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

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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

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figs (Hazarika *et al*., 2019), fig is a superior source of minerals and vitamins, providing iron (30%), calcium (15.8%), potassium (14%) thiamin (vitamin B_1) (7.1%), riboflavin (vitamin B_2) (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 (T_0), 100% NPK (T_1), RDF, 75%NPK + 25% Poultry manures (T_2), 75%NPK + 25% Vermicompost (T_3), 75%NPK + 25% Mushroom Waste (T_4), 50%NPK + 50% Poultry manures (T_5), 50%NPK + 50%Vermicompost (T_6), 50%NPK + 50% Mushroom Waste (T_7), 25%NPK + 75% Poultry manures (T_8), 25%NPK + 75% Vermicompost (T_9) and 25%NPK + 75% Mushroom Waste (T_{10}). 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 T_0. 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 T_3 followed by T_2 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 T_3 gave the highest titratable acidity (0.24%) and was statistically at par with T_4 and T_2, *i.e.*, 0.23, 0.23% respectively. However, the lowest titrable acidity (0.18%) was recorded in T_0. 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 T_9 (93.21) followed by treatment T_0 (91.37). While, minimum TSS/acid ratio was recorded in treatment T_3 (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 T_3 (18.90%) followed by T_4 (18.78%).

The maximum percentage of reducing sugar (17.60%) was found with 75%NPK + 25% Vermicompost (T_3) While, it was minimum T_0 (15.20%). Application of 75%NPK + 25% Vermicompost (T_3) resulted in minimum percentage of non-reducing sugar (1.29%) whereas, it was maximum in T_1 (2.41%) followed by T_0 (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 (T_3) 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 + 50% Mushroom waste	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 + 75% Vermicompost	17.71	0.19	93.21	17.70	15.71	1.99	7.52
T_{10}	25%NPK + 75% Mushroom waste	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 (T_3) 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 (T_3) 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.

References

Crisosto, C.H., Ferguson, L., Bremer, V., Stover, E., Colelli, G. 2011. Fig (*Ficus carica* L.). In: Yahia, E.E. (Ed.), Postharvest Biology and Technology of Tropical and Subtropical Fruits. Fruits, 3. Cocona to Mango. Woodhead Publishing Ltd., Cambridge, UK, pp. 134–158.

Ennab, H. 2016. Effect of Organic Manures, Biofertilizers and NPK on vegetative growth, yield, fruit quality and soil fertility of Eureka Lemon Trees (*Citrus limon* (L.) Burm). *Journal of Soil Sciences and Agricultural Engineering*, 7(10): 767-774.

Flaishman, M.A., Rodov, V. and Stover, E. 2008. The Fig: Botany, horticulture and breeding. *Hortic. Rev*., 34: 113–197.

Gawande, S.S., Jiotode, D.J., Turkhede, A.B. and Darange, S.O. 1998. Effect of organic and inorganic fertilizers on yield and quality of sapota. *Journal of Soil and Crops*, 8(1): 58-60.

Goswami, A.K., Lal, S., Thakare, M. and Kumar, R. 2015. Studies on integrated nutrient management on yield and quality of guava cv. Pant Prabhat. *Indian Journal of Horticulture*, 72(1):139-142.

Hazarika, T.K. and Aheibam, B. 2019. Soil nutrient status, yield and quality of lemon (*Citrus limon* Burm.) cv. 'Assam lemon's influenced by bio-fertilizers, organic and inorganic fertilizers. *Journal of Plant Nutrition*, 42(8): 853-863.

Kjellberg, F., Gouyon, P.H., Ibrahim, M., Raymond, M. and Valdeyron, V. 1987. The stability of the symbiosis between dioecious figs and their pollinators: a study of *Ficus carica* L. and *Blastophaga psenes* L. *Evolution*, 41: 704–963.

Kumar, S.P., Singh, C., Verma, A.K. and Jain, B.P. 1998. Effect of potassium, nitrogen, zinc and gibberellic acid on yield attributes of guava (*Psidium guajava* L.). *Journal of Research, Birsa Agriculture University*, 10(1): 52-55.

Kurubar, A.R., Allolli, T.B., Naik, M.K. and Angadi, S.G. 2015. Effect of organic and inorganic fertilizers on fruit characters, quality and economics of fig production (*Ficus carica* L.). In: *V International Symposium on Fig.* 1173: pp. 213-216.

Manjunatha Hebbara, M.H., Ganiger, V.M., Reddy, B.G.M. and Joshi, V.R. 2006. Integrated nutrient management in sapota (*Manilkara zapota*) using vermicompost to increase yield and quality. *Indian Journal of Agricultural Sciences*, 76(1): 587-590.

Mishra, S. and Bahadur, V. 2019. Effect of chemical fertilizers, bio-fertilizers and organic manure on growth, yield and quality of guava under Prayagraj agro-climatic condition. *Journal of Pharmacognosy and Phytochemistry*, 8(4): 3154-3158.

Pereira, L.S. and Mitra, S.B.L., 1999. Studies on organic along with inorganic nutrition in guava. *Indian Agric*., 43 (3-4): 155-160.

Sharma A., Wali V K., Bakshi P. and Jasrotia, A. 2013. Effect of Organic and Inorganic Fertilizers on Quality and Shelf Life of Guava (*Psidium guajava* L.) Cv. Sardar. *The Bioscan*, 8(4): 1247-1250.

Sharma, A., Wali, V.K., Bakshi, P. and Jasrotia, A. 2013. Effect of integrated nutrient management strategies on nutrient status, yield and quality of guava. *Indian Journal of Horticulture*, 70(3): 333-339.

Shukla, S.K., Adak, T., Singha, A., Kumar, K., Singh, V.K. and Singh, A. 2014. Response of guava trees (*Psidium guajava*) to soil applications of mineral and organic fertilisers and biofertilisers under conditions of low fertile soil. *Journal of Horticultural Research*, 22(2): 105-114.

Singh, L. and Sadawarti, R.K. 2021. Effect of INM (Integrated nutrient management) on plant growth, yield and quality of strawberry (*Fragaria ananassa* Duch.). *The Pharma Innovation Journal*, 10: 244-47.

Singh, S. R. and Banik, B. C. 2011. Response of integrated nutrient management on flowering, fruit setting, yield and fruit quality in sweet orange (*Citrus sinensis*). *Asian Journal of Horticulture,* 6(1): 151- 154.

Solomon, A., Golubowicz, S., Yablowic, Z., Grossman, S., Bergman, M., Gottlieb, H.G., Altman, A., Kerem, Z. and Flaishman, M.A. 2006. Antioxidant activities and anthocyanin content of fresh fruits of common fig (*Ficus carica* L.), *J. Agric. Food Chem.*, 54: 7717−7723.

Vinson, J.A. 1999. The functional food properties of figs. *Cereal Foods World*, 44(2): 82-87.

Vinson, J.A., Zubik, L., Bose, P., Samman, N. and Proch, J. 2005. Dried fruits: excellent in vitro and in vivo antioxidants. *Journal of the American College of Nutrition*, 24(1): 44-50.

Vitamin and mineral recommendations; http://www.nal.usda.gov/fnic/etext/000105.html#q2

Weibin, J., Kai, M., Zhifeng, L., Yelin, W. and Lianju, W. 2001. The production and research of fig (*Ficus carica* L.) in China. In *II International Symposium on Fig*. 605: pp. 191-196.