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Influence of Foliar Application of Panchagavya and Fish Extracts and Application of Organic Substances on Yield and Quality of Ash Gourd under Organic Farming

V. Dhanushkodi [aω*] and R. Nageswari [a#]

[a] Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirappalli, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Recently, farmers are shifting to organic farming and are interested in the adoption of various plant and animal waste as nutrient sources in organic agriculture to supply the nutrients for getting the expected yield. Currently, farmers believe that the application of panchagavya and fish extracts play a major role in enhancing the biological efficiency of crop plants. Hence, a field study was conducted to assess the effect of foliar application of panchagavya, fish extracts and organic substances on yield and quality of ash gourd under organic farming during *Kharif*, 2020 at Murungai village in Tiruchirappalli district of Tamil Nadu. The results of the study indicated that foliar application of Panchgavya @ 3%, and fish extracts @ 0.5% along with soil application of FYM @25 t/ha, Groundnut cake @ 100 kg/ha and Neem cake @ 200kg/ha recorded significantly higher fruit yield (25.55 t/ha) compared to other treatments. Further, nutrient contents of ash gourd were studied under various foliar applications of organics and the fruit pulp was used for analysis. The quality parameters viz., protein content of fruit (0.54 g/100 g), Fat (0.13 g/100 g), carbohydrate (2.44 g/100 g), Fibre (1.14g/100 g), Zinc (0.14mg/100 g), Iron (0.44 mg/100 g) recorded were significantly higher with the application of Panchagavya, fish extract and oil cake application. Therefore, it is found that foliar application of

[ω] Assistant Professor (Soil Science and Agricultural Chemistry);
[#] Associate Professor (Agronomy);
**Corresponding author: E-mail: dhanushselgi@yahoo.com.au;*

Panchgavya @ 3%, and Fish extracts @ 0.5% along with FYM (25 t/ha), Groundnut cake (100 kg/ha) and Neem cake (200 kg/ha) could be used for getting more yield under organic farming system.

Keywords: Organic farming; Panchagavya; fish extracts; FYM; oil cakes; ash gourd.

1. INTRODUCTION

Ashgourd derives its name due to the colour of the fruit skin as Ashy look and wax gourd in some regions as the skin of the Ash gourd is having a waxy shine. It was originated from South Asia including India and it is widely grown throughout South and South East Asia, including Myanmar, Malaysia, China, Japan and almost all countries of South East Asia as a prominent crop. It cannot survive the extreme cold [1]. Ash gourd is one of the important palatable cucurbitaceous vegetables grown extensively throughout the tropical and subtropical countries [2]. It contains nearly 96% water and a great source of vitamin B1, B3 and vitamin C and also possesses carbohydrates and various minerals such as calcium, sodium, zinc, iron, phosphorus. Ash gourd is cultivated largely in Uttar Pradesh, Punjab, Rajasthan, Bihar, Tamil Nadu and Jharkhand. It's fruit is used as a vegetable and also for preparation of 'Petha' by confectioners. Seeds are edible and used in preparation of different types of sweets [3].

The modern agriculture highly depends on addition of more chemicals like fertilizers and pesticides. With the continuous application of chemicals since the last green revolution, the soil and its fertility is showing the sign of fatigue and plant's capability for developing resistance to insect pests and diseases is breaking down and causing overall pollution to soil and water. Hence, the farmers and consumers are looking for environment friendly avenues to overcome this problem in recent days and organic farming seems to be creating awareness among farmers and consumers alike. Organic farming is one alternative farming system to conventional farming practiced and has scope in appropriate regions [4].

Recently, farmers are interested in adoption of Panchagavya and fish extracts as nutrient sources in organic agriculture. Organic farming is based on the system-oriented approach and the use of organic liquid products like Panchagavya resulted in higher growth, yield and quality of crops and hence there had been an increasing interest in the use of liquid formulations [5]. Panchagavya having several macronutrients N, P, K and micronutrients are required for growth and development of plants. It also contains various amino acid, vitamins, growth regulators like auxis, gibberlins and also beneficial microorganisms which can support the growth of plants [6]. Panchagavya is a product of the blend of five cow products *viz*., dung, urine, milk, curd and ghee. Farmers believed that application of panchagavya and found them to enhance the biological efficiency of the crop plants and the quality of fruits and vegetables. Fish remains have also been traditionally used as fertilizer, given their wealth of nutritive elements (principally N and P) and their rapid decomposition. Nearly, 75% of the total weight of the fish was generated as solid waste in the form of gut, head, skin, bones, fins and frames after processing. The fish wastes are rich in nitrogen, potassium, phosphorus and trace minerals can serve as raw material for the production of many nutritive and non-nutritive products [7]. The oil cakes are used as manures and they enrich the soil organic carbon to soil that in turn increase the microbial activity [8]. Hence, the present study was conducted at Murungai village in Thiruchirapalli district of Tamil Nadu with the main objective of finding out suitable combination of organics for foliar spraying to increase the ash gourd production under organic farming system.

2. MATERIALS AND METHODS

The investigation was carried out during *Kharif* season of 2020 to find out the suitable organics spray to increase fruit yield of ash gourd in Karaipottanar sub basin in Tiruchirappalli district of Tamil Nadu during 2019-20, where organic farming under drip irrigation system was adopted. Tiruchirappalli district is located at the Central part of Tamil Nadu. It lies between $10^0$10' and $11^0$20' of the Northern latitudes and $78^0$10' and 79^0 0' of Eastern longitudes in the centre part of Tamil Nadu. The soil type of the experimental farm was sandy loam with low in Organic carbon content (0.31 per cent) with a pH value of 7.2 and EC of 0.4 dS/m, and the fertility level falls under low in available N(150.4 kg/ha) and available P(5.6 kg/ha) and medium in available K(212.7 kg/ha). All the inter-cultural operations were followed as per the recommendations of Tamil Nadu Agricultural University. The experiment was

conducted with seven different treatments viz., T_1-Application of FYM @ 25 t/ha) alone, T_2- T_1 + Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha, T_3- T_1 +Fish extract spray 0.5% , T_4- T_1 +Panchagavya spray 3%, T_5-T_1+Panchagavya spray 3%+ Groundnut cake @ 100 kg/ha and Neem cake @ 200kg/ha, T_6-T_1 +Fish extract spray 0.5 %+ Groundnut cake @ 100 kg/ha and Neem cake @ 200kg/ha and T_7- T_1 + Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha +Panchagavya spray 3%+Fish extracts spray 0.5%. imposed in Randomized Block Design with three replications. The characteristics of the organic materials used in the experiment is presented in the Table 1. The oil cakes were applied during the last ploughing. Seeds of ash gourd hybrid F1 No. 700 was sown in the distance of 2x3 ft spacing. Further, different organics *viz*., panchagavya @ 3%, and fish extracts @ 0.5% were used as foliar spray at 15 days after planting at 15 days interval (Table 1). The crop was maintained at near field capacity for the first month to enhance good crop establishment. The experimental crop was maintained under sub surface drip fertigation system and need based plant protection care and hand weeding twice were followed as a common practice for all the plots. The yield and income of farmer's practices and different treatments were collected for interpretation. The calculation of benefit-cost ratio was done by finding the ratio between the gross return and total cost of production. The data on growth parameters and yield attributes were pooled and analyzed statistically [9].

3. RESULTS AND DISCUSSION

3.1 Effect of Foliar Spraying and Application of Different Organic Substances on Yield and Income of Ash Gourd

The performance of different organics application through foliar spraying in ash gourd is presented in Table 2. The data revealed that application of different organics influenced significantly on the yield parameters, fruit yield and income of ash gourd cultivation. Foliar spraying of two organic sources panchagavya (3%) and fish extracts (0.5%) applied in ash gourd along with the organic manures proved its superiority than other treatments comprising their individual spraying with FYM or in combination with groundnut cake or neem cake alone. This might be due to the combined effect of all the organic substances with their respective nutrient supply. Better performance in growth and yield parameters was observed in panchagavya (3%) and fish extracts (0.5%) along with oil cake (groundnut cake (100 kg/ha) and neem cake (200 kg/ha).

The highest fruit yield of 25.55 t/ha was recorded with application of groundnut cake (100 kg/ha) and neem cake (200 kg/ha), Panchagavya (3%) and Fish extracts (0.5%). Where as the lowest fruit yield (20.75 t/ha) was recorded with the application of FYM @ 25t/ha only and the difference in yield might be due to the fact that availability of nutrients and growth promoting substances present in the oil cake and organic nutrient sources might be reflected in growth and yield of fruit. Similar trend was observed in foliar application of panchagavya in leafy vegetables [10,11], in fish extracts application in *Cucumis sativus* by [7] and oil cake application in persimmon [12] and in vegetables [8].

3.2 Effect of Foliar Spraying and Application of Different Organic Substances on Quality of Ash Gourd

The quality parameters of ash gourd as influenced by foliar application of different organic substances under organic farming and drip irrigation system is presented in Fig. 1. The highest protein content (0.54 g/100 g), Fat (0.13 g/100 g), carbohydrate (2.44 g/100 g), Fibre (1.14 g/100 g), Zinc (0.14mg/100g) and Iron (0.44mg/100g) in fruit pulp was recorded by the application of groundnut cake (100 kg/ha) and neem cake (200 kg/ha), panchagavya (3 %) and fish extracts (0.5%) along with FYM @25 t/ha under organic farming and drip irrigation system. This might be due to the favourable effect of panchagavya, fish extracts and oil cake application by influencing the nutrient availability and increasing microbial activity in the root zone. The panchagavya, fish extracts and oil cakes applied could have acted as alternate source of nutrients for to chemical fertilizers, so that the nutrients that are contained in them were available for the crops and increased the yield and quality of ash gourd under organic farming [7,8,10,12]. Fish waste such as fish backbones and bones-rich heads constitute an important source of phosphorus and calcium and showed a quick and good effect on the growth of plants [13].

Table 1. Nutrient content of various organics used in the experiment

S.No.	Nutrient content of Organic manures	FYM	Panchagavya	Fish waste extracts	Neem cake	Groundnut cake
1.	Total Nitrogen (%)	0.49	0.023	2.9	5.18	0.72
2.	Total Phosphorus (%)	0.19	0.019	0.18	1.10	0.31
3.	Total Potassium (%)	0.53	0.024	1.1	1.28	0.59

Table 2. Effect of foliar spraying and application of different organic substances on yield and income of ash gourd under organic farming

Treatments	Treatment details	No. of Fruits / plant	Individual fruit weight (kg)	Fruit yield (kg/ha)	Net income (Rs./ha)	BC Ratio
T_1	Application of FYM @ 25 t/ha) alone	7.10	2.25	20.75	143000	3.22
T_2	T_1 + Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha	7.18	2.36	23.50	167500	3.48
T_3	T_1 +Fish extract spray 0.5%	7.15	2.29	22.71	159500	3.36
T_4	T_1 +Panchagavya spray 3%	7.20	2.35	23.55	167500	3.48
T_5	T_1 +Panchagavya spray 3%+ Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha	7.24	2.45	24.63	178500	3.64
T_6	T_1 +Fish extract spray 0.5 %+ Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha	7.15	2.41	23.94	171500	3.54
T_7	T_1 + Groundnut cake @ 100 kg/ha and Neem cake @200kg/ha +Panchagavya spray 3%+Fish extracts spray 0.5%	7.35	2.50	25.55	187500	3.78
	SEd	0.15	0.13	0.16	951	0.09
	CD(p=0.05)	0.31	0.28	0.33	1987	0.18

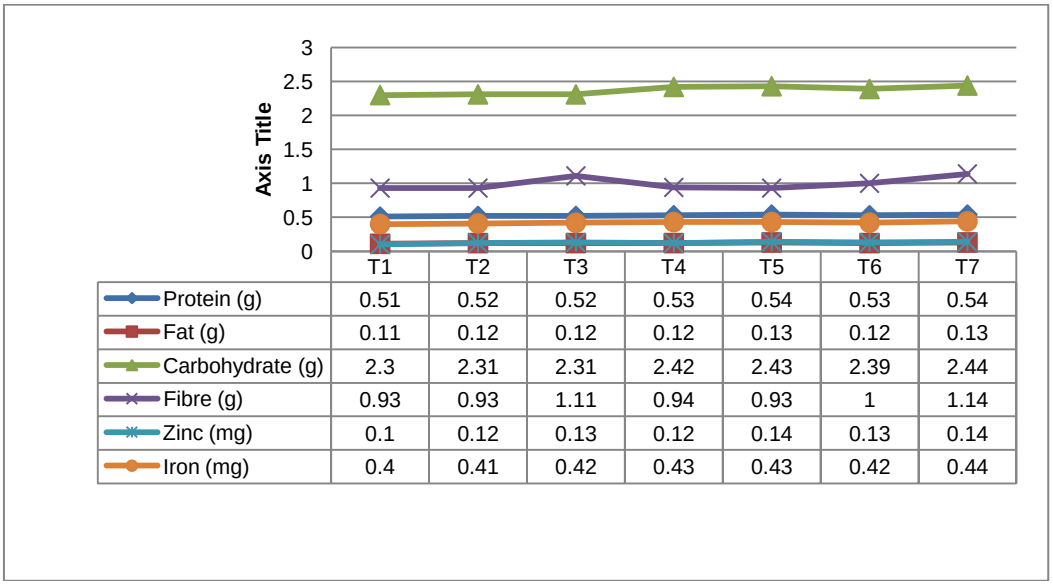

Fig. 1. Effect of foliar spraying and application of different organic substances on Quality parameters of ash gourd under organic farming

4. CONCLUSIONS

The results of this investigation brought out that remarkably higher yield of ash gourd and better quality could be achieved through the application of Panchagavya, fish extract and oil cakes. Favouable cost benefit ratio is self explanatory of economic viability of the different organics which is highly suitable for enhancing the productivity of ash gourd in Tiruchirappalli district in Tamil Nadu. It is concluded that application of groundnut cake @ 100 kg/ha and neem cake @ 200kg/ha, panchagavya spray 3% and fish extracts spray 0.5% along with 25 t/ha of farm yard manure was found to be effective in increasing the yield and income in ashgourd cultivation under organic farming practiced with drip irrigation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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