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P Bhavithra
Assistant Professor
(Horticulture), Department of
Horticulture, Kumaraguru
Institute of Agriculture, Erode,
Tamil Nadu, India

Dr. R Kasthuri Thilagam
Assistant Professor (Food
science and Nutrition),
Department of Horticulture,
Kumaraguru Institute of
Agriculture, Erode, Tamil
Nadu, India

Evaluation of moringa genotypes (*Moringa oleifera* Lam.) for leaf yield and quality

P Bhavithra and Dr. R Kasthuri Thilagam

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Abstract

The present experiment was conducted at the moringa genetic resource garden, Department of Horticulture, Kumaraguru Institute of Agriculture, Erode, during 2023- 2024 using 8 moringa genotypes maintained in gene pool with an aim to identify suitable genotypes for high leaf yield with desirable quality traits for further use in hybridization programme and to assess the information on the genetic diversity at morphological level. The results of this study exhibited the significant importance among the eight different Moringa genotypes studied for growth, yield, and nutritional importance the accessions T₁ (Madurai local), T₃ (Keezhvani local), T₆ (Coimbatore local), T₇ (Moongilpatti local), showed the best results for fresh leaf yield per plant, No. of. Secondary branches, Leaf area, Chlorophyll, Moisture content, Carotenoid content, Plant height and No. of. Primary branches. Since it is a preliminary study to catalogue the growth, yield and nutritional content of selected eight different moringa genotypes.

Keywords: Moringa, leafy yield, genotypes, nutrition, growth

Introduction

Moringa (*Moringa oleifera* Lam.) is a type of local medicinal Indian herb which has turned out to be familiar in the tropical and subtropical countries. The other terms used for Moringa are 'Horse Radish' tree, 'Drumstick' tree, 'Ben-oil tree', 'Behen oil tree', 'Cabbage tree', 'Mother's best friend' and 'Miracle tree'. *Moringa oleifera* is a native of the sub-Himalayan regions of Northwest India, which is now indigenous to many regions in Africa, Arabia, South East Asia, the Pacific and Caribbean Islands and South America. A total of 13 tropical and subtropical species of the Moringa genus are known.

Moringa plants can grow and survive in a wide range of climatic and edaphical situation. The tree is reported to be tolerate up to 48 degree Celsius and can survive in shade, light frosts and can also establish well in slightly alkaline soils upto pH 9 (Chang *et al.*, 2006) ^[1]. Anwar *et al.*, (2007) ^[2] reported that this plant is an important food commodity which serves as a natural nourishment for the people of the tropics and sub-tropics.

The leading producer of moringa vegetable is India, with an annual production rate of 1.1 to 1.3 million ton from 38000 ha of land (Rajangam *et al.*, 2001) ^[2]. In India, moringa is cultivated in Andhra Pradesh, Tamilnadu, Karnataka, Kerala, Maharashtra and Orissa. Andhra Pradesh is leading in both area and production among the states of India. In Tamil Nadu, it is being cultivated in the districts of Madurai, Dindigul, Theni, Tuticorin, Ramanathapuram, Erode, Dharapuram, Karur, Coimbatore, Tirunelveli and under large scale area in Kanyakumari.

The different parts of this plant has analgesic, diuretic, antihypertensive, antispasmodic, antitumor, anticancer, antiulcer, cholesterol lowering effect, hepato protective, and hypoglycemic effect and also effective in skin and mucosal diseases (Guevara *et al.*, 1999) ^[4]. Moringa tree is an effective remedy for malnutrition, especially among infants and nursing mothers. Village women of south western Senegal were trained in the preparation and use of Moringa leaf powder in foods for development of growth and improving overall health in children, pregnant women recovered from anaemia and had babies with higher birth weights and breast-feeding women increased their production of milk (Sambou Diatta 2002) ^[5]. Leaves of *Moringa oleifera* are promoted in areas of pronic malnutrition as a nutritional supplement for weaning infants and nursing mothers (Doerr *et al.*, 2009) ^[6].

Corresponding Author:
P Bhavithra
Assistant Professor
(Horticulture), Department of
Horticulture, Kumaraguru
Institute of Agriculture, Erode,
Tamil Nadu, India

There is limited knowledge of available genetic diversity present in moringa species in general and of *Moringa oleifera* in particular. Therefore the present research aimed at the evaluation of moringa genotypes for leaf yield and quality.

Materials and Methods

Eight moringa ecotypes maintained in moringa genetic resources garden of the Department of Horticulture, Kumaraguru Institute of Agriculture, Erode were collected from different districts of Tamil Nadu viz., Olagadam, Moongilpatti, Periyakulam, Keezhvani, Madurai, Tirunelveli, Coimbatore, Dindugal through limb cuttings, seeds and details of the genotypes used in the present study are listed below.

Table 1: Description of moringa genotypes

Treatments	Name of the genotypes	Places of collection
T ₁	Madurai local murungai	Madurai
T ₂	Ottanchathiram local murungai	Ottanchathiram
T ₃	keezhvani local murungai	Keezhvani
T ₄	Tirunelveli local murungai	Tirunelveli
T ₅	Olagadam local murungai	Olagadam
T ₆	Coimbatore local murungai	Coimbatore
T ₇	Moongilpatti local murungai	Moongilpatti
T ₈	PKM 1	Periyakulam

The above eight genotypes were taken for genetic evaluation of moringa for leaf quality and leaf yield. The field experiment was laid out in a Randomized Block Design with three replications and with eight treatments. Plant height was measured from base of the plant at ground level to the tip of main stem and expressed in centimeter. The length of the leaf was taken from the petiole to the tip and the mean expressed in centimetre. The breadth of the plant leaves were measured at the maximum point of the blade, with the help of scale and the mean value was expressed in cm. Leaf area per plant was worked out by the length and breadth measurement method. The number of branches was recorded in two randomly selected accessions and mean was computed and expressed in numbers. The number of leaflets per rachis was made in two randomly selected rachi from each accession and mean was computed and expressed in number. The weight of leaves taken from two randomly selected plants in each of eight accessions was recorded and the mean value was expressed in grams. The fresh leaves from two plants of each eight accessions were sun dried and the average dry weight was recorded in percentage. Ascorbic acid was estimated according to the procedure given by (A.O.A.C 1975) [7] and expressed as mg per 100 g of fresh sample. Carotenoid content was determined on fresh leaves by following method of Arnon (1949) [8]. The carotenoid content present in the leaf sample was calculated and expressed in mg g⁻¹ tissue. The moisture content was determined by taking the weight of fresh leaves and it was dried in oven to get the weight of dry leaves. It was worked out and expressed in percentage. Chlorophyll content was determined by using the SPAD meter and expressed in mg/gm of leaf.

Results and Discussion

The results are tabulated and enumerated here the result obtained and evaluation of moringa genotype for leaf yield and quality via, plant height, no. of leaflet/rachis, no. of primary branch, no. of. Secondary branch, chlorophyll content, leaf area, Vitamin-C, carotenoid, yield, moisture

content and potassium revealed that there were a significant difference are discussed here.

Growth Parameters

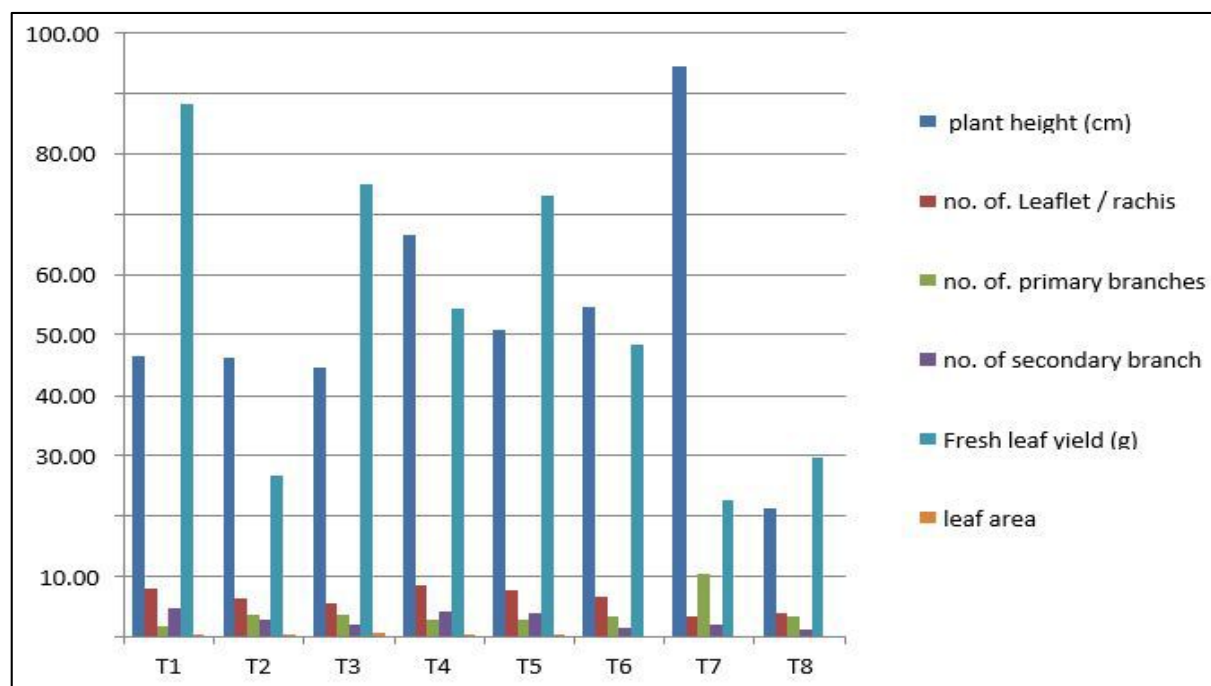
The plant height was found to be highest in T₇ (94.50 cm) and lowest in PKM- 1 T₈ (21.25 cm) can be selected for leaf purpose and higher growth rate recorded by *Moringa oleifera* confirmed by early reports and that it is a growing species Anele *et al.*, (2008) [9], Nduwayezu *et al.*, (2007) [10]. The no. of leaflets/rachis was recorded maximum in T₄ (8.50) which is significantly differed one and lowest value was recorded in T₇ (3.50). No.of.primary branches was recorded maximum in T₇ (10.50) and minimum in T₁ (1.75). No. of secondary branches was recorded is highest in T₁ (4.75) and lowest in T₈ (1.25). No. of leaflets/ rachis , primary branches, secondary branches which is the prime factor that contributing to the yield and also it is the vital character in deciding the leaf yield potentiality (Lakshmi *et al.*, 2019) [14]. Chlorophyll content was recorded highest in T₃ (34.13 mg/g) which is significant in over all other treatments and lowest in T₇ (12.15 mg/g). Leaf chlorophyll content is the key factor for determining the rate of photosynthesis and considered as index for metabolic efficiency of the plants. This green pigment was responsible for harnessing solar energy and converting it into a chemical energy and exhibited a differential pattern on accumulation of nutrients. The content of pigment on the plant was important not only for colouration and physiological function, but also because of their acknowledged role in plant health.

Yield Parameters

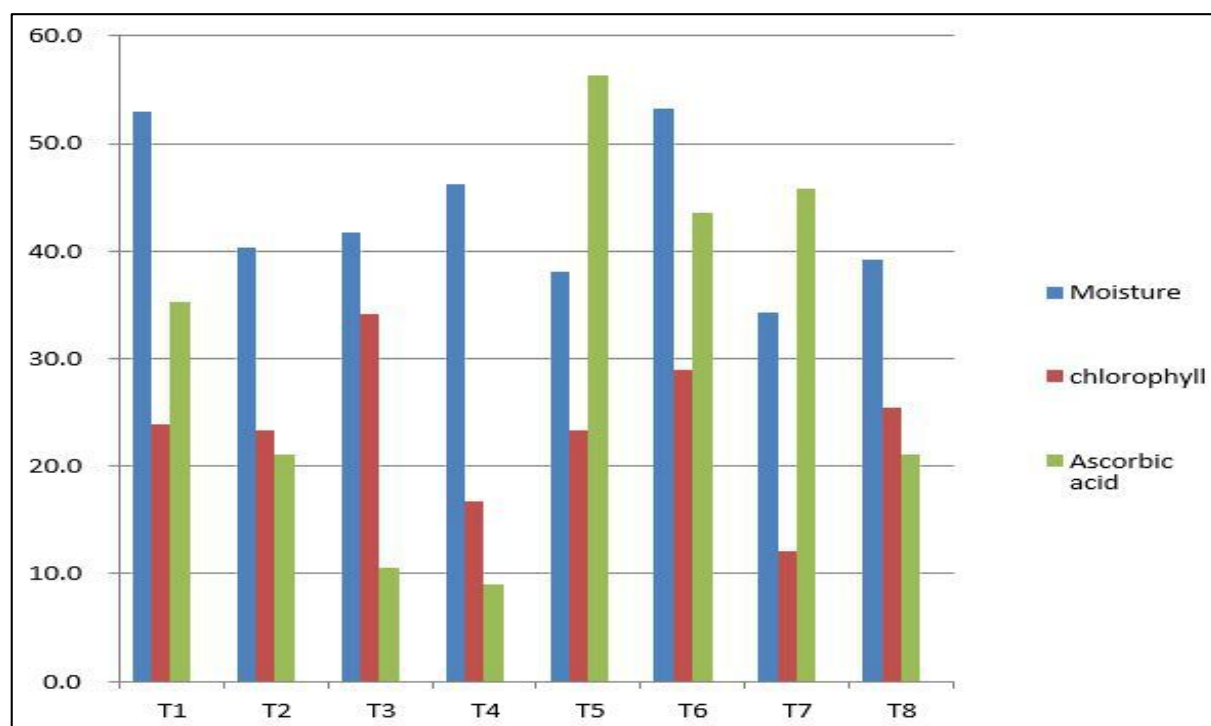
Among the eight genotypes studied maximum of leaf yield was obtained in T₁ (88.13) were significant among all other treatments and lowest in T₇ (22.59 g). This may be due to the highest leaf area, number of leaflets/rachis, number of leaves observed in moringa species. Since moringa plant were mainly grown for fresh leaf / pod and number of leaves per plant along with leaf size and leaf thickness determine the total yield. Sarker *et al.*, (2015) [11] reported that foliage leaf had significant relation with plant height. Leaf area among the thirty vegetable amaranthus genotypes evaluated.

Biochemical parameters

Moringa is a good source of vitamin C yet it is use as a good source of ascorbic acid is not explored much. Among the eight accessions under evaluation, the highest vitamin C content was recorded in T₅ (56.40 mg/g) and lowest content was recorded in T₄ (9.08 mg/100 g). Similar result was observed by (Sankhyan *et al.*, 2013) [12]. The highest carotenoid content were observed in T₆ (0.00018 mg) which was found significantly superior over all other treatments and lowest was observed in T₂ (0.000042 mg). Similar trends of variation were also reported by (El Sohaimy *et al.*, 2015) [13]. Among the eight genotype studied the maximum of moisture content was observed in T₆ (53.25%) were significant among the other treatments and minimum was recorded in T₇ (34.35%). Similar findings were correlated with Lakshmi *et al.*, (2019) [14]. Leaf area per plant was often useful measurement in productivity studies. The maximum leaf area was observed in T₃ (0.75 m²) were significant over all other treatments and minimum was recorded in T₇ (0.14 m²). Increased leaf area result in increased leaf photosynthesis and leaf yield reported by (Azadbakht *et al.*, 2015) [15]



Growth Parameters



Biochemical Parameters

Conclusion

The results of this study exhibited the significant importance among the eight different *Moringa* genotypes studied for growth, yield, and nutritional importance the accessions T₁ (Madurai local), T₃ (Keezhvani local), T₆ (Coimbatore local), T₇ (Moongilpatti local), showed the best results for fresh leaf yield per plant, No.of.Secondary branches, Leaf area, Chlorophyll, Moisture content, Carotenoid content, Plant height and No.of.Primary branches.

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