Guava is commonly known for its food and nutritional value across the world. The medicinal properties of guava fruit, leaf and other parts of the plant are also well known in traditional system of medicine. Since each part of guava plant possesses economic value, it is cultivated on commercial scale. Guava because of its high nutritional value is considered as poor man’s apple in tropics. Guava is rich in tannins, phenols, triterpenes, flavonoids, essential oils, saponins, carotenoids, lectins, vitamins, fiber and fatty acids. Guava fruit is higher in vitamin C (80 mg/100 g of fruit weight) than citrus and contains an appreciable amount of vitamin A as well. Guava fruits are also a good source of pectin, which is considered a useful dietary fiber responsible for bowel movement. Its fruits are very rich in antioxidants and vitamins and high in lutein, zeaxanthin and lycopene. Guava being a source of flavonoids and quercetin demonstrates antibacterial, anti-diarrheal and antidyentery activity, relaxes intestinal muscle and inhibits bowel contractions. Several value-added products, viz. jam, jelly, cheese, marmalade, nectar, squash, dried powder, ice cream, etc., can be prepared from guava fruits.

**Keywords:** *Psidium guajava*, cultivar, physical properties, minerals.
the weight of guava fruits ranged from 198.4g (Sel. Lucknow 49) to 85g (Sel. Dhawar 34) under Pune conditions. Prakash (1976) compared two cultivars of guava for quality characters and noted maximum fruit weight of cv. Sardar (171g) than the fruit weight of cv. Dhawar (133g). Thonte and Chakrawar (1982) evaluated 11 guava strains under Parbhani conditions and revealed that the average weight of fruit ranged from 327g (ABD1) to 117.50g (BHR1). The weight of fruit ranged between 220.9g (Guiness) and 118g (White Flesh) under Lucknow conditions (Tandon et al., 1983). Singh (1988) evaluated 25 guava cultivars under Basti (U.P.) conditions and found that the fruit weight of cv. Florida Seedling and BaraKfhana ranged from 51.6t0 220g, respectively. Babu et al. (2007) evaluated the performance of eight years old guava selections and found the maximum weight of guava fruit for the cultivar Selection 11 (144.20g) followed by Lucknow 49 (140.50g). Biochemical studies of guava done by Kaur et al. (2011) who observed a significant variation in fruit yield and fruit weight of different guava cultivars, fruit size (6.5 cm x 5.4 cm) and fruit weight (95g/fruit) being maximum of cultivar Lucknow 49. Miano et al. (2010) reported maximum fruit weight (241 g) after four days of storage at room temperature when stored at green stage after wrapping in tissue paper, while at fringe temperature, fruits wrapped in newspaper proved better and had maximum fruit weight (244g). After 8 days of storage, the fruit wrapped in tissue paper had maximum weight (222.63g) at room temperature, while at fringe temperature, the fruit wrapped in newspaper had maximum weight (239.80g). However, in case of yellow and no yellow fruits wrapped in tissue paper had maximum weight on 4th (242.40 g) and 8th day of storage (218.80g) at room and fringe temperature. Patel et al. (2011) noticed that the genotype RCGH4 produced largest fruits (184.50g), whereas, the cv. Sangam produced smallest fruits (92.48g). Deshmukh et al. (2013) recorded the maximum fruit weight of genotype RCGH4 (183.52g) and minimum of cv. Lalit (138.06 g) followed by RCGH7 (143.15g). Khan et al. (2013) revealed that the fruit size of guava cv. Gola was more in winter (133.6g) than in summer (82.5g). In another experiment of Guava, Aslam et al. (2014) observed that the cultivar Surahi exhibited bigger fruit size (131.41 g) than the cultivar Gola (99.68 g) during both the seasons. Mehta et al. (2016) recorded maximum fruit weight of guava cv. Lucknow 49 (158.08 g).

**Fruit length**

While comparing the quality characteristics of two guava cultivars fruits, Prakash (1976) recorded fruit length of Sardar cultivar (6.16 cm) more than the fruit length of Dhawar cultivar (6.03 cm). However, under Parbhani conditions, Thonte and Chakrawar (1982) found that ABD1 exhibited maximum fruit length (8.99 cm). Mitra et al. (1983) reported length of guava fruit between 5.8(cv. Lucknow49) and 4.2(cv. Seedless) cm under West Bengal conditions. Patel et al. (2011) observed that the length of guava fruit varied from 5.16(cv. Sangam) to 7.08(genotype RCG2) cm. Deshmukh et al. (2013) noticed maximum fruit length in guava genotype RCG4 (6.54 cm). While working on guava cultivars during 2010 and 2011, Aslam et al. (2014) observed that the cultivar Surahi (81.64 mm in winter and 49.74 mm in summer) showed more fruit length as compared to cv. Gola (62.32 mm in winter and 37.63 mm in summer).

Mehta et al. (2016) recorded maximum fruit length of cultivar Lucknow 49 (6.10 cm).

**Fruit diameter**

According to Patel et al. (2011), the cultivar RCGH 4 produced the fruits of maximum diameter (7.08 cm), while the cultivar RCG1 produced the fruits of minimum diameter (5.25 cm). However, it was recorded 5.80(cv. Seedless) to 4.60(cv. Strawberry) cm under Punjab conditions (Aulakh, 2005). Among 11 cultivars of guava, the cultivar Pant Prabhat produced fruits ofmore diameter (7.13 cm) followed by IIHR Hybrid21 (6.75 cm) as reported by Pandey et al. (2007). Patel et al. (2007) evaluated five years old six genetically diverse hybrids / cultivars under Meghalaya conditions and found that the fruit diameter ranged from 6.91(cv. Lucknow-49) to 5.63(Hybrid2) cm. Deshmukh et al. (2013) harvested fruits of maximum diameter from the plants of genotype RCGH4 (6.99 cm) and of minimum diameter from the plants of cv. Allahabad Safeda (6.15 cm). Binepal et al. (2013) noticed maximum fruit diameter (7.91 cm), fruit length (7.52 cm) and volume of fruit (217.41 ml) in cultivar T9 under conditions of Madhya Pradesh Malwa plateau. Aslam et al. (2014) noted 65.21 mm width of Gola fruits in winter and 47.29 mm in summer, which was more than the width of Surahi cultivar fruits in winter (61.07 mm) and in summer (47.85 mm). Mehta et al. (2016) showed maximum diameter of guava fruits of Lucknow 49 cultivar (6.45 cm).

**Fruit volume**

Under Bangalore conditions, the volume of guava fruits ranged from 119.40(TG sel. 6/8) to 69.20(TG sel. 5/5) ml among ten seedling progenies of Taiwan guava (Biradar and Mukunda, 2007). While studying 12 different guava cultivars under Punt Nagar conditions, Raghav and Tiwari (2008) observed variation in fruit volume ranging from 17.88 to 209.68 ml. Dolkar et al. (2014) conducted a trial on growth and yield attributes of commercial guava (Psidium guajava L.) cultivars under subtropical conditions of Jammu (India) and recorded maximum fruit volume in cultivar L49 (141.25 ml) followed by Hisar Safeda (132.75 ml), Hisar Surkha (126.24 ml), Allahabad Safeda (119.75 ml), Lalit (110.25 ml), ArkaAmulya (109.50 ml) and minimum in cv. Pant Prabhat (108.20 ml).Mehta et al. (2016) noted maximum volume of fruits (160.87 ml) in cultivar Lucknow 49.

**Number of seeds per 100 g fruit weight**

In a study conducted on 272 open pollinated seedling progenies of Apple Colour, Marak and Mukunda (2007) noticed that the fruits of A.C. Sel. 6/10 had a smaller number of seeds per fruit (142). The study of Patel et al. (2011) reveals that the genotype RCG11 had minimum number of seeds per 100g fruit weight (53.29 seeds), whereas, the genotype RCG 2 had maximum number of seeds per 100 g fruit weight (361.44 seeds) followed by RCG3 (358.08 seeds) and RCG1 (310.32 seeds). Shukla et al. (2012) recorded seeds in the range of 125 to 450 per fruit. Among the hybrids and cultivars of guava, Deshmukh et al. (2013) observed a wide variation with respect to number of seeds per 100g fruit weight, which was recorded minimum in cultivar RCGH7 (111.18 seeds) and maximum in cultivar Lalit (169.07 seeds), followed by RCG 1 (140.31 seeds) and Allahabad Safeda (145.41 seeds). Bisen et al. (2014) noticed maximum number of seeds (327.37 and 325.96) in fruits harvested from the plants supplied with T16 (C3+G3) and minimum (299.00 and
304.51 seeds) in fruits harvested from the control plants in 2009-10 and 2010-11, respectively. Dolkar et al. (2014) noticed maximum number of seeds in fruits of cultivar Arka Amulya (380.25) followed by Pant Prabhat (300.50) and minimum in fruits of cultivar Lalit (205.75). Kumar et al. (2015) observed that smaller number of seeds per fruit is a desirable character, which is due to the more pulp area of fruit though different genotypes. They also found maximum number of seeds in fruits of genotype GWS8 (352.89) followed by the genotype GWS3 (314.77) and lowest number of seeds in fruits of genotype GWS8 (352.89) fruit though different genotypes. They also found maximum desirable character, which is due to the more pulp area of fruit than different genotypes.

Specific gravity

In a trial on storage of guava, Miano et al. (2010) observed that yellow fruits had the maximum specific gravity (0.96 and 1.11) after 4 days of storage at room temperature respectively under plastic bags. However yellow fruits of fridge temperature after 12 days of storage had the maximum specific gravity (1.84) under tissue wrappers. Mehta et al. (2016) recorded maximum specific gravity of fruit (0.99 ml) under guava fruit cultivar Lucknow 49.

Chemical Characteristics

Total soluble solids

Taste is a balance between acids, sugars and volatiles present in fruits. Babu et al. (2002) estimated 11.88, 10.20 and 9.35% total soluble solids in fruits of genotype RCG11, RCGH7 and Lalit, respectively. The lower total soluble solids content among varieties of different regions might be due to difference in soil and climatic conditions of the growing region (Aulakh, 2004). Dutta et al. (2009) measured total soluble solids 11.80° Brix in fruits of Sardar Guava cultivar. Adreess (2010) analysed nutritional value of different guava varieties, which revealed total soluble solids between 7.64 and 11.87%, with maximum value in fruits of Safaid cultivar. Miano et al. (2010) recorded maximum increase in total soluble solids of green mature guava fruits after 4 days of storage in tissue wrappers (11.36° Brix) followed by news papers (11.33°Brix) after 8 days of storage, however, the yellow fruits had the maximum total soluble solids (12.23°Brix) after 8 days of storage at room temperature in news papers followed by storage after 4 days (12.08°Brix). Kaur et al. (2011) noticed significant variation in total soluble solids of different cultivars fruits with more total soluble solids (11.0%) in fruits of Allahabad Safeda cultivar than the fruits of Lucknow 49 cultivar (10.8%). In Bangladesh, Nag et al. (2011) found chemical changes in fruits of different guava varieties during different ripening stages and observed maximum total soluble solids in fruits of Swarupkathi cultivar (11.60°) at last ripening stage followed by the cultivar Mukundapuri (10.75°), Local (9.48%) and Kazipiara (7.93). The total soluble solids (11.82°Brix) were recorded maximum in guava fruits of Lucknow 49 cultivar (Mehta et al., 2016).

Acidity (Citric acid)

In fruits of Sardar Guava cultivar, Dutta et al. (2009) estimated 0.441% acidity. Patel et al. (2011) recorded minimum acidity in fruits of cultivar RCGH7 (0.45%) followed by RCG11 (0.46%), RCG1 (0.48%), RCG2 (0.49%), RCGH1 (0.51%), RCG3 (0.52%) and L49 (0.55%) and maximum in fruits of Sangam cultivar (0.65%). In Bangladesh, Nag et al. (2011) observed maximum acidity in fruits of Local variety (0.39%) than the acidity in fruits of Kazipiara (0.32%), Swarupkathi (0.31%) and Mukundapuri (0.24%) at ripening stage. Aslam et al. (2014) estimated titratable acidity in fruits of cultivar Surahi and Gola 0.88 and 0.98% in summer and 0.70 and 0.83% in winter, respectively.

Total sugars

Sugar is one of the important ingredients for the preparation of value-added durable products from guava, and its high content offers pleasant taste to the fruit. As the guava ripens, the total soluble solids and total sugars increase in both peel and pulp, whereas, the titratable acidity declines after reaching its climacteric peak. In general, the climacteric fruits undergo considerable changes in sugar content during ripening. Dutta et al. (2009) observed total sugars 9.58% in fruits of Sardar Guava cultivar. Shukla et al. (2009) obtained significantly higher fruit weight (153.30 g), total soluble solids (14%), ascorbic acid (198.30 mg/100 g pulp), reducing sugars (4.77%) and total sugars (8.10%) with the combined application of 50% dose of recommended NPK + 50kg farmyard manure + 250g Azotobacter. A trial conducted in Pakistan on nutritional quality evaluation of by Adreess (2010) who estimated the content of total sugars from 4.33 to 6.36% in guava fruits of different varieties. Among different cultivars, Kaur et al. (2011) noticed that the content of total sugars varied significantly, being highest in fruits of Allahabad Safeda cultivar (3.60%) followed by Lucknow49 (3.41%). Patel et al. (2011) studied variability among guava genotypes in Meghalaya and recorded maximum total sugars in fruits of genotype RCGH7 (8.39%) followed by genotype RCGH1 (8.28%) and GCG11 (8.12%), while minimum in genotype RCG3 (6.04%). A trial conducted on comparative studies of guava hybrids at mid hills of Nagaland (India) by Deshmukh et al. (2013) who estimated the maximum total sugars in fruits of genotype RCGH1 (8.07%) followed by the cultivar RCGH7 (8.05%), while the minimum in cultivar RCGH4 (6.42%) followed by the cultivar Lalit (6.58%). Mehta et al. (2016) recorded maximum content of total sugars (7.38%) in fruits of guava cv. Allahabad Safeda.

Pectin content

High pectin content leads to high production of ascorbic acid in guava as pectin degradation is linked with ascorbic acid production. The galacturonic acids are substrate needed in the synthesis of ascorbic acid and period of ascorbic acid accumulation corresponded with falling of pectin content in fruit. Chyan et al. (1992) reported higher pectin content in guava fruit at mature green stage than in the ripe stage, while in fruits of a Shambati and Shendi cultivars, the total pectin content was higher at ripe stage than at mature green stage. The explanation for this difference may lie in chemical activity as well as quantitative differences between pectic enzymes of the cultivars. Babu et al. (2002) observed maximum pectin content in fruits of guava genotype RCGH7 (1.38%) followed by the genotype RCGH1 (1.35%), RCG3 (1.30%) and RCH11 (1.29%), while lowest in fruits of genotype RCG2 (0.82%) followed by the genotype RCG1 (0.87%). According to Deshmukh et al. (2013), the pectin content was maximum in fruits of genotype RCGH1 (1.33%) followed by the genotype RCGH7 (1.31%). Simultaneously, they found significant variations among the hybrids and cultivars with respect to pectin content. Mehta et al. (2016)
observed maximum pectin content (0.98%) in fruits of guava cv. Allahabad Safeda.

Ascorbic acid

Guava is considered as an outstanding source of ascorbic acid, which is three to six times higher than the content of an orange, and after acerola cherries, it has the second maximum concentration among all the fruits. Fruit variety is one of the main factors affecting ascorbic acid content in guava, influencing more than ripening stage or storage conditions (Mitra, 1997). Ram and Rajput (2000) reported that ascorbic acid increased with the increase in moisture content, being maximum in guava fruits of Sardar and Allahabad Safeda cultivar (336.34 and 261.51 mg/100 g, respectively) at 23.30% soil moisture during third week of December. Within the fruit, the ascorbic acid is concentrated in the fruit skin followed by mesocarp and endocarp. Bashir and Abu-Goukh (2002) reported 800 and 670 mg ascorbic acid per kilogram fruit weight for white and pink cultivar of guava, respectively. Dutta et al. (2009) noted 128.52 mg ascorbic acid per 100 g fruit pulp of Sardar Guava cultivar. In another study on evaluation of nutritional quality of different guava varieties by Adrees (2010), the content of ascorbic acid ranged from 136.5 to 220.4 mg/100g fruit weight. Among different genotypes, Patel et al. (2011) revealed maximum value of ascorbic acid (246 mg/100g) in fruits of genotype RCGH1 and lowest in fruits of genotype RCGH 3 (149.13 mg/100g). Deshmukh et al. (2013) recorded maximum ascorbic acid in fruits of guava genotype RCGH 1 (231.86 mg/100 g) followed by the genotype RCGH 7 (205.26 mg/100 g) and minimum in fruits of Lalit cultivar (168.78 mg/100 g). In summer, Aslam et al. (2014) estimated ascorbic acid in fruits of guava cultivar Surahi and Gola and found maximum ascorbic acid in fruits of cultivar Surahi and Gola (729.04 and 279.04 mg/100 g, respectively). Bisen et al. (2014) noticed that pre-harvest treatments with calcium nitrate alone (247.18 and 266.56 mg/100g) or in combination with higher concentration of GA₃ (246.62 and 267.12 mg/100g) showed greater ascorbic acid at different storage period, respectively. Mehta et al. (2016) showed maximum ascorbic acid in fruits of guava cv. Allahabad Safeda (230.44 mg/100 g).

Conclusion

Guava is cultivated in almost all parts of the country. Allahabad is famous to produce best quality fruits of guava in India as well as in the world. The weight and size of the fruit show wide variation due to genetic makeup of various genotypes. It is a major quantitative inherited factor determining yield, fruit quality and consumer acceptability. Therefore, the genotype may be expected to produce larger fruits under better cultural practices. In guava, medium-size attractive fruits are preferred by the consumers in the market.

References


