Considerations Concerning the Impact of the Management on Pine Trees Drying Phenomenon

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Bulletin UASVM series Agriculture 73(2)/2016

Print ISSN 1843-5246; Electronic ISSN 1843-5386

DOI 10.15835/buasvmcn-agr: 12451

Abstract

The pine trees may support the consequences of the action of a series of various natural harmful factors, as break downs determined by strong winds, storms, or large amounts of snow, pathogens and mites' attacks, and also anthropogenic harmful factors. The research was developed in Reghin Forestry District, arrangement unity Breaza 2, county of Mureș, in the year 2012. The biological material consisted of pine (*Pinus nigra*) trees, 40 years old. The following climatic and pine tree developmental parameters were monitored: temperature, humidity, and rainfall regimen, pine height, pine average diameter, and pine slenderness ratio. The experimental research emphasizes climatic conditions represented by an annual temperature of 9.27°C, atmospheric humidity of 71.17%, and rainfall regimen of 5.48 mm. The averages of the diameter of the pine trees is of 11.76 m, of the height of 11.19 m, and of the slenderness ratio of 0.95, while the statistical analyze is representative. A strong positive correlation between pine trees' diameter and height, of 88.70%, representative for 78.60% of the sample may be mentioned, and between diameter and slenderness ratio, the correlation is equal to 0.452, representative for 20.40%.

Keywords: *basic statistics, climate, diameter, height, slenderness ratio.*

INTRODUCTION

During their development, and also during their entire existence, trees, generally speaking, and pine trees, in particular, are subject to the action of a series of various natural harmful factors, as break downs determined by strong winds, storms, or large amounts of snow. Also, important harmful effects upon pine forest trees is exercised by both pathogens and mites attacks. They may produce considerable damages in trees health status. All these factors, we mentioned, may disturb the forest structure and protective function, by reducing trees' productive capacity and survival rate (Burduhos *et al.*, 1994)

Another issue that may be considered in estimating factors affecting the pine tree forests, in particular is represented by the anthropogenic

actions as: unauthorized trees' cuttings, animal grazing, pollution, and/or tourism.

To all these mentioned factors, the forestry improper interventions may be added. They can lead to adverse changes in the composition and structure of forest stands. The failure in performing, accurate and timely, care maintaining works in pine tree forests, may lead to failure in the regeneration of trees, and can affect the structure and function of complex stands (Dorog, 2007).

When drying phenomenon is encountered in pine trees' forests, several measures must be taken, and. Among these, we may mention the replacement of harmed stands with inappropriate composition, in terms of structure, productivity and ability to meet eco-protective goals of forests, with healthy trees (Florescu *et al.*, 2003).

When drying stand phenomena are encountered in forest, complex management approaches are required. Among a series of measures, these must include: maintaining or introduction of mixing species and shrubs; avoid planting species outside their natural range; stimulate the natural regeneration of trees; promote tree varieties resistant against infections, defoliation, or even drought; care proper execution of works; applying appropriate techniques for fighting against specific mites and pathogens; prevent forest offenses, etc. (Parascan *et al.*, 2001; Simionescu, 2003; Tăut, 2003; Warren *et al.*, 2011).

MATERIALS AND METHODS

The research was developed within an experimental field located in Reghin Forestry District, arrangement unity Breaza 2, county of Mureș, in the year 2012. The biological material consisted of pine (*Pinus nigra*) trees, 40 years old. In the beginning of our observation, the drying phenomena affected at low extent the target biological material, pine trees, respectively. This situation is the result of the maintaining works carried out at the Forestry District level. Thus in the year 2002, cleaning works were carried out, and during the experimental year 2012, works destined to extract dried trees were applied. In the experimental year, the observations showed that the field was strongly attacked by the erosion phenomenon, while the soil, of regosol type, medium deep, is exposed to

dryness. In this study, a number of 50 trees were included. The climatic parameters were also monitored, using a mobile monitoring station. This was placed in the field with the aim of real time recordings of climatic parameters, which are interesting for our study: temperature, humidity, and rainfall regimen, respectively. The basic statistics of the average height, average diameter, and slenderness ratio are calculated, together with correlation coefficients and regression lines between trees' diameter and height, and trees' diameter and slenderness ratio. SPSS for windows was used for calculation of aimed parameters.

RESULTS AND DISCUSSIONS

Specific climatic conditions represented by annual average temperature, humidity and rainfall regimen are characteristic for the experimental field. By the year 2012, the average annual temperature reached 9.27°C, with a minimum of -18°C, and a maximum of 26°C (Tab. 1). The histogram of the temperatures, considered for the experimental period correspondent to the year 2012, is monomodale, with distributions positively orientated, signifying the predominance of warm climate (Fig. 1). In terms of humidity, the average annual atmospheric humidity was equal to 71.17%, with a maximum of 109%, and a minimum of 32%, by entire year (Tab. 2). The histogram is bimodale, signifying the presence of two periods of maximum humidity (Fig. 2).

Tab. 1. The averages and parameters of dispersion of temperature (°C) within experimental field in 2012

Year	n	$\bar{X} \pm s_{\bar{X}}$		s	Min.	Max.
2012	366	9.27	± 0.55	10.48	-18.00	26.00

Tab. 2. The averages and parameters of dispersion of humidity (%) within experimental field, in 2012

Period	n	$\bar{X} \pm s_{\bar{X}}$		s	Min.	Max.
2012	366	71.17	± 0.80	15.23	32.00	109.00

Tab. 3. The averages and parameters of dispersion of the rainfall regimen (L/mm²) within experimental field, in 2012

Period	n	$\bar{X} \pm s_{\bar{X}}$		s	Min.	Max.
2012	366	5.48	± 0.28	2.77	1.00	14.00

Fig. 1. The histograms of the average temperature (°C) recorded in experimental area in 2012

Fig. 2. The histograms of the average humidity (%) recorded in experimental area in 2012

Fig. 3. The histograms of the average rainfall (mm) recorded in experimental area in 2012

The average rainfall regimen, by the year 2012 was of 5.48 mm, with a minimum of 1 mm, and a maximum of 14 mm (Tab. 3). The monomodal histogram is oriented to right, demonstrating, that majority of rainfall supply may be reported as low (Fig. 3).

The interval of variation is large for temperature and rainfall supply, as expected, and demonstrated by both histograms shapes, and values of the dispersion values presented in Tab. 1 and Tab. 3, and Fig. 1, and Fig. 3, respectively. Not the same thing may be observed concerning humidity. The histogram is more restraint (Fig. 2), demonstrating that the values are closer one to each other, fact also assessed by the dispersion values (Tab. 2).

As we already mentioned, within the analyzed experimental field located in Reghin Forestry District, arrangement unity Breaza 2, county of Mureș, the structural parameters of the researched trees are emphasized using the calculation of the most

important elements of the structures considered in the aimed area. Here we speak about average height, average diameter, and slenderness ratio (Tab. 4).

Within the monitored experimental area, resulted an average diameter of 11.76 m and an average height of 11.19 m, which correspond to an average slenderness ratio of 0.95 (Tab. 4). The values of the dispersion parameters indicate a good homogeneity of the development phenomenon expressed by growth in terms of tree diameters, and height, of the pine trees located within the experimental field. Also, the coefficients of variability corresponding to the average diameter and average height, of 15.97%, and 16.63 %, respectively, and the coefficient of variability corresponding to the slenderness ratio (2.59%), are much lower compared to the threshold of 30%, and this confirm that the statistical analysis is representatively (Tab. 4).

Tab. 4. The averages and parameters of dispersion of height, diameter, and slenderness ratio within experimental field located in Reghin Forestry District, county of Mureș 2012

Issue	n	$\bar{X} \pm s_{\bar{X}}$			s	Min.	Max.	V%
H (m)	50	11.19	±	0.26	1.86	8.20	14.00	16.63
D (m)	50	11.76	±	0.26	1.88	8.40	14.90	15.97
Z	50	0.95	±	0.002	0.02	0.91	0.99	2.59

Note: H – height, m; D – diameter, m; Z – slenderness ratio.

Fig. 4. The distribution of the heights by categories of diameters, within pine trees experimental field, located in Reghin Forestry District, in experimental year 2012

Fig. 5. The distribution of the slenderness ratio function of diameters, within pine trees experimental field, located in Reghin Forestry District, in experimental year 2012

If we analyze the graphic representation of the distribution of the average diameters of the pine trees taken into consideration within the present experiment, function of their height (Fig. 4), we find that it is emphasized a close similarity of the values located on the regression line. This emphasizes the strong positive correlation between pine trees' diameter and height, which reaches 88.70%, being representative for 78.60% of the sample, and in the meantime, very significant ($p < 0.001$).

Concerning the graphic representation emphasizing the interdependence between the slenderness ratios and the diameters of the pine trees (Fig. 5), we may find some kind of similarity of the values on the regression line. We may also note a

positive weak to average correlation of 0.452, not significant ($p > 0.05$), and representative just for 20.40% of the sample. This emphasize that an increase in pine tree diameter supplies, just at low extent, the increase of the slenderness ratio.

CONCLUSIONS

This experimental shows that in specific climatic conditions, characterized by the average annual temperature of 9.27°C, average annual atmospheric humidity of 71.17%, and average rainfall regimen 5.48 mm. The average diameter of the pine trees, by experimental period of the year 2012, is of 11.76 m, the average height of 11.19 m, and average slenderness ratio of 0.95, in condi-

tions of representative statistical analyze. A strong positive correlation between pine trees' diameter and height, of 88.70%, representative for 78.60% of the sample ($p < 0.001$), is recorded, while between pine trees' diameter and slenderness ratio, an average correlation of 0.452, representative just for 20.40% ($p > 0.05$), is recorded.

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