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Influence of Light Condition on Quality and Quantity Characteristics of Beech (*Fagus orientalis* Lipsky) Sapling in North of Iran

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Abstract: The influence of light condition on quality and quantity characteristics of beech sapling (*Fagus orientalis* Lipsky) was studied in Sefidab (North of Iran). Beech forest growing in mountain region (1250-1450 m.a.s.l) of Iran. The experimental plots were establish in regenerations gaps resulting from natural regeneration. With each gaps, 9 sample points were selected systematically. To determine light intensity, one photometer was taken from sample point (LX-101 luxmeter). The result shows that the quality and branching (number, angle) were strongly correlated with light intensity. Relative light intensity had significant effect on collar diameter in sapling but doesn't have influence height of sapling.

Key words: Beech (*Fagus orientalis* Lipsky) sapling, light intensity, quality and quantity characteristics, Iran

INTRODUCTION

Iran is located in the North Temperate Zone from 25° to 40° latitude and 44° to 63° longitude, with a total area of approximately 1,650,000 square kilometers. The total forest area of Iran was estimated approximately 18 million hectares about three decades ago^[1,2]. Unfortunately, tremendous proportions of those forests have been destroyed. The main native species of trees in Iranian forests are Beech (*Fagus orientalis* Lipsky), Hornbeam (*Carpinus betulus*) and Oak (*Quercus castanefolia*). These species make up 32.72, 31.17 and 8.44 % of the total volume respectively, for a combined total of 72.33%^[2]. The interest in and need for silvicultural systems, which rely on natural regeneration has increased within the last decade in Iran. The gap-phase, which is the most dynamic part forest mosaic-cycle, is essential to natural regeneration and the processes taking place in the gap phase have consequences for both short-term and long-term forest dynamics. Research has aimed at improving the understanding of the pattern and demand of light for beech sapling in gap regeneration. In Iran, specific studies on gap regeneration are relatively new^[3,4]. However, information on natural regeneration in other beech (*Fagus orientalis* Lipsky) silvicultural system, such as shelter woods is well studied^[5-8]

MATERIALS AND METHODS

Study site: This study was conducted on natural virgin forest in eastern of Guilan province (Fig.1). This stand with 3443 ha was located in 36,15,16 to 36,58,30 latitudes and 50,12,2 to 50,17,15 longitudes. This forest was located in number 28 water shade of guilan province^[9]. The forest is located at 150 to 2000 m sea level and consists of deciduous species, mainly beech. Mean annual precipitation and temperature are approximately 2000 mm and 15.46°C. The climate is moist and very moist. Soils in this area are usually loam well drained a zonal and also brown forest soil. Data for beech regeneration were collected in the winter of 2003.

Method: In sefidab virgin forest five gaps were studied. The gaps were created by natural processes, with each gap, 9 sample points were selected systematically. Within each gap, a N-S and E-W grid system was laid out, with 3-3 m distances between sample plots. Each sample plot was nearest sapling to theses point. Sample sapling recording were done in five gaps on Quality and Quantity Characteristics. Light intensity was determined by one photometer (LX-101 luxmeter). Two groups were studied in gaps, close forest with light intensity to 300 lux and open forest with light intensity over 300 lux.

Table 1: The quantity aspects of the beech sapling in two canopy classes

Light intensity to 300 lux	Light intensity over 300 lux
Mean of collar diameter 7.16 mm	Mean of collar diameter 10.56 mm
Mean of height 82.96 cm	Mean of height 67.85 cm
T test about collar diameter between two group	*
T test about height between two group	ns

Table 2: The quality aspects of the beech sapling in two canopy classes.

Light intensity to 300 lux	Light intensity over 300 lux
The number of secondary branches	The number of secondary branches
a. Have (%) 60	a. Have (%) 80
b. Without (%) 40	b. Without (%) 20
The condition of bole	The condition of bole
c. Mono (%) 68	c. Mono (%) 55
d. Poly (%) 32	d. Poly (%) 45
The angle of secondary branches	The angle of secondary branches
e. A little (%) 74	e. A little (%) 56
f. Medium (%) 26	f. Medium (%) 44
χ^2 (Chi square), ($\alpha=0.05$). About quality aspect between two group	*

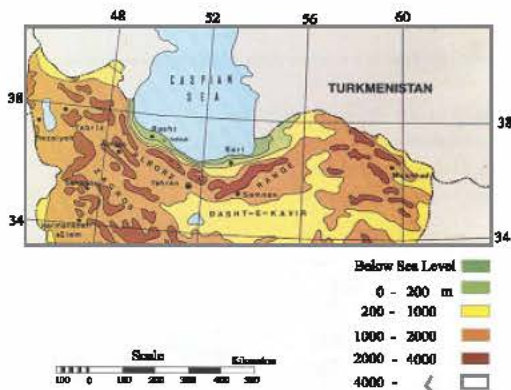


Fig. 1: Location of experimental stations (North of Iran)

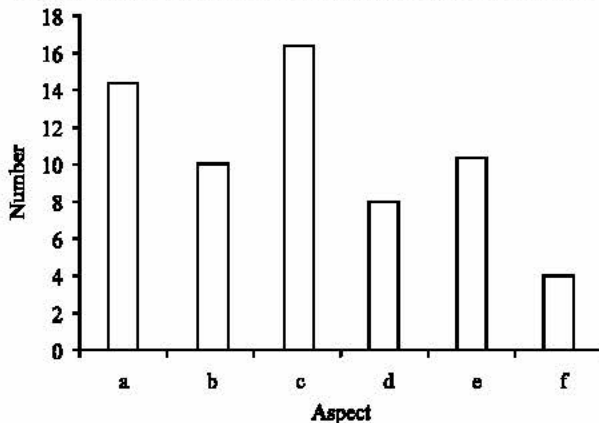


Fig. 2: The quality aspect in beech saplings to 300 lux

On sample sapling quality and quantity characteristics were studied: the collar diameter, the height, the number of secondary branches, the condition of bole, the angle of secondary branches^[10].

RESULTS AND DISCUSSION

The beech saplings (quantity) were surveyed; the collar diameter and height of trees. The situation of the

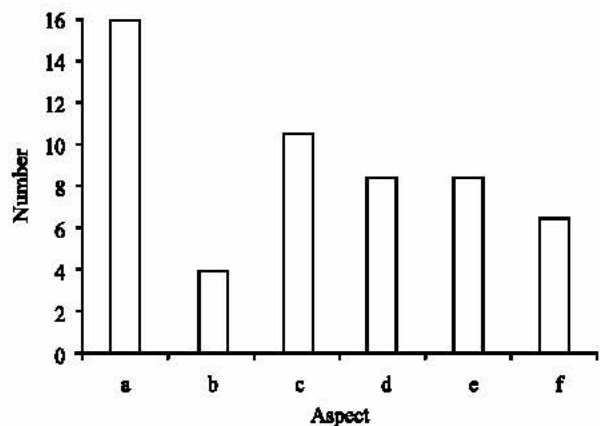


Fig. 3: The quality aspect in beech saplings over 300 lux

stand's collar diameter and height are presented in Table 1. The two group of canopy was tested with t² student ($\alpha=0.05$)^[8,10].

The beech saplings (quality) were surveyed; the number of secondary branches, the condition of bole and the angle of secondary branches. The two group of canopy was tested with χ^2 (chi square), ($\alpha=0.05$).

The statistical analysis (Table 1 and 2) showed that there was a significant difference ($\alpha=0.05$) between two groups of canopy in gaps, with increasing light intensity correlated to increasing negative aspect in beech saplings^[7].

The study showed that the presence of a gap in a natural forest caused considerably different micro site conditions within gap than in the surrounding closed forest (Fig. 1 and 2). However, the light intensity and canopy (%) within gaps can created different condition for saplings^[11]. Unfortunately, the severe browsing by domestic animal in other forest and gaps in Iran caused formation of small, ball-shaped (bonsai) beech trees of a height less than 0.5 m. The collar diameter increased in open gaps but, conversely, height growth did not increase immediately after canopy opening^[12].

Because the correlation between light intensity and quality-quantity characteristics were relatively high, the availability of suitable regeneration appear relatively easy to control by felling practice. In practical forestry, the removal of 2-3 canopy trees would make the relative light intensity much higher within the gap than under closed canopy. Thus, on beech forest (with site condition similar to sefidab forest) open canopy and high light intensity may cause negative aspect in saplings. Also, fundamental knowledge of virgin forest research is confirmed, that is that regeneration is always established on closed canopy in gaps and saplings survive for years under canopy^[4,13]. It shows how a virgin forest exists without any human impacts and gives recommendation to use these experiences as support to minimize efforts in managed forests^[14].

REFERENCES

1. Amanzade and Siaei-por, 1999. Study of increment and wood production in *Picea abies* in Asalem. Pajohesh-va-sazandegi Mag. No. 46, pp: 64-67.
2. Amani, M. and Oamze, 1996. The first results of thinning program from quality and quantity aspects in Maple (*Acer insigne*) in Amanzade abdola Amol. Pajohesh-va-sazandegi Mag. No. 35, pp: 6-21.
3. Berges, 1978. Study on Iranian trees. The Range and Forest Research Department, Iran.
4. Sageb, T., 1996. Quantitative und qualitative Merkmale von Buchenungwachsen (*Fagus sylvatica* L.) unter dem Einfluss des Lichtes und anderer Standortsfaktoren. Zurich Suisse, pp: 219.
5. Taheri Abkenar, K., 1991. Study of natural regeneration in beech forest under shelter wood method in asalem. Tarbiat Modares University. pp: 215
6. Taheri Abkenar, K., 1999. Study of quality aspects in young beech trees in asalem. Shahed University Mag., pp: 35-42.
7. Taheri Abkenar, K., 2002. Study of bole warp in young beech trees in Iran. Iran and Russia Conference, Moscow, 16-22 Sep., 2002.
8. Taheri Abkenar, K., 2001. Study of beech regeneration structure in Lomer forest in asalem. Tarbiat Modares University, pp: 16-21.
9. Sajadi, 1995-96. The exotic conifers in Guilan province. The Forest and Range Res. Org. Pub., pp: 23.
10. Zobeiri, M., 1993. The Forest Survey. No.2238. Tehran University Press, pp: 401.
11. Hahn, K., Skov and Landskab, 2004. Natural regeneration in two gaps in rankeskoven, stodam reservatet, Denmark. Nat-Man Project, the European Community 5th Framework Programmer.
12. Collet, C., O. Lanter and P. Marta, 2000. Effect of canopy opening on height and diameter growth in naturally regeneration beech seedlings. Forest Sci., 58: 127-134.
13. Mlinsek, D., 1986. Die urwalder in jugoslawien. AFZ, 30/31: 757-759.
14. Ryel, R.J. and W. Beyschlag, 2000. Gap Dynamics. Sheffield Academic Press, pp: 251-279.