Asian Journal of Plant Sciences

ISSN 1682-3974

science alert

ANSInet
an open access publisher
http://ansinet.com

Asian Journal of Plant Sciences 6 (7): 1143-1146, 2007
ISSN 1682-3974

Performance of Planted Maple in Western Guilan Province, Iran

[1]Kambiz Taheri Abkenar and [2]Elham Safarpour
[1]Department of Forestry, Faculty of Natural Resources, University of Guilan, Guilan, Iran
[2]Department of Environment Resources, North Talegani Ave, Kardj, Iran

Abstract: The success of planted *Acer velutinum* investigated in western Guilan Province in Iran. This region was reforested in 1985. The study was carried out in the autumn of 2003 with using the full callipering method. The goal of this study is to review the maple plantation, in order to present a new background that is useful for an ecological evaluation of the maple plantations in Iranian forests. Some quantity and quality factors about bole and crown were evaluated. The resistance of maple to difficult conditions such as irregular cutting and its resistance to light (full sun light in clear place, some trees can tolerant to full sun light) and fire make this species very important for plantation (wood farming). This study showed that, after a period of 21 years, maple is suitable for plantations on the Caspian Sea flat area and the slopes of the Alborz Mountains and can financially compete with other endemic and exotic species.

Key words: Maple (*Acer velutinum*), plantation, pure stand, wood farming, caspian sea, Iran

INTRODUCTION

Iran is located in the North Temperate Zone between 25 to 40° latitude and 44 to 63° longitude, with a total area of approximately 1,650,000 km^2. The total forest area of Iran was estimated to be approximately 18 M ha about three decades (Amani, 1996; Alizade, 1997). Unfortunately, significant 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 32.7, 31 and 8.4% of the total volume and 27.7% other (Alizade, 1997) the use of exotics for reforestation has traditionally been very limited. Maple (*Acer velutinum*) as an endemic species has been planted on a large scale on flat land and in the highlands of the Guilan Province (Abkenar, 1991, 1999, 2002). Iran needs 9 M m^3 wood for 70 M people and plantation is only solution for this problem. Hence high priority is placed on expansion of the plantation area.

The main purpose of this study is to review the plantation maple, in order to present a new background that is useful for an ecological evaluation of the maple plantation in Iranian forests.

The second goal is compare maple increment condition with other species.

Maple (*Acer velutinum*) from the Aceraceae family is a native to the plain and mountain areas of northern Iran. It is superior to the species in having larger leaves and flower (Archibald, 1995). The leaves are similar to sycamore but larger, with some pubescence on the leaf veins on the under side of the leaf. The leaves are lobed, up to 15 cm long and across, with usually five coarsely toothed lobes, yellow-green above. The Bark grey-brown and smooth. Flower small and green and the fruit have large wings, set at right angles, up to 4 cm long (Polunin and Martin, 1985). On the northern slopes of Alborz Mountains, the maple (*Acer velutinum*) group association includes Querco-Boxetum, Querco-Carpinetum, Carpino-Quercetum and Fagetum (Burschel and Hass, 1987; Berges, 1978).

MATERIALS AND METHODS

The study site: This study was conducted on a maple plantation in the western part of Guilan Province in northern Iran is one part of Iran map and shows the situation of this study in Guilan province. This stand with 5.9 ha is located between 37°18 latitude and 49°18 longitudes. The mean annual rainfall is 1557 mm. Most of the rainfall is received during August to May. June and July (34.6°C) are the hottest months whereas January and February (6.4°C) are the coldest. The climate is humid and moderate (Alizade, 1997). The topography of the study area is plain with slope of 5%. The topsoil has a loamy texture and the subsoil a clay texture with a depth of 25 cm. The important characteristics of the soil in the study site are shown in Table 1.

The pure stand of maple planted was planted in 2×2 m grid. Mean annual rainfall was 1557 mm. Most of

Corresponding Author: Kambiz Taheri Abkenar, Department of Forestry, Faculty of Natural Resources, University of Guilan, Guilan, Iran

Table 1: Important properties of the soil in the study area

Soil depth (cm)	Organic carbon (%)	Soil acidity (pH)	Total N (%)	C/N	Texture
0-25	5.52	6.3	0.35	15.77	Loam
25-50	1.44	6.1	0.13	11.08	Clay
50-75	0.96	5.8	0.12	7.50	Clay
75-100	0.72	5.7	0.12	5.67	Clay

the rainfall is received during August to May. June and July (34.6°C) are the hottest months whereas January and February (6.4°C) are the coldest. The climate is humid and moderate (Alizade, 1997). The topography of the study area is plain with slope of 5%. The topsoil has a loamy texture and the subsoil a clay texture with a depth of 25 cm. The important characteristics of the soil in the study site are reported in Table 1.

Sampling methods: Data for planted maple were collected in the winter of 2004 (approximately 10 ha). Studies were carried out with tally inventory (100%) And analyzed with the volume formula

$$V = GHF$$

Where:

V = The volume of tree
G = The basal area
F = The form factor (0.5)

On all trees, the diameter, height, bottom bole warp, number of the secondary branches, health of crown and bole, crown symmetry, plumb line and situation of bole axial were measured. The situations of stand were tested with probability index and skew ness and chi-squared tests were performed on diameter and height distributions and ratio of height/diameter (H/D ratio) (Zobeiry, 1993, 2004).

RESULTS AND DISCUSSION

The planted *Acer velutinum* were surveyed and diameter distribution in 5 cm classes was calculated. The situation of descriptive statistics on tree diameters is shown in Table 2 and on height and volume in Table 3. The diameter distribution curve shows positive skew ness (Fig. 1). The amount of skew ness become very high (b = 0.44), this condition shows competition and lack of intermediate cutting (Collet *et al*., 2000). The height distribution curve shows negative skew ness (b = -0.15).

The nonlinear relationship between tree diameter (dbh) and H shown in (Fig. 2) is significant at α = 1% level.

The regression equation is:

$$H = 0.762905+0.0442053\ dbh–0.000076\ dbh^2\ R^2\ 0.87573$$

Table 2: Descriptive statistics of stand diameter for a 21 year period

Mean of diameter (cm)	16.23
Median (cm)	15.50
Mode class (cm)	15.00
Variance (cm)	24.41
SD (cm)	4.94
CV (%)	30.43
Pierson index (this index can be show amount of the skew Aness)	0.44
Diameter increment (cm)	0.82
Age (year)	21.00

Table 3: The statistic situation of the stand height and volume

Mean of height (m)	15.76
Top height (m)	18.09
Height increment (m)	0.88
Volume ($m^3\ ha^{-1}$)	11.13

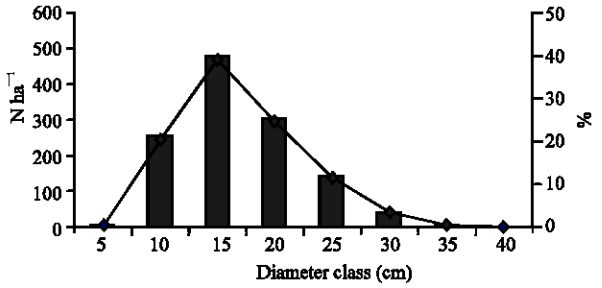

Fig. 1: The diameter distribution on the curve on the base of number per hectares (N ha^{-1})

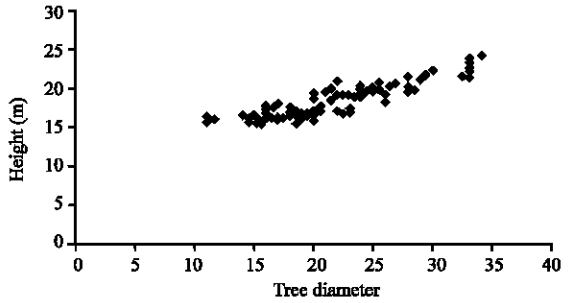

Fig. 2: The relationship between tree diameter (cm) and height (m)

The volumes of testifier (selected) trees as obtained the V = GHF formula were analyzed and the relationship between diameter in dbh and volume was found to be significant at the 1% level.

$$V = 0.96810 + 017569\ D\text{-}001319\ D^2,\ R^2\ 0.99503$$

Stand normality was tested with Chi-square test and probity index. The Chi-square test showed the distribution was non-normal (α = 95%) and probability index showed this stand has skew ness and the Henry line breakdown in 10 cm classes (Fig. 3).

Table 4: Bole and crown quality aspects in maple stand

Quality aspect	Relative frequency (% of trees)
Bole healthiness: Illness	28.0
Spiral grain in bole	42.4
Live branch in bole	50.5
Dead branch in bole	19.7
Biaxial trees	26.0
Crown symmetric	64.6
Crown healthiness: Safe	90.2

Table 5: Proportions of trees in various crowns in story 3 of stand

Growth dominance group	Proportion of trees (%)
Dominant	38.8
Co-dominant	43.9
Suppressed	17.3

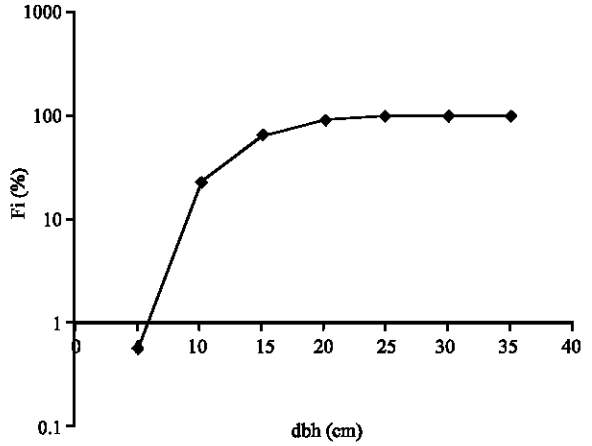

Fig. 3: Cumulative relative frequency (Fi %) of tree dbh (cm)

The quality aspects were studied on testifier trees (Table 4, 5).

The biaxial trees are common in maple trees (Amani, 1996; Njad, 2000). In this study, tree bole was measured vertically into 4 sections. The most maple trees were biaxial in the second section.

The height to diameter (H/D) index of 91.7 indicates an unstable condition (Burschel and Hass, 1987), where removal of thinning may be dangerous. Bole and crown were tested between the situation of trees in story with chi-square test and a significant difference was found (α = 0.01). The result showed significant difference between populations.

There are a number of fast growing here are a number of fast growing potential tree species including poplars, *Eucalypts*, *Alnus* and *Pinus* species which can be exploited under short-rotation forestry. The total forest area of Iran was estimated approximately 18 Million hectares about three decades ago (Sajadi, 1995, 1996).

Abkenar (2001) reported that Iran has 1.8 Million hectares of commercial forest. Unfortunately, large areas of those forests have been destroyed with irregular cutting and grazing. Therefore, there is a need to expand production forestry which involves raising plantations of fast-growing species under short-rotation intensive culture. Iran need 9 m m^3 of wood for 70 Million people but Iranian natural forest product 1 m m^3 (Abkenar and Khoshkebigary, 2004).

The resistance of maple against difficult conditions including irregular cutting and tolerant to light (maple trees can be tolerant to full sun light) and fire (regenerate after fire) make this species important for timber plantations (Mlinsek, 1986).

This study showed that, after 21 years, planted maple has the ability to grow successfully on the Caspian Sea flat area and slopes of Alborz Mountains (Ryel and Beyschlag, 2000) and to withstand competition with other endemic and exotic species.

In terms of condition of maple trees: The mean annual increment in maple was 0.82 cm compared with 0.44 cm for beech trees (the main commercial trees in Iranian forest) in the best condition (Siahipor, 2002).

- The mean annual height increment in maple was 0.79 m which is competitive with planted exotic pine in same conditions (maritime pine, 0.99 m) (Abkenar and Khoshkebigary, 2004; Vygler, 1980).
- The mean annual volume increment in maple was 11.13 sylve compared with 4.82 cubic meters for Beech trees in the best site conditions (Abkenar and Khoshkebigary, 2004) had 2.6 cubic meters for maritime pine.
- The situation of maple trees makes it suitable for an agri-silvi production system (Talebi, 1996). It is a suitable species for growing in plantation in social forestry, agro-forestry and industrial plantations. Further testing of maple plantations in other areas in north of Iran appears to be warranted.

APPENDIX

F = The form factor: The form factor is used to estimate volume of and timber yield from a species (of trees in a forest stand).

Significant at the α = 1% level: Statisticians use the Greek letter alpha (α) to indicate the probability of rejecting the statistical hypothesis tested when in fact, that hypothesis is true.

Story: A roughly horizontal layer (or strata) of vegetation in a plant community; in forests these generally correspond to canopy layers.

The height to diameter (H/D) index: This index and its implications for stand stability have been described by Burschel and Huss (1987).

Tolerant: The ability of an organism to subsist under particular environmental conditions. In forestry, tolerance generally refers to the capacity of trees to develop and grow in the shade of surrounding trees.

REFERENCES

Abkenar, K.T., 1991. Study of natural regeneration in beech forest under shelter wood method in kilesara asalem. Tarbiat Modares University.

Abkenar, K.T., 1999. Study of quality aspects in young beech trees in Asalem. Shahed Univ. J., pp: 35-42.

Abkenar, K.T., 2001. Study of beech regeneration structure in Lomer Forest in Asalem. Tarbiat Modares University, pp: 16-21.

Abkenar, K.T., 2002. Study of bole warp in young beech trees in Iran. The 3rd International Iran and Russia Conference. Moscow, pp: 16-22.

Abkenar, K.T. and F. Khoshkebigary, 2004. Study of success planted maritime pine (*Pinus pinaster*) in Caspian Seashores Area, IUFRO Short Rotation Forestry conference, IUFRO. Nauni, Solan, India.

Alizade, A., 1997. Climatology, Ferdosi University Publishers. Mashhad, Iran, pp: 398.

Amani, M., 1996. The first results of a thinning program from quality and quantity aspects in maple trees in Amamzade Abdola Amol. Pajohesh-va-sazandegi J., 35: 6-21.

Archibald, 1995. Ecology of the World, Chapman and Hall, London.

Berges, 1978. Study on Iranian trees. The range and forest Research. Departman. Tehran Iran.

Burschel and Hass, 1987. Grundriss des Waldbaus, Verlag Paul Parey, Hamburg und Berlin.

Collet, Lanter and Marta, 2000. Effect of canopy opening on height and diameter growth in naturally regeneration beech seedlings. For. Sci., 58: 134-137.

Mlinsek, D., 1986. Die Urwalder in Jugoslawien. AFZ, 30/31: 757-759.

Njad, H., 2000. Study of Morphology of Maple in Natural and a Forestation Stand, Guilan University Publishers, Rasht, Iran.

Polunin, O. and W. Martin, 1985. A Guide to the Vegetation of Britain and Europe. Oxford University Publishers, pp: 238-299.

Ryel, R.J. and W. Beyschlag, 2000. Gap Dynamics. Sheffield Acad. Press, pp: 251-279.

Sajadi, 1995/1996. The Exotic Conifers in Guilan Province, The Forest and Range Research Organisation Organization Publishers.

Siahipor, A., 2002. Assessment of diameter growth of beech (*Fagus orientalis*) in Guilan Province. Iran. For. Poplar Res., No. 266.

Talebi, S., 1996. Quantitative und qualitative Merkmale von Buchenungwuchsen (*Fagus sylvatica* L.) unter dem Einfluss des Lichtes und anderer Standortsfaktoren, Zurich, Suisse.

Vygler, A., 1980. Biomass of Tree Layer of Spruce Forest in the Bohemian Uplands. Academia Publishing House of the Czechoslovak Academy of Sciences, Praha, 1981, pp: 396.

Zobeiry, M., 1993. Forestry Survey, No. 2238, Tehran University Publishers, pp: 401.

Zobeiry, M., 2004. Forest Biometry, No. 2561. Tehran University Publishers, pp: 411.