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MODELING OF THE EFFECT OF SOWING AND SATISFACTION OF GROUND ON GROWTH OF OATS DEVELOPMENT IN THE CONDITIONS OF ODESA REGION

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Odessa region belongs to the zone with insufficient and unstable humidity conditions for growing a large set of agricultural crops. Ovs belongs to one of the main cereals, whose products are used in many spheres of activity, except for food, feed, as well as in the medical and cosmetic industries. However, in order to obtain high and sustainable crops of this crop in this territory, it is necessary to use irrigation, in connection with the increased requirements of this culture to moisturize. Unfortunately, the water used for irrigation purposes in the Odessa region does not always meet the requirements for its use for irrigation. The main limiting indicators are mineralization and natrium-calcium potential, which are included in the work. In the framework of the work, with the help of a mathematical model that allows predicting the level of possible salinization and soil solubilization, the simulation of the effect of these processes on the growth and development of oats in the conditions of the Odessa region was performed. Calculations were carried out on the basis of field experiment data, which was conducted at the scientific and research station of the ODEKU in the period from 2008 to 2018. The obtained results in the mathematical model are in good agreement with the data obtained with the help of the experiment, therefore they can be used to provide practical recommendations that reduce the negative impact of irrigation on the growth and development of oats in the Odessa region.

***Key words**: simulation, salinity, salinization, mathematical model, oats.*

Introduction. Odessa Oblast is one of the most problematic areas in terms of providing optimal conditions for the existence of agro ecosystems. This is due to the complex climatic, soil, landscape, microclimatic and other conditions. Miscalculations in design, insufficient account of environmental factors, poor quality of irrigation water with a shortage of water resources in many cases negatively affect the soil cover. Particularly rapid negative changes occur in the soils of the steppe zone, where, under irrigation, mineralized groundwater is formed which is rapidly rising to a critical level and intensively developing processes of salinization and salinity [1].

Problem. Providing mankind with sufficient quantity of food is one of the main tasks of modern science. Oats are an agricultural crop that can partially solve this problem, namely providing grain and feed resources.

Analysis of recent research and publications. The question of estimating the impact of irrigation on agricultural plants was a fairly large number of scientists [2]. It took into account the main factors that determine the qualitative and quantitative characteristics of water used for irrigation purposes [3].

The purpose of research. Assess biogenic loading on the soil cover of the agricultural area of the South of Ukraine with the help of mathematical modeling, which will provide practical recommendations to reduce the negative impact on the latter.

Research results. Due to climate change, in conditions of the Odessa region, there is a need to apply irrigation regime to most agricultural plants. The water used for irrigation does not always meet the requirements, which in turn causes salinization and soil salinization. The soil salinity, as is known, is an increase in the content of easily soluble salts (sodium carbonate, chlorides, sulfates). If the salinity process is due to the salinity of the soil forming rocks, the addition of salts by ground and surface waters, salinization is then called primary or secondary. The process of solubilization represents the formation of molds from solonets by degrading the latter as a result of substituting the exchange Na + for H +. It is due to the sodium-calcium potential of irrigation water. The process of soil salinization is due to the amount of mineral salts found in irrigated water, that is, the value of its mineralization [1]. The risk of salinization of soils is estimated at the mass concentration (mineralization) of irrigation water and chlorine, ie, the ratio of Cl- / SO42-. For irrigation suitability, water is divided into five classes. First class water is suitable for all crops and soil types. Water of the second class can be used for most crops and soils, but in the presence of drainage. The third grade water is recommended for use on light soils with a rinsing irrigation regime, washing with fresh water in the period between irrigation taking into account salt stability of crops. The use of fourth grade water is very limited: subject to the requirements listed for water of the third class, this water needs to be diluted and chemically improved. Water of the fifth grade used for irrigation is inappropriate. For the irrigation of the southern chernozems (which are spread only in the Odessa region), only the water of the first and partly the second class is suitable. Third grade water can only be used on light soils. The influence of soil soils on the formation of crop yields is taken into account by means of the effects of the level of the sodium-calcium potential of the soil on the growth of the plant mass [3]:

$$K^{j}_{Na-Ca} = 1 - (0{,}31P^{почв(j)}_{Na-Ca} - 0{,}4)\mu^{j}TSL^{j}n^{j} \quad (1)$$

where K^{j}_{Na-Ca} – function of the effect of sodium-calcium soil potential on the growth of dry biomass of an entire plant; $P^{почв(j)}_{Na-Ca}$ – sodium-calcium soil potential; - the potential intensity of plant growth.

The decrease in plant productivity under the influence of soil salting is calculated by means of the effect of the degree of salinity of the soil on the growth of biomass of plants [3]:

$$K^{j}_{S} = 1 - q_S(S^{j}_{почв} - S^{кр}_{почв})\mu^{j}TSL^{j}n^{j} \quad (2)$$

where K^{j}_{S} - the function of the effect of salt content in soil on the growth of biomass of plants; q_s – reduction of biomass increment per increment of salinity; $S^{j}_{почв}$ - salt content in water extraction of soil, gr/l; $S^{кр}_{почв}$ - critical level of salinity, gl $^{-1}$.

With the help of the considered model and scientific experiment, the functions of the effect of salinization and soil solubilization on the growth and development of oats in the conditions of the Odessa region for the period from 2008 to 2018, which are shown in Figures 1-4, were calculated.

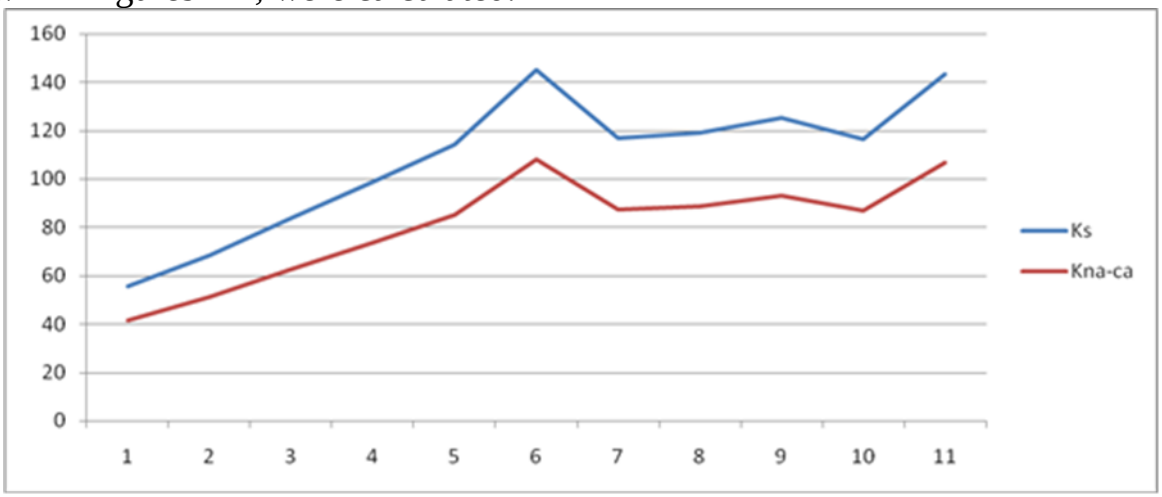

Fig. 1. Functions of influence of salt content and the function of the influence of sodium-calcium soil potential on the growth of dry oyster biomass in 2008.

From the graph, it is evident that from the beginning of the growth period there is an increase in the function of the influence of both processes on owl plants. The maximum values of these functions are reached in the sixth decade of development, after which there is a slight decrease in these characteristics.

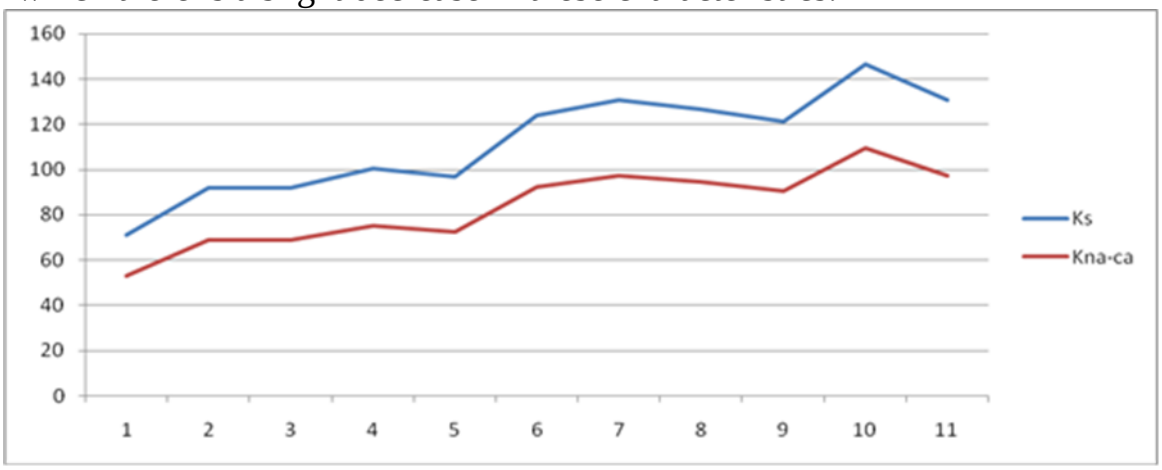

Fig. 2. The effects of salt retention and the effect of the sodium-calcium potential of the soil on the growth of oyster dry biomass in 2013.

The peculiarity of the functions of the effect of irrigation on oats in 2013 is a uniform increase in the values of both functions of influence, their maximal value they reach in the last periods of development. In 2014, there was a significant increase in the values of the functions of influence in the first half of the period of growth and development, while the minimum functions of influence on quantitative indicators were marked. This is probably due to the fact that this year the temperature background was significantly lower than in previous years. With reduced air temperature, the flow of salinization and salinization on plants decreases.

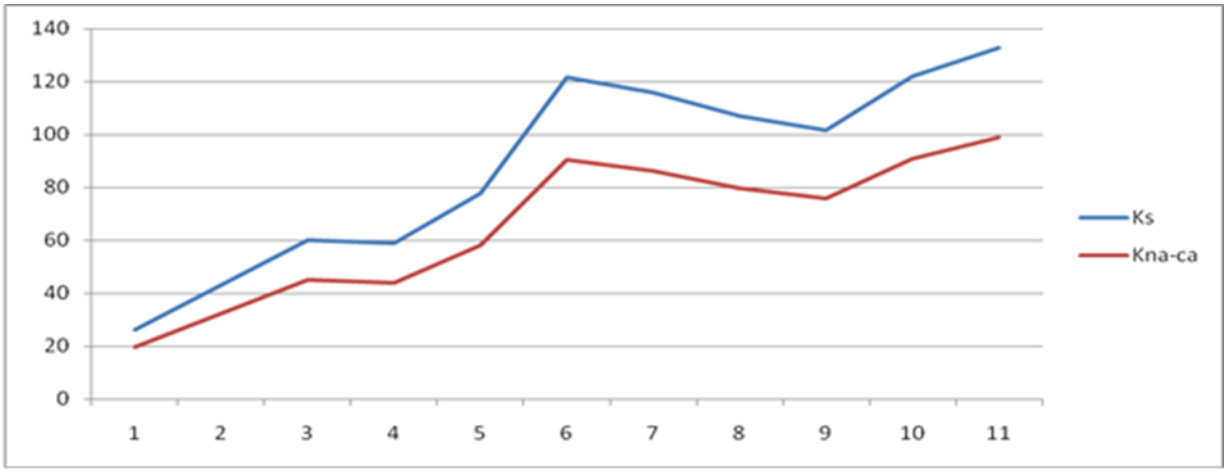

Fig. 3. The effects of salt retention and the effect of the sodium-calcium soil potential on the growth of oyster dry biomass in 2014.

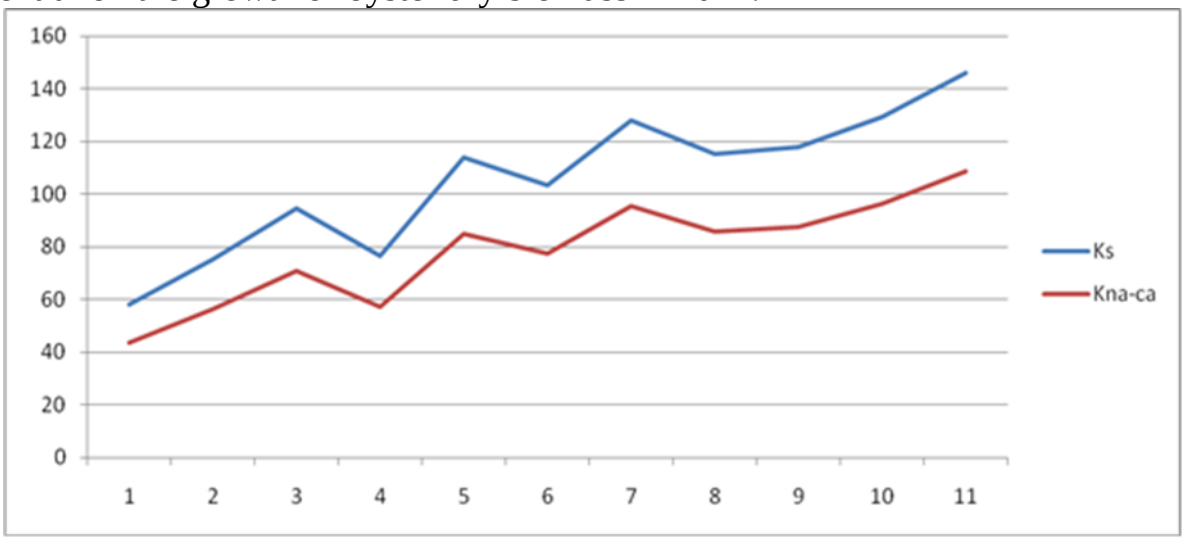

Fig. 4. The effects of the salt content and the effect of the sodium-calcium soil potential on the growth of dry biomass of oats in 2018.

The peculiarity of the influence of salinity and salinization on the growth and development of oats in the conditions of the Odessa region is the significant dependence of these processes on the temperature of air, namely on the effective temperature, which is included in the calculations and determines the biological peculiarities of the plant. The conducted research allows to optimize oyster irrigation regime and provide practical recommendations for the terms of sowing this crop in the Odessa region with minimal influence of negative factors.

REFERENCES

1. Shevelukh B.C. Plant growth and its regulation in ontogenesis. M., 1992

2. Konstantinov I.C. Protection of soil from erosion in intensive agriculture. - Kishinev: Shtiintsa, 1987. - 240s.

3. Grigoriev V.Ya., Krasnov SA, Kuznetsov M.S. Forecasting and prevention of erosion in irrigation. - Moscow: Izv. MSU, 1992. - 206c.

4. Barabanov A.T. Agromelioration in soil protection agriculture. - Volgograd,

1993.- 156s.

МОДЕЛИРОВАНИЕ ВЛИЯНИЯ ЗАСОЛЕНИЯ И и ОСОЛОНЦЮВАНЯЯ ПОЧВЫ НА РОСТ И РАЗВИТИЕ ОВСА В УСЛОВИЯХ ОДЕССКОЙ ОБЛАСТИ

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Одесская область относится к зоне с недостаточными и неустойчивыми условиями увлажнения для выращивания большого набора сельскохозяйственных культур. Овес относится к одной из основных зерновых культур, продукция которого используется во многих сферах деятельности, кроме продуктовой, кормовой, а также в медицинской и косметологической отраслях. Но, для получения высоких и устойчивых урожаев этой культуры на данной территории необходимо использование орошения, в связи с повышенными требованиями этой культуры к увлажнению. К сожалению, вода, используемая для целей орошения в условиях Одесской области не всегда соответствует требованиям, к возможностям использования ее для орошения. Основными лимитирующими показателями являются минерализация и натриево - кальциевый потенциал. В рамках работы, с помощью математической модели, которая позволяет спрогнозировать уровень возможного засоления и осолонцевания почвы, выполнено моделирование влияния этих процессов на рост и развитие овса в условиях Одесской области. Расчеты проводились по данным полевого эксперимента, который проводился на научно - исследовательской станции ОГЭКУ в период с 2008 по 2018 г. Полученные результаты по математической моделью хорошо согласуются с данными, полученными с помощью эксперимента, поэтому их можно использовать для предоставления практических рекомендацій по уменьшению негативного влияния орошения на рост и развитие овса в Одесской области.

Ключевые слова: *моделирование, засоления, осолонцевания, математическая модель, овес.*