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Effect of Integrated Nutrient Management on Meadow Orcharding of Guava for Better Growth, Yield

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present experiment was conducted at Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. Prayagraj during the session 2023 - 2024. The experiment was laid out in randomized block design with three replications, and the study consists of ten treatment combinations including control by using different Effect of integrated nutrient management on growth yield and quality of guava under meadow orcharding. The best treatment was T9 (50% RDF + 10 Kg FYM + Azotobacter + VAM) &T8 (50% RDF + 10 Kg FYM + VAM) which shows highest values in all the parameters viz., fruit weight (145.98 g), fruit diameter (8.00 cm), number fruit/tree (41.81), fruit yield/tree (6.02 kg), yield (t/ha) (30.09). All the treatments were significantly superior in their fruit yield and fruit growth of guava over control (T0) and (T9).

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1. INTRODUCTION

One of the most widely grown fruit crops in tropical and subtropical regions is the guava (*Psidium guajava* L.), sometimes referred to as the "apple of the tropics" or the "poor man's apple." It is indigenous to Tropical America, which stretches from Mexico to Peru, and is a member of the Myrtaceae family with chromosome number 2n = 22. Radha and Mathew, [1]. Early in the 17th century, the Portuguese brought the plant to the Indian subcontinent (Singh, 1995). However, at the moment, the main nations that produce guavas are Bangladesh, China, Thailand, India, Mexico, Indonesia, and Pakistan [2-4]. However, it appears to be an Indian fruit since it is readily available, affordable for the average person, and a good source of nutrients [5].

After mango, banana, citrus, and apple, guava is India's fifth most significant fruit in terms of acreage and output. Approximately 0.27 million hectares are planted with guava in India, yielding 4.10 million tonnes and a productivity of 13.7 million tonnes per hectare. The state of Uttar Pradesh in India has the greatest area and highest output of guava fruit, whereas Andhra Pradesh has the highest productivity. “In homestead gardens across India, it grows without much attention, but it's also grown commercially in Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal, Punjab, Gujarat, Maharashtra, Karnataka, and Andhra Pradesh” [6].

“In India, guava is the perfect fruit crop for ensuring nutritional security. With 2 to 5 times more fibre (6.9%) than fruit next to fig crop, it is the third-richest source of Vitamin C (299 mg/100g) after Barbados cherry (1000–4000 mg/100g pulp) and Aonla (600 mg/100 g of pulp)” [7]. In addition to being high in vitamin C, it also contains significant amounts of vitamin A, calcium, thiamine (B1), riboflavin (B2), and iron. The fruit has a pleasant scent, and both the peel and the fruit are edible. It is often consumed raw, green, and ripe (when it starts to smell good). Three to thirteen percent of the seed is oil, which is rich in important fatty acids and may be dressed salads. A variety of goods, including jam, jelly, syrup, drinks, sauces, ice cream, butter, marmalade, chutney, and other items, are made from guava. The leaves are used for tanning, drying, and curing diarrhoea in some regions.

Integrated nutrient supply/management, or INM, optimises the benefits from all available plant nutrient sources in an integrated way with the goal of maintaining or adjusting soil fertility and plant nutrient supply to an optimal level for maintaining the targeted crop productivity [8]. Because there are nutrients in the soil for crops in the next season, it increases production levels in a long-term sustainable way. Additionally, by slowly releasing fertilisers, it reduces the current discrepancy between nutrient supply and removal caused by the constant use of chemical fertilisers [9]. Using organic fertilisers is a standard procedure that helps to reduce the use of chemical treatments and their detrimental effects on the ecosystem as a whole. The most important organic matter added to the soil is high-quality farm yard manure, chicken manure, vermicompost, biofertilizers and green manures.

2. MATERIALS AND METHODS

This experiment was laid out during the August 2023 to March 2024 at Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The horticulture research farm is situated at 25^0 39” 42” N latitude, 81^0 67” 56” E longitude and at an altitude of 98 m above mean sea level. Six to seven years old uniform trees of guava (*Psidium guajava* L.) cv. Allahabad Safeda under meadow orcharding were selected for this study at Guava Orchard. The treatment consisted of T_0 - 100% RDF (NPK-180,90,90g), T_1 - 75% RDF + 2.5 kg vermicompost, T_2 - 50% RDF + 2.5 kg vermicompost, T_3 - 75% RDF + 10 kg FYM, T_4 - 50% RDF + 10 kg FYM, T_5 (75% RDF + 10 kg FYM) + Micronutrient, T_6 - 50% RDF + 10 kg FYM) + Micronutrient, T_7 - 50% RDF + 10 kg FYM + *Azotobacter*, T_8 -50% RDF + 10 Kg FYM + VAM, T_9 -50% RDF + 10 Kg FYM + *Azotobacter* + VAM. The experiment was laid out in a Randomized Block Design with 10 treatments and replicated thrice. Data recorded on different aspects of fruit crop, *viz.,* growth, yield were subjected to statistically analysis by analysis of variance method. (Gomez and Gomez, 1976) and economic data analysis mathematical method.

3. RESULTS AND DISCUSSION

3.1 Fruit Physical Parameters

3.1.1 Fruit weight (g)

In data on fruit weight of guava as influenced by integrated nutrient management are summarized in Table 1.

The data reveals that the fruit weight of guava increased significantly by the application of integrated nutrient management under experimentation over the control. The maximum fruit weight (145.98 g) was recorded with treatments 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM respectively, while the minimum fruit weight (118.63 g) was recorded under treatment 0 (control), respectively. Further, the interaction effect of integrated nutrient management significantly influenced the fruit weight in guava.

It may be due to increased the rhizosphere microbial activity and larger quantity of nutrients of the soil. Ramana et al. (2014) found that "application of different fertilizers, organic manures and biofertilizer improve the vegetative growth, number of fruits and yield of guava cv. Sardar". The similar effect were found by Rao et al. [10] and Ray et al. [11].

3.1.2 Fruit diameter (cm)

In data on fruit girth of guava as influenced by integrated nutrient management are summarized in Table 1.

The data reveals that the fruit diameter of guava increased significantly by the application of integrated nutrient management under experimentation over the control. The maximum fruit diameter (6.60 cm) was recorded with treatments 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM respectively, while the minimum fruit diameter (5.30) was recorded under treatment 0 (control), respectively. Further, the interaction effect of integrated nutrient management significantly influenced the fruit diameter in guava.

It may be due to increased the rhizosphere microbial activity and larger quantity of nutrients of the soil. Kumrawat et al., [12] found that application of different fertilizers, organic manures and biofertilizer improve the vegetative growth, number of fruits and yield of guava cv. Sardar. The similar effect were found by Jamwal et al. [13] and Prabhu et al. [14].

3.1.3 Fruit shape

The data on fruit shape of guava as influenced by integrated nutrient management are summarized in Table 1

The best fruit shape was best recorded with treatment 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM).

3.1.4 Fruit colour

The data on fruit colour of guava as influenced by integrated nutrient management are summarized in Table 1.

The best fruit colour was best recorded with treatment 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM).

3.2 Yield Parameter

3.2.1 Number of fruits/plant

In data on number of fruits/plant of guava as influenced by integrated nutrient management are summarized in Table 2.

The data reveals that the number of fruits/plant of guava increased significantly by the application of integrated nutrient management under experimentation over the control. The maximum number of fruits/plant (41.81) was recorded with treatments 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM respectively, while the minimum number of fruits/plant (20.92) was recorded under treatment 0 (control), respectively. Further, the interaction effect of integrated nutrient management significantly influenced the number of fruits/plant in guava.

Tiwari et al., [15] reported that "the application of different fertilizers, organic manures and biofertilizers improve the vegetative growth, number of fruits and yield of guava cv. Sardar". Similar findings have been reported by Porismita et al., [16].

3.2.2 Yield/plant (kg)

In data on yield/plant of guava as influenced by integrated nutrient management are summarized in Table 2.

The data reveals that the yield/plant of guava increased significantly by the application of integrated nutrient management under experimentation over the control. The maximum yield/plant (41.81) was recorded with treatments 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM respectively, while the minimum yield/plant (20.92) was recorded under treatment 0

Table 1. Effect of different levels integrated nutrient management on fruit growth of guava

Treatment Symbol	Treatment Combinations	Fruit Weight (g)	Fruit Diameter (cm)	Fruit shape	Fruit colour
T_0	100% RDF (NPK-180,90,90g)	118.63	5.91	Oval	Dark green
T_1	75% RDF + 2.5 kg vermicompost	125.40	6.50	Oval	Dark green
T_2	50% RDF + 2.5 kg vermicompost	120.10	6.21	Oval	Dark green
T_3	75% RDF + 10 kg FYM	138.61	7.60	Round	Green
T_4	50% RDF + 10 kg FYM	135.30	7.55	Round	Green
T_5	(75% RDF + 10 kg FYM) + Micronutrient	129.81	6.88	Round	Green
T_6	(50% RDF + 10 kg FYM) + Micronutrient	131.90	6.95	Oval	Dark green
T_7	50% RDF + 10 kg FYM + *Azotobacter*	140.52	7.81	Round	Yellowish
T_8	50% RDF + 10 Kg FYM + VAM	142.85	7.90	Round	Yellowish
T_9	50% RDF + 10 Kg FYM + *Azotobacter* + VAM	145.98	8.00	Round	Yellowish
	F-test	**S**	**S**	**-**	**-**
	SEm(±)	3.94	0.24	-	-
	CD (p=0.05)	11.70	0.73	-	-

Table 2. Effect of different levels integrated nutrient management on fruit yield of guava

Treatment Symbol	Treatment Combinations	Number of Fruits/Plant	Yield/Plant (kg)	Yield (t/ha)
T_0	100% RDF (NPK-180,90,90g)	20.92	2.49	12.47
T_1	75% RDF + 2.5 kg vermicompost	25.71	3.27	16.37
T_2	50% RDF + 2.5 kg vermicompost	22.60	2.71	13.56
T_3	75% RDF + 10 kg FYM	35.31	4.89	24.47
T_4	50% RDF + 10 kg FYM	32.51	4.35	21.73
T_5	(75% RDF + 10 kg FYM) + Micronutrient	28.60	3.72	18.60
T_6	(50% RDF + 10 kg FYM) + Micronutrient	30.48	4.06	20.31
T_7	50% RDF + 10 kg FYM + *Azotobacter*	38.98	5.28	26.38
T_8	50% RDF + 10 Kg FYM + VAM	39.05	5.55	27.76
T_9	50% RDF + 10 Kg FYM + *Azotobacter* + VAM	41.81	6.02	30.09
	F-test	S	S	S
	SEm(±)	0.92	0.13	0.66
	CD (p=0.05)	2.72	0.39	1.95

(control), respectively. Further, the interaction effect of integrated nutrient management significantly influenced the yield/plant in guava.

Sandhyarani et al*.,* [17] found that “application of different fertilizers, organic manures and biofertilizer improve the vegetative growth, number of fruits and yield of guava cv. Sardar”. The similar effect were found by Gupta et al*.,* [18].

3.2.3 Yield (t/ha)

In data on yield (t/ha) of guava as influenced by integrated nutrient management are summarized in Table 2 [19-22].

The data reveals that the yield (t/ha) of guava increased significantly by the application of integrated nutrient management under experimentation over the control. The maximum yield (t/ha) (41.81) was recorded with treatments 9 (50% RDF + 10 Kg FYM + *Azotobacter* + VAM respectively, while the minimum yield (t/ha) (20.92) was recorded under treatment 0 (control), respectively. Further, the interaction effect of integrated nutrient management significantly influenced the yield (t/ha) in guava. [23,2].

Shubham et al*.,* [3] found that “application of different fertilizers, organic manures and biofertilizer improve the vegetative growth, number of fruits and yield of guava cv. Sardar”. The similar effect were found by Jaiprakash et al*.,* [4] and Tyagi et al*.,* [24].

4. CONCLUSION

In the present investigation concluded that among the different treatment combinations the treatment T9 [50% RDF + 10 Kg FYM + *Azotobacter* + VAM) was superior in respect to fruit growth and yield parameters.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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