Tree Seedlings Growth in Dry Tropical Environment

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Abstract

This report focuses on the effectiveness of tropical areas and the development of the seedlings in dry tropical atmosphere. These areas have two types of soil; those are black soil and red soil. Black soil contains greater organic matter and more enzyme activities, higher microbial biomass, and greater nutrition (such as amoA) and *denitrification* (such as nirS and nirK). These develop a positive bacterial community structure for the development of plants and dense forests. This report found that An effective ecological atmosphere is related to the photosynthesis criteria, that light interception (that is SLA or specific leaf area), light absorption (that is $Chl_{a/b}$ or chlorophyll a and b ratio), light use (that is F_v/F_m or fluorescence parameters; PI_{abs} and P_{total}), biochemical limitations (that is A_{sat}, CO_2 assimilation saturated by light) and diffusive limitations (that is g_s and *stomatal* conductance).

Keywords: Tropical areas, dry tropical atmosphere, seedlings, soil, rain, temperature, biomass, ecology

Introduction

Tropical areas are mentioned as the middle part of the globe. This part gets the light and heat of the sun directly; as a result, these areas get the heat more than any other part of the world. This results in heavy rain in these areas. In other words, it can be said that tropical areas have a different atmosphere and weather than any other area in the world. Hence, living beings are also affected by this kind of weather. High temperatures, as well as heavy rains, allow the trees to grow larger and develop dense forests in these areas. Tropical areas include some parts of Asia, Africa, Australia, South America, and South America.

Dry tropical environment

A tropical environment is effective for the development of tree seedlings. Due to the heat and enough rate of rain, woody plantations are fostered in this region. Furthermore, the soil of tropical areas is also effective. The soil has a positive combination and correlation between microbial biomass and soil organic carbons. As a result, the trees get high nutrients from the soils. However, microbial biomass sometimes negatively affects the nutrition level of the trees and plants there, and this also positively generates nitrogen mineralisation [2]. Hence, the quality and the nutrition level of the soil are developed and become proper for seedlings, with enough protein from the solid. Again, enough availability of heat and water also fosters the quick growth and development of the seeds.

Soil heterogeneity is the most important part of the tropical areas; the rainfall measurement determines the dry season and wet season in the tropical area. The areas or seasons that receive less than 18 hundred mm of rain per year are considered dry tropical weather of dry tropical regions [13]. However, the rain measurement is effective to determine the quality of soil and level of nutrition in these areas. Soil heterogeneity, rainfall seasonality, and nitrogen deposition highly control the environment, weather, and microbial aspects of these areas. These areas have two types of soil; those are black soil and red soil. Black soil contains greater organic matter and more enzyme activities, higher microbial biomass, and greater nutrition (such as amoA) and denitrification (such as nirS and nirK). These develop a positive bacterial community structure for the development of plants and dense forests.

A huge part of the tropical areas is currently being dry due to climate change and global pollution effects. Due to the increase of CO_2 and global warming, atmospheric changes are observed, when in tropical areas; hence, this is also the same for the tropical regions [10]. As a result, the dry tropical areas also begin with dry forests and savannah regions. Hence, this is also effective for biomass aspects in this region. Biomes are large plant formations with diverse physical shapes (physiognomies) and global ecological processes. Climate has historically been used to define biomes. However, in this day and age of environmental monitoring, biodiversity investigations have shown that in the drought-prone tropical, numerous biomes with drastically varying physiognomy, species composition, and ecology coexist under similar climates.

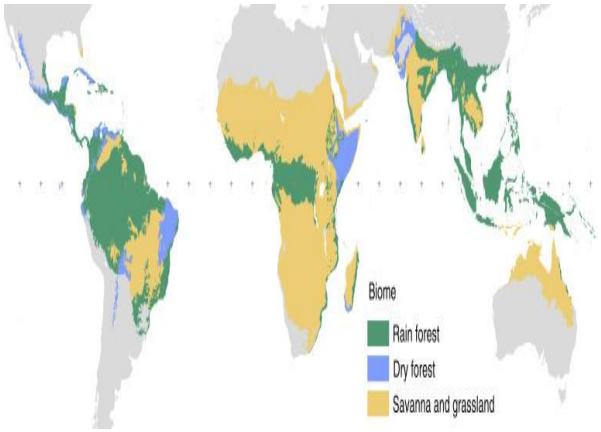

Figure 1: Global map for Tropical dry forests

(Source: Reference [10])

Plant physiology is based on the weather characteristics of these tropical areas. The tropical areas also have summer and rainy seasons, though there is not a high difference in temperature and rain measurement here. However, a global warning has changed these criteria in a quite observable manner. A severe dry summer in the tropical area has a temperature of 26^{o}C and rainfall of almost 1750 mm [7]. Hence, it is observed that severe dry summer observes less than 1800 mm rainfall here. Such an atmosphere results in 5cm growth of the trees in a month, and the measurement is also effective for air seedlings, with softer stems.

Non-significant variations in GP or germination percentage and GSI or germination speed index values were also detected in experiments using natural *"M. caesalpiniifolia", "P. stipulacea"*, and *"L. ferrea"* extracts. This Madagascar-native plant was brought into the semiarid environment and has a strong invasive potential. *"M. caesalpiniifolia"* exhibited no GP impact when exposed to *"P. moniliformis"* leaf or fruit extracts [6]. There were no studies that evaluated the allelopathic influence on GP and GSI in the remaining species (*"A. urundeuva", "C. pyramidale"*, and *"P. moniliformis"*), therefore their data could not be utilised for comparison.

"Seasonally Dry Tropical Forests" or SDTF cover large areas in the tropical parts of most continents, with dry seasons lasting up to six months (terms of the number of months of rainfall of 100 mm). These woods may be found in the Neotropics, encompassing the "Amazon basin" and continuing north into Mexico and the Caribbean. Despite their wider availability in South America, the majority of SDTFs are found in solitary patches. The Caatinga Biome (Northeast Brazil) is the sole exception, with a viable ecosystem encompassing an area of around 800,000 km2 [11]. Furthermore, this ecosystem has been classified as one of the world's most significant wildlife places, as well as one of the world's most biodiversity and endemic dry forests.

Ecology for tree seedlings growth

The observation of researchers reveals a 1-year observation of the sapling growth in dry tropical areas. The average temperature was 22.4^{o}C and the total rainfall was almost 1590 mm. In such an atmosphere, almost 1560 saplings were in that region from 122 different species [15]. This observation revealed that the development of the samplings and their growth do not depend only on the temperature and rainfall measurement, but also depend on the root mass fractions, and lead mass fraction. The leaf economic spectrum or LMA is effective for measuring the necessary ecology for seedling growth. Lower LMA results in a low level of photosynthesis, and this result in thick leaves. Soil nutrition, as well as light gradients, is also important for the development of the sampling growth and development. These also influence the photosynthesis level and the thickness of leaves. Such an atmosphere increases the rate of seedlings growth due to the trees' biological needs for light.

A natural disaster is one of the prime reasons for the development of trees and plants, as well as human living criteria. Hence, the tropical cyclone is also effective for the development of the ecosystem as well as the sapling growth. North Atlantic basins observed almost 15% of rain from 1989 to 2018 [17]. The same timeframe observed more than 30% of cyclones in the Northern Pacific, and 5% in the Indian Ocean. Tropical cyclones are becoming more intense and larger, and as a result, their value as disturbance agents is growing. The Atlantic Basin is favoured for cyclone ecology; however cyclone impacts on forests vary among oceanic basins due to changes in storm occurrence and power. The impacts of cyclones on ecosystem processes such as primary production and nutrient cycling are mediated through a variety of direct disruption effects on individual plants or seeds and life forms such as yellowing leaves and tree death. Forest dwarfing caused by individual storms gradually removing towering trees exemplifies the cumulated short-term impacts of many cyclones on the moulding long-term forest area.

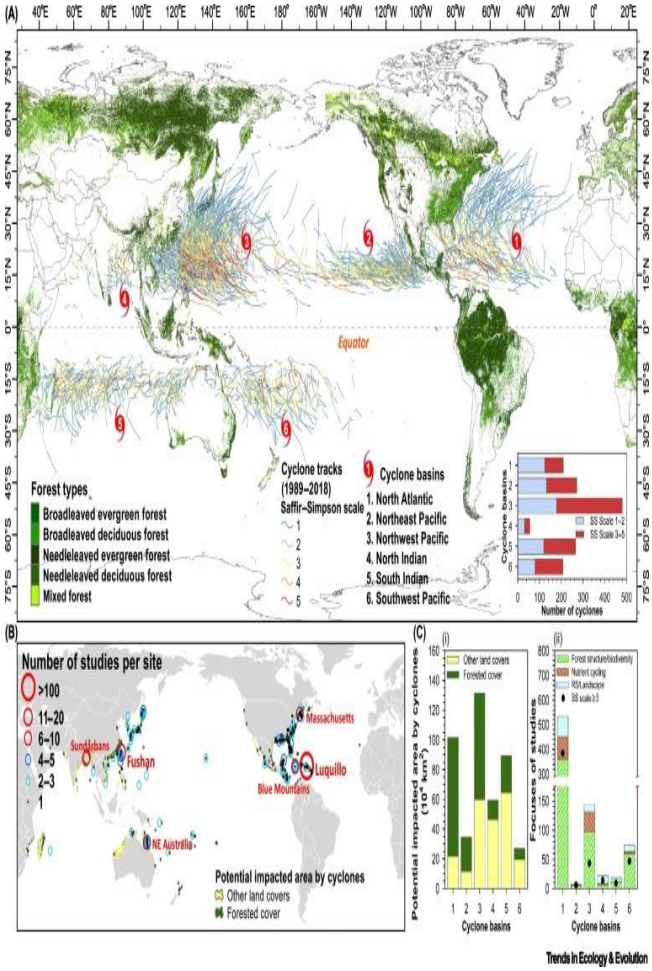

Figure 2: Global distribution of cyclones with special reference to tropical areas

(Source: Reference [17])

Tropical regions observe the most important aspect of climate change and seedling-based climate in the tropical areas. The western part of North America dominant ecological role in tree reproduction, plant development, and seedling growth [16]. Both light and water are the most important part of the development of seedlings in the development of the saplings. Water, especially rain, determines the soil structure and the level of nutrition in it. Drought stress has a negative impact on sampling growth and seed regeneration; in other words, during drought time, the mortality of the tropical trees and saplings is negatively affected. The trees in tropical areas are very tall height and they hinder the way of light to the ground, this limited the seedlings and growth of saplings, however, the development of the seeds in these times highly depends on the quality and nutrition level of the soil.

The development of seeds and seedlings highly depends on the availability of seeds and their germination. Arctic trees, as well as alpine tree lines, require high needs and temperature, which is available in the tropical region. Tree seedlings seem to be relatively homogeneous, which requires a high level of nutrition in the soil [12]. This is available in dry tropical areas, and the measurement is also effective for the development of seedling cycles and mortality of the trees in the Alpine regions. With a proper balance of the soil nutrition, vegetation, and growth of

saplings are affected. Nitrogen levels and biomass are necessary ecological features for effective seedlings. Aside from warmth, a variety of biotic and a biotic factors element such as moisture, snow, nutrition, light, and nearby vegetation influenced tree seedling establishment. Different seedling life cycles do not respond to environmental influences in the same way. Temperature, for example, had a favourable influence on growth, whereas warming had a significant impact on tree seedling survivability and germination. Furthermore, when compared to one of five additional environmental factors, warmth was almost always the most powerful element affecting tree seedling establishment. Furthermore, warming impacts were frequently caused by various factors such as humidity or the existence of nearby plants. Tree distribution and abundance in the alpine mountain region and Arctic tree line are affected by environmental changes.

Photosynthesis is one of the most important tree activities for tree survival and forest mortality; this is the same for the seedlings. Enrichment of plant activity is measured and depended on the development of the photosynthesis activities of the trees. This determines the growth, as well as the speed of growth of the trees [14]. An effective ecological atmosphere is related to the photosynthesis criteria, that light interception (that is SLA or specific leaf area), light absorption (that is $Chl_{a/b}$ or chlorophyll a and b ratio), light use (that is F_v/F_m or fluorescence parameters; PI_{abs} and P_{total}), biochemical limitations (that is A_{sat}, CO_2 assimilation saturated by light) and diffusive limitations (that is g_s and stomatal conductance).

The growth of the seedlings highly depends on the soil quality and the nutrition level in it. The nutrition level of the soil increases through germination, as well as the extraction of the fallen leaves from other trees. However, ecological degradation negatively affects these seedling aspects and their development [4]. The Indian subcontinent experiences climate degradation which negatively affects the seedling processes, and their growth. As a result, vegetation is also hindered in that region. Global warming is the prime reason for excessive temperature and irregular raining timing.

Importance of dry tropical environment for tree seedlings

"Seasonally dry tropical forest" or SDTF is considered one of the most important biomass for regional as well as global carbon and hydrologic fluxes. Inter-annual and seasonal variability of *ET* or evapotranspiration is effective for the development of the tropics area [18]. The regions, such as Northwest o9f Mexico, Northeast Brazil, and northern Argentina have the *ET* standards for the development of the seedling processes. Seedlings and vegetation are composed primarily of woody, thorny, xerophyte, semi-deciduous and deciduous physiognomies of the trees. Sustaining water stress is an important part of all these things. This idea indicates timely rain, and regular and seasonal rainfall, which can include the soil transformation process effectively, with reactions among soil ingredients. As a result, seedlings are fostered with the increase of the vegetation process, as well as the growth of forest areas.

Species diversity in tree community, structure, and functional diversity among the trees and saplings depends on soil condition and climate. The growth of seedlings is affected by drought climate and defoliation [9]. Hence, this is also necessary for the development and effectiveness

of soil for the nutrition level in it. Plants have different traits; the seedlings are also the same in this aspect. Hence, this is necessary for the development of sustainable soil, with proper ingredients of biomass, nutrition, and nitrogen. Sustainable soil develops wood density in dry forests as well. Hence, it can be said that sustainable soil and good weather are effective for the increases and seedling growth in tropical areas.

Sustainable environment and climate management is an increasing focus for the development of the existing management, as well as forest development. One positive aspect is the fertilisation of atmospheric CO_2 along with an anthropogenic change in climate [3]. Though photosynthesis is an important part of the plant life cycle, and CO_2 is one of the prime necessary things for photosynthesis, climate change negatively affects seedling development and seedling management. An increasing amount of CO_2 does not foster any positive effect on the trees and negatively changes the world climate.

Silicon or Si is one of the most important ingredients of soil that increases the quality of soil and seedling development is fostered due to the good quality of the soil. Si has a positive effect on the growth of saplings. This ingredient is stored in the tissues of the plants which fosters their growth, regeneration as well as fitness, and has a positive effect on plant performance [5]. In tropical forests, phosphorus has also a positive influence on the tree performance, forest structure, a function of the ecosystem, and plant distribution. In other words,

The soil variant determines the positive growth of the saplings and the measurement of the seedlings' growth. Woody vegetation and the seasonal growth of the plants are effective for the development of forest areas, as well as the climate [8]. The tropical areas contain the development of the soil, with enough nutrition, biomass, and enough level of nitrogen. As a result, the soil in these regions is developed and highly positive for the growth of the plants. Again, these regions, especially the dry climate of tropical regions, provide proper temperature and rain, developing the quality of soil, and quantity of moisture in the atmosphere.

In reaction to changes and developmental restrictions, plants absorb carbon from the air and distribute it to various organs. Plants will allocate more carbon to roots if the limiting resource is belowground, such as water as well as nutrients, and more carbon above-ground if the restricting source is light or CO_2. Plants will assign greater carbon to bases if the restricting resource is weather depression and related, such as nutrients and water, and more carbon aboveground if the restricting supply is light or CO_2 [1]. Saplings and tiny trees are likely to spend more biomass below-58 ground level in order to absorb water and nutrients for rapid development and survival.

Conclusion

Tropical areas are one of the major concerns of current scientific research regarding the development of plants in ecological changes and the way the saplings and seedlings are affected by effective use of the natural resources, such as light, water, and soil nutrition. In other words, the natural quality is highly effective for plant growth. Even the dry tropical region is also effective for the development of the seeds. Hence, it also can be said that tropical areas and the

climatic features are effective for the development of the seeds, as well as the vegetation process for human civilisation.

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