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Study of Bottom Bole Warp in Young Beech (*Fagus orientalis lipsky*) trees in Asalem Forest in Guilan Province

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Abstract: The bottom bole warp of young beech (*Fagus orientalis* Lipsky) trees has been investigated in Asalem (Lomer) in guilan province. Studies have been carried out on natural regeneration of beech in stand managed by shelter wood system. Linear plots (Transect) were layed out with random method survey and the object with Ratio Estimation are determinated. The bottom bole warp determined with distance L (from end to end of the angle) and distance D (amount of the warp). The classification of bottom bole warp studied for first time in Iran. The relation of L and D showed a significant correlation.

Key words: Young beech trees, bottom bole warp, classification, ratio estimation

INTRODUCTION

Iran is located in the North Temperate Zone from 25 to 40 degrees latitude and 44 to 63 degrees longitudes. A large area of the country is covered with high mountain ranges which amounts to about 50% of total land area and large sections of the interiors is characterized by arid basins.. Unfortunately, a tremendous proportion of those forests have been destroyed. On the northern slopes of Alborz mountains, at about 680-2000 m, the beech forest association appear: *Fagetum*, *Fageto-carpinetum*, or *Carpineto-Fagetum*, dominated, respectively by 2 main species *Fagus orientalis* Lipsky and *Carpinus betulus* L (Forest and Range Organization, 1990). This slow-growing, common, deciduous trees reach its greatest size in the brown forest soils of the Asalem forest in Guilan province and may attain ages of 300-400 years (Polunin, Martin, 1985). The regeneration area of Lomer (Asalem) is the oldest forestry plan in the Guilan province (Taheri, 1992, Assadollahi, 1980). This area was managed by Shelter wood system during 1963-1980 and natural regeneration was established. The main goal of this research is study of Beech regeneration quality. For study of the regeneration quality, 6 important aspects in silviculture (Crown-bole) were determined. The most important bole quality aspect is bottom bole warp in young beech trees. The classification of bottom bole warp was studied for first time in Iran. Surveys of forest and trees have not this classification in Iran. This classification can be important for economical evaluation in forestry plans, the lack of this classification in Iran and other country is main problem in this research.

MATERIALS AND METHODS

Study site: This study was conducted on Asalem forest in the Guilan province (North of Iran). This forest with 409 ha was located in 37°, 43′ latitude and 49°, 56′ longitudes.

Mean annual precipitation is approximately 1500-2000 mm, with most precipitation occurring in spring and autumn. The climate is cool and moist. The beech forest association is accompanied by following trees and shrubs: *Acer velutinum*, *A. cappadocicum*, *Tilia begonifolia*, *Taxus baccata*, *Fraxinus excelsior*, *Sorbus torminalis*, *Lonicera iberica*, *Mespilus germanica* and etc.

The herbaceous ground covers are as follows: *Dentaria bulbifera*, *Lathyrus vernus*, *Mercurialis perennis*, *Euphorbia amygdaloides*, *Fragaria vesca*, *Carex sylvatica* and etc.

The beech association generally is found on inceptisols and alfisols. Soils on this area are acidic and well-drained inceptiols (Forest and Range Organization, 1990).

Sampling methods: Data for young trees (Diameter 15 and 20 cm in D.B.H) and regeneration (less than 12.5 cm in D.B.H) were collected in the summer of 2000. The bottom bole warp, healthy and tilt bole of beech were studies in linear plots (Transect) using random method survey (Fig. 1). Ten samples plot (east to west direction) were established in beech regeneration. Two independent data sets were obtained from the system of transects. These data determined the bottom bole warp (Frize, 1987; Hasanzad, 1992; Wenger, 1984).

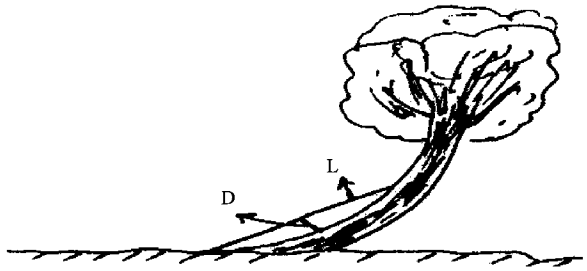

Fig. 1: The procedure of bottom bole warped determines

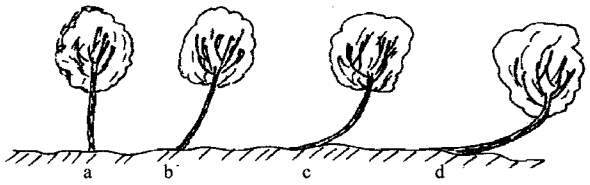

Fig. 2: The classification of bottom bole warp in young beech tree

1-Distance L: End to end of the angle,
2-Distance D: Amount of the warp.

The classification of bottom bole warp (Fig. 2) was studied for the first time in Iran. This classification has four types:

a-No warp: D = 0, b-Little warp: D<45 cm and L≤8.5 cm, c-Intermediate warp: D = 46-65 cm and L≤13 cm, d-High warp: D≤65 cm and L≤37 cm .

Data analysis: Ratio estimation was used to analyze the objects. Because the number of young beech trees were different in plots (transect), the cluster sampling we used (with unequal groups). The standard error, ratio object and confidence interval were calculated as (Gomez, 1990; Hasanzad, 1992; Morton, 1991; Zobeiry and 1993):

$$s\bar{p} = \sqrt{\frac{1}{(\bar{x})^2}\left[\frac{s^2y + \bar{p}^2s^2x - 2\bar{p}sxy}{n}\right]}$$

$$\bar{p} = \frac{\bar{y}}{\bar{x}} \qquad CI = \bar{p} \pm t(s\bar{p})$$

Where
$\bar{x}$: The total number of young trees:
$\bar{y}$: The number of special object:
s^2x: Variance of X:
s^2y: Variance of Y:
sxy: Covariance of X, Y:
n: The number of samples
t = (α = 0.01) t-student

RESULTS

A total of 146 young beech (Trees and regeneration) were determined along the transects. The distribution of bottom bole warp varied by the number of transects and warps types (Table 1).

The highest frequency of bottom bole warp was seen in little warp condition type. The distribution of diameter in young beech varied by D.B.H classes (Table 2). In young beech, the number of bottom bole warp cases decrease with increase in diameter (Galaly, 1980; Godarzy, 1996). The main direction of bottom bole warp is on the bottom of the slopes, this condition increases with ground gradients (%). Table 3 shows the statistical estimate results.

Unlinear relationship was significant between L (End to end of the angle) and D (Amount of the warp) (p = 0.01) (Fig. 3).

Table 1: The distribution bottom bole warps in young beech with four types

	The number of transect										
Types	1	2	3	4	5	6	7	8	9	10	Total
No warp	4	4	3	4	2	5	2	6	3	5	38
Little warp	5	7	8	8	6	7	3	4	16	15	79
Intermediate warp	1	2	1	3	1	--	1	--	2	--	11
High warp	4	2	2	3	3	1	2	1	--	--	18
Total warp	14	15	14	18	12	13	8	11	21	20	146

Table 2: The distribution of diameter in young beech by D.B.H classes

Types DBH Classes	No warp	Little warp	Intermediate warp	High warp	Total	%
(CM)						
0-2.5	8.0	29.0	4.0	5.0	46	31.5
2.5-7.5	11.0	29.0	3.0	12.0	55	37.6
7.5-12.5	6.0	10.0	1.0	--	17	11.6
15	9.0	7.0	2.0	1.0	19	13.0
20	4.0	4.0	1.0	--	9	63.0
Total	38.0	79.0	11.0	18.0	146	100.0
%	26.1	54.1	7.5	12.3	100	

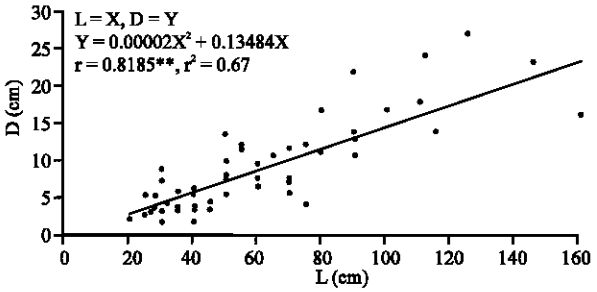

Fig. 3: The relationship between (L) and (D)

Table 3: The results of statistical estimate in young beech

Type	No.	Percent (%)	Standard error	Confidence interval (p = 0.05)
No warp	38	26.1	0.032	26.1±6
Little warp	79	54.1	0.053	54.1±10
Intermediate warp	11	7.5	0.02	7.5±4
High warp	18	12.3	0.034	12.3±6
Total	146	100		

Unlinear relationship was significant between L (End to end of the angle) and D (Amount of the warp) (p = 0.01)

This relationship can be help to evolution of tree quality in survey, because determine of Distance L: End to end of the angle are very easy. The Model of this research is the first study in Iranian forest.

DISCUSSION

The hard wood forests of Caspian Sea in Iran are one of the most important broad-leaved, deciduous ecosystems in the world (Archibold, 1995; Burgess, 1977). Among these ecosystems, Beech association is among the most widespread and have very important in terms of ecological resources. Since many of these forests have been destroyed, the management of their habitats has become a conservation priority. The most important factor in forest management is surveying (Quality-Quantity). The main goal of this research is study of beech regeneration quality. Most of young beech trees have bottom bole warp. There is not any quality classification of young beech in Iran. The classification introduced in this paper was done for the first time in Iran (Marvy, 1976 and 1977). This classification was original question in this research. Most of young beech in Asalem have little warp or no warp. This shows that young beech have good quality condition. From this study, it seems that, this situation occurred; as a result of heavy snow in the winter of 1971 (This situation may also occur because of genetically properties). It is necessary for the classification introduced in this paper to be carried out in other beech sites in Iran. The new model introduce in this research can support forest survey, but it is the first model in Iran. These lack of information are main difficult in beech trees quality evaluation and new model can help these goal.

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