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Effects Of Extractıon From Compartment On Soıl Enzymes

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ABSTRACT
This research which carried out in the mixed forest of the coastal pine + eastern beech in the Amasra-Kazpınarı region, the effects of different extraction techniques carried out using the trailer system mounted on a 4x4 ATV on catalase and urease enzyme activities at the upper soil level (0-10cm). For this purpose, variance analysis and Duncan test applied to the results of catalase and urease enzyme activity analyzes performed from soil samples taken from the topsoil depth (0-10 cm) with 11 repetitions, which will be 11 repetitions from the friction parcels where no extraction is performed, and two different compartments are performed. According to the results, a statistically significant difference was detected between the parcels in terms of catalase enzyme activity at the p <0.05 confidence level. Accordingly, as a result of Duncan test performed at p <0.05 confidence level, the highest catalase enzyme activity value (12.75) was determined in the control plot, while the lowest catalase enzyme activity value (3.38) was determined in the first plot where one end of the log was removed from the chamber by rubbing it in the soil.
KEYWORDS: *Seperation, scrubbing, enzyme activity, catalase, urease, ATV*

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I. INTRODUCTİON

Ensuring the continuity of natural resources is very important for the existence of humanity and healthy community life. In this context, sustainable management based on scientific foundations should be implemented in all natural resources. It is understood from the recent research results that a significant part of the natural resources on the earth will reach the point of exhaustion in the next 50 years as a result of the high increase in the world population and the combined effects of global climate change caused by it (Curtis et al., 2008). Due to the excessive use of natural resources and reductions caused by pollution, the openness that emerges in supply and demand balances causes agricultural production and water resources to become polluted and unusable every day, especially the use of clean air, which is one of the life vessels of the society. Today, as a result of pollution and large losses in water resources in many areas, especially in the African continent, people have faced with hunger and thirst, mass deaths and migrations have occurred (Lea et al., 2008). These negative events repeat every year in different parts of the world and the natural living conditions and the ecological balance that ensures the continuity of these conditions are hardly damaged by this situation. In this context, the protection of energy resources, which play an important role in ensuring the conditions of modern society, we have become very difficult. Developed countries, especially those who need high energy use, prefer to exploit the natural energy resources (oil, coal, natural gas, etc.) of underdeveloped or developing countries instead of using all of their resources to meet their own needs. Today, in the 19th century, which has been left behind by many researchers who are considered as an authority in the field of international relations and politics, the use of fossil origin energy resources of these countries in accordance with their own benefits in the emergence of turmoil and internal revolts in the countries of the Middle East, Africa, and South America. It is reported to arise from requests to provide (Radkau, 2009). This negative Picture is seen in agricultural areas, wetlands, clean water sources and fossil-based energy sources that also manifest itself on forests, the most important natural resource that can naturally renew itself. All the world forests, especially the amazon forests located in the equator, have lost their efficiency and natural structure as a result of excessive cuts, storms, earthquakes, erosion, and especially fires made in the last 30 years. According to the latest statistical information announced by the World Food and Agriculture Organization (FAO) in 2018, approximately 42.7% of forest vegetation has been destroyed in the world in the last 30 years with the effect of biotic and abiotic factors (FAO, 2018). Due to these

destructions occurring in forest areas, unexpected drought events started to appear worldwide and the climate of the earth started to show clearly the signs that it was negatively affected by this situation. This situation caused significant losses in fertile soil due to drought and heavy metal pollution (Allen et al., 2015). Depending on the variety of products and services they provide, forests, which are a very important natural resource in terms of protecting community life and other natural resources, have the most important function in eliminating the negative effects of global climate change on the earth. These natural resources, which have an important feature such as carbon storage, constitute the most important object of sustainable natural resource management. Fires occurring in amazon forests known as the lungs of the world and forest resources belonging to the Australian continent caused approximately 20 million hectares of forest losses only in 2019 and 2020. Even this negativity has caused 780 thousand living species to be damaged and 80 million dollars of damage to occur in forest areas where these fires occur (ANGA, 2020). In this respect, all negative developments in natural forest resources affect the whole life. Therefore, sensitive forestry practices should be carried out by using new and natural balance sensitive methods in the transmission and management of forests, as the great destructions in forests endanger the continuity of forests in recent years. Silvicultural activities are among the most important technical practices in forestry. As a result of silvicultural practices, forests are maintained or forests are rejuvenated by natural or artificial means. Rehabilitation and restoration practices are also frequently used within the scope of today's modern forestry activities.

In this research, the effects of different extraction operations carried out with the carrier trailer system mounted on the 4x4 ATV used in production studies on soil enzymes were investigated.

II. MATERİALS & METHODS

2.1.Materials

The research was carried out in the coastal forest + eastern beech mixed forest in Kazpınarı region of Amasra district of Bartın province (Figure 1).

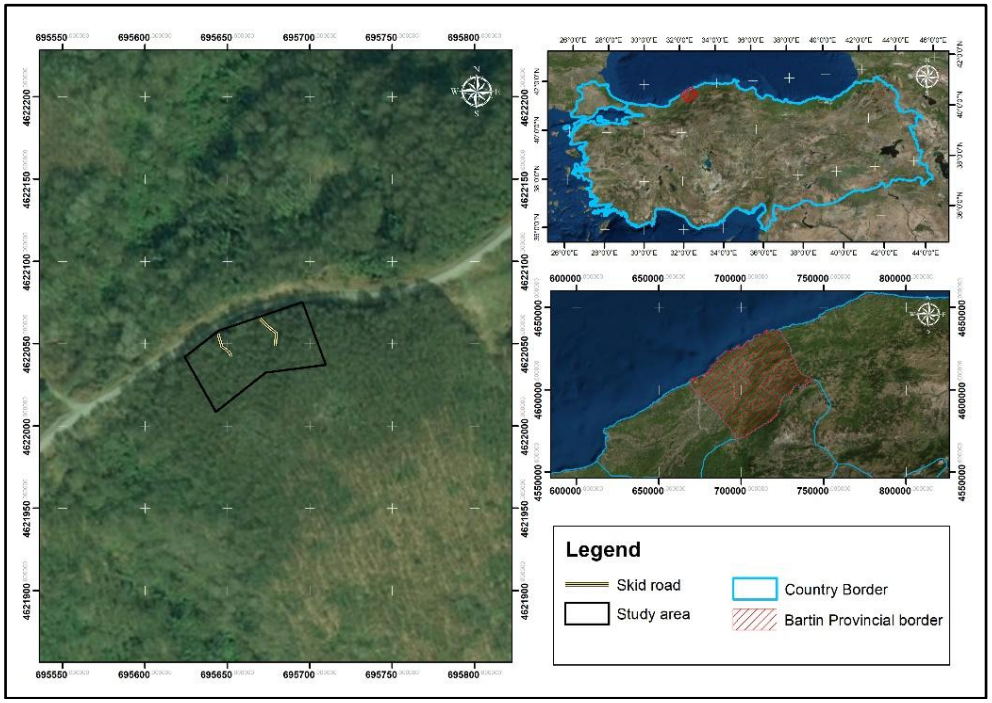


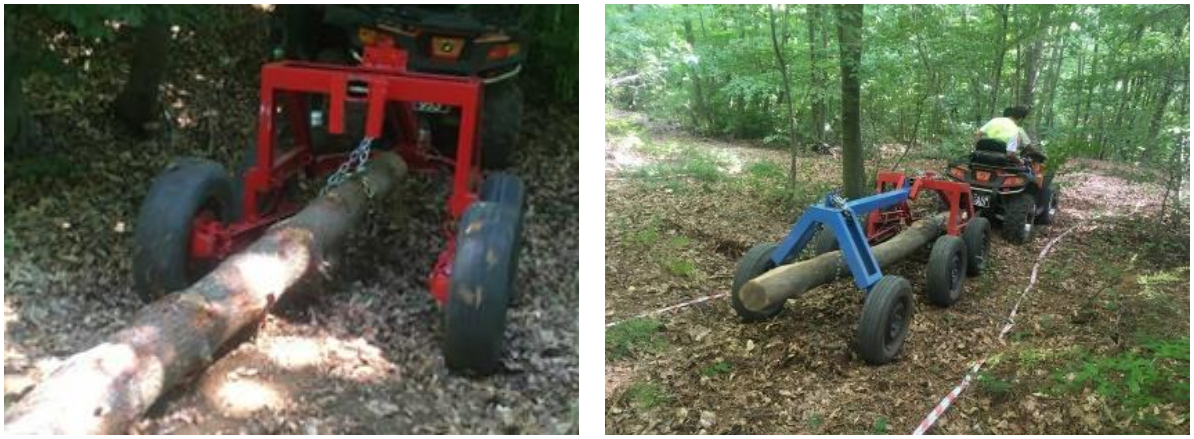
Figure 1. Research area (Varol et al., 2020).

The research area, where different extraction operations are carried out, is located in the Western Black Sea Euxin lower forest zone in terms of plant sociology, its altitude is 410m, the balance is between southeast and the slope of land is between 8-12%. In the research area, the soil has sandy-loam texture, clastic structure and medium depth conditions. The average annual temperature in the research area is 17.2 ° C and the average annual precipitation is 1063mm (Varol et al., 2020)

2.2.Method

2.2.1. Establishment of Trial Plots and Taking Soil Samples

Within the scope of the research, with the carrier trailer system developed in connection with 4x4 ATV, beech logs of 35.6cm in diameter and 3.54 m in length were removed from the area in two different ways. In the first operation, one end of the beech tree trunk from the first skidding road is suspended in the carrier trailer system and the other end is removed from the area by (a). In the second operation carried out on the second skidding road, both ends of the same beech tree trunk were suspended from the area (b), suspended in the carrier trailer system (Figure 2).



(a) **(b)**

Figure 2. Extraction from two different compartments performed in the study (Varol et al., 2020)

The third skidding road was left for control purposes and no skidding was carried out in this area, and the natural soil structure was not allowed to deteriorate. Soil samples were taken from the upper soil level of 0-10 cm depth in the control skidding road, where there is no operation for the purpose of control by two skidding paths, where two extraction operations are carried out from two different compartments (Figure 3 and Figure 4). The skidding was carried out in 20 repetitions.

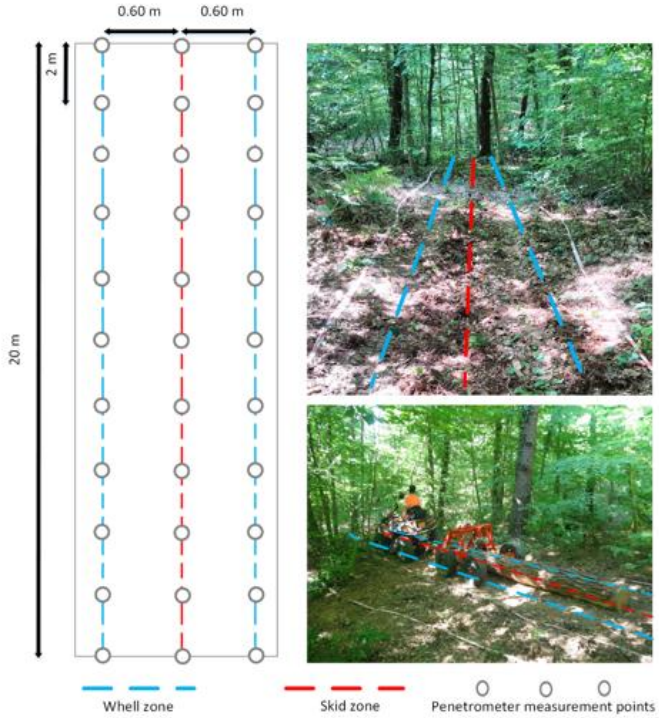


Figure 3. The points where top soil samples are taken in the skidding road plots (Varol et al., 2020)

Figure 4. Soil samples taken from the upper soil level (Varol et al., 2020)

2.2.2. Determination of Enzyme Activities in Soil Samples

Enzymes that start and finish different biochemical processes in the soil are involved. However, enzymes that are especially important in terms of microorganism activities and plant nutrition are catalase and urease (Jhonson, 2009). In this research, the effects of different extraction processes on these two enzyme activities were investigated to the extent of possibilities.

2.2.2.1. Determination of Catalase Activity

The solution (10 mg) prepared with 5 g soil samples taken from 0-10 cm upper soil depth level, with 11 repetitions from each treatment parcel, was bound to Scheibler Calcimeter (Küçük and Cevheri, 2018). By providing interaction of samples with hydrogen peroxide, oxygen output was determined in ml and catalase activity was determined (Küçük and Cevheri, 2018). Catalase activity was determined at a value of Ph 7.45.

2.2.2.2. Determination of Urease Activity

250 µl of toluene, 750 ml of citrate buffer and 10% of 1 ml of urea solution were incubated for 3 hours with soil samples taken from 0-10 cm upper soil depth level, and ammonium was released in the contents after incubation (Küçük and Cevheri, 2018). The amount of ammonium released was read using a 578 nm wavelength spectrometer. The results were calculated in mg N / 100 g soil (Küçük and Cevheri, 2018). Urease activity was also detected when the pH value was 7.45 as in the catalase activity.

2.2.3. Statistical Analysis

Within the scope of the research, the analysis of the determination of catalase and urease enzyme activities performed in the top soil samples taken from two skim parcels, where the removal of the plots from the two different compartments created according to the trial pattern, and one of the skidding parcels opened for control purposes, was performed 11 times. Variance analysis (ANOVA) was performed to determine the effect of separation methods on these enzymes and Duncan Test was applied at $P < 0.05$ confidence level to group the processes in case of differences between enzymes due to separation methods. All statistical analyzes used in the research were performed with SPSS Statistical Package Program (SPSS Inc., 2001).

III. RESULT AND DISCUSSION

3.1 Conclusion and Discussion on Catalase Enzyme Activity

The results of variance analysis and Duncan test applied to the data obtained from the analyzes of catalase enzyme activity performed in the soil samples taken from the upper soil level (0-10 cm), which will be 11 repeats from the control parcel and the parcels from which two different compartments are performed are shown in Table 1.

Table 1. Variance analysis and Duncan test results applied to the catalase enzyme results determined in the plots from the control plot and the plots where different extraction techniques are applied

Separation Operations	Catalase Activity
A. Removing one end of the logs from the chamber by rubbing it	3.38 (0.08)^{a*}
B. Removing both logs from the chamber by suspending them on the carrier trailer	7.61 (0.05)^{b*}
C. Control	12.75 (0.03)^{c*}

***: p <0.05 a, b and c:** Different letters indicate different groups.

When the results in Table 1 are analyzed, it is determined that there are statistically significant differences between the parcels where the subtraction process from 2 different compartments is performed and the upper soil samples were taken 11 replicates from the control parcel, as a result of catalase enzyme activity analysis results at p <0.05 confidence level. (Table 1). As a result of this variance analysis, Duncan grouping test was applied at p <0.05 confidence level in order to group the plots in terms of catalase enzyme activity. According to the Duncan test result; While the lowest value of catalase enzyme activity (3.38) was determined in the first plot from which one end of the log was removed from the cutting area by rubbing it on the ground, the highest value (12.75) was determined in the control plot where no extraction was performed and no soil chewing and compaction occurred on it (Table 1).). Catalase activity in the soil is an important soil enzyme activity not only for determining the current status of microbial activities but also for the knowledge of the levels of utilization of organic nutrients of trees and other plants in the soil, as well as for the harmful toxicity of the toxic substances that are toxic to living things in the soil. (Küçük and Cevheri, 2018; Yang et al., 2018). Therefore, catalase enzyme activity, soil type, soil depth, physical and chemical properties of the soil, organic matter content, microorganism activity, seasons, soil pollution, vegetation cover, bacterial type, soil cultivation, irrigation and fertilizing. depending on it, it may show important changes (Sun et al., 2003; Roldan et al., 2005). The reason for the low value of the enzyme activity in the friction parcel, where one end of the beech logs was removed from the chamber by rubbing at the other end of the beech logs, from the parcels from which different extraction operations were performed and the upper soil level (0-10 cm) from the control parcel to these determination and research results. As a result of the cultivation process, it is thought that the decrease in the microorganism population and the amount of organic matter may be effective due to the transport in the fertile top soil layer. As a matter of fact, in a study conducted in China on this subject, it is reported that the deterioration in soil conditions, especially due to soil loss, negatively affects catalase enzyme activity, which is closely related to water and yield loss, especially microorganism activity and organic matter amount (Yao et al., 2006). According to this comparative information, soil fertile upper soil loss in the skid plot appears to be an important factor that negatively affects catalase enzyme activity.

The ecological factors that affect the formation and shaping of the forest ecosystem consist of climatic, edaphic and physiographic elements (Barnes et al., 1998). Among these elements, soil, which constitutes the basis of life with its unique physical and chemical properties and especially the physical space provided for the formation and development of trees, which are the leading plants of high-rise plants, as well as the nutrient and water minerals, has special importance. For this reason, different situations caused by all kinds of technical interventions carried out in forestry studies or previously unknown natural events caused by open field conditions have direct or indirect effects on soil conditions. This effect is especially evident in the soil fauna and flora consisting of very different living organisms (Jhonson, 2009). For this reason, to follow the microorganism activities and the factors that activate the chemical and biological processes occurring within the scope of these activities, in terms of obtaining the mineral nutrients required for the separation of organic matter in the soil and the other elements of the forest and other elements of forest vegetation. It is important in terms of preventing problems and choosing and implementing ecological forestry activities by taking necessary protective measures (White, 2006).

3.2. Conclusion and Discussion on Urease Enzyme Activity

The variance analysis and Duncan test results applied to the analysis results related to the urease enzyme activity performed in the top soil samples taken from the control parcel and the parcels where different extraction processes are applied are given in Table 2.

Table 2. Variance analysis and Duncan test results applied to the urease enzyme results determined in the plots taken from the control plot and the plots where different extraction techniques are applied.

Separation Operations	Urease Activity
A. Removing one end of the logs from the chamber by rubbing it	10.92 (0.05)^{NS}
B. Removing both logs from the chamber by suspending them on the carrier trailer	11.47 (0.03)^{NS}
C. Control	11.63 (0.04)^{NS}

^{NS}: Non significant

According to the results in Table 2, as a result of the analysis of variance applied to the data obtained from the analysis of the urease enzyme activity carried out from the parcels from which different extraction processes are applied and the upper soil (0-10 cm) samples taken from the control parcel; There was no statistically significant difference in terms of the value of urease enzyme activity between the parcels from which the extraction was applied and the control parcel (Table 2). Accordingly, the highest urease enzyme activity (11.63) was determined in the control plot, where no treatment was performed, as in catalase enzyme activity, and preserving its natural structure in all respects (Table 2). According to the research results, urease

enzyme activity, which is one of the important soil enzyme types held by soil colloids, does not vary depending on soil microorganism activities and organic matter content, and according to the variety of plant species naturally found in the area or the types of crops grown in agricultural areas. It has been found to vary (Küçük and Cevheri, 2018). As a matter of fact, this also confirms the results of the analysis of the urease enzyme activities performed on the plots from which different extraction techniques are applied in the research area and the upper soil samples taken from the control plot (Table 2). In addition, it is possible to relate the absence of a statistically significant difference between the parcels in terms of urease enzyme activity with the low level of species diversity in the sub-forest natural vegetation in the research area. Because the biochemical changes and differences that the plants, which have different physiological and anatomical features, especially in the soil through their roots, directly or indirectly affect urease enzyme activity. Because it is a fact that has been revealed as a result of many studies that the microbial community in the soil and the activities of this community by means of the roots of the plants (Cusack et al., 2011; Ren et al., 2018). In this context, it is stated that urease enzyme activity does not change with upper soil transport or loss of organic matter caused by different extraction applications performed in the research area, but the enzyme in question is located at a medium level in the upper soil levels as a result of very low vegetative biological diversity in the forest bottom flora.

In this research, which was carried out in the mixed forest of the coastal pine + eastern beech in the Amasra-Kazpınarı region within the borders of the Bartın province, 4x4 ATV for the removal of the wood raw material resulting from the maintenance and rejuvenation studies within the scope of ecological forestry applications with the least damage to the remaining forest area. The effects of the changes caused in the soil on the physical and chemical properties of the soil and catalase and urease enzyme activities, which are very important for the soil microorganism activities, were investigated in 2 different ways with the trailer system installed in the area. As a result of the analyzes carried out in soil samples taken from the upper soil level, it was determined that the lowest value of catalase enzyme activity was obtained in the control parcel where the natural structure of which no application was performed was preserved in the control plot where no application was performed (Table 1). On the other hand, urease enzyme activity did not show a statistically significant difference either in the parcels where different extraction activities were performed or in the control parcel where no treatment was performed, and it was found that the urease activity was not affected by different extraction processes in the soil samples taken from the upper soil level (Table 2). In line with these findings obtained from the research, it is very important to preserve the natural structure of the soil, which is one of the most important natural components of the forest, and the balance of living populations in the soil in harvesting and splitting processes, which constitute one of the most important stages of technical forestry practices. For this reason, it is of great benefit in preferring applications and equipment in which the skidding process is minimized as much as possible in the extraction processes and the contact of soil and wood material is kept to a minimum. Especially after natural rejuvenation applications, the fertile top soil layer that provides the appropriate germination environment for the seeds should be protected and the amount of organic matter should be constantly checked at this soil level. For this purpose, the study of catalase enzyme activity in the said upper layer should be used and evaluated as a good indicator in terms of building efficient conditions or ensuring continuity. On the other hand, before the technical interventions in the forests, after the biological diversity interventions caused by all the plants that are naturally or semi-naturally located in the lower flora, they should be re-established in the area either naturally or artificially. In this sense, urease enzyme activity to be performed in soil samples taken from the upper and lower soil levels can also be evaluated as an important monitoring parameter in order to check whether an adequate level of vegetative biological diversity is achieved.

On the other hand, as a result of the variance analysis, it was revealed that the value of urease enzyme activity in the upper soil depth did not show any changes to the different extraction processes performed. Accordingly, the highest urease enzyme activity value (11.83) was determined in the control plot, while the lowest urease enzyme activity value (10.92) was determined in the first plot where the logging was removed from the soil in the form of rubbing one end of the logs. Compression caused by rubber wheels of ATV and carrier trailer caused a decrease in catalase enzyme activity in upper soil depth but did not cause a significant change in urease enzyme activity.

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