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Economics of using concentrated organic manures as sources nutrients for cultivation of green chillies (*Capsicum annuum* L.)

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ABSTRACT

In view of the economic importance of organic farming, the present study was taken up to evaluate the economics of using concentrated organic manures for cultivation of green chillies. The experiment consisted of seven treatments, comprising of organic treatment, inorganic treatment, and combination of both organic and inorganic treatment and an absolute control with three replications. Combined application of both organic and inorganic manures through 75 per cent jatropha oil cake, 25 per cent RDF and three per cent foliar spray of panchagavya recorded highest value of net return and Benefit Cost Ratio (BCR).

Key words: Oil cakes, organic manure, green chillies, economics.

Organic farming relies primarily on the cycling of organic matter to maintain soil fertility. Compost, cover crops, plant byproducts, animal manure and other biological materials form the bulk of what is applied to organic fields for fertility. Organic farmers are also permitted to supplement the addition of organic matter with the use of other natural products, such as mined minerals. The standard requires organic producers to manage soil fertility and crop nutrients in a way that maintains or improves soil organic matter content. This objective is achieved through crop rotations, growing cover crops and the application of plant and animal materials (Shaikh and Patil, 2013). Organically grown product has got its own export values, for which a systemic research and development programme in respect of sustaining agricultural production through pure organic agriculture needs initiation (Rawat, 2002). There is a considerable demand and scope for development of organic technologies either individually or in package (Sharma, 2002). Organic agriculture is environment friendly, ecological production system that promotes and enhances biodiversity, biological cycles and biological activity. It is based on minimal use of off-farm inputs and management practices that restore, maintain and enhance ecological harmony. The primary goal of organic agriculture is to optimize the health and productivity of interdependent communities of soil, plant, animal and people. Organic materials such as poultry manure, oilcakes, vermicompost, green manures and crop residues can substitute inorganic fertilizers to maintain productivity and environmental quality (Chaudhary, 2002). It is reported that the quality of agricultural produce, particularly horticultural produce *viz.*, flowers, vegetables and fruits improves when the nutrients are supplied through organic manures than in the form of fertilizers. This is because of the supply of all essential plant nutrients by the manures besides growth principles like enzymes, hormones and growth regulators etc. As a result, the metabolic function gets regulated more effectively, resulting in better synthesis of proximate constituents and consequent improvement in the quality of produce (Kumarasamy, 2002).

Manures are plant and animal wastes that are used as sources of plant nutrients. They release nutrients after their decomposition. Manures can be grouped into bulky organic manures and concentrated organic manures based on concentration of the nutrients. Concentrated organic manures are higher nutrient content than bulky organic manure. Among them most important are

oilcakes, blood meal, fish manure etc. These are also known as organic nitrogen fertilizer. Organic nitrogen is converted into readily usable ammonical nitrogen and nitrate nitrogen through bacterial action. These organic fertilizers are, therefore, relatively slow acting, but they supply available nitrogen for a longer period (Das, 2013). Oil cakes are concentrated organic manures. After the oil is extracted from oil seeds, the remaining solid portion is dried as cake and as organic manure. Oil cakes have two different types *viz.*, edible and non-edible oil cakes. Edible oil cakes like coconut cake and ground nut cake are safely fed to livestock, but non edible oil cakes like jatropha cake, castor cake, neem cake and mahua cake are not fit for feeding livestock. Else these non-edible oil cakes serve as a good source of organic manure especially for horticultural crops, as these contain high amount of plant nutrients. Nutrients present in oil cakes, after mineralization, are made available to crops within 7-10 days after application. Oil-cakes need to be well powdered before application for even distribution and quicker decomposition (Sankaranarayanan, 2004). Most of non-edible oil cakes are valued much for their alkaloid content, which inhibits the nitrification process in soil. Among the non-edible oil cakes, jatropha oil cake is a good source of plant nutrients, which is similar to that of chicken manure. Approximately one ton of jatropha oil cake is equivalent to 200 kg of mineral fertilizer. The jatropha oil cake cannot be used as animal feed, because of its toxic principles or antifactors (Makkar and Becker, 1997) and hence can be used as organic manure. Keeping all above information in view, the experiment was carried out to study the economics of using concentrated organic manures *viz.*, jatropha, neem and castor oil cakes for cultivation of green chillies.

MATERIALS AND METHODS

The experiment was carried out in moderately deep, well grained sandy clay loam soil. The soil was low (205.62 kg ha^{-1}), medium (16.51 kg ha^{-1}) and high (620.25 kg ha^{-1}) in available N, P and K content, respectively. The following treatment were adopted T_1 -100 per cent Recommended Dose of Fertilizer (RDF*) (120:60:30 kg NPK ha^{-1})+ Chlorpyriphos (3 ml l^{-1}), T_2-100 per cent Jatropha oil cake + 3 per cent foliar spray of panchagavya ,T_3- 75 per cent Jatropha oil cake + 25 per cent RDF* + 3 per cent foliar spray of panchagavya , T_4-50 per cent Jatropha oil cake +50 per cent RDF* + 3 per cent foliar spray of panchagavya, T_5-100 per cent Neem oil cake + 3 per cent foliar spray of panchagavya, T_6-100 per cent Castor oil cake + 3 per cent foliar spray of panchagavya and T_7-Absolute control with three replications. The expenditure incurred from field preparation to harvest was worked out and expressed in Rs ha^{-1}. Total income obtained from green fruit was worked out up to the last harvest based on the market prices that prevailed during the crop period. The net return was obtained by subtracting the cost of cultivation from gross return. Finally BCR was obtained by dividing the gross return by total cost of cultivation.

RESULTS AND DISCUSSION

Descriptive Statistics

Concentrated organic manures (oil cakes) were analyzed for their nutrient content and the quantities of organic manures were decided based on N equivalent ratio. The average nutrient content of different oil-cakes were analyzed and presented in Table 1. Among the oil cakes castor oil cakes showed the highest nitrogen and potassium content of 4.83 and 1.60 per cent respectively and jatropha oil cakes showed the highest phosphorus content of 1.90 per cent. The effect of organic and inorganic source of nutrients on yield parameters of green chillies is showed in table 2. The increase in green fruit length, green fruit girth and number of fruits per plant were observed under T_3 (75 per cent jatropha oil cake + 25 per cent RDF + 3 per cent foliar spray of panchagavya. The highest green fruit weight of 5.24 g was recorded in T_3 (75 per cent jatropha oil cake + 25 per cent RDF + 3 per cent foliar spray of panchagavya), which was significantly higher when compared to other treatments. Karup *et al.* (2007) reported that there was significant increase of fruit weight in okra when applied with oil cake as a source of organic manure. Natarajan (1990) also found that significant increase in green fruit weight per plant in chillies with the application of organic manures through the oil cakes. The highest green fruit yield of 10.64 t ha^{-1} was observed in T_3 (75 per cent jatropha oil cake + 25 per cent RDF + 3 per cent foliar spray of panchagavya) (Figure 1). This might be due to the supply of balanced nutrition to the crop from organic sources that favours the crop with slow and steady nutrient availability throughout the crop

growth period and the inorganic sources meet out the immediate nutrient requirements in an adequate level.

Table 1. Nutrient content of oil cakes (concentrated organic manures)

Oil Cakes	Nitrogen (%)	Phosphorus (%)	Potassium (%)
Jatropha oil cake	4.16	1.90	0.98
Neem oil cake	4.38	1.20	1.40
Castor oil cake	4.83	1.80	1.60

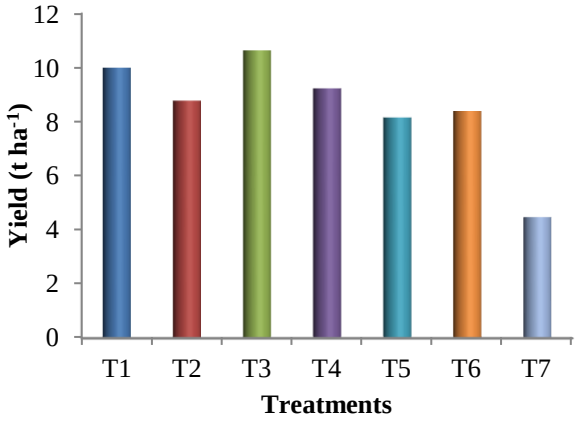

Fig. 1 Effect of organic and inorganic sources of nutrients on fruit yield of green chillies

Table 2. Effect of organic and inorganic sources of nutrients on yield of green chillies

Treatments	Yield parameters				
	Green fruit length (cm)	Green fruit girth (cm)	Number of green fruits plant^{-1}	Green fruit weight (g)	Green fruit yield (t ha^{-1})
T_1	7.68	4.20	29.00	4.48	10.00
T_2	7.57	4.05	29.33	4.47	8.78
T_3	7.86	4.57	32.33	5.24	10.64
T_4	7.42	4.04	29.67	4.37	9.24
T_5	7.81	4.06	28.00	4.27	8.16
T_6	7.70	4.45	26.00	4.81	8.40
T_7	7.19	3.47	17.67	3.21	4.48
SEd	**0.098**	**0.042**	**0.943**	**0.041**	**0.068**
CD (0.05)	**0.211**	**0.089**	**2.022**	**0.087**	**0.209**

Table.3 Economics of crop production of green chillies

Treatments	Cost of Cultivation (Rs ha^{-1})	Gross Return (Rs ha^{-1})	Net Return (Rs ha^{-1})	Benefit Cost Ratio
T_1	15510	49390	33880	3.18
T_2	29530	66810	37280	2.26
T_3	25840	83850	58010	3.24
T_4	22075	65450	43375	2.96
T_5	26425	54920	28495	2.08
T_6	25450	50250	24800	1.97
T_7	10525	13375	2850	1.27

These results are in line with the findings of Yadav *et al.* (1998), who reported that the beneficial effects of combined use of organics and inorganics in boosting up crop yields as well as maintaining soil health on long term basis. The lowest fruit yield was recorded in absolute control (T_7) and this might be due to the lack of soil available nutrients to meet the crop requirement. The technology recommendation by the scientist and the adoption by the farmers, economic evaluation play a pivotal role. The economic evaluation done in the present investigation is showed in table 3. The results revealed that, 100 per cent jatropha oil cake + 3 per cent foliar spray of panchagavya (T_2) recorded highest cost of cultivation followed by 100 per cent neem oil cake + 3 per cent foliar spray of panchagavya (T_5). The increased cost of cultivation in the above treatments was due to high cost of

jatropha and neem oil cake. Application of 75 per cent jatropha oil cake + 25 per cent RDF + 3 per cent foliar spray of panchagavya (T_3) recorded highest net return (Rs 58010 ha^{-1}) and benefit cost ratio of 3.24, which is the index for economic sustainability. The lower economic value was recorded in absolute control (1.27). The highest return per rupee invested was due to the highest market price for organic chillies. Hence, T_3 (75 per cent jatropha oil cake + 25 per cent RDF + 3 per cent foliar spray of panchagavya) was suggested as the best management practices for production of green chillies.

CONCLUSION

Combined application of both organic and inorganic manures through 75 per cent jatropha oil cake, 25 per cent RDF and three per cent foliar spray of panchagavya recorded highest value of net return and Benefit Cost Ratio (BCR). Therefore, application of 75 per cent jatropha oil cake, 25 per cent RDF and three per cent foliar spray of panchagavya was found to be the best suited management practice for green chillies, for increased a net return, improved quality products and sustaining the soil health. However, further multiplication field trails need to be conducted, to confirm these findings for field adoption..

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