

**STRUCTURAL CHARACTERISATION AND ASSESSMENT
OF THE SPATIAL DISTRIBUTION OF *PINUS HALEPENSIS*
IN THE EL HAMIMET FOREST (EASTERN ALGERIA)**

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ABSTRACT

Aleppo pine plantations were studied in the region of El Hamimet, the diameter at 1.30m from the ground, the total height of *P. halepensis* individuals were measured on 4 plots according to an altitudinal gradient. The establishment and interpretation of diameter and height structures are essential for forest management decisions. Knowledge of these parameters is an essential step in their sustainable management. The diameter and height structures were established according to diameter or height classes. The stand on plot 4 is characterized by the lowest diameter and height values. The analysis of the diameter and height structures reveals an increase in the frequency of young individuals. These results contribute to the improvement of the knowledge on the indicators of the current state of the natural *Pinus halepensis* stands that can be used as a basis for the management of the El Hamimet forest.

Keywords: *Pinus halepensis*, Diameter structure, Spatial location

INTRODUCTION

Forests play a crucial role in sustaining life on the planet [1]. They play a role in the regulation of global and regional climate systems [2]. They are carbon sinks [3], are very rich in biodiversity, and provide vital resources to human populations. Despite these multiple functions, the management of natural forests, particularly in arid and semi-arid areas in Algeria, is faced with a lack of data to understand the functioning of these ecosystems in terms of floristic composition, demographic structure, and regeneration. Therefore, developing strategies and approaches to sustainable management based on reliable scientific foundations remains very difficult [4]. The study of the structure of a forest formation serves as a basis for its silviculture, guides forest economics, allows the assessment of the state of degradation of ecosystems, helps to understand the past management history of stands and forest dynamics [5]. This work was designed to try to address concerns closely related to our goal of conservation and management of Aleppo pine plantations of the forest of El Hamimet. We aim here mainly, the knowledge of the

dynamics and the evolution in time of the growth of Aleppo pine by integrating the parameters of competition.

MATERIAL AND METHODS

Presentation of the study area

Forest of El Hamimet is located north of Oum EL Bouaghi (Algeria). The forest spreads over an area of 1460 ha. Extreme altitudes of the forest are about 1039 m (maximum altitude) and 800 m (minimum altitude). Its bioclimatic is semi-arid to arid. The average annual rainfall is estimated at 378.75mm. It is generally a rugged relief with an average altitude of 848 m, with a slope of 12.5%. The geology of the forest is dominated by clay-limestone to limestone soils.

Dendrometric parameters

The location of the sample plots is the most essential point in any work, as it is the strategic point for determining the dendrometric characteristics of the stands. Moreover, circular plots are more interesting and usable because of their easy and quick installation in the field. Thus, they allow reducing considerably the number of doubtful cases of trees belonging or not to the plot [6].

The demographic structure was analyzed using the distribution of woody individuals in diameter and height classes.

Spatial location was estimated by two main factors, the degree of cover and the spacing factor. The degree of cover estimates the percentage of the ground surface covered by the canopy in relation to the percentage of the surface where light reaches the ground. Hart Becking's spacing factor [7] is used primarily to quantify and specify the degree of the vigor of a thinning; it gives a relationship between the average spacing "a" of trees and the dominant height of the stand.

RESULTS AND DISCUSSION

For the first diameter class (diameter < 7.5cm), regeneration exists in plots 1, 2, and 4 for Aleppo pine (Figure 1). The class of diameter 17.5cm to 27.5cm has a high rate in plots 1 and 4 because this species is dynamic and regenerates quite well [8]. Also, many individuals of this species are only at a youthful life stage. On the other hand, large-diameter stems are low (Plots 2 and 3) and non-existent (Plots 1 and 4).

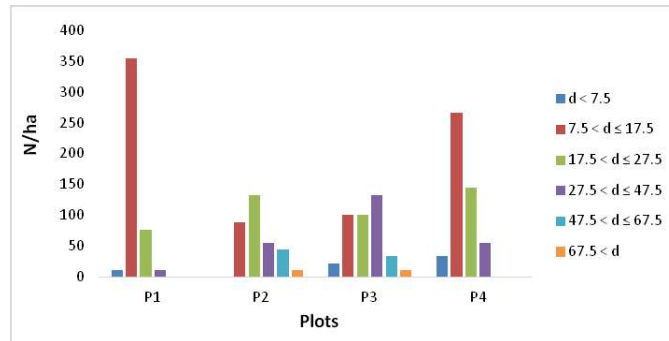


Fig. 1. The number of trees by diameter classes.

The height structure is given by the distribution of the number of stems in all plots per hectare for each height class and provides information on the vertical stratification of the stand. A large proportion of trees are between 4 and 10 m tall (saplings to low perch) with 1390 individuals, the 2 to 4 m class has a smaller number of individuals because of regeneration, which remains almost nil (Figure 2). There is an almost total absence of trees above 10 m (high perch to young forest or forestry).

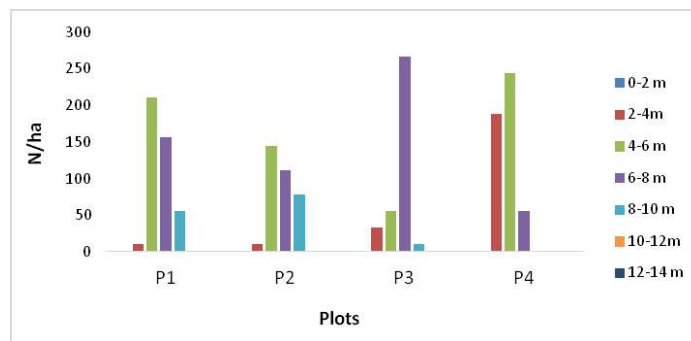


Fig. 2. Distribution of the number of trees by height classes.

The degree of cover represents the sum of the projections of the crowns of the trees of the stands compared to its total surface. When the degree of the cover of the stand is higher than 50%, the area is forested. When the degree of cover is less than 30%, the area is in principle non-forested. The degree of cover must be higher than 100% to judge the good stability of the stand. Indeed, a cover of 100% means a normal horizontal closure. The crown projection areas cover the entire land area under consideration [9]. The results obtained show that the degree of coverage of Aleppo pine is between 30 and 50% in all the plots, this shows that these stands have clear and open forest vegetation; the importance of the degree of coverage is due to the large extent of the tree crowns.

The spacing factor is expressed as a percentage and is mainly used to quantify the intensity of a thinning; it gives a relationship between the average spacing and the dominant height [10]. An average spacing around 4m is considered as an indicator of good viability for the spatial context [11]. Considering all diameter

categories, the abundance of Aleppo pine is 425 individuals per hectare, which gives them an average spacing of 20.08 meters. The stands are thus characterized by a low density.

CONCLUSION

Monitoring a forest allows us to detect changes over time. Any living environment is constantly changing. The study of the dendrometric characteristics of *Pinus halepensis* according to the study plots showed that the density increased with the altitudinal gradient. The individuals of large diameter are totally absent in the different Aleppo pine stands. The silvicultural analysis provided knowledge on the forest stands, their size, their dynamism, their state of development, their structure. Finally, this state will constitute a reference for the next results of monitoring and decision for the foresters in the framework of management.

REFERENCES

- [1] Myers N., The world's forests: Problems and potentials. *Environmental Conservation*, 23, pp 156-168, 1996.
- [2] Gedney N., Valdes P. J., The effect of deforestation on the northern hemisphere circulation and climate, *Geophysical Research Letters*, 27, pp 3053-3056, 2000.
- [3] Grace J., Lloyd J., McIntyre J., Miranda A. C., Meir P., Miranda H.S., Carbon dioxide uptake by an undisturbed tropical rain-forest in southwest Amazonia, 1992 to 1993. *Science*, 270, pp 778-780, 1995.
- [4] Godoy R., Some organizing principles in the valuation of tropical forests, *Forest Ecology and Management*, 50, pp 171-180, 1992.
- [5] Merino A., Real C., Álvarez-González J.G., Manuel A., Rodríguez-Gutián M. A., Forest structure and C stocks in natural *Fagus sylvatica* forest in southern Europe: The effects of past management, *Forest Ecology and Management*, 250, pp 206-214, 2007.
- [6] Rondeux J., La mesure des peuplements forestiers. Gembloux, Belgique, Les Presses agronomiques de Gembloux, 522p, 1999.
- [7] Habou R., Abdoulaye D., Babou A., Kossi N., Kossi A., Adzo D., Raoufou R., Kouami K., Ali M., Mahamane S., Structure des peuplements naturels de *Pterocarpus erinaceus* Poir. dans le domaine soudanien, au Niger et au Burkina Faso., *Bois et forêts des tropiques*, 325 (3), pp 71-83, 2015.
- [8] Rabenilalana G., Rakoto H., Rapport final. Suivi écologique et analyse socio-économique d'un aménagement participatif de bassin versant dans la zone de Mandraka - Madagascar, pp 70, 2008.
- [9] Pardé J., Une notion pleine d'intérêt: la hauteur dominante des peuplements forestiers. *Rev. For. Fr.* VIII (12), 850-856, (1956).

Section ECOLOGY AND ENVIRONMENTAL STUDIES

[10] Massenet J., Hauteur des arbres. Lycée forestier – Château de Mesnières, pp 25, 2011.

[11] Forster H., Matar B., Badmokréo B., Méthodologie et Instruction pour l'Exécution des Inventaires Forestiers Détaillés et Participatifs au Niveau des Marchés Ruraux. Projet Energie Domestique (PED). Agence pour l'Energie Domestique et l'Environnement (AEDE), 41p, 2001.