The Soil-Climate Conditions Of Ganja-Gazakh Region And The Study Of The İnfluence Of Siderate Plants On The Ecological Condition Of The Soil

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Abstract
The Law of the Republic of Azerbaijan "On Environmental Protection" stipulates that the interaction between society and nature should be regulated in order to improve the quality of the environment, efficient use and restoration of natural resources, and strengthening of legislation and legal regulations in the field of environmental protection. According to the law, the use of nature should be based on the efficient and economical use of natural resources without disturbing the ecological balance of the environment, taking into account the needs of future generations, in order to meet the socio-economic requirements of the society [1].
Excessive use of chemical fertilizers in agriculture and heavy metals in some fertilizers (for example, cadmium and chromium) cause many environmental problems [2].
Nitrogen is the most widely used type of fertilizer in Azerbaijan agriculture, as in the whole world. Almost all nitrogen, phosphorus and potassium fertilizers are brought to Azerbaijan from abroad. When greenhouse gas emissions resulting from the use of chemical fertilizers in Azerbaijan are analyzed by year, it appears that the amount of waste was high in the first years of independence. This is the result of excessive use of chemical fertilizers per hectare of cultivated land during the Soviet Union [3].

Key words: cotton, siderates (autumn peas, barley), agrophysical, agrochemical, phytosanitary conditions.

The actuality of the subject. The area where we conducted our research is located in the Samukh district in the plains of the Small Caucasus mountains. During the years of the field experiments, the average monthly air temperature and the amount of rainfall during the vegetation period changed little from the average multi-year indicators. The agrochemical analyzes we conducted on these soils show that, according to the gradation adopted in our republic, these soils are poorly supplied with nutrients [4]. Therefore, the application of siderate plants and mineral fertilizers is very important for the growth, development, high yield of the cotton plant in these soils, preservation of soil fertility, and improvement of water-physical properties of the soil. However, scientific research conducted in the agricultural system for many years shows that in the cultivation of agricultural plants, especially in the cultivation of cotton, mineral fertilizers, pesticides, herbicides, it is possible to get a high yield and increase soil fertility without using fertilizers. In terms of environmental and soil protection, development of alternative farming systems and new cultivation agro-technologies in order to obtain ecologically clean products in agriculture is one of the urgent problems [5].

Scientific novelty of the work. For the first time in the research work, the role of siderate plants was studied to obtain high and quality raw cotton from Ganja-114 variety of cotton plant in irrigated gray-brown (chestnut) soils. The agrochemical, water-physical properties of the soil have improved due to the effect of the siderate plants buried in the soil, and the productivity and quality indicators of the product have increased.

Research location and methodology. Field experiments on irrigated gray-brown soils were conducted in Ganja Regional Center for Agrarian Science and Innovation in 2016-2019 with Ganja-114 variety of cotton plant.
The field experiments were carried out in the following scheme: 1) Control (every year biomass is removed from the field); 2) N90P120K90 (biomass is removed from the field every year); 3) Every year, the biomass is chopped and put under the main plow in autumn; 4) Barley is sown before the last irrigation of vegetation and in December, all the above-ground mass is chopped and put under the main plow; 5) Autumn peas are sown before the last irrigation of the vegetation and in December, the whole above-ground mass, together with the biomass, is chopped and put under the main plow; 6) Before the last vegetation irrigation, winter peas are sown together with barley, and in December, the entire above-ground mass is chopped together with biomass and put under the main plow.
Dry, dark gray-brown soils are widespread in the Ganja-Kazakh region. These soils are grouped into the following types: dark gray-brown, gray-brown, light gray-brown, primitive gray-brown, anciently irrigated gray-brown, etc. [6].

The following four vertical zones are observed within the Small Caucasus region: 1. High mountain zone (above 2800 m); 2. Middle mountainous zone (1200-2800 m); 3. Foothill zone (500-1200 m); 4.Zone of sloping plains (400-600 m). The belt of sloping plains includes an area from the low foothills to the Kura River [7].

Samukh district is mainly an irrigated agricultural zone. Most of the territory of the region is located in the Kura plain. In the plain part of the region, vegetable growing, grape growing, fodder growing and potato growing have developed widely [8].

The time and duration of the first and last frosts in the region have been studied by climatologists. In spring, the last frosts occur at the end of March and the beginning of April, and the first frosts in autumn at the beginning of November, and the number of frost-free days during the year is 240 days on average.

Based on the data from the Ganja Regional Hydrometeorology Center, here are the average monthly air temperature and the amount of rainfall during the years of field experiments. The average monthly air temperature in 2017-2019 was 15.1-15.70 C, and the amount of rain was 156.3-245.1 mm. In the research years, the average monthly temperature of the air during the vegetation period differed slightly from the average multi-year indicator, and the amount of rains was less than the average multi-year indicator in 2017 and 2018, and in 2019 due to the dry weather many differences were observed.

It was determined by the conducted studies that the amount of absorbed ammonia, exchangeable phosphorus and exchangeable potassium in the soil of the experimental area is below the limits that can ensure the normal development of agricultural crops. Therefore, these soils should be provided with organic and mineral fertilizers in order to increase fertility [9].

The agrochemical characteristics of gray-brown-brown soils, which have been irrigated since ancient times in the conditions of the Samukh region where we conducted the research, are given in Tables 2-4.

Table 2 Agrochemical characteristics of experimental field soils

Depth, cm	pH in aqueous solution	Total humus, %	Nitrogen		Phosphorus		Potassium	
			Total, %	Easily hydrolyzable nitrogen, mg/kg	Total, %	Active, mg/kg	Total,%	Exchangeable, mg/kg
0-30	7,8	2,13	0,17	108,5	0,18	18,5	2,53	275,5
30-60	8,0	1,30	0,12	70,8	0,13	12,5	2,03	205,3
60-100	8,2	0,88	0,05	20,3	0,07	4,5	1,75	105,3

Table 3 The main physico-chemical characteristics of the soils of the experimental area

Depth, cm	Absorbed bases in 100 grams of soil, mg/eq			Sum of absorbed bases, mg/eq	Granulometric composition,%	
	Ca	Mg	Na		<0,001 mm	<0,01 mm
0-30	19,5	6,7	1,3	27,5	23,5	52,5
30-60	17,6	5,8	0,8	24,2	24,1	55,1
60-100	15,2	3,6	0,5	19,3	21,6	53,6

Table 4 The main physical characteristics of the soils of the experimental area

Depth, cm	humidity,%	Special weight, q/sm^3	volume mass, q/sm^3	Total porosity, %
0-30	15,6	2,67	1,28	52,06
30-60	17,3	2,72	1,40	48,53
60-100	19,5	2,75	1,63	40,73

Thus, the agrochemical analyzes carried out on the gray-brown soils show that according to the gradation accepted in our republic [65, p.81-83], these soils are poor in nutrients. Therefore, the application of siderate plants and mineral fertilizers is very important for the growth, development, high yield of the cotton plant in these soils, preservation of soil fertility, and improvement of the basic physical properties of the soil.

In research work, during the use of siderate plants, green mass and dry matter in green mass (NPK) pass to the soil along with cotton seed, which played an indispensable role in improving the water-physical properties of the soil and increasing its biological activity. So, before the last irrigation of the vegetation, the barley sown between the rows together with the above-ground mass was chopped in December and put under the main plow, according to the option of 93.5-97.6 s/ha, and in the autumn pea plant, 50.5-55.3 s/ha of green mass entered the soil. At this time, the NPK entering the soil with barley is 9.3-11.3; 3.7-4.9 and 18.7-21.2 kg/ha; 12.7-14.5 respectively in winter peas; 3.0-4.0 and 5.2-6.4 kg/ha.

In addition, the water physical properties of the soil have also improved due to the effect of siderate plants. In the option of applying mineral fertilizers, 57.47-58.34% of particles with a size of 10...<10 mm, which are considered the best soils agronomically, in the soil layer of 0-30 cm, and in the option of mixed planting of siderate plants, 10... <10 mm sized particles accounted for 67.46-70.68%. Thus, the application of siderate plants under the cotton plant had a significant effect on the degree of fragmentation in the 0-30 cm soil layer. In the 0-30 cm layer of the soil, at the end of vegetation, the amount of particles with a size of 10...<10 mm increased by 11.44-18.93% in the siderates mixed planting variant compared to the control variant. .

The increase of the macrostructure in the soil means the improvement of its important agronomic indicator. The macrostructure (size 10...<10 mm) has increased in the soil due to the fact that siderate plants have different root system structures (barley - fringed root, autumn pea - spindle root) and break the soil into small particles through their roots. As a result of shredding, the necessary ratio is created between the solid phase of the soil and capillary and non-capillary pores, plant roots go deeper and efficiently use water and nutrients, the water regime of the soil - drainage, irrigation, water capacity improves, gas exchange in the soil increases and aerobic the life activity of microorganisms is activated, which leads to the mineralization of organic matter and the transformation of nutrients that are difficult for plants to absorb.

In addition, the effect of siderate plants on the phytosanitary condition of the soil was also studied. An increase in the weeding rate of the field was observed due to the effect of siderate plants. So, due to the effect of mineral fertilizers, the number of weeds before sowing in the N90P120K90 variant is 9.3-8.8 pieces/m2, before the 1st cultivation 9.0-9.1 pieces/m2, before the 2nd cultivation 8.3-9, 2 units/m2, and 3.7-4.8 before the 3rd cultivation; in the mixed planted version of siderates, the number of weeds is 7.4-5.8 units/m2, 6.8-5.3 units/m2 before the 1st cultivation, 7.0-6.8 units/m2 before the 2nd cultivation, Before the 3rd cultivation, it increased to 3.9-2.8 units/m2 compared to the control variant. The fact that weeding of the field is slightly higher in the version with siderate plants can be associated with the increase in the amount of nutrients in the soil.

Results. Thus, without applying mineral fertilizers, before the last vegetation irrigation of cotton, winter peas are sown together with barley, and in December, all the above-ground mass is chopped together with the cotton stubble and when it is put under the main plow, green mass is added to the soil with the dry matter (NPK) in cotton stubble, which plays an indispensable role in improving the water-physical and agrochemical properties of the soil, increasing its biological activity.

Although the weeding rate of the field is slightly increased in comparison with the control and mineral fertilizer option, its role in the cultivation of ecologically clean crops is irreplaceable, and it is possible to control the number of weeds by carrying out harrowing and tillage.

Literature

1. Law of the Republic of Azerbaijan on environmental protection / [electronic resource]/ https://www.e-qanun.az/framework/3852
2. Atılgan, A. Chemical and organic fertilizer usage levels and possible environmental effects in greenhouses in Antalya region / Coşkan, A., Saltuk, B., Erkan // Ekoloji, M. -2007. 15(62): - p. 37-47
3. Elchin N. The relationship between sustainable agriculture and the environment in Azerbaijan / Doctoral thesis in the field of agricultural economics / Bursa - 2021, p. 72-76
4. Gulakhmedov A.N., Akhundov F.G., Ibragimov S.Z. Gradation on the content of mobile forms of plant nutrients in the soil for differential application of mineral fertilizers under agricultural crops. Baku, 1980, 13 p.
5. Alekbarov, F.Sh. The effect of the main cultivation methods of soil-pag on its fertility and the yield of cultivated plants in the three-field cotton-alfalfa-cereal rotation system: /. Dissertation abstract on rural engineering / - Baku, 2010, -19 p. Babayev, A.H. Basics of ecological agriculture / A.H. Babayev. -Baku: Law Publishing House, -2011. - 544 p.
6. Salaev, M.E. Diagnosis and classification of soil in Azerbaijan / Salaev M.E. Baku: Elm, -1991. -239 p.
7. 18. Budagov, B.A. Nature of Azerbaijan / B.A. Budagov - Baku: Maarif, -1988. -204 p.
8. Jafarov, J.A. Agrochemical properties of light-gray brown soils common in Samukh region // Scientific works of AKTA, 1st issue, Ganja: AKTA publishing house, 2008. - pp. 47-48.
9. Mustafayev, M.Q. Fertility indicators of Salyan plain soils / M.Q. Mustafayev, L.Z. Jalilova, S.M. Talibi // Collection of works of ANSA Institute of Soil Science and Agrochemistry, XIX c., -Baku: Elm, -2011. - pp. 96-100.