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A Case Study of Morphologic and Health Examination of Alnus Species Being Thicker than 60 cm, (the 10th Series of Roshan Deh in Shafaroud, the9th catchment of Shafaroud)

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ABSTRACT

With the help of the morphologic characteristics of Alnus, the other forest and forestry operations can be done more carefully; studying existing relations between morphologic characteristics, markers can mark with more trust. As the sample of the study, and through the use of forest method, we have selected 107 species of Alnus whose diameter is more than 60 cm ; more than 10 factors of their morphologic characteristics are extracted being included in the related tables. The factors are entered into SPSS after being organized in EXCEL and after taking Levene test, the parametric and non-parametric data are analyzed with Spearman test. The results show that the minimum and the maximum diameters are 60 cm 150 cm, respectively; the minimum height is 15 cm and the maximum studied height is 38 cm; 69% of the thickest Aluna trees are at 1 and 2 degrees whereas 31% of the studied species are at the 3rd degree; there is no 4th degree in the studied species; the minimum trunk height is 2m and the maximum is 12 m, the minimum height of the tree up to the crown is 15m and the maximum is 28 m; 80.4% of the studied species are single-branched and 19.6% of them are two-branched, 77.7% of the thick species have a cylindrical trunk while about 7.5% of the studied species do not have any branching; in 19.6% of the species the branching is low, and in 72.9% of the species the branching is high; 50.5% of samples are relatively healthy.

Keywords: *morphologic characteristics, Alnus, the health of tree, Roshan Deh.*

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INTRODUCTION

The summer Alder trees are considered as the most valuable forest species in north Iran (commercial species). Trees appear for natural causes and that their health and diameters are important in the marking. Despite the intense operations on the most of the northern forests of Iran, still trees with more than 60 cm diameter are found. Information about morphologic characteristics and health of these trees can be effective in decision making and their marking. This study also provided information about the determination of the diameter of the target alder species which is important in terms of silvics and exploitation of these species. Since, vegetation communities differ from each other in terms of the ecological composition, the forests and the ages of trees as well as their positions are effective in the shape of the trees. Needless to mention that the morphologic characteristics are used because they are the only operational marking tools in the diagnosis of the health of the trees. Therefore, in this study, the morphological characteristics of alder trees with diameters of more 60 cm were used so that we can carefully mark the trees (Namiranian, 2000). Rezayi et al (2011) showed in a study that the average thickness of planting spacing treatments have a significant difference, such that these averages in planting spacing of 1*1 and 1*2 m have had the minimum quantitative thickness, while the 5th treatment has have the maximum thickness. Also, the maximum height of Aluna in the planting spacing is 2*3 and 3*3 m and the minimum height is recorded in 1*1 planting spacing. Kargar Fard et al (2011) showed in thir study that bending strength of Alder boards was the highest in the steaming time of 10 and the pressing time of 6 minutes and the resin consumption of 11 percent; but the internal resin strength of fibers boards was higher than other treatments in the steaming time of 15 minutes and resin consumption of 11 percent. Koomes et al (2007) showed that the diameter distribution of beech forests is almost of exponential form. Human involvements have had a profound impact on forests' structures, especially in the early stages of development of the masses. Mature beech trees in the mountains have had a high variability in their architecture. According to the ecological importance of alder trees (having more than 60 cm diameter) in the north Iran, we attempted in this study to evaluate the morphology and size of the trees. Knowing and studying the different sizes of trees can be a good guide to forestry practices and implementation of proper methods of breeding to achieve the objectives of fostering forests.

PROCEDURES

According to the objectives of the study, an area out of the whole region was selected as the society which have had the commuting capabilities as well as the least human involvement. Hence, after visiting the joint-stock company of Shafaroud Forest and investigating divisions, the Part 4 of the 10 Series of Roshan Deh was selected as the case study because of its easy access to the region and the appropriate part of the region. In this stage, first some inventory forms were prepared with the aim of statistical investigation of Alnus species (diameters more than 60 cm) so that the possibility of extracting the following characteristics could be achieved. The calculation of all species, was performed on the 1.30 m from the land surface. Using the Clinometer, the slope of the tip and the base of the trees as well as the distance of an the individual from the trees were specified and the trees' heights were calculated on the basis of above features. Trunk's height was estimated by clinometer through the use of the estimation method of trunks height with the purpose of calculating the percentage of trunk being a good indicator for measuring quality. Height of trunk from the land level to the tip of crown was measured by the aim of estimating sustainable rate of tree; the same method of calculation of the total height using clinometer and meter was used. The first ten meters included three branchless sub branch, two branches and a few branches. The quality of trunk was evaluated in three levels of crooked, vertical and curved. The shape of the crown was divided into four groups: moderate, split, split and sweep. Development of branches (branching) on the trunk, which is due to the characteristics of mass, is divided into three categories of branchless, few branches, and numerous branches. The other features of the health of species included factors such as tree health - skin health – wounds of the lower back of the trunk and the rotting of the trunk being categorized to three healthy, unhealthy and limped groups. After preparation of forms, the statistical operation of harvesting of Alnus species (over 60 cm diameter) began in the area. For this purpose, by the use of foresting method, we visited the area and the mentioned features were measured for any species with the diameter of 60 cm being put in the corresponding column. The index of branchless trunk percentage was used to evaluate the trunk. One of the important factors to evaluate the trees' resistance to wind is the height that can be considered in suitable breeding operations. After doing the calculations and harvesting 107 trees, the data were entered into the Excel and mentioned characteristics were separated by their diameters; therefore, the statistical computing were prepared. Distribution characteristics of each factor were assessed through statistical descriptive analysis. Then, to assess distribution, the levene test was taken on factors that were suspected of parametric distribution so that non-parametric data were separated from parametric ones. After that, to determine the correlation between morphological data of the factors with parametric distributions, pearson and for non-parametric factors, spearman tests were taken.

FINDINGS

According to descriptive statistics results, the minimum diameter is 60 cm and the maximum diameter is 150 cm. The most frequency is related to the diameters of 75 to 120 cm, which encompass the entire distribution data. The minimum height is 15 meters and the maximum height is 38 m. 83% of the data are in the range of 15 to 21 meters and 27 to 37 m, this means that thick trees have different heights. 69% of thick alder trees are situated in grades 1 and 2 and 31% of species in grade 3 and grade 4. However, 31% of the species are placed in grade 1. The minimum height of the branchless trunk is 2 meters and the maximum height of the branchless trunk is 12 meters. Height to the crowns differs from 15 meters to 28 meters and the distribution study shows that the height have an appropriate distribution resulting in genetics of Aluna or an environment in which the experiment should be conducted. Based on the results 4.80% of the species are single branched and 6.19% of the species are two-branched. 7.77% of thick trees had cylindrical trunks and the rest had curved ones. This means that the majority of alder trees in the region are cylindrical. Around 5.7% of the studied species do not indicate branching (growth of branches) on the trunk; 6.19% show few branching, and 9.72% of trees have numerous branching. According to genetic features of Aluna trees being light-friendly species, the statistics shows opening mass and entrance of light to the mass that may be the result of old forest or incorrect operation. Statistics indicate the relative health of the forests such that 5.50% of trees have a relative health. Based on the results of descriptive statistics, 6.5% of trees have specified complexity to the left and 4.8% of the trees have specified complexity to the right. The minimum coefficient of elongation length is 2.17 and the maximum value is 3.68. According to sustainable relation and elongation factor of the trees we can find that all studied Aluna trees indicate a coefficient below 60; this shows species' sustainability. According to genetic features of Aluna trees being light-friendly species, the statistics shows opening mass and entrance of light to the mass that may be the result of old forest or incorrect operation. Crown assets ratio well reflects that 70% of the species have a rate higher than 40% and most crown coefficient are equivalent to 80%; this shows high branching or the oldness of the forest.

The levene test was taken on factors that were suspected of parametric distribution and the following results were obtained. According to Table 1 parametric and nonparametric tests were used for various distributions.

Table 1 – Levene test

Sig.	Df2	Df1	Levene Statistic	
0.077	20	10	2.090	Height of tree and elongation coefficient
0.017	20	10	3.010	Height of tree and crown coefficient
0.337	32	12	1.180	Diameter and elongation coefficient
0.409	32	12	1.079	Diameter and crown coefficient

Correlation evaluation of parametric data

According to the methodology, at this stage, the Pearson test was used and Table 2 was obtained.

Table 2 - correlation evaluation of parametric data

Correlation

		Height of tree	**elongation coefficient**
Height of tree	Pearson correlation	1000	**0.866****
	Sig.(2-tailed)		**0.000**
	N	107000	**107**
elongation coefficient	Pearson correlation	0.866**	**1000**
	Sig.(2-tailed)	0.000	
	N	107	**107000**
Crown coefficient	Pearson correlation	0.400**	**0.454****
	Sig.(2-tailed)	0.004	**0.001**
	N	107	**107**
Diameter equal to chest	Pearson correlation	-0.019	**-0.354***
	Sig.(2-tailed)	0.893	**0.012**
	N	107	**107**

Table 3 - Correlation evaluation of parametric data

Correlation			
		Crown coefficient	**Diameter equal to chest**
Height of tree	Pearson correlation	0.400**	**-0.019**
	Sig.(2-tailed)	0.004	**0.893**
	N	107	**107**
elongation coefficient	Pearson correlation	0.454**	**0.54***
	Sig.(2-tailed)	0.001	**0.012**
	N	107	**107**
Crown coefficient	Pearson correlation	1000	**0.016**
	Sig.(2-tailed)		**0.913**
	N	107000	**107**
Diameter equal to chest	Pearson correlation	0.016	**1000**
	Sig.(2-tailed)	0.913	
	N	107	**107000**

Table (3) Apart from the result of matrix, "tree height and crown ratio" (according to the levene test they have non-parametric distribution), other factors in Table 3 show that the height of the tree is correlated with elongation coefficient effective in 99 percent. In addition, the elongation coefficient is reversely correlated with crown at 99 percent and with diameter at chest at 95 percent.

Correlation evaluation of non-parametric data

Except for the mentioned factors in the parametric data, the correlation of the rest of the data was evaluated by spearman test, hence Table 4 were obtained. We can evaluate different correlations in level 95% and 99% in table (4). But according to the terms, the factors that are simple as well as economic were discussed.

Table 4 - Correlation evaluation of non-parametric data

Correlation				
Quality	Height of tree	Diameter equal to chest		
0.031	0.007	1000	Correlation coefficient	Diameter equal to chest
0.832	0.964		Sig.(2-tailed)	
107	107	107	N	
-0.0033	1000	0.007	Correlation coefficient	Height of tree
0.822		0.964	Sig.(2-tailed)	
107	107	107	N	
1000	-0.033	0.033	Correlation coefficient	Quality
	0.822	0.832	Sig.(2-tailed)	
107	107	107	N	
-0.044	0.341*	-0.157	Correlation coefficient	Height of the branchless trunk
0.761	0.015	0.227	Sig.(2-tailed)	
107	107	107	N	
-0.007	0.441**	0.000	Correlation coefficient	Height to crown
0.963	0.001	1000	Sig.(2-tailed)	
107	107	107	N	
0.109	-0.223	-0.137	Correlation coefficient	First ten meters
0.452	0.120	0.342	Sig.(2-tailed)	
107	107	107	N	
0.009	-0.128	0.255	Correlation coefficient	Quality of the trunk

0.949	0.375	0.074	Sig.(2-tailed)	
107	107	107	N	
0.032	-0.102	-0.011	Correlation coefficient	Branch development
0.825	0.482	0.937	Sig.(2-tailed)	
107	107	107	N	
0.727**	-0.107	0.015	Correlation coefficient	Health
0.000	0.461	0.915	Sig.(2-tailed)	
107	107	107	N	
-0.107	-0.098	0.027	Correlation coefficient	Complexity
0.461	0.499	0.853	Sig.(2-tailed)	
107	107	107	N	
-0.250	-.150	-0.135	Correlation coefficient	Numbers of branching on the trunk

Quality of body	first ten meters	Height to crown		
0.255	-0.137	0.000	Correlation coefficient	Diameter equal to chest
0.074	0.342	1000	Sig.(2-tailed)	
107	107	107	N	
-0.128	-0.223	0.441**	Correlation coefficient	Height of tree
0.375	0.120	0.001	Sig.(2-tailed)	
107	107	107	N	
0.009	0.109	-0.007	Correlation coefficient	Quality
0.949	0.459	0.963	Sig.(2-tailed)	
107	107	107	N	
-0.145	-0.328	0.75**	Correlation coefficient	Height of branchless trunk
0.317	0.020	0.001	Sig.(2-tailed)	
107	107	107	N	
-0.343*	-0.449**	1000	Correlation coefficient	Height to crown
0.015	0.001		Sig.(2-tailed)	
107	107	107	N	
0.175	1000	-0.449**	Correlation coefficient	First ten meters
0.223		0.001	Sig.(2-tailed)	
107	107	107	N	
1000	0.175	-0.343*	Correlation coefficient	Quality of trunk
	0.223	0.015	Sig.(2-tailed)	
107	107	107	N	
-0.214	0.119	-0.094	Correlation coefficient	Branch development
0.136	0.411	0.516	Sig.(2-tailed)	
107	107	107	N	
0.082	-0.036	-0.017	Correlation coefficient	Health
0.573	0.802	0.906	Sig.(2-tailed)	
107	107	107	N	
-0.099	0.193	-0.210	Correlation coefficient	Complexity
0.495	0.179	0.143	Sig.(2-tailed)	
107	107	107	N	
-0.100	0.104	-0.184	Correlation coefficient	The numbers of branch development on the trunk

The numbers of branch development on the body	Complexity	Health	Branch development		
-0.135	-0.027	0.015	-0.011	Correlation coefficient	Diameter equal to chest
0.349	0.853	0.915	0.937	Sig.(2-tailed)	
107	107	107	107	N	
-0.150	-0.098	-0.107	-0.102	Correlation coefficient	Height of tree
0.298	0.449	0.461	0.482	Sig.(2-tailed)	
107	107	107	107	N	
-0.250	-0.107	0.727**	0.032	Correlation coefficient	Quality
0.080	0.461	0.000	0.825	Sig.(2-tailed)	
107	107	107	107	N	
-0.275	-0.272	-0.073	-0.092	Correlation coefficient	Height of body without branch
0.072	0.056	0.615	0.524	Sig.(2-tailed)	
107	107	107	107	N	
-0.184	-0.210	-0.017	-0.094	Correlation coefficient	Height to crown
0.201	0.143	0.906	0.516	Sig.(2-tailed)	
107	107	107	107	N	
0.104	0.193	-0.036	0.119	Correlation coefficient	First ten meters
0.474	0.179	0.802	0.411	Sig.(2-tailed)	
107	107	107	107	N	
-0.100	-0.099	0.082	-0.214	Correlation coefficient	Quality of trunk

0.492	0.495	0.573	0.136	Sig.(2-tailed)	
107	107	107	107	N	
0.290*	-0.030	0.110	1000	Correlation coefficient	Branch development
0.041	0.835	0.446		Sig.(2-tailed)	
107	107	107	107	N	
-0.174	-0.126	1000	0.110	Correlation coefficient	Health
0.228	0.385		0.446	Sig.(2-tailed)	
107	107	107	107	N	
0.216	1000	-0.126	-0.030	Correlation coefficient	Complexity
0.132		0.383	0.835	Sig.(2-tailed)	
107	107	107	107	N	
1000	0.216	-0.174	0.290*	Correlation coefficient	The numbers of branch development on the trink

Crown coefficient	Height coefficient		
-0.055	-0.392**	Correlation coefficient	Diameter equal to chest
0.077	0.005	Sig.(2-tailed)	
107	107	N	
0.452**	0.875**	Correlation coefficient	Height of tree
0.001	0.000	Sig.(2-tailed)	
107	107	N	
-0.038	-0.004	Correlation coefficient	Quality
0.569	0.977	Sig.(2-tailed)	
107	107	N	
-0.126*	0.341*	Correlation coefficient	Body height without branch
0.385	0.015	Sig.(2-tailed)	
107	107	N	
-0.534**	0.342*	Correlation coefficient	Height to crown
0.000	0.015	Sig.(2-tailed)	
107	107	N	
0.251	-0.125	Correlation coefficient	First ten meters
0.079	0.389	Sig.(2-tailed)	
107	107	N	
0.220	-0.201	Correlation coefficient	Quality of body
0.124	0.161	Sig.(2-tailed)	
107	107	N	
-0.067	0.014	Correlation coefficient	Branch development
0.643	0.924	Sig.(2-tailed)	
107	107	N	
-0.134	-0.035	Correlation coefficient	Health
0.352	0.807	Sig.(2-tailed)	
107	107	N	
0.096	-0.072	Correlation coefficient	Complexity
0.509	0.617	Sig.(2-tailed)	
107	107	N	
0.076	-0.086	Correlation coefficient	The numbers of branch development on the body

CONCLUSION AND PROPOSALS

Tree height is one of the factors that is always measured in different ways and according to the results, the height factor is correlated with the four factors. In other words, the height factor can be used to estimate the other morphological characters. Quality of species is one of the factors that is always evaluated with 4 grades. According to this topic that quality of species is one of the main factors in economic value, so this factor was considered as one of the studied factor and **results** show that the quality of species has correlation with many factors, so that tree health is one of the main factors in forest having a 99% correlation with skin health, mushroom corrosion and wounds, elongation coefficient (that is the main factor of sustainability) and crown coefficient (that is one of the main factors of biomass production). The results of the present study confirm a previous results of Muradi and colleagues (2002) who considered wound of the trunk as a factor for the corrosion. While in the current study (by 99% probability) the trunk quality factor determines the status of the species, although trunk quality is a more comprehensive factor than wound of lower trunk, it can confirm previous results. The results can confirm the results Namiranian 2000, because the shape of the crown proves direct contact with many morphological characters and environmental factors as well as the shape pf the crown, its effect and status.

According to the presented arguments, we can conclude that in the forests similar to the case study having open space and regeneration problems (the forests are getting old) it is better to cinsider the quality factor of the species more than other factors; in addition, the statisticians and supervisors should emphasize on quality more, because it provides the possibility of making decisions for future purposes. However, due to the high correlation of the quality of health factors, it can be concluded that in such forests, with a probability of 99% and correlation of 50% to 70% in various factors, corrosion and wounds can be observed; if this factor is not regarded we will be faced with hallow trees and worthless logs. It is worthy for the marker to pay attention to the quality of the species in addition to considering the diameter and heights. It is recommended that the high quality species be preserved (not to be cut for the wood), because, as mentioned, they are likely to be rotted and worthless. While if we look at these species form the ecological point of view, they will have much better economic return. In other words, we can conclude that cutting any thick tree with a lower quality is not economic and their preservation is more economical because of their environmental services .

According to the results, it is recommended that in the separated studies, regard the results in the evaluated region. It is recommended the current research be conducted in other habitats of alder trees. It is suggested that the rate of woods obtained in higher qualities of trunk be compared with the expected woods and the differences (if any) be evaluated economically. It is suggested that in a separate study the environmental impact be assessed on the two factors. It is assumed in this study that alder trees with a diameter greater than 60 cm and above are not healthy, because their biological age is passed, and this is recognizable through morphological characteristics. Because the case study region (Series 10) at Shafaroud forest is currently inactive proposal, most of the alder trees are old and partially exploited. It is also recommended that the animal traps get out of the woods, in order to maintain and support the natural regeneration of the forest and help create an enclosed area, and the marking be avoided in areas adjacent to the river within 50 meters.

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