

ECOTYPE ANALYSIS OF MORINDA CITRIFOLIA, L.FROM DIFFERENT HABITATS OF KANNUR, KERALA

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ABSTRACT

Morinda citrifolia L, known commercially as Noni ,grows widely throughout the Pacific and is one of the most significant sources of traditional medicines among Pacific island societies. This small evergreen tree or shrub is native from South Asian Asia to Australia, and now has a pantropical distribution. Noni is the Hawaiian name for the fruit of *Morinda citrifolia* L. (Rubiaceae). It grows naturally in relatively dry sites or lowland areas in close proximity to shorelines, or as an important forest understorey species in low elevation Pacific island forest and rainforests. The present study focused on - the various ecotypes of *Morinda citrifolia* L. in different habitats of Kannur district, analyse ecological factors controlling ecotypes and comparative study of anatomy ,morphology stomatal index, chlorophyll content, protein content of ecotypes in different habitats. Randomly selected 2 areas ,Taliparamba, and Payyambalam by treating them into midland laterite and sand shore regions. From the selected area plants and soil samples were collected. The samples are investigated to understand the various features like morphology, anatomy, stomatal index, leaf area, total protein content, chlorophyll and also various soil parameters controlling the plant growth by using standard methods. . From the study we observed a significant variation in stomatal index and

determination of leaf area. Anatomical studies on stem, quantitative estimation of the chlorophyll and protein also shows variation from one to another. While considering the soil parameters like pH, electrical conductivity, organic carbon, phosphorous, and potassium there also shows significant variation from one soil to another. Due to the various developmental activities our soil and air is polluting rapidly and affects our habitats also . As *Morinda citrifolia* L.widely used in Ayurveda this study is more significant to understand the changes in plants due to the influence of habitat.

Key Words : Noni, Chlorophyll, stomatal index

INTRODUCTION

Morinda citrifolia L, known commercially as noni ,grows widely throughout the Pacific and is one of the most significant sources of traditional medicines among Pacific island societies. This small evergreen tree or shrub is native from South Asian Asia to Australia, and now has a pantropical distribution. Noni is the Hawaiian name for the fruit of *Morinda citrifolia* L. (Rubiaceae). Its various vernacular names are: "Indian mulberry", "nuna", or "ach" on the Indian subcontinent, "mengkudu" in Malaysia, "nhau" in South-east Asia, "painkiller bush" in the Caribbean, or "cheese fruit" in Australia. Noni is noted for its ex-

tremely wide range of environmental tolerance. It can grow in infertile, acidic, and alkaline soils and also in very dry to very wet areas. It grows naturally in relatively dry sites or lowland areas in close proximity to shorelines, or as an important forest understory species in low-elevation Pacific island forest and rainforests. Noni's extensive range of environmental tolerances also included exposure to wind, fire, floods, and saline conditions. Although not considered to be invasive to a degree that threatens ecosystems, Noni is treated as a weed in some settings, is very persistent and difficult to kill, and is one of the first plant to colonize harsh waste areas or lava flows. All the part of the plant have traditional and modern uses, including root and bark, trunks and leaves and fruits. The medicinal applications, both traditional and modern, span a vast array of conditions and illnesses, although most of these have yet to be scientifically supported. Despite its strong smell and bitter taste, the fruit is nevertheless eaten as a famine food and in some Pacific islands, even a staple food, either raw or cooked. Southeast Asians and Australians consume the fruit raw with salt or cook it with curry. The seeds are edible when roasted. *Morinda citrifolia* L fruit powder contains carbohydrates and dietary fibre in moderate amounts. These macro nutrients evidently reside in the fruit pulp. The main micronutrient of *M.citrifolia* pulp powder is vitamin C, niacin, iron, and potassium. Vitamin A, calcium, and sodium, are present in moderate amounts. When juice alone is analyzed and compared to pulp powder, only vitamin C is retained in an amount that is about half the content of a raw orange. Sodium levels in noni is high compared to an orange fruit. It contains a number of phytochemicals, including lignans, oligoand polysaccharides, flavanoids, iridoids, fatty acids, catechin, beta-sitosterol, damnacanthal and alkaloids. Polynesian healers have used noni fruit for thousands of years to treat a variety of health problems such as diabetes, high blood pressure, aches, pains, burns, arthritis, inflammation, tumors, the effects of ageing, and parasitic, viral and bacterial infections. Ancient healing manuscripts cite the fruit as a primary ingredient in natural healing formulations

The present study focused on - the various ecotypes of *Morinda citrifolia* L. in different habitats of Kannur district, analyse ecological factors controlling ecotypes and comparative study of anatomy, morphology, stomatal index, chlorophyll content, protein content of ecotypes in different habitats.

MATERIALS AND METHODS

Study Area - Randomly selected 2 areas, Taliparamba, and Payyambalam by treating them into midland laterite and sand shore regions. From the selected area plants and soil samples were collected.

Plant and soil sampling

From each area 3 to 4 fresh samples with leaf, flower, fruit (if available) collected. Taxonomic studies were conducted. Leaf area, Stomatal Index, quantitative estimation of chlorophyll (Arnon, 1949) and protein (Lowry et al. 1951) were determined. Materials preserved for anatomical studies. Specimens collected for Herbarium preparation and illustrations are also provided. Leaf area worked out by Graphical method and Stomatal index determined by method of Salisbury 1927. After collection soil samples dried under shade, crushed the soil clods lightly with wooden pestle and mortar. Sieve using a stainless steel 2mm sieve and discard plant residues, gravel and other foreign matter retained on the sieve. Organic carbon in the soil measured using Walkley-Black wet Digestion Method (Walkley, 1947), Available phosphorus (reduced molybdate blue colour method).

RESULTS AND DISCUSSION

The various ecotypes of *Morinda citrifolia*, L in two different habitats of Kannur District shows variations in anatomy, stomatal index, leaf area, protein content and chlorophyll content with respect to its ecology. One is growing in normal laterite soil (Taliparamba) and another one is growing in saline soil (Payyambalam). *Morinda citrifolia* L show specialty in fruit size, leaf morphology, palatability, odor of ripe fruit and number of seeds per fruit. Leaves opposite, pinnately veined and glossy. Blades membranous, elliptic to ovate,

20-45 cm wide ,glabrous .Petioles stout,1.5-2 cm long. Stipules connate ,1-1.2 cm long, the apex entire .Flowers perfect , in ovoid to globose heads. Peduncles 10-30 mm long. Calyx limb 5mm,truncate with leafy bract-like lobe, green. Corolla-tube to 1 cm long; lobes 5,throat hairy. Stamens 5;filaments small, hairy, attached to the throat of the corolla tube, anther linear. Ovary 2;ovules solitary; style slender, with 2 stigmatic branches. Fruit a syncarpium formed by the succulent enlarged calices, showing many 4-sided pyramidal sections each with 4 cartilaginous or pyrenes ,the pyrenes often with an empty ventral cavity. Seeds oblong , Seeds winged below.

The soil analysis of the two different habitats shows ,the pH of the soil is almost similar in that two areas that is, acidic. The soil of Payyambalam shows higher electrical conductivity(0.93) than the soil sample collected at Taliparamba(0.29) (Fig-1).The organic carbon is higher in the soil sample collected in Payyamalam(2.145) but it is normal in the soil of Taliparamba (Fig-). The amount of potassium and phosphorous is higher in the two areas(Fig-).

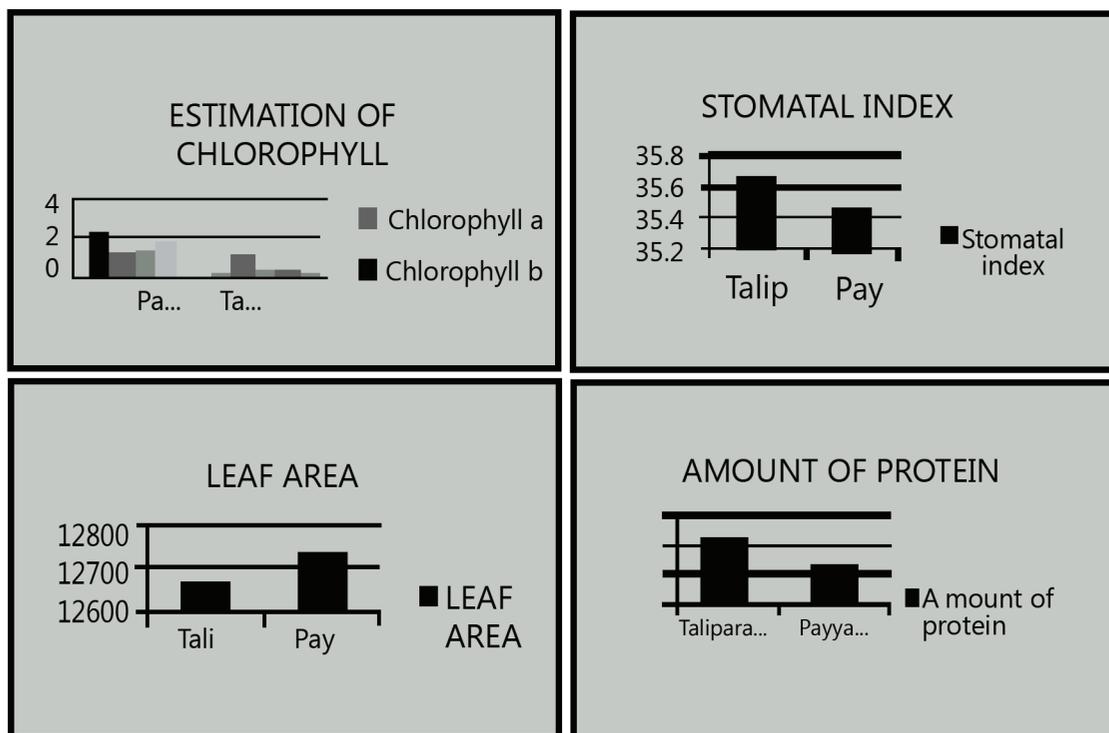
The stomatal index of *Morinda citrifolia* L.collected from (35.666±2.2883)is higher than the *Morinda* collected from payyambal-

am(35.4652±0.0312).The leaf area of the sample collected in Taliparamba is higher than the leaf area of the sample collected at Payyambalam The protein is more concentrated to the *Morinda* collected from Payyambalam.(1.9±0.1414) than the *Morinda* collected from Taliparamba (1.7±0.1414).Quantitative estimation of chlorophyll shows chlorophyll a (2.1305±1.3473) ,chlorophyll b(1.1432±0.0594), total chlorophyll(1.6728±0.1221) and the ratio of chlorophyll a,b(1.1329±0.6554) is higher in the sample collected from Payyambalam than the sample collected from Taliparamba.

Anatomy - Anatomy of the stem from both sites shows secondary thickening even from very small stages itself. Both having thick epidermis followed by cortex, endodermis and secondary xylem. Secondary tissues are well developed and tightly packed more vessels in *Morinda* stem collected from Payyambalam. The collected stem from Taliparamba shows thin patches of secondary xylem with extensive pith. *Morinda* from Payyambalam shows more sclerenchyma than that from Taliparamba. This shows the ecological changes clearly affects the anatomy of the plant.

PARAMETERS	SITE-1(TALIPARAMBA)	SITE- 2 (PAYYAMBALAM)
PH	5.7(Acidic)	6.7(Acidic)
EC(mhos/cm)	0.29(normal)	0.93(Higher)
ORGANIC.CARBON(%)	1.39(Medium)	2.145(Higher)
POTASSIUM(kg./ha)	412.16(Higher)	483.84(Higher)
PHOSPHOROUS(kg./ha)	149.18(Higher)	185.24 (Higher)
STOMATAL INDEX	35.6666 ± 2.2883	35.4652 ± 0.0312
LEAF AREA	12666.67 ± 348.81095	12733.33±227.301
CHLOROPHYL-a	2.1305±1.3473	0.1755±0.0125
CHLOROPHYL-b	1.0544±0.0431	0.1432±0.0594
CHLOROPHYL(total)	1.6728±0.1227	0.3259±0.0422

Table -1- Results of various parameters studied



GRAPH SHOWING RESULTS OF FACTORS UNDER STUDY

CONCLUSION

In the present study on the ecotypes in *Morinda citrifolia* L. collected from different habitats shows great variation within the species level. We collected *Morinda citrifolia* L. from selected habitats, wet land and normal laterite soil. From the study we observed they are morphologically similar during taxonomic studies. From the study we observed a significant variation in stomatal index and determination of leaf area. Anatomical studies on stem, quantitative estimation of the chlorophyll and protein also shows variation from one to another. While considering the soil parameters like pH, electrical conductivity, organic carbon, phosphorous, and potassium there also shows significant variation from one soil to another. Quantity of protein, chlorophyll etc, may be the result of their particular soil characters. We need further studies on the quantification of volatile organic compounds through GC-MS, to prove quantitative variation among the ecotype and also we need atomic absorption spectroscopic studies for identifying the heavy metal accumulation. As *Morinda citrifolia* L. widely used in Ayurveda this study is more significant to understand the changes in plants due to the influence of habitat.

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