Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5909

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (6):** 223-226 (2017)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Fruit Development Studies in Sapota Cultivars

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Received: 19.10.2017 | Revised: 26.11.2017 | Accepted: 29.11.2017

ABSTRACT

Sapota fruit development followed a characteristic double sigmoid pattern growth which could be divided into three growths stages such as i) Period of rapid growth (1-6 months), ii) Lag phase or slow growth phase (6-7 months) iii) Accelerated growth phase (7-9 months). Results showed that cv. PKM-3 was recorded maximum fruit length (75.40 mm) whereas minimum fruit length was recorded in cv. Cricket Ball (57.41 mm). The minimum width was recorded in cv. Guthi (49.78 mm).

Key words: *Accelerated growth, Double Sigmoid, Fruit development, Lag phase, Rapid growth*

INTRODUCTION

Sapota (*Manilkara archas* (Mill) Forb.), a hardy fruit crop is commercially grown on a large area in Karnataka, Gujarat, Maharashtra, Andhra Pradesh etc. Area under this crop is increasing due to its wider adaptability to varied agro-climatic conditions and higher productivity. Trees are medium sized, erect to spreading evergreen plant with milky latex, growing to a height of 20 m.

Sapota fruit are prized for a pleasant aroma and sweet taste. Fruit growth follows a sigmoid pattern[1,2]. The main problems in sapota cultivation is its long gestation period between fruit set to fruit harvest, erratic flowering habit and the presence of fruit at all stages of development on the tree make it difficult to determine optimum harvest time**.** Fruit harvested later than optimum time usually soften very rapidly and become very difficult to handle. Fruit harvested earlier than physiological maturity may not soften, are usually low in sweetness and high in astringency when ripe with a rather unappealing alcoholic aftertaste, and form pockets of coagulated latex that lower quality. Unripe fruit are highly astringent and contain large amounts of leucoanthocyanidins. In addition, the climacteric nature of sapota fruits necessitates careful post-harvest handling to reduce losses, further hindering the storage and distribution of sapota fruits. Observable parameters such as fruit size, scurf content and colour of skin or peel after scratching have been correlated with the stages of harvesting of fruit. Nevertheless, considerable experience is required to make correct determinations.

Therefore, this study was carried out to know the observable changes occurs during fruit development during different growth stages and more precise determination of the time after fruit-set to reach maturity in sapota.

Cite this article: Choudhury, P., Shirol, A.M., Hiremath, S. and Pujar, D.U., Fruit Development Studies in Sapota Cultivars, *Int. J. Pure App. Biosci.* **5(6):** 223-226 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5909

MATERIALS AND METHODS

The present experiment was conducted at the 'All Indi Co-ordinated Research Project on Fruits, Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka during the period from 2013-2014. For this study 20 just set fruits (30 DAS) were selected from all direction and the fruit set was confirmed by enlargement of ovary. Observations were recorded at monthly interval. The distance between stalk end and apex of the fruit was considered as length while girth was measured at widest middle point of the fruit where maximum girth was noticed. The measurement was taken with the help of digital vernier caliper and expressed in millimeters (mm).

RESULTS AND DISCUSSION

The observations on fruit development at monthly interval showed that sapota fruit development followed a characteristic double sigmoid pattern growth which could be divided into three growths stages such as i) Period of rapid growth (1-6 months), ii) Lag phase or slow growth phase (6-7 months) iii) Accelerated growth phase (7-9 months).

The data reveals that in all the varieties, though the fruit growth during initial 1-2 month was slow but increases in length and width were rapid at the earlier stage of growth i.e. until the sixth month (30-180 DAFS). Growth slowed down from six to seven months (180-210 DAFS) after which the increase was rapid again. These results are in accordance with result obtained by Sundararajan and Mahadevarao[7], Sulladamath[6] and Mohamad *et al*[4]. The present investigation showed lag phase of one month (180-210 DAFS) which is in conformation with Mahadevaiah[3] and Mone[5]. The slow stage of growth at six to seven months was due to the embryo having reached maximum developmental state; the increase in growth observed after this period was due to the enlargement of the cells and the extracellular space. It was also observed that the diameter superseded the length during initial period of fruit growth after which increase in length become more visible.

Cv.PKM-3 was recorded maximum fruit length (75.40 mm) followed by cv.CO-1 (69.54 mm). Cv. Cricket Ball (57.41 mm) followed by CO-3 (58.79 mm) showed minimum fruit length. Among cultivars maximum fruit girth was recorded in DHS-1 (69.43mm) while Guthi (49.78 mm) followed by Kalipatti (54.06 mm) showed minimum fruit diameter. The significant difference among varieties for size of fruit during different developmental stage is may be due to their varietal character.

The figure illustrated that sapota fruit development followed a characteristic double sigmoid pattern growth which could be divided into three growths stages.

Table 1: Fruit length at different stages of fruit development in sapota cultivars

	Fruit length (mm)					Per cent increase in fruit length			
Cultivars	**30 DAFS**	**90 DAFS**	**150 DAFS**	**210 DAFS**	**270 DAFS**	**30-90 DAFS**	**90 -150 DAFS**	**150-210 DAFS**	**210-270 DAFS**
Kirthibarthi	7.56	13.57	38.80	45.70	53.52	79.49	185.92	17.78	17.11
Kalipatti	8.17	15.12	40.36	49.23	58.47	85.06	166.93	21.97	18.76
Guthi	7.90	14.37	40.03	48.65	58.86	81.19	178.56	21.53	20.98
Cricket Ball	8.32	13.20	38.36	46.06	57.41	58.65	190.60	20.07	24.64
Oval	8.24	13.71	39.35	46.74	64.61	66.38	187.01	18.78	38.23
CO-1	8.28	15.95	41.32	49.81	69.54	92.63	159.05	20.54	19.73
CO-3	8.33	14.21	40.09	48.21	58.79	70.58	182.12	20.25	21.94
PKM-2	8.51	15.59	42.68	51.66	61.23	83.19	173.76	21.04	18.52
PKM-3	8.62	15.61	44.29	52.35	75.40	81.09	183.72	18.19	44.03
DHS-1	9.07	14.24	41.92	50.13	65.56	57.00	194.38	21.91	30.77
DHS-2	8.27	13.86	40.20	49.17	65.35	67.59	190.04	22.31	32.90
S. Em ±	**0.061**	**0.16**	**0.094**	**0.05**	**0.11**	-	-	-	-
C.D. at 5%	**0.18**	**0.50**	**0.28**	**0.16**	**0.34**	-	-	-	-

DAFS = Days after fruit set

Table 2: Fruit girth at different stages of fruit development in sapota cultivars

Cultivars	Fruit girth (mm)					Per cent increase in fruit girth			
	30 DAFS	90 DAFS	150 DAFS	210 DAFS	270 DAFS	30-90 DAFS	90-150 DAFS	150-210 DAFS	210-270 DAFS
Kirthibarthi	8.50	12.65	34.12	41.21	60.75	48.82	169.72	20.78	47.41
Kalipatti	9.54	15.10	36.38	43.62	54.06	58.28	140.93	19.90	23.93
Guthi	8.15	13.36	34.73	42.35	49.78	63.93	159.95	21.94	17.54
Cricket Ball	8.75	14.19	38.16	46.75	61.49	62.17	168.92	22.51	31.53
Oval	9.31	14.21	36.40	44.30	60.87	52.63	156.15	21.70	37.40
CO-1	9.26	15.52	37.51	45.72	64.73	67.60	141.69	21.89	41.58
CO-3	9.09	15.38	37.31	45.85	59.82	69.19	142.59	22.89	30.46
PKM-2	8.94	15.09	33.64	41.38	54.57	68.79	122.93	23.01	31.87
PKM-3	9.10	15.73	34.50	42.45	53.86	72.85	119.32	23.04	26.88
DHS-1	9.42	15.01	38.76	46.84	69.43	59.34	158.23	20.87	48.23
DHS-2	8.21	13.48	36.82	44.72	58.21	64.19	173.14	21.45	30.16
S. Em ±	**0.03**	**0.03**	**0.04**	**0.02**	**0.20**	-	-	-	-
C.D. at 5%	**0.10**	**0.09**	**0.12**	**0.08**	**0.60**	-	-	-	-

DAFS = Days after fruit set

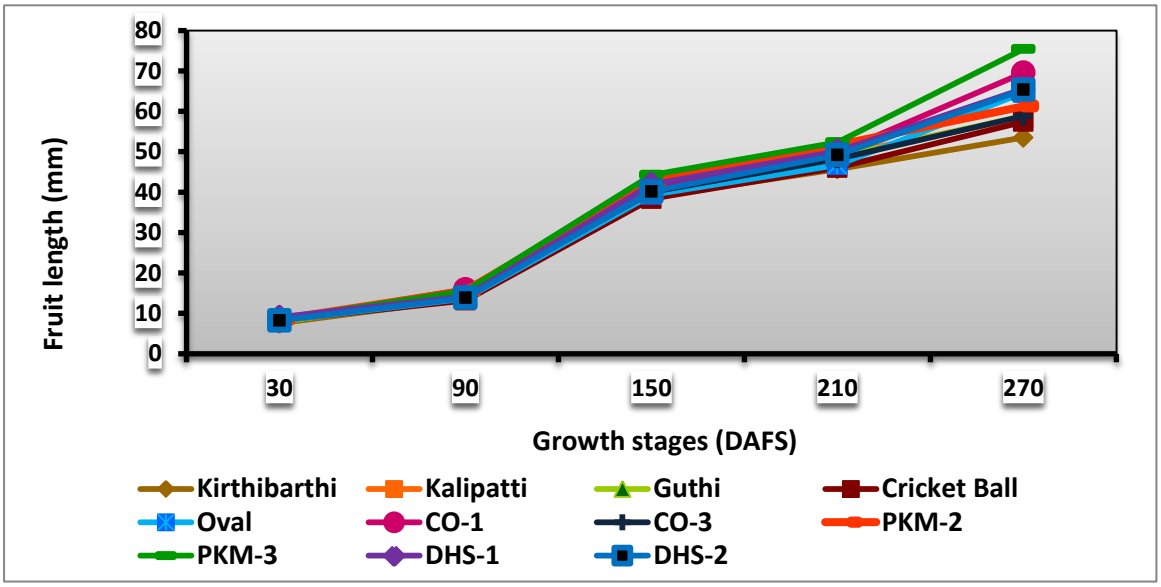

Fig. 1: Fruit length at different stages of fruit development in sapota cultivars

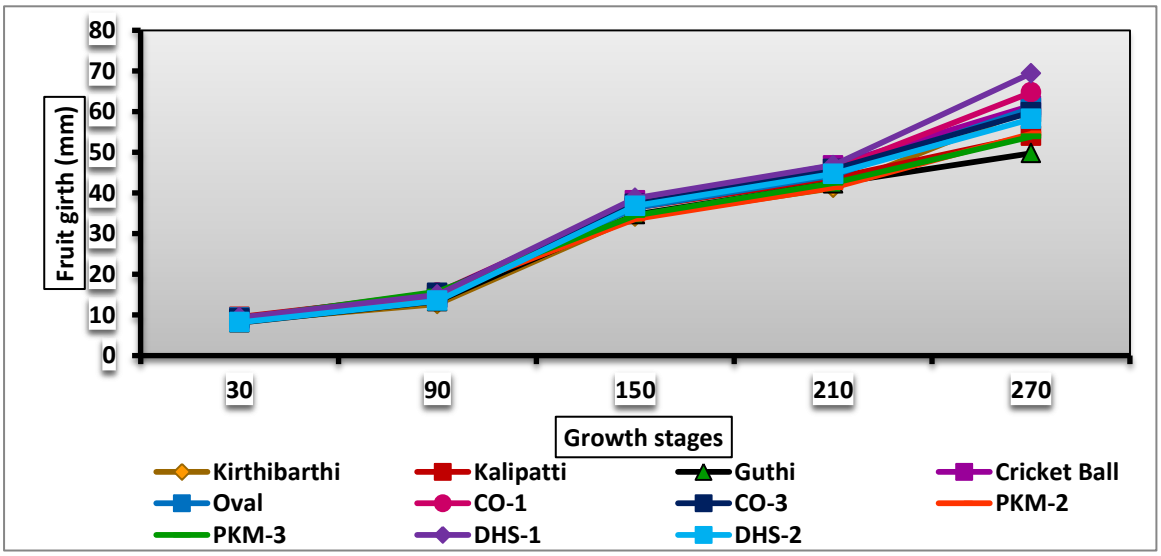

Fig.2: Fruit girth at different stages of fruit development in sapota cultivars

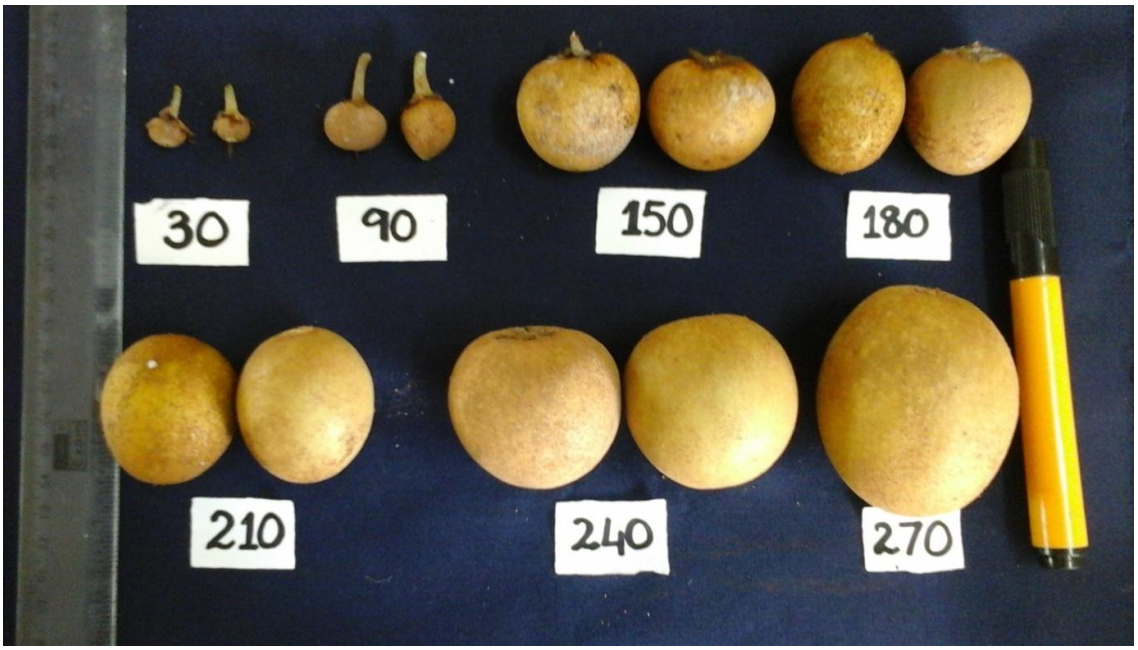

Plate 1: Stages of fruit development at different days after fruit set (DAFS)

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