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## The Larch in the Russian Far East: Decorative and Curative Properties.

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### ABSTRACT

The article describes peculiarities of growth of the larch trees in the Far East conditions. Distinctions in origin left their mark on other characteristics and properties of the larch trees as well. We've mentioned that the most ancient species are characterized by more advanced development of hypodermic tissue in the larch needles, have lesser photophily. The larch trees needles and new shoots contain considerable quantities of ascorbic acid, that's why they are used both fresh and in the form of aqueous infusions for treatment and prevention of scurvy and saturation of an organism with Vitamin C. In the Russian Far East grow nine larch tree species which were formed during different geological periods and therefore preserved their distinctions in decorative and other properties.

**Keywords:** larch tree species, larch tree ecology, healing properties.

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## INTRODUCTION

The larch tree is the most widespread specie in the Russian Far East; the forests where the larch tree predominates occupy 59.2% of the total area of the Far East forests. Along with considerable commercial value the larch forests are of great protective value. Growing both on the steep rocky slopes near the forest line, in wetlands and fresh alluvial river sediments the larch forests perform various soil-protective, water-regulating and water-protective functions. The larch is widely used in a variety of plantings for the purpose of greening of cities and other settlements, as artificial fire lines and field shelterbelts, forest seed plots and for many other purposes. Decorative properties of the larch have not been yet sufficiently studied, the landscaping works are usually performed without due consideration of both the larch tree specie and its intraspecific distinctions and forms which have different silvicultural and biological properties, therefore this affects the degree of decorativeness of the created plantings in the future.

This article is aimed at description of a variety of the larch tree species at the territory of the Russian Far East as well as a history of their origin. Since the larch species appeared during different historical eras they preserved a lot of properties of their progenitors, this fact had an impact on the species vitality, occupied localities, silvicultural and decorative characteristics. The article is targeted at providing a short summary of the genus *Larix* and its individual species and varieties from the point of view of decorative properties, suitability for landscaping as well as large-scale implementation in walkway plantings, roadside belts and parklands.

## MATERIALS AND METHODS

According to many researchers the southern part of the Russian Far East is an area of the greatest concentration of the larch species. During different years up to eight larch tree species were identified and described in this area however independent status of some species is still a matter of argument. At the present time taxonomy specialists speak of nine larch tree species for the whole vast territory of the Far East region, among which only four species, namely Olga Bay larch (*Larix olgensis* A. Henry), Dahurian larch (*L. Gmelinii* (Rupr.) Rupr.), Cajander larch (*L. kajinderi* Mayr), Kamchatka larch (*L.kamtschatica* (Rupr.) Carr.) refer to stable "pure" species although a possibility of the hybridization processes taking place within their areas canon not be excluded. The rest five species demonstrated polymorphism of a lot of morphological, anatomical and other diagnostic characters which substantiated their classification as hybrid species. The Far East hybrid larches include:

1. Lubarski larch (*L. x lubarskii* Sukacz.). A complex hybrid specie having four parental species: Olga Bay larch, Kamchatka larch, maritime larch, the Prince Rupprecht's Larch (*L. principis rupprechtii* Mayr, widespread in the Northern China).
2. Maritime larch (*L. x maritima* Sukacz.). A triple hybrid of Dahurian, Kamchatka and Olga bay larches. The maritime larch is characterized by heterotic growth and other properties valuable for the forest sector.
3. Amur larch (*L. x amurensis* B. Kolesn.). A hybrid of Dahurian and Cajander larches. Like the majority of hybrids is characterized by an advanced growing capacity.
4. Okhotsk larch (*L. x ochotensis* B. Kolesn.). A hybrid of Cajander and Kamchatka larches.
5. Komarov larch (*L. x komarovii* B. Kolesn.). A hybrid of Olha Bay and Cajander larches.

All of the Far East larch species have quite similar morphological, anatomical, biological and silvicultural properties, that's why their differentiation is connected with difficulties. Intraspecific larch distinctions are not taken into account while its use for practical purposes (wood harvesting, formation of artificial stands, landscaping) so this wood specie is mainly used under its generic name.

## RESULTS OF INVESTIGATIONS

Our long-term investigations [1,2] demonstrated that the Far East larches due to different historical age preserved distinctions in morphological, anatomical, biological and silvicultural properties. At the end of the Tertiary period the whole Far east was covered with a unique deciduous-coniferous forest vegetation formed by Turgai flora species [4]. Due to successful paleophytologic investigations many researches arrived at an idea of Arctic origin of the Tertiary flora which is then received a name of the Arcto-tertiary flora [7]. Migration of larches and local transformation of new species and subspecies in connection with geological and

climatic changes, widely developed processes of larches hybridization caused the high concentration of the modern larches species diversity in the southern part of the Far East. Since the larch species appeared during different historical eras they preserved a lot of properties of their progenitors, these distinctions should be taken into account in the process of larch forests management.

General analysis of the works dedicated to the history of development of larch trees on the south of the Far East gave an opportunity to compose the following historical sequence for the larches starting from the most ancient ones (occurred in the Pliocene- Pleistocene of the Tertiary period) and ending with the most young (belonging to the Holocene age) larch species: 1 – maritime larch; 2 – Lubarski larch; 3 – Olga bay larch; 4 - Okhotsk larch; 5 – Komarov larch; 6 – Amur larch.

There is quite close connection between historical age and some morphological properties of the larch tree. For example more ancient species are distinguished by larger cones, this dependence of cones length is in the most close correspondence with the following second-order parabolic curve equation  $Y=30.6-4.3X+0.4X^2$ , where:  $Y$  – cones length, mm;  $X$  – order number of the larch tree historical age. In the equation the correlation index is equal to 0.992 and the correlation index reliability is equal to 13.8. Almost the similar dependence can be observed in regard of the larch cone width.

Differences in origin had its impact on other characteristics and properties of the larch as well. We have noticed that the most ancient types are distinguished by more advanced development of hypodermic tissue in the needles of larch trees, have lesser photophily, shed needles at a later time, tolerate well brunch cutting even when they are mature. In the young age (2-5 years) the ancient larches do not shed needles for winter which may be indicative of belonging of the larches to the evergreen trees for the most part of the Tertiary period especially if to take into account late needles shedding by mature trees.

A gracile larch tree is extraordinarily beautiful in all seasons. During early spring its buds are covered with pale-green bundles of needles which afterwards are gradually supplemented by yellow, green or maroon “bulbs”. Numerous yellow bulbs are male reproductive organs, after shooting out blossom dust they all shed in May. Green and maroon bulbs are female cones and represent two forms of larches depending on the cone color. The biological forms divided by the color of young cones are characteristic for all larch species and during the whole life of a tree (a life cycle of a larch tree exceeds 200 years) the color of young cones remains the same. As the process of maturity goes the both forms of cones acquire the similar light-brown color so in summer it is not possible to identify which form of a larch tree is growing in your neighborhood (the maroon-coned or the green-coned one).

In summer the larch is covered with a light-green cover. Numerous soft needles on short branches resemble a “green canvas” imbued with bright sunlight. A resinous smell of pine needles, slender dark-brown trunks of larch, light laced crown attracts the eye of a traveler and almost everyone wants to stop and to pet slightly the rough trunk and to inhale the incredible smell of pine needles of a young tree. For many people the larch is a mascot, knowing people advise to lean against the trunk and to stand for at least 5-10 minutes. If this is “your” tree, you will improve your health and mood for sure.

Seeds of all larch forms and species are being considerably damaged by various insects. We’ve found out that the seeds of the trees having young cones of green color were less affected by a pinecone moth (*Bioritryctria abietella* F.) and the seeds of the the maroon-coned trees by a larch cone fly (*Hylemyia laricicola* Karl.). It is due to distinct cones blossoming and ripening time of different larch forms and to biological properties of some depredators. In spring the larches with reddish coloring of young cones have more decorative value while the light-green cones are almost indistinguishable against the background of needle sprigs.

In the autumn the larch needles gradually gain golden-yellow color. The tree looks just as beautiful as in the spring and in the summer, the gradually shedding needles with the same resinous smell resemble a yellow storm which is a prophet of white snowdrifts. A man feels light sadness and sorrow while looking at the farewell dance of the larch needles. Only the hope that everything in nature will come again and everything “will still be” can calm the feelings allowing you to enjoy the sceneries of other seasons.

One more specie, namely Japanese larch (*L. Leptolepis* Gord.) grows in the plantations in the neighborhood of Ussuriysk at the territory of the scientific-experimental forestry enterprise “Dalnevostochnyi” of Primorskaya State Academy of Agriculture. This specie refers to the introduced species; its seeds were obtained from Yuzhno-Sakhalinsk from the forest plantations of this larch tree. The trees were planted by Japanese foresters at the beginning of the XX century at time when the South Sakhalin was under Japanese occupation within the period of 40 years (from 1905 to 1945). The Japanese larch is distinguished in the street plantations by its unique decorative properties. It is less heliophilous, develops large conical crown and almost never forms straight full-boled trunks, it can be hardly pruned so its long branches covered with bushy fur needles spread almost near the ground. For single plantings a weeping form of this larch tree is of special interest since it has long hanging-down branches. This larch has rounded widely-open cones size of which significantly exceeds the cones of all Far East larch species, its young annual shoots are of red-violet color. The “female” larch species almost every year produce high “yield” and numerous cones remain on branches for several successive years. Characteristic feature of this specie is that in the autumn needles on its branches keep being green while needles of other larch species at this time already went yellow and partially shed.

In the winter the larch (all species) vaguely resemble a tree trunk with a lot of small birds (sparrows) sitting on its branches. The larch cones stay on the trees during several years, they gradually go black, destroy and from afar resemble a flock of birds sitting on the branches and having rest before putting off on a long journey.

The larch tree is a monocious ambisexual plant. It has a well marked effect of sexualization – the “female” species produce the largest quantity of cones during all plentiful growing seasons (frequency of seed production makes 4-6 years), the “male” species form only single cones at any level of productiveness. It is better to use female species of larch trees for street plantations since they will please people with 1-5-year-old cones on all branches even in winter time. In order to select female species for the street plantations it is necessary to cut grafts from the selected adult species and grow plantlets from them. The seeds gathered from parent trees will not ensure the necessary results since the larch blossom dust does not have air pockets and usually settles within a tree crown radius. In case of spontaneous pollination there can be observed a phenomenon of parthenospermia when the seeds inside the cones form free from a germ and almost all of them do not produce young seedlings. A cross-pollination (with several trees growing near each other) may increase germinative ability up to 40-50% but in this case there is no a guarantee that the trees grown from such seeds will retain the female innate characters. In order to preserve female characters in the larch tree brood it is necessary to use stem cuttings, in this case both the green, semi-dormant and dormant cuttings demonstrate approximately the same survival index.

The larch belongs to the fast-growing species, it is relatively gas-resistant, winter-resistant, is not affected by wood-destroying fungi, unpretentious to the soil. It has hygrophilous properties so during drought periods the larch plantations should be irrigated. At the latest time the larch tree became more popular, people started to plant it in their gardens and household plots using group plantings for arrangement of summerhouses, seesaws, hammocks, artistic sceneries etc.

The larch needles have a lot of curative properties this means that you have a full-scale drug-story on your land plot. The larch needles and young shoots contain significant amount of ascorbic acid that’s why they are used both fresh and in the form of aqueous infusions for treatment and prevention of scurvy and saturation of an organism with Vitamin C. Baths with decoction of the larch needles are prescribed in case of uratic arthritis and affected joints, needles and young shoots infusions are prescribed against hernia and a range of internal diseases [5]. In brief the larch tree is equally suitable both for street plantations, parks, public gardens and for gardens and household plots.

#### DISCUSSION OF OBTAINED DATA

The larch tree is very valuable specie for landscaping. Such its properties as fast growth, beautiful appearance, unique needles coloring, resistance against harmful gases and good survival ability put it on the first place among other coniferous species used for the purposes of landscaping. However the landscaping works should take into account not only the biological properties of different larch tree species but also its intraspecies distinctions, namely sexual belonging, color of young cones, form of crown and other which are best inherited from the parent forms through vegetative reproduction.



REFERENCES

- [1] Gukov G.V. Recommendation on forest management in the larch forests of the Sikhote-Alin. – Vladivostok, DSP, 1976. 301 p.
- [2] Gukov G.V. Larch trees and larch forests of the Russian Far East. – Vladivostok: Mountain taiga station of the Far East Branch of the Russian Academy of Sciences, 2009. 350 p.
- [3] Kolesnikov B.P. About taxonomy and history of development of larch-trees of *Pauciseriales Patschke* section: materials dedicated to history of flora and vegetation in the USSR. – M.;L.: Academy of Sciences of the USSR, 1946. –Issue 2. –P.321-364.
- [4] Krystophovich A.N. Geological review of the Far East countries. M.-L., 1932. 232 p.
- [5] Nedoluzhko V.A. Outline of dendroflora of the Russian Far East. – Vladivostok: Dalnauka, 1995. 208 p.
- [6] Tagiltsev Yu. G., R. D. Kolesnikova, A. A. Nechaev. The Far Eastern plants are our doctor. Khabarovsk, 2004.520 p.
- [7] Popov M. G. Outline of vegetation and flora of the Carpathian Mountains. M., 1949. 248 p.
- [8] Urusov V.M., Lobanova I.I., Varchenko L.I. The conifers of the Russian Far East –as valuable objects of study, protection, cultivation and use.- Vladivostok: Dalnauka, 2007. 440 p.
- [9] Eisenreich H. Fast-growing wood species: translated from German. M., 1959. 236 p.