EFFECT OF NATURAL AND ARTIFICIAL SHELTER ON GROWTH PARAMETERS AND WEED CONTROL IN SEEDLINGS OF ARIZONA CYPRESS

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Abstract: Arizona cypress is one of the most important species on the basis of low ecological needs and tolerance against winter dry and summer heat. It is very current in forest plantation in degraded ecosystems and dry and semi-dry shrub lands in Iran. The aim of this research was investigation on the effect of various light treatments in format of natural and artificial shelter on growth and quality of seedlings and amount of weeds. A complete randomized design with four replications was performed. At first 24 quadrates including 24 seedlings per quadrat (total 576 seedlings) were indicated. Six different light treatments including 0, 33%, 50%, 67% and 100% and one treatment including the seedlings under tree canopy with four replications were performed. Other situations of nursery including: soil, irrigation, etc. were the current methods in nurseries and it was similar for all of treatments. Total height, vitality and survival were recorded 9 times. The weight of weeds was measured. The results showed the most and lowest amount of survival was in 33 and 100% light treatments respectively. The other results showed that shade treatments had not any significant effect on vitality of seedlings. Shade treatments caused decrease of weeds. The total results of research showed 33% and 50% light treatments are the best ones for this species in nurseries.

Key words: Arizona cypress, Seedlings, height growth, weed, light treatments

INTRODUCTION

Valuable role of forests and green space in water and soil preservation, wood production, sight seeing, fauna and flora preservation and many other values is not covered for anyone. As the forest area of Iran in comparing with country surface is very low thus the upper benefits is not accessible and many parts of country is poor in plant cover. In the northern part of Iran there are big wood factories that for their primary materials have many problems and the Hycranian forests of North Slope of Alborze Mountain are imposed to this problem. In order to decreasing the pressure on this valuable forests which its other benefits are more important than wood, thus plantation of tree species is more urgent.

Forest areas cover only 7% of Iran surface. 12 million ha of Iranian forest resources are unique ecosystems that their conservation is a must.
Forest plantation is very common due to low forest cover and Iran, with one million hectares forest plantation, is among the first ten countries in the entire world in forest plantation. The Mediterranean areas cover considerable surface in Iran that *Cupressus arizonica* is one of the most important alternatives for plantation for rehabilitation of natural ecosystems. *Cupressus arizonica* is one of the most important species on the basis of low ecological needs (Park, 1980) and tolerance against winter dry and summer heat. It is very current in forest plantation in degraded ecosystems and dry and semi-dry shrub lands in Iran. It is an important species for urban green space too. A lot of its seedlings are produced in Iranian nurseries per year. The investigation on alternatives for producing high quality seedlings of this valuable species is very important. Light affects on growth and quality of seedlings (Van Auken, Bush, 1991; Saxena, 1995; Elliott, White, 1994; Saju, 2000; Valladeres, Chico, 2002) and weeds amount. Due to possibility of light and shade treatments effect on growth, survival, quality and weed amount in seedling production of *Cupressus arizonica* that a lot of its seedlings are producing in Iranian nurseries per year, the aim of this research was investigation on the effect of various light treatments in format of natural and artificial shelter on growth and quality of seedlings and amount of weeds. The results of this research can help the managers of nurseries for make best decision and strategy about seedling production of high quality seedlings of this valuable species.

**MATERIAL AND METHODS**

**The Study Area**

The study site, Talukula nursery is with 4 million annual seedlings production and with an area of 80 ha. Located in 12 km distance of Sari - the center of Mazandaran province in the centre of Hyrcanian forests in north of Iran that Hyrcanian region forests in the southern coasts of Caspian Sea along with similar North American and East Asian forest areas (Sagheb-Ta1ebi et al., 2005). The annual precipitation is 848mm. The soil texture of nursery is sandy-clay including 55% sand, 14% silt and 31% clay (Fig. 1.). Characteristics of the study area briefly prepared in Table 1.

**Considered Species**

The studies were performed on Arizona cypress (*Cupressus arizonica*). It is an important option for plantation for rehabilitation of Mediterranean ecosystems. This species is tolerant against winter dry (Wolf, 1984) and summer heat (Vogl, 1977). It is an evergreen species and its plantation in urban Greenpeace is very current in Iran.
Fig.1. The situation of study area

Table 1

Characteristics of the study area

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 to 63 m</td>
<td>Altitude Range from sea level</td>
</tr>
<tr>
<td>0 to 3 %</td>
<td>Common slope</td>
</tr>
<tr>
<td>80 ha.</td>
<td>Area extension</td>
</tr>
<tr>
<td>848 mm</td>
<td>Mean annual rainfall (1993-2004)</td>
</tr>
<tr>
<td>212 mm in Dec.</td>
<td>The mean maximum monthly rainfall</td>
</tr>
<tr>
<td>19 mm in Jun.</td>
<td>The mean minimum monthly rainfall</td>
</tr>
<tr>
<td>17 °C</td>
<td>Mean annual air temperature</td>
</tr>
<tr>
<td>26 °C in Aug.</td>
<td>The mean maximum monthly air temperature</td>
</tr>
<tr>
<td>7.5 °C in Feb.</td>
<td>The mean minimum monthly air temperature</td>
</tr>
</tbody>
</table>

Methodology

A complete randomized design with four replications was performed. At first 24 quadrates including 24 seedlings per quadrate (total 576 seedlings) were indicated. Six different light treatments including full shadow (made by dark cloth on shelter frame), 33% light (shelter with 67% closed surface and 33% open surface of shelter), 50% light (shelter with 50% closed surface and 50% open surface of shelter), 67% light (shelter with 33% closed surface
and 67% open surface of shelter), 100% light (without any shelter) and one treatment including the seedlings under tree canopy with four replications were performed. Other situations of nursery including soil, irrigation and so was the current methods in nurseries based on nursery standards (Dur-yea, Landis, 1984) and it was similar for all of treatments. Total height, vitality and survival were recorded 9 times. The weight of fresh weeds was measured.

Statistical Analysis

For data analysis the Kolmogorov-Smirnov test was used for normality test, Bartlet test were used for test of homogeneity of variances. Then due to normal distribution of data improved by Kolmogorov-Smirnov normality test and equability of variances showed by Bartlet test, One-way analyses of variance (ANOVA) were used to compare several treatments and its effect on survival, height and diameter growth and weight of fresh weed. Duncan multiple range tests were used to separate the means of dependent variables which were significantly affected by shade treatments.

RESULTS

The shade effect on vitality of seedlings

Fig. 2 shows the shade effect on seedlings vitality. Vitality is different to survival, survival percent is percent of alive (non dead, dried and declined) seedlings and vitality percent is ratio of vital seedlings (seedlings with good health and quality with green needles without any defect). The result of performing Duncan test with 95% probability insert light treatment of 33% and the seedlings located under trees shelter in a subset and other light treatments in b subset. It shows that the best light treatments on the basis of vitality are light treatment of 33% and the seedlings located under trees shelter.

The shade effect on total height of seedlings

Table 2 shows the shade effect on total height of seedlings. The best total height of seedlings belongs to shade treatments in light intensity of 33% and 50%. The result of performing Duncan test with 95% probability insert light treatment of 33% and 50% in a subset and the less amount of total height was belong to full light without any shelter and seedlings located under trees shelter.

The shade effect on survival of seedlings

Fig. 3 shows the shade effect on survival of seedlings (percent of alive (non dead, dried and declined) seedlings). Duncan multiple ranges test in-
Fig. 2. Percent of vital seedlings in different shades

Table 2
The Shelter effect on total height (cm) of seedlings

<table>
<thead>
<tr>
<th>Standard error</th>
<th>Standard Deviation</th>
<th>Mean (cm)</th>
<th>Number</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5318</td>
<td>4.9313</td>
<td>21.74ab</td>
<td>86</td>
<td>full shadow</td>
</tr>
<tr>
<td>0.5330</td>
<td>5.1124</td>
<td>22.56a</td>
<td>92</td>
<td>33% light</td>
</tr>
<tr>
<td>0.6229</td>
<td>5.7089</td>
<td>22.72a</td>
<td>84</td>
<td>50% light</td>
</tr>
<tr>
<td>0.5762</td>
<td>5.3122</td>
<td>21.89ab</td>
<td>85</td>
<td>67% light</td>
</tr>
<tr>
<td>0.6193</td>
<td>5.6080</td>
<td>19.94b</td>
<td>82</td>
<td>100% light</td>
</tr>
<tr>
<td>0.4107</td>
<td>3.9182</td>
<td>19.884b</td>
<td>91</td>
<td>Under Tree shelter</td>
</tr>
<tr>
<td>0.2289</td>
<td>5.2188</td>
<td>21.46</td>
<td>520</td>
<td>Total</td>
</tr>
</tbody>
</table>

serts light treatments of 33% and under trees shelter in higher subset and others in lower subset. It shows that the best light treatments for survival are light treatment of 33% and the seedlings located under trees shelter. This result was exactly similar to vitality percent (ratio of vital seedlings (seedlings with good health and quality with green needles without any defect)).

The shade effect on weed

Fig. 4 shows the weight of fresh weed in different treatments. Shade treatments cause significant decrease in fresh weed amounts. Duncan multiple ranges test inserts full light treatments of 100% in higher subset with maximum amount of fresh weed weight and the samples located under trees shelter in lowest subset with lowest amount of fresh weed weight.
Height growth of seedlings in the period of growth season

Fig. 5 shows total height growth of seedlings in different months in the period of growth season. Fig. 6 shows weather parameters in growth season and Fig. 7 shows rainfall (mm). It shows a peak of height growth occurred in August that has the warmest temperature.

The most significant positive correlation was found between mean and minimum of temperature and height growth. The precipitation did not show significant correlation with height growth because in dry times the seedlings were irrigated.
CONCLUSION

Shade Treatments cause increase in seedling quality (vitality) and quantity (survival). Shade Treatments cause significant decrease in fresh weed amounts that it is due to light needs of weed. The less amounts of weed, result of shade decrease irrigation needs and it is very important case in nurseries management.

August with warmest temperature between growth season period has
the most rate of total height growth. This result improved that *Cupressus arizonica* is a thermophile species. Also the most significant positive correlation was found between mean and minimum of temperature and height growth. Non-significant correlation between precipitation and height growth was due to irrigation during dry condition period.

The total results of research showed all of shade treatments causes increase of total height. The most and lowest amount of survival was in 33% and 100% light treatments respectively. In total 33% and 50% light treatments and also the light condition under tree canopy are the best light treatments for this species in nurseries. In total this research improved that shelter is suitable for this species in nurseries with similar condition to this research area.

**REFERENCES**

Barizan, P. S. R. 1994. Growth and survival of planted seedling of *Hemera odorata* under different light conditions and fertilizer in a logged over forest, proceedings, Fifth Round Table conference on Dipterocarps, Chiang Mai, Thailand Z-10 November, 180-188.


Kim, Y. C. 1986. Effects of inorganic environmental factors on the growth of *Pinus komenclusa* seedling, 10, the influence of shading on the growth of the seedling growth on the sheedbed, J. of Korean Forestry Society, 37, 43-54.


ЕФЕКТ НА ЕСТЕСТВЕН И ИЗКУСТВЕН ПОЯС ВЪРХУ РАСТЕЖНИТЕ ПАРАМЕТРИ И КОНТРОЛА НА ПЛЕВЕЛИТЕ В ПОНИЦИ ОТ АРИЗОНСКИ КИПАРИС

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(Резюме)

Аризонският кипарис е важен вид поради незначителните си екологични изисквания през зимата и през лятото. Той се използва често за залесяване в ултрасухи и полусухи земи в Иран. Целта на изследването е да се установи ефекта на различни светлинни режими на естествен и изкуствен пояс върху растежа и качеството на понициите и количеството плевели. Използвана е рандомизирана схема в четири повторения. Бяха формирани 24 квадрата с по 24 поини на квадрат (общо 576). Използвани бяха 6 режими на осветяване – 0, 33%, 50%, 67% и 100%. Останалите параметри бяха еднакви за всички преминавания. Бяха измерени общото тегло, жизнеността и преживяемостта на понициите. Беше измерено теглото на плевелите. Резултатите показваха, че най-високата и най-високата преживяемост бяха при 33% и 100% осветление съотв. Сянката не оказа съществено влияние върху жизнеността на понициите, но намалява плевелите. Според резултатите осветление 33% и 50% са най-подходящи за отглеждане на поници в разсадници.

Ключови думи: аризонски кипарис, поиници, растеж, плевели, светлинен режим

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