EDITORIAL

Hypotheses on Biology and Co-existence of Woody Plants in a Forest Ecosystem

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In a forest ecosystem woody plants are predominantand grow in a harmony with other species in sharing and capturing solar radiation and absorbing nutrients and water from different soil profiles with their rootsystems. There exist large variations in crown architecture, branching pattern,leaf canopy with simple to compound leaves. Top crown leaves function as solar panel in capturing the solar radiation. In a forest ecosystem varied trees and shrubs exist in different strata. Each strata comprises of trees and shrubs of definite heights, those that have faster growth rate are able to capture the solar radiation in a very efficient manner and occupy the top layer of the strata. As the light is absorbed while passing through the canopy a large portion of it is rich in the far red wavelength of light. Mutual shading by the top most leaves occur and the shade loving plants are mostly seen as the bottom ground layers. The arrangement of trees and shrubs at different heights in this ecosystem enables them to utilize the solar radiation more effectively. Further most of these also exhibit stratification of the root structure also. Some will be possessing deep roots and others superficial roots, where roots are confined to over a few centimeters deep in the soil. This is also an adaptation enabling the plants to overcome the competitive effects among themselves for nutrients, water etc.

The Tamaulipan thorn scrub in the North eastern Mexico, at Linares also have a wide range of vegetation. Trees and shrubs occupying this region exhibit wide variability in the crown architecture, branching pattern, leaf size and structure, phenology etc. During the past few years we are working in Forest Science School on various aspects of biology of woody plants such as variations leaf morphology, size, branching pattern,tree crown, leaf canopy architecture, anatomy of plantorgans, phenology, besides various aspects of physiology, and biochemistry viz., leaf pigments, epicuticular wax, leaf macro and micronutrients, carbon fixation (carbonsequestration), water relations etc. The Tamaulipanthornscrub vegetation showed large variations among woody species. All these variations help in theco-existence and adaptations of the species in a forestecosystem. On the basis of the results during the processof investigation we generated few hypothesis on the biologyand co-existence of these woody species in a forest ecosystem.

Crown architecture and branching pattern

Variations in tree crown architecture, leaf canopycould be related with the productivityof the species.

Woody plant species with open canopy (all leaves exposed to solar radiation) have higher capacity of photosynthesis) and productivity compared to close canopy ones (all leaves not exposed to solar radiation. They grow taller and taller, highly branched and are highly productive.

Leaf Anatomy

There exist variations in the presence or absence of stomata on the adaxial and abaxial surface of leaves in different species which could be related to adaptation to xeric conditions. There exist large variations in trichome density, cuticular thickness, compactness of palisade tissues among species which could be related to drought. Variations in petiolar anatomy with respect petiole thickness, cuticle, collenchyma, presence of sclerenchyma and vascular bundle area among species could be related to the adaptation of the species to the environments and productivity.

Venation Pattern and Venation Density

Large variations in venation pattern and venation density

existing among woody species could be related to the adaptation and the productivity of the species.

Wood Anatomy

Large variations in wood anatomical structures, such vessel size, xylem density, fibre cell wall thickness and its abundance could be related to the wood quality and its utilization. Species with high density and narrow vessels are reported to act against cavitation and embolism against drought and cold temperature which requires further confirmation.

Wood Density

Variations in wood density among woody species studied could be related to wood quality and wood anatomy.Woody species with open leaf canopy produced hard wood with high wood density.

Ecophysiology and Biochemistry

Variations in leaf pigments (Chl a, b, total chlorophyll, carotenoids) among species could be related to the productivity of trees at different locations.Epicuticular wax helps in the reflection of solar radiation,and reduce leaf temperature, variations in leaf epicuticular wax among woody species studied could be related to their adaptive ability under droughts and low temperatures.

Leaf Nutrients

Large variations in macro-and micronutrients among tree species studied could be related to the productivity of trees and nutritional values of wild animals.

Carbon Fixation (Carbon Sequestration)

Variations in per cent carbon in the biomass of these species indicates the presence of carbon sequestrations, and thus these species have the capacity to fix larger quantities of C into their biomass may be suitable for taking up plantations during a city planning or in areas which are highly polluted so that the carbon pollution leading to global warming could be reduced.

These species selected for high carbon sequestrations could be planted in carbon polluted areas to reduce carbon load.

The hypotheses put forward could be confirmed or nullified in future research.