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IMPACT AGROCHEMICAL AND PHYSICO-CHEMICAL PROPERTIES OF THE SOIL ON THE DEVELOPMENT OF POPULATIONS *PRIMULA VERIS* L.S.L.

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The main characteristics of soils on the trial plots that differ in their typological conditions have been studied. The values of the following soil indexes were determined: fertility index, acidity index, salinity index; also the distribution and development of the population of the species involved was established. The soil nutrient content necessary for the primula species growth was investigated.

Keywords: *Primula veris L., site conditions, flowering productivity, degree of availabity, acidity, salinity, alkalihydrolyzed nitrogen, soil fertility, humus.*

Introduction. The soil is a complex subekosystem which is constantly changing and developing according to the laws of soil formation. This is the main of plant life-support factors, the environment, in which numerous exchanging processes go on between the soil and plants. An important prerequisite to the formation of stable coenopopulations as well as their ability for reproduction is a favorable combination of physical - and - chemical, biochemical, thermal properties of the soil, the soil depth and groundwater level also being of significance. The depth of humus and illuvial horizons (A – and B horizons), the characteristics of parent material, the presence of leached or calcareous horizons, their granulometric composition determine the totality of physical, chemical and biological indicators of soil fertility as well as the environmental conditions that are to meet the requirements of particular plants [1, 2, 8, 9, 13].

Primula veris L. is one of herbaceous plants that have found wide practical use including planting greenery in towns and cities. In the process of transplanting a plant into other soil environment, great amount of nutrients is taken together with the roots, which will result in agrochemical changes in the soil horizon and floristic

composition of the phytocoenosis as a whole [6, 7, 11, 13]. The removal of nutrients together with plant organisms is not only an indicator of consumption growth life-support factors, but also a significant growth and development of the plants that have remained on the exploited site. Therefore, the supply of nutrients in the soil, under conditions of non-deficient balanced, must meet the requirements of the plants that are associated with a particular site type and the soil-and-climatic growing conditions [4, 5, 14].

The peculiarities of the soil may have a significant impact on the development of phytocoenosis and its populations of the species under study. That is why the necessity of studying the soil conditions for the members of the plant world is a primary task for a wide circle of researchers.

The objective of the study. A series of investigations are focused on the study of the effect of soil factors on the growth and development of *Primula veris* L. The present work is aimed: (1) at revealing agro-ecological peculiarities of the soil under different typological conditions, (2) to investigate the influence of physical-and-chemical properties of the soil on the pattern of the species development, (3) to identify the degree of plant nutrients availability and clarify its effect on flowering productivity of *Primula veris* L.

Materials and methods. In order to study the main agroecological characteristics of the soil, we took soil samples from 12 plots that vary in their forest typological conditions. The study was based on the commonly accepted methods for identification of the main soil characteristics [3, 6, 12, 17].

Results. Soil acidity has a profound effect on the growth of forest vegetation and its vital activity processes: seed germination and shoot growth, formation and development of generative and vegetative organs. The degree of soil salinity is an indicator that determines the possibilities of formation and functioning of a certain plant populations under certain soil conditions [10, 14].

For the most species of grass cover, the following soil reaction is considered favorable: neutral (pH> 6) or near-to-neutral (pH = 5.6 – 6.0) reaction of the soil solution. However, there are plants that are able to grow and develop only under

conditions of weakly acid soil reaction (pH = 5.1 to 5.5) or medium acid soil reaction (pH = 4.6 to 5.0). Quite a few members of the plant world make a successful growth on highly - acidity soils (pH 4.1 to 4.5) and also on extremely high acidity soils (pH <4.0) [4, 12]. The acidity and pH of salinity limits under different site type conditions for the *Primula veris* L. growth in the grass cover are given in Table 1.

1. The influence of hydrolytic acidity and pH salinity of soils on the number of *Primula veris* L. plants for various edatopes

Trofotope	Higrotope	Sample plot	Soil indexes		Plant indexes		
			Hydrolytic acidity, mg-equiv. per 100g of soil	pH salinity	The number of plants, pcs/m^2		Percentage of plants with flowers, %
					In total	With flowers	
B	2	2	3.11	5.4	179	44	24.6
		6	1.56	6.1	108	21	19.4
	3	13	1.13	6.2	28	7	25.0
		17	1.26	6.7	71	28	39.4
C	2	5	3.41	5.5	112	19	16.9
		15	3.59	5.0	164	23	14.0
	3	1	2.46	5.1	150	48	32.0
		3	2.63	5.2	57	21	36.8
D	2	12	3.63	6.3	42	7	16.6
		21	0.40	7.0	165	68	41.2
	3	4	2.03	5.8	73	21	28.6
		16	1.64	6.9	138	20	14.5

The soil on the study sites is characterized by hydrolytic acidity values ranging from 0.40 to 3.63 mg-equiv.; these are conditions of a fresh fertile site type. The flowering productivity of *Primula veris* L. under such conditions makes up 16.6 – 41.2%. On identifying the degree of salinity, it should be noted that the limit for pH salinity extract makes up 5.1 to 7.0 mg-equiv. On less acid, saline soils, the share of flower-bearing stems which are able of setting ovary makes up 41.2%. The plots that have the highest value of hydrolytic acidity (3.63 mg-equiv.), with the value of pH salinity being equal to 6.9 mg-equiv. are characterized by a relatively low productivity index (16.6 %).

It should be pointed out that pH values for fresh and wet fairly infertile site types vary between 5.4 and 6.7, while the index value for hydrolytic acidity makes up 1.13 - 3.11 mg-equiv. Fresh and wet fairly fertile site types are characterized by soil

indexes ranging as follows: hydrolytic acidity – 2.63 - 3.59 mg-equiv.; salinity level – 5.0 - 5.5 mg-equiv. Under conditions of fresh and wet fertile site types (D_{2-3}), pH value is equal to 5.8 - 7.0, hydrolytic acidity values ranging from 0.4 to 3.63 mg-equiv.

At the lowest hydrolytic acidity value (0.40 mg-equiv.), the highest productivity index of flowering reaches 41.2%, while at the highest hydrolytic acidity value (3.41 mg-equiv.) the number of flowering organs on the inventory plot is considerably smaller: 16.2%.

The soil fertility level and humus content are closely related to the presence of nutrients in the form available for plant uptake: nitrogen oxides, phosphorus, potassium, calcium and others. The soil commonly contains large supplies of nutrients in the form not available for plant uptake, but these can be transformed into soluble form due to the plant-soil interaction. Phosphates create a most important buffer system in plants, nitrogen compounds are the basic components of amino acids from which proteins are synthesized [9, 10, 14, 16]. The influence of soil nutrients on the flowering productivity is shown in Table 2.

2. The influence of soil nutrient elements on the *Primula veris* L. flowering productivity

Trofotope	Higrotope	Sample plot	Soil indexes				Share of flowering plants, %
			P_2O_5 mg/kg	K_2O mg/kg	Alkalihydrolyzed nitrogen, mg/kg	Humus content, %	
B	2	2	94	119	198.0	7.21	24.6
		6	59	86	169.0	6.90	19.4
	3	13	82	95	308.0	9.89	25.0
		17	73	88	154.0	4.20	39.4
C	2	5	97	127	226.9	6.12	16.9
		15	46	189	200.6	5.20	14.0
	3	1	37	418	268.8	6.42	32.0
		3	50	186	205.2	4.76	36.8
D	2	12	41	148	198.8	4.82	16.6
		21	134	367	291.2	8.94	41.2
	3	4	105	122	206.9	7.59	28.6
		16	141	139	199.5	4.43	14.5

The soil, as is evidenced by the data in Table 2, is characterized by high humus content. Whatever the site type is, these values fluctuate in the range from

5.20 to 9.89%. With these values, the flowering productivity of the *Primula veris* L. plants makes up 14.0 - 41.2%. In the soils having the lowest content of alkalihydrolyzed nitrogen (154.0 mg/kg) the flowering productivity makes up 39.4%, while at the highest content of nitrogen compounds (308.0 mg/kg) the share of flowering plants is 25.0%. The lowest content of K_2O (88 mg/kg) is found under conditions of a wet fairly infertile site type, while its content is the highest (481 mg/kg) under conditions of a wet fairly fertile site type. The flowering productivity makes up 39.4 and 32.0% for the lowest potassium content and for the highest potassium content respectively. We will point out that the lowest phosphorus compounds content in the soil (37 mg/kg – wet fairly fertile site type) corresponds to a 36.0% flowering productivity *Primula veris* L. whereas the highest content (141.0 mg/kg – wet fairly site type) corresponds to the share of flowering plants of 14.5 %.

Conclusions. The results of the agrochemical analysis of the soil lead to the following conclusions: the species under study tends to grow and establish populations in the neutral soil environment with pH values ranging from 5.0 to 7.0; the limit values hydrolytic acidity make up 0.40 – 3.63 mg-equiv.; the degree of soil fertility on the sample plots is characterized by a high value (the humus content make up 5.20 – 9.89 %). Thus, the most suitable conditions for the growth and development of the *Primula veris* L. populations are wet fairly infertile and wet fairly fertile site type. The level of available soil nutrients, the soil fertility and acidity indexes have an impact on the formation of a certain share of flower-bearing stems.

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ВПЛИВ АГРОХІМІЧНИХ ТА ФІЗИКО-ХІМІЧНИХ ПОКАЗНИКІВ ҐРУНТУ НА РОЗВИТОК ПОПУЛЯЦІЙ *PRIMULA VERIS* L.S.L.

Вивчено основні особливості ґрунту на пробних площах, відмінних між собою за типологічними умовами. Виявлено показники родючості, кислотності, ступеня засоленості ґрунтів та їх вплив на поширення та розвиток популяцій досліджуваного виду. Досліджено вміст елементів ґрунтового живлення для особин первоцвіту весняного.

Ключові слова: *первоцвіт весняний, лісорослинні умови, продуктивність цвітіння, ступінь забезпечення, кислотність, засоленість, лужногідролізований азот, родючість ґрунту, гумус.*