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Evaluation of pomegranate varieties for growth and fruit quality attributes under Andhra Pradesh condition

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Abstract

Five pomegranate varieties (Ganesh, Mridula, Bhagwa, Ruby and Jalore Seedless) were evaluated for vegetative and quality parameters for consecutive seven years under at Horticulture Research Station, Anantapur. Jalore Seedless (check) recorded significantly highest values for plant height (2.99 m), no. of stems per plant (5.25) and plant spread (2.64 m EW 2.51m NS). Among all the varieties, fruit yield per plant and per hectare was highest in Bhagwa (19.13 kg and 11.96 t) with fruit weight of 305.21g, total aril weight (168.05g) and 100 aril weight (35.35 g) TSS of 17.87° Brix. Bhagwa was best performer as compared to other popular varieties like Ganesh, Mridula, Ruby and Jalore Seedless. Therefore, on the basis of plant growth and fruit quality attributes variety Bhagwa is recommended for arid regions of Andhra Pradesh.

Key words: Pomegranate, varietal evaluation, fruit quality, yield

Introduction

Pomegranate (*Punica granatum* L.) is most popular table fruit of tropical and subtropical regions of the world. It belongs to genera *Punica* and family Punicaceae (Chatterjee and Randhawa, 1952; Joshi, 1956). It is a native fruit of Iran, and is also cultivated extensively in countries like Spain, Morocco, Egypt, Afghanistan and Baluchistan. The cultivation has also been initiated on small scale in countries like USA (California & Florida), Mexico, Palestine, Israel, China, Japan, Burma, the USSR, Pakistan and many parts of India (Singh, 2000). In India, its cultivation is extended from Kashmir to Kanyakumari. It is grown commercially in the states of Gujarat, Rajasthan, Karnataka, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Punjab and Haryana. In India, it is considered as a crop of the arid and semi-arid regions because it withstands different soil and climatic stresses (Kaulgud, 2001).

The juice is valued for its medicinal properties mainly for leprosy patients. Juice is also used as cooling ingredient refrigerant of mixtures and some medicines for dyspepsia. The bark and rind of the fruits and seeds are used as astringent in cases of diarrhoea and dysentery. In peninsular India, a kind of wine is prepared from pomegranate juice which is considered superior to grape vine. The sweet types of pomegranate are said to be mildly laxative, while the less sweet types are believed to be good in inflammation of stomach and in heart pain. The powdered flower buds are used in bronchitis. The seeds are considered to be stomachic and the pulp cardiac and stomachic (Anonymous, 1998). For effective utilization, the evaluation of varieties for their performance and quality attributes for table purpose and value addition are the areas of concern.

Materials and Methods

To study the adaptability, performance and potentiality of improved varieties of pomegranate under arid zone of Andhra Pradesh, the experiment was conducted for consecutive seven years at HRS, Anantapuramu under Randomized Block Design with four replications. The vegetative parameters like plant height (m), plant spread (m), stem girth (m), yield per plant and quality parameters *i.e.* fruit weight, peel weight, aril weight, 100 arils weight, TSS, pH, acidity and anthocyanin were evaluated. A total of ten fruits from each variety was analysed for various physical attributes. The arils were first separated manually and then 100 arils weight (g) was recorded. Also, peel weight (g) per fruit were computed. The extracted fruit juice was then utilized in the experiments for the determination of chemical composition of fruits.

A. Titratable acidity

Total titratable acidity (TA) was determined by the method as defined by Ranganna (1986). In this method, 5 ml of water added to 5 ml aril juice and mixed thoroughly. The sample solution was titrated against 0.1 N NaOH using phenolphthalein as indicator. Appearance of light pink colour

denotes the end point. The acidity of aril juice was expressed in per cent and calculated by using the formula.

B. Total soluble solid (°Brix)

The total soluble solid (TSS) content of the pomegranate juice was measured by Digital Refractometer and expressed as °Brix (Ranganna, 1986).

C. pH

The pH measurements were done using a digital pH meter.

D. Anthocyanin content

For estimation of anthocyanin, juice from 1 g arils was macerated in 1 ml of methanol was extracted and mixed with 4 ml 1% HCl and kept overnight at 0°C and the absorbance of diluted solution was measured at 530 nm by Spectrophotometer. The absorbance of diluted juice was used as index for anthocyanin concentration (Harborne, 1973).

Data analysis

All the experiments were performed in triplicate and the recorded data were analysed by using ANOVA.

Results and Discussion

Significant differences were observed among pomegranate varieties for all the growth characters studied (Table 1). Jalore Seedless (check) recorded significantly highest values for plant height (2.99 m), no. of stems per plant (5.25) and plant spread (2.64 m EW 2.51m NS). Significantly more number of harvestable fruits per plant was observed in Bhagwa (87.83) followed by Ganesh (77.59). The pooled yield per plant and per hectare were significantly high in Bhagwa (19.13 kg and 11.96 t) followed by Ganesh (18.29 kg and 11.43t), respectively. Such variations in growth characters are reported by Sharma and Bist (2005). Also, Rao and Subramanyam (2009) reported that among nine years old four varieties of pomegranate Mridula recorded with highest fruit yield/tree (14.1 kg) under scarce rainfall zone. Similar results were reported by Mir *et al.* (2007 a & b) showed significant variations on all the growth and yield parametersdue to various cultivars. The highest plant height and spread was recorded in cv. Kabuli Kandhari, whereas maximum number of suckers was recorded in cv. Jyoti.

The data on fruit quality parameters (Table 2) revealed that maximum fruit weight (424.05 g), total aril weight (253.20 g) and 100 aril weight (40.65 g) were recorded in Jalore Seedless compared to other varieties. High TSS was recorded in Bhagwa (17.87°Brix) followed by Ganesh (16.33°Brix), Mridula (15.81°Brix) and Ruby (15.50°Brix). The per cent acidity was high in Jalore Seedless (0.85) whereas, it was low in Mridula (0.27) and Bhagwa (0.31). The anthocyanin content was high in Mridula (19.30 mg/100g) followed by Ruby (17.86 mg/100g) and Bhagwa (17.52 mg/100g). Similar variations in fruit parameters were recorded in the cultivar Chawla which was superior in its nutritive value to Akanar and Nabla (Sood *et al.,* 1982). Malhotra *et al*. (1983) also observed high juice content (62.5%) in various cultivars. Similarly, TSS, sugars (reducing & non-reducing), acids and vitamin C in the seed juice and total phenolics as tannins in the fruit skin revealed great inter-varietal differences. In general, all the cultivars were found to contain high fraction of reducing sugars as part of total sugars. Dhillon and Kumar (2004) studied the biochemical changes in pomegranate and indicated that TSS and vitamin C content increased up to 150 days of anthesis but acidity decreased during fruit development. High total soluble solids and total sugars were recorded in cv. Kandhari. The highest TSS/acid ratio was recorded in cv. G-137. Cultivar Kabuli Kandhari observed the highest ascorbic acid content followed by Bedana. The anthocyanin content was observed higher in Ganesh followed by Kabuli Kandhari and lowest in Chawla. The juice content was found to be highest in Bedana (Mir *et al*., 2007 a & b). Varasteh *et al.* (2009) evaluated five commercial cultivars in Iran for different fruit characteristics and observed total soluble solids, titrable acidity and anthocyanin index which varied from 16.60-18.26 °Brix), 0.79- 1.35% and 1.04-1.92 mg/100g, respectively. Akbarpour *et al.* (2009) studied 12 pomegranate cultivars for different physical and chemical characters. Their reducing sugars ranged from 13.89 to 29.83 g/100 ml and TSS ranged from 15.17 to 22.03%. Cultivar Syah-e-Saveh had significantly more TSS (22.03°Brix). The maximum acidity was found in Lamsari-e-Behshahr (3.36%) and minimum in Khazar-e-Bardeskan (0.35%). Vitamin C ranged from 9.68-17.45 mg/100 ml and anthocyanin from 225.17 to 705.50 mmol/100 g.

Table 1. Growth, yield parameters of pomegranate varieties (pooled data 2013 to 2020)

Varieties	Plant height (m)	No. of branches/plant	Plant spread (m)		No. of fruits/plant	Yield (kg/plant)	Yield (t/ha)
			EW	NS			
Ganesh	2.25	4.28	2.17	2.27	77.59	18.29	11.43
Mridula	2.03	3.85	1.95	1.67	53.84	11.34	7.09
Bhagwa	2.00	4.61	1.95	1.87	87.83	19.13	11.96
Ruby	2.05	3.80	2.01	1.96	64.40	12.83	8.02
Jalore seedless	2.99	5.25	2.64	2.51	46.00	12.04	7.53
CD	0.238	0.647	0.28	0.22	13.19	3.14	-
SE(m) ±	0.082	0.222	0.11	0.07	4.55	1.08	-
CV	10.214	14.42	12.58	10.54	19.5	20.87	-

Table 2. Fruit quality parameters of pomegranate varieties (pooled data 2013 to 2020)

Varieties	Fruit weight (g)	Peel weight (g)	Aril weight (g)	100 arils weight (g)	TSS (°Brix)	pH	Acidity (%)	Anthocyanin (mg/100g)
Ganesh	381.06	148.71	232.94	43.52	16.33	2.67	0.33	16.40
Mridula	275.64	93.78	180.76	36.56	15.81	2.72	0.27	19.30
Bhagwa	305.21	126.89	168.05	35.35	17.87	2.74	0.31	17.52
Ruby	282.79	99.64	194.46	36.94	15.50	2.73	0.33	17.86
Jalore Seedless	424.05	16.89	253.20	40.65	13.90	2.47	0.85	11.20
CD	61.41	24.45	42.2	5.32	0.96	0.08	0.08	1.24
SE(m)±	20.81	8.29	14.3	1.8	0.33	0.03	0.03	0.42
CV	15.27	16.12	17.02	11.45	5.92	2.87	16.89	6.22

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