Relations between Growth and Some Ecological Properties of Fir Stands in Gümüşhane-Karanlıkdere

Murat YILMAZ* Murat BAKKALOĞLU Ayhan USTA* Uğur KEZİK***

* Karadeniz Technical University, Faculty of Forestry, Trabzon ** Republic of Turkey Ministry of Forestry and Water Affairs, Ankara

ABSTRACT

Site index affects tree growth in various ways. Thus, while it can be optimal for one it also can be bad for the other. Relations between growth and some ecological properties of Norman fir (*Abies nordmanniana subsp. nordmanniana*) were studied. Location of these fir stands is Gümüşhane-Karanlıkdere. The research area comprises 1122.0 ha. and located in the Eastern Black Sea Region, about 40 km from Gümüşhane province, Türkiye. Meanwhile, this area is located in the upper land of the Harşit River which carries effects of the sea in land but the climate of this area is moist, low temperature, and highly water shortage during vegetation period and near the continental climate. In this study, 44 sample areas were created on fir stand locations. All the areas represented with soil samples that were taken from their soil profiles. Soil size particle (clay percent, silt percent, sand percent) analyses, organic matter percent, pH, electrical conductivity (EC), available water capacity (AWC) analyses were made on the collected soil samples. Results of the study demonstrated a relation between fir growth and some ecological properties of their site. The ecological variables of elevation ($p<0.001$, $r=0.494$), % silt ratio ($p<0.001$, $r=0.327$), % field capacity ($p<0.001$, $r=0.221$) and AWC % ($p<0.001$, $r=0.257$) were positively correlated with Site index of Norman fir in Karanlıkdere. In contrast, the % sand ratio ($p<0.001$, $r=-0.228$) and pH ($p<0.001$, $r=-0.353$) were negatively correlated with SI.

Key Words: Norman fir, efficiency, ecological properties

INTRODUCTION

Plants are enable to live and constantly influencing them with physiographic, edaphic, climatic and biotic environmental conditions in the forest areas. A balance and dynamic relations between these conditions are ecological environments are known as (habitat) site index. In other words, "forest habitat" has complex factors as supporting to grow of the forest plants and constantly influencing them (Kantarcı, 1980).

Determination of habitat conditions in the Areas of natural distribution of forest trees is really important for forestry management and scientific research. To understand of habitat of any tree species, a silvicultural intervention to stands belonging to this tree species and allows the selection of accurate tree species to reforestation areas.

Starting to most effective growing areas, choosing accurate tree species more economically valuable than the others and need to deeply understand of habitat for to make a successful management plan.

Norman fir has a very decorative appearances' with intense branches, long and coiled leafs is is extremely favorable for parks and gardens. It uses for Christmas tree for this reason (Karaşahin et al., 2002).This species (*Abies nordmanniana subsp. nordmanniana*) naturally spread to Eastern Black Sea in Turkey and western Caucasus region (Fig.2) adjacent to Eastern Black Sea in Turkey. The Norman fir can located highest quality stands between 1500-2000 m altitude in Turkey (Saatçioglu, 1976). This distribution area is almost moisture-rich the Eastern Black Sea Mountains edge of influencing from Black Sea, but some of them are located at the back of mountains zones has the continental climate (Demirci, 2001).

In this study, Relations between growth and some ecological properties of Norman fir (*Abies nordmanniana subsp. nordmanniana*) which is naturally spreading boundary of Kocadal village belonging to Torul, Gümüşhane were investigated in Gümüşhane-Karanlıkdere.

MATERIALS AND METHODS

Research material are topographic maps (Scale 1:25.000), climate data, geological maps (scale 1:25.000), datas (as aspect, elevation, slope… etc. collected from temporarily sample plots designated as a systematic and 141 soil samples (Fig.3) were taken from research site.

Determining Specific Position Factors

Some data were collected for Specific Position Factors as elevation, slope, aspect, relief, and the neighboring environment-specific information.

Determination of Soil Properties

Soil profiles were opened and determined their layers from each sample plot (Irmak, 1970; Kantarcı, 2000). Soil samples were taken after determining the thickness of each layer. In addition, each soil profile were excavated the depth of absolute, physiological, and excavation (Çepel, 1984-1985).

Laboratory Analysis

The soil samples obtained from the land, after being transformed into air-dry soil, were grounded inside the mortar, sifted through 2 mm sieve, and was prepared for the analysis (Gülçür, 1974; Karaöz, 1989a). The soil analyses were conducted on the soils, with particle diameter of Ø<2 mm, by using the standard methods. The determination of the particle size distribution (sand, silt, clay) of the soils were conducted by using Bouyoucos hydrometer method; soil acidity (pH) was analyzed according to the glass electrode method in pure water; and the analyses of the soil organic matter (SOM) by using Walkley-Black wet burning (Gülçür, 1974; Arp, 1999; Karaöz, 1989b). The amounts of available water capacity (Karaöz, 1989a, Kantarcı, 2000).

Determination of Actual Productivity

As known, average height of dominant of stand which is one of the best criteria shows actual productivity for regular stands. Therefore, The dominant height of standard age taken as a criterion for determination of actual productivity classes (site index classes) about research area (Günlü et al., 2006). In our country, the determination of different classes of the old dominant trees is made by Saracoglu (1988) according to Lloyd-Haffley (1977) method.

Statistical Analysis

First of all, partial correlation analysis was used to investigate the relationships between Site productivity and site factors depending on ecological variables. Finding a good relationship, after partial correlation analysis, regression analysis was performed for site traits. After than new regression equations were established (Ver. 15.0, SPSS Inc., USA).

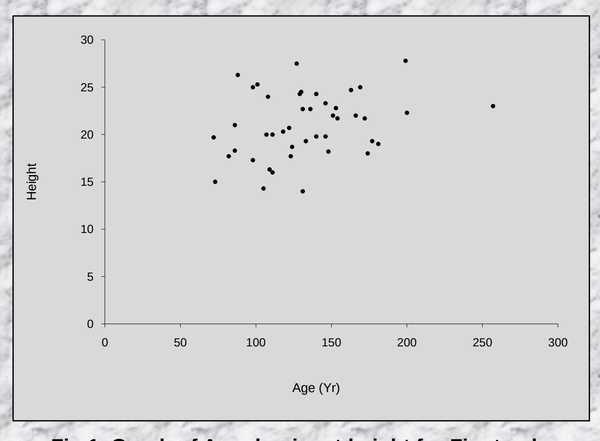


Fig 1. Graph of Age-dominant height for Fir stands



Fig 2. Stands of fir and Scotch pine in study area



Fig 3. Soil Profile

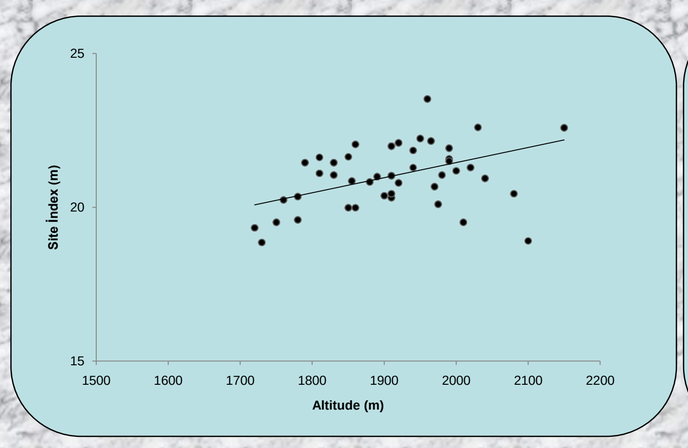


Fig 4. Relationship between SI and altitude

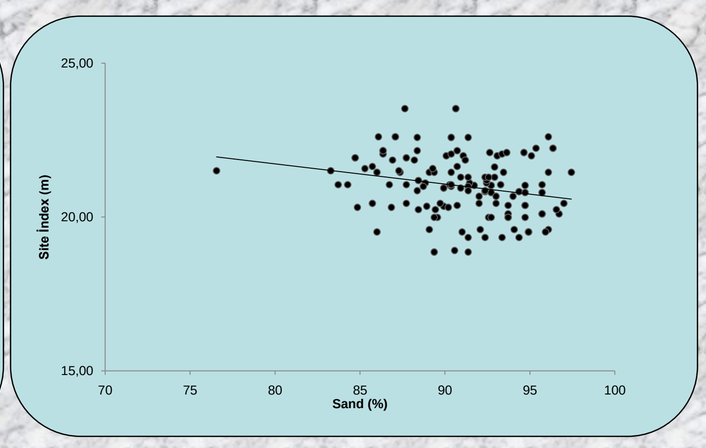


Fig 5. Relationship between SI and Sand

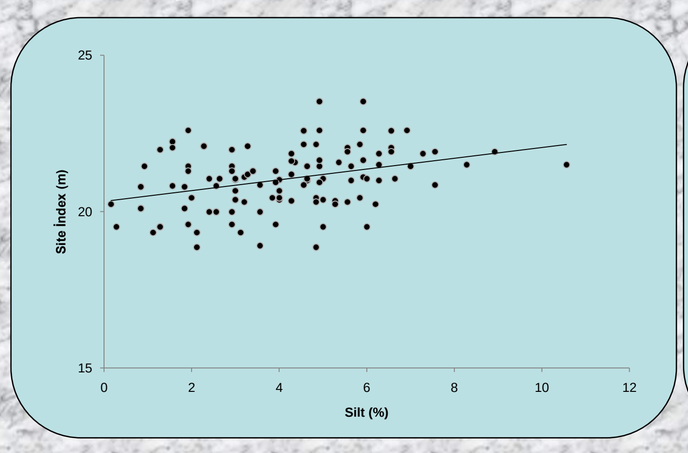


Fig 6. Relationship between SI and Silt

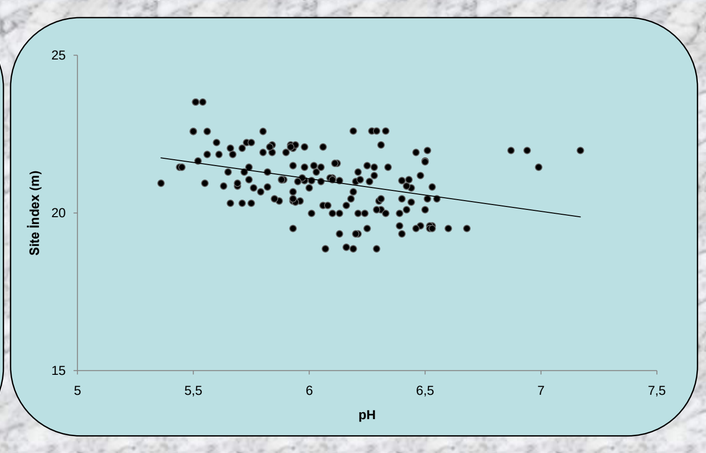


Fig 7. Relationship between SI and pH

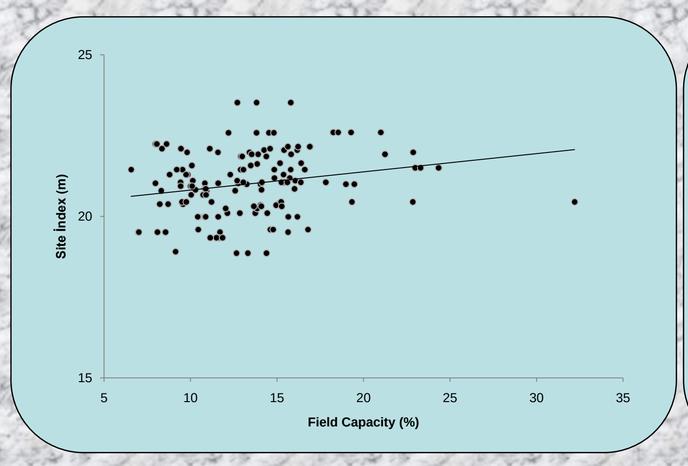


Fig 8. Relationship between SI and FC

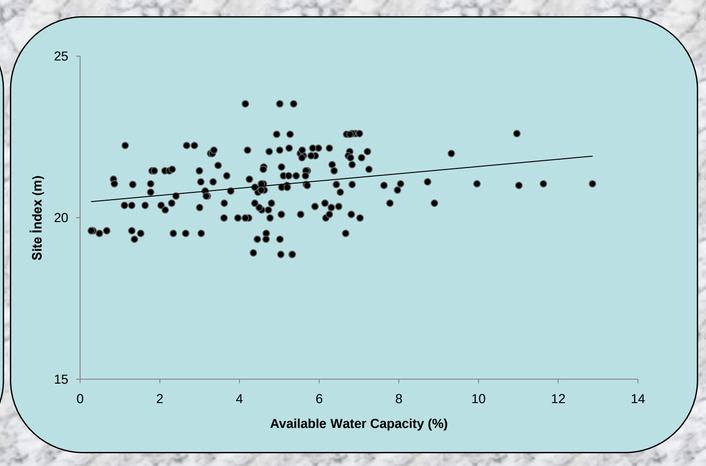


Fig 9. Relationship between SI and AWC

DISCUSSION

The ecological variables of elevation, sand, silt, clay, pH, field capacity and AWC were found significant relations with the SI of Norman fir (Fig 4,5,6,7,8,9).

The ecological means; increasing of elevation, silt ratio, field capacity and AWC directly increasing productivity of Norman fir.

CONCLUSION

► This study carried out into Norman fir (*Abies nordmanniana subsp. nordmanniana*) forest in boundaries of Torul district of Gümüşhane province which is located the backward of eastern Black Sea region

► The study was conducted in a local. For this reason, the obtained results are valid for Norman fir trees of Karanlıkdere locality. It is need to investigate the relationships between site factors and site index of Norman fir that is widely distributed in different site in the eastern Black Sea.

► Thus, it makes easy to understand how it affects different conditions for the productivity of the Eastern Black Sea fir by the studies from local areas.

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