



Evaluation of an off season pummelo germplasm in the hilly region of Bangladesh

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ABSTRACT

The study was conducted at the Hill Agricultural Research Station, BARI, Khagrachari during the year 2016 to 2018. One off-season/late season pummelo germplasm (CGKha001) was selected for the evaluation along with a check variety (BARI Batabilebu5). High yielder (107 fruits/plant and 154.1 kg/plant) on 12 year old plant compared to check variety (18.33 fruits/plant and 16.04 kg/plant). Fruits of the proposed line were pyriform shape, large size average individual fruit weight (1450 g) with excellent light yellow colour of rind where check variety produced less (875 g). Pulp is very sweet in taste, soft juicy, light pink in colour, having pleasant aroma and bitterness. Average edible portion was high (67.55%). Average TSS was comparatively high (9.30%) than check variety (9.05%). Fruit retention percentage was very high. Seeds were small in size (weight of 100 seed is 40.44 g). The germplasm (CGKha 001) was less susceptible to insect-pests and diseases and plant can survive in drought condition. In general, the fruiting season of pummelo starts from August to October, but the fruit of the selected line were harvested till late January. Thus it will help in extending availability of pummelo as well as may increase the export of sweet pulp citrus.

INTRODUCTION

Citrus is grown commercially in tropical as well as sub-tropical regions of the world (Ahmed et al., 2019). Pummelo (*Citrus grandis*) is one of the important citrus fruits grown all over the country. It is originated from the island east of Malaya archipelago including Fiji or in China (Bose et al., 2001). It contains vitamin C more than twice than those of other citrus which can fulfill the demand of vitamin C. The fruit is a fat, sodium and cholesterol free and this makes a very good source for dieters. It is also a good source of vitamin C and calories (Roy et al., 2014). A wide genetic variation of pummelo germplasm was observed in the Hilly areas. But most of them are one season flowering. Hence, the study was undertaken to select high yielding desirable line for off-season/late-season bearing.

MATERIALS AND METHOD

The experiment was laid out during the years 2016 to 2018 on trees grown at Hill Agricultural

Research Station, BARI, Khagrachari. An off-season/late-season pummelo germplasm (CG Kha 001) along with a check variety (BARI Batabilebu5) was selected for the study. The manures and fertilizers were applied at the rate of Cow dung 15kg, Urea 500g, TSP 400g and MOP 450g per plant. Fertilizers are to be applied in two equal installments. First half: April-May (Before monsoon) and rest half: September- October (After monsoon). Fertilizers are applied in pegging method at hilly. Irrigation was given at 15 days' interval during dry season. Flowering time, March-April was observed in the off-season/late-season line CGKha001. Fully mature fruits were harvested from the plant and data on different parameters were recorded after ripening of the fruits and the mean data have been presented in the Table. Fruits were harvested from December-January. Data on plant growth characteristics, yield attributes and yield, quantitative fruit characters, qualitative fruit characters and disease-pest reaction were recorded) on the basis of IPGRI (International Plant Genetic Resources Institute) Citrus descriptor (Anonymous, 1999). For fruit

characters, ten fruits/plant were collected randomly and observation were recorded on each fruit separately fruit diameter, fruit length, albedo thickness, fruit rind thickness, fruit axis diameter, seed length and seed width were recorded using Digital Vernier Calipers. Total soluble solids content of fully mature fruits was recorded using Digital Hand Refractometer. Seeds from fruits in each replication were collected by cleaning and washing. Seed number/fruit was counted manually for each fruit. Seed weight was recorded on the basis of average of 20 seeds per replication. Three years pooled data were used to evaluate the germplasm.

Tree volume was calculated by using the formula. Tree volume (m³) = 4.3 x π x spread (East-West x North- South/ 4 x height/2).

RESULT AND DISCUSSION

Table 1: Growth characteristics of pummelo germplasm in the hilly region

Accession/Variety	Age of tree (Years)	Plant height (m)	Base girth (cm)	Canopy Spreading (m)		Tree volume (m ³)
				E/W	N/S	
BARI Batabilebu5	8	3.3	30.75	3.20	2.94	16.92
CG Kha001	12	5.3	82.25	3.5	3.0	29.91

Yield attributes and yield of pummelo germplasm

Average number of fruits per plant was found 106.67 for the evaluated lines (CG Kha001) and 18.33 for the check variety (BARI Batabilebu5). Three years pooled average yield/plant was 24.04 t/ha (154.1 kg/plant) for the evaluated lines (CG Kha001) and 10.03t/ha (16.04 kg/plant) for the check variety (BARI Batabilebu5).

Table 2: Yield attributes and yields of pummelo germplasm

Accession/Variety	Fruit/plant (No.)	Yield/plant (Kg)	Yield (t/ha)
BARI Batabilebu5	18.33	16.04	10.03
CG Kha001	106.67	154.1	24.04

Quantitative fruit characters of pummelo germplasm

Three years pooled data on growth, yield, yield components, fruit characteristics and disease and pest reaction of pummelo (CG Kha 001) at HARS, Khagrachari during 2016-17, 17-18 & 18-19 are given in Table 1-5.

Growth characteristics of pummelo germplasm

The plant of evaluated line (CG Kha001) was medium in size (5.3 m) and regular bearing in habit while the check (BARI Batabilebu5) was 3.3 m height. Base girth was 82.25 cm of the evaluated lines (CG Kha001) and 30.75 cm for the check (BARI Batabilebu5). Tree volume (m³) was recorded 29.91 for the evaluated lines and 16.92 cm for the check (BARI Batabilebu5) where E/W×N/S canopy (m) was 3.5×3.0 for the evaluated line (CG Kha001) and 3.20×2.94 for the check (BARI Batabilebu5).

Three years pooled average individual fruit weight was 1450 g for the evaluated lines (CG Kha001) and 875g for the check variety (BARI Batabilebu5). Mitra et al. (2011) obtained more wide range of fruit weight (570 – 2010 g), but studied by Ara et al. (2008) and Samarasinghe (2005) the variation of fruit weight was more or less similar. Average length & breadth was 14.8 cm & 13.33 cm for the evaluated lines (CG Kha001) while for the check variety (BARI Batabilebu5) it was found 11.64cm & 12.26cm respectively. Average skin weight was found 448.67 g for the evaluated lines (CG Kha001) and 238 for the check variety (BARI Batabilebu5). Average 100 seed weight was found 40.44 g for the evaluated lines (CG Kha001) and 45.69g for the check variety (BARI Batabilebu5).

Average pulp weight was found 981.94 g for the evaluated lines (CG Kha001) and 590.2 for the check variety (BARI Batabilebu5). Average edible portion also found higher (67.55%) for the evaluated lines (CG Kha001) while less (66.26%)

was observed for the check variety (BARI Batabilebu5).

Rind thickness (cm) was found similar (1.04 & 1.05) for both the Accession/Variety. Average no. of seeds/fruit was found 56.28 for the evaluated lines (CG Kha001) and 52.5 for the check variety (BARI Batabilebu5). Average no. of segments/fruit was found 14.43 for the evaluated lines (CG Kha001) and 12.67 for the check variety (BARI Batabilebu5).

Table 3: Quantitative fruit characters of pummelo germplasm(s) in the hilly region

Accession/Variety	Individual fruit weight(g)	Fruit size	
		Length (cm)	Breadth (cm)
BARI Batabilebu5	875	11.64	12.26
CG Kha001	1450	14.8	13.33

Accession/Variety	Skin weight (g)	100 weight (g)	Seed
BARI Batabilebu5	238	45.69	
CG Kha-001	448.67	40.44	

Accession/Variety	Pulp weight (g)	Edible portion (%)
BARI Batabilebu-5	590.2	66.26
CG Kha-001	981.94	67.55

Accession(s)/Variety	Rind thickness (cm)	Seeds/fruit (No.)	Segments/fruit (No.)
BARI Batabilebu-5	1.04	52.5	12.67
CG Kha-001	1.05	56.28	14.43

Table 4: Qualitative fruit characters of pummelo germplasm(s) in the hilly region

Accession(s)/Variety	TSS (%)	Fruit shape	Skin colour	Mesocarp colour	Flesh colour	Flesh texture	Bitterness
BARI Batabi5	9.05	Spheroid	Yellowish green	Light pink	Pinkish	Soft Juicy	Nil
CG Kha001	9.30	Pyriform	Light Yellow	Light pink	Pinkish	Soft Juicy	Nil

Qualitative fruit characters of pummelo germplasm

Average TSS is comparatively high (9.30%) for the evaluated lines (CG Kha001) compared (9.05%) to the check variety (BARI Batabilebu5). Shape of fruit was found pyriform for the evaluated lines (CG Kha001) while it was observed spheroid for the check variety (BARI Batabilebu5). Light yellow skin color was observed for the evaluated lines (CG Kha001) and yellowish green for the check variety (BARI Batabilebu5). Light pink mesocarp colour was observed for both the accession/variety. Flesh color was observed same (pinkish) for both the accession/variety. Texture of flesh also found same (soft juicy) for both the accession/variety. Bitterness found nil for both the accession/variety. The accession/variety is less susceptible to insect-pests and diseases.

CONCLUSION

The line CG Kha 001 was selected as it performed best among the germplasm in terms of adaptability, yield, fruit quality, attractiveness and tolerant to diseases and insect. In general, the fruiting season of pummelo starts from August to October, but the fruit of the selected line can be harvested till late January. So this line has been proposed for releasing as a late variety. Thus it will help in extending availability of pummelo as well as may increase the export of sweet pulp citrus.

Table 5: Disease and insect pest incidence of the line CG Kha 001 over BARI Batabilebu5 (Control)

Accession/variety	Disease incidence	Pest infestation
2017		
BARI Batabilebu5	-	Lemon butterfly, Leaf miner
CG Kha-001	-	Lemon butterfly
2018		
BARI Batabilebu5	Shooty mold	Lemon butterfly, Leaf miner
CG Kha-001	-	Lemon butterfly
2019		
BARI Batabilebu5	-	Leaf miner
CG Kha-001	-	Lemon butterfly

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