

## Collection and evaluation of Colombo lemon germplasm at Narsingdi region, Bangladesh

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### Abstract

The experiment was conducted to evaluate at the research field of Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Shibpur, Narsingdi from 2014-16 with RCBD design and three replication. Five Colombo lemon germplasm, viz. CL Nar-001, CL Nar-002, CL Nar-003, CL Nar-004 and CL Nar-005 were included in this study. Significant variation was observed in case of growth, yield contributing characters, yield and fruit quality of the germplasm studied. The highest plant height (4.02 m), base girth (0.1 m), canopy spreading (3.49 m × 3.20 m) were noted from the germplasm CL Nar-005. Maximum number of fruits/plant (89.01) yield (15.31 t/ha) were obtained from CL Nar-005. On the other hand minimum (81.62) number of fruit/plant, yield (229.06 t/ha) was recorded in CL Nar-003. CL Nar-005 was also free from disease whereas the others suffered from gummosis. Leaf miner was common in case of all the germplasm. Fruit size was the highest in CL Nar-005 (13.46 cm × 7.60 cm) followed by CL Nar-004 (12.65 cm × 6.75 cm). Pulp color is white for all the germplasm. But juicy content is high and strong juice and fruit aroma was found in CL Nar-005. Maximum edible portion (61.19 %) and percent TSS (7.13 %) was noticed from CL Nar-005.

**Keywords :** Germplasm, Canopy, yield, fruit size and Pulp

### Introduction

Different lemon and lime are popular in Narsingdi which have significant variation. Colombo lemon (*Citrus limon*) is popular for its extraordinary aroma and size. Its a commercially important citrus fruit crop and every year a huge amount of Colombo lemon is exported in different European countries. Its skin is edible and used for perfume production. Seed is the main mode of propagation of citrus fruits (IPGRI, 1999). So variability is found among different genotypes (Ballve *et.al*). Due to climate and soil type mutation and segregation is always conducted. Nonetheless different genotype has significant characteristics which are also needed to characterize. But there is no recommended variety of Colombo lemon. It is essential to find out significant variation so that there can be released a wonderful variety. For this above mentioned research work was accomplished.

### Materials and Methods

The experiment was conducted at Regional Horticulture Research Station of Bangladesh Agriculture Research Institute, Shibpur, Narsingdi during the year 2015-16. Five Colombo

lemon lines were collected from the different locations of Narsingdi district. The plants were planted in March, 2014 and were planted in a single row system giving the spacing 4 m × 4 m accommodating 5 plants in each row. Each plant were fertilized with 15 kg cowdung, 90 g N, 90 g P, 100 g K, 4.0 g Zn and 1.0 g B in three equal splits during February, April-May and September-October. Fertilizer were applied around the tree up to the canopy spread leaving 50-100 cm from the tree base and mixed gently with the soil followed by irrigation (Fertilizer Recommendation Guide-2012, BARC). Two full cover spray of copper oxichloride (Amivit 50 WP @ 7g/L of water) was applied to control canker disease. Imidachloprid (Imitaf @ 0.25 ml/L) was applied to control leaf miner when new leaves emerged. Weeding was done in rainy season before applying fertilizer. Different quantitative and qualitative data were analyzed and means were separated by STAR computer programme.

### Results and Discussion

A wide variation was observed in growth, yield and fruit quality of Colombo lemon germplasm (Table 1). The highest plant height (4.02m) was

recorded from CL Nar-005 while the lowest (2.90 m) was found from CLNar-001. Base girth was noted the highest in CL Nar-004(0.14 m). CL Nar-005 was found with maximum canopy (3.49 m×3.20 m).In case of leaf lamina the highest length was recorded in CL Nar-005 (13.83 cm). Dense branching with good growth condition was found in BS Nar-005 and most of the other germplasm occupied with good and sparse branching with good growth condition (Table 1). Flowering time for all the germplasm was Jan-Feb and Aug-Sept. On the other hand harvesting time for all the germplasm was May-June and Dec-Jan (Table 1).

The highest number of fruits/plant (89.01) was obtained from CL Nar-005 followed by the lowest

(81.62) in CL Nar-003 (Table 2). Fruit size was observed maximum in CL Nar-005 (13.46 cm ×7.60 cm) followed by CL Nar-004 (12.65 cm × 6.75 cm). Fruit length (13.46 cm) and diameter (7.60 cm) was recorded maximum in CL Nar-005 and minimum length (9.07 cm) and diameter (5.65 cm) was found in CL Nar-003 (Tale 2). Individual fruit weight ranged from 229.06 g to 301.67 g.CL Nar-005 (301.67 g) and CL Nar-003 (229.06 g) were exhibited the highest and the lowest, respectively. Rind weight and rind thickness measured maximum (117.07 g) and (0.83 g) in CL Nar-005 but minimum (90.53 g) in CL Nar-003and (0.67 cm) in CL Nar-002. Pulp weight was maximum (184.60 g) in CL Nar-005 and minimum (138.53 g) in CL Nar-003.

**Table 1. Growth characteristics, flowering and harvesting time of the different Colombo lemon germplasm**

Accession	Plant height (m)	Base Girth (m)	Canopy(m)		Leaf size (cm)		
			E/W	N/S	Lamina length	Lamina width	Petiole length
CL Nar-001	2.90	0.09d	2.60	3.02	11.23c	6.63b	2.54
CL Nar-002	3.50	0.12b	3.05	2.80	12.17b	5.87d	2.26
CL Nar-003	3.30	0.11c	3.20	2.85	12.30b	6.33c	2.06
CL Nar-004	3.25	0.14a	2.90	3.10	11.16c	5.27e	2.20
CL Nar-005	4.02	0.12b	3.49	3.20	13.83a	7.71a	2.65
Level of sig.	NS	*	NS	NS	*	*	NS
CV (%)	8.85	6.63	7.01	9.21	10.12	8.65	9.32

\* indicate significant at 5% level of probability; NS: Not significant

**Table 1 contd.**

Flowering time	Branching density	Growth condition	Harvesting time
Jan-Feb & Aug-Sept	Sparse	Good	May-Jun & Dec-Jan
Jan-Feb & Aug-Sept	Sparse	Good	May-June & Dce-Jan
Jan-Feb & Aug-Sept	Sparse	Good	May-Jun & Dce-Jan
Jan-Feb & Aug-Sept	Dense	Good	May-Jun & Dec-Jan

**Table 2. Quantitative characteristics of fruit of the different Colombo lemon germplasm**

Accession	No. of fruit/plant	Fruit size(cm)		Individual fruit wt.(g)	Rind wt.(g)	Rind thickness (cm)	Pulp wt.(g)	No. of segment/fruit
		Length	Diameter					
CL Nar-001	83.13d	11.13c	6.23	259.79c	105.55c	0.72d	154.24c	11c
CL Nar-002	84.45c	10.92d	6.01	246.57d	101.67d	0.67e	144.90d	11c
CL Nar-003	81.62e	9.07e	5.65	229.06e	90.53e	0.73c	138.53e	10d
CL Nar-004	85.42b	12.65b	6.75	281.27b	112.10b	0.75b	169.17b	12b
CL Nar-005	89.01a	13.46a	7.60	301.67a	117.07a	0.83a	184.60a	13a
Level of sig.	*	*	NS	*	*	*	*	*
CV (%)	10.31	8.43	5.61	12.31	9.73	7.63	13.43	7.23

\* indicate significant at 5% level of probability; NS :Not significant

No. of seeds/fruit & seed wt./fruit measured maximum (24.67 & 4.95 g) in CL Nar-002 but minimum (19.21 & 3.41 g) in CL Nar-005 (Table 3). Edible portion is one of the most important features of any fruit. Maximum edible portion (61.19%) was recorded from CL Nar-005 as compared to minimum (58.76%) in CL Nar-002. The highest percent TSS (7.27%) was recorded in CL Nar-002, while the lowest (5.67%) was noted in CL Nar-001. The highest yield (15.31 t/ha) was recorded in germplasm CL Nar-005 and the lowest one (11.33 t/ha) in CL Nar-003.

Qualitative characteristics of the colombo lemon germplasm are shown in table 4. In respect of fruit shape fruit skin color all the germplasm

showed ellipsoid shape and green in color. Most of the fruit surface texture was rough whereas one of them is bumpy and another is smooth. Pulp color (white) and pulp consistency (soft and sticky) were all alike. Juice content in endocarp reflects in most of the germplasm was medium but only CL Nar-005 content high. Juice taste evaluation was very good only for CL Nar-005 and in rest of the germplasm was pleasant. Fruit aroma and juice aroma were strong only in CL Nar-005 and in the rest of the germplasm was average.

No disease infection was observed in CL Nar-003 and CL Nar-005 whereas the others suffered from gummosis. Leaf miner was common in all of the germplasm (Table 5).

**Table 3. Quantitative characteristics of fruit of the different Colombo lemon germplasm (continued)**

Accession	No. of seeds/fruit	Seed wt./fruit(g)	yield (t/ha)	Edible portion(%)	TSS (%)
CL Nar-001	24.54a	3.45	12.85c	59.37c	5.67e
CL Nar-002	24.67a	4.95	12.56c	58.76d	7.27a
CL Nar-003	22.45b	3.45	11.33d	60.47b	6.95d
CL Nar-004	21.03c	3.43	13.42b	60.14b	7.10c
CL Nar-005	19.21d	3.41	15.31a	61.19a	7.13b
Level of sig.	*	NS	*	*	*
CV(%)	9.10	8.36	7.01	11.12	5.87

\* indicate significant at 5% level of probability; NS :Not significant

**Table 4. Qualitative characters of fruit of the different Colombo lemon germplasm**

Accession No.	Fruit Shape	Fruit skin color	Fruit surface Texture	Pulp color	Pulp consistency
CL Nar-001	Ellipsoid	Green	Rough	White	Soft & Sticky
CL Nar-002	Ellipsoid	Green	Bumpy	White	Soft & Sticky
CL Nar-003	Ellipsoid	Green	Smooth	White	Soft & Sticky
CL Nar-004	Ellipsoid	Green	Rough	White	Soft & Sticky
CL Nar-005	Ellipsoid	Green	Rough	White	Soft & Sticky

**Table 4.1 Qualitative characters of fruit of the different Colombo lemon germplasm (continued)**

Accession No.	Juice content in endocarp	Juice taste	Juice taste evaluation	Fruit Aroma	Juice Aroma
CL Nar-001	Medium	Acidic	Pleasant	Average	Average
CL Nar-002	Low	Acidic	Pleasant	Average	Average
CL Nar-003	Medium	Acidic	Pleasant	Average	Average
CL Nar-004	Medium	Acidic	Pleasant	Average	Average
CL Nar-005	High	Acidic	Very good	Strong	Strong

**Table 5. Disease and insect pests of the different Burmese grape germplasm**

Accession	Disease incidence	Insect pest infestation
CL Nar-001	Gummosis	Leaf miner, citrus flat mite
CL Nar-002	Gummosis	Leaf miner, lemon butterfly
CL Nar-003	Nil	Leaf miner, lemon butterfly
CL Nar-004	Gummosis	Leaf miner, lemon butterfly
CL Nar-005	Nil	Leaf miner

**Conclusion**

Contemplating yield, edible portion, TSS, disease and insect infestation the germplasm CL Nar-005 showed the best characteristics among all of the other germplasm.

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