RESEARCH ON SIZE AND FREQUENCY VARIABILITY OF SOME STANDING TIMBERS' DEFECTS UNDER INFLUENCE OF THEIR BIOLOGICAL ORIGIN

Bartha Szilárd*, Dinulică Florin, Dorog Lucian Sorin***

* University of Oradea, Faculty of Enviromental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: szilardbartha@yahoo.com

Abstract

The paper presents results of measurements and observations made on Turkey oak (Quercus cerris) species in the sample areas located in the forest area of Boboştea (Bihor county) and in some other forests (Tăşnad Forest District and Dumbrava - Beliu Forest District), which allowed some conclusions on the variability of size and frequency of defects in standing timbers, under the influence of their biological origin.

Key words: timber defect, Turkey Oak tree, biological origin.

INTRODUCTION

Regeneration as other collective processes taking place in the living community life of the forest, takes place under the influence of two groups of factors namely: the biological characteristics of trees to multiply, and environmental conditions where the process takes place. The regeneration process, in general, varies in content and duration depending on the nature of species, overall structure of the forest, origin and provenance of stand, stationary conditions, silvo-technical interventions, etc. (Negulescu et al., 1973).

In relation to the material used for regeneration in the establishment of forest cultivated, one differentiates between seed based regeneration and vegetative regeneration (regeneration from sprouts). Natural seed based regeneration is based on the ability of the trees to produce, for a certain period of time (after the transition to maturity stage), the seed which, once reaching favourable environmental conditions, may generate new samples. Regeneration from sprouts is the characteristic of some wood timber species to form sprouts on the stem or stump after the cutting. If at first, sprouts, have a thrifty stand in size than seed based plants due to the fact that they benefit from the snag rootlet system, after approx. 12-15 years they are surpassed by seed based samples and remain inferior in terms of quantity and quality of the achieved output (Florescu and Nicolescu, 1996).

MATERIAL AND METHOD

The research was carried out in the period 2004-2010 in the several locations in the country (Bihor, Arad, Satu Mare). Sampling for assessing the quality of Turkey oaks (*Quercus cerris*) wood was the result of a large number of desk and on field operations.

Investigations were conducted in 14 forest stands of Boboştea forest section, of the Boboştea VII Management Unit. Also, investigations were extended (as a basis for comparison) to the Tăşnad Forest District (V Supur Management Unit) in two stands, and Grove - Beliu Forest Unit (I Beliu Management Unit), respectively. Total number of Turkey oaks (*Quercus cerris*) samples measured in the 18 sample areas was 742 (see Table 1).

Table 1

Sampling in stand where sampling areas were located in

No	Forest District/ Management Unit	Subcompartment	Station type	Forrest type	Consistency	Age (years)	Area (m^2)	Assessed standing timber
1	1	**3D**	6143	7432	0.9	70	2200	30
2	1	**5A**	6143	7432	0.9	70	2000	47
3	1	**6C**	6143	7432	0.8	70	2000	45
4	1	**8D**	6143	7432	0.8	80	2000	43
5	1	**34B**	6142	7411	0.8	75	2000	46
6	1	**55C**	6153	7513	0.6	100	2400	30
7	1	**69B**	6143	7432	0.8	75	2000	50
8	1	**77B**	6143	7432	0.8	100	2000	46
9	1	**83A**	6143	7432	0.8	105	2000	58
10	1	**87A**	6143	7432	0.7	100	2000	46
11	1	**87C**	6143	7432	0.8	90	2000	44
12	1	**87D**	6143	7432	0.6	90	2200	30
13	2	**124A**	8321	7421	0.8	85	2000	51
14	2	**128A**	8321	7421	0.8	80	2000	47
15	3	**9A**	6143	7111	0.8	85	2000	40
16	3	**16B**	6142	7112	0.7	135	2000	38
17	4	**62A**	6143	7412	0.7	130	2000	30
18	4	**72C**	6143	7412	0.5	120	2000	21
Grand total		**-**					**36800**	**742**

Remark for Forest district /Management Unit: 1-Sfânta Maria Forest District/VII Boboştea Management Unit; 2-Oradea Forest District/VIII Mihis Management Unit; 3-Dumbrava Forest District/I Beliu Management Unit; 4-Tăşnad Forest District/V Supur Management Unit.

The location of sample plots was established by using the electronic hypsometer (Vertex IV) to determine slope and crosscut allowance of the side located toward the highest slope. Sample plots have rectangular shape of 2000-2400 m^2, according to homogeneity in terms of stationary conditions, stand, and the number of constituent trees (at least 30 trees counted/sampling area), (Dinulică, 2008). The exception is the sample plot area located on the 72C subcompartment (Tăşnad Forest District, Management Unit V. Supur) where, due to silvo-technical interventions, the number of remnant tress was lower (21 samples/sampling area).

Starting from the sorting system (dimensional and qualitative) of oak raw wood according to European standards (Balleux, 2004; Beldeanu, 2008), in the case of Turkey oaks (*Quercus cerris*) samples surveyed we also defined three quality areas on the trunk height, as follows: the 1st quality area includes the first 6m of trunk height, 2nd quality class ranges from 6m up to the tree crown, and the 3rd quality contains the trees' crown. Due to the incidence of quality defects on both quality areas (1st quality area I and 2nd quality area), we defined an intermediate area (see Fig. 1).

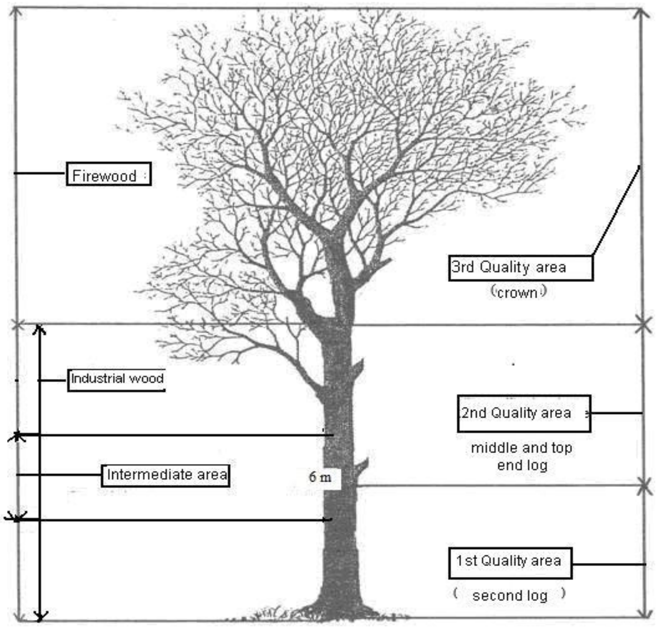


Fig. 1. Quality areas of Turkey oak (*Quercus cerris*) samples reviewed - (adaptation by Oak raw wood, according to European standards): 1st Quality area (0-6 m), 2nd Quality area (ranging from 6m to the crown), 3rd Quality area (crown), intermediate area

In relation to the shape of the trunk, associated with other defects, we defined the following types of the assessed Turkey oak (*Quercus cerris*) samples: form **1a**-straight cylinder without defects, form **1b**-straight cylinder, with other defects, form **2a**-straight, slight curved, without other defects, form **2b**-straight slightly curved, with other defects, form **3a**-sinuous, curved shape without defects, and form **3b**-sinuous, curved with other defects.

Desk work consisted in computing and interpreting data collected from the field; thus they were centralized by source provenance and diameter classes. The making of charts was performed by using MS Office Excel software.

RESULTS AND DISCUSSIONS

In order to capture existing variations between the biological origins of the trees identified in the surveyed area (seed and sprouts), regarding the distribution of some of defects, we used the bon-parametric Kruskal-Wallis one-way analysis of variance by ranks.

● The statistical significance of differences among the biological origins of trees as regards the appearance and localization of exterior rot, pruning height, height of first green branch, on tree trunk shape, quality class, the root-sweeling presence, undercovered knots height on the trees height, respectively, show the biological origins of trees and represent highly significant statistical factor with impact on trees (see Tables 2, 3, 4, 5, 6, 7, and 8).

Table 2

Statistical significance of the influence of trees biological origin on rot occurrence and localization

Kruskal-Wallis analysis results: H=28.56046***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.012257
Sprout origin	0.012257	

Table 3

Statistical significance of the influence of trees biological origin on pruning height

Kruskal-Wallis analysis results: H=18.28200***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.000019
Sprout origin	0.000019	

Table 4

Statistical significance of the influence of trees biological origin on the height of first green branch

Kruskal-Wallis analysis results: H=18.28200***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.000019
Sprout origin	0.000019	

Table 5

Statistical significance of the influence of trees biological origin on trunk shape

Kruskal-Wallis analysis results: H=18.02437***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.000050
Sprout origin	0.000050	

Table 6

Statistical significance of the influence of trees biological origin on quality class of trees

Kruskal-Wallis analysis results: H=29.19033***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.000004
Sprout origin	0.000004	

Table 7

Statistical significance of the influence of trees biological origin on incidence of root-sweeling of the trees

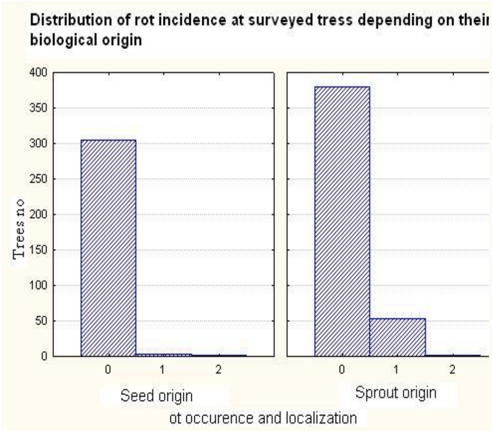
Kruskal-Wallis analysis results: H=20.69181***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.007908
Sprout origin	0.007908	

Table 8

Statistical significance of the influence of trees biological origin on the localization of undercovered knots by height of trees

Kruskal-Wallis analysis results: H=23.10836***, N = 742 trees, f=1 degree of freedom, p<0.1%		
Transgression probability matrix on the individual variations caused by biological origin of trees		
	Seed origin	Sprout origin
Seed origin		0.000072
Sprout origin	0.000072	

Figure no. 2 shows that the exterior rot occurs in a higher percentage at trees of sprout biological origin (in 53 cases in 1st Quality class area, an in 1 case in 2nd Quality class), while the seed origin trees are less affected by this defect (3 cases for the 2nd Quality area and 2 cases for the 2nd Quality area).



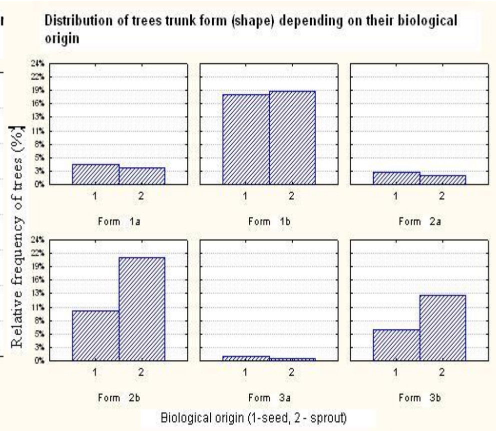


Fig. 2. Distribution of exterior rot at surveyed trees depending on their biological origin

Fig. 3. Distribution of tree trunk shape depending on their biological origin

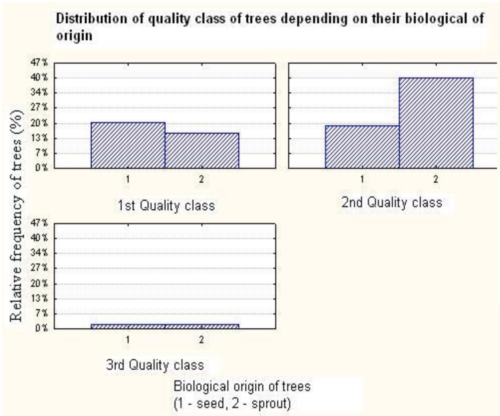
As regards the shape of Turkey oaks (*Quercus cerris*) trunk (see Figure 3), one may observe the existence of valuable shapes **1a**, **2a** and **3a** respectively, in a higher proportion in case of seed related biological origin. Sprout origin samples dominate in the shapes **1b**, **2b** and **3b**, in those with different combinations of defects.

Seed based samples are better pruned (H pruning=15.94 m, on average) compared to those with sprouts/shoots of biological origin (H pruning=14.53 m, media), the difference being of roughly 1.5 m.

Regarding the differences between quality classes of trees, depending on their biological origin (see Figure no 4), seed based samples remain almost at the same percentage as in the 1st Quality class (20.35%) and the 2nd quality class (19.27%), while the sprouts based samples maintain different percentages i.e. 40.43% at 2nd quality class and 15.76% in 1st quality class.

The root-swelling affects, in larger proportions, the seed based samples (60 cases) compared with sprout based ones (36 cases).

Regarding the occurrence of undercovered knots (see Fig. no 5), by biological origins, sprouts based samples are much affected as seed based ones. Higher frequencies appear within the intermediate area (21.83%) and the 1st Quality class area (1.88%), in case of sprouts based biological origin of tree.



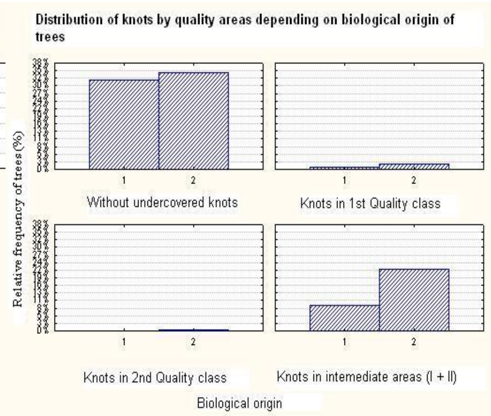


Fig. 4. Distribution of quality class of trees depending on their biological origin

Fig. 5. Distribution of undercovered knots by quality areas depending on their biological origin

CONCLUSIONS

One may conclude that the biological origin of the Turkey oak trees (*Quercus cerris*) within the surveyed area represents a **statistical highly significant factor** as regards: the occurrence and localization of trees' exterior rot, pruning height, height of first green branch, trees trunk shape, quality class of trees, root-swelling presence and localization of undercovered knots, respectively.

Seed based biological origin has many advantages in comparison with the sprout one, as follows:

- ● A reduced incidence of exterior rot by quality areas of trees (1.61% versus 12.47%, in the case of sprout based ones);
- ● Existence of **1a, 2a** and **3a** valuable forms (as regards trees trunk), in a larger proportion at seed based biological origin samples, to the detriment of poor forms **1b**, **2b** and **3b**, which are in a larger proportion a sprout biological origin;
- ● Seed samples are better pruned (mean=15.94m) compared with the sprout based ones (mean=14.53 m);
- ● Seed origin samples remain almost at the same percentage both in the 1st Quality class (20.35%) and 2nd Quality class (19.27%), while those of sprout origin remain in different percentages, 40.43% in 2nd Quality class, and 15.76% at 1st Quality class;
- ● Regarding the occurrence of undercovered knots, of biological origin, seed origin samples are less affected compared to sprouts origin, higher frequencies occurring within the intermediate area

(21.83%) and the 1st Quality class (1.88%), in case of sprouts biological origins excrescences;

Sprout biological origin show the following advantage, compared to those of seed biological origin:

● A reduced root-swelling incidence 8.31%, as against 19.41%, in the case of seed origin samples.

REFERENCES

1. Babos, K., 1980: *A csertölgy* (*Quercus cerris* L.) *faanyagának gyűrűs repedékenysége és az azt előidéző eltérő évgyűrűszélességek és térfogatsúlyok vizsgálata*. Az Erdészeti és Faipari Egyetem tudományos közleményei, 1 kötet, Sopron, p. 17-23.
2. Balleux, P., 2004: *Les débouchés du chéne*, Silva Belgica, nr. 6.
3. Beldeanu, E., 2008: *Produse forestiere*, Editura Universităţii Transilvania din Brasov.
4. Beldeanu, E.C., 1999: *Produse forestiere şi studiul lemnului I*. Ed Universităţii Transilvania, Braşov.
5. Chiţea Gh., 1997: *Biostatistică*, Editura Universităţii "Transilvania", Braşov.
6. Collardet, J., Besset, J., 1988, 1992: *Les bois commerciaux et leurs utilizations*. Tome I. Bois résineux (Coniféres). Tome II. *Feuillus des zones tempérées*. Dourdan. Éditions H. Vial et CTBA, Paris, 277 p et 400 p.
7. Dinulică, F., 2009: *Carnet de teren pentru investigaţii asupra calităţii lemnului pe picior*, Universitatea Transilvania Braşov.
8. Dinulică, F., 2008: *Cercetări privind factorii de influenţă asupra formării lemnului de compresiune la brad*. Teză de doctorat, Universitatea Transilvania Braşov.
9. Dorog S., 2008: *Biostatistică forestieră*, Editura Universităţii din Oradea, Oradea.
10. Giurgiu V., Decei I., 1997: *Biometria arborilor din România*: *Metode dendrometrice*. Ed. Snagov, Bucureşti.
11. Florescu, I.I., Nicolescu, N.V., 1996: *Silvicultura*, Vol. I, *Studiul pădurii*, Ed Lux Libris Braşov.
12. Leahu, I., 2004: *Aplicarea teoriei statistice a selecţiei în monitorizarea sustenabilă a ecosistemelor forestiere*. Revista de Silvicultură şi Cinegetică 19-20, p. 15-24.
13. Negulescu, E.G., Stănescu, V., Florescu, I.I., Târziu, D., 1973: Silvicultură, vol. I, Editura Ceres, Bucureşti.
14. *** 1997: Amenajamentul U.P. VII Boboştea (O.S. Oradea), I.C.A.S. Oradea.
15. *** 1997: Amenajamentul U.P. VIII Mihiş (O.S. Oradea), I.C.A.S. Oradea.
16. *** 2005: Amenajamentul U.B. I Beliu (O.S. Dumbrava-Arad).
17. *** 2003: Amenajamentul U.P. V Supur (O.S. Tăşnad), I.C.A.S Oradea.
18. *** 2003: *Amenajamentul U.P. IV Chega (O.S. Tăşnad)*, I.C.A.S Oradea.