Changes in Physico-chemical Attributes of *Burmese Grape* (B*accaurea sapida* Muell. Arg.) during Growth and Development

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Abstract

Burmese grape or *Baccaurea sapida* Muell. Arg. is an underutilized fruit crop and it is grown as homestead condition of northern districts of West Bengal. Locally the fruit is called as *Latka*, or *Latkan* or *Lotko* or *Notko*. Very limited document is available regarding the fruit quality and its changing pattern during fruit growth and development pattern. The present study on developmental pattern of *Burmese grape* was carried out in respect to different physical and biochemical aspects of fruits on the plants of farmers house hold nearer to the Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal. All the plants aged between ten to fifteen years and were well grown, free from pests and diseases. After fruit set, the required fruit bunches were tagged on all sides to obtain uniform result. The fruits were harvested and subjected for studies on physico-chemical changes from 30th days after fruit set and continued up to 86th days after fruit set at weekly interval. Fruit size (length and diameter), juice content increased while peel thickness and seed weight decreased with advancement of maturity. Notable increase in TSS, sugar content and sugar: acid ratio were observed with decrease in acidity. At the time of harvest the fruits have attained TSS around 12.13^{O}Brix, acidity less than 2.16%, 4.18% total sugar and pericarp colour should be yellowish green. Considering the fruit size, fruit weight and all the fruit quality characteristics it is suggested that the *Burmese grape* can be harvested in between 80-85 days after fruit set for best desert quality.

1. Introduction

Burmese grape or *Baccaurea sapida* Muell. Arg. is an under exploited fruit of eastern India. It is found throughout Asia, including India and present in wild form in east and north eastern states and Andaman also. The fruits are harvested and used locally as desert. It is also used medicinally to treat skin disease. Still now no literature has been cited about its physico-chemical changes during and maturity. The harvesting of the fruit is also need to be standardized for desired quality and acceptability to the local market. In the present study, an attempt has been made to evaluate the bio-chemical pattern of fruit during its development to ascertain its optimum harvest period in North Eastern India.

2. Materials and Methods

The studies were carried out on the plants of farmers house hold nearer to the Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal. All the plants aged between ten to fifteen years and were well grown, free from pests and diseases infestation. After fruit set, the required fruit bunches were tagged on all sides to obtain uniform result. The fruits were harvested and subjected for studies on physico-chemical changes from 30th days after fruit set (DAFS) and continued up to 86th days after fruit set at 7 days interval. On each sampling date three fruit bunches were harvested randomly from each selected plant and ten fruits of each bunch were taken to observe the fruit length (cm), fruit diameter (cm), fruit weight (g), peel weight (g), peel thickness (mm) in average and 10 seed weight (g). The total soluble solids (TSS) of the fruits measured with hand refractometer. Total sugar content and titratable acidity were determined with standard of A.O.A.C., 1980. The observations were analyzed in a Randomized Block Design as suggested by Gomez and Gomez (1983).

3. Results and Discussion

The data presented on the tables represent the changes in physical and bio-chemical attributes of fruits under development from 30th to 86th DAFS. The changes in pericarp colour (Table 1) from green to light green, light yellowish green and finally yellowish green was mainly due to the degradation of chlorophyll to carotenoids during the developmental stages of fruits up to ripening (Singh, 2003). The significant increase was observed in fruit length (from 2.43 cm at 30th DAFS to 3.12 cm at 79th DAFS) and fruit diameter (2.16 cm at 30th DAFS to 3.14cm at 79th DAFS). This rapid increase in fruit size (Table 1 and Figure 1) in *Burmese Grape* with advance in age of the fruit became statistically stabilized at 79 DAFS. Thereafter a gradual increase was observed until last harvesting date when fruits obtained highest size (3.13 cm in length and 3.15 cm in diameter). The increase of fruit weight (Table 1 and Figure 1) was in similar trend of fruit size and was maximum at last harvest (17.85 g). The above increases may be due to cell division at early stages (Biale, 1950) and cell enlargement (Bain and Robertson, 1951). Translocation of carbohydrates from source to sink and accumulation (Coombe, 1960) may also responsible for increase of fruit size and fruit weight. The similar changes were observed by Mahajan (2002) in litchi and Dhillon et al. (2007) in pomegranate. In the present study the peel weight (Table 1 and Figure 2) was gradually increased up to 79th DAFS and became stabilized (5.59 g) after that. But the peel thickness (Table 1 and Figure 2) was in decreasing trend and was lowest (2.00 mm) on the last date of harvest. It is clear from the data presented on the Table 1 that juice content of 10 fruits from 7.29 ml at 30th DAFS to 69.17 ml at 86th DAFS periodically while the 10 seed weight (Table 1 and Figure 2) decreased from 4.58 g at 30th DAFS to 4.39 g at 86th DAFS with the advancement of maturity of fruits to maturity. Malhotra et al. (1983) and Sulman et al. (1983) also reported similar findings in case of pomegranate. Total sugar content (Table 2 and Figure 3) increased from 2.99% at 30th DAFS to 4.17% at 86th DAFS. This may be associated with increased translocation of photosynthates from leaves to the fruits (Lepold and Kriedman, 1975). TSS (Table 2 and Figure 3) also increased from 5.47° Brix at 30th DAFS to 12.13°Brix at 86th DAFS. This increase was possibly due to the difference in the *in vivo* activities of invertase (Chan et al., 1975). These sigmoid changes in total sugar and TSS were close accordance with those reported by Dhillon et al., 2007. The acidity (Table 2 and Figure 3) of the fruits was gradually decreased from 11.15% at 30th DAFS to 2.03% at 86th DAFS. The decrease in acidity during the fruit growth might be due to use of organic acids as respiratory substrates during ripening (Ulrich, 1974). Hence the sugar and acid ratio (Table 2 and Figure 3) increased from 0.27 at 30th DAFS to 2.05 at 86th DAFS. The findings were in agreement with those reported by Kodade et al. (1999) and

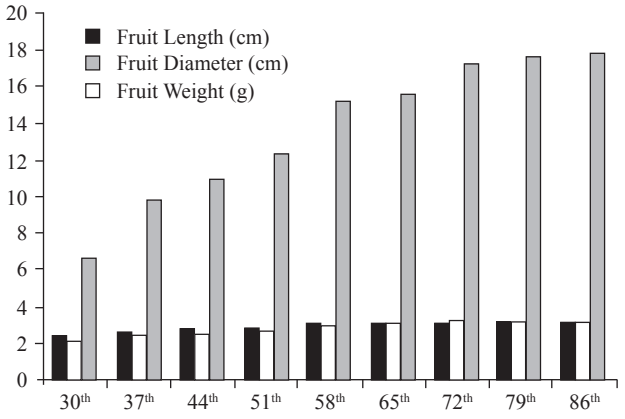

Figure 1: Changes in Fruit Length (cm), Fruit Diameter (cm) and Fruit Weight (g) of *Burmese grape*

Table 1: Changes in fruit physical characters of *Burmese grape*

Date of sampling	Days after fruit set	Changes in Fruit Physical Characters							
		Pericarp Colour	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Peel weight (g)	Peel thickness (mm)	10 Seed weight (g)	Juice content of 10 fruits (ml)
30-05-07	30	Green	2.43	2.16	6.67	3.35	2.20	4.58	7.29
07-06-07	37	Green	2.66	2.45	9.83	4.25	2.20	5.27	18.17
14-06-07	44	Green	2.74	2.56	10.85	4.78	2.20	5.88	31.10
21-06-07	51	Light Green	2.85	2.81	12.42	5.04	2.13	5.63	39.30
28-06-07	58	Light Green	3.03	3.01	15.25	5.21	2.07	5.92	59.17
05-07-07	65	Light Yellowish Green	3.07	3.07	15.67	5.75	2.07	5.54	64.53
12-07-07	72	Light Yellowish Green	3.09	3.13	17.34	6.42	2.03	5.33	65.53
19-07-07	79	Yellowish Green	3.12	3.14	17.67	5.59	2.03	4.44	69.57
26-07-07	86	Yellowish Green	3.13	3.15	17.85	5.59	2.00	4.39	69.17
SEm±	-		0.018	0.033	0.258	0.134	0.037	0.022	0.055
CD (*p*=0.05)	-		0.038	0.099	0.547	0.285	0.078	0.047	0.118

Table 2: Changes in fruit biochemical characters of *Burmese grape*

Date of Sampling	Days after fruit set	Changes in Biochemical Characters			
		Acidity (%)	Total sugar (%)	TSS (°Brix)	Sugar : acid ratio
30-05-07	30	11.15	2.99	5.47	0.27
07-06-07	37	6.87	3.17	9.27	0.46
14-06-07	44	4.01	3.46	9.73	0.85
21-06-07	51	3.27	3.65	11.27	1.11
28-06-07	58	2.50	4.09	11.33	1.63
05-07-07	65	2.32	4.09	11.47	1.76
12-07-07	72	2.31	4.18	12.00	1.81
19-07-07	79	2.16	4.18	12.13	1.93
26-07-07	86	2.03	4.17	12.13	2.05
SEm±	-	0.045	0.009	0.128	0.022
CD (*p*= 0.05)	-	0.095	0.019	0.271	0.046

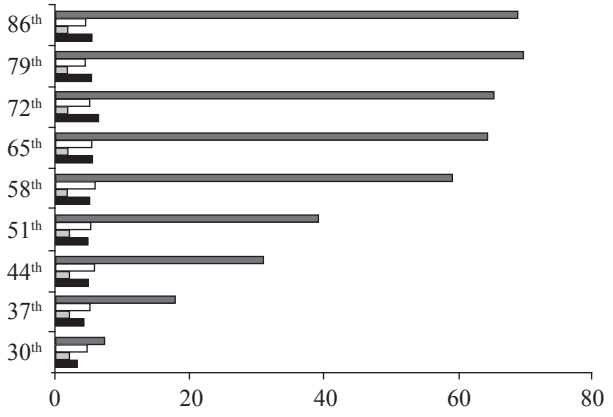

Figure 2: Changes in juice content of 10 fruits (ml), 10 seed weight (g), peel thickness (mm) and peel weight (g) of *Burmese grape*

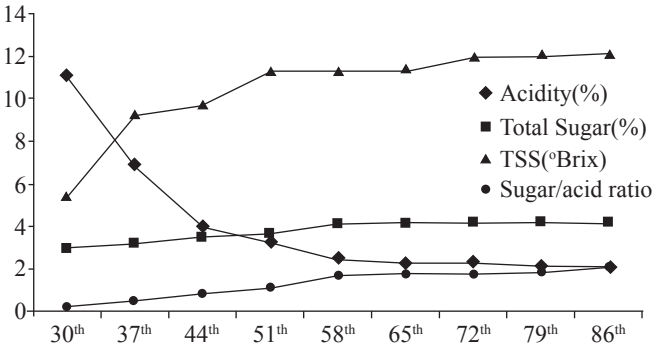

Figure 3: Changes in acidity (%), total sugar (%), TSS (obrix) and sugar:acid ratio of *Burmese grape*

Dhillon et al. (2007).

4. Conclusion

A perusal of data presented in the Table 1 indicate that about 85-90% maturity of *Burmese Grape* was completed within 19th July and remaining 8-10% maturity obtained by 26th July. In other words the fruits should be harvested in between 80-85 days after fruit set for best desert quality. At the time of harvest the fruits must have attained TSS around 12.13° Brix, acidity less than 2.16%, at least 4.18% total sugar and pericarp colour should be yellowish green.

5. Acknowledgement

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5. References

A.O.A.C., 1980. Official Methods of Analysis. Association of Official Analytical Chemistry, Washington, DC.

Bain, J.M., Robertson, R.N., 1951. Physilogy of Growth of Apple Fruits. Australian Journal of Scientific Research 4, 75-91.

Biale, J.B., 1950. Post Harvest Physiology and Biochemistry of Fruits. Annual Review of Physiology 1, 183-205.

Chan, H.T., Kwok, C.M., Owel, L., 1975. Sugar Composition and Invertase Enzyme Activity in Litchi. Journal of Food Science 40, 772-774.

Coombe, B.G., 1960. Relationship of Growth and Development to Changes in Sugars, Auxins, Gibberellins in Fruits of Seeded and Seedless Varieties of Vitis. Plant Physiology 35, 241-250.

Dhillon, W.S., Singh, A., Singh, R., 2007. Biochemical Changes in Developing Semi-soft Pear Fruits. Indian Journal of Horticulture 64(1), 81-83.

Dhillon, W.S., Kumar, A., 2004. Some Physico-biochemical changes During Fruit Development in Pomegranate. Indian Journal of Horticulture 61(3), 219-222.

Gomez, K.A., Gomez, A.A., 1983.Statistical Procedures for Agricultural Research. John Wiley and Sons, New York.

Kodade, M.S., Wavhal, K.N., Kala, P.N., 1999. Physico-chemical Changes During Growth and Development of Pomegranate Fruit. Indian Horticulture 47(1), 21-27.

Lepold, A.C., Kriedman, P.F., 1975. Plant Growth and Development. TATA McGraw Hill Publishing Company Ltd., New York.

Mahajan, B.H.C., 2002. Developmental Pattern and Maturity Standards of Litchi (*Litchi chinensis* Sonn) cv. Calcutta. The Orissa Journal of Horticulture 30(1), 43-45.

Malhotra, V.K., Khajuria, H.N., Jawanda, J.S., 1983. Studies on Physico-chemical Characteristics of Pomegranate Cultivars. Punjab Horticulture Journal 23, 158-161.

Singh, A., 2003. Jackfruit, Fruit Physiology and Production, Kalyani Publishers, India. 209.

Sulman, Y., Fainberstein, L., Lavee, S., 1984. Pomegranate Fruit Development and Maturation. Journal of Horticultural Science 59(2), 265-274.

Ulrich, R., 1974. Organic Acids. In: A.C. Hulme (Ed.). Biochemistry of Fruits and Their Products. Academic Press, New York. 89-118.