

## GENETIC DIVERSITY

Leaf samples were collected from randomly selected 120 *Tecomella undulata* trees from six districts of Rajasthan namely Nagaur, Bikaner, Pali, Jalore, Sikar and Churu. Genomic DNA was extracted using optimized DNA extraction protocol and ISSR-PCR amplifications were conducted with shortlisted 22 primers under standardized PCR conditions. These samples were then subjected to various genetic parameters such as Nei's gene diversity, Shannon's Information Index, Percent polymorphism, Gene flow, AMOVA, Principal coordinated analysis and UPGMA based dendrogram for estimation of genetic diversity using twenty-two ISSR markers.

Study reveals narrow distribution of *Tecomella undulata* populations in Rajasthan but demonstrates high levels of genetic diversity within the populations. Overall population structure is however, weak.

ISSR marker identified four populations like PJ (Pali), PK (Pali), NM (Nagaur) and NP (Nagaur) as most diverse populations in Rajasthan. These populations can serve as a repository of genes for future improvement work.

Populations identified from the present study provide superior germplasm and can be useful for clonal propagation using modern techniques due to negligible success of conventional vegetative propagation methods in this slow growing and climate resilient hardy tree species.

## STEM CANKER OF ROHIDA

Insect pests and disease studies reveal that the tree deformity pertaining to hollowness might initiate the formation of cankers in the main trunk of the trees. Cankers are localized dead areas of bark in trees and shrubs caused by fungi and bacterial infection. Canker pathogens can cause annual branch and twig dieback, disfiguring perennial stem cankers, or large, diffuse trunk cankers capable of killing trees in a short time. Stem canker is a typical cancerous overgrowth or sunken growth on the stem which not only reduces the aesthetic value of a tree but also causes economic losses in timber species. Rohida is a source of valuable timber and stem canker poses a threat in production of quality timber from this species.



Symptom of canker

LS of stem showing discoloration of cankered area.

Fungal species responsible for the damage of bark and canker of *T. undulata* was identified as *Lasidiopodia theobromae* (= *Botryodiplodia theobromae*). The infection occurs in the form of splitting of bark on the bole, which spread upward and downward both. Infection process of canker was studied in the form of biochemical changes (total protein, sugar, phenolics and phenyl amine lyase(PAL)) and anatomical studies of infected and healthy seedlings. Increase in level of protein can be correlated with the expression of defense genes. Gene expression is the process by which information from a gene is used in the synthesis of a functional gene product. It has been reported that Salicylic acid application induces accumulation of pathogenesis-related (PR) proteins. Salicylic acid (10 mM) was found effective in management of the disease but requires to be introduced in early stage of infection.



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## *Tecomella undulata* (Rohida): Marwar Teak of Rajasthan (A Step Towards Genetic Improvement)



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*Tecomella undulata* (Sm.) Seem, a member of Bignoniaceae family, is a medicinally and economically important plant species. In Rajasthan, it is mainly found in Barmer, Jaisalmer, Jodhpur, Nagaur, Sikar, Churu, Bikaner, Pali and Jalore and some other districts. Rohida flower has the status of 'State flower' in Rajasthan due to its three colors attracting flowers (red, yellow and orange). The wood of Rohida has excellent physical and mechanical properties.



#### Three flower color morphotypes of *Tecomella undulata*

This species occurs on flat and undulating areas including gentle hill slopes and sometimes in ravines also. It is well adapted to drainy loam to sandy loam soil of pH 6.5-8.0 but thrives very well on stabilized sand dunes, areas of scanty rainfall and extremes of temperatures (-1 to 50°C) and can tolerate environmental stresses like drought, frost, fire and wind.



#### Trees growing in the farmer field, wood log of Rohida

It is valued for its high-quality timber with best grains therefore used in furniture, carving, and agricultural implements. It is a common agroforestry tree of Thal (Thar) desert and has played an important role in providing livelihood support to the local communities in arid and semi-arid lands. Cost of single tree is assumed to Rs 1000 per year.

Accordingly, 40 year old tree costs approximately Rs 40,000-50,000.

This tree also acts as a soil binder and wind breaker, therefore, considered as an important species for environment conservation in arid zones as a stabilizer of shifting sand dunes.

In addition to playing an important role in regional ecology and economy, *Tecomella undulata* has multifarious use in pharmacology due to the presence of numerous bioactive constituents in its leaves, stem and bark. It has occupied a reputed position of having valuable medicinal properties in both folk and classical streams of indigenous medicinal systems. The plant parts are also used for the cure of syphilis, eczema, enlarged spleen, gonorrhea, leucoderma and liver diseases.

#### GENETIC IMPROVEMENT

Forty-one candidate plus trees were selected based on the height, crown diameter, DBH, bole height, number of branches, health of leaf and tree, colour of the flower from Sikar, Churu, Bikaner, Nagaur, Pali and Jalore districts of Rajasthan. Fresh pods and seeds were collected for establishing progeny trials. During the month of April-May, care was taken to collect the dry pods directly from the selected trees and maintained the individual tree identity. Seeds were artificially propagated by directly sowing the seeds in polythene bags containing the mixture of sand, soil and FYM (1:1:1), seeds sown at a depth of 1.5 to 2.0 cm vertically sprout out within four to six days. Manual watering and weeding were done at regular interval.



#### Identified candidate plus trees of *Tecomella undulata*



#### Collected pods and winged seeds of *Tecomella undulata*

Multilocal progeny trial of 36 progenies of *Tecomella undulata* was established in 2013-14 at Jodhpur and Jhunjhunu districts of Rajasthan in RBD at a spacing of 3m\*3m. Plants were irrigated five times during first year, three times in next subsequent two years. All silvicultural operations (weeding, cleaning) were carried out to maintain the trial in good shape and on survival percentage, growth parameters were collected. At the age of five years, progeny-36 from Pali district performed best attaining the height of 180 cm and collar diameter of 3.2 cm at Jodhpur site. Whereas, at the age of four years progeny-25 from Churu district performed best attaining the height of 75.5 cm and collar diameter of 0.78 cm at Jhunjhunu site.



#### Preparation of nursery and establishment of progeny trial of *Tecomella undulata*