

Original Research Article

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Impact of NPK Application on Growth and Yield of Guava cv. Hisar Safeda

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ABSTRACT

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A field experiment was conducted to evaluate the impact of NPK application of different RDF levels on growth and yield of guava cv. Hisar Safeda. The treatment combinations consist of five levels of RDF *i.e.* RDF (60%), RDF (80%), RDF (100%), RDF (120%) and RDF (140%) during 2015-16 and 2016-17. Among the different treatments RDF (120%) was optimum for plant height, plant girth and canopy spread (E-W) and (N-S). Similarly, in terms of fruit set (58.46%), fruit retention (68.51%), number of fruits, fruit weight (104.47 g) and fruit yield (55.79 kg/tree) was best with RDF 120%.

Introduction

Guava (*Psidium guajava* L.) belongs to the family Myrtaceae and indigenous to Tropical America. It is commonly known as 'Apple of Tropics' owing to its high nutritive value. Guava is an ideal fruit for nutritional security. The fruit is in great demand in domestic as well as in international markets and traded in more than 60 countries. The major guava producing countries are Brazil, India, Mexico and South Africa. Guava is being exported mainly to Nepal, Sri Lanka and Saudi Arabia.

Guava was introduced in India during 17th century. It is being cultivated on commercial scale in Uttar Pradesh, Madhya Pradesh,

Bihar, Maharashtra, Punjab and Haryana. In India, guava occupies an area of 2.55 lakh hectares with annual production of 40.48 lakh tonnes and productivity 15.9 MT/ha (Anonymous, 2017). In Haryana, the area under guava crop is 11.21 thousand hectares with total production of 1.52 lakh tonnes (Anonymous, 2017). Guava is very popular among poor people due to moderate price, good taste and easy availability. It is highly nutritious in nature having high vitamin C content (75-260 mg/100 g) and good source of thiamine (0.03-0.07 mg/100 g), riboflavin (0.02-0.04 mg/100 g), phosphorus (22.5-40 mg/100 g), calcium (10-30 mg/100 g), iron (20-25 mg/100 g) and pectin (0.5-1.8%) (Shukla *et al.*, 2009). It contains good amount of antioxidant that helps in controlling systolic

blood pressure. Nitrogen, phosphorus and potassium are the major and essential nutrients for plant growth and development. Nitrogen is an essential component of amino acid, proteins, nucleic acids, porphyrins, purines and pyrimidine nucleotides, flavin nucleotides, enzyme, co-enzyme and alkaloids. Being a constituent of nucleic acids *viz.* Ribo Nucleic Acids (RNA) and Deoxyribo Nucleic Acids (DNA), it is responsible for the transfer of genetic code to the off-springs. Phosphorus is involved in energy transfer, photosynthesis, transformation of sugars and starch, nutrient movement within the plant and transfer of genetic characteristics from one generation to the next (Rattan and Goswami, 2009). Potassium plays a major role in transport of water and nutrient throughout the plant in xylem. It increase root growth and improves drought tolerance. Potassium is also responsible for activation and synthesis of protein-forming nitrate reductase enzyme (Rattan and Goswami, 2009). Nitrogen, phosphorus and potassium are most indispensable of all mineral nutrients for growth and development of the plant as these are the basis of fundamental constituents of all living matter (Throughton *et al.*, 1974). Therefore, the objective of this work was to investigate the effects of soil application of N, P and K on vegetative growth and yield of guava cv. Hisar Safeda.

Materials and Methods

The present investigation was conducted at Experimental Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar. The selected orchard is located at 29°10'N latitude and 75°46'E longitude at an elevation of 215.2 m above mean sea level. The fifteen year-old guava planted at a spacing of 6 m x 6 m were selected and divided it into 5 treatment plots with each having four plants. Treatments were allocated in randomized block design (RBD) with four replications in each treatment. The

soil of the experimental orchard was slightly alkaline in pH, medium in organic carbon, available potash content and low in available phosphorus and nitrogen as per the soil test rating chart given by Antil *et al.*, (2002). The total rainfall received during the year 2015-16 and 2016-17 were approx 529.6 mm and 505.9 mm, respectively. The treatments consist of RDF levels (60%, 80%, 100%, 120% and 140%). The RDF 100% (690:200:240 g NPK/tree) was taken as recommended dose of CCS Haryana Agricultural University, Hisar. In additional 75 kg FYM per plants were also applied in month of February. The different macronutrients were applied under the canopy 30 cm radius from the trunk. Growth parameters were observed during start of the experiment and after harvest. The plant height was recorded from the base of trunk to the tip of the terminal extension growth with the help of pre-marked bamboo pole. The stem girth was measured with the help of measuring tape at a point marked above 15 cm from the ground level, whereas, the canopy spread was recorded by measuring the most of branches of tree grown in east-west and north-south directions using a pre-marked bamboo pole and expressed in per cent increase. The annual increment in plant height and girth were recorded and expressed as per cent increase. The number of flowers per branch was counted on all tagged branches in four sides of plants. The fruit set was calculated at pea size fruit. The average weight of ten randomly selected fruits from each treatment was recorded. The yield was calculated by multiplying the number of fruits with average fruit weight. The fruit and yield data were recorded during harvesting season. Statistical analysis of mean data collected on various parameters during the study was performed using randomized block design as per the methods suggested by Panse and Sukhatme (1967) using OPSTAT statistical software package (Sheoran *et al.*, 1998).

Results and Discussion

The data on effect of different RDF levels on growth parameters is presented in Table 1. The plant height, girth and canopy spread increased significantly with increase in NPK levels during both the years *i.e.* 2015-16 and 2016-17. The pooled data of two years reflects that maximum that the maximum increase in plant height (6.37%) was recorded in the plants receiving 140 per cent of RDF, which was significantly higher than all the treatments except RDF 120%. However, the minimum increase in plant height (4.43%) was observed in RDF 60%. The maximum increase in stem girth (3.26%) was recorded with the application of RDF 140%, closely followed by RDF 120% whereas, minimum stem girth (2.44%) was observed with RDF 60%. The maximum East-West (8.20%) and North-South canopy spread (8.04%), was recorded with the application of RDF 140%, in which, the canopy spread was significantly higher than all the treatments except RDF 120%. However, the minimum canopy spread was observed with the application of RDF 60%. This increment in vegetative growth may be due to more absorption of nitrogen, phosphorus and potassium by plant, which combined with carbohydrates in the leaves leading to formation of amino acids, proteins, chlorophyll and other amides. These effects increase the photosynthetic activity of the plants and greater synthesis of carbohydrates,

which is responsible for building up of new tissue and are associated with a number of metabolic processes, which in turn favours better development of plants, hence enhanced the stem growth. Similar growth response due to application of NPK levels were obtained by Bhubia *et al.*, (2005), Baksh *et al.*, (2008), Kumar *et al.*, (2010), Sahu *et al.*, (2015) in guava.

The perusal of data presented in Table 2 states that significantly maximum number of flowers per branch (23.63), fruit set (58.97%), fruit retention (69.25%) and number of fruits per tree (540.6) were recorded with the application of RDF 140%, which was at par with RDF 120%. The increase in number of flower per branch by higher NPK was due to more uptakes of nitrogen, phosphorus and potassium by plant from the soil, which ultimately increase growth. This may be due to improved extension of terminal and lateral shoots of guava that resulted in more number of flowers. The result of present investigation are well supported by Kumar *et al.*, (2009) and Jat and Kacha (2014) in guava. The more number of fruits might be due to role of nitrogen, phosphorus and potassium in various metabolic processes, which improved fruit bud differentiation, flower intensity, higher ratio of perfect male flowers, more fruit set and fruit retention.

Table.1 Effect of different NPK levels on per cent increase in plant growth parameters of guava cv. Hisar Safeda

Treatments	Plant height	Plant girth	Canopy spread	
			E-W	N-S
RDF 60% (414:120:144 g NPK/tree)	4.43	4.39	5.82	5.75
RDF 80% (552:160:192 g NPK/tree)	5.21	5.19	6.70	6.56
RDF 100% (690:200:240 g NPK/tree)	5.93	5.97	7.55	7.49
RDF 120% (828:240:288 g NPK/tree)	6.24	6.31	8.03	7.87
RDF 140% (966:280:336 g NPK/tree)	6.37	6.43	8.20	8.04
CD at 5%	0.24	0.24	0.20	0.22

Table.2 Effect of different NPK levels on flower and yield parameters of guava cv. Hisar Safeda

Treatments	No. of flowers per branch	Fruit set (%)	Fruit retention (%)	No. of fruits per tree	Fruit weight (g)	Fruit yield (kg/tree)
RDF 60% (414:120:144 g NPK/tree)	14.88	47.82	56.98	483.8	80.98	39.18
RDF 80% (552:160:192 g NPK/tree)	17.63	51.99	62.03	509.3	90.79	46.24
RDF 100% (690:200:240 g NPK/tree)	20.63	55.98	66.43	523.4	98.39	51.50
RDF 120% (828:240:288 g NPK/tree)	22.25	58.46	68.51	534.0	104.47	55.79
RDF 140% (966:280:336 g NPK/tree)	23.63	58.97	69.25	540.6	107.22	57.97
CD at 5%	2.06	2.64	1.63	14.1	3.70	2.29

The maximum fruit weight (107.22 g) and fruit yield (57.97 kg/tree) were obtained with the application of RDF 140%, which was significantly higher than all the treatments except RDF 120%. The increased fruit weight with higher application of NPK might be due to the fact that plants applied with sufficient quantity of nitrogen, phosphorus and potassium have better capability for CO₂ assimilation. It would lead to higher rate of synthesis and supply of carbohydrates in the plants. The fruits are very strong sink for carbohydrates, so more carbohydrates would be transported to the fruits. The results of present findings are in accordance with the finding of Kaur and Chahil (2006) and Brar *et al.*, (2015) in guava. The increase in fruit yield might be due to more number of fruits per tree, increased fruit set, fruit retention and higher fruit weight with the higher NPK application. These results are in close agreement with the findings of Kumar *et al.*, (2009) and Sahu *et al.*, (2015) in guava.

From this experiment, it is concluded that RDF 120% (828:240:288 g NPK/tree) was best dose for optimum plant growth and yield parameters of guava cv. Hisar Safeda.

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