STUDY OF THE VIABILITY OF ALEPPO PINE TREES BY USING PHF INDEX

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ABSTRACT

This work, which was conducted in the Chettaba forest about the viability of the stands can be given by the PHF index, a three-digit index that gives a judgment of the position of the tree (in relation to the others and thus indicating the dominance and the stage of competition or exposure to the dominant stage), of the general shape of the crowns, and of the shape of the shafts, it allows a more detailed silvicultural interpretation to predict the future of the stand and ultimately deduce the viability of the stands. Thus, there is an essential need for a study to be conducted in this regard to understand the existing problems and to bring about proposals on the appropriate intervention in logged surface. The slenderness coefficient of a tree is defined as the ratio of the total height (H) to the diameter at 1.3 m above ground level (d). For the stand level, the slenderness coefficient is calculated using the root mean square diameter and the average tree height as (H/D). It is well known that there is a direct relationship between the stand slenderness coefficient and the risk of stem breakage. It is well known that there is a direct relationship between the stand slenderness coefficient and the risk of stem breakage or tree fall due to abiotic factors such as wind or snow. Sustainability monitoring is crucial to the credibility, validation, value of the options implemented and should be considered early on in the planning process this allows us to say that these stands are stable in the forest and always in the 6 plots studied. Analyses results show a mid-viability for the forest and more of individual listed present instability which is indicated by a medium stability of forests stand's quality (PHF = 123) and a slenderness coefficient (H/D = 34.47).

Keywords: *Aleppo pin, stability, Viability, PHF. Slenderness coefficient (EC)*

INTRODUCTION

Aleppo pine (*Pinus halepensis* Mill.) plays an important role in the ecology and landscape of different countries around the Mediterranean basin. This pioneer and undemanding species is easily regenerated and capable of rehabilitating very poor and degraded soils. It is an essential component in reforestation strategy for limy soils in the arid or semi-arid climates around the Mediterranean basin, due to both

its intrinsic ability to colonize and its effect in improving soils and microclimates [1]. In Algeria, the Aleppo pine occupies vast stands in Sidi Belabbes, Saida, Tlemcen, Tiaret, Medea and the Ouarsenis regions [2].

The Aleppo pine is a conifer native to the Mediterranean region. In Algeria, Aleppo pine, considered the most important and dominant local forest species covers a surface estimated at more than 800.000 ha. It is a typically Mediterranean species, easily adaptable to various eco-climatic conditions, which grants it the privilege of being the most often used tree species in the country's reforestation programs [3].Our choice fell on the Aleppo pine which is one of the dominant species in this forest. Until now, no system of measurement or supervision of its viability was created so that the ecological status is unknown at all. The quality of the stands can be given by the PHF index, a three-digit index that gives a judgment of the position of the tree (in relation to the others and thus indicating the dominance and the stage of competition or exposure to the dominant stage), of the general shape of the crowns, and of the shape of the shafts [4], it allows a more detailed silvicultural interpretation to predict the future of the stand and ultimately deduce the viability of the stands.

MATERIAL AND METHODS

Presentation of the study area

Forest of Chettaba is located southwest of Constantine (Algeria). The estimate terrain elevation above sea level is 865 meters. The study area is located on the map topographic Constantine Scale 1/200 000 sheet N° 17 and located between the coordinates 36°19'4" north latitude and 6°28'36" East longitude. The forest of Chettaba spreads over an area of 2398 ha and 94a, and is perfectly limited and divided into six districts. Extreme altitudes of the forest is about 1104 m (maximum altitude) and 652 m (minimum altitude), corresponding to each of them respectively following map coordinates: (x = 839, y = 344), (x '= 839.9, y' = 340.3). Its bioclimatic is semi-arid to sub-humid. The average annual rainfall is estimated between 670 and 800 mm and the mean annual temperature of the region is 18°C, with an average of the warmest month above 35°C and the coldest month varies between 1.25 and 3.05°C. A large plant grouping as the forest of Chettaba can be studied in its entirety, especially when it concerns hundreds of acres to be treated in the detail.

Dendrometric data collection inventory and description of the stands are a prerequisite for any successful forest management and sylvicultural planning [4]. We are interested in achieving this inventory to highlight the structure, stand density and the difference of perspective development for each station. The structure of the stand is defined as the manner in which these are arranged dendrometric variables [5].The tree inventory was conducted in each plot.

Analysis of the quality of the stands

The slenderness coefficient (EC) is the ratio between total height and diameter that reflects the stability of a forest stand or a single tree [6]. According to

Rajoelison et al. [7], a forest stand is considered stable when the ratio h/d<100. There EC is given by the following formula: CE = H/D

Estimation of the vitality state of Aleppo pine by the PHF Index

The quality of the stands can be given by the PHF index (three-digit index) which gives a judgment of the position of the tree in relation to the others and thus indicating the dominance and the stage of competition or the exposure towards the dominant stage (P), the general shape of the crowns (H) and the shape of the shafts (F). It allows a more detailed silvicultural interpretation to predict the future of the stand [5] and ultimately deduce the viability of the stands [7].

RESULTS AND DISCUSSION

The results obtained for the P index show that 25 individuals/ha (P2) and 24 individuals/ha (P3), have a crown in full light, completely free from above and laterally, they are mostly dominant trees. Trees of Aleppo pine stands have a crown in full light from above but covered laterally are 39.87%; the maximum value is obtained in plot 2 (100 individual/ha) while the minimum value is 10 individual/ha is encountered in plot 6. For trees with partially free crowns and full light from above (intermediate) and trees with covered crowns, without light from above and partially illuminated laterally, their percentages are respectively 10.74 and 25.98%; while trees with fully covered crowns, without direct light, present the lowest percentage in plot 5 and 6 (Fig. 1).

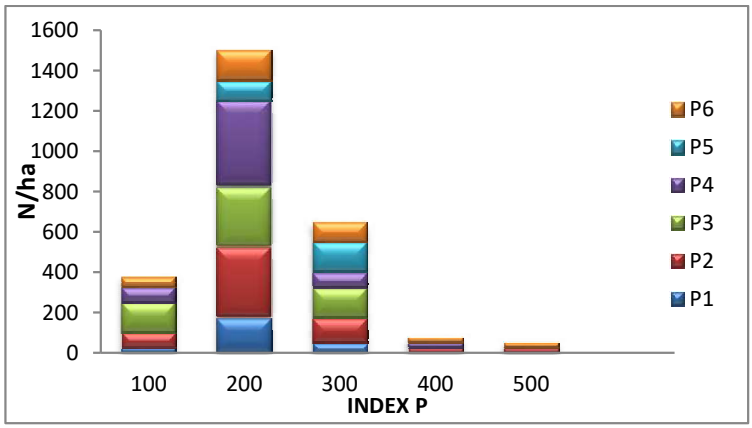

Fig.1. *Proportion of the number of stems by P index.*

The results of the H index indicate that the trees with a perfect crown, circular in symmetry, dense and extensive have a low percentage; they are trees of the dominant stage with a very good exposure to the sun. Half of the Aleppo pine individuals have a more or less circular crown in plan with some symmetry deficiencies or with some dead branches and their percentage is 60% (these are the co-dominant trees); the maximum values are obtained in plot 2 and 3 (100 and 175 individuals/ha) while the minimum values is 50 individuals/ha which is met in plots 1 and 5. For individuals have a tolerable, partially asymmetrical and open crown

and trees have a strongly asymmetrical crown with only a few green and dense branches, but still having the appearance of a tree that can survive (Fig. 2).

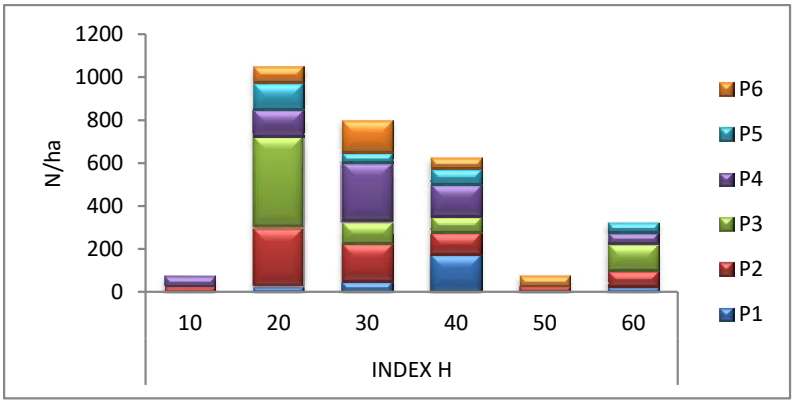

Fig. 2. *Proportion of the number of stems by H index.*

The results obtained from the F index show that Aleppo pine trees have a straight, round and full bole; cylindrical, without defects and without branches represent the majority of trees in the studied stand of trees have a straight, cylindrical, slightly bulging, full bole for division into sections, without defects and without branches. This type of bole provides partly veneer wood (Fig. 3). Trees with a partially straight, curved bole up to 1.8 meters high, partly cylindrical, generally conical and without defects and which have good saw wood, have a low rate. The trees have a very irregular, much forked and twisted, conical bole with clearly visible defects; they are mainly used as energy wood and have a rather low percentage (5.61%). The lowest percentage of the F index is obtained in plots (1) (5) and (6).

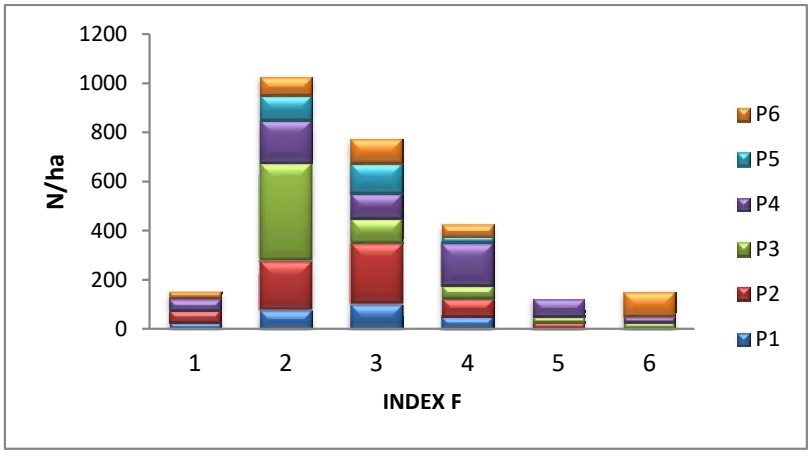

Fig.3. *Proportion of the number of stems by F index.*

The quality of the stands studied according to the PHF index is rather variable between the different plots. Plots 2, 3 and 4 has the best quality compared to other plots which allows us to deduce their good viability and their large competitor aspect especially towards the dominant stage.

The slenderness coefficient (EC) gives an idea of the ecological stability of forest species. For better stability, the value of the coefficient should be close to 100 [8]. The plots 4, 2, 3 and 1 with an average diameter between 24.39 and 30.59 cm, have slenderness coefficients between 30.59 and 41.90 and 28.94 therefore less than 100; this means that these stands are stable and regular [9]. Plots 5 and 6 with a slenderness coefficient of around 28.51 to 28.94 represent the most stable stand, the most resistant to wind; snow and wind throw with a strong competitive power [10]. This allows us to say that these stands are stable in the forest and always in the 6 plots studied (Table 2).

Table 2. *Quantitative characteristics of the stands.*

Plots	H (m)	D (cm)	H/D	N/ha
P1	9.03	30.61	30.59	250
P2	9.29	25.65	37.97	600
P3	10.02	26.42	38.88	600
P4	9.71	24.39	41.90	600
P5	9.28	32.99	28.51	250
P6	7.79	28.68	28.94	350

CONCLUSION

In conclusion, this research has proved that the forest of Aleppo pine has been the subject of anthropic and biologic pressures and analyses results show a mid viability of these species. This is indicated by a medium stability of forests stand's quality (PHF = 123). And with have slenderness coefficients (H/D = 34.47 therefore less than 100; this means that these stands are stable and regular; this allows us to say that these stands are stable in the forest and always in the 6 plots studied. summarizes the quality of the stands studied according to the PHF index; this quality is rather variable between the different plots.

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