Original Research Article……..

International Journal of Agricultural Invention

(online available at www.agriinventionjournal.com)

***International Journal of Agricultural Invention* 9(2): 231-234: December, 2024**

ISSN: 2456 – 1797 (P)

To study about the physiological and biochemical variability of Tamarind germplasm in Jabalpur district of Madhya Pradesh

Rahul Dongre[1], U. K. Chanderia[2], *Bharti Choudhary[3]

[1]Department of Forestry, JNKVV, Jabalpur, M.P., India
[2]Department of Horticulture, JNKVV, Jabalpur, M.P., India
[3]AICRP on Arid Zone Fruits, Department of Horticulture, JNKVV, Jabalpur, M.P., India
***Corresponding email**: *bharati.choudhary06@gmail.com*

ARTICLE INFO

Original Research Article
Received on November 18, 2024
Revised on November 23, 2024
Accepted on December 09, 2024
Published on December 18, 2024

Article Authors
Rahul Dongre, U. K. Chanderia, Bharti Choudhary

Corresponding Author Email
bharati.choudhary06@gmail.com

PUBLICATION INFO
International Journal of AgriculturalInvention (IJAI)
RNI: UPENG/2016/70091
ISSN: 2456-1797 (P)
Vol.: 9, **Issue:** 2, **Pages:** 231-234
Journal Homepage URL
http://agriinventionjournal.com/
DOI: 10.46492/IJAI/2024.9.2.35

ABSTRACT

Generally, the exploration for germplasm collecting is conducted for desired genetic material to use in the crop improvement programme and varietal development. Tamarind (*Tamarindus indica*) is a leguminous tree bearing edible fruit that is indigenous to tropical Africa and naturalized in Asia. The genus *Tamarindus* is monotypic, meaning that it contains only this species. It belongs to the family Fabaceae. The tamarind tree produces brown, pod-like fruits that contain a sweet, tangy pulp, which is used in cuisines around the world. The pulp is also used in traditional medicine and as a metal polish. The tree's wood can be used for woodworking and tamarind seed oil can be extracted from the seeds. Because tamarind has multiple uses, it is cultivated around the world in tropical and subtropical zones. Legumes, related plants, are a very important component of global plant genetic resources, more particularly in the tropics and the subtropics. Under AICRP- AZF JNKVV, Jabalpur survey was done for collection of Tamarind germplasm in different locations of Jabalpur district (Madhya Pradesh). During survey eight germplasm are identify based on pod weight, length and visual appearance. In all eight germplasm observed that pod weight is ranged from 14.5 to 27.0g, Seed weight (3.0 to 6.5), pulp percent (31-64.2 %), Bark weight (1.5 to 6.5 g), No of Seed (5 to 9), Length (121.3 to 16.8 cm) and Width (2.0 to 3.5 cm).

KEYWORDS

Germplasm, Tamarind (*Tamarindus indica*), Physiological Variability, Biochemical Variability

HOW TO CITE THIS ARTICLE

Dongre, R., Chanderia, U. K., Choudhary, B. (2024) To study about the physiological and biochemical variability of Tamarind germplasm in Jabalpur district of Madhya Pradesh, *International Journal of Agricultural Invention,* 9(**2**): 231-234. DOI: 10.46492/IJAI/2024.9.2.35

Tamarind (*Tamarindus indica* L.) belonging to the family Fabaceae, indigenous to Tropical Africa and Southern India. It is also called as 'Indian date', a multipurpose tree known for drought tolerance and used primarily for its fruits, which are eaten fresh or processed and used as a seasoning or spice, or the fruits and seeds are processed for non-food uses and an excellent tree for social-forestry and agro-forestry. Tamarind is drought tolerant and frost tender tree and can be cultivated in any type of soil. In the waste land development and dry land horticulture, tamarind assumes great significance due to its multifarious uses and capacity to withstand adverse soil and climatic conditions. When properly dried and cured with salt, tamarind pulp has a great keeping quality. Pulp is high in glucose (47.7% of total sugar) the pulp constitutes 30-50% of the ripe fruits. The shell and fiber account for 11-30 % and seed about 25-40 %, respectively. Tartaric acid (8-18%), as well as malic and citric acids (2%) is responsible for the pulp's sour flavor. Phosphorus, calcium, and iron are all abundant in the fruit. It's also possible to eat the tender leaves and blooms.

Tamarind seeds can be used as a low-cost alternative for grain starch in the textile industry. The pulp of the ripe fruits has considerable export value in many parts of the world. Tamarind products are exported to around 60 countries and major importers are France, Germany, Netherlands, Japan, USA, UK, Switzerland, Saudi Arabia, UAE, Egypt, Syria, Pakistan and Sri Lanka. Tamil Nadu, Madhya Pradesh, Andhra Pradesh, Maharashtra and Karnataka are the major tamarind growing states of India. Tamarind (*Tamarindus indica* L.) is a truly pantropical tree that thrives in dry land areas, including degraded, eroded, gravelly, saline, and sodic wastelands. By conducting surveys, researchers can identify and document different tamarind varieties, their unique traits, and genetic variations. This information helps maintain a diverse gene pool, which is essential for the resilience and adaptability of the specie.

Tamarind has been used for centuries as a medicinal plant; its fruits are the most valuable part which have often been reported as curative in several pharmacopoeias. Many parts of tamarind plant have long been used in traditional medicines for the treatment of a wide variety of ailments and diseases such as jaundice, gonococci and gastrointestinal disorders (Polysaccharides and their derivatives have been the choice of polymers as rate controlling carriers in sustains drug delivery system. The objective of the present study was to determine the physicochemical characteristics of some local germplasms of Tamarind (*Tamarindus indica* L) found in Madhya Pradesh and Chhattisgarh.

Tamarind holds immense commercial value due to the usefulness of almost all its parts the leaves, flowers, fruits, and wood. By surveying and conserving germplasm, we safeguard the potential for developing improved cultivars with desirable traits. These traits may include higher fruit yield, disease resistance, or adaptability to specific environmental conditions. So the present survey was carried out for study of variability among different genotypes will be helpful in conserving germplasm from being eroded and its further utilization in tamarind improvement programme.

Materials and Methods

The survey was conducted under All India Coordinated Research Project on Arid Zone Fruit at Horticulture Farm, Department of Horticulture, JNKVV, Jabalpur (M.P.). It is situated at 23° 10' N latitude and 79° 59' E longitude having an altitude of 412.00 meter above the mean sea level. The soil of the experimental site has clay loam texture with average fertility. It is tenaciously sticky when wet and hard when dry. The climate of the region/location is characterized by long hot summer and cool winter. The survey was carried out in the month of June 2021 in different villages of Jabalpur and Katni district of Madhya Pradesh. Each tree surveyed was mapped using Global Positioning System (GPS) and location coordinates obtained. In different location total eight germplasm was collected and the germplasms coded in JT-1, JT-2, JT-3, JT-4, JT-5, JT-6, JT-7 and JT-8.Data was collected through personal interviews with key informants and questionnaires. Farmer provided information on type of production system, cultural practices, source of planting material, time taken to maturity, fruit yield per tree, market, transport, pests, diseases and harvesting. Collected fruit of germplasm was analysis in both physical and chemical.

Table 1. Site and Source of collected germplasm

JT-1	:	Farmers field
JT-2	:	Government site
JT-3	:	Government site
JT-4	:	Farmers field
JT-5	:	Farmers field
JT-6	:	Farmers field
JT-7	:	Farmers field
JT-8	:	Farmers field

Physical Analysis

The physical properties determined of collected tamarinds were determined at maturity state. The observations were recorded on tamarind fruit, number of seed per pod, pod length, breadth and thickness. Length, breadth and thickness of randomly selected tamarind fruits were recorded in before removing cover using a Vernier caliper. Length of the tamarind from base to the apex of the fruit was considered as length and was measured with the help of Vernier caliper.

While maximum linear distance between two shoulders and between the two edges were too measured as breadth and thickness respectively with the help of Vernier caliper.

Chemical Analysis

The edible portion of the tamarind pulp (flesh) was homogenized us in GA mortar and pestle. The biochemical analysis like pH, titrable acidity, total soluble solids (TSS) content of tamarind pulp. Browning was measured using spectrophotometer as per the procedure of Ranganna. The pH measurements were performed using a digital pH meter. Titratable acidity was determined by titration with 0.1 N NaOH solutions and expressed as percent of tartaric acid. Total soluble solid (TSS) were determined with a digital refractometer, the results were reported as ^{o}Brix.

Results and Discussion

The physical and biochemical characteristics of fruit play a very important role in development of new variety. Quality of any fruit can be judge by the physical parameter. The physiological and biochemical parameters like pod weight, length, width, number of seeds, pH, Acidity and TSS observed variation on different germplasm. Total eight germplasm was collected and were observed that pod weight is ranged from 14.5 to 27.0g, Seed weight (3.0 to 6.5), Pulp percent (31-64.2 %), Bark weight (1.5 to 6.5 g), No of Seed (5 to 9), Length (121.3 to 16.8 cm) and Width (2.0 to 3.5 cm). With reference to chemical parameter TSS ranged from 19.3 to 25.2 ^{o}Brix, acidity 3.5 to 5.5 and pH 2.9 to 3.8 were observed in different germplasm.

The maximum fruit weight (27.0g), fruit length (16.8 cm), fruit width (3.0 cm) recorded in JT-2, bark weight (7.5 g) and no. of seeds (08) recorded in JT-1 and maximum pulp percent (64.2 %) was recorded in JT-7. Tamarind tree exhibits genetic diversity within its species. Tamarind may naturally have variations in pod size and shape due to genetic factors. Growing conditions such as soil type, climate, temperature, and sunlight exposure can influence the size and shape of tamarind pods. Variations in these environmental factors can lead to differences in pod development.

Wide variations were also observed in sweetness, acidity, size, shape and bearing habits in tamarind under Madhya Pradesh conditions (Shinde and Kulwal, 1995, Keskar *et al*., 1989b and Karale *et al.*, 1999). It is highly heterozygous, cross-pollinated (Usha and Singh, 1996) fruit crop and as such seedlings exhibit a wide range of variations, which aids in the selection of the superior desirable genotypes. In chemical analysis maximum TSS (25.2 ^{o}Brix) were recorded in JT-7, maximum pH 3.8 in JT-2 and minimum acidity (3.5%) were recorded in JT-6. The level of pH leads to inhibition of food spoilage microorganism's growth, hence extending the shelf life of tamarind and its products like juice, vinegar and pickles. Tamarind fruit pulp has great potentialities (its high sugar concentration, low pH) to be used industrially in many products such as concentrates, pickles, confections, powdered etc.

Conclusion

Tamarind (*Tamarindus indica* L.) is a truly pantropical tree that thrives in dryland areas, including degraded, eroded, gravelly, saline, and sodic wastelands. By conducting surveys, researchers can identify and document different tamarind varieties, their unique traits, and genetic variations. This information helps maintain a diverse gene pool, which is essential for the resilience and adaptability of the specie. In all germplasm pod weight is ranged from 14.5 to 27.0g, seed weight (3.0 to 6.5), pulp percent (31-64.2 %), bark weight (1.5 to 6.5 g), no of seed (5 to 9), length (121.3 to 16.8 cm) and width (2.0 to 3.5 cm). The fruit also contained glucose, fructose and arabinose as inverted sugars, besides; it has a lower acidity efficient utilization of tamarind fruit in many products such as vinegar.

Acknowledgements

The authors express their sincere gratitude to the All India Coordinated Research Project on Arid Zone fruits, CIAH, Bikaner and AICRP-AZF, Department of Horticulture, College of Agriculture, JNKVV Jabalpur for their unlimited assistance.

Table 2. Physiological and Biochemical Variability of different germplasms of Tamarind

Sample	Pod wt (g)	Seed wt	Pulp %	Bark wt	No of Seed	Pod Length (cm)	Pod Width (cm)	pH	Acidity	TSS
JT-1	25.5	7.5	54.1	4.2	9	15.5	2.5	3.2	5.5	22.2
JT-2	27.0	4.0	57.4	7.5	5	16.8	3.0	3.8	5.3	19.3
JT-3	14.5	3.5	31.0	4.3	7	12.3	2.5	3.1	5.1	22.5
JT-4	18.4	6.5	35.3	2.4	8	15.4	2.4	3.1	4.8	21.8
JT-5	16.5	3.0	43.6	6.3	6	14.2	2.1	3.0	3.9	20.6
JT-6	18.0	5.5	61.1	1.5	6	14.5	2.6	2.9	3.5	23.2
JT-7	21.0	5.5	64.2	2.0	8	16.0	2.3	3.0	4.2	25.2
JT-8	16.5	3.5	48.4	5.0	5	13.5	2.0	3.5	4.5	22.3

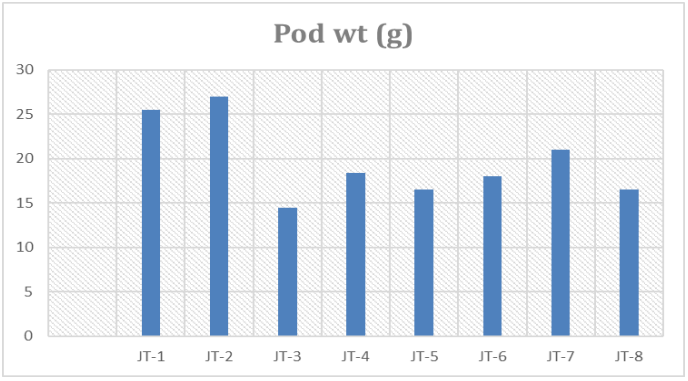

Fig 1. Pod wt (g) of different germplasms

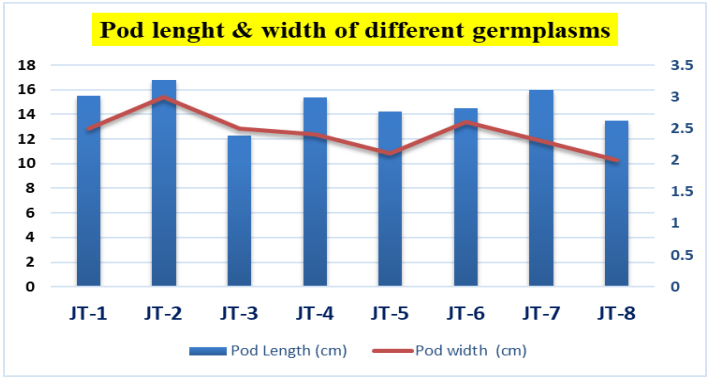

Fig 2. Pod length and width of different germplasms

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