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Study of Angiosperm in Carbon Sequestration

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Abstract

This study examines how angiosperms, or blooming plants, contribute to carbon sequestration. Specifically, it looks at how they might be able to absorb and hold carbon dioxide (CO_2) from the atmosphere, which would help with attempts to mitigate climate change. The photosynthetic mechanisms of angiosperms, which inhabit a wide range of environments from wetlands and coastal regions to forests and grasslands, are essential to the global carbon cycle. By measuring the carbon sequestration capability of different angiosperm species, this study seeks to understand their long-term capacity to store carbon by looking at variables like growth rate, biomass accumulation, root depth, and soil carbon retention.Both field and lab data were used in the study, with a focus on grasses in grassland ecosystems and tree species in forest habitats—two of the best at sequestering carbon. According to the results, some angiosperm trees, such those found in temperate and tropical forests, store a considerable quantity of carbon above and below ground. Through their large root systems, grasses and other herbaceous angiosperms in wetlands and grasslands also help to store carbon by improving the retention of carbon in the soil.The research also assesses environmental factors including temperature, soil quality, and water availability that affect angiosperm sequestration efficiency. Reforestation, afforestation, and sustainable agriculture practices are among the management strategies that have been found to improve angiosperms' capacity to sequester carbon, making them important contributors to nature-based climate solutions.

Key words : Angiosperm, Carbon sequestration.

The fight against climate change has made the need for efficient carbon sequestration techniques imperative as global CO_2 levels continue to grow. Due to their innate capacity to absorb and retain carbon from the atmosphere, angiosperms, or flowering plants, are important participants in the global carbon cycle. With distinct carbon sequestration techniques and capacities, these plants are extremely varied and widely distributed, found in wetlands, forests, grasslands, and coastal areas. With the goal of assessing their potential as a sustainable, natural way to lower atmospheric CO_2 , this study aims to understand how various angiosperm species contribute to carbon sequestration. Through photosynthesis, angiosperms store carbon, turning CO_2 into biomass in their leaves, stems, roots, and, in the case of trees, large woody structures. The capacity of angiosperm-dominated forest ecosystems to store carbon for extended periods of time above and below ground makes them some of the most efficient carbon sinks. The extensive root systems of grasses and other herbaceous angiosperms, which improve soil carbon storage and lessen the release of CO_2 back into the atmosphere, are a major factor in the carbon sequestration of grasslands and wetland ecosystems in addition to forests.Growth rate, biomass accumulation, soil quality, and root depth are some of the variables that affect the capacity of different angiosperm species to sequester carbon in a variety of habitats. In order to maximize their contribution to carbon storage, sustainable land management approaches may benefit from an understanding of these characteristics, which will also help select the most effective angiosperm species for carbon capture. The impact of environmental parameters including temperature, water availability, and nutrient supply on angiosperm sequestration capabilities is also examined in this study because these variables have a major influence on plant growth and carbon uptake.The results of this study emphasize the significance of preserving and rehabilitating angiosperm-rich ecosystems to improve natural carbon sequestration, with wide-ranging implications for land-use policies and climate policy. By highlighting the vital role angiosperms play in managing carbon, this study advances worldwide efforts to become carbon neutral and helps create nature-based solutions for reducing climate change.Because of their widespread distribution and significant contributions to the global carbon cycle, angiosperms' function in carbon sequestration has been a focus of ecological and environmental studies.

Angiosperm-dominated ecosystems, particularly forests and grasslands, have been repeatedly demonstrated to be efficient carbon sinks. The main conclusions from current research on the processes, effectiveness, and determinants of carbon sequestration in angiosperms are summarized in this study.

1. *The function of angiosperms in sequestering carbon :*

Because of their vast biomass and capacity to store carbon in a variety of plant components, including leaves, stems, roots, and woody tissues, angiosperms are essential to global carbon cycles. Trees and other large angiosperms are essential to carbon management efforts[5] because studies demonstrate that they sequester huge amounts of CO_2.

According to recent research by Crowther *et al.*[3], the density and distribution of trees have a direct impact on the amount of carbon stored globally. They emphasize that wooded regions, which are predominantly made up of angiosperms, are crucial carbon sinks.

2. *Building up Biomass and storing Carbon:*

The biomass of angiosperms, especially

trees, has a significant carbon storage capability. For instance, tropical forests, which are primarily composed of angiosperms, contain around half of the world's forest carbon store[10]. Angiosperm species differ in growth rate, wood density, and environmental adaptability, according to studies, which affects how quickly they store carbon. As a result, choosing specific angiosperm species may maximize carbon sequestration efforts.

3. *Carbon sequestration in soil and root systems :*

Through their root systems, angiosperms contribute in a special way to the sequestration of carbon in soil. By keeping organic carbon in the soil stable, root biomass helps store carbon for a long time and can lower the amount of CO_2 released back into the atmosphere[6].

It may be possible for angiosperm species with larger, deeper root systems to store more carbon in soil profiles. In semi-arid and tropical environments, where below-ground biomass is crucial for sustaining soil carbon pools, Jackson's (2002) study emphasizes the importance of root biomass carbon contributions.

4. *Environmental Factors' effect on Carbon sequestration :*

The ability of angiosperms to sequester carbon is greatly influenced by environmental conditions such as temperature, precipitation, and soil quality. According to studies, nutrient-rich soils in warmer, wetter climates tend to have higher carbon storage capabilities because they promote higher biomass accumulation and faster growth rates.

Furthermore, angiosperm-dominated ecosystems suffer from land-use changes like urbanization and deforestation, which lessens their capacity to function as efficient carbon sinks.

5. *Reforestation and restoration using Angiosperms :*

Increasing the capacity for carbon sequestration requires reforestation and afforestation projects that incorporate angiosperm species. According to studies by Griscom *et al.*,[4], installing a variety of angiosperm species on degraded areas can greatly aid in achieving climate mitigation objectives.

Diverse angiosperm communities in forest ecosystems improve overall ecosystem productivity, resilience, and carbon sequestration capacity, which highlights the significance of species diversity in these endeavors.

According to the research, angiosperms' high biomass, vast root systems, and environmental tolerance make them essential for sequestering carbon. Our knowledge and use of angiosperms in global carbon management may be improved by conducting more research on particular species, ideal growing environments, and restoration techniques.

Climate change affects the ability of angiosperms to sequester carbon. Research has indicated that elevated CO_2 concentrations might accelerate development and photosynthesis in certain angiosperm species, which may boost their capacity to store carbon[9]. The resistance and carbon sequestration effectiveness of angiosperms in some areas may be lowered by climate change's side effects, which also include droughts, pest infestations, and changing temperature patterns[1].

To optimize their capacity to sequester carbon, angiosperm-rich habitats must be protected. Carbon sinks can be improved by conservation measures including replanting with native angiosperm species and stopping deforestation. It has been demonstrated that utilizing cover crops and agroforestry techniques with angiosperm species in agricultural systems increases soil carbon storage, which benefits crop yields and the environment[7,11]. Angiosperms in grasslands and wetlands, in addition to forests, are essential for sequestering carbon. Particularly in the soil, where roots and soil organic matter hold carbon for extended periods, angiosperm-dominated grasslands are important carbon sinks[2]. Anaerobic conditions inhibit decomposition and encourage long-term carbon storage in wetland angiosperms, which include species like grasses and sedges[8].

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