

COMPARISON OF TREE SPECIES ALBEDO AND SOIL CARBON SEQUESTRATION AS EFFECTIVE FACTORS ON GLOBAL WARMING IN REFORESTATION OF HYRCANIAN FORESTS

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Introduction: Hyrcanian forests that have situated in the North of Iran were formed at the end of the third geological period. Nowadays, the areas of these forests have decreased; hence they should be replaced via reforestation and plantation by tree species that tolerate climate change impacts. Climate change is one of the greatest challenges to land management and society. Forests significantly can influence local climate via a number of different mechanisms. Albedo and carbon sequestration are the most important mechanisms that play a major role in the energy balance of the earth's surface.

Methods: Here, we examined variation of albedo and carbon and nitrogen stocks for three stands (25 years old) with maple (*Acer velutinum*), poplar (*Populus deltoides*) and cypress (*Cupressus sempervirens*). The field plot data were measured during the growing season of 2016 (summer). Albedo was measured with albedometer set-up (CMA6 Kipp & Zonen) that sat on movable masts above the canopy height at the 20-24 meters. In order to determine the soil's carbon and nitrogen sequestration, 10 sample profiles were taken in each stand from 0-10 soil depth and analyzed for soil characteristics such as pH, soil texture, bulk density, EC, total soil carbon and total nitrogen. The relative importance of each of the sub options (tree species) was determined using TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) methodology.

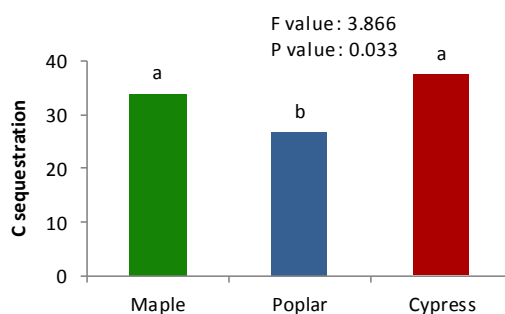
Results: The results indicated that summertime canopy albedo in three species ranges from 0.15 to 0.28 (in sunny days). Average of albedo in cypress stand was 0.15, in maple 0.25 and in poplar was 0.28. Analysis of variance indicated that there is significant difference between three stand albedos ($p < 0.01$). Broad-leaved trees have a large amount of albedo in comparison to the needle-leaved trees. The results of carbon sequestration showed significant difference in soil carbon and nitrogen amounts among three stands. Tree species effect on these parameters. The highest mean soil carbon and nitrogen stocks were observed in cypress (37.66, 1.68 ton ha⁻¹) followed by maple (34.06, 1.45 ton ha⁻¹) and polar (26.76, 1.2 ton ha⁻¹). The results of TOPSIS technique indicated that under global warming conditions, the preferred species to develop the forested areas are maple followed by polar and cypress has not preference to develop in this region.

Discussion: Understanding the influence of forest tree species on albedo and carbon sequestration are urgently needed in forest management under climate change and global warming conditions. Our results demonstrated that broad-leaved such as maple considering the albedo and carbon and nitrogen sequestration, with the highest value in TOPSIS technique has the most cooling effect among three species. Thus, for increase in forested areas broad leaf tress should be considered rather than using needle-leaved species (cause warmer environment because they absorb solar radiation more than broad-leaved trees). Therefore, forest managers with selecting the optimal tree species in reforestation and afforestation can help to mitigate the climate change and global warming impacts

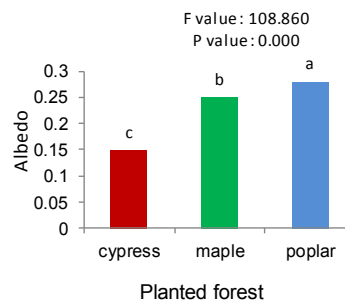
Biography

Leila Vatani is PhD student at Tarbiat modares University in Iran. Her thesis is on Reaction of Tree Species (Needle Leaved and Broad Leaved) in Plantation and Reforestation on Effective Global Warming Factors. Climatic changes are inevitable and trees have various and effective impacts on regional alterations, either directly or indirectly. The increasing emission of greenhouse gases, production of aerosols, changes in ground's reflection ratio (Albedo) and heating pollution are different factors affecting the speed of climatic changes. Trees also affect the surrounding environments and the regions considering the related factors, but there are many researches regarding the effectiveness rates of trees on important factors which influence the regional changes. Hence, this research aims at answering to this question if the plantations could help the earth to be cooled, and if so, which species in plantations is the best one.

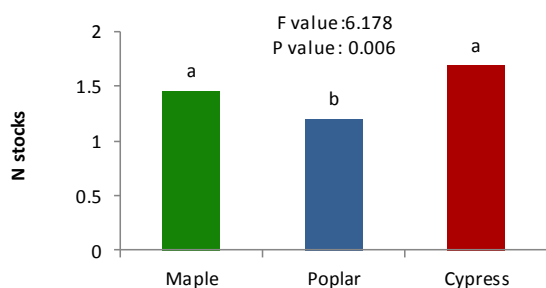
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Soil carbon sequestration in maple, poplar and cypress



Albedo amounts in three stands (*Acer velutinum*, *Populus deltoides* and *Cupressus sempervirens* L. var. *horizontalis*)



Soil nitrogen sequestration in maple, poplar and cypress