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The Influence of Intermediate Sowings of Fodder Crops on Water Physical Properties of Irragic Gypsic Calcisols (in Wrb)

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Abstract

We have studied the influence of the biological productivity of fodder crops on water physical properties of Irragic Gypsic Calcisols in the Absheron zone.

It has been found experimentally that the cultivation of the intermediate sowings of fodder crops in Irragic Gypsic Calcisols (in WRB) favour the decrease in their volume weight (from 1.21 to 1.00g/cm3), the increase in specific weight (from 2.69 to 2.79g/cm3), the rise in total porosity (from 55 to 64%), water permeability (from 1.16 to 1.92mm/min.) and the amount of the annual neogenic humus from plant residues by 0.06-0.11%, as well as the fortification of the forage reserve for animal husbandry (1250 centners/ha of the green mass for three harvests per annum).

Keywords: Soil; Specific weight; Volume weight; Porosity; Water permeability; Humus; Stubble; Root remains.

Introduction

In the Absheron zone, the areas of the irrigated soils have decreased by 39% as compared with 1992. Every year these soils undergo water erosion, salinization and deterioration of water physical properties. The result is the degradation of soils and their disuse in agriculture.

The study of the factors and regularities of the anthropogenic soil degradation and the improvement of soil water physical properties, fertility and capability is necessary for the preservation, the reproduction and the adequate use of soil resources in this area [1,2].

Water physical properties of soils have the main impact on the process of soil formation and fertility. Therefore the study and the improvement of water physical properties of Irragic Gypsic Calcisols in the Absheron zone are of the theoretical and practical importance.

Materials and Methods

The area of agricultural land in the Absheron zone is 222 thousand ha. This territory is a slightly dissected undulating plain composed of alluvial heavy loams, clays, sands, and gravelly sediments [2]. The studied zone is characterized by a subtropical climate with a dry and hot summer. The average annual temperature is 12-15 °C. Soils don't freeze up. The accumulated active temperatures (>10 °C) reach 4700-4900 °C, the amount of precipitation does not exceed 190-350mm [3,4].

Field studies have been conducted on Gypsic Calcisols (in WRB), in the territory of Guzdek station and their irrigated analogues, which represent the main soil resources of the Absheron zone. The soils are often carbonate and slightly saline. The salinization is of the chloride-sulfate type. The humus content in the upper 25cm soil layer is 1.8-1.9%. Soil bulk density is high (1.29-1.39ha/cm3) but inter aggregate porosity and water permeability are low [3,4]. In Irragic Gypsic Calcisols, the upper boundary of carbonate accumulation is located deep as compared with the non irrigated soils.

The scheme of the experiment

Virgin soil (common sowing) - II. Winter barley (*Hordeum*) ---> corn (*Zea mays*); III. Winter rye (*Secale*)) ---> corn (*Zea mays*) IV. Lucerne (*Medicago*); V. Sainfoin (*Onobrychis*); VI. Corn (*Zea mays*) (spring sowing); VII Corn (*Zea mays*) + soya (*Glycine*) + *sorghum* + amaranth (*Amaranthus*) (spring sowing); VIII.Winter barley (*Hordeum*) + vetch (*Vicia*) + rape (*Brassica napus*) --> corn (*Zea mays*) + soya (*Glycine*) + *sorghum* + amaranth (Amaranthus) ---> barley (*Hordeum*) + vetch (*Vicia*);. IX. Rye (*Secale*) + vetch

(*Vicia*) + rape (*Brassica napus*)---> corn (*Zea mays*) + soya (*Glycine*) + sorghum + amaranth (*Amaranthus*) ---> Barley (*Hordeum)* +vetch (*Vicia*); X. Lucerne (*Medicago*) (agricultural sowing).

The experimental area under crops is 70m^2, the fourfold replication Agrotechnology-zonal. The soil samples have been taken from every plot before and after harvesting. The root assessment has been conducted by monolith method in the 0-25 and 25-50cm soil layer in the three-fold replication, the assessment of stubble remains-by gravimetric method from 1cm^2 in the five-fold replication. Soil laboratory analyses (water physical properties) of superterranean and subterranean mass of plants (chemical composition) have been conducted by standard methods [5,6].

Results and Discussion

The soil fertility is assessed by its humus-integral characteristics (pH, water physical, chemical, biological, etc.). In this connection while assessing soil humus we assess many other soil properties.

The main source of humus formation in soil is the energy biomaterial - plant residues [1,7]. Therefore the continuous soil replenishment with organic matter in the form of stubble and root remains will allow preserving soil fertility.

This is possible to carry out by the system of uninterrupted soil use - intermediate crop sowings. So the main target of intermediate sowings of fodder crops in Irragic Gypsic Calcisols is the increase in humus content, the improvement of water physical soil properties and the fortification of the forage reserve for animal husbandry in the Absheron zone.

In consideration of the importance of preservation and improvement of fertility of Irragic Gypsic Calcisols in the conducted researches we have studied: the biological productivity of fodder crops depending on the type of sowing; qualitative and quantitative composition of stubble and root remains; water physical properties (volume and specific weights, porosity, permeability of soils, etc) of the soil.

According to the results, during the year, variant IV with winter sowing rye+ vetch + rape and the sowing corn+ soya+ sorghum + amaranth (harvest II), uninterrupted barley and vetch (harvest III), which provides the uninterrupted field use and the harvest of 1250 centners of the green mass from 1ha per annum, favours the accumulation of the air-dry mass of stubble and root remains- 185.4 centners/ha in the 0-50cm soil layer. But in variant II in the same soil layer 108.1 centers/ha of the air-dry mass of stubble and root remains is accumulated.

At the same time every year in the sum of three harvests together with plant residues the soil receives up to 164kg of nitrogen, 118kg of phosphorus, 257kg of potassium.

This has favoured the activation of soil biological activity (the total number of microorganisms has increased in 1g of soil up to 19x10^5) and the annual increase in the content of neogenic humus from root and stubble residues in the soil by 0.06-0.11%.

Table 1: The water physical properties of Irragic Gypsic Calcisols (in WRB) under intermediate sowings of fodder crops (2008-2014 yrs).

Variants	Depth of soil layer, cm	Specific weight, g/cm3	Volume weight, g/cm3	Total porosity,%	Ro tlayer soil moisture, %	Soil permeability, mm/min
I. Virgin soil	0-25	2.69	1.21	55	13.5	1.16
	25-50	2.75	1.41	49	12.4	0.7
II. Winter barley (*Hordeum*)	0-25	2.58	1.16	55	16.7	1.69
	25-50	2.65	1.21	54	15.4	1.57
Corn *(Zea mays)*	0-25	2.6	1.18	55	15.9	1.7
	25-50	2.67	1.23	54	14.6	1.59
III. Winter rye (*Secale*)	0-25	2.6	1.18	55	16.3	1.7
	25-50	2.66	1.22	54	15.1	1.58
Corn (*Zea mays*)	0-25	2.62	1.19	55	15.5	1.7
	25-50	2.69	1.25	54	14.4	1.57
IV. Lucerne (*Medicago*) (biennial)	0-25	2.6	1.14	56	17.7	1.88
	25-50	2.68	1.17	56	17	1.6
V. Sainfoin (*Onobrychis*) (biennial)	0-25	2.61	1.14	56	17.7	1.88
	25-50	2.68	1.18	56	17	1.61
VI. Corn *(Zea mays*) (spring sowing)	0-25	2.6	1.2	54	16	1.69
	25-50	2.68	1.3	51	15.5	1.57

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VII. Corn (*Zea mays*)+soya(*Glycine*) +*sorghum*+amaranth (*Amaranthus*) (spring sowing)	0-25	2.59	1.18	54	16.4	1.8
	25-50	2.63	1.26	52	15.8	1.56
VIII. Winter barley(*Hordeum*) + vetch(*Vicia*) + rape(*Brassica napus*)	0-25	2.68	1.1	59	18.9	1.9
	25-50	2.7	1.17	57	18.1	1.6
Corn (*Zea mays*) + soya(*Glycine*) +*sorghum* + amaranth (*Amaranthus*)	0-25	2.65	1.14	57	17.7	1.87
	25-50	2.74	1.19	56	15.9	1.6
Barley (*Hordeum*) +vetch(*Vicia*)	0-25	2.78	1	64	18.9	1.92
	25-50	2.79	1.14	59	18.6	1.63
IX. Winter rye (*Secale*) +vetch(*Vicia*) +rape(*Brassica napus*)	0-25	2.66	1.12	58	18.3	1.86
	25-50	2.69	1.16	56	17.8	1.58
Corn(*Zea mays)*+soya(*Glycine*) +*sorghum*+amaranth (*Amaranthus*)	0-25	2.63	1.16	56	17.2	1.86
	25-50	2.72	1.21	55	15.9	1.59
Barley (*Hordeum*) +vetch(*Vicia*)	0-25	2.73	1.07	61	18.9	1.9
	25-50	2.76	1.16	58	18.5	1.61
X. Lucerne (*Medicago*) (*biennial, agricultural sowing*)	0-25	2.62	1.17	55	16.7	1.82
	25-50	2.69	1.19	55	15.6	1.58

The continuous soil enrichment with plant residuals has had a good effect on its water physical characteristics. The comparative analysis of the studied variants has revealed a number of differences in volume and specific weights, porosity, soil permeability (Table 1). The comparison of the types of intermediate sowings provides insight into the dynamics of the change of the soil volume weight. It has been found experimentally that during all the terms (in autumn, spring and summer) the determination of the soil volume weight under variant IV in the 0-25cm and 25-50cm soil layer is low as compared with other variants by 0.21-0.13g/cm^3. This indicates the loose structure of the arable layer due to the even allocation of the root system of fodder crops (cereals, legumes, crucials) whether horizontally or vertically. The growth of the biennial lucern, sainfoin and maize per se and in mixture (spring sowing) has favoured the puddling in the 0-25cm soil layer and deeper. It can be explained by the impact of the growing root system of the given crops on the soil.

There has been the difference in the specific weight of the soil among all the examined variants 2.69-2.75g/cm^3 (variant I), 2.65-2.79g/cm^3 (variant IV), 2.62-2.69g/cm3 (variant X).

There has been the difference in overall soil porosity among the variants.

Thus due to scant herbage on the unit of virgin land area, under variant I the soil porosity has been 55 - 49%, under variant IV- by 4-9% higher. The similar data have been obtained from other variants.

The Irragic Gypsic Calcisols has improved under variants IV, V, VI. Thus under variant I (virgin land) the index is 1.16-0.7mm/min but under variants IV, V, VI -1.90-1.92, 1.86-1.90,1.60-1.88mm/min. This indicates that water is soaked faster into the soil.

Thereby on the basis of the findings we can say that the intermediate sowings of fodder crops favour the better water physical properties and fertility of Irragic Gypsic Calcisols (in WRB).

Conclusion

a. In the irrigated Absheron zone, we have studied the intensive water and resource-saving technologies of obtaining annually two (953.11 centners) and three (1250 centners) harvests of the green mass from 1ha.

b. It has been found experimentally that the cultivation of the intermediate sowings of fodder crops in Irragic Gypsic Calcisols (in WRB) has favoured the decrease in their volume weight (from 1.21 to 1.00g/cm3), the improvement of the specific weight (from 2.69 to 2.79g/cm3), the increase in overall porosity (from 55 to 64%), the water permeability (from 1.16 to 1.92mm/min.), the amount of annual neogenic humus from plant residuals by 0.06-0.11%, the fortification of the forage reserve for animal husbandry (1250 centners/ha of the green mass in the sum of three harvests per annum).

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References

1. Babaev MP, Gurbanov EA, Ramazanova FM (2015) Main Types of Soil Degradation in the Kura–Aras Lowland of Azerbaijan. Eurasian Soil Science 48(4): 445-456.
2. Mammadov G (2015) Creation of electron land-cadastral maps and "E-Agriculture" Article book. International Soil Science Congress on "Soil Science in International Year of Soils 2015" October 19-23. Sochi, Russia, p. 243-246.
3. Babaev MP, Djafarova Ch M, Gasanov V (2006) Contemporary soil classification of Azerbaijan. Baku, Elm, p. 359.
4. Salaev ME, Babaev MP, Djafarova Ch M, Gasanov V (2004) Morphogenetic profiles of Azerbaijan Soils. Baku, Elm, p. 202.
5. (1972) The workbook on the soil and plant sampling and analyses and the registration of harms caused by diseases and vermin. Bezenchuk p. 24.
6. Dokuchaev VV (1987) The guideline on the study of indicators of soil fertility, humus balance and nutrients in long-term experiments. Soil Science Institute p. 78.
7. Kaimakamis I, Aggelopoulos S, Pavloudi A (2013) Agricultural Production and climate change a case of Greece. J Environmental Protection and Ecology 14(2): 693-698.

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