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Chemical Composition and Amount of Macro and Microelements of Pine *(Pinus silvestris* L*)* and Larch *(Larix sibirica Ldb)* Trees in Mongolia

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Abstract

One thousand seed weight of pine and larch trees taken from district Bugant of province Selenge and district Mungen Mort, Tuv province and the bark, other mixture and the items still with bark were defined and comored. Chemical composition of the seeds of pine and larch trees was defined. The dry substance in pine seeds was 94.6%, protein 45.1%, oil 22.1%, ash 1.5%, respectively. In the seeds of larch trees dry substance was 93.8%, protein 18.7% and ash 2.1%, respectively. The amount of macro and microelements in the ash samples of above tree seeds is determined in a spectrum laboratory. There were 20 elements in the seeds of pine trees and 19 elements in the seeds of larch trees.

Key words: *Pinus sylvestris, Larix sibirica*, seeds, pure seed, macroelements, microelements.

Introduction

In coniferous trees such as pine and fir, monoterpenes accumulating in resin ducts found in the needle twigs, and trunk. The principal monoterpenes of conifer resin are α-pinene, β-pinene, limonene and myrcene. Many conifers respond to bark beetle infestation by producing additional quantities of monoterpenes (Taiz & Zeiger, 1998; Shatar, 1975).

Seeds of pine cones ripen after the blossom of the following year. The size of cores varies 2 to 30cm depending on the species. The seed size is equal to 0.5-2.5 cm (Jamsran, 1957). The ripen cones of larch trees are 2-4 cm in length and color is brownish grey (Myagmar *et al.*, 1992).

The pine tree is mostly used for medicine while the bark of larch tree is used for treating grippe, pneumonia, acute bronchitis and head diseases (Nikolaev *et. al.*, 1994; Khaidav *et. al.*, 1985).

The researchers of our country have already determined those including 1000 seeds weight of conifers, seed plantation and seed ling, however, the study of chemical composition of minerals is just only in the beginning stage. We have interested the minerals of conifer seeds taken for the study. The elements used for plant seed are involved in various biochemical processes and determined the structure of organic molecules and penetrating power of membrane. Feeding substances exert favorable condition to the growth of plants.

Mineral salt of non-organic acids exist in plants in a form of liquid, and about 99% of total dry weight of animals and plants are K, Ca, Mg, Na, S, P, Fe and Si, together with C, H and O_2. The principal microelements in plants are Fe, Cu, Zn, Se, Co, Mn, Ni and Al. The quantity of those elements is limited and it depends on the biogeochemical structure landscape. The microelements are actively participating in metabolism, synthesis of enzyme, hormones and blood creation (Bitutskiy, 1999).

It was approved that in vascular plants the iron is unfailingly present. It has active interaction capacity with gumin substances, organic acids, phenolis, siderophors (Bitutskiy, 1999). Today, over 80 chemical elements of the periodic table of Mendeleev have been found in plant tissues. The distribution systems of chemical elements in plants are linked closely with the earth's crust (Dorjgotov & Ligaa, 1979).

Material and Methods

Seed samples of larch trees were taken from District Mungen Mort, Central Province and those of pine trees from District Bugant, Province Selenge in central and northern parts of Mongolia, respectively. The seed weight of both the trees was determined by 1000 seeds' weight, other mixture

and pure weight were defined by weighting and separating way, while dry substances are defined with weighting, the determination of ashes - by burning, the oil - with Sokslet, protein amount - by Ganning method, and macro and microelements were determined by spectrum evaporation method. Sample seeds used for this study were collected in August and September, 2001 and had been stored for four months.

Results

The results of definition of pure seed weight, additional mixture weight amount of pine and larch trees are shown in Table 1.

Table 1. Weights of pure seed and additional mixtures of pine and larch trees

Tree species	Weight of 1000 seeds	Sample amount	Pure seed weight		Peel weight		Foreign mixture		Halved seed, stuck with peel part	
	(g)	(g)	(g)	(%)	(g)	(%)	(g)	(%)	(g)	(%)
Pinus sylvestris	5.93	30	28.987	96.6	0.092	0.3	0.357	1.19	0.545	1.81
Larix sibirica	5.962	10	9.94	99.4	-	-	0.04	0.4	0.02	0.2
I class	7.19	10	9.33	93.3	-	-	0.25	2.5	0.42	4.2
II class	6.72	10	8.29	82.9	-	-	1.07	10.7	0.63	6.3
III class										

If we compare seeds of these two trees then the weight of 1000 seeds of larch is higher than that of other one by 0.696 g, but the seeds of pine trees have more pure weight than that of the other tree species by 4.8 g.

Odgerel *et al.* (2001) noted that the seeds of pine trees obtained from forestry of Ulaan-Ude, Russia have 7.6 g for 1000 big seeds and the weight of such 1000 small seed weight equal to 4.7 g. The chemical composition of pine and larch tree seeds are shown in Table 2.

Table 2. Chemical composition of pine and larch tree seeds (%)

Tree species	Dry substance	Protein	Oil	Ash
P. sylvestris	94.66	45.17	29.12	1.5
L. sibirica	93.84	18.7	27.75	2.1

We found that the chemical compositions of seeds of these two tree species are quite different. For instance, the seeds of larch trees contain more protein (by 26.5%) and oil (by 1.4%) than those in the seeds of pine trees. However, the amount of the ash of larch tree seeds is more than that of the pine tree seeds by 0.6%.

We have determined the amount of macro and microelements in the seed ashes of these two species of coniferous trees and the results are shown in Table 3.

As the result, the authors found the presence of 20 chemical elements in the seed ashes of these two tree species. The amount of Na in both tree seed ashes is very low. Among macroelements, such as Na, Ca, P, Mg and Ba, only the amount of P and Mg in both seeds present with equal volume. However, in these samples we did not found basic macroelements as K, S etc. This fact might be explained according to scarce content of those

Table 3. Amount of macro and microelements in the seed ashes of pine and larch trees

Elements \ Tree species	*P.sylvestris* (%)	*L. sibiricus* (%)
Na	+	+
Ca	0.05	~0.1
P	>1	>1
Mg	>1	>1
Bo		0.01
Cu	0.05	0.01
Al	0.002	0.018
Fe	0.2	0.2
Si	>1	>>1
Mn	~1	0.3
Ti	0.0007	0.001
Zn	0.03	0.007
Cr	0.0005	0.0005
Ni	0.007	0.002
V		0.0003
Mo	0.0003	0.0005
Pb	0.0007	0.0002
Ag	0.0001	
Bi	0.0003	
Sr	0.02	0.01
Zr	0.001	0.001
Ga	0.0011	0.00015

elements in the soils, where the trees are growing.

Based on the result of this study, it is obvious that the amounts of following microelements such as Al, Ga, Mo and Sr are different in two samples, but the contents of Fe, Si, Cr and Zr are just same for both tree seed samples. However, in the seed ash of pine we did not found Ba, V and the seed ash of larch was free from Ag and Bi.

Discussion

If we compare the weight of the 1000 seeds of two species conifer trees, which used in our research with that of such trees provided from Ulaan-Ude forestry, one could regard of moderate weight. The seeds of *Pinus sylvestris* have more oil by applying distillation method. The fact of absence of the basic macroelements such as K, S and an important microelement, Ba in the seeds of two different tree species prove the lack of those elements in the soils.

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