Short Communication

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Determination of maturity indices for harvesting of pomegranate cv. Bhagawa

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Pomegranate (*Punica granatum* L.) is an important fruit crop of arid and semi-arid regions of the world with immense medicinal and nutritional value (Pal and Babu, 2015). It's a diploid (2n=2x=16) perennial shrub from the family 'Lythraceae' (sub-family: Punicoideae). The versatile adaptability and built-in drought tolerance paves the way for its sustainability under marginal lands. It is believed to have originated from Iran and highly adapted to climatic conditions of India. In India, it is cultivated over 2.16 lakh ha with a production of 25.67 lakh tonnes/annum and a productivity of 11.56 t/ha during 2016-17 (NHB, 2017).In pomegranate, Bhagawa, Ruby, Arakta and Mridula are some of the popular cultivars of pomegranate which are commercially cultivated in different states of India (Jadhav and Sharma, 2007) and these cultivars vary in their maturity period depending on the prevailing climatic condition.Of late, Bhagawa has become the predominant cultivar occupying major area under cultivation as it has huge export demand due to its attractive red skin, red arils, seed mellowness, bold arils etc.

The maturity has been divided into two categories viz., physiological maturity and horticultural maturity. Physiological maturity is the stage when a fruit is capable of further development or ripening when it is harvested i.e. ready for eating or processing. Horticultural maturity refers to the stage of development when plant and plant part possesses the prerequisites for use by consumers for a particular purpose. i.e. ready for harvest.Determination of maturity indices help ensure sensory quality (flavor, colour, aroma and texture) and nutritional quality, ensure an adequate shelf life, facilitate scheduling harvest and packing operations besides facilitating marketing over the phone or through internet.

Fruits harvested too early may lack flavour and may not ripen properly. Being 'non-climacteric' crop, fruits of pomegranate should be harvested once they attain maturity in the plant itself (Pal and Babu, 2014). At the same time late harvesting should be avoided as it limits the market life of fruits and increases the incidence of physiological disorder, Internal breakdown. So, it is essential to harvest the fruits of pomegranate at right stage of maturity to ensure better quality and optimum market life of harvested fruits. Hence, an experiment was conducted with the objective of determining the maturity indices for harvesting of pomegranate cv. Bhagawa.

The experiment was undertaken at the Hiraj Experimental Farm of ICAR-National Research Centre on Pomegranate, Solapur during 2015-16 and 2016-17. The crop regulation was done during mrigbahar by withholding the water during January- February months. Standard practices of bahar treatment viz., pruning, defoliation, manuring, etc were followed. The flowers were tagged during anthesis and fruit samples were drawn after fruitset at 15 days interval for physico-chemical analysis. During the fag end of maturity, the fruit samples were drawn at narrow interval of 3-5 days period so as to fix up the appropriate maturity indices under Solapur conditions.

Fruit weight was recorded using the electronic weighing scale. Fruit length and diameter, aril length and aril diameter were recorded using digital Vernier caliper. 100 aril weight was recorded using precision electronic balance. Total soluble solids content (TSS) was measured using Digital Refractometer (Atago, Japan Make) by placing a drop of juice on the prism which indicate how much a light beam will be slowed down when it passes through the fruit juice and recorded as °Brix. The tritrable acidity was determined through titration against 0.1N NaOH using phenolphthalein indicator (Ranganna, 1978). Brix-acid ratio was determined by dividing the TSS with Titrable acidity. The statistical analysis was carried out by following the standard procedure (Panse and Sukhatme, 1985).

A perusal of data given in Table 1 reveals that fruit weight ranged from 24.87 to 286.60g/ fruit. The increase in fruit weight was significant from 15 days after full bloom to 180 days after full bloom (313.33g). Beyond 180 days, there was no significant difference in the increase in fruit weight. This is in corroboration with the findings of Babu *et al*. (2014). Fruit length was found to range from 34.89 mm to 81.56mm during the different stages of fruit growth and development. The fruit length kept on increasing from 15 Days after full bloom (DAFB) (34.89mm) to 180 DAFB (81.56mm). The fruit length was maximum on 180 DAFB (81.56mm) and it remained constant afterwards. Similarly, the fruit diameter also had an upward trend and it recorded 82.59mm on 180DAFB. Similar results were also reported by Godara *et al*. (1989)

100 aril weight is an important trait in determining the aril size (boldness of arils). The 100 aril weight increased from 3.99g on 15 DAFB to 34.03g on 180 DAFB. The 100 aril weight increased significantly from 15 DAFB to 180 DAFB.

Beyond 180 days, there was a slight decrease in the 100 aril weight.

100 aril juice volume was about 1.30 ml on 15 DAFB. It increased significantly with the advancement of growth and development of fruits. On 180 DAFB, the juice recovery from 100 arils was about 23.00ml.

Aril length was found to increase from 15 DAFB to 180 DAFB. On 15 DAFB, it was 6.11mm, whereas it was 10.29mm on 180 DAFB. Similarly, aril width was also increasing from 15 DAFB (3.17mm) to 180 DAFB (6.48mm). This is in line with the findings of Mir et al., (2007) who also studied different physic-chemical properties of pomegranate.

Total soluble solids (TSS) content ranged from 8.22 to 15.95°B during the fruit growth and development period (Fig.1). On 15 DAFB, the TSS was minimum (8.22°B) and it attained the maximum on 180 DAFB (15.95°B). There was a significant increase in the TSS content of juice from 15 DAFB to 180 DAFB. Similar findings were also reported by Mir *et al*. (2012).

The titrable acidity content ranged from 0.64 to 0.50% during the fruit growth and development period (Fig. 2). On 15 DAFB, the TSS was highest (0.64%) and it attained the lowest level on 180 DAFB (0.50%). There was a significant decrease in the TSS content of juice from 15 DAFB to 180 DAFB which followed a downward trend. This is in line with the findings of Mir *et al.* (2007) and Babu *et al.* (2014).

The sugar acid or TSS acid ratio is often better related to palatability of fruit than either sugar or acid level alone. The brix acid ratio was ranging from 12.84 to 33.90 during the period of fruit growth and development. On 15 DAFB, it was 12.84, which showed a significant increase upto 180 DAFB (32.96). Beyond 180 days, this showed a slight decline (32.60)

Table 1. Determination of maturity indices for pomegranate variety Bhagawa

Sampling period (Days after full bloom)	Fruit weight (g)	Fruit length (mm)	Fruit dia (mm)	100 aril weight (g)	100 aril juice volume (ml)	Aril length (mm)	Aril width (mm)
15	24.87	34.89	33.52	3.99	1.30	6.11	3.17
30	43.31	52.34	50.28	5.99	1.95	6.16	4.10
45	76.81	56.57	52.66	10.56	3.67	7.52	4.76
60	120.58	64.64	65.19	16.81	9.17	8.36	5.46
75	156.48	68.11	67.04	18.52	12.00	8.79	5.79
90	187.77	69.50	68.71	20.65	13.50	9.05	6.06
105	213.05	71.72	70.90	22.12	15.00	9.52	6.18
120	234.42	73.70	72.86	24.58	16.33	9.80	6.26
135	255.70	75.12	74.86	28.42	18.83	10.01	6.38
150	268.64	78.11	77.05	31.67	20.00	10.17	6.40
165	279.06	79.08	79.75	32.83	21.60	10.25	6.42
180	285.33	81.50	82.54	34.03	23.00	10.29	6.48
185	286.60	81.56	82.59	34.01	22.80	10.29	6.48
CD(p=0.05)	10.08	3.76	1.02	0.54	0.78	0.24	0.13

From the above it can be concluded that the maturity indices for harvesting the fruits of pomegranate variety Bhagawa under Solapur conditions of Maharashtra is as detailed below:

S.No	Characteristics	Maturity index
1	Days after full bloom	180 days
2	100 aril weight	34.03g
3	TSS	15.95°B
4	Titrable acidity	0.50%
5	TSS/acid ratio	33.90

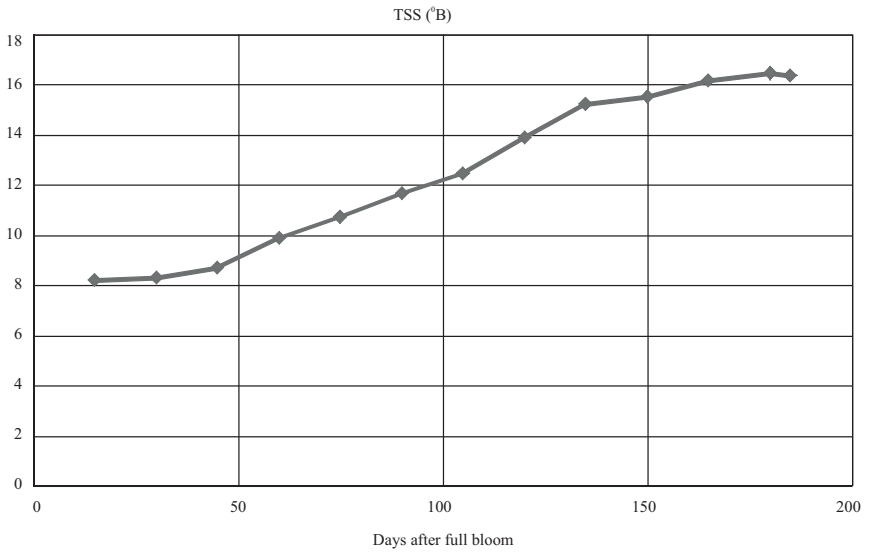

Fig. 1: Total soluble solids content of pomegranate cv. Bhagawa

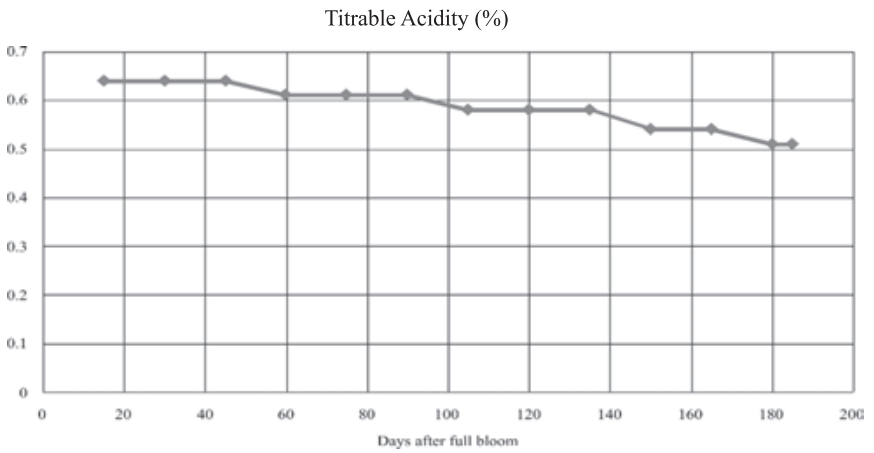

Fig. 2 : Titrable acidity of pomegranate cv. Bhagawa

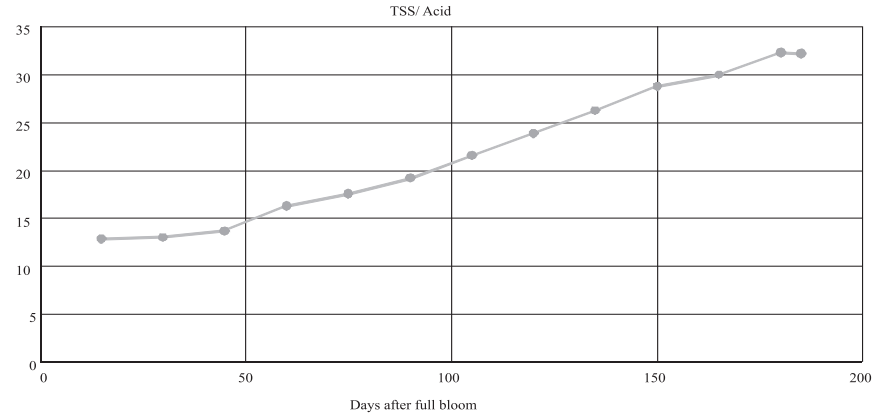

Fig. 3 : TSS/Acid ratio of pomegranate cv. Bhagawa

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