Effects of Environmental Variability on the Genus *Olea* L.

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Abstract. In Azerbaijan, as well as on the Absheron Peninsula, the pressing problems of our time are climate change, emissions of harmful gases into the atmosphere, high temperatures, changes in groundwater levels, drought and suppression of local flora by introduced invasive species. Deformations of vegetative organs, developmental delays, premature transition to the generative phase, early aging, and infestation with various pests are observed in bioindication species sensitive to environmental changes. The article presents the results of studies of Olea europaea L. species resistant to the soil and climatic conditions of the Absheron Peninsula, which have undergone introduction testing. Taking into account the climatic factor, the results of soil and water analysis of these species, the changes occurring in the plant are scientifically substantiated. According to the results of the analysis of irrigation water in this area, it was determined that the EC is 5.46 mS/cm. In addition, excessive salinization caused an increase in the Na level in the leaves, gas exchange, growth retardation and a decrease in yield. As a result of the research, it was found that the species adapts to arid climates, but water deficit and high temperatures create environmental stress that seriously affects the plant. As a result of the research conducted during the monitoring of Absheron parks and gardens, it was found that the trunks and branches of the species are infected with Saissetia oleae Olivier. At the same time, under climate change, differences in the life cycle of S.oleae colonies and increased resistance to insecticides were observed.

Keywords: *Olea* L., invasive, *Saissetia oleae Olivier, Olea europaea* L., Absheron Peninsula, climate change, environment

1 Introduction

Climate change is undoubtedly the most pressing environmental issue facing the world today. The flora and fauna of the Republic of Azerbaijan have not remained unaffected by the impact of global climate change. Over the past 100 years, average annual temperatures in Azerbaijan have increased by 0.4 – 1.30C. Against the backdrop of climate change, Azerbaijan

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experiences floods, avalanches, storms, hurricanes, surges, strong winds, droughts, melting glaciers, salinization, land degradation, desertification, reduction of precipitation and water resources, etc., being exposed to such extreme climatic phenomena. Species sensitive to climate change experience various pathological diseases [16].

1.1 Literature Review

Olea europaea L. -European olive, which is used in greening in the Absheron peninsula, was selected as a research object, and the variations occurring in the species due to environmental impact were investigated.

Olea europaea L. is an important species in establishing green belts and the food industry in the Absheron Peninsula. Olive plant *Oleaceae* Lindl. belongs to the genus *Olea* L. and more than 80 varieties are known. 6 cultivars of the genus Olea are commercially important, *Olea europaea* subsp. (Mediterranean), *Olea cuspidata* subsp. (South Africa to all of East Africa, Arabia to Southwest China), *Olea europaea guanchica* subsp. (Canary Islands), *Olea europaea cerasiformis* subsp. (Madeira), *Olea europaea maroccana* subsp. (Morocco) and *Olea europaea laperrinei* subsp. (Algeria, Sudan, Niger). Olive is an evergreen, 4-6 m, rarely 10-12 m tall tree, in various umbrella forms. The diameter of the umbrella can reach up to 2 meters. The leaves are entire, 3-8 cm long and 1-5 cm wide. The upper part of the leaves is dull green, the lower part is silver-shiny, and the edges are twisted. Starch accumulates in the epidermal layer of the leaves for the second time in winter. The leaves remain on the tree for 2-3 years without shedding. It has small white or green flowers, which are not so attractive to the eye, and fruits that are colored black-purple when ripe. The fruit is one-seeded, has a fleshy, fatty side, and the seeds are elongated and brown. Olive blossoms in May-June and fruits ripen in October-November. Its fruits contain up to 70 % high-quality fatty oil, and 25-30 % in its seeds [10]. Currently, the most popular variety, the European olive, is cultivated in most countries with a tropical and subtropical climate, including Azerbaijan. There are many varieties of olives created in the former USSR and imported from abroad in Azerbaijan, and the Absheron economic zone accounts for 65 % of olive production among the economic regions. About 15 new selection varieties of olives were created in our country, of which 5 varieties (Azerbaijani, Shirin Zeytun, Buzovna, Agababa, and El Zeytun) were regionalized in 1981-2009 [2].

The olive tree grows well in subtropical regions at an altitude of 2,850 meters above sea level and generally prefers a semi-arid, warm climate. The optimum temperature and rainfall requirement for olive tree cultivation varies between 15-20°C and 650-900 mm, respectively. Olive cannot tolerate humid conditions as it hurts fruit development. It is less resistant to frost. Perennial parts at 17-20°C, young shoots perish at 8-10°C frost. It is very demanding on light. In well-lit areas, fruits are of good quality and trees are productive. It is a plant that is not demanding on the soil. Well-drained, fertile, deep, and loamy soil with an alkaline pH (6.5-7.5) is suitable for olive production. It can grow in different types of soil with good water and air permeability [7].

The vegetation of the olive plant starts at the end of March or the beginning of April, depending on the weather conditions and the place where it is grown when the air temperature is 8-10 ^{0}C. For olive trees, it is clear that the two vegetative coloring periods are spring and summer. Spring coloring of crows is more intense, starting in April and ending in June. At the same time, the trees grow 20-50 cm in Absheron, and up to 80 cm in other regions. The second summer vegetation lasts from the end of July and the shoots grow 10-40 cm tall. Olive trees begin to bloom in early June when the average daily air temperature is 20-23 ^{0}C. Flowers open evenly and last 3-6 days depending on the variety. The olive plant is pollinated by the wind. Although the trees are monoecious, both fertile (self-fertilizing) and sterile varieties require cross-pollination. As a result of cross-pollination, the number of ovaries increases, the amount of dropped fruits decreases, and productivity increases. Therefore, weather conditions during the flowering period play an important role in the production of the current year's crop. Relatively calm (without Absheron's north wind), warm, rainless weather contributes to good pollen distribution, more complete fertilization of flowers, and high productivity. Olive is propagated by seeds and vegetative parts. Seed propagation is used only for breeding and breeding purposes. Semi-woody and fully wooded senses are used during the cultivation of olives in agricultural conditions [11].

The depth, spread, and degree of branching of the root system of the olive tree depend on the type of soil, the content of aeration, and irrigation water. Environmental conditions have a great influence on the growth rate of existing roots, as well as on the formation of new roots. Absorption of water and nutrients from the soil occurs in the youngest parts of the root, i.e. root tips. Young roots are white, constantly renewed, and turn brown over time. White roots play a major role in the assimilation of minerals. These parts are most susceptible to infectious diseases by fungi and nematodes. In aerated soils, the root system can reach a depth of 6-7 meters or more. In poorly aerated soil, the spread of lateral roots increases, and the depth of the root system decreases. Also, the olive root system can adapt to heavy, airless soils by developing a very superficial and widespread root network. In irrigated gardens, the olive root system is relatively superficial. Most of the roots are concentrated in the upper layer of 70-80 centimeters, and only a few scattered roots develop into deep layers up to 1.5 meters [11].

The olive tree plays an important role in cleaning the atmosphere from toxic gases. The anatomical structure of the leaves helps them easily adapt to environmental conditions that will cause excessive transpiration, that is, they protect against water loss. The upper part of the leaf benefits from more sunlight than the lower part. As it ages, the thickness of the leaf increases, and the ability of the leaves remaining in the shade to transmit light and photosynthesize decreases. The lifespan of an olive leaf is about 3 years, but most of the leaves are shed in the second year during growth and when in the shade. The photosynthetic capacity between the leaves in light and shade is quite large, and the inner leaves of the olive tree remain quite lacking in photosynthesis [7].

The olive, which is an evergreen plant, gives Absheron natural beauty and coolness, and the oils and pickles made from it, as well as various preserves, are distinguished by their quality and are highly appreciated by the population. Olive fruits are harvested when they are green and fully biologically ripe. The nutritional value is higher in fully ripe fruits, and the fat content reaches 65-75 %. For medicinal purposes, the oil obtained from the leaves (*Follum oleae*) and ripe fruits (*Oleum olivarum*) of the European olive is used. Olive is a low-calorie fruit due to its carbohydrate, protein, and fiber content. However, the quality of the protein is high because it contains almost all the essential amino acids. Due to the presence of some phenols such as chlorogenic acids, oleanolic acid, choline-ergic, and maslinic acid, olives are known to have several beneficial effects such as antioxidant, antimicrobial, anti-inflammatory activity, chemopreventive effect, and antiproliferative activity. Several phenols in olives also play a role in preventing hyperglycemia, Alzheimer's (dementia), and Parkinson's disease [7].

As a drought-tolerant species, olive trees are naturally adapted to arid and semi-arid climates. It can suffer negative effects when faced with water scarcity for a long time. Drought conditions cause water stress in olive trees, which occurs when there is insufficient water supply for normal physiological functions. As a result, water intake in trees decreases, which causes dehydration of plant tissues. Water stress negatively affects the development, health, and productivity of olive trees. A lack of water in olive trees manifests itself as signs of drying, with paleness, reddening, and curling of the edges. Drought can significantly inhibit the growth and development of olive trees. Lack of sufficient watering affects the number of flowers. Drought can cause fruit development to slow down and oil quality to decrease. Studies show that olives harvested from trees suffering from drought have changed fatty acid content and reduced oil content. Drought weakens the resistance of olive trees to pests and makes them more susceptible to diseases.

According to the research conducted by Azerbaijani entomologists, as a result of climate change and environmental pollution, cultivated olive plants planted in the territory of the republic were infected with 38 types of pests belonging to 15 families, 19 of which belong to *Homoptera*, and 12 belong to *Coleoptera*. Widespread pests of the olive plant include the olive moth, olive fly, olive worm, etc. belonging to [4]. Olive false shield pad (*Saissetia oleae* Olivier.)- located mainly on the underside of the leaf, and rarely on the stem of the plant. Reproduction is carried out by parthenogenesis. The female is a black-scale motor, lays eggs from April to September and, like other species of the Saissetia genus, protects them under her body until they hatch [19]. The female lays up to 2500 eggs. Egg incubation time varies with temperature, with eggs taking 16 days to hatch in summer and up to six weeks in winter. There are usually one or two generations per year, but three generations have been observed in certain regions. Colonies of *S.oleae* secrete copious amounts of sap, resulting in the weakening of the host plant and shedding of leaves, fruits, and withering of branches. In such cases, the yield loss is close to 60-70%. In the following years, the olive tree does not bear fruits [5].

The Absheron peninsula was chosen as the area for the research. This area is 40°20′ and 40°30′ on the east coast of the Greater Caucasus and the west coast of the Caspian Sea; It is located in latitudes 49°45′ and 50°15 east of Greenwich. The Caspian Sea covers the peninsula from three sides. The area of the peninsula is 2192 km^2, which is 2.5 % of the territory of the Republic of Azerbaijan. About 30,000 hectares of the territory belong to dunes, and other areas belong to gray-brown soils. The height of the Absheron peninsula rises from 26 meters to 300-400 meters above sea level and decreases from west to east. The relief of the Absheron peninsula was mainly formed in the fourth period, and it is made of various mixtures - soil, sand, sandstone and limestone fragments, clay, etc. organized. For the relief of the peninsula, arid-denudation processes, canyons, depressions, erosion and abrasion changes, fragmentations, desert forms, etc., belong to the dry semi-desert and desert climate. The relief and composition of the area consist of monoclinal elevations and synclinal plateaus consisting of denudation-resistant limestones. Along with atmospheric sediments, winds also have a strong influence on the formation of the region's relief. Thus, water erosion plays an important role in the degradation process of soils and sparse vegetation in the area [1].

The vegetation of the Absheron Peninsula is semi-desert, and a small amount of wormwood, ephemeral formations are dominated by desert. The flora of the area is not rich in terms of trees and shrubs, natural vegetation consisting of trees and shrubs can be found here only on rocks and gravel. *Lonicera iberica* M. Bieb, *Rhamnus pallasii* Fisch., *Rubus* subg., *Lycium ruthenicum* Murray., *Tamarix* L., *Artemisia* L., and other shrubs are found around large stones and between rocks. In recent times, the establishment of green areas, parks, and gardens has greatly enriched the species composition of dendroflora. Based on the monitoring carried out by experts, it was found that 660 types of trees and shrubs belonging to 87 families and 230 genera are used in the greening of the Absheron peninsula [1].

2 Materials and methods

Scientific research was carried out in field and laboratory conditions. To carry out the research work, monitoring works were carried out in the parks and gardens of the Khazar region of the Absheron Peninsula, and Saissetia oleae Olivier was observed in olives. The environmental factors that caused the infection of the pest were thoroughly investigated. Soil (40.45578 – 49.97536) and water (40.45578 – 49.97536) samples were taken from the area at a depth of 0-30 cm and analyzed in laboratory conditions. "Mohr" method for determining the amount of Cl^- in water, "GOST 26423-85" method for determining the electrical conductivity, pH, and solid residues of aqueous extract, "Volumetric" method for determining the amount of iodine and Mg (the concentration of a substance in a solution, in a solution with a known concentration evaluation by adding the same number of compounds of another substance present) referred to.

The Kjedahl method or Kjedahl digestion was used for the quantitative determination of organic nitrogen and ammonium in the sample (Johan Kjeldahl, 1883). Determination of organic matter was carried out by the Walkley-Black wet digestion method using organic carbon. For phosphorus determination, the Olsen sodium bicarbonate method was used for highly calcareous soils (pH greater than 7.4). The amount of total K_2O, Ca, Na, and Mg (AAA apparatus) was calculated by the method of Maslovyi ($CHCOONH_4$), Scheibler, and the amount of carbonate in the soil. The amount of elements Zn, Fe, Mn, and Cu for neutral and calcareous soils was determined by the DTPA test (Lindsay and Norvell 1978).

Argov and Rossler (1993), Lampson and Morse (1992), Bartlett (1960), and Gill (1988) were referred to in the study of the morphological structure of the pest, the distribution areas of the parasite and the influence of ants on infection [3].

3 Results

To carry out the research work, a case of infection with Olive false shield pad (*Saissetia oleae* Olivier.) was detected on the branches of European olive individuals used in the parks and gardens of the Caspian region of the Absheron Peninsula, as well as in the greening of roadside areas [6]. Since the monitoring work coincided with the summer months, it was observed that the female individuals were fully seated and covered with a thick shell. It was determined that the colonies on the tree were 10-12 in number on one branch, located 0.3 cm away from the leaf rule, dark brown or black. In the infected branches, the leaves are yellow, curled inward, and dry (Fig. 1.).

a *b* *c*

Fig. 1. *Saissetia oleae* Olivier.

Climate conditions of the Absheron Peninsula have been summarized taking into account multi-year research works (tab. 1.).

Water samples (40.45578 - 49.97536) were analyzed in laboratory conditions to research the irrigation water of the area. To determine the suitability of water for irrigation and drinking, it is first necessary to determine the electrical conductivity (EC), anion, and cation values. As a result of laboratory analysis of Khazar region irrigation water, it was found that EC in water is 7.42 mS/cm. It is known that water with an EC of 2.25 dS/m or more is class IV and is not recommended for use in irrigation (tab.2.).

Table 1. Climatic conditions on the Absheron Peninsula.

Climatic conditions of the Absheron Peninsula	
The average temperature of the warm time of the year	20-27 °C
The maximum temperature of the warm time of the year	40-45 °C
The average temperature of the cold time of the year	13,5-13,7 °C
Relative humidity throughout the year	20-30% slight and (30-50%) weak
Lack of moisture	700-945 mm
Annual rainfall	200-400 mm
Possible evaporation during hot periods (April-October)	1000 mm
Annual amount of total solar radiation	130-135 kcal/sm^2
The annual amount of sunny time	2200-2445 hours
Number of dry days in June-September	5-25 days
Continuation of the frost-free period throughout the year	250 days and above
Number of days with air temperature below 0°C	10-20 days
Number of days with snow cover during the year	10 and less
Average annual wind speed	4-6 m/s and higher

Sodium adsorption rate (SAR) is an important parameter used to determine whether water is suitable for use on agricultural land. Class I is excellent when SAR < 10 (1).

$$SAR = \frac{Na}{\sqrt{\frac{(Ca+Mg)}{2}}} = \frac{33.7}{\sqrt{\frac{31}{2}}} \approx 8.55 \text{ (Class I excellent)} \qquad (1)$$

The percentage of sodium (Na %) is an important parameter that indicates the suitability of water for use as irrigation water in agriculture. In order not to harm the soil and plants, the amount of Na% should not exceed 60% (Meg/l values of the parameters are used in the calculation) (2).

$$Na\,\% = \frac{Na}{(Ca+Mg+Na+K)} \times 100\% = \frac{33.7}{16+0.48+33.7+0.4} \approx 67\,\% \qquad (2)$$

One of the important parameters used in irrigation water quality assessment is Potential Salinity (PS). Water with PS less than 3 is suitable for irrigation, between 3-15 is medium, and water above 15 is not suitable for irrigation (3).

$$PS = Cl + \left(\frac{SO_4}{2}\right) = 28.9 + \left(\frac{30.1}{2}\right) = 43.95 \qquad (3)$$

According to liquid water analysis results, Mg content was 48%, <50 below the norm. Salt in water exists chemically in the form of NaCl. The salinity and sulfate content of the solution was determined by the "Mohr" method, the amount of Cl^- is more than 28.9 meg/l, and sulfate is at a risky level (tab.2.).

To carry out the research work, soil samples (40.45578 - 49.97536) were taken from the area where olives were planted (Khazar region) from a depth of 0-30 cm and analyzed in laboratory conditions. During the determination of phosphorus in the soil, 1 gram of dried soil and 20 milliliters of 0.5 M sodium bicarbonate ($NaHCO_3$) solution were shaken for 30 minutes. A blue color in the filtered extract is developed with molybdate-ascorbic acid reagent and measured at 880 nm with a Brinkman PC 900 probe colorimeter. Results are reported as parts per million (ppm) of phosphorus (P) in the soil. The upper reporting limit for this test is 50 ppm. A pH value of 8.83 is strongly alkaline. Carbonation and assimilable Na content in the soil is very high (tab.3.).

Table 2. Water analysis results

Depth		cm			
Coordinates		40.45578 – 49.97536			
Land Description		Irrigation water Baku emergency number 10			
Parameter	Method Reference	Unit	Result	Norm	Conclusion
Chlorine (Cl^-) (in irrigation water)	Mohr's method (titer)	meq/l	28.9	7-12	Class V
Sulfate (SO^{4-})	Calculation	meq/l	30.1	7-12	Class V-unusable
Saltiness EC (in irrigation water)	GOST 26423-85	mS/cm	5.46	0.250-0.750	IV class-risky
pH (in irrigation water)	GOST 26423-85	-	7.42	6.5-8.5	
SAR (in irrigation water)	Calculation	-	8.64	18-26	I class-excellent
Ca+Mg	Volumetric method (titer)	meq/l	31	8-12	
Magnesium (in irrigation water)	Volumetric method (titer)	%	48	<50	Useful
Potassium (K) (in irrigation water)		meq/l	0.4		
Sodium (Na) (in irrigation water)		meq/l	33.7		
Ca^{2+} (in irrigation water)		meq/l	16		
SO_4 (in irrigation water)		meq/l	30.1	7-12	
$CO_3{}^{2-}$ (in irrigation water)		meq/l			
HCO_3 (in irrigation water)		meq/l	6.1		

Table 3. Khazar region 0-30 cm soil layer analysis results.

Depth		0 - 30 sm			
Coordinates		40.45578 – 49.97536			
Land Description		Tubshahi Mosque located in the territory of the Four Corners Fort			
Parameter	Method Reference	Unit	Result	Norm	Conclusion
Organic matter (humus)	Walkley-Black	%	0.37	2-3	Very weak
Phosphorus (P_2O_5) (Available)	Olsen ($NaHCO_3$)	kg\ha	70.53	60-120	Medium
Potassium (K_2O) (Available)	Maslovıy (CH_3COONH_4)	kg\ha	450	250-550	Medium
pH	1:2.5 soil water mixture	-	8.83	6.6-7.5	Strong alkali
Saltiness (EC)	1:2.5 soil water mixture	mS/cm	0.397	0-2	Without salt
Total nitrogen (N) (in soil)	Kjeldahl	%	0.07	0.09-0.17	Weak

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Continuation of table 3.

Calcium (Ca) (Available)	Maslovıy (CH_3COONH_4)	mq/kg	5968	1150-3500	High
Magnesium (Mg) (Available)	Maslovıy (CH_3COONH_4)	mq/kg	200	160-480	Medium
Water saturation	Saturation	ml	34	51-70	Light grainy
Lime (carbonate)	Scheibler	%	46	5-15	Very high
Natrium (Na) (Available)	Maslovıy (CH_3COONH_4)	mq/kg	1500	81-120	Very high
CO_3 $^{2-}$ (in irrigation water)					
HCO_3 (in irrigation water)			1.98		
Chlorine (Cl^-)(in irrigation water)	Mohr's method (titer)	meq/l	7.84	7-12	
Sulfate (SO^{4-})	Calculation	meq/l	12.69	7-12	
SAR (in soil)	Calculation	mel/l	3.04	<12	
Na^+ (in soil)	Saturation filtrate	mel/l	8.03		
Ca^{2+} (in soil)	Saturation filtrate	mel/l	10		
Potassium (K_2O) (Available)	Maslovıy (CH_3COONH_4)	kg/ha	0.48	250-550	Very weak
Ca+ Mg^{2+} (torpaqda)	Saturation filtrate		14		
Mis (Cu) (Available)	DTPA	mq/kg	2.08	>0.2	Enough
Zinc (Zn) (Available)	DTPA	mq/kg	3.44	1.0-2.4	High
Iron (Fe) (Available)	DTPA	mq/kg	9.12	2.5-4.5	High
Manganese (Mn) (Available)	DTPA	mq/kg	7.52	14-50	Weak

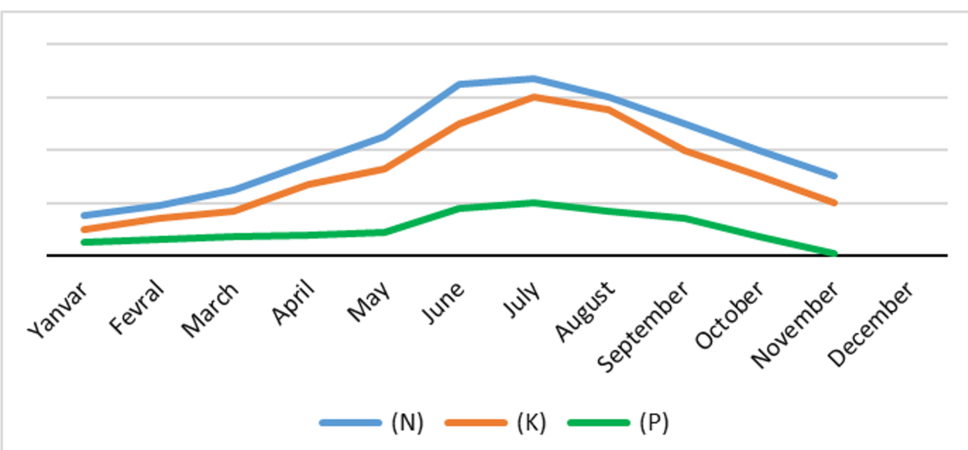

Fig.1. Seasonal nutrient requirements indicators of olive trees

As a result of the research, it was found that the lack of elements in the soil and water affects the formation of certain changes in the species. Phosphorus (P) is essential for many life processes such as photosynthesis and carbohydrate metabolism. Increases resistance to diseases and drought. It also affects flower structure and overall vegetative growth. Leaves with potassium (K) deficiency are light green, and in severe deficiency cases, leaf tip burning is observed. Nitrogen (N) deficiency causes small, yellowish leaves. The seasonal demand for olives for each main element is different (fig.1.).

4 Discussion

Saissetia oleae Olivier is grown in the European olive species in the Khazar region of the Absheron Peninsula. Monitoring work was carried out to investigate the pest and its consequences, the obtained results were summarized and reflected in tables and graphs.

It was found that the drying of olives is more on the sides of the highways. It is believed that the amount of lead released into the atmosphere from cars affects the growth of the pest. Also, lack of water and drought affect the formation of stress in olives. A weakened species becomes susceptible to the pest. Based on the results of water and soil analyses, the presence of salinity in irrigation water at a risky level affects gas exchange. Based on the analysis results of the irrigation water of the area, it was determined that EC is 5.46 mS/cm, excessive salinity causes an increase in the level of Na in the leaves, gas exchange, retardation of development, and a decrease in productivity.

The studied pest (*Saissetia oleae* Olivier.) attaches itself to the leaves and branches of the plant and absorbs the sap from the plant tissue. Depending on the severity of the infestation, the degree of damage to the plant can vary. The pest secretes a sticky liquid while feeding. The excreta coats the leaves, fruit, or nearby surfaces. Although not toxic to humans, the sticky fluid reduces the photosynthetic capacity of the leaves and can reduce the market value of the affected fruit [8]. Correct performance of agrotechnical maintenance works is a primary preventive measure against the pest. 5-10-year-old olive groves are given organic (manure) and mineral fertilizers - phosphorus and potassium in autumn, around the trunk, that is, 40-45 kg of rotted manure, 600 g of superphosphate and 150-200 g of potassium salt are given under each tree. 400 g of nitrogenous fertilizers are given under each tree during spring cultivation and 200 g in summer. In arid regions, plants are watered 9-10 times depending on the demand, the conditions of the year, and the amount of precipitation (2 times in spring, 5 times in summer, 2-3 times in autumn and winter to collect moisture).

Researching the development stages of olive trees is important for predicting future climate impacts and developing mitigation strategies [9].

5 Conclusions

The drying out of European olives as a result of climate change and environmental pollution has been studied in detail. It has been established that changes in the mineralogical composition of soil and water have increased the risk of infection of the species with new diseases. Taking into account the long-term findings of foreign researchers on pest control, both biological and chemical methods can be proposed. For biological control, the parasitoid wasps Metaphycus helvolus (Compere) and Metaphycus lounsburyi (Howard) (Hymenoptera: Encyrtidae) are recommended for combating powdery mildew on olive and citrus trees. As an agronomic control measure, infected leaves, fruits, branches and plant debris should be collected and burned in orchards infested with the pest before bud break. Trunks of trees infested with the needle fly are cleaned with a cod brush. As a result of observations, when 6-7 adult nymphs of the pest appear on a branch 10-15 cm long, a decision is made to spray with a winter or summer preparation: Preparation 30, Confidor OIL, Coruma summer, Winterol-S, etc. During the period of intensive growth of crows (May, June), it is necessary to monitor the development of falls on trees. When mobile imagos and larvae appear, control is carried out using a chemical preparation containing 25% Carbosulfan and 40% Dimethoate, or Chlorpyrifos EC 480 g/l. In July-August, against the second generation of bugs (5-7 per branch, 10-15 cm long, and 2-3 per 100 fruits) when nymphs and larvae of the pest appear, the recommended active ingredients include 480 g/l Chlorpyrifos Ethyl, 50% Fosmet, and 25% Carbosulfan. A repeat treatment is carried out with one of the preparations containing Carbosulfan. To prevent the spread of the pest, planting material of host plants of the S. oleae species should be inspected and cleaned of contaminants before transportation during the growing season. The main method of pest control is biological measures. The use of pesticides in the fight against these pests is not considered effective.

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