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Research Article

Afforestation Effect with Conifer and Hard Wood Species on some Physical and Chemical Soil Characteristics

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ABSTRACT

In long periods, afforestations have great effects on the physical and chemical soil characteristics. Preserving nutritions elements density of the soil in a balanced quantity in afforestated areas in order to consider the constant development principle is necessary and considerable negative changes shouldn't take place in soil characteristics.
This research compares the pure Pinus teada and blended local conifer afforestations on some soil characteristics in Azbarm Siyahkal area. Soil sample taking method was random-systematic and12 blended samples from hardwood afforestation and 12 blended samples also from conifer afforestations were prepared from the depth of 0 to 30 cm and were transferred to the laboratory to determine the physical and chemical parameters (including: soil tissue, special apparent and superficial mass, pH, electrical conductivity, soil saturation humidity percentage, nitrogen, phosphor, potassium. calcium). The results showed that the amount of humidity saturation percentage, Carbon ratio to nitrogen and phospher among pinus teada species, Ace insigne and Alnus substrata and Quercus castaneifolia at the confidence level of 95% is significant. The humidity saturation percentage and phospher in hardwood stand was more in comparison with conifer and Carbon ratio to nitrogen in hardwood stand was less in comparison with conifer.

Keyword: Pinus teada afforestation, local hardwood afforestation, chemical and physical characteristics, Guilan province.

INTRODUCTION

As for the destruction process of natural forests in the world human population multiplition and ever-increasing need for wooden productions and other services of the forest, forest extention by afforestation at the present and in the future is inevitable, each tree species as a live creature can influence its environment and can be influenced by it.

Conifer nonresident species and some hardwood species can have different effects on the soil and the vegetative cover of that area. In Iran that besides having a dry and ruptured ecosystem forest destruction speed is more than its restoration and development (World Bank, 2000), considering the great advantages of the forests there should be an effort to protect and develop these resources with an essential management administration.

The recognition of soil characteristics is one of the fundamental needs of essential forest management that many selvics selections such as species selection, stand growth rate and sapling survival percentage anticipations are influenced by it (Danial et al.,1979).Repeatedly it has been expressed that forests have an advantageous effect on the soil and trees effect soil enrichment from the view point of nutrition's ingredients in some temperate areas that have changed to afforestations. For example the researches done in conifer afforestations in temperate areas showed changes in some chemical characteristics of the soil such as PH decrease and increase in the capability of absorbing nutritious ingredients (Farly and colly,2004).

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Here to fore a lot of scientists have studied tree species effect on the soils physical and chemical characteristics. In Neiryck (2000), after studying the effect of 5tree species on the chemical and physical characteristics of the soil reported that the quantity of carbon to nitrogen in the maple soil of the external land is less than others and

Tilia platyphyllos, Fraxinus excelosor and acer psedoplatanus that produce hums, generally have more Ph compared to Quercus robur fagus sylvatica species.

Fisher (1995) studied the effect of eleven tree species in Costa Rica and reported that most species have increased the main cation viscosity of the soil but only three species have increased the organic carbon of the soil.

In Gereece (****), studying the effect of the two afforested stands, black pine and locust tree, on the soil showed that each afforestation caused a new region in the soil and decreased the electrical conducing and soil acidic of the area, and afforestation has caused increase of organic materials compared to the witness area. But in this case there was no significant difference among the two afforestated stands. Besides afforestation whit locust species has caused increase in the quantity of soil magnesium but has not caused any different in the quantity of calcium (Panagopolous and Hatzistathis,1995).

The study of blended locust and spruce pine afforestation effect on the area soil and mutual effect among tree species in China also showed that blended afforestation of these two species has leaded to considerable increase of soil nitrogen azote (Goufang et al., 1998). So this argument about the relationship among soil and vegetative cover has always been one of the interesting subjects in forest management science and sciences related to forest pedology; the purpose of this research also is mutual relationship among afforestated species and the physical and chemical characteristics of the soil.

METHODS AMD MATERIAL

Under study area

This research was selected in 25th aquiferous district north forest, in two blended local hardwood parcelle with70 hectares measurement and second parcelle, pinus teada afforestation with 44 hectare measurement. The considered series is located among 49 56 2 to 49 52 30 eastern longitude and 37 7 30 to 37 5 15 northern latitude.

Its minimum height from high sea levels equals 50m and its maximum height equals 1100m and its general direction is towards west and southwest. Its average annual precipitation is 1264/5mm (Pastures and forest organization of the country, 2002).

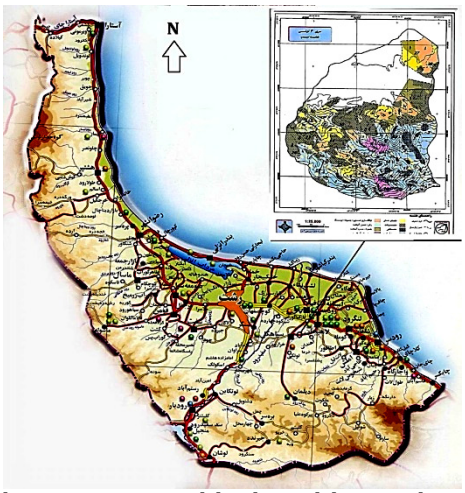

Fig.1_the under study area geographical position series 3 in Guilan province

Study Method

According to the sprayer forests that were done in the under study area, 12 soil samples from hardwood afforestation and 12 soil samples from conifer afforestation (totally 24 compound samples) from the depth of 0to 30 cm were selected in a compound to determine the physical and chemical parameters in each stand (determining soil tissue_real and superficial special mass_Ph_electrical conduction_moisture saturation percentage_nitrogen_phosphor_calsium) and transfer them to the laboratory. In this research soil Ph was

measured by electronic Ph meter device in 2.5:1 delution of soil to aquapura. Soil tissue was measured by Baykas Dansimeter method, carbon percentage by using walki block method, total nitrogen by using kjdal method and kjdal device, and phosphor and potassium by using flame photometry method (Ghazenshahi, 2006). The obtained information were given to the computer and the information being normal was confimed by klomogrof-Smirnov method by using Spss software. As for abnormal information logarithmic transformation was done and also for comparing the average of information related to soil characteristics multivariate test of Duncan was used. Independent t-test was also used to compare the average among the two- afforestated stands.

RESULTS

The results obtained from independent t-test on soil characteristics in hardwood and conifer afforestations showed that phosphor and moisture saturation percentage and the amount of carbon to nitrogen have a significant difference, but the other studied factors did not show any significant difference. The results obtained from analysing the variance of the information related to phosphor (milligram on kilogram) showed that among the average of phosphor, hardwood and conifer stand in Siyahkal Azbarm area is a significant difference at 99 percent confidence level (table1).

Table (1): Analyzing the variance of the amount of soil phosphor among the amount of soil phosphor among the two hardwood and conifer stands in Guilan province

Under study stands	mean	df	Std. Deviation	Std.Error Mean	T	significant
Conifer	1/1483	22	1/24421	0/35917	24/738	0/000**
Hardwood	23/9333	11/072	21/78469	6/28870		

** Significant at 99 percent confidence level

Comparing average amount of phosphor by using independent t-test showed that among the two stands conifer and hardwood in Guilan province is a significant difference at a 99 percent confidence level and the results of data analysis has been showed in figure2.

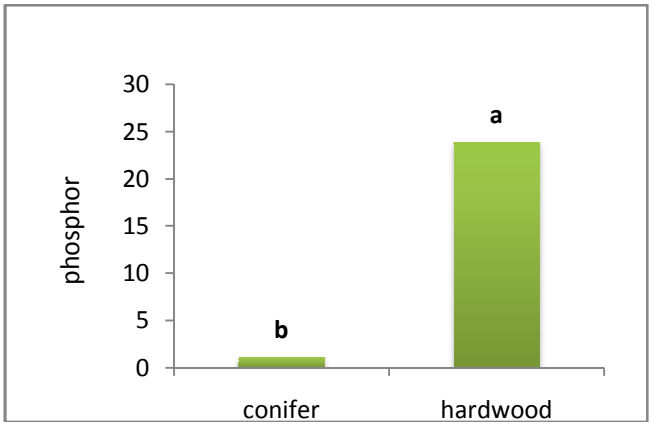

Fig2: the amount of phosphor in conifer and hardwood stands in Guilan province

The results of information variance analysis related to moisture saturation of soil showed that among the average percentage of soil moisture staturation in the two conifer and hardwood stands in Guilan province is a significant difference at 95 percent confidence (table2).

Table (2): Variance analysis of moisture saturation percentage of the soil in the two conifer and hardwood stands in Guilan province

Under study stands	mean	df	Std. Deviation	Std.Error Mean	T	significant
Conifer	52/2983	22	4/06100	1/17231	6/501	0/018**
Hardwood	56/9133	18/299	6/59165	1/90285		

** Significant at 95 percent confidence level

Comparing the average moisture saturation percentage by the use of independent t-test showed that among the two conifer and hardwood stands in Guilan province is a significant difference at 95 percent probability, and the results of the information analysis have been showed in figure2.

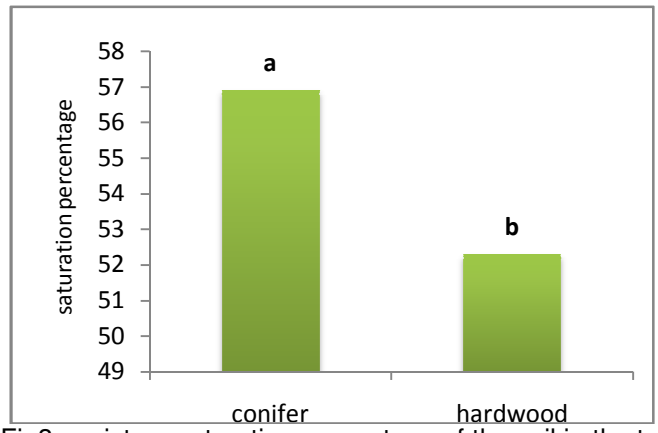

Fig3: moisture saturation percentage of the soil in the two conifer and hardwood stands in Guilan province

The results obtained from information variance analysis related to the amount of carbon percentage to nitrogen showed that among percentage average of carbon to nitrogen in conifer and hardwood stands in Guilan province showed that there is a significant difference at 99 percent probability level (table3).

Table (3): Variance analysis percentage of carbon to nitrogen in conifer and hardwood stands in Guilan province

Under study stands	mean	df	Std. Deviation	Std.Error Mean	T	significant
Conifer	9/3876	22	3/37277	0/41793	10/789	0/003**
Hardwood	6/7031	14/921	1/44776	0/97364		

** Significant at 99 percent confidence level

Comparing average percentage of the amount of carbon to nitrogen by the use of independent t-_test showed that among conifer and hardwood stands in Guilan province is a significant difference at 95%probability level and the results of information analysis has been shown in figure 4.

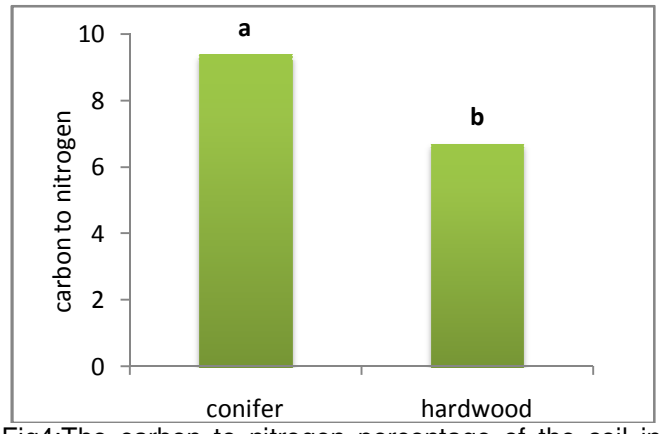

Fig4:The carbon to nitrogen percentage of the soil in conifer and hardwood stands in Guilan province

DISCUSSION

The amount of moisture saturation of the soil in hardwood stand lesser compared to conifer stand; this factor shows clay tissue of the soil in conifer stand compared to loam tissue in hardwood stand. Because of alasyth character of clay in it, it absorbs high moisture and this causes it to absorb more moisture so that it is saturated. The results obtained from this research show the obvious difference in the absorbable amount of phosphor in conifer and hardwood stands at 99 percent probability level. As if the amount of phosphor in hardwood stand with three types of canopy percentage compared to conifer stand with more different canopy percentage is more probably different, trees have different effect and sometimes conflicting effects on phosphor compounds and phosphor cycle and accumulation in soil. Organic phosphor is not absorbable for the plants and its mineral form by the intermediacy of microorganism could become absorbable for the plants.

As seen in the present research as the canopy percentage increases in hardwood stand the activity of micro organisms become severe and phosphor become severe and absorbable for the plant and the amount of the phosphor in the soil decreases.

Ardakany (2002) mentions that the change of organic phosphor to mineral causes week biological activities such as soil that contain humus moor that is usually formed by conifer and its humus and becoming mineral takes place very slowly and conversely in soils with strong biological activity and humuses such as mole, this stabilization and becoming mineral is faster. The results obtained from researches show that the amount of carbon to nitrogen in hardwood stand has a significant difference at 99 percent probality level with conifer stand. As the amount of organic carbon percentage to the amount of carbon to nitrogen is higher it indicates that the organic elements are more in the area. Zarinkafsh (2002) confirm the results of the research. In another research Zarinkafsh (2002) mentions that the more the azote of the plant leaves the C/N relevancy becomes smaller the faster the mineralistion and trees leaves leftovers analysis is done. Aubert *et al.* (2003) found out that hardwood humus compared to conifer humus has a better quality. Because hardwood trees humus have less varbon to nitrogen amount and lignin andas a food priority for insect to be in soil is important.

The studies done show that species which leaves have more nitrogen have lowerC/N such as alnus. Subcordata and papilionaceae trees release co_2 and mineral nitrogen with a definite regularity. In such a way that C/N relation stays almost stable or decrease very little. In this situation of C/N relation the formed humus is decreased in soil's superficial regions and its amount would be much lesser than the region formed from plant's humus (forest mole).

REFERENCES

Ardakani MR (2002). Ecology. Tehran University Press. 340p. (In Persian)

Aubert, M., Hedde, M., Decaens, T., Bureau, F., Margerie, P. and Alard, D. 2003. Effects of tree canopy composition on earthworms and other macro-invertables in Beech of Upper Normandy (France). Pedobiologia.47:904-912.

Danial, T.W؛Helms, J.A and Bker.FB.1979.Principles of silviculture.Mc Grow.Hill Book Company 500p.

Farley KA and Kelly EF (2004). Effects of Eucalyptus saligna and Albizia falcataria on soil processes and nitrogen supply in Hawaii. Oecologia, 113(4):547_556.

Fisher, R.f. 1995. Amelioration of journal rain forest soils by plantation of native trees, Soil Science Society of America, 59(2): 544_549.

Ghazanshahi, J. 2006. Plant and Soil Analysis. Aeezh Press. 272p. (Translated in Persian)t

Goufang, S.,j Liming and Z.Mingpu.1998.The soil amelioration effect of poplarblack locust mixed plantation on sand soil and the interaction of mutual supplement of nutrients between the tree species. Scientia- Silvae, 34:12_20

Neiryck, J. 2000.Impact of Tillia *plutyhyllos Scop, Fraxinus excelsor* L.,*Acer Psedoplatanus* L., *Quercus ruber* L. and *Fagus sylvatica* L. on earthworm biomass and physico-chemical properties of loamy top soil, Forest Ecology and Management, 133(3): 275-286.

Panagopolous T.and Hatzistathis, A.1995.Early growth of Pinus nigra and Robinia pseudacacia stand, contributions to soil gensis and land scape improvement on lignite spoils in Ptolemaidia. Landscape and Uran Planning, 320:19_29

World Bank, 2000. World resources 2000-2001: people and ecosystems, the fraying web of life. Washington D.C. Word Resources Institute, 389pp.

Zarrinkafsh M (2002). Forestry Soil, Interaction of Soil and Plants Regarding Ecological Factors Forests Ecosystems, Forests and Rangelands Research Institute Press, 361p. (In Persian)