Artificial Regeneration of Pinus Sylvestris var. Mongolica under the Canopy

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Abstract: After progressive grading, artificial regeneration experiments were performed at the apex of Pinus sylvestris var. mongolica at vertices less than 0.4. Ten years later, the growth of each species was observed and the land under the forest was investigated. The results show that the artificial regeneration method of this segment can transform the pure forest of Pinus sylvestris. Mongolians are in mixed forests of many species; four species of Pinus sylvestris can be used as the main species under the crown; artificial regeneration under the crown can be gradually improved, delaying the decline of Pinus sylvestris var.

1. Introduction

Pinus sylvestris var. mongolica, also known as Hailarsong, is a geographical variant of the European red pine (P. sylvestris), a third-grade relict plant, and a representative of the Daur in the northern temperate flora. Since 1955, the college entrance examination researchers have become a great wind-fixing and sand-fixing tree species in the area of the “Three North” afforestation in the Zhangkutai Kerqin Sandy Land in Zhangwu County, Liaoning Province and the southern edge of the Pinus sylvestris var. At present, Pinus sylvestris var. mongolica is dominated by Pinus sylvestris var. mongolica [1], afforestation techniques, growth characteristics and ecological functions of Pinus sylvestris var. mongolica, economic growth of artificial and natural regeneration , soil A large number of studies have been carried out on the nature of, microbial and other regions, as well as the regional combination of researchers and sylvestris sylvestris, to guide the management of Saudi pine forests, to manage their operations and to evaluate their ecological functions. . However, research on Pinus sylvestris in artificial sandstone plantations has been relatively rare. Scotch pine forest has been planting pine trees for 40 years, entering maturity, and gradually leaving a large gap through the forest; Pinus sylvestris is part of the region, forest forest age seems to be a little lack of water and shoot injury infection After taking care of health, a large number of forest permits were also left. With the upcoming update of these crown blanks to be transformed into the original mixed spring forest, further promotion of sustainable sandy planting of Pinus sylvestris is an urgent issue. The research on artificial regeneration technology at home and abroad on the plantation of Pinus sylvestris var. mongolica plantation in sandy land is still a blank, and there are many technical problems in species selection. Therefore, the tent artificial pine sylvestris carried in this article is gradually cut, prolonging the ecological function of Pinus sylvestris var. mongolica forest and promoting the healthy growth of Pinus sylvestris Linn.

2. Research Area Overview and Research Methods

2.1. Overview of the study area

Yudaokou is located in the northern part of Chengde City, Hebei Province, in the Weichang Manchu and Mongolian plains. Dongba to Liang, adjacent to the forest in the north, bordering Duolun County in Inner Mongolia in the northwest, with a total area of 1036km3[2]. In the south instead of the north, the landscape is a typical undulating plateau with a forest height of 1230~1820m. In the hilly territory of the region, the topographic dunes are connected to each other and connected to the grassland transition zone. It is a typical northern pastoral area on the soil gray soil, grassland, marshland, soil in the sandy soil type, soil thickness is 10 ~150cm[3]. The damp area is a mild continental climate monsoon. Cold winter, -0.5 ° C, annual average temperature, January average

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temperature is -21 ° C, -42.9 ° C[4], extreme minimum temperature in Hebei Province. The annual average of 2827.7h is sunny and the light is sufficient to provide enough heat for plant growth, and the rain is hot during the same period. The frost-free period is short, with an average of 80D, the average annual rainfall is 452.6 mm, the average evaporation is as high as 1556.8~2400.0 mm, the wind speed is 4-5 times higher, the wind speed is 3.4 million, the wind speed is as high as 28 m / s, and the average wind days are For 62d, the earth is heavily eroded, and dust storms often form[5]. Vegetation coverage in the western region accounts for about 40% of the total area, accounting for 95% of the birth area. A variety of plants, more than 50 families, more than 400 varieties. The main species are Pinus sylvestris var. mongli-ca Litv., Pinus tabulaeformis Carr., Larix principis-rupprechtii Mayr, Betula dahurica Pall., broadleaf Betulaplatyphylla Suk., Juglans mandshurica Maxim., Tilia amurensis Rupr., Quercus mongolica Fisch.ex Ledeb., Acersaccharum Marsh., Populus L .)Wait.

2.2. Test methods

2.2.1 Setting of test site

The test plot was selected in Pinus sylvestris var. The eucalyptus plantation was planted in the 1956 large chamber experimental area. In 1997, the first rampage was carried out and afforestation was carried out under the canopy in the spring of 1999. At the time of afforestation, the canopy density of the forest was 0.40. In 2001, due to the onset of scorpion pine disease, the second sexual cutting. Mongolian oak, the canopy density is 0.30. Species and seedlings under canopy specifications: 3 - 0 type Acer mono, 2 - 0 type Syringa amu-rensis, 2 - 0 type saponin (Gleditsia sinensis), 2 - 0 type Ulmus pumila, Platincladus orien-tails, 2 - 0 Fraxinus insularis. The artificial regeneration under the crown is limited by the land preparation space, and afforestation is used for afforestation. 100 plants were planted in clusters with a line spacing of 2 m × 3 m and repeated 3 times.

2.2.2 Determination method

In the first ten days of September 2018, in the test area and control area (same management measures, the same management measures), select 10 points according to the "S" shape, take 0~10 cm topsoil, sorting method, take about 1 Kilograms of soil. Store in a sterilized plastic bag at 4 °C. Soil organic matter, total nitrogen, total phosphorus, basic nitrogen, available phosphorus and available potassium are conventional methods[6]. The catalase activity was measured by potassium permanganate titration; the neutral phosphatase activity was determined by the phenylphosphonium phosphate colorimetric method; the urease activity was determined by the Nessler colorimetric method[7]. The soil microbial biomass carbon was fumigated with chloroform and extracted with 0.5 mol•L-1K2SO4 and determined with high TOCII + N (Elementar II, Germany) [8].

3. Results and Analysis

3.1. Effects of artificial regeneration under the crown on survival rate and preservation rate

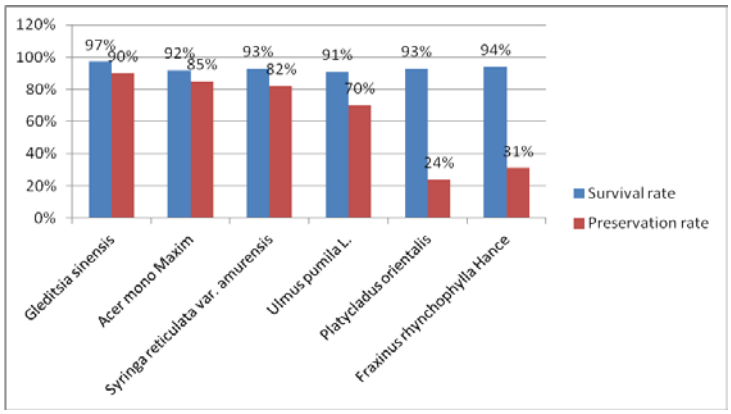

Fig.1 Survival rate and preservation rate of each species

As can be seen from Figure 1, the survival rate of these six species is 90%. In 2009, the preservation rate of saponin was 90%, the fresh-keeping rate of colored maple was 85%, and the preservative rate of juicy clove was 82%. The fresh-keeping rate of white peony is 70%, and the fresh-keeping rate of arborvitae and tartary buckwheat is very low, the content of arborvitae is 24%, and the content of tartary buckwheat is 31%.

3.2. Growth status of artificially regenerated tree species under the crown

In order to better analyze the growth of each tree under the crown, the same species planted in the same year as the control was used as a control. The evaluation criteria for the growth status of each tree were determined by comparing the heights of the trees (Table 1). See also indicators such as breast diameter and crown width.

Table 1 Evaluation criteria for growth status of tree species

Tree height ratio (under the crown / under the crown)	＞90%	70%-90%	50%-70%	＜50%
Growth Status	Exuberant	General	bad	Very bad

It can be seen from Table 2 that the growth of white peak is very strong and can adapt to the ecological environment under the crown of Pinus sylvestris var. According to observations, the color of maple and grapefruit began to rise in the 13th year of afforestation. Growth is generally estimated, and saponins are characterized by the characteristics of the tree species and are not branched and dried. One-third of the seedlings grow slowly and do not meet the general standard requirements, but the crown area is large and grows well, so the growth of the saponin is also determined to be general. The growth status of Platycladus orientalis and T. chinensis was poor, and the growth of Platycladus orientalis was very poor. The twigs of T. chinensis were poor, indicating that these two species were not suitable for the environment under the crown of Pinus sylvestris var. . At present, the white scorpion, the color maple, the squid, the saponin and the slash pine preserved have formed a stratified forest.

Table 2 Growth status and evaluation of each tree species

species	Ground diameter (cm)	Breast diameter (cm)	Crown (m)	Tall(m)	Average tree height under the crown (m)	Evaluation
Gleditsia sinensis		4.76	2.56	3.00	3.50	General
Acer mono Maxim		2.43	1.72	2.53	3.10	General
Syringa reticulata var. amurensis	4.1	1.95	2.40	1.65	2.63	General
Ulmus pumila L.		4.49	2.20	4.61	4.72	Exuberant
Platycladus orientalis	4.36		1.09	1.84	4.21	Very bad
Fraxinus rhynchophylla Hance	3.41		1.22	2.16	3.32	Bad

3.3 Effects of artificial regeneration under the crown on surface soil properties

3.3.1 Effect of Artificial Regeneration under Crown on Surface Soil Nutrients

Compared with the control area, the surface soil nutrient content (0~10cm) increased significantly after artificial regeneration, and the surface soil organic matter, total phosphorus, alkali nitrogen, available phosphorus and rate potassium increased. A plot of artificially replanted under the crown. It is almost twice as large as the control area.

Table 3 Nutrient content of artificially upgraded topsoil under the crown

Soil sampling point	Depth(cm)	Organic matter (g·kg-1)	Total P(g·kg-1)	Total K(g·kg-1)	Alkaline nitrogen (mg·kg-1)	Effective P(mg·kg-1)	Rate K(mg·kg-1)
Manual update under the crown	0-10	17.510a	0.230a	12.525a	60.904a	4.187a	80.818a
Control area	0-10	9.850b	0.168b	10.763b	38.451b	2.658b	36.252b

Note: The difference between the values marked with the same letter in the peer is not significant (p = 0.05)

3.3.2 Effect of artificial regeneration under the crown on surface soil enzyme activity and microbial biomass carbon

Enzymes are involved in many important biochemical processes and material circulation in the soil. Among them, catalase accelerates the decomposition of soil organic matter and the synthesis of humus. Its activity can characterize soil humus strength and organic matter accumulation. Neutral phosphatase is the soil. Hydrolase is widely distributed in the catalytic hydrolysis of phosphonates. Its activity directly affects the decomposition and conversion of organic phosphorus in soil and its bioavailability. Urease can promote the hydrolysis of peptide bonds in organic molecules, indicating the nitrogen supply status of soil[9].

Soil microbial biomass refers to the total amount of microorganisms in the soil is less than 5-10μm3, which has far-reaching effects on the availability of soil organic carbon and main nutrients (such as nitrogen and phosphorus) and terrestrial circulation. ecosystem. It can directly or indirectly reflect changes in soil fertility[10]. It can be seen from Table 4 that compared with the control area, the activities of catalase, phosphatase and urease in the surface soil of artificially renewed forest under the canopy were significantly improved, and the microbial biomass was also significantly improved. This indicates that broadleaf species are planted under the canopy of Pinus sylvestris var. Pinus sylvestris var. mongolica is beneficial to the accumulation of soil organic matter, improving soil nitrogen supply capacity and increasing soil available phosphorus content. Soil fertility can be considered to be improved[11]. According to the results of Liu Mingguo and others, the soil nutrients of Pinus sylvestris var. The Mongolian oak forest in Zhanggutai area basically follows the law that soil conditions begin to deteriorate after 30 years[12], indicating that this measure can effectively delay the decline of soil fertility and improve soil traits.

Table 4 Enzyme activity and microbial biomass carbon content of artificially upgraded topsoil under the crown

Soil sampling point	Depth (cm)	Catalase (mL·g-1·h-1)	Phosphatase (mg·kg-1·h-1)	Urease (NH3-Nmg·kg-1·h-1)	Microbial biomass carbon (mg·kg-1)
Manual update under the crown	0-10	0.538a	17.721a	26.314a	92.444a
Control area	0-10	0.361b	14.140b	21.361b	74.222b

Note: The difference between the values marked with the same letter in the peer is not significant (p = 0.05)

4. Conclusion

1) After gradual felling of pure Pinus sylvestris var. mongolica forest over 140 years old, some drought-resistant and Barren-Tolerant broad-leaved tree species were planted under the canopy. The original pure forest could be transformed into a multi-species mixed multi-layer forest to improve the

stability of the stand.

2) Acer palmatum, clove, soap horn and elm can adapt to the habitat of Pinus sylvestris var. mongolica. Mongolian Pinus sylvestris var. mongolica, with high protection and growth, can be used as the main cultivated tree species under the canopy of Pinus sylvestris var. mongolica plantation.

3) Under the cover of Pinus sylvestris var. mongolica var. mongolica and Pinus sylvestris var. mongolica can delay the degradation of soil and prolong the protection period of Pinus sylvestris var. mongolica and Pinus sylvestris var. mongolica.

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