

FEATURES OF PRODUCTIVITY, RIPENING AND GERMINATION OF JUNIPER SEEDS

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ABSTRACT	KEYWORDS
The article presents the results of a study on the Features of fruiting, ripening and germination of juniper seeds. The time of flowering, ripening of pine berries was determined, the summary data on the quality of pine berries and seeds of forest-forming juniper species, the time of biological dormancy, how to avoid biological dormancy and obtain the results of sowing in a short time were studied. The development of seedlings in natural conditions, the difference between juniper seedlings of various species from each other has been studied.	juniper turkestanica, juniper semiglobosa, juniper seravschanica, seed;seeds, seedlings, pine berries, vegetation, slopes and expositions

Introduction

Juniper forests, light forests and dwarf thickets (juniper forests) are widespread in the mountainous regions of Central Asia, Crimea, Altai-Sayan mountainous region, the Caucasus and the Far East. They lose their ecological purpose and diverse protective role, at the same time, they themselves experience the negative impact of such natural processes as soil erosion, mudflows, landslides and avalanches. Due to the decrease in forest cover in the mountains, cases of avalanches, landslides and mudflows have recently become more frequent, causing colossal damage to the national economy and often causing death. The most destructive factor for juniper forests and open woodlands is the anthropogenic factor: unauthorized, mainly forced-selective, logging, unregulated grazing, excessive recreational load, unorganized tourism, brushwood harvesting and forest fires, which cause significant damage to juniper forests. This led to a decrease in forested areas and an increase in low-density

plantations and open spaces, digression, and sometimes complete destruction of the soil cover, herbaceous and shrub vegetation in juniper forests and the development of erosion processes.

Scientific literature on scientific and experimental topics is analysed. Used materials on expeditions, reports on afforestation, documents on the basis of juniper forests in forestry are collected. The data of meteorological stations, natural conditions at experimental stations are studied. The yield of herbage was determined by the method of mowing on sites of 1 m². To determine the general assessment of the state of juniper stands under the influence of the conservation and grazing regime, the methods developed by the Institute of Forest and Walnut Growing of the Kyrgyz HAH, as well as the Department of Ecology and Forest Protection of the Moscow State University of Forestry (Mozolevskaya, Kataev, Sokolova, 1984) were used. All trees were subdivided into 6 categories, their condition was established by external signs: Category 1- trees without signs of weakening; Category 2 - weakened; Category 3 - strongly weakened, Category 4 - drying out; Category 5 - dead wood of the current year; Category 6 - dead wood of past years.

Experimental plots are created under natural riparian trees under the maturation of local trees. Calculations are made as well. Field observation expeditions in the field of research are conducted in spring and autumn. In this case, are selected native coastal trees. The process of seed propagation around the mother tree is determined. This includes remote monitoring. The yield of the herbage was determined by the method of cutting on the sites.

Material And Research Methods

The materials and facilities and scientific literature on scientific and experimental topics are analyzed. Materials collected on expeditions, reports on afforestation, documents collected on the basis of juniper trees in forestry are used. Data from meteorological stations and natural conditions at experimental stations are being studied. The study of the effect of livestock grazing on the phytocenosis of the juniper forest was carried out according to the generally accepted methodology, as well as on the recommendation of K.I. Isakov and K.I. Ismanova, (1973). The yield of herbage was determined by the method of mowing on sites of 1 m². To determine the general assessment of the state of juniper stands under the influence of the regime of conservation and grazing, the methods developed by the Institute of Forest and Walnut Growing of the Kyrgyz National Academy of Sciences, as well as the Department of Ecology and Forest Protection of the Moscow State Forest University (Mozolevskaya, Kataev, Sokolova, 1984) were used. All trees were subdivided into 6 categories, their condition was established by external signs: category 1 - trees without signs of weakening; Category 2 - weakened; Category 3 - strongly weakened, Category 4 - shrinking; Category 5 - dead wood of the current year; Category 6 - dead wood of past years. The study of natural renewal was carried out by the method of continuous accounting of undergrowth by height gradations: up to 0.5 m; 0.6-1.0 m; 1.1-1.5 m; 1.6-2.0 m; 2.1-2.5m; 2.6-3.0 m; 3.1-3.5 m. The results of accounting for juniper undergrowth by height gradations were recalculated per 1 ha and statistical indicators were calculated. The data obtained were grouped according to similar conditions, analyzed and conclusions were drawn about the success of the natural regeneration of juniper and the influence of various environmental and anthropogenic factors on this process.

Discussion of The Results

Their leaves are small, scaly, pressed against the shoots in pairs opposite or in three-membered whorls. Only in one species (Siberian juniper) and in all young plants, the leaves are coniferous, linear lanceolate, with a sharp top and therefore prickly.

Flowers are collected in small oval-shaped dioecious spikelets. Male (anther) ones are larger, they are laid at the ends of suitable shoots in the previous year before pollination, in June, and after 2-3 months they become quite mature and consist of several pairs of stamens, which look like scales of scutes on which legs. The scutes are located crosswise on the spikelet shaft and bear 4 oval-oblong anther sacs on the upper side. In this state, the spikelets overwinter.

Female (seed) spikelets are laid in the fall in the axils of annual branches. At this time, they are very small, completely undifferentiated and barely distinguishable from growth vegetative buds. The following spring, just before flowering, they very quickly develop to normal size, become visible to the naked eye and consist of 4-6 cross-arranged scales, each bearing two (very rarely one) bottle-shaped ovules on the upper side.

During flowering, a drop of sticky liquid emerges from the inlet (pollen inlet), which catches the pollen and draws it into the ovule.

Juniper blooms depending on location and weather conditions: in March, April or May [3].

After pollination, the scales of a female spikelet, becoming fleshy, quickly grow into a berry-like formation. Therefore, the fruits of juniper were named - pineapple [3].

Ripening of cones takes two years (sometimes three). But by the end of the first year, they reach the size of a two-year-old and take their characteristic form, however, they have significant differences. Biennial cones berries with ripe brownish dark green resinous flesh. In juniper turkestanica, they are black, shiny, in *J. semiglobosa*, they are blue-black, with a thick bluish bloom, and in *J. seravschanica*, they are dark-burgundy, almost black.

The seeds in such cones are shiny, brown, hard, quite easily separated from the resinous pulp of the fruit when it is crushed. The cones of the first year of development are green, the pulp is less resinous, light green, the seeds in them are dull, not so hard, it is difficult to separate them from the pulp of the fruit.

It should be noted that under the influence of pest infestation, the cones of the first year of life turn brown, but retain their yellowish-green tint and all their inherent qualities.

The described differences between pine berries of the first and last years of development are clearly visible already in August, especially in detached trees and on illuminated parts of the crown in plantations.

In connection with the annual setting and two-year ripening of each year, the same tree contains cones of different ages and qualities: the first year immature ones with seeds that do not yet have a developed embryo, and the second year ones - with normally developed seeds and embryos.

Juniper seeds are distinguished by an interesting biological feature - the delayed development of the embryo.

After pollination, the ovule changes rather quickly, and by the end of the first year it already has a thick membrane and a protein core filled with endosperm (nutritive tissue), but does not yet have a developed embryo. Outwardly, such an ovule looks like a seed, but due to the absence of a fully developed embryo, it is not suitable for germination, and is not a seed.

The full development of the embryo ends only by the end of the second summer (in elfin trees - by the end of the third). It consists of a small root and two fleshy cotyledons.

The ripening of juniper seeds ends by August (rarely by September) of the second summer. At this time, in juniper forests, an increase in soil and air dryness is observed, which causes a sharp change in the structure of the shell of a mature seed, consisting of dense rows of very small and thick-walled cells. With increasing drought, the seed coat undergoes further compaction due to the strong drying out of its cells. The latter become even smaller, even thicker-walled and close together. All this makes the seed coat (peel) completely air and watertight, due to which the juniper seeds become incapable of swelling.

Over time, due to a complex biochemical process, the cells of the seed coat gradually soften, the coat becomes permeable, and the seed acquires the ability to swell and germinate.

While the seed coat prevents the access of air, and most importantly water to the endosperm, the embryo cannot use nutrients. They are not ready for its use and the embryo is not capable of further development and, therefore, germination.

The inability of seeds to swell for a certain period after ripening, due to the special structure of the shell, is called biological dormancy. Seeds that have this feature are called difficult to germinate.

Biological dormancy is observed in the seeds of many plant species, especially those growing in arid areas, but its duration is different for different plants. In all local species of juniper, biological dormancy lasts for 2-3 years. This is proved by the fact that the completely ripe seeds collected in the fall, cleared of the pulp of the pine berries and immediately sown, even with good care in the nursery, germinate only after two, and sometimes even three years.

The same seeds, but after winter storage in cones and sown next spring, germinate only after a year. In this case, their germination extends over several years.

The treatment of such seeds with various stimulants in the form of strong oxidants (for example, dichromic anhydride) and alkalis, as well as the usual stratification in the sand, do not accelerate their germination.

The process of softening the seed coat proceeds in itself rather slowly and is almost the same both in the soil when sowing with freshly harvested seeds with a hardened coat, and when they are properly stored in cones.

In the first case, the farm will have the so-called "dead crops", which must be looked after until the emergence of seedlings for two, and sometimes three years.

If, however, fully mature seeds are collected before the onset of the autumn drought, when the seed coat is still sufficiently permeable to water, and immediately sown into moist soil, then biological dormancy does not occur in the seeds. On the contrary, high autumn temperatures with abundant watering of the soil and with sufficient water permeability of the seed coat ensure the normal course of biochemical processes in the endosperm, which leads to further development of the embryo. With the onset of winter cooling, biochemical processes die out, but do not transform, and in the spring, with an increase in soil temperatures, they are rapidly activated, and the seeds germinate together.

However, it must be remembered that amicable seedlings in this case will give only fully ripe seeds, but not yet gone into deep biological dormancy.

The period from full seed ripening to deep dormancy in juniper is very short and often difficult to detect.

Consequently, the seeds harvested in September, and even more so in October, even if they are immediately sown in moist soil, will not germinate next spring, since they have already gone into deep dormancy. As a result, they will rise only after 2-3 years.

It is precisely the late terms of harvesting pine berries in order to obtain seed and ignorance of the biological characteristics of seed ripening and germination that explain the failure of foresters when trying to grow juniper seedlings. Until recently, the main reasons for these failures were considered to be the extremely low germination of seeds of all local juniper species and the very long term of their germination.

The period of biological dormancy can be shortened by prolonged summer stratification at high temperatures and with abundant moisture, which will be discussed below.

Fruiting of all types of juniper is usually abundant and annual. Only in unfavorable springs, cones are not tied and there is no fruiting.

Juniper begins to bear fruit in natural plantings at about the age of 30-50 years. Moreover, the *J. seravschanica* enters the fruiting season somewhat earlier than other species, and the *J. turkestanica*, on the contrary, later.

At the beginning of fruiting, cones are usually tied very few, they rarely ripen and often crumble unripe. Massive and more stable fruiting is established by about a century of age.

All types of juniper bear fruit until old age. Very often, 800-1000 year old trees are found high in the mountains, severely affected by stem rot, but still bearing fruit. However, the cone berries of such trees are much smaller than usual and contain, as a rule, a lot of empty seeds.

The main crop of cone berries with a high percentage of good-quality seeds comes from middle-aged trees.

The number of fruit-bearing trees in a plantation depends on the completeness of the stand, the exposure of the slope and the height of the terrain above sea level. With an increase in crown density, all other things being equal, the number of fruit trees and the yield of pine berries decrease. On the contrary, with an increase in the absolute height of the area up to certain limits, the percentage of fruiting juniper trees increases. However, at the upper boundary of the distribution of each species, the number of fruiting trees decreases.

The percentage of fruiting trees of *J. turkestanica* to their total number in the plantation is always higher than that of *J. semiglobosa* and even more *J. seravschanica*. This phenomenon, apparently, is explained by the more frequent occurrence of the monoecious of *J. turkestanica*. In addition, fluctuations in the percentage of fruit-bearing and non-fruit-bearing trees in a plantation, depending on the exposure of the slope and the height of the area, are not as pronounced as in other species.

In the matter of fruiting, the quality of the seeds is very important.

As a result of numerous analyzes of seeds of all three forest-forming species of juniper growing in the Turskestan, Alai, Chatkal, Talas and Kirghiz ridges, an extremely high infestation by pests was established. The main reason for this situation is the clutter of juniper forests, as well as the lack of sanitary felling and other forest care measures. Infected trees are found at different heights at different exposures in stands of different densities.

However, there are certain patterns in the spread of pests of juniper seeds.

1. The highest infection of seeds of *J. seravschanica* and *J. turkestanica* is observed mainly in the middle part of the juniper belt, within the absolute heights of 2600-2800 m, i.e. where juniper forests are most concentrated.

2. The drier and warmer the slope occupied by plantations (regardless of the types of juniper), is the greater the degree of infestation is.

3. In all cases, pests affect the seeds of *J. semiglobosa*, then *J. turkestanica* and, to a lesser extent, *J. seravschanica*.

In addition to the high infestation by pests, the quality of seeds is also reduced due to a rather large number of empty seeds. The majority of empty seeds are usually in the *J. seravschanica* and less in the hemispherical. As a result of all this, the lowest seed quality (on average 30%) was noted in juniper *turkestanica*, then *J. seravschanica* (35%). In hemispherical juniper, the average percentage of good quality does not exceed 40%.

The table shows that in order to obtain one kilogram of good seeds that are 100% suitable for sowing, with their best quality and high yield, it is necessary to prepare at least 3 kg of cones of each type of juniper. With poor quality and low yield, in order to obtain one kilogram of good seeds, it is necessary to prepare 70-80 kg of *J. turkestanica* and *J. seravschanica* cones, and 125 kg for *J. seravschanica*. At average rates, to obtain one kilogram of good-quality seeds, 10-12 kg of cones of each type of juniper will be required.

Ripening of ripe pine berries begins at the end of summer and continues until late autumn. The decomposition of the resinous pulp of the fruit under natural conditions lasts for a very long period and depends on its density, the degree of resinousness and the conditions in which the cones fall. For example, even light coverage with damp forest floor will accelerate the decomposition of the fruit pulp. When cones lying on an open surface dry strongly, decomposition can continue for many years. Until the seeds are freed from the pulp of the pineberries, they do not germinate and remain not only viable for a long time (their germination capacity last for at least 5 years), but also germinate gradually at different times. As a result, seeds from one crop can sprout in natural conditions for several or even many years.

Table 1. Summary data on the quality of pine berries and seeds of forest-forming juniper species.

The quality of the cone berries and seeds	Type of juniper					
	J. turkestanica		J. semiglobosa		J. seravschanica	
	From to	In the middle	From to	In the middle	From to	In the middle
Lumpyagodi						
Weight 1000 pieces. gram	416-1250	800	100-188	144	350-750	500
Pieces in 1 kg	800-2400	1200	3100-5700	4000	1500-2700	2000
Seeds						
% exit from pineapple	12-50	35	8-42	26	15-32	24
Weight 1000 pcs, g	120-166	154	15-30	21	42-67	54
Healthy seeds,%	10-60	30	10-80	40	10-60	35

Seedlings in plantations appear not earlier than June, when the air and soil are already warming up well, but still contain enough moisture.

Juniper seedlings of various species from the first days of appearance differ from each other. Seedlings of the *J. seravschanica* have long, light green or green cotyledons with small white dots. Their plate is from above in the middle with a prominent, somewhat longitudinal vein. The bottom of the cotyledon

is monotonous, lighter in color, with a longitudinal groove in the middle. The needles are subulate, light green above, slightly bluish, with two deepened stripes, painted in a bluish color. The stripes are arranged with a sharp tongue, the apex of which does not reach far to the apex of the plate, and the sides abruptly taper off to the edges of the plate at its base. The bottom plate of the needles is keeled, widened to the base, passing to the stem. The edges of the plate are bent somewhat inward with two bluish stripes. The top and bottom of the plate are of the same color.

The seedlings of juniper of the *turkestanica* cotyledon and stem are fat, like no other species of juniper. Cotyledons are blue-green, convex above, depressed below, edges are slightly curved. The needles are dark green with a bluish tinge. Above with a convex middle, with two wide deepened stripes, painted in a deep blue-green color. The bottom plate is keeled, all monochrome, green.

In juniper shoots, *J.semiglobosa* cotyledons and the first whorl of leaves are light and bright green, monochromatic on top, the stem is reddish brown. In general, the seedlings of juniper hemispherical are the smallest and thinnest.

The development of natural seedlings is very slow: the growth does not exceed 1 cm per year, and branching is observed only in the second year, and sometimes even later. The slow development of seedlings under natural conditions is due to the extremely short growing season, no more than 2-3 months per summer. The beginning of the growing season is delayed by a lack of heat, and the end is caused by the dryness of the soil, which has been observed in juniper forests since the end of August. In irrigated nurseries, with good care, juniper seedlings develop much faster: at the age of one, the average height of the *J. seravschanica* is 6-7 cm, that of hemispherical ones is 4-5cm, and at the age of two, respectively the height is 12-20cm and 8-10 cm accordingly.

Conclusion:

We follow the conclusion that if you prepare juniper cones for sowing to biological dormancy, you can get results by next spring. Reproduction of juniper by seeds in natural conditions is very difficult. For this purpose, the seeds need to be collected on time and to be planted in the nursery. Even after the growth, it can be clearly seen that the seedling grown in nurseries is better than that grown in natural conditions.

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