

EFFECT OF PLANT GROWTH REGULATORS ON PHYSICO-CHEMICAL CHANGES IN GUAVA CULTIVARS UNDER ULTRA HIGH DENSITY PLANTING SYSTEM

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Abstract: A field experiment was carried out during the year 2014-15 in winter season at research field of Precision Farming Development Centre (PFDC), Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) to study the effect of plant growth regulators on physico-chemical changes in guava (*Psidium guajava* L.) under ultra high density planting. Accommodation of the maximum number of precocious plants per unit area to get the maximum profit per unit of the tree volume without impairing the soil fertility status is called the high density planting. Better light distribution within tree canopy increases the number of well illuminated leaves. The experiment was carried out with three varieties (Lalit, Allahabad Safeda and L-49). Plant growth regulators showed maximum plant height, plant spread, plant girth, number of fruit/plant fruit yield/plant and fruit yield/hectare. The average fruit weight, acidity, pH and TSS were also maximum with varieties Lalit.

Keywords: Plant growth regulator, Guava, UHDP

INTRODUCTION

Guava (*Psidium guajava* L.) is a very popular fruit in India and has been under cultivation in India since early 17th century. It belongs to family "Myrtaceae" and an important commercial fruit crop of tropical and sub-tropical region of India. It is known as "Apple of tropics" and rich in vitamin "C" and pectin content besides being a good source of other vitamins and minerals. Fruits are fair source of vitamin A (about 250 mg/100 g) and contain appreciable quantities of thiamine, niacin and riboflavin. The ascorbic acid content ranges from 75-260 mg/100 g, which varies with cultivar, season, location and stage of maturity. The fruit also contains considerable amount of calcium, phosphorus and iron. However, 80% of iron remain in the seed and is not utilizable. Moreover, guava fruits are rich source of pectin which ranges between 0.5 and 1.8% (Adsule and Kadam, 1995).

The area under guava in India is 235.6 thousand ha and production is 3198.3 thousand metric tonnes with a productivity of 13.6 metric tonnes/ha. The highest area under guava cultivation is in Maharashtra (39.00 thousand ha). Madhya Pradesh is the leading state of guava production (801.00 thousand metric tonnes), as well as productivity (37.6 metric tonnes/ha). Whereas, in Chhattisgarh, the area of guava is 17119 ha and production is 140908 metric tonnes (Anon., 2013).

Plant growth regulators modify or regulate physiological processes in an appreciable measure in the plant when used in a small concentration and also play an important role in fruit set, fruit production, fruit weight and fruit size without causing any adverse effect in fruit quality. The use of plant

growth regulators has assumed an integral part of modern fruit production especially under high density orcharding to improve quality. Ethrel, a ripening hormone induces early and uniform ripening. Different nutrients in association of plant growth regulators increase economic yield facilitating harvesting. NAA induces more fruiting, promotes flowering, whereas, GA3 increases fruit retention. Gibberellins are known for their ability to increase cell enlargement (Arteca, 1996; Davis, 2004; Pharis and King, 1995), thus enhancing fruit growth in certain species such as citrus (Eman *et al.*, 2007; El-Sese, 2005), litchi (Stern and Gazit, 2000; Chang and Lin, 2006), guava (El-Sharkawy *et al.*, 2005), and pear (Zhang *et al.*, 2007). In all species so far studied, gibberellins had the potential for increasing fruit size. The beneficial effects of gibberellic acid (GA3) and nutrient elements specially zinc on yield and fruit quality of different fruit crops were mentioned by many investigators including Swietlik (2002). Also, the use of GA3 as a growth regulator to promote size and to control fruit drop was reported by Arteca (1996).

MATERIAL AND METHOD

Field experiment was carried out during the year 2014-15 in winter season at research field of Precision Farming Development Centre (PFDC), Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). Raipur is situated in the central part of Chhattisgarh at latitude 21.16 °N and longitude 81.36 °E at an altitude of 289.56 meters above the mean sea level. Raipur comes under dry, sub-humid agro-climatic region. The source of rainfall is South West monsoon. It receives an

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average annual rainfall of 1200-1400 mm, most of which (about 85%) is received from third week of June to mid September and very little (rest of 15%) during October to February. May is the hottest and December is the coolest month of the year. The pattern of rainfall, particularly during June to September months has a great variation from year to year. The maximum temperature goes as high as 46 °C during summer and minimum as below as 6 °C during winter months. The atmospheric humidity is high from June to October. The Meteorological data viz., temperature, sunshine hours, relative humidity, wind velocity and evaporation. The weekly maximum and minimum temperature was 34.4 °C and 8.6 °C, respectively. The maximum temperature during the experimentation varied between 28.3 °C to 33.4 °C from September 2014 to December 2014 whereas, minimum temperature varied between 8.3 °C to 25.1 °C. The total rainfall during the period of experimentation was 236.4 mm, relative humidity throughout the crop season varied between 27-95%. The average maximum relative humidity for different months varied from 84-95%, while, monthly average minimum relative humidity varied between 27-83%. The average values of open pan evaporation ranged from 1.7-4.1 mm/day, whereas average sunshine values varied from 0.5-9.0 hrs/day, maximum wind velocity during crop period was 6.9 km/hrs and minimum was recorded 1.9 km/hrs.

RESULT AND DISCUSSION

The maximum plant height (135.22 cm) was found under the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (131.04 cm) in the cultivar Lalit followed by Allahabad Safeda (127.07 cm) with the same treatment combinations. The minimum plant height (125.95 cm) was observed in the cultivar L-49 with the treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (127.70 cm). Similar findings were reported by Nath and Pathak (2006) in guava. Plant girth was maximum (8.86 cm) in Lalit cultivar with treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (8.64 cm) followed by Allahabad Safeda (8.36 cm) with the same treatment combinations. However, it was minimum in Sardar (L-49) cultivar with treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (7.97 cm). The maximum plant canopy spread (160.80 cm) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (162.80 cm) in the cultivar Lalit followed by Allahabad Safeda (160.32 cm) with the same treatment combinations. The minimum plant canopy spread (156.81 cm) was observed in the cultivar Sardar (L-49) with the treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (157.04 cm). The above findings are in accordance with the report of

present investigation. The maximum number of fruits per plant (46.65) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (44.64) in the cultivar Lalit followed by Sardar (L-49) (43.63) with the same treatment combinations. The minimum number of fruits per plant (39.23) was observed in the cultivar Allahabad Safeda with the treatment combinations of calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (41.61). The maximum fruit yield per plant (8.37 kg) was found in the treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (7.82 kg) in the cultivar Lalit followed by Sardar (L-49) (7.77 kg) with the same treatment combinations. The minimum fruit yield per plant (6.67 kg) was observed in the cultivar Allahabad Safeda with the treatment combinations of calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (7.38 kg). Significantly, the maximum fruit yield per hectare (41.82 t/ha) was found in the treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (39.10 t/ha) in the cultivar Lalit followed by Sardar (L-49) (38.84 t/ha) with the same treatment combinations. The minimum fruit yield per plant (33.43 t/ha) was observed in the cultivar Allahabad Safeda with the treatment combinations of calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (36.85 t/ha). The maximum fruit weight (183.62 g) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (179.38 g) in the cultivar Lalit with followed by Sardar (L-49) (178.59 g) with the same treatment combinations. The minimum fruit weight (169.32 g) was observed in the cultivar Allahabad Safeda with the treatment combinations of calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (175.86 g). The obtained results are also supported by El-Sharkawy and Mehaisen (2005) on guava. The role of GA in improving fruit quantity namely, fruit weight and fruit size may be due to its role in increasing cell elongation (Eman *et al.*, 2007). The maximum number of seeds per fruit (216.04) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (217.00) in the cultivar Lalit followed by Sardar (L-49) (215.23) with the same treatment combinations. The minimum number of seeds per fruit (213.34) was observed in the cultivar Allahabad Safeda with the treatment combination of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (213.64). The maximum seed weight (6.64 g) was found in the treatment combinations calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (5.48 g) in the cultivar Lalit with followed by Allahabad Safeda (5.57 g) with the same treatment combinations. The minimum seed weight (4.08 g) was noticed in the cultivar Sardar (L-49) with the treatment combination of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (5.37 g). The maximum TSS (14.99 °Brix) was found in the treatment combinations of calcium nitrate 2% +

NAA (100 ppm) + GA3 (40 ppm) (13.88 °Brix) in the cultivar Lalit followed by Allahabad Safeda (13.84 °Brix) with the same treatment combinations. The minimum TSS (12.53 °Brix) was observed in the cultivar Sardar (L-49) with the treatment combinations of calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (13.69 °Brix). The maximum pH of fruit juice (4.94) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (4.40) in the cultivar Lalit with followed by Allahabad Safeda (4.15) with the same treatment combinations. The minimum pH of fruit juice (3.94) was noticed in the cultivar Sardar (L-49) with the treatment combination of 100% ET + calcium nitrate 3% + NAA (150 ppm) + GA3 (60 ppm) (4.30). The maximum acidity (0.64 %) was found in the treatment combinations of calcium nitrate 2% + NAA (100 ppm) + GA3 (40 ppm) (0.61%) in the cultivar Lalit followed by Allahabad Safeda (0.56 %) with the same treatment combinations. The minimum acidity (0.55 %) was noticed in the cultivar Sardar (L-49) with the treatment combinations of calcium nitrate 1% + NAA (50 ppm) + GA3 (20 ppm) (0.55%).

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