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Comparative Study on Oak-tree Forests in the Zei-Burein Plain, Far East Russia

Сравнительная характеристика дубняков южной части Зейско-Буреинской равнины

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Abstract

There were three kinds of oak woods: *Corylus* plain (humid) oak-groves, Lespedeza oak-groves and flood-plain oak-groves. In the article the information is given on different kinds of trees, undergrowth, underbrush, as well as the comparative estimation of forest evaluation according to the type of oak-groves. Different oak-groves, besides Mongolian oak (*Quercus mongolica* Fisch. ex Ledeb.) often include davurican birch (*Betula davurica* Pall.), flat-leaved birch (*Betula platyphylla* Sukacz.), Amurskaya lime-tree (*Tilia amurensis* Rupr.), aspen (*Populus tremula* L.), various types of willows (*Salix*). Oak-groves are single-layer by their form: according to the composition there exist both pure and mixed wood groups. The average diameter is 10.2 cm. The average height of the present oak-groves is 7.4 m. The average reserve on 1 hectare is low (76 m^3), it depends on the age and plenitude of the wood groups. The most part of the trees (83.8%) is the diameter of middle size (8, 10, 12 and 14 cm). The undergrowth consists mainly of different-leaved nut (*Corylus heterophulla* Ficsh. ex Trautv.), different kinds of sweetbrier (*Rosa*), spirei (*Spiraea*) and dichromatic lespedeza (*Lespedeza bicolor* Turcz.). The undergrowth is mainly represented by Mongolian oak (85%), aspen, berry-apple, amurskaya lime-tree (=linden), davurican birch may compose it as well.

Key words: oak woods, oak, birch, lime-tree (=linden), Amur

Introduction

The data obtained by different scientists (Dokturovskiy, Korotkiy, Komarov, Sochava) in the end of the 20th century and the beginning of 21st century support the idea that until the beginning of human activity, the Zei-Burein plain (ZBP) was dominated by forests dominated by oak trees. At present, the vegetation of ZBP is represented by forests, flood land vegetation, steppe cenoses and agricultural areas in or out of use. The great diversity of vegetation is closely connected to the large anthropogenic impacts on the land in Amur region that has been exposed for several centuries. Some fragments of different kinds of oak and birch have survived in the central part of the Zei-Burein plane, which has been totally changed by human activities. The dominant vegetation on the riversides in the area consists of different willow species, mixed at places with thickets. The latter contain small-leaved and valley-elms, poplars, Asian bird cherries, dwarf apples, Daurian and pinnate hawthorn, and other kinds of trees and shrubs.

In this report, we show the current status of forest vegetation in Amur region based on several statistical and descriptive literatures.

Over-view of current status of forests

Oak forests at various levels of damage can be observed in different parts of ZBP. Dobrynin (2000) described that oak forests and lists up the species in steppe oak forests typical of the southern parts of the Russian Far East. In the studied cases the grass cover characteristic of those forests remains even after the forests have perished. In a study of some cenospecies (one of the ecological systems, i.e. individual species are isolated in nature but they can be genetically melted) in ZBR. Korotkim (1912) describes a number of species characteristic of oak forests in the region of the villages, such as Gribskoe, Duhovskoe, etc.

Oak forests contain mainly Mongolian oak (*Quercus mongolica* Fisch. ex Ledeb.), often mixed with birches (*Betula davurica* Pall., *Betula platyphylla* Sukacz.), basswood (*Tilia amurensis* Rupr., popular (*Populus tremula* L.), and willow (*Salix* sp.).

1) Oak forests

Two types of oak forests - wetland hazel oak and flood land oak - exist in the surveyed area. For the study of *lespedeza,* oaks were designated in four experimental areas in each one measuring 0.25 ha. The oak forests are single-leveled and in terms of variety

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could be either homogenous or mixed. For example, Amur willows could sometimes constitute 20-25% of the forests while Daurian birch, aspen and flat-leaved birch could be 2-5% of the forests (Table 1).

The result of the survey is: The forests are represented by young (experimental areas 1 and 3) and middle-aged trees (experimental areas 2 and 4). The average diameter of the trees is 10.3 cm. The average height is 7.4 m. The average stock per hectare for lower forests (76.0 m^3) depends on the age and density of the forests. The diameter of the majority of trees (83.8% m^3) is within the range of average thickness (8, 10, 12 and 14 cm). Distribution of Mongolian oak by the diameter of tree trunks is shown in Figure 1.

The trees in all experimental areas have grown from sprout shoots, low class bonitet (IV). Here, "bonitet" is defined as forest environment including soil condition, climate condition and biological environment as a whole. Mongolian oak trees have been damaged by frosts (their trunks are fissured) and pests. As a result of the above mentioned facts the forests do not have economic importance. The undergrowth consists mainly of lespedeza (*Lespedeza bicolor* Turcz.) mixed with hazel (*Corylus heterophylla* Ficsh. ex Trautv.).

Table 1. Description of Lespedeza oak forest areas.

Experimental area No	Constitution of species*	Age	Number of trees		Ration of crown projection	Cross section ($м^2 ha^{-1}$)	Average		Reserves m^3/ha
			Per exp. area	Per hectare			Diameter(cm)	Height (m)	
1	9O1L+DB, A	25	280	1120	0,8	29,9	11,2	8,0	82,2
2	7O2L1DB	45	215	860	0,8	33,9	13,1	9,5	85,6
3	10O+L	20	295	1180	0,7	16,4	8,0	5,5	59,2
4	8O2L+DB	30	255	1020	0,8	32,5	9,1	7,0	76,9

*: Abbreviation: O-Oak, L-Linden, A-Aspen, DB-Deciduous broadleaved trees

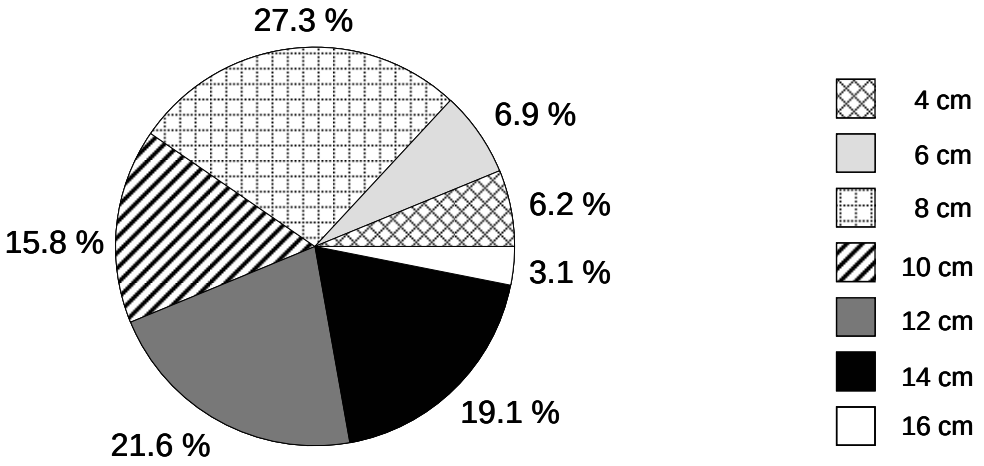

Fig. 1. Distribution of Mongolian oak trees in the Lespedeza oak forests by the diameter class of their trunks.

The undergrowth has either average density or is thick at the forest fringes. Young trees are represented mainly by Mongolian oak (85%) and aspen, dwarf apple, Amur linden and Daurian birch (Fig. 2).

Analysis of the experimental areas showed that the number of trees is sufficient for natural regenerated forests but the quality of the reserves is not high enough to ensure natural restoration. The study of the young Mongolian oak of natural origin leads to the following conclusions: Trees are less than 5 years of age. Trees are damaged by pests. The absence of more than 5-year-old trees explains their perishing as a result of low temperatures and thin snow cover. For the survey of hazel-oak, forests were designated in three areas, each one measuring 0.25 ha. Hazel oak forests are described as simple (single-leveled). In terms of species composition they are predominantly mixed but could be also homogenous. While Amur linden constitutes 20% of those forests, Daurian birch and aspen comprise 5 to 10% of the tree reserves (Table 2).

Analysis leads to the following conclusions: The forests are represented by middle-aged (class III-IV – 21-40 years of age) and mature-age (class V – 41-50 years of age) plants. The average diameter was 13.1 cm. The average height of the oak trees was 7.8 m. The average stock per hectare was poor and in lespedeza

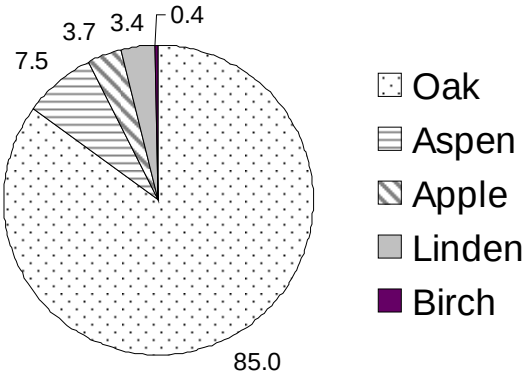

Fig. 2. Species composition of young lespedeza oak forests (In order from the largest to the smallest number of trees per species: Oak, Aspen, Apple, Linden, Birch)

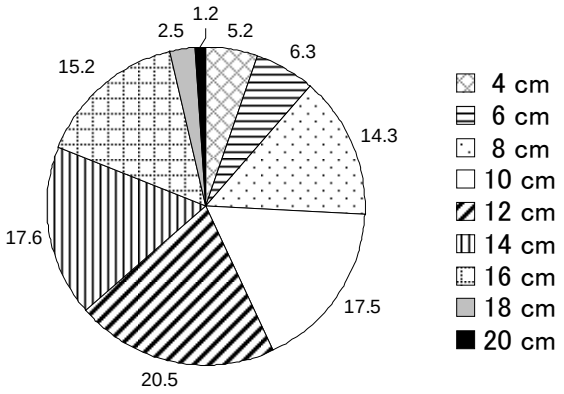

Fig. 3. Diameter distribution of stems of Mongolian oak trees in the hazel-oak forests.

Table 2. Description of hazel oak forest areas.

Experimental area No	Constitution of species*	Age	Number of trees		Spread of crown	Cross section m^2/ha	Average		Number of seedlings ($m^3 ha^{-1}$)
			Per experimental area	Per hectare			Diameter (cm)	Height (m)	
3	7O2L1A	45		860	0,8	33,9	13,2	12,5	95,6
7	8O2L+DB	30		1020	0,8	32,5	14,0	10,0	86,9
10	5O4DB1L	45		870	0,8	31,6	12,2	12,0	84,0

*: Abbreviation: O-Oak, L-Linden, A-Aspen, DB-Deciduous broadleaved trees

oak forests (84 m^3) depends on the trees' origin. The diameter of stem at breast height (DBH) the largest part of the trees (88.8%) is within the average (10, 12, and 14 cm). Distribution of DBH in a Mongolian oak stand is shown in Figure 3.

The trees in all experimental areas have grown from shoots, low class bonitet (IV). Mongolian oak has been damaged by frosts (frost crack or frost split（shake）; stem with a trace of crack) and pests. As a result of the above mentioned facts, the forests do not have economic importance. The undergrowth consists mainly of hazel (*Corylus heterophylla* Ficsh. ex Trautv.), sometimes mixed with *Rosa davurica* Pall., *Spiraea* sp. and *Lespedeza bicolor* Turcz. The distribution of the undergrowth is irregular, mostly large in stem at the forest edges. Deforested by local people in the last 10 years, the areas have been dominated by *Corylus heterophylla*, forming high density forest that inhibiting the natural regeneration of the other forest species. The undergrowth is represented mostly by Mongolian oak (74%) mixed with aspen, Amur linden, Daurian birch (Fig. 4).

The condition of hazel oak forests was similar to that of the lespedeza forests. For the survey of flood land oak forests were set in three areas, each one measuring 0.25 ha. Flood-land oak forests are described as simple (single-leveled) by shape and homogenous by constitution (Table 3). The survey had the following result: forests consist of middle-age trees (bonitet class III~IV, 21~40 years of age).

Table 3. Description of flood land oak forest areas.

Experimental area No	Constitution of species*	Age	Number of trees		Spread of crown	Cross section (m^2ha^{-1})	Average		Reserves (m^3ha^{-1})
			Per experimental area	Per hectare			Diameter (cm)	Height (m)	
6	10O+B	30		1180	0,7	19,4	6,0	6,5	67,8
8	10O+DB	30		950	0,8	15,4	8,1	7,5	61,4
11	10O+A	40		1168	0,9	35,4	10,5	12,5	76,2

*: Abbreviation: O-Oak, L-Linden, A-Aspen, DB-Deciduous broadleaved trees

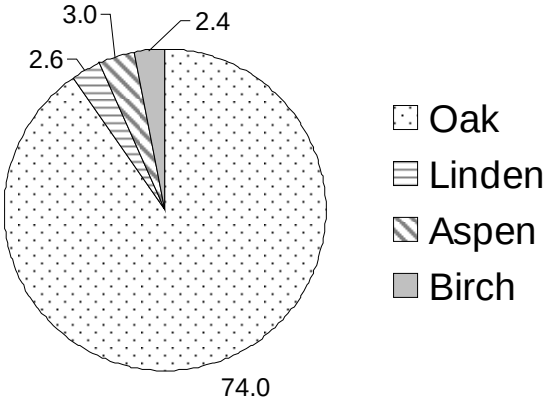

Fig. 4. Constitution of the undergrowth in hazel – oak forests (In order from the largest to the smallest number of trees per species: Oak, Linden; Aspen; Birch).

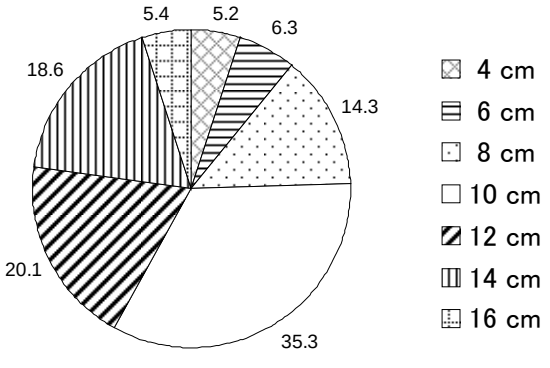

Fig. 5. Diameter of distribution of stems of Mongolian oak trees in the flood land forests.

The average diameter was 8.8 cm. The average height of the trees was 5.8 m. The average reserve per hectare in the lower forests was 68.5 m^3. DBH of the largest part of the trees (88.8%) was situated within the average. The DBH distribution of Mongolian oak is shown in Figure 5. The trees in all experimental areas have been grown from shoots of the lowest class bonitet- the lowest of all kinds of oak forests growing in the southern part of the Zei-Burein plane. Mongolian oak has been damaged by frosts (frost crack) and pests. As a result of the above mentioned facts the forests do not have economic importance.

2) Undergrowth

The undergrowth is sparse and includes *Corylus heterophylla* and *Spiraea*. The young growth is represented predominantly by Mongolian oak. The natural restoration by the criterion proposed by the "*ДальНИИЛХ*" (Forest Economic Science center in Far East Russia, RAS) is poor. The condition of young oak forests regenerated on flood land was similar to that of the lespedeza and hazel oak forests. The oak forests, growing in the southern part of the Zei-Burein plane do not have any economic values but they have functions of ecosystem conservation. Since they grow on the slopes and edges of gullies, they have an anti-erosive function. On the other hand, those, growing on the borders of farming areas serve as wind-breaks protecting agricultural lands from strong winds. However, the area covered by the forests seems to be not large enough. Therefore, it is necessary to increase the forest areas by planting, including Mongolian oak for conservation in the ecotone of Amur region.