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Research Article

Comparatives studies of commercially important varieties of pomegranate (Physico-chemical properties)

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SUMMARY : Field experiment was conducted at farmer's field near Hiriyur, Chitradurga district to know the performance of certain commercially important varieties of pomegranate with respect to their Physico-chemical characters.The experiment included six varieties *viz*., Bhagwa, Arakta, Ruby, MHP 7/2, G-137 and Ganesh. The results revealed that the Bhagwa variety of pomegranate is an outstanding variety for all the characters studied. Bhagwa variety recorded the maximum fruit weight and weight of arils (320.60 g and 220.80 g, respectively), maximum number of arils recorded in the variety Ganesh and maximum quantum of juice recovered in the variety Ganesh (161.60 ml/fruit).With regard to overall acceptance of fruit for Organoleptic qualities, Bhagwa variety emerged as the best variety fetching heighest score of 90.80 out of 100.

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KEY WORDS :
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BACKGROUND AND OBJECTIVES

Pomegranate (*Punica granatum* L.) is an important arid zone fruit crop. It is being grown since ancient times for its fruit, ornamental and medicinal purpose and in recent times, it has emerged as a commercially important fruit crop. The hardy nature, low maintenance cost, steady and high yields, fine table and therapeutic values, better keeping quality and the possibility to put the crop into rest period whenever the water potential is low are some of the qualities which make the plant ideally suitable for semi-arid and arid regions. However, the performance of the plant will be excellent if maintenance is with protective irrigation. It is commercially cultivated in Maharastra, Karnataka, Gujarat, Rajasthan, Uttar Pradesh, Andhra Pradesh, and Tamil Nadu. The major pomegranate growing districts in Karnataka are Bijapur, Bagalkot, Belgaum, Bellary, Chitradurga, Koppal and Gulburga. In the recent past, pomegranate has attained export potential and foreign exchange. Fruits are exported to Europe, Middle East, Africa, America and Asian countries. In Karnataka Chitradurga district stands fourth place in area and production. Chitradurga comes under central dry zone of Karnataka. Many varieties are under cultivation in this region but evaluation and recommendation regarding their suitability for this zone has not been done. In this regard present work was carried out to know the physico-chemical properties of different important varieties in this region.

RESOURCES AND METHODS

Field experiment was conducted in August 2004 to July 2005 at a farmer's field near Hiriyur, Chitradurga district. In this experiment five varieties which are cultivated commercially in this region Ganesh, G-137, Bhagwa, Arakta, Ruby and MHP 7/2 which are a multiple hybrids from Indian Institute of Horticulture Research, Bangalore. Ganesh was used as a control in this variety. The design of experimental plot was Randomized Complete Block Design replicated thrice with two plants per replication. For observation of shoot length, number of leave per shoot, leaf area per

shoot, number of flowers, fruits set per shoot were taken by randomly selecting twenty shoots in each plant. Ten fruits from each variety were selected for taking observations of fruit characters and for organoleptic evaluation.

OBSERVATIONS AND ANALYSIS

Among the commercially important varieties studied the length of the fruit was highest in G-137 (9.08 cm), Ganesh (8.52 cm) and Bhagwa (8.14 cm) varieties; the breadth of the fruits was highest in Ganesh (8.74 cm) and Bhagwa (8.62 cm); circumference of the fruit was highest in Bhagwa (27.32 cm) and Ganesh (26.30 cm). The volume of the fruit was highest in Bhagwa (323.00 ml) and the weight of the fruit was highest in Bhagwa (320.60 g), G-137 (290.80 g) and Ganesh (290.80 g) (Table 1). It may be concluded that the fruits of Bhagwa variety were large in size. There are reports that the fruit of some of the selection, multiple hybrids and improved varieties were large in size. For example selection No. 79/1 fruits were 8.4 cm in length (Anonymous, 1991); selection No. 5 and G-137 fruits were 7.9 cm each (Chadha, 1998) and GKVK selection No.1 7.93 cm (Anonymous, 1996). Similarly with respect to breadth of fruit also Ramanagaram selection fruit were 9.1 cm; selection 79/1 fruits were 9.1 cm and GKVK-2 selection were 8.6 cm (Anonymous, 1991) and selection No. 5 was 8.9 cm (Anonymous, 1996). This clearly shows the fruit of the multiple hybrids or selections were large in size and it may be due to a genetic variation in the plant.

Table 1 : Length, breath and circumference of fruit in different varieties of pomegranate

Varieties	Length of fruit (cm)	Breadth of fruit (cm)	Circumference of fruit (cm)
Bhagwa	8.14	8.62	27.32
Arakta	7.24	7.50	23.70
Ruby	7.42	7.94	27.14
MHP 7/2	7.54	8.18	25.84
G-137	9.08	8.38	25.80
Ganesh (control)	8.52	8.74	26.30
F-test	*	*	*
S.E.±	0.32	0.16	0.72
C.D. (P=0.05)	0.95	0.49	2.12
C.V. (%)	9.07	5.52	6.18

* indicates significance of value at P =0.05

In the present study the multiple hybrid Bhagwa and clonal selection G-137 recorded the highest weight of fruit (320.6 g and 295.9 g, respectively) whereas least weight of fruit was noticed in Arakta (207.00 g) (Table 2). The highest weight of fruits in Bhagwa may be attributed to hybrid vigour as it is a multiple hybrid and G-137 may be attributed to clonal variation where a better clone from Ganesh was isolated

Table 2 : Volume and specific gravity of fruit in certain pomegranate varieties

Varieties	Volume of fruit (ml)	Specific gravity of fruit
Bhagwa	323.00	0.98
Arakta	209.00	0.98
Ruby	280.00	1.00
MHP 7/2	255.00	0.99
G-137	290.00	1.01
Ganesh (control)	292.00	1.01
F-test	*	NS
S.E.±	16.27	0.20
C.D. (P=0.05)	48.00	_
C.V.(%)	13.23	5.53

NS= Non-significant
* indicates significance of value at P =0.05

keeping in mind the fruit weight as one of the criteria. The literature also clearly indicates the weight of fruit in G-137 was highest (289.92 g) as reported by Keskar *et al.* (1990). The selections P-23 and P-26 also yielded fruits of highest weight (385 and 379, respectively); selection No. 79/1 (Anonymous, 1991) and selection No. 5 (414 g), P-23 (385 g), p-20 (379 g) (Chadha, 1998). Least weight of peel per fruit was noticed in Arakta (38.80 g/fruit) the least weight of seed per fruit in MHP 7/2 (18.00 g/fruit) and the least weight of non-edible portion per fruit was noticed in Ruby (87.00 g/fruit)(Table 2). In all the cases multiple hybrids exhibited least weight of non-edible portion of fruit this is mainly attributed to the hybrid vigour. The least weight of peel per fruit, seed per fruit as well as least weight of non-edible portion of fruit was noticed in MHP 7/2 and Arakta (Nataraja, 2002).

Mean weight of aril per fruit was highest in the variety Bhagwa, the arils in this variety was bold in size and the weight of non-edible portion of fruit which consists of peel and the seed is medium in the variety Bhagwa. The superiority of Bhagwa variety in the aril characters mainly attributed to the genetic make up of the plant. This hybrid might have obtained these desirable characters of the arils either from Afghan or Indian varieties, which were, employed in development this multiple hybrid. Similarly various workers from time to tome observed desirable characters. Sayed *et al.* (1985) was of the opinion that weight of arils per fruit was 63 to 76 per cent in YCD-1 variety and it was highest in both Ganesh and G-137 (69%) as reported by Jagtap *et al.* (1992b). In this present study weight of 100 arils was highest the variety G-137 (34.8 g) while volume of 100 arils was highest in the variety Ruby (30.60 ml). The weight of 100 seeds was least in the variety MHP 7/2 (2.57 g) followed by Ruby (2.76 g). Maximum volume of 100 arils and minimum weight of 100 seeds in both MHP 7/2 as well as Ruby may be attributed to the hybrid vigour (Table 3). Nataraja (2002) was also of the opinion that multiple hybrid pomegranate 30/2 and 30/8 yielded maximum weight of 100

Table 3 : Variation in physical parameter of fruit in certain varieties of pomegranate

Varieties	Weight of fruit (g)	Weight of arils/ fruit (g)	No. arils/ fruit	Weight of peel (g) (A)	Weight of seeds (g) (B)	Weight of non-edible portion of fruit (g) (A+B)
Bhagwa	320.60	220.80 (68.87)	716.20	97.80 (30.50)	20.20 (6.30)	118.00 (36.80)
Arakta	207.00	165.40 (79.90)	677.20	38.80 (18.74)	24.00 (11.59)	62.80 (30.33)
Ruby	288.20	219.20 (76.05)	572.00	62.20 (21.58)	24.80 (8.60)	87.00 (30.18)
MHP 7/2	255.60	188.80 (73.86)	549.00	68.80 (26.91)	18.00 (7.04)	86.80 (33.95)
G-137	295.80	219.40 (74.17)	656.00	71.00 (23.84)	23.60 (7.97)	94.60 (31.98)
Ganesh (control)	297.80	220.00 (73.87)	786.80	71.00 (23.84)	40.80 (13.70)	111.80 (37.54)
F-test	*	*	*	*	*	*
S.E.±	17.97	13.72	26.42	3.43	1.30	4.45
C.D. (P=0.05)	53.04	40.48	77.96	10.13	3.8	13.13
C.V.	14.48	14.92	11.25	8.95	11.52	10.65

* indicates significance of value at P =0.05 #: Figures in parenthesis shows percentage on total fruit weight basis

arils that is 31.21 and 30.31 g, respectively. Similarly Sree Ramu *et al*. (1996) recorded maximum weight of 100 arils in the selections Jyothi (34.2 g) and Ganesh varieties (33.8 g).

Juice recovery from 100 arils was highest in the variety Bhagwa (27.6 ml) followed by G-137 (24.8 ml). however, it was least in the variety Arakta (21 ml) followed by Ruby and MHP 7/2 (both 21.6 ml) (Table 4). It may be concluded that both Bhagwa and G-137 were juicy varieties and it is because of more juice and small seeds in the variety Bhagwa while in the variety Arakta the seeds were large in size coupled with low juice content. Similarly in the juice recovery per fruit also followed the same trend as that of juice recovery from 100 arils

Table 4 : Weight of 100 arils, volume of 100 arils and weight of 100 seeds in certain varieties of pomegranate

Varieties	From 100 arils		
	Weight (g)	Volume (ml)	Weight of seed (g)#
Bhagwa	28.20	27.40	3.70
Arakta	28.20	26.4	5.40
Ruby	32.20	30.60	2.76
MHP 7/2	28.60	29.00	2.57
G-137	34.80	23.60	7.86
Ganesh (control)	27.40	27.00	6.90
F-test	*	NS	*
S.E.±	1.73	8.71	0.57
C.D. (P=0.05)	5.11	_	1.68
C.V. (%)	12.95	24.37	16.24

NS: Non significant * indicates significance of value at P=0.05 #: After extraction of juice

Table 5 : Juice recovery per fruit and from 100 arils in certain varieties of pomegranate

Varieties	Juice recovery/fruit (ml)	Juice recovery from 100 arils (ml)
Bhagwa	155.00 (48.34)	27.60
Arakta	130.20 (62.89)	21.00
Ruby	147.00 (51.00)	21.60
MHP 7/2	147.20 (57.58)	21.60
G-137	150.00 (50.70)	24.80
Ganesh (control)	161.60 (54.26)	23.60
F-test	*	*
S.E.±	5.96	1.08
C.D. (P=0.05)	17.58	3.18
C.V. (%)	8.97	10.34

* indicates significance of value at P=0.05 #: Figures in parenthesis indicates percentage juice recovery

Table 6 : TSS and total sugars content in fruit juice of certain varieties of pomegranate

Varieties	TSS (°Brix)	Total sugars (%)
Bhagwa	14.52	13.72
Arakta	13.86	13.24
Ruby	14.74	13.58
MHP 7/2	14.48	13.40
G-137	14.52	13.40
Ganesh (control)	14.74	12.74
F-test	*	NS
S.E.±	0.19	0.24
C.D. (P=0.05)	0.58	_
C.V.	3.08	4.10

NS= Non-significant * indicates significance of value at P=0.05

Table 7 : Organoleptic qualities of fruits in certain varieties of pomegranate

Varieties	Color of rind (15)	Color of aril (15)	Taste of aril (30)	Aroma of aril (20)	Hardness of seed (20)	Overall acceptance (100)
Bhagwa	14.40	12.30	27.90	17.20	17.60	90.80
Arakta	14.00	14.50	20.00	14.20	14.80	76.10
Ruby	12.70	10.50	26.60	14.50	16.60	80.90
MHP 7/2	13.60	11.20	27.10	15.60	15.00	82.50
G-137	9.90	8.40	22.00	12.40	15.40	68.10
Ganesh (control)	9.00	7.80	17.40	10.60	13.00	57.80
F-test	*	*	*	*	NS	*
S.E.±	0.64	0.96	1.79	0.97	1.05	3.38
C.D. (P=0.05)	1.89	2.84	5.30	2.88	_	9.9
C.V. (%)	11.55	10.78	17.12	15.54	15.28	9.95

where juice recovery per fruit was highest in Ganesh and Bhagwa and least in Arakta. The juice recovery reported per fruit was also least in Arakta (Nataraj, 2002) Jyothi (Sulladhmath, 1985), Gulsha (Jagtap *et al.*, 1992a), Both in RCR and alandi (Sreeramu *et al.*, 1996).

Though there was a non significant difference in the total sugar content of the aril, there was a significant variation in the TSS of the arils both Ruby and Ganesh varieties recorded highest TSS of 14.74^{O}Brix, it was medium in both Bhagwa and G-137 varieties (14.52^{O}Brix), a low TSS of 13.86 was noticed in Arakta. Both in multiple hybrid (Ruby) as well as selection (Ganesh) highest TSS was noticed (Table 5). Similarly various workers noticed highest TSS in both multiple hybrids as well as selections of pomegranate. For example Nataraja (2002) was of the opinion that multiple hybrids 30/2 and 7/2 had 15.4 and 14.73^{O}Brix TSS, respectively; Jalikop and Kumar (2000) reported 16^{O}Brix TSS in Ruby and Chadha (1998) reported 17.9 and 17.2^{O}Brix TSS in Mridula and Ruby varieties, respectively. Balasubramanyan *et al.* (1998) reported 16.8 and 16.6^{O}Brix TSS in Ganesh and Jyothi varieties, respectively. Prasad and Bankar (2000) reported 18.2 and 18.0^{O}Brix TSS in Jalore Seedless and GKVK-1 varietis; Anonymous (1996) reported 17.9^{O}Brix TSS in Arakta and 17.2 in Ruby and Keskar *et al.* (1990) reported 16^{O}Brix TSS in G-137 varieties.

In organoleptic evaluation of fruit Bhagwa variety of pomegranate fetched the highest score of 14.4 out of 15 for the rind colour character. Similarly with respect to taste of aril and aroma of aril Bhagwa variety fetched the highest score of 27.9 and 17.2 score out of 30 and 20, respectively. Further, the overall acceptance of the variety also Bhagwa variety fetched the highest score of 90.80 out of 100 (Table 6). This clearly shows that Bhagwa was an out standing variety specially for the organoleptic characters evaluation. However, Ganesh variety fetched the lowest score for all the parameters studied under the organolpetic qualities of fruits. The reason for blood red colour of fruit rind of Bhagwa as well as bright and sparkling red colour arils of Bhagwa might have acquired from its parents Gulsha Rose Pink and Kabul. Similarly the delightful flavour and excellent taste of multiple hybrid might have acquired from its parents of Indian varieties of pomegranate. Similarly in the crop improvement work of pomegranate excellent quality hybrids, or multiple hybrids or selection made from time to time by various workers have been reported *viz.*, in Jyothi (Sulladhmath, 1985), in GKVK-1 (Anbu *et al.*, 1987), in G-137

(Keskar *et al.*, 1990) and in RCR-1 (Sree Ramu *et al.*, 1996) in multiple hybrids 7/2 (Nataraja, 2002).

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REFERENCES

Anbu, S., Radakrishnan, J. and Vinayaga Murthy, A. (1987). Varietal trail in ber and pomegranate. Research papers and reports. Fourth national workshop-arid zone fruit research. Tamil Nadu Agricultural University, Madurai, Sept. 16-19, 1987. pp. 76-78.

Anonymous (1991). Germplasm introduction and evaluation; pomegranate, Bangalore. Annual Report, Co-ordination cell, AICRP – arid zone fruits, ICAR. pp. 42-44.

Anonymous (1996). Pomegranate. In: *Co-ordinated fruit research in Indian arid zone*, A two decades profile (1976-1995) Edt. O.P. Pareek and Vishal Nath, National Research Center for Arid Horticulture, Bikaner, Rajasthan, India, 45 pp.

Balasubramanyan, S., Anbu, S., Bangarusamy, U. and Chokalingam, P. (1998). Performance of pomegranate in black soil under rainfed condition. *South Indian J. Hort.,* **46** (1/2) : 78-80.

Chadha, K.L. (1998), Improvement in tree fruit and plantation crops. *Indian J.Hort.,* **55** (4) : 265-296.

Jagtap, D.B., Desai, U.T. and Kale, P.N. (1992a). Assessment of pomegranate germplasm for important fruit physico-chemical characteristics. *J. Maharashtra Agric. Univ.,* **17** (3) : 399-401.

Jagtap, D.B., Desai, U.T. and Kale, P.N. (1992a). Chemical composition of some indigenous and exotic cultivars of pomegranate. *Maharashtra J. Hort.,* **6** (1) : 10-12.

Jalikop, S.H. and Kumar, S.P. (2000). New fruit varieties for arid regions: pomegranate 'Ruby' and custard apple 'Arka Sahana'. *Indian Hort.,* **45** (2) : 19-20.

Kesar, B.G., Karale, A.R., Dhawale, B.C. and Choudhari, K.G. (1990). 'G-137' A promising clonal selection (pomegranate). *J. Maharashtra Agric. Univ.,* **15** (1) : 105-106.

Nataraja, K.H. (2002). Evaluation of multiple hybrids of pomegranate (*Punica granatum* L.) in Southern Dry Region of Karnataka. M.Sc.(Hort.) Thesis, University of Agricultural Sciences, Bangalore, KARNATAKA (INDIA).

Prasad, R.N. and Bankar, G.J. (2000). Evaluation of pomegranate cultivars under arid conditions. *Indian J. Hort.,* **57** (4) : 305-308.

Sayed, S., Seemanthini Ramadoss, Nanjan, K. and Muthuswami, S. (1985). YCD -1 pomegranate. *South Indian Hort.,* **33** (1) : 67.

Sreeramu, B.S., Narayana Reddy, P., Abbashussain, S. and Patilk, P.B. (1996). A new seedless selection from pomegranate cv. ALANDI, *Curr. Res.,* **25** (7) : 122-124.

Sulladmath, U.V. (1985). Improvement in pomegranates, jackfruit and tamarind, Progress report, third national workshop arid zone fruit research, Mahatma Phule Agricultural University, Rahuri. 5-8 July.