

Studies on Morphological and Biochemical Description of Elaichi Lemon- A Unique Aromatic Lemon Landrace of Tripura

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Abstract

Elaichi lemon locally known as Elaichi nimboo/ Elaichi lebu is popular and prominent in the Tripura after mandarin in Jampui hills because of its sweet aroma and flavour. It is found only in few pockets of Hawaibari, Teliamura region of Tripura and the region is known for commercial elaichi lemon production in the state. The microclimate of Hawaibari, Teliamura region favours the growth and typical fragrant of Elaichi lemon landrace as it is specifically found in that region only similar to that of Kachai village for Kachai lemon in Manipur. An investigation was carried out on Elaichi lemon, an aromatic lemon landrace of Tripura with an objective to characterize the morphological characters associated with yield. During the survey, two types of elaichi lemon available in the state: seeded and seedless. Plants are evergreen, aromatic, bushy type, dwarf with maximum height of 2 – 3m suitable for high density planting, fruiting round the year with 3 peak seasons of fruiting. There is a need for proper identification and description which is required for any future improvement programme and measures to be initiated for up scaling production and conservation of this economically important aromatic *Citrus* sp either *in situ* or *ex situ* etc.. Thus in the present study, few important morphological and physico - chemical properties have been evaluated on the basis of tree morphology, fruit and seed characters which are commonly considered for their greater applicability in determining the quality and consumers' acceptance.

Introduction

The Northeastern region of India is considered to be the natural home of various *Citrus* species (Ghosh, 1977; Gobind and Yadav, 1999). Several *Citrus* species and their natural hybrid have been reported to originate exist in this area; however, this vast indigenous *Citrus* diversity of India has not been used to its full potential for *Citrus* conservation and improvement programs. There are many important citrus species such as oranges, lemons, grapefruits, pummelos, and limes. Limes and lemons are acid members of this group. India is the leading country in the production of limes and lemons in the world with an approximate production of about 2.78 MT and a productivity of 10.77 MT/ha (Anon., 2017). Limes and lemon are grown in area of 4965ha with a production of 23931 MT and productivity of 4.82 MT/ha at Tripura (Anon., 2020). The probable centre of origin of *Citrus limon* (L.) Burm is the Eastern Himalaya. Singh and Singh (2006) collected 17 *Citrus* accessions belonging to different species (*viz.* *C. grandis*, *C. medica*, *C. aurantifolia*, *C. limon*, *C. reticulata*) from Tripura. The existence of citrus's vast resources has been a reason for

considering the NE India as one of the major centers of diversity of *Citrus* (Govind and Yadav 1999). Prominent landraces from the region include Kachai lemon, Elaichi lebu and Assam lemon. Among the different limes and lemon types grown in the state, Elaichi lemon is an important landrace of Tripura. Elaichi lemon locally known as Elaichi nimboo / Elaichi lebu is popular and prominent in the Tripura after mandarin in Jampui hills because of its sweet aroma and flavour costing @ Rs. 8-10/ fruit at market. It is found only in few pockets of Hawaibari, Teliamura region of Tripura and the region is known for commercial elaichi lemon production in the state contributing to the food, nutritional security and livelihood enhancement. I.P. Singh *et al* (2004) reported one dwarf genotype (plant height 2–3 m) known as *Elaichi Nimbu* was located in Teliamura area of West Tripura. During earlier times roadsides of the Hawaibari region were filled with the scent of elaichi lemon and passersby enjoyed the pleasant aromatic scent while traveling through that area. The fruit is round to oval in shape, green (light yellow when ripe) and comes to harvesting during the monsoon season. The microclimate

of the region favours the growth and typical fragrance of this landrace as is the case with Kachai lemon of Kachai village in Manipur. Hence, the study was conducted to characterize this aromatic landrace of Tripura for its morphological and biochemical characters.

Materials and Methods

Survey was conducted during the harvesting season at Hawaibari (23.8183°N, 91.5949°E), Teliamura, Khowai district of Tripura where comparative studies were done to differentiate and identify between the Elaichi lemons types observed in the area. Tree morphological parameters were recorded at the site. Fruits and leaves collected were taken to the laboratory at the ICAR research Complex for Northeastern Hill Region, Tripura Centre, Lembucherra

during harvesting season and few important physical properties like fruit morphology and quality parameters were recorded as per the standard procedures.

Results and Discussion

The study revealed that Elaichi lemon plants are evergreen, aromatic, bushy and spreading type, dwarf with maximum height of 2 – 3m, suitable for high density planting, fruiting round the year with 3 peak seasons of fruiting. During the survey, two types of elaichi lemon were identified: seeded and seedless. Both the tree types are spreading in nature with presence of thorns and leaves are dark green, scented with wingless petiole. The morphological and physico-chemical characters of the two types of Elaichi lemon types are presented in Table 1.

Table 1. Morphological and physico-chemical characters of two types of Elaichi lemon from Tripura

Characters	Type 1 (Seeded)	Type 2 (Seedless)
Leaf length (cm)	9.9	4.1
Leaf breadth (cm)	4.4	2.2
Fruit weight (g)	180.2	130.1
Fruit volume (ml)	146.0	105.0
Fruit length (cm)	7.3	5.7
Fruit diameter(cm)	6.5	5.4
Rind thickness (mm)	9.0	8.0
Juice content per fruit(ml)	29.0	28.0
No. of seeds per fruit	14	0
Yield (kg/plant)	65 - 70	55 -60
TSS (°Brix)	10	9.6
Titrateable acidity (%)	8.4	

It was found that seeded fruits were bigger in size with fruit length (7.3 cm), fruit diameter (6.5 cm), fruit weight (180.2 g) and number of seeds per fruit (14). Seedless fruits, on the other hand, were smaller in size with fruit length (5.7 cm), fruit diameter (5.4 cm), weight (130.1 g). Chhetri *et al.* (2018) also conducted similar investigations on Tasi orange, a semi-wild type of sweet orange in Arunachal Pradesh and reported two types one with bigger leaves and relatively narrow leaves and another with smaller fruits and broad leaves under semi wild conditions. Seed content plays a role in fruit

size. A linear relationship between fruit size and seed number is common in citrus, which indicates a strong influence of seeds on fruit development. Seedless fruit are generally small and an increase in the seed content can increase the fruit size as fruit development is linked to the development of the ovule. However, seedlessness has been considered as a desirable trait in *Citrus* species worldwide (Ciminet *al.*, 2021). Seedlessness may be due to various factors like environment (low and high temperature, chromosomal aberrations and some genetic factors like genes controlling meiosis process). The yield

of lime plantation was recorded to be comparatively low as the plantation was located on the unterraced hill slopes with practically no soil conservation measures adopted,

leading to nutrient erosion due to excessive rains leading exposure to comparatively less fertile and extremely acidic subsurface leading to a decline in productivity of orchard.



Fig.1. Elaichi lemon fruits from Hawaibari, Tripura



Fig 2. Unmanaged Elaichi lemon orchard and with the lady farmer at Hawaibari, Teliamura

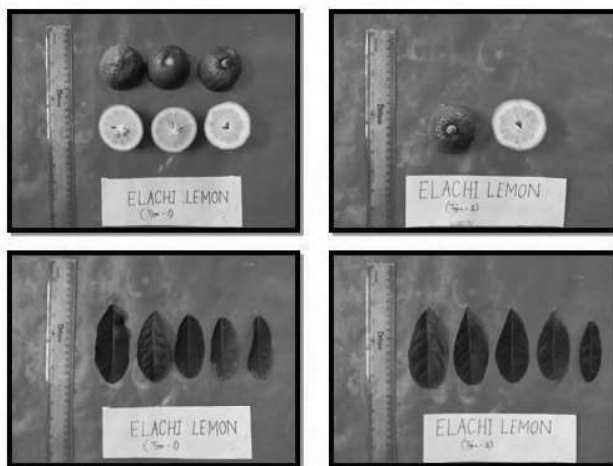


Fig 3. Morphological features of fruits and leaves of Type 1 and 2 of Elaichi lemon

Conclusion

Elaichi lemon, an aromatic lemon type is found growing under both wild and domestic need to be systematically characterize, evaluate, conserve and mass multiplied. Shifting cultivation and farmers' choice for commercial types only are identified as potential threats to the diversity of *Citrus* occurring in these areas. Little attention has been given for conservation and mass multiplication of this important land race. There is a need for proper identification and description required for any future improvement programme and measures to be initiated for up scaling production and conservation of this economically important aromatic *Citrus* species both through *in-situ* and *ex-situ* measures.

References

- Anon., (2017). Horticultural Statistics at a Glance (2017). National horticulture Board, Gurgaon, Haryana. pp 142.
- Anon., (2020). Economic Review of Tripura, 2019-20 21st Issue. Published by: Research & Publication Unit. Directorate of Economics & Statistics, Government of Tripura, Shankar Chowmuhani, Agartala, Tripura pp-62
- Chhetri Ashok, Angami, T., Omi Tayeng Hazarika B.N Pandey P.K. & Singh M.C.(2018). Studies on Morphological Description of Tasi, a Semi Wild Sweet Orange Type in East Siang District, Arunachal Pradesh. *International Journal of Agriculture Sciences*, 10(16): 6954-6955.
- Cimen, B., Yesiloglu, Incesu, M. & Yilmaz, B. (2021). Studies on mutation breeding in Citrus: Improving seedless types of 'Kozan' common orange by gamma irradiation. *Scientia Horticulturae*, 278, 109857.
- Govind S. & Singh I.P (2006). Evaluation of Citrus germplasm in North Eastern Hill region. *Indian Journal of Plant Genetic Resources*, 15:19-22.
- Govind S. & Yadav D.S. (1999). Genetic Resources of citrus in North Eastern Hill region of India. In: Singh S, Ghosh S.P (Eds.) Hi-Tech citrus management. ISC, ICAR, NRCC, Nagpur, pp. 38-46.
- Singh, I.P (2004). Exploration, collection and characterization of *Citrus* genetic diversity from Manipur and Tripura. *Indian Journal of Plant Genetic Resources*, 17(2):128-132.