EXPLORING THE IMPACT OF ABIOTIC FACTORS ON *PYRUS* L. SPECIES IN EX SITU ENVIRONMENTS WITHIN THE GREATER CAUCASUS REGION

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Abstract: The study is devoted to a detailed examination of the reaction of *Pyrus* L. species occupying the northeastern sector of the Greater Caucasus region to various abiotic variables in controlled ex situ habitats. This study has important theoretical and practical implications for the conservation of genetic diversity among these uncommon species, as well as the effective implementation of environmental greening projects. The core focus lies in understanding the interplay between the introduced *Pyrus* L. species and a spectrum of environmental variables when subjected to ex situ conditions. By delving into this relationship, the study aims to contribute valuable insights that transcend theoretical boundaries and extend into practical applications. The protection of the gene pool of these rare species is a paramount objective, and the findings are anticipated to inform and enhance strategies for the successful implementation of greening efforts. In essence, the research not only seeks to deepen our theoretical understanding of how *Pyrus* L. species respond to abiotic factors but also strives to provide practical knowledge that can be harnessed for the preservation of biodiversity and the successful execution of environmental conservation initiatives."
Keywords: *Pyrus* L., *ex situ*, temperature, light, water.

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Received: 29 June, 2023; **Accepted:** 30 November, 2023; **Published:** 12 December, 2023

DOI: 10.54414/SABI4591

Introduction:

There are a number of factors that create different types of environmental problems in nature. Among these factors, anthropological factors occupy the main place. The growth of cities, the creation of factories and factories, and the increase in the number of automobiles have a serious impact on the environment. Environmental problems have a direct impact on all living things in nature, including plants. Therefore, these effects need to be investigated. Recently, more and more attention has been paid to environmental problems. Because pollution of the atmosphere and nature affects all living things. It is known that extensive research is being carried out to study the nature of the Caucasus. Recently, oil production and road construction in the Caucasus have also caused the emergence of new environmental problems. Therefore, as the economy and technology develop, it is necessary to solve environmental problems. Environmental issues need to be researched and the impact of these issues on people, animals and plants should be explored. The results obtained will be used in the study of the Caucasus. Therefore, in recent years, extensive experimental and theoretical research has been carried out in these areas (biological, geological, geographical, etc.).

Environmental factors are the sum of environmental components that affect living things. The ecological factors of the environment affect the biochemical and physiological processes in the body - nutrition, respiration, photosynthesis, etc. affects the processes, as well as its distribution, development, productivity, life, daily and annual activity. According to the mechanism of influence of factors on the body, there are some generalities as well as special cases. Whatever

the factor, its effect on the organism is debilitating when it deviates from the optimal (most favorable) part, and at the very edge it is lethal. As we know, living organisms are directly or indirectly affected by environmental factors in their environment. These influencing factors create abnormal changes in the life activity of plants. For this reason, it has a negative effect on the growth and development of plants. In the article was studied, the relationship of *Pyrus* L. species to various abiotic factors.

Materials and methods:

The research object is *Pyrus* L. which is naturally distributed in the northeastern part of the Greater Caucasus. 5 pear species belonging to the *Pyrus* L. genus (*Pyrus communis* L. – Common pear, *Pyrus caucasica* Fed. – Caucasian pear, *Pyrus georgica* Kuth. – Georgian pear, *Pyrus vsevolodii* Heideman – Vsevolod pear, *Pyrus salicifolia* Pall. – Willowleaf pear).

The research was conducted some ecological methods as to divide plants into ecological groups Walter (1967), K.A. Akhmatov (1972), when studying heat resistance, P.A. Genkel (1967), for drought resistance, N.A. Ploxinskiy (1998) and G.N. Zajcev (1984) for mathematical statistical calculation of experimental results .

Results and discussion:

The studied plants (*Pyrus caucasic*a Fed., *Pyrus communis* L., *Pyrus georgica* Kuth., *Pyrus vsevolodii* Heideman, *Pyrus salicifolia* Pall.) are mainly light-loving plants. As a result of the research, it has become clear that developmental retardation manifests itself in places where light deficit is observed.

However, it can be noted that the limiting factors of plants in different light conditions also have the characteristic of variability. Cultivation of light-loving plants in a shaded area is considered to be the introduction or adaptation of shade-loving plant traits to them as unnatural adaptive traits.

It can be said that light-loving plants, like other groups, have developed some adaptive features against the light factor. Naturally, those plants are resistant to high light intensity. Shade-loving plants do not tolerate high light intensity, because they cannot use the weak light potential to a high percentage. Of course, we can explain these characteristics by the fact that there is a high adaptation for maximum use of light intensity for those losses. Naturally, the light factor determines the location of both light-loving and shade-loving plant groups, the characteristic of leaf arrangement, and creates stratification in species under humidity conditions. We can note that the light intensity in natural conditions has an optimal value. This indicator is higher mainly in tropical and subtropical regions. It is for this reason that the role of the lower leaves of the tree in the shade can be noted in the process of synthesis (Isgandar, 2017).

In the research work, one day temperature changes were studied. Research work was conducted in July on 5 types of *Pyrus* L. species (Table 1). The highest temperature was observed at the closest distance to the ground almost before pm 2-3 o'clock in the afternoon. A decrease in the amount of heat was observed as we moved away from the ground. It was observed that temperature changes are higher on the surface closest to the soil surface. Of course, this feature has some differences depending on the species.

From the general observations, we can say that the temperature at the height from the soil surface to the hill can be 7-8°C lower than the part close to the soil surface. Of course, this feature can vary depending on the species.

As we know, if the temperature is too high, it creates conditions for the breakdown of proteins and the accumulation of ammonia in plants .

Table 1. Effect of temperature on the studied plant species (July 2017)

№	Species	Height above the ground (trunk)		
		rhizome	medium	top
		Temperature, °C		
1	*Pyrus caucasica* Fed.	31.0±1.5	27.0±1.3	24.0±1.2
2	*Pyrus communis* L.	32.0±1.6	27.0±1.3	25.0±1.3
3	*Pyrus georgica* Kuth.	32.0±1.6	27.0±1.3	25.0±1.2
4	*Pyrus vsevolodii* Heideman	33.0±1.6	28.0±1.4	26.0±1.3
5	*Pyrus salicifolia* Pall.	33.0±1.6	29.0±1.4	27.0±1.3

Thus, the Absheron area is distinguished by the fact that the soil is drier than other areas in the summer season. The amount of annual precipitation is 200-300 mm, and evaporation is equal to 1000 m, which adapts the plant species belonging to that area to climatic factors. Introduced to the Absheron Peninsula, they spend vegetation in a difficult situation. From our observations, it became clear that in ex situ conditions, leaves were falling or yellowing. Among such species, we can mention *Pyrus georgica* Kuth. and *Pyrus caucasica* Fed. Due to the increase in temperature, the growth and development process stops in those research species when the drought continues. Later, with the decrease in temperature, the growth process of those species starts again.

As a result of the observations, it became clear that burns are observed in some of the studied species (*Pyrus georgica* Kuth., *Pyrus caucasica* Fed., *Pyrus communis* L.). Those burns first start from the outer part of the leaf and go towards the middle part of the leaf. Then it already covers the entire mesophyll part of the leaf. As a result, leaf shedding occurs. In July 2017, when we conducted the research, the temperature indicator was in the range of 36-42°C, so it was found that burns appeared on the leaves. Akhmatov's method was used to determine the lethal effect of heat on the leaves of the studied plants. In this case, thermos containers were used (Table 2).

Table 2. Lethal effect of heat on the leaves of the studied plants

№	Species	Temperature, °C
1	*Pyrus caucasica* Fed.	52.0±2.6
2	*Pyrus communis* L.	52.0±2.6
3	*Pyrus georgica* Kuth.	52.0±2.6
4	*Pyrus vsevolodii* Heideman	54.0±2.7
5	*Pyrus salicifolia* Pall.	54.0±2.7

So, from the analysis of the research, it became clear that the leaves of the plants are divided into 2 parts according to the heat resistance feature:

1. Highly resistant ones (54°C) – *Pyrus salicifolia* Pall., *Pyrus vsevolodii* Heideman;
2. Moderately resistant (52°C) – *Pyrus caucasica* Fed., *Pyrus commu*nis L., *Pyrus georgica* Kuth.

It was clear from experience that the leaves of plants are damaged by heat in the range of 52-54°C. General results showed that the heat resistance feature of plants is related to their individual biological characteristics. Therefore, the species we studied have different characteristics due to heat and drought in the ex situ environment.

Unlike species that thrive in humid conditions, there are 2 types of adaptive features for birches in arid areas. The first is maintaining the turgor pressure, and the second is maintaining the vitality of the plants while protecting them from dehydration. It is for this reason that a number of symptoms occur in species found in arid areas. In those species, the root system develops well, the trunk and leaves shrink, become covered with wax or hairs and take the form of skin .

In addition to these, a number of adaptive features appear in the physiological signs of plants.

The development of underground and above-ground organs was studied by giving 10, 20, 30 liters of water every 10 days to the 2-3-year-old sprouts of the studied plants under *ex situ* conditions. According to the obtained results, the accumulation of dry matter was 2-5 times more depending on the species compared to the control plants.

Table 3.Grouping of studied pear species according to their attitude to water.

№	Species	Groups				
		Hygrophyte	Mesophyte	Xerophyte	Mesoxerophyte	Xeromesophyte
1	*Pyrus caucasica* Fed.				+	
2	*Pyrus communis* L.		+			
3	*Pyrus georgica* Kuth.					+
4	*Pyrus vsevolodii* Heideman.			+		
5	*Pyrus salicifolia* Pall.			+		

Conclusion:

From our visual observations and experiments, it became known that the research plants were divided into 4 groups according to their relationship to water (Table 3).

Among the studied plants, 1 species - *Pyrus communis* L. mesophyte was included in the group living in moderately moist places. In nature, these plants are found in open fields in the foothill forests. The root system, stem and leaves are well developed in *Pyrus communis* L., a mesophytic species.

Xerophyte - this group, which is not so demanding of water and can satisfy its need even in small amounts - is grouped under *Pyrus vsevolodii* Pall., *Pyrus salicifolia* Pall. species. Observations have shown that those species retain the characteristic of normal growth and development in arid areas. It was also clear from the observations that *Pyrus georgica* Kuth. is considered a xeromesophyte, and *Pyrus caucasica* Fed. is a mesoxerophytic species. As we know, the species included in the xeromesophyte and mesoxerophyte group constitute an intermediate stage between the xerophyte and mesophyte species. The mentioned plants have the characteristics of both groups, so they are included in those groups.

It was clear from the research results that all of the studied wild pear species are light-loving (5 species); high (2 species) and medium (3 species) resistant to heat; according to water, it is included in such ecological groups as mesophyte (1 type), xerophyte (2 types), mesoxerophyte (1 type), xeromesophyte (1 type).

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