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Influence of organic and inorganic source of nutrients on physico-chemical attributes of fig (*Ficus carica* L.) cv. Dinkar

Shivam Kumar Gautam¹, Anand Singh², Bijendra Kumar Singh³, Abhishek Pratap⁴, Vijay Kumar Maurya¹ and Pushpendra¹

P.G. Scholar¹, Professor², Assistant Professor³, Ph.D. Scholar⁴

Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda-210 001 (U.P.)

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ABSTRACT

A field experiment was conducted during 2023-24 to evaluate the impact of organic and inorganic nutrients on the physico-chemical attributes of fig cv. Dinkar. The highest fruit size, including length (5.31 cm), width (5.42 cm), fresh fruit weight (44.38 g), dry fruit weight (21.48 g), fruit volume (45.70 cc), and specific gravity (0.970), were observed in plants applied with 75% NPK + 25% Poultry manure. Additionally, the highest values for TSS (18.86° Brix), reducing sugars (17.60%), non-reducing sugars (1.29%), total sugar (18.90%), and TSS/Acid ratio (93.21) were also recorded with 75% NPK + 25% Poultry manure. The lowest acidity (0.24%) was found in plants treated with 75% NPK + 25% Poultry manure, while the highest acidity (0.24%) was noted in those treated with 75% NPK + 25% Vermicompost. The highest ascorbic acid content (13.30 mg/100g pulp) was also observed in the 75% NPK + 25% Poultry manure treatment.

Introduction

The fig (*Ficus carica* L.) belongs to the family Moraceae. It is among the earliest cultivated fruit trees in the world (Solomon *et al.*, 2006). Although the fig tree is native to central Asia, it has spread throughout the Mediterranean region where it is well-adapted to several types of soils and climates due to its tolerance to salinity and drought. Consequently, figs are grown in many parts of the world where the climate is moderate (Crisosto *et al.*, 2011). The common fig is a gynodioecious plant species with two different genders: female trees that produce syconia with female flowers that will develop into edible seeded figs (syconium with multiple one-seed fruits or drupelets) and caprifigs that produce syconia with male and female flowers that present a style

shorter than the fruit of female trees. Pollen is only produced by caprifigs, so the reproductive system is functionally dioecious (Kjellberg *et al.*, 1987). Three edible types of female figs are grown commercially viz., the common fig type that develops fruit parthenocarpically, the Smyrna type that needs pollination from caprifigs (caprification) to develop fruit, and the San Pedro type that produces a first crop (breba) parthenocarpically and a second or main crop (fig) only after caprification. Common-type figs can produce one (unifera types) or two crops (bifera types) (Fleishman *et al.*, 2008). Fig is an important crop worldwide for dry and fresh consumption. A per the Dietary Reference Intakes (DRI) data (Goswami *et al.*, 2015) and the nutrient composition of dried

figs (Hazarika *et al.*, 2019), fig is a superior source of minerals and vitamins, providing iron (30%), calcium (15.8%), potassium (14%) thiamin (vitamin B₁) (7.1%), riboflavin (vitamin B₂) (6.2%) and ascorbic acid (15.65 mg/100 g fruit pulp). Figs are sodium free as well as fat and cholesterol free (Hazarika *et al.*, 2019 and Kjellberg *et al.*, 1987). Fig fruits contain at least 17 types of amino acids, among which aspartic acid and glutamine are the highest ones (Kjellberg *et al.*, 1987). The dried figs also contain relatively high amounts of crude fibers (5.8%, w/w) which is higher than all other common fruits (Hazarika *et al.*, 2019). More than 28% of the fiber is of the soluble type, which has been shown to aid in the control of blood sugar and blood cholesterol and in weight loss. Dried figs also contain one of the highest concentrations of polyphenols among the commonly consumed fruits and beverages (Hazarika *et al.*, 2019 and Kumar *et al.*, 1998). Keeping in view, the importance of fig in human diet, an experiment was conducted on effect of organic and inorganic source of nutrients on physico-chemical attributes of fig cv. Dinkar.

Material and Methods

A field experiment was conducted during 2023-24 at the Fruit Orchard, College of Horticulture, Banda University of Agriculture and Technology, Banda. The experiment was laid out in Randomized Block Design with three replications. The treatments comprised of Control (T₀), 100% NPK (T₁), RDF, 75%NPK + 25% Poultry manures (T₂), 75%NPK + 25% Vermicompost (T₃), 75%NPK + 25% Mushroom Waste (T₄), 50%NPK + 50% Poultry manures (T₅), 50%NPK + 50%Vermicompost (T₆), 50%NPK + 50% Mushroom Waste (T₇), 25%NPK + 75% Poultry manures (T₈), 25%NPK + 75% Vermicompost (T₉) and 25%NPK + 75% Mushroom Waste (T₁₀). Five fruits were randomly harvested from each

treatment having uniform shape and size. Six morphological or physical characters and seven chemical attributes of fig fruits were studied during the study.

Results and Discussion

The physical characters of fig viz., fruit length, fruit width, fruit weight and fruit volume were found to be significantly influenced with organic and inorganic sources of nutrients (Table 1). The fruit length ranged from 4.37 to 5.31 cm. Maximum fruit length (5.31cm) was observed in the plants treated with 75%NPK + 25% Vermicompost, followed by (5.27 cm) treatment 75%NPK + 25% Mushroom waste. The maximum fruit width (5.42 cm) was observed in the plants treated with 75%NPK + 25% Vermicompost, followed by (5.37 cm) treatment 75%NPK + 25% Mushroom waste. The minimum fruit width (4.81 cm) was recorded in control. It is evident from the result the treatment 75%NPK + 25% Vermicompost had significant effect on fresh fruit weight (44.38 g), which was statistically at par with 75%NPK + 25% Mushroom waste (43.32 g) and 75%NPK + 25% Poultry manure (42.38 g). The dry weight of fruit was found highest (21.48 g) in treatment 75%NPK + 25% Vermicompost which was statistically at par with treatment 75%NPK + 25% Mushroom waste, (20.32 g) and treatment 75%NPK + 25% Poultry manure (19.99 g). While the lowest dry weight of fruit (14.21 g) was recorded in control. The result indicated that the treatment 75%NPK + 25% Vermicompost had the maximum fruit volume 45.70 cc which was significantly superior over all other treatment, followed by treatment 75%NPK + 25% Mushroom waste (44.58 cc) and treatment 75%NPK + 25% Poultry manure (43.90 cc) respectively. The minimum fruit volume (30.09 cc) was found with treatment T₀. A similar report has also been provided by Ratna *et al.* (2011 & 2019) in guava, Sharma *et al.* (2013) in guava, and Singh *et al.* (2017) in strawberry.

Table 1. Influence of organic and inorganic source of nutrients on physical fruit traits of fig

	Treatments	Fruit length (cm)	Fruit width (cm)	Fresh fruit weight (g)	Dry fruit weight (g)	Fruit volume (cc)	Fruit specific gravity
T ₀	Control	4.37	4.81	29.72	14.21	31.09	0.950
T ₁	100% NPK (RDF)	5.10	5.08	36.94	17.56	38.33	0.961
T ₂	75%NPK + 25% Poultry manures	5.19	5.31	42.64	19.99	43.90	0.963
T ₃	75%NPK + 25% Vermicompost	5.31	5.42	44.38	21.48	45.70	0.970
T ₄	75%NPK + 25% Mushroom waste	5.27	5.37	43.32	20.32	44.58	0.967
T ₅	50%NPK + 50% Poultry manures	5.12	5.28	38.89	17.79	40.29	0.963

T ₆	50%NPK + 50% Vermicompost	5.15	5.14	39.12	18.46	40.52	0.963
T ₇	50%NPK + 50% Mushroom waste	4.84	5.21	34.93	16.36	36.30	0.960
T ₈	25%NPK + 75% Poultry manures	4.61	4.99	33.57	15.21	34.66	0.957
T ₉	25%NPK + 75% Vermicompost	4.63	4.91	33.57	15.62	34.84	0.960
T ₁₀	25%NPK + 75% Mushroom waste	4.47	4.85	33.17	14.66	34.38	0.957
	SEm±	0.04	0.01	1.07	0.69	1.057	0.003
	CD at 5%	0.12	0.03	3.20	2.05	3.141	NS

The fruit quality parameters of fig were found to be significantly affected by the application of inorganic nutrients and organic manures (Table 2). The maximum TSS (18.86° Brix) was recorded with the treatment T₃ followed by T₂ which had TSS of 18.63° Brix. The study affirms with the studies conducted by Gawande *et al.* (1998), Majunnatha *et al.* (2006) and Pereira and Mitra (1999) in guava. The response to treatment T₃ gave the highest titratable acidity (0.24%) and was statistically at par with T₄ and T₂, i.e., 0.23, 0.23% respectively. However, the lowest titratable acidity (0.18%) was recorded in T₀. The similar results were observed by Kurubar *et al.* (2017) and Sharma *et al.* (2013) in fig and Ennab (2016) in Eureka Lemon Trees (*Citrus limon* L.).

Among all the treatment, significantly maximum TSS/acid ratio was observed in treatment T₉ (93.21) followed by treatment T₀ (91.37). While, minimum TSS/acid ratio was recorded in treatment T₃ (78.59). This study is supported by the findings Singh and Banik (2011), Hazarika *et al.* (2019)

in mandarin and Kurubar *et al.* (2017) in fig. The maximum percentage of total sugar in fig fruit pulp was found with treatment T₃ (18.90%) followed by T₄ (18.78%).

The maximum percentage of reducing sugar (17.60%) was found with 75%NPK + 25% Vermicompost (T₃). While, it was minimum T₀ (15.20%). Application of 75%NPK + 25% Vermicompost (T₃) resulted in minimum percentage of non-reducing sugar (1.29%) whereas, it was maximum in T₁ (2.41%) followed by T₀ (2.12%). The similar results were also reported by Kurubar *et al.* (2017) in fig cv. Poona Fig. Kumar *et al.* (1998), Shukla *et al.* (2014) and Sharma *et al.* (2013) in guava also confirmed the present findings. The treatment 75%NPK + 25% Vermicompost (T₃) resulted in significantly higher ascorbic acid content (13.30 mg/100g pulp) over all other treatments. These results are in conformity to the findings reported by Yadav *et al.* (2011), Shukla *et al.* (2014) and Goswami *et al.* (2015).

Table 2. Influence of organic and inorganic source of nutrients on fruit quality parameters of fig

Treatments	TSS (°Brix)	Titratable acidity (%)	TSS/ Acid ratio	Total sugars (%)	Reducing sugar (%)	Non-reducing sugar (%)	Ascorbic acid (mg/100g fruit pulp)
T ₀ Control	16.45	0.18	91.37	17.32	15.20	2.12	5.26
T ₁ 100% NPK (RDF)	18.17	0.22	81.41	18.38	15.98	2.41	9.17
T ₂ 75%NPK + 25% Poultry manures	18.63	0.23	81.00	18.70	17.18	1.52	12.60
T ₃ 75%NPK + 25% Vermicompost	18.86	0.24	78.59	18.90	17.60	1.29	13.30
T ₄ 75%NPK + 25% Mushroom waste	18.48	0.23	79.24	18.78	17.33	1.45	11.79
T ₅ 50%NPK + 50% Poultry manures	18.29	0.21	85.77	18.59	16.94	1.64	10.11
T ₆ 50%NPK + 50% Vermicompost	18.41	0.22	84.99	18.69	17.15	1.54	10.96

T ₇	50%NPK + Mushroom waste	50%	18.16	0.21	85.15	18.31	16.51	1.80	8.39
T ₈	25%NPK + 75% Poultry manures		17.60	0.20	86.76	17.51	15.66	1.85	6.59
T ₉	25%NPK + Vermicompost	75%	17.71	0.19	93.21	17.70	15.71	1.99	7.52
T ₁₀	25%NPK + Mushroom waste	75%	16.96	0.19	87.66	17.36	15.34	2.02	5.26
	SEm±		0.089	0.004	1.692	0.046	0.063	0.051	0.23
	CD at 5%		0.265	0.012	5.026	0.136	0.188	0.151	0.69

Conclusion

From the results, it is concluded that the application of inorganic nutrients combined with organic manures. 75%NPK + 25% Vermicompost (T₃) resulted in the highest fruit length, width, weight, volume, and dry weight, along with superior fruit quality attributes, including TSS, titratable acidity, total sugars, and ascorbic acid content. Among all treatments, 75%NPK + 25% Vermicompost (T₃) showed the most consistent and positive effects on the physical and biochemical properties of fig, demonstrating its potential for enhancing fruit quality in fig cultivation.

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Conflict of Interest

The authors have no conflict of interest.

Data Sharing

All relevant data are within the manuscript.

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