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RESEARCH ARTICLE

DETERMINATION OF GROWTH AND ADAPTATION ABILITY OF NATURAL REGENERATION STUDIES OF ORIENTAL BEECH-STEM MAPLE (*ACER TRAUTVETTERI MEDW.*) STANDS IN THE SAKARYA-HENDEK DISTRICT IN TURKEY

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ABSTRACT

In this research, the growth and adaptation status of natural young people coming to the area at the end of the first year were investigated as a result of the natural rejuvenation studies made on the beech-stem maple trees (*Acer trautvetteri* Medw.) in Sakarya-Hendek region. According to the measurement results obtained from the natural regeneration area, the mean height growth ranged from 10.6 to 13.4 cm, the mean root collar diameters ranged from 1.2 to 1.6 mm and the number of natural juvenilities varied from 4.3 to 5.6 item/m^2.

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INTRODUCTION

It is possible to say that as a result of the extreme utilization of fossil resources every day, people turn to forests, which is the most important resource that can naturally renew itself in order to provide many products and services, in particular energy needs. From the very first moment of its existence, mankind has continuously used forests for the purpose of sheltering, nourishing and warming, and has been able to take effective use of other protective services provided by forest resources over time. In today's modernizing world, forests have been the most effective way to repair mental worn-outs, particularly those caused by the high standard of living in big cities, and since the 21st century all forests have been used effectively for recreational purposes. The increasing diversity of other products and services provided by the forests has increased the importance of this natural resource and made it indispensable. However, forests throughout the world and our country are severely worn out by the effects of various biotic and abiotic factors and their assets are threatened.

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Ensuring the sustainability of this important asset plays an important role in protecting the ecological balance in the world, with great importance in every sense. Forests are becoming more and more important assets due to their being carbon deposits, playing an active role in global warming, and providing new sources of economic livelihood by providing positive contributions to life through wood and non-wood products. However, every decrement of forest existence should be prevented and necessary silvicultural and legal measures should be taken. Indeed, one of the most important tasks in ensuring the continuity of the existence of forests falls into the science of silviculture, which defines the task of successful rejuvenation, maintenance and afforestation as its task. Although the silvicultural characteristics and the dynamics of youth and other developmental periods should be well known in order to be able to fulfill this purpose, the factors affecting the success of rejuvenation and afforestation studies should be well known. In this context, multidimensional decision making and review techniques should be put in place and the success of rejuvenation with a large number of variables must be examined and supervised. This is even more important when we consider the necessity of ensuring the continuity of pure and mixed forests of numerous species of biology and species that our country has because of the different conditions of the growing environment it has.

In our country, especially the broad-leaved species, there are very valuable forests with their own and needle-leaved species. However, some broad-leaved forest tree species have been severely damaged due to extreme exploitation and are at risk of disappearing. At the beginning of these species is a beech-covered maple. In this study, it was aimed to determine the first growth dynamics at the same time when the success of the *Acer trauvetteri* species was investigated in the rejuvenation area of 59.4 ha in the Aksu Forest Management Department of the Hendek Forest Management Directorate.

MATERIALS AND METHODS

Material

This work was carried out at the beech-bodied maple seed stand at the 79th section of Aksu Forestry Works. The size of the seed stands is 5.1 ha, the average annual precipitation is 852mm, the average annual temperature is 14.5°C, the relative humidity is 72.3% and the dominant wind direction is north-east. The average elevation of the regeneration area is 1350m, the mean slope is 40% and the general view is north and north east. In the regeneration area, the main rock is limestone and schist, while the soil type is sandy-slime (Anon., 1984). In the research area, natural rejuvenation work was carried out on the grounds that there were abundant seed years in 2016. As a result of the insemination period, approximately 38.6% of the existing wealth was removed from the field. A light and somewhat moderate alive cover was cut out from the area before the field sanding section and removed to the mineral soil area by raking (Anon., 2015).

Method

The size of the boy, the root throat and the number of juveniles per square meter, which are important quantitative characters for youth rejuvenation studies and youth dynamics, have been determined in there search. A centimeter-size dheightgauge for juvenility height measurements, digital gauge mm-precision for root collar diameter measurements, and a wood enlathtoidentify one square meter in number of juvenilities (Figure 1). A total of 5 sample plots of 25x40m in size were taken in the research area and a square system was constructed in which 20 counts of each 5x5m size were made in this temporary sample plots and the juvenilities counts were realized (Tunçtaner and Özel, 2008). Growth and juvenilities number graphs were created for each sample plots by taking the arithmetic mean of the measurement and count values obtained in the square system. All counts and measurements were made in March 2017, the first year of germination, before the vegetation period began in the region. The first dynamism values were determined by comparing the measurement and counting results with the help of column charts.

RESULTS

Figure 2 shows the height growth graph determined by the sample plots by taking the mean height measurements of natural juvenilities at the age of first germination at 1 year. When the data in Figure 2 were examined, it was determined that the mean height growth varied from 10.6 to 13.4 cm in the sample plots. One of the important quantitative characters examined in the study is the diameter of the root collar. The mean root collar diameter growth values determined by the sample plots by taking the arithmetic mean of the data obtained from the measurements made in the temporary sample plots taken in the field are given in Figure 3. When the mean root collar diameters values in Figure 3 are examined, it has been found that the mean root collar diameter changes between 1.2-1.6 mm, while the growth performances are closer to each other in the sample plots. The most important variable used in evaluating success in natural regeneration studies is the number of juvenility in square meters. It is aimed to determine the number of different juvenilities in the field of new juvenilities stables in the scope of Uniform Shelter wood Method (USM), which is applied especially for natural regeneration studies for almost all types. The most important success criterion for regeneration is the number of natural juvenilities, the conditions of the growing environment, the number of healthy seeds emerged during abundant seed years, and the dynamics of the stands. For this purpose, we tried to determine the number of natural juvenilities in the field of beekeeping maple regeneration in the field of research and in our country where there is no study on natural regeneration and natural juvenilities growth dynamics. In this respect, the numbers of the natural juvenilities in square meters are given in Figure 4 in terms of the average values. When the findings in Figure 4 were examined, it was determined that there were not very large numerical differences among the mean number of natural juvenilities in the sample plots, but when all the sample plots were evaluated, it was determined that the mean number of natural juvenilities of maple in the research area changed between 4.3-5.6 item/m^2.

DISCUSSION

Natural regeneration work is at the head of the silvicultural interventions intensively carried out in our country. These applications are generally carried out at the desired level of success, especially in pure stands, but the success is not high due to reasons such as the large leaves have been introduced, but the techniques have not been successfully applied in the mixed forests of broadleaved and conifer species and the regeneration periods are inadequate. However, USM is the only and unique method applied to all rejuvenation work, both in pure and mixed forests. In USM, in which four different cutting techniques are applied, regeneration is attempted with a single seeding segment, which is generally carried out in middle or good seed years (Saatçioğlu, 1979; Genç, 2004). As a result of some researches on the problems of seed and regeneration in our primary forests, we can not say that these studies have been successfully carried out in pure and dense mixed stands, especially by our second leafy species, with successful regeneration studies with many experiences obtained in practice. Because of this reason, it is generally dangerous to generations because of the lack of continuity of main species which serve for the formation of a healthy and quality top layer of the main stand, especially in the intermediate and lower troughs (Odabaşı *et al*., 2004).

One of these important talisman species is the beech wood maple. Today, IUCN is implementing the widest and most efficient spread of this kind in our country, which has been protected by the Red List in the natural distribution areas of Europe and Asia since 2016. Especially in the east of the Marmara and north of the Western Black Sea Region, rarely pure and generally mixed forests are brought to the scene (Saatçioğlu, 1969). The seed stands which constitute the most important gene sources of this line are found in Hendek and Aksu regions.

Figure 1. Size measurement and counting in natural juvenilities

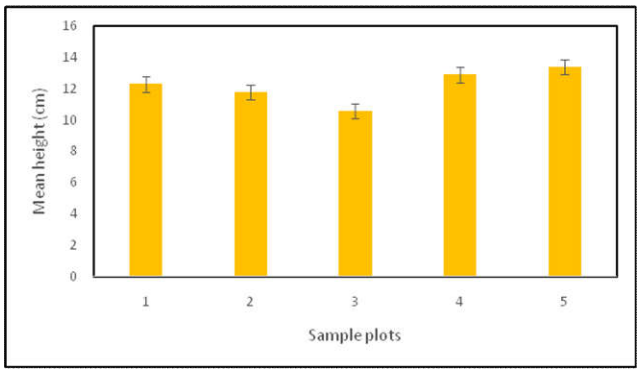

Figure 2. Mean height growth of natural maple juvenilities according to the sample plots

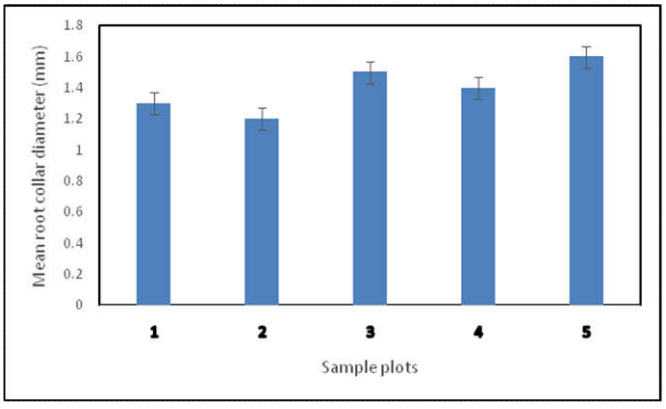

Figure 3. Mean root collar diameter growth according to the sample plots of natural maple juvenilities

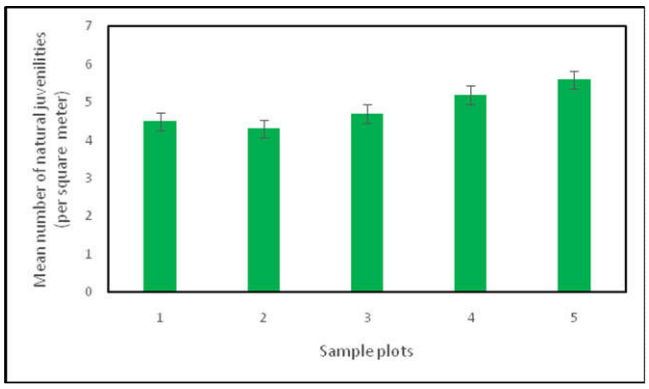

Figure 4. Mean number of natural juvenilities according to the sample plots

No technical interventions other than seed collection have been carried out in the natural stands where the first selection works have been carried out since 1984. Therefore, as the natural destructions and tensions that arise in aged forests are experiencing significant biological and economically significant depreciation, the continuity of the running generation is also in dangerous. In this context, the first natural rejuvenation of the maple tree (Saatçioğlu, 1969), which is generally regarded as the eastern beech growth trend, was realized in 1984 at the Aksu Forest Management Department, In 2016, the first germination occurred in the first quarter of 2017 (Anon., 2015) as a result of insemination among individuals who were selected as seedlings due to the abundant seed year of species. The first growth dynamics and growth performances of beech-bodied maple trees were started to be measured and counted in March of 2017 before the vegetation season was reached.

However, the results obtained have not been evaluated by the results of other investigations because there is no research work done in this country in our country. In this context, the growth performance and the first juvenility dynamics were tried to be compared with the oriental beech which has silvicultural characteristics very close to it and which has biology. According to this, the first height growth values in the beech-carved maple tree vary from 10.6-13.4 cm on mean in the 5 temporary sample plots taken from the regeneration field (Figure 2). In oriental beech germination in the first years, this value varies between 7.2-9.3 cm in the Bolu-Aladağ region, which has similar growth environment conditions to the research area (Tosun and Gülcan 1985; Tosun *et al*., 2002). The second variable is the diameter of the throat measured and measured in the field of research which consists of sample plots and natural regeneration field. Root collar diameter is a very important variant (Çepel, 1992, 1995) in order to determine the potential of natural juvenilities to benefit from organic matter and moisture found in the first year, especially in the top soil layer of 20 cm. As a result of root-neck diameter measurements carried out in this context, root collar diameter changes of natural maple juveniles were found to vary between 1.2-1.6 mm at the end of the first year (Figure 3). This value varies between 1.1-1.4mm in Ordu-Akkuş region in oriental beech, 1.3-1.7mm in Kastamonu-Cide region and between 1.2-1.9mm in Düzce-Ayıkaya region, which provides similar development performance with species (Suner, 1978). In this context, it can be said that the first growth performances of beech domed maple trees in general are at a good level and exhibit a good development trend in comparison with the oriental beech.

The most important criterion for success in natural regeneration work is the number of natural juvenilities remaining after the elderly stand is completely removed from the field. The number of natural juvenilities living in urban areas is also important in terms of ensuring the establishment of the next stand by adhering to the area of natural juvenilities as well as the acquisition of biological independence of natural juvenilities and the progression of the transition to the age of frequentness (Saatçioğlu, 1969; 1972; Ata, 1995; Odabaşı vd., 2004). For this reason, in this study, the number of natural juvenilities per square meter at the end of the first year was determined as the test areas of beech-stem maple species. According to this, it was determined that the number of square meters of maple natural juvenilities varied between 4.3-5.6 item/m^2 (Figure 4). This number varies between 2.8-9.3 item/m^2 in oriental beech stalls in the West and Central Black Sea growth environment conditions (Suner, 1978, Tosun, 1992, Tunçtaner and Özel, 2008).

Conclusion

It is difficult to talk about the number of natural juvenilities during the first germination period in this study. But the important thing here is to ensure that the first natural juvenilities, if at all, are held in the field as much as possible. This will guarantee the transfer of future generations and the continuity of the biological, technical and economic benefits provided in the country's forests. For this reason, genetic resources should be created both inside and outside the natural distribution area, and it should be ensured that natural residues are placed in sufficient proportions.

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