on residual moisture. Hence Paddy – lathyrus sequential cropping plays a significant role in total productivity of crops in Eastern Vidarbha. An integrated nutrient management (INM) practices involving the input of vermicompost, farmyard manure (FYM) and crop residues viz. paddy straw and bio fertilizers are advocated to improve N use efficiency, soil organic carbon, crop productivity and soil health and plays vital role in sustaining both the soil health and crop production on long term basis without degrading the natural resources. Organic manure provides regulated supply of plant nutrients by slowly released resulted in increasing yield of rice and nitrogen use efficiency. Therefore, there is a need for systematic approach of nutrient management to the system as a whole to increase the fertilizer use efficiency and improve the fertility status of soil by accounting the residual effect of the

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applied fertilizers, vermicompost and succeeding crops.

Hence, the present experiment “**Integrated nutrient management in Paddy – Lathyrus cropping system in Eastern Vidarbha region**” was conducted at College of Agriculture, Gadchiroli.

MATERIAL AND METHODS

The experiment was conducted at College of Agriculture, Gadchiroli. The soil was clay having pH 7.12, EC- 0.19 (dsm⁻¹), organic carbon 0.39%, available nitrogen, phosphorus and potassium are 229.30 kg ha⁻¹, 27.10kg ha⁻¹ and 298.70 kg ha⁻¹, respectively. The experiment was conducted in split plot design with 4 main plot treatment to Paddy (N₁- 100% RDN, N₂ - 75% RDN through fertilizer + 25% N through Vermicompost, N₃ - 75% RDN through fertilizer +25% N through Paddy straw compost, N₄ - 50% RDN through fertilizer + 50% RDN (Vermicompost + Paddy straw compost), 3 subplot treatments to Lathyrus (F₁ - 0% RDN, F₂ - 50% RDN and F₃ - 100% RDN) with 3 replications during 2011-12. The paddy was sown by transplanting by Japanese method and Lathyrus by Utera cultivation. The variety of Paddy is Sindewahi-1 and Lathyrus is Ratan used for sowing. The experimental data was analysed with the help of analysis of variance (ANOVA) by using the statistical procedure with a three replications of four main factor and three sub factor to determine the statistically difference between treatments in split plot design. The average values were compared using the least significant difference (LSD) test at the 5% level. The

experiment was conducted with the following objectives

1. To study the effect of different sources of nutrient on Rice-Lathyrus cropping system.
2. To workout the economics of Rice-Lathyrus cropping system

RESULTS AND DISCUSSION

Effect on Growth and Yield Attributes of Paddy

Data from table 1 revealed that ancillary characters viz. plant height, number of tillers plant⁻¹, number of effective tillers plant⁻¹, length of panicle (cm), number of grains panicle⁻¹, grain yield hill⁻¹ and test wt. (g), grain and straw yield of paddy were recorded maximum in treatment N₂ (75% RDN+ 25% RDN through vermicompost) followed by treatment N₁ (100% RDN), N₃ (75% RDN+ 25% RDN through paddy straw compost) and N₄ (50% RDN through fertilizer 50% RDN through vermicompost and paddy straw compost) except plant height which was maximum with N₁ followed by N₂, N₃ and N₄.

Effect on Yield of Paddy

Grain and straw yield of paddy were recorded maximum in treatment N₂ (75% RDN+ 25% RDN through vermicompost) followed by treatment N₁ (100% RDN), N₃ (75% RDN+ 25% RDN through paddy straw compost) and N₄ (50% RDN through fertilizer 50% RDN through vermicompost and paddy straw compost).

Table 1
Ancillary Characters and Yield of Paddy as Influenced by Different Treatments during 2011-12

Treatments	Plant pop/ sq mt	Plant height (cm)	No. of tillers plant ⁻¹	No. of effect. tillers plant ⁻¹	Length of panicle (cm)	No. of grains panicle ⁻¹	Grain yield hill ⁻¹ (g)	Test wt. (g)	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)
N management										
N ₁	524.00	107.33	20.00	15.33	19.33	205.33	39.23	14.80	4191	5882
N ₂	527.00	105.00	20.67	16.67	22.33	206.67	40.23	15.07	4287	6011
N ₃	525.67	104.33	18.67	15.00	18.67	200.67	36.30	14.87	3926	5399
N ₄	523.67	102.67	17.33	13.67	16.00	195.33	33.17	14.30	3773	4990

Effect on growth, yield attributes and yield of Lathyrus

Data shown in table 2 indicates that the effect of nitrogen management and fertility levels on growth, yield attributes and yield of Lathyrus during the year 2011-12.

Effect of Nitrogen Management

Number of pods plant⁻¹ and grain yield ha⁻¹ of lathyrus were recorded significantly highest with treatment

N₂ (75 % RDN+ 25 % RDN through vermicompost) which was superior over N₄ (50 %RDN through fertilizer+ 50% RDN through vermicompost & paddy straw compost), but at par with treatment N₁(100% RDN through chemical fertilizer) and N₃ (75 % RDN+ 25 % RDN through paddy straw compost). Highest no. of branches plant⁻¹, and straw yield ha⁻¹ was recorded with N₂ which was significantly superior over N₃ and N₄ but at par with N₂. Treatment N₂ recorded significantly highest grain yield plant⁻¹

which was superior over N1, N3 and N4. However, plant population, plant height and test wt. were found non significant.

Effect of Fertility Levels

Treatment F3 (100%RDN) recorded significantly highest no. of branches plant⁻¹, no. of pods plant⁻¹, grain yield plant⁻¹, grain and straw yield ha⁻¹ of

lathyrus which was significantly superior over F2 (50% RDN) and F1(0% RDN), However, plant population, plant height and test wt. were found to be non significant.

Effect of Interaction

Interaction effects were found to be non significant

Table 2
Ancillary Characters, Grain and Straw Yield of Lathyrus as Affected by Different Treatments during 2011-12

Treatments	Plant pop. m ⁻²	Plant height (cm)	No. of branches plant ⁻¹	No. of pods plant ⁻¹	Grain yield plant ⁻¹ (g)	Test wt. (g)	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)
A) N management								
N1	44.33	25.85	3.64	7.31	83.22	7.57	380	469
N2	45.00	26.86	3.78	7.56	89.69	7.77	401	497
N3	45.56	26.20	3.31	7.16	80.20	7.48	349	407
N4	44.00	24.31	3.18	6.16	67.74	7.43	297	353
SE(m)	0.67	1.09	0.09	0.19	1.61	0.14	11	16
CD at 5%	NS	NS	0.33	0.66	5.59	NS	39	57
B) Fertility levels								
F1	44.17	24.62	3.15	6.12	73.52	7.31	315	358
F2	44.67	26.15	3.50	7.15	81.01	7.61	358	437
F3	45.33	26.64	3.78	7.87	86.10	7.77	398	499
SE(m)	0.42	0.61	0.12	0.16	1.19	0.13	11	16
CD at 5%	NS	NS	0.35	0.48	3.57	NS	34	49
C) Interaction								
SE(m)	0.85	1.22	0.23	0.32	2.38	0.26	23	33
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS
GM	44.72	25.81	3.48	7.04	80.21	7.56	357	431

Effect of Paddy- Lathyrus system on Paddy grain equivalent yield and economics

Data shown in table 3 indicates that Paddy grain equivalent yield and economics of Paddy- Lathyrus system as affected by different treatments during 2011-12.

Effect of Nitrogen Management

Gross Monetary Returns of Paddy-lathyrus system are recorded maximum with treatment N2 followed by N1, N3 and N4. But, Net Monetary Returns and B:C ratio was maximum with N1 followed by N2, N3

Table 3
Paddy Grain Equivalent Yield and Economics of Paddy- Lathyrus System as affected by Different Treatments during 2011-12

Treatments	Paddy grain equivalent yield (kg ha ⁻¹)	GMR (Rs ha ⁻¹)	NMR (Rs ha ⁻¹)	B:C ratio
A) N management				
N1	4834	68958	41142	2.48
N2	4965	70805	35287	1.99
N3	4517	64326	32231	2.00
N4	4276	60754	7440	1.14
SE(m)	343			
CD at 5%	NS			
B) Fertilizer levels				
F1	4577	65256	28194	1.88
F2	4649	66233	29048	1.91
F3	4717	67143	29834	1.92
SE(m)	19			
CD at 5%	58			
C) Interaction				
SE(m)	39			
CD at 5%	NS			
GM	4648	66211	29025	1.90

And N4 (Table 4). However, Paddy grain equivalent yield was found to be non significant.

Effect of Fertility Levels

Paddy grain equivalent yield was recorded significantly highest with F3 which is superior over F2 and F1. However, Gross Monetary Returns, Net Monetary Returns and B:C ratio was recorded maximum with F3 followed by F2 and F1

Effect of Interaction

Interaction effects were found to be non significant

CONCLUSIONS

- (1) Application of 75 % RDN through fertilizer+ 25% RDN through vermicompost to paddy and 100 % RDN to lathyrus recorded highest GMR.
- (2) Application of 100 % RDN to paddy and lathyrus recorded highest NMR and B:C ratio

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