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INFLUENCE OF NATURAL PLANTATIONS WITH PARTICIPANCE OF VELVETWEED OAK ON SOIL FERTILITY

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According to research in natural 31-167 annual overgrown plantations of velvetweed oak established that in soil of mixed forest plantation more humus and nitrogen compared with pure. On the content of phosphorus and potassium certain regularity was not found.
***Keywords:** velvetweed oak, forest floor, physical and chemical properties of soils.*

Problem formulation

Formation and improving of organization of the territory of agricultural enterprises requires to getting out from using degraded and unproductive lands, transforming them into the direction of increasing environmental functions. Therefore land with the most degradationed soils both from economic and environmental reasons most appropriate transform under afforestation.

Creation of persistent and highly artificial plantations possible with comprehensive study not only biological and environmental features of tree species, but also a reverse effect of life activity of tree stand on soil properties. Especially it important at stopping the intensive use of agricultural land for a fixed period and afforestation of degraded and unproductive lands, economic use which is environmentally and economically not effective. Considering all these features will make it possible to form biotic persistent and highly productive afforestation with simultaneous improvement of soils.

Analysis of the recent scientific research and publications

Academician S.S. Sobolev indicates that the forest is the most effective and powerful tool to combat with soil erosion [5]. Planting and sustained growth of woody vegetation at some land not only affects on soil moisture, but also on its physical and chemical properties. In the opinion of S.V. Zonna [2], in all cases after 10-20 years, and sometimes rather, orest vegetation causes clear regular changes in the soil. Direct experiments of V.I. Oberto [4] showed that a significant impact on soils has been observed for 16 years after afforestation of land. At this great importance has the forest floor, during the decomposition of which nutrients penetrate into the soil and improve it's properties.

Forest floor plays an important role in the life forest plantations, especially

in Steppe. Therefore, learing of it's reserve and properties give particular attention such scientists as: V.S. Nakonechnyy, V.F. Romanovskyy (1979); V.V. Babenko, T.V. Bolehano, N.M. Nosovska (1986); I.A. Dobrovolskyy (1986); Ya.D. Fuchylo (1987) and others.

Aim of the article - to investigate the influence of the composition, age and completeness of natural plantations of velvetweed oak on the reserve of forest floor and physical and chemical properties of soil.

Results of the research. Plantations of velvetweed oak in Ukraine and Republic of Moldova located in the southern regions, characterized by insufficient amount of atmospheric precipitation and high temperatures. It's natural and artificial plantations occupy normal chernozems, and also are found on dark-grey forest loamy soils.

On soil fertility significantly affects the forest floor. In pure natural plantations it's reserve ranges from 13,2 to 22, 7, t/ha (table.1). Moreover conditions of habitat no significant impact on it's mass. Reserve of defoliation of mixed plantations considerably exceeds it's weight in pures.

1. Reserve of forest floor in relatively clean natural plantations of velvetweed oak. Hyrbovetskyy forestry

Testing area Num.	Species composition	Age, years	Faction of forest floor			Sum total
			semi-decompose	decompose	branches, bark, acorns	
37	100% Quercus pubescens + Q.robur	80	5,0 / 23,4	14,8 / 70,0	1,4 / 6,6	21,2 / 100
36	100% Q.pubescens + Acer campestre	165	5,6 / 24,4	15,3 / 67,5	1,8 / 8,1	22,7 / 100
52	100% Q.pubescens + Robinia pseudoacacia	130	3,9 / 18,6	15,8 / 74,2	1,5 / 7,2	21,2 / 100
71	100% Q.pubescens + Acer tataricum	60	2,8 / 21,0	8,8 / 67,1	1,5 / 11,9	13,1 / 100
73	100% Q.pubescens	55	2,3 / 16,6	9,6 / 69,1	2,0 / 14,3	13,9 / 100

Note. Here and further in the numerator shows the quantity of forest floor in tonnes per hectare, and in the denominator - a percentage.

According to our data with increasing of age to a certain limit, reserve of forest floor increases significantly. Thus, in 30-th years plantations it makes about 9-10 t/ha (testing area (TA) 46 and 51), in 50-55 years – 12-15 t/ ha (TA 48, 49, 72) and in plantations older than 70 years (TA 52, 53) - 20-25 t/ha (table. 2).

2. The influence of age on the natural plantations on the reserve of forest floor. Hyrbovetskyy forestry. Very dry groves.

Testing area Num.	Species composition	Age, years	Faction of forest floor			Sum total
			semi-decompose	decompose	branches, bark, acorns	
1	2	3	4	5	6	7
46	80% Q.pubescens , 10% Q. petrea, 10% Q. robur	30	2,3 / 23,4	6,2 / 63,1	1,3 / 13,5	9,8 / 100
51	60% Q.pubescens , 20% Q. petrea, 20% Cerasus avium	30	1,7 / 19,2	6,5 / 71,8	0,8 / 9,0	9,0 / 100
48	80% Q.pubescens , 20% Q. petrea,	50	2,6 / 21,4	8,0 / 66,9	1,4 / 11,7	12,0 / 100
49	90%Q.pubescens , 10% Q. petrea,	55	3,2 / 21,2	10,5 / 69,0	1,5 / 9,8	15,2 / 100
52	100% Q.pubescens , singly Robinia pseudoacacia	130	3,9 / 18,6	15,8 / 74,2	1,5 / 7,2	21,2 / 100
53	80% Q.pubescens, 10% Robinia pseudoacacia, 10% Fraxinus excelsior, singly Ulmus foliacea	135	5,3 / 19,3	20,0 / 72,6	2,2 / 8,1	27,5 / 100

If the presence in plantation dense undergrowth of certain correlation between the age of tree stand its fullness and reserve of forest floor not observed (table. 3).

3. Reserve of forest floor in natural plantations of velvetweed oak depending on their fullness. Very dry groves

Testing area Num.	Species composition	Age, years	Faction of forest floor			Sum total
			semi-decompose	Sum total	branches, bark, acorns	
39	90%Q.pubescens, 10% Q. robur, brush-wood thick Acer tataricum	70	5,2 / 26,5	12,9 / 65,5	1,6 / 8,0	19,7 / 100
47	60% Q.pubescens, 40% Q. petrea	70	3,0 / 19,7	10,6 / 68,5	1,9 / 11,8	15,5 / 100
69	100% Q.pubescens + Q. petrea	65	2,0 / 11,0	15,2 / 83,7	1,0 / 5,3	18,2 / 100
73	100% Q.pubescens	55	2,3 / 16,7	9,6 / 69,0	2,0 / 14,3	13,9 / 100

Contents of nutrients in newly cut leave changes depending from conditions of habitat. Thus, the 160 - th years plantations of velvetweed oak located on the south-western slope steepness of 18º. In newly cut leaves, located in lower part of slope, contains more nitrogen, magnesium, but less calcium, potassium and phosphorus and approximately identical quantity (table. 4).

4. The content of nitrogen and ash elements in the leaves of velvetweed oak,% on dry matter (TA 54, age of plantations 160 years). Hyrbovetskyy forestry

Location of trees	Ash	Nitro-gen	Phos-phorus	Pota-ssium	Calcium	Magnesium	pH water
South-western slope							
upper part	0,44	1,37	0,40	1,99	0,68	0,30	5,35
lower part	0,43	1,75	0,41	1,87	0,44	0,60	5,30

According to our data, the amount of nutrients in forest floor affects the composition of plantations. In mixed plantations in comparison with relatively pure, in forest floor more nitrogen, calcium and magnesium. Phosphorus and concentration of hydrogen ions approximately identical quantity (TA 45, 49, 37 and 47). Certain regularity for content of potassium in organic precipitation is not determined (table. 5).

5. The content of nitrogen and ash elements in the forest floor of natural plantations,% on dry matter

Testing area Num.	Species composition	Age, years	Ash	Nitro-gen	Phos-phorus	Pota-ssium	Cal-cium	Magne-sium	pH water
49	90% Q.pubescens, 10% Q. petrea	55	0,23	0,33	0,30	1,35	0,45	1,16	6,33
1	2	3	4	5	6	7	8	9	10
45	60% Q.pubescens, 40% Q. petrea + Q.robur, Cerasus avium	55	0,16	0,99	0,30	1,57	0,49	1,18	6,30
47	60% Q.pubescens, 40% Q. petrea	70	0,20	0,67	0,30	1,42	0,52	1,01	6,28
37	100%Q.pubescens + Q. robur	75	0,30	0,59	0,31	1,74	0,34	0,63	6,19

According to data of I.A. Krupenikova [3], under plantations of velvetweed oak forming xerophytic - forest chernozems. They differ from from chernozems of southern Moldova, that are formed under steppe plantations, wealth of humus. Our research has shown that, despite the same soil types in Hyrbovetskyy forestry the largest quantity of humus (1,80-4,80 %) to a depth of 120 cm was found in the natural 55 year old plantations of composition 50% Q.pubescens 30% Robinia pseudoacacia, 10% Q. robur,10% Fraxinus excelsior (TA 39) and least (1,08-3,45 %) in 76-167 years old conditional pure plantations of velvetweed oak (TA 36, 37). Interim place by humus content in the soil occupied by 41-year-old mixed plantations of composition 80% Q.pubescens , 20% Q. robur (1,81-3,95%; TA 35). Nitrogen in the top 50-cm layer of soil is also more in natural 53 years old mixed plantations (TA39). In this plantation nitrogen less with depth than other investigated plantations. In conditional pure plantations (TA 35 and 36) to a depth of 38-42 cm amount of nitrogen is identical, and the deeper it less in spoiled by long standing plantation (TA 36). The admixture of white acacia increases the nitrogen content only in the upper accumulative horizon (TA 39, table. 6).

6. Physical and chemical properties of soil in natural plantations with the participation of velvetweed oak and others breeds of Hyrbovetskyy forestry

Testing area Num	Species composition	Genetic horizon	Power of horizon, cm	Test of efferve-scence	Humus, %	Nitrogen	Phosphorus	Potassium	Amount of absorbed bases	Hydrolytic acidity	pH water	pH saline
						mg / 100 g of soil			mg- eq. / 100 g of soil			
35	80% Q.pubescens, 20% Q.robur + Acer tataricum (40)	A_1	3-38	None	3,95	5,48	4,99	13,39	30,08	6,31	6,00	5,15
		B_1	38-68	Effer-vescence	2,60	3,17	1,07	74,16	50,88	0,54	8,00	7,35
		B_2	68-93	>>	1,81	2,60	1,07	70,04	50,99	0,36	8,15	7,54
		C	93-150	>>	1,05	1,71	1,06	65,28	50,44	0,18	8,19	7,54
36	100% Q.pubescens + Acer campestre (165)	A_1	4-42	None	3,42	5,48	3,36	14,42	25,75	3,24	6,64	5,82
		B_1	42-74	>>	2,33	2,86	2,56	13,26	21,01	2,50	6,35	5,55
		B_2	74-101	>>	0,95	2,29	2,04	13,77	19,89	1,43	6,70	5,65
		C	101-160	Effer-vescence	0,32	1,43	1,06	65,28	50,18	0,36	7,95	7,55
37	100% Q.pubescens + Q.robur (75)	A_1	3-48	None	3,45	4,90	5,67	12,88	29,66	3,70	5,88	5,98
		B_1	48-86	Effer-vescence	1,62	3,75	1,57	22,70	43,26	0,90	7,22	7,67
		B_2	86-110	>>	1,08	3,17	2,06	20,60	50,88	0,18	7,74	7,69
		C	110-150	>>	0,43	2,57	1,06	17,30	50,59	0,18	7,85	7,71
39	50% .pubescens, 30%Robinia pseudo acacia, 10%Q. robur,10% Fraxinus excelsior (55)	A_1	3-52	None	4,80	6,06	5,93	14,42	27,3	5,05	6,40	5,70
		B_1	52-86	Effer-vescence	2,35	3,17	1,07	67,98	41,51	0,54	7,52	7,37
		B_2	86-120	>>	1,80	1,14	1,06	63,24	50,49	0,18	8,14	7,55
		C	120-150	>>	0,32	0,86	1,06	61,20	50,59	0,18	8,25	7,55

Larger humus content and nitrogen in plantations involving velvetweed oak, acacia white and ash explaining that that organic defoliation of two last contain much nitrogen and accelerates the decomposition of organic defoliation of oak [1]. In addition, on the roots of acacia white developing tuberous bacteria, extinction of which increases the nitrogen content in soil. Intensive development of soil invertebrates in the soil cultures of ash and microorganisms in its rhizosphere provides better retention of nutrients from washing out in the lower horizons of soil. The admixture of ash in oak plantations, thus increases the fertility of the soil in the upper horizons of soil.

According to the content phosphorus, potassium, the amount of absorbed bases and hydrolytic acidity, and also concentration of hydrogen ions certain regularity we have not found. In soil of some plantations more potassium, phosphorus, the amount of absorbed bases in the humus horizon, and other more in alluvial or illuvial horizons.

Conclusions

Reserve of forest floor in relatively pure natural plantations of velvetweed oak ranges from 13 to 23 t / ha. Conditions of habitat does not significant impact on reserve of forest floor, but the composition of plantations affect it's weight. In mixed plantations on the reserve of forest floor affects age and fullness. Defoliation of mixed natural plantations much bigger than defoliation of pure. In the presence of dense undergrowth in plantations of certain dependence between age of tree stand, it's fullness and reserve of forest floor not observed.

The content of nutrients in the newly cut leaves depends from conditions of habitat: on quantity of them in forest floor affects the composition of plantations.

In plantations of velvetweed oak in the upper accumulative horizon of soil humus content ranged from 3.42 to 4, 80%, at a depth of 130-150 cm - from 0.32 to 1.05%, nitrogen - accordingly from 1.90 to 6.06 and from 0.86 to 2.57 mg per 100 g of soil. Certain ependence between humus content and nitrogen in the soil is not revealed. According to the content of phosphorus and potassium in the soil of all investigated plantations taking into account of age, composition, landscape elements and depth of sampling defined regularity is not revealed.

Amount of absorbed bases in the investigated plantations gradually increases to a depth of 80-100 cm, which is explained by the presence of carbonates in lower layers of soil. Hydrolytic acidity is in the range of 3,2-6,3 mg-eq. by 100 g of soil in accumulative horizon and 0,18-0,36 at a depth of 130-150 cm. With the depth in all plantations hydrolytic acidity and the concentration of hydrogen ions systematically reduced.

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По исследованиям в естественных 31-167 летних порослевых насаждениях дуба пушистого установлено, что в почве смешанных насаждений больше гумуса и азота по сравнению с чистыми. По содержанию фосфора и калия определенной закономерности не выявлено.

***Ключевые слова**: дуб пушистый, лесная подстилка, физико-химические свойства почв.*

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За дослідженнями в природних 31-167 річних порослевих насадженнях дуба пухнастого встановлено, що в ґрунті змішаних лісонасаджень більше гумусу і азоту порівняно з чистими. За вмістом фосфору і калію певної закономірності не виявлено.

***Ключові слова**: дуб пухнастий, лісова підстилка, фізико-хімічні властивості ґрунтів.*