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Effect of organic manures on economics of scented rice (*Oryza sativa* L.)

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Abstract
A field experiment was conducted at Instructional cum Research Farm, Barrister Thakur Chhedilal College of Agriculture and Research Station, IGKV, Bilaspur, (C.G.). During *Kharif* 2020 with a view to study the "Effect of organic manures on economics of scented rice (*Oryza sativa* L.)". The rice variety Vishnubhog was used to grown and treatment was replicated three times in randomized block design (RBD). The soil of experimental field was clay loam soil. There were fertilizer application nitrogen, phosphorus and potassium and Manures application Recommended amount of compost, cow dunk, green leaf manure (GLM) and rock phosphate were applied at different concentrations in rice in nine treatment *viz*., T_1: -100% RDN through Compost, T_2:- 100% RDN through Green leaf manure, T_3:- Decomposed cow dung enriched with rock phosphate amendment (7.59 q/ha), T_4:- 100% RDN through Compost + Decomposed cow dung enriched with rock phosphate amendment (7.59q/ha^{-1}), T_5:- 100% RDN through green leaf manure + Decomposed cow dung enriched with rock phosphate amendment(7.59 q/ha^{-1}), T_6:- 100% RDN through FYM enriched with consortia, T_7:- Decomposed cow dung enriched with rock phosphate @ (12 q/ha^{-1}), T_8:- 100% RDF 60:40:30 kg NPK ha^{-1} and T_9:- Control (No NPK). The economic parameters like gross monetary returns, net monetary returns and B:C ratio were superior in the treatment T_8 (100% RDF (60:40:30) NPK kg ha^{-1}). The cost of cultivation was superior in treatment T_6 (100% RDN through FYM enriched with consortia), while the lowest was recorded in the treatment T_9 (Control (No NPK)). Therefore, it may be concluded that treatment T_8 (100% RDF (60:40:30) NPK kg ha^{-1}) may be prefer for higher growth and yield with economics in rice.

Keywords: Organic manures, Vishnubhog, scented rice, clay loam soil, compost, cow dunk, green leaf manure (GLM), rock phosphate and randomized block design

1. Introduction
Rice (*Oryza sativa* L.) is the second most widely consumed cereal in the world next to wheat. It is the most important and extensively cultivated food crop grown in tropical and sub-tropical region which provides half of the daily food for one of every three person on the earth. About 70% of the world population takes rice as staple food while in Asia alone, more than 2 billion people 60-70% of their energy intake from rice and its derivatives (Kumari *et al*., 2014) [7].
Rice is the major crop in India and occupies the largest cropped area of 43.19 million ha with annual production of 110.15 million tons and productivity of 2.55 tons/ha. (Anonymous, 2017) [1]. Total production of rice during 2019-20 is estimated at record 117.47 million tonnes. In 2018, Chhattisgarh produced 10.5 million tonnes of paddy with an average annual rainfall of around 1,207 mm; the net sown area of the state is 47.75 lakh (4.7 million) hectares, which is 34 percent of the state's total geographical area. Vishnu bhog is one of the signature-aromatic rice of Chhattisgarh. This rice is Non- Basmati aromatic short to medium grain rice. These are traditional Indian cultivar with intermediate amylose and gelatinization temperature.
In Chhattisgarh state rice occupies major area of 3.74 million ha. Total production of rice in Chhattisgarh is 5749.07 million tons, productivity 1482/ha and total area under rice 43.79 ha with production of 109.70 million tons with productivity 2494 kg/ha (Anonymous, 2019) [3]. The Chhattisgarh extends south east of Madhya Pradesh from 170 46'N to 240 5' N latitude and from 800 15' E to 840 20' E longitude. Chhattisgarh has a tremendous agricultural potential with a diversity of soil and climate, mountains, plateau, rivers, natural vegetation and forest. It is unique in sense in many ways. It has no seas and no connection with Himalaya and yet it has hilly and mountains with big rivers. The temperature goes down up to 1 °C in Chilpi and Surguja. The rainfall ranges from 800 mm to 1700 mm in different years. Diversified crops and cropping systems are the typical characteristics of Chhattisgarh.

2. Materials and Methods

A field experiment was conducted at Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur (Chhattisgarh) university of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) during *Kharif* 2020. The Research Farm is situated at 22.09˚N latitude, 82.15˚E longitude and at an altitude of 298 m above mean sea level. The region falls under the Eastern plateau and hill region (Agro-climatic zone-VII) of India. Chhattisgarh state is classified into three agro-climatic zones, of which Bilaspur falls under the Chhattisgarh plains zone of the state. The texture of soil of experimental field was clay loam soil. The soil was neutral in reaction, medium in organic carbon, low in nitrogen and medium in phosphorus and potash content.

Recommended amount of compost, cow dunk, green leaf manure (GLM) and rock phosphate were applied as per treatment as basal before transplanting. The manure was applied uniformly in plots by using broadcasting method. The chemical composition of green leaf manure was N (Nitrogen 3.5%), P (Phosphorus 0.60%), K (Potassium 1.25%), composition of compost was N (Nitrogen 0.5%), P (Phosphorus 0.15%), K (Potassium 0.5%), and composition of farm yard manure was N (Nitrogen 0.5%), P (Phosphorus 0.15%), K (Potassium 0.43%). Observations were recorded on randomly tagged competitive plants of each treatment for all the parameters separately. Recorded observations were averaged over replication to get treatment mean.

3. Results and Discussion

Data pertaining to economic attributes influenced by various treatment has been given in Table 1.

The highest cost of cultivation (43,232 Rs.ha^{-1}) was recorded in treatment 100% RDN through FYM enriched with consortia) (T_6). The lowest cost of cultivation (26,412 Rs.ha^{-1}) was recorded in the treatment Control (No NPK) (T_9).

The highest gross monetary returns (1,10,256 Rs.ha^{-1}) was recorded in treatment 100% RDF 60:40:30 kg NPK ha^{-1}) (T_8). The lowest gross monetary returns (49478 Rs.ha^{-1} was recorded in the treatment Control (No NPK) (T_9). Ramteke *et al.*, (2018) [10] showed Similar trends were reported in gross returns (58500 Rs. ha^{-1}) and net return (32250 Rs. ha^{-1}), showing better opportunities of organic agriculture in rice.

The highest net mandatory return (79155 Rs.ha^{-1}) was recorded under application of 100% RDF 60:40:30 kg NPK ha^{-1}) (T_8). Followed by (T_5). Almost equal gross mandatory return were found under 100% RDN through Compost + Decomposed cow dung enriched with rock phosphate amendment (7.59q ha^{-1}) (T_4) and Decomposed cow dung enriched with rock phosphate @ (12q ha^{-1}) (T_7). The lowest net monetary returns (23066 Rs.ha^{-1}) was recorded in the treatment T_9 (Control (No NPK). Tiwari *et al*., (2017) [11] was also recorded highest net return, B: C ratio, NPK uptake etc.

The highest Benefit: cost ratio (2.55) was recorded in treatment T_8 (100% RDF 60:40:30 kg/ha). Followed by (T_7), (T_5) and (T_3). The lowest Benefit: cost ratio (0.87) was recorded in the treatment T_9 control (No NPK). The Kumar *et al.*, (2010) reported that B:C ratio was higher in scented rice with application of RDF alone compared to sole organic alone treatment, due to increase cost. The similar results have been also reported by Chaudhary *et al.*, (2011) [4].

The total net returns and benefit-cost ratio were higher with the application of rock phosphate along with lime in coastal soil. Gross, net returns and benefit cost ratio at the highest nitrogen level of 140 kg N ha^{-1} were comparable with 100 kg N ha^{-1}, while the lowest gross returns were recorded with 80 kg N ha^{-1}.

Table 1: Effect of organic manures and inorganic fertilizers on cost of cultivation, gross monetary returns, net monetary returns and B:C ratio of scented rice

Tr.	Treatments	Cost of Cultivation (Rs/ha)	Gross Monetary Returns (Rs/Ha)	Net Monetary Returns (Rs/Ha)	B:C Ratio
T_1	100% RDN through Compost	34,412	70,122	35,710	1.04
T_2	100% RDN through Green leaf manure	27,532	75,744	48,212	1.75
T_3	Decomposed cow dung enriched with rock phosphate amendment(7.59q ha^{-1})	28,138	85,110	56,972	2.02
T_4	100% RDN through Compost + Decomposed cow dung enriched with rock phosphate amendment (7.59q ha^{-1})	36,255	98,018	61,763	1.70
T_5	100% RDN through green leaf manure + Decomposed cow dung enriched with rock phosphate amendment (7.59q ha^{-1})	29,375	1,01,176	71,801	2.44
T_6	100% RDN through FYM enriched with consortia	43,232	89,134	45,902	1.06
T_7	Decomposed cow dung enriched with rock phosphate @ (12q ha^{-1})	28,978	90,392	61,414	2.12
T_8	100% RDF (60:40:30) kg NPK ha^{-1}	31,101	1,10,256	79,155	2.55
T_9	Control (No NPK)	26,412	49,478	23,066	0.87

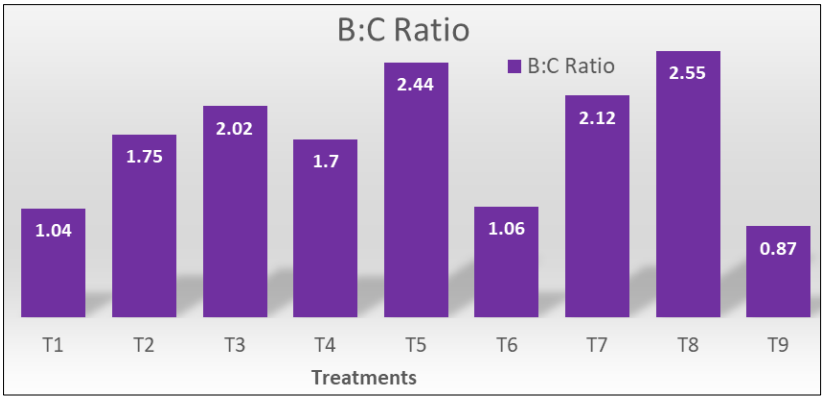

Fig 1: Effect of organic manures and inorganic fertilizers on B:C ratio of scented rice

Plate 1: Field view

Plate 2: Taking observation at different stage

4. Conclusion

The economic parameters like gross monetary returns, net monetary returns and B:C ratio were superior in the treatment T_8 (100% RDF (60:40:30) NPK kg ha^{-1}). The cost of cultivation was superior in T_6 (100% RDN through FYM enriched with consortia).

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