

Original Research Article

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Flowering Behavior of Wax Apple Germplasms in New Alluvial Zone of West Bengal, India

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ABSTRACT

The performance of wax apple in new alluvial zone of West Bengal with five types was carried out at Horticulture Research Station, Mondouri, Bidhan Chandra Krishi Viswavidyalaya in the year 2015-16 with an objective of screening suitable wax apple types. A wide range of variation was noted in respect of flowering behavior and fruit yield parameters such as Flower bud emerged from 3rd week of October to last week of April with a period of bud development of 15.25 to 31.75 days among different germplasm of wax apple. The germplasms of wax apple flowered from 2nd week of November to 1st week of June with two (Type 1 and Type 2) or three (Type 3, Type 4 and Type 5) flowering seasons. The flowering duration was wide during 2nd flowering season (16.25-51.00 days) as compared to 1st (16.45-22.00 days) and 3rd flowering season (20.50-30.25 days). The duration of 2nd flowering season was higher in Type 3 (43.25 days), Type 4 (30.75 days) and Type 5 (51.00 days). It is concluded that the performance of Type 3, Type 4 and Type 5 are comparatively superior in new alluvial zone of West Bengal as compared to other types.

Keywords

Wax apple,
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Introduction

Wax apple, a member of the Myrtaceae family, is botanically identified as *Syzygium javanicum* Miq. (Syn. *S. samarangense* Merr. and Perry, *Eugenia javanica* Lam.). The various vernacular names are Java apple, samarang rose apple, makopa, wax jamboo etc. This tropical fruit tree is indigenous to regions extending from Malaya to the

Andaman and Nicobar Islands (Morton, 1987a). Wax apple and water apple (*Syzygium aqueum* Alst.) are somewhat similar fruits of the genus *Syzygium* but the later has originated in south India and the fruits have uneven shape, being wider at the apex than base. On the other hand, wax apple fruits are nearly round or bell shaped or pear shaped with long neck. Wax apple fruits are usually eaten fresh mainly as a thirst quencher and in salads. Fruit

has a cooling effect which makes it useful as a summer time fruit like cucumber. The greenish fruits are eaten raw with salt or may be cooked as a sauce. They are also stewed with true apples. Fruits have aromatic flesh, sweet taste and become crisp when ripe. The edible portion is about 80 per cent and water 90 per cent (Nakasone and Paull, 1998). Wax apple is a newly introduced fruit crop in India mainly from Bangladesh and Thailand. Fruits have more demand than water apple due to attractiveness with remarkable variation. It has immense scope of commercial cultivation in West Bengal and in tropical and sub-tropical regions. There are no recommended standard or named varieties in the country. Hence, the present research work entitled "Characterization of wax apple and water apple germplasm in new alluvial zone of West Bengal" was carried out with an objective to find out the suitable germplasm.

Materials and Methods

The experiment was carried out at Horticultural Research Station, Mondouri of Bidhan Chandra Krishi Viswavidyalaya for characterization of wax apple and at Farmers Training Centre (FTC), Kalyani of Bidhan Chandra Krishi Viswavidyalaya for characterization of water apple during the year 2015-16. The analytical works were conducted in the laboratory of the department of Fruits and Orchard Management, Mohanpur. Fifteen matured leaves were taken from each replicated plant for taking observations like leaf size and petiole length. Sixty fruits at edible ripe stage from each type comprising three replications were collected randomly and immediately brought to the departmental laboratory for studying the physico-chemical characters. Leaf and fruit size were measured with the help of a slide calipers and weight of fruits with digital pan balance. The total soluble solids (TSS) content of the fruits was measured with the help of a refractometer

which was calibrated in °Brix at 20 °C. Total sugars, reducing sugar and titratable acidity of fruits were determined by following the methods as described in AOAC (1984). The ascorbic acid content of fruits was determined by 2, 6-dichlorophenol indophenol dye titration method as described by Ranganna (2000). The quantitative or measured data obtained were analyzed statistically by the analysis of variance method as suggested by Panse and Sukhatme (1978) and the significance of different source of variation was tested by error mean square by Fisher's 'F' test of probability level of 0.05 percent.

Results and Discussion

Emergence and development of flower bud and fruit set

Time of flower bud emergence

Table 1 exhibited that flower bud emerged twice in Type 1 and Type 2 and thrice in Type 3, Type 4 and Type 5. The flower bud from 1st flush appeared earliest in Type 5 (3rd week of October). The variation in the time of flower bud emergence during 2nd flush was noted from 3rd week of January to 1st week of March. Earliest flower bud emergence was observed in Type 5 whereas it was late in Type 1 (last week of February) and Type 2 (1st week of March). Similarly, the variation in the time of flower bud emergence during 3rd flush was noted from 1st week of March to last week of April.

Period of flower bud development

The data in Table 1 clearly indicated that maximum period (22.25 days) required for flower bud development was in Type 5 during 1st flush. During 2nd flush, the maximum and minimum period of flower bud development was observed in Type 3 (31.75 days) and Type 2 (21.25 days), respectively.

Table 1: Emergence and development of flower bud and fruit set of different wax apple germplasm

Types	Flower bud emergence			Period of flower bud development (Days)			Number of flower bud/cyme			Number of fruit set/cyme		
	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush
Type 1	--	Last week, February	Last week, April	--	25.25	15.50	--	3.72	3.00	--	2.25	1.70
Type 2	--	1 st week, March	Last week, April	--	21.25	15.25	--	3.25	3.20	--	2.27	1.97
Type 3	Last week, October Last week, October 3 rd week, October	Last week, January	1 st week, April	20.10	31.75	27.25	3.20	3.80	3.45	1.86	2.32	2.60
Type 4		3 rd week, February	1 st week, April	21.45	23.00	23.75	2.85	4.60	3.02	1.65	2.90	2.62
Type 5		3 rd week, January	1 st week, March	22.25	27.00	20.00	3.25	5.00	3.62	1.84	3.30	2.55
SE(m)±	--	--	--	--	0.77	0.86	--	0.11	0.10	--	0.10	0.11
LSD(0.5)	--	--	--	--	2.41	2.69	--	0.36	0.33	--	0.33	0.36

Table 2: Flowering behaviour of different wax germplasm

Types	Start of Flowering			End of Flowering			Flowering Duration (Days)			Peak Flowering Duration (Days)		
	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush	1 st Flush	2 nd Flush	3 rd Flush
Type 1	--	3 rd week, March	1 st week, May	--	1 st week, April	Last week, May	--	16.25	20.50	--	6.50	6.25
Type 2	--	3 rd week, March	2 nd week, May	--	1 st week, April	1 st week, June	--	16.25	24.25	--	6.00	7.00
Type 3	2 nd week, November	Last week, February	Last week, April	Last week, November	1 st week, April	Last week, May	16.45	43.25	20.25	5.85	13.25	6.50
Type 4	2 nd week, November	2 nd week, March	Last week, April	1 st week, December	2 nd week, April	3 rd week, May	22.00	30.75	20.75	7.55	13.00	7.50
Type 5	2 nd week, November	3 rd week, February	3 rd week, March	Last week, November	1 st week, April	3 rd week, April	19.25	51.00	30.25	6.20	15.50	9.00
SE(m)±	--	--	--	--	--	--	--	0.59	0.76	--	0.52	0.43
LSD(0.5)	--	--	--	--	--	--	--	1.84	2.37	--	1.62	1.34

However, flower bud development during 3rd flush was maximum in Type 3 (27.25 days) and minimum in Type 2 (15.25 days).

Number of flower bud per cyme

It is revealed from Table 1 that the number of flower bud was recorded higher (3.25-5.00/cyme) during 2nd flush as compared to 1st flush (2.85-3.25/cyme) and 3rd flush (3.00-3.62/cyme) irrespective of germplasm. Second flush produced higher number of flower buds in Type 5 (5.00/cyme) and Type 4 (4.60/cyme). Type 1 and Type 3 showed moderate number of flower buds (3.72 and 3.80/cyme, respectively) whereas Type 2 had least number of flower bud (3.25/cyme).

Number of fruit set per cyme

It is clearly noted from Table 1 that the number of fruit set was very less during 1st flush (1.65-1.86/cyme). Fruit set varied significantly during 2nd flush (2.25-3.30/cyme) and 3rd flush (1.70-2.62/cyme). Maximum fruit set from 2nd flush was recorded in Type 5 (3.30/cyme) and lesser in Type 1 (2.25/cyme) and Type 2 (2.27/cyme). During 3rd flush, maximum fruit set was recorded in Type 4 and minimum in Type 1.

Flowering behavior

Table 2 revealed that flowering occurred twice in Type 1 and Type 2 whereas it was thrice in remaining three types. The start of flowering from 1st flush was noted from 2nd week of November in Type 3, Type 4 and Type 5. The variation of start of flowering from 2nd flush among different wax apple germplasm was noted from 3rd week of February to 3rd week of March whereas it was from 3rd week of March to 2nd week of May during 3rd flush. Type 5 produced flowering earliest in both 2nd flush (3rd week of February) and 3rd flush (3rd week of March).

End of flowering

In Table 2, it is clearly noted that the end of flowering ranged from last week of November to 1st week of December during 1st flush, 1st week of April to 2nd week of April during 2nd flush and 3rd week of April to 1st week of June during 3rd flush. All the types completed flowering from 2nd flush on 1st week of April except Type 4 which ended on 2nd week of April.

Duration of flowering

It is clearly noted from the Table 2 that the duration of flowering during 2nd flowering season varied widely (16.25-51 days) among different germplasm whereas the variation was less during 1st (16.45-22 days) and 3rd (20.25-30.25 days) flowering season. Type 5 showed maximum flowering duration in both 2nd flush (51.00 days) and 3rd flush (30.25 days). Flowering duration of 2nd flush was least (16.25 days) in both Type 1 and Type 2.

Peak flowering periods

Table 2 showed peak flowering period with duration of 5.85 to 15.50 days irrespective of type and flush. However, the variation was wide during 2nd flush with higher duration of peak flowering period in Type 3 (13.25 days), Type 4 (13.00 days) and Type 5 (15.50 days) and lesser in Type 1 (6.50 days) and Type 2 (6.00 days). The variation of peak flowering period was less during 1st flush (5.85-7.55 days) and 3rd flush (6.25-9.00 days), irrespective of types.

In the present experiment, flower bud emerged from 3rd week of October to last week of April with a period of bud development of 15.25 to 31.75 days. Saha Ray (1995) obtained more duration for development of flower bud. Wax apple, in the present studies, flowered from 2nd week of

November to 1st week of June with two (Type 1 and Type 2) or three (Type 3, Type 4 and Type 5) flowering seasons. The flowering duration was wide during 2nd flowering season (16.25-51.00 days) as compared to 1st (16.45-22.00 days) and 3rd flowering season (20.50-30.25 days). The duration of 2nd flowering season was higher in Type 3 (43.25 days), Type 4 (30.75 days) and Type 5 (51.00 days). Morton (1987 b) noticed that the tree blooms in March and April in India and from April to June in Java. The number of flowering and fruiting times in the present studies was more as compared with the findings of Al Saif *et al.*, (2011).

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