

THE IMPORTANCE OF CROTALARIA JUNCEA L. PLANT IN REDUCING SOIL SALINITY

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Abstract: *In this article, the increase of salinity and salt residues as a result of a sharp decrease in water resources in the coastal areas and the role of the drought- and salt-resistant tropical plant Crotalaria (Crotalaria juncea L.) in reducing salt residues, as well as the effect of the use of stimulants on the level of salinity and the use of fertilizers as a solution to these problems, are described.*

When planting Crotalaria seeds, treating them with Geohumat stimulator, during the budding and flowering phases of the growing season, the dry residue in the 0-30 cm soil layer is -0.108, when fed with NPK - 20% liquid fertilizers at the rate of 1.5 kg per hectare; HCO_3^- —0.006; SO_3^{2-} -0.005; Cl^- - 0.003; SO_4^{2-} - 0.058; the sum of components - reduced to, the degree of salinity is from strong to moderate salinity and dry residue in the 30-50 cm layer is -0.050; HCO_3^- - 0.006; SO_3^{2-} - 0.002; Cl^- - 0.005; SO_4^{2-} - 0.038; the sum of components - decreased to 0.265%, and the salinity level changed from moderate to weak salinity.

Key words: *Crotalaria juncea L., Geohumat and Fertilife stimulants, liquid fertilizer with NPK -20%, sum of components, type and level of salinity.*

Enter. The aggravation of the environmental situation on the island and along the island is worrying the world community. The Aral Strait is one of the largest regional environmental disasters, affecting more than 35 million people living in the sea basin, including a large part of the population of Uzbekistan. In the recent past, the Aral Sea, considered one of the largest lakes in the world, is rapidly drying up. The increase in the area of irrigated land in Central Asia and the misuse of water have decided the fate of the Aral Sea. In the last 40-45 years, the sea level has dropped by 22 meters and the volume of water has decreased from 1064 km³ to 80 km³, in its place salt marshes and shifting sands have formed. The long-term average seawater salinity is 9-10 g/l, but now it has increased to 110-280 g/l, and the sea has lost its importance as a bioproductive basin. Biodiversity

has declined dramatically. The number of 174 animal species in the marine region has decreased to 40.

The salinity of cultivated lands has increased year by year and has become unusable. This problem is an important issue not only for Karakalpakstan or Uzbekistan, but for the entire region. Therefore, greening of the seabed, opening of water basins and mitigating the consequences is an urgent issue today.

In recent years, Uzbekistan has been paying serious attention to mitigating the negative consequences of climate change, transitioning to a "green" economy, ensuring environmental stability and preserving biodiversity, and rational use of natural resources.

Today, the concept of "Area of ecological innovation and technologies of the Aral Bay region" and the "Roadmap" for its implementation are being developed.

In particular, measures were taken to eliminate the consequences of the Aral disaster and improve the ecological situation in the region, to prevent desertification by planting green plantations on the dry bottom of the sea, to stimulate socio-economic development in the region and to adapt to climate change, to develop ecotourism and other measures.

In response to these tasks, scientific and research work was carried out on the development of agro-technologies for the cultivation of non-traditional crotalaria (*Crotalaria juncea* L.), which is a type of legume crop that can reduce soil degradation and salinity, restore soil fertility, and become an additional source of income in animal husbandry, used as fertilizer, fodder, fiber, and medicine in the Aral Bay areas. is going.

Literature review. The formation of sand and salt from the dry part of the Aral Sea under the influence of the wind reaches an average of 100-150 million tons per year. The main process of sand and salt migration takes place in an area of 100 km along the coast of the island. The dust on the island contains sulfate salts 25-48%, chlorine salts 18-30%, carbonate salts 10-20% [1].

Currently, the natural areas of the island are also in an unsatisfactory ecological condition. Water almost does not reach the Aral Sea.

This leads to the retreat of sea water, as a result of which the surrounding lands become salinized, and the productivity of cultivated fields decreases sharply. The island crisis is the complete disappearance of the sea, the largest ecological and humanitarian disaster in human history, taking over the territory of more than 35 million people living in its basin [10].

In recent years, contamination of soils with toxic metals as a result of human activities has become a serious problem. Phytoremediation is a method that uses plants or microorganisms to remediate such problems, and *Crotalaria* has also been studied as a phytoremediator of lead-contaminated soils. When the concentration of metals in soil, plant leaves and roots was determined by atomic absorption spectrometry method, the highest amount of lead was found in plant roots [7].

Crotalaria also removes copper, which has been identified as a heavy metal in the soil. In *Crotalaria*, despite the presence of copper in the soil, mechanisms have been

identified that reverse the toxic effects of copper and ensure plant growth [5]. Also, *Crotalaria juncea* maintained in herbicide-contaminated soils showed a high capacity for phytoremediation [4].

D.W.Reeves and others [6] stated that *Crotalaria* plants, being a leguminous crop, accumulate nodule bacteria in their roots and increase soil fertility. *Crotalaria* can also be used as mulch. The advantage of using legume as organic mulch rather than green manure is that when the plant is left as mulch, 30.4-32.2 kg\ha of nitrogen is produced in the soil over winter.

According to C.Cook and G.White [2], *Crotalaria juncea* crop is a plant for green manure, soil improvement, environmental cleaner and biological control of weeds.

Yaqubov G. and others [9] reported that the *Crotalaria* plant has a positive effect on the improvement of soil reclamation due to the fact that it reduces the amount of residual salts in the soil, improves the soil environment, and to some extent increases the amount of humus and total nitrogen in the soil.

At the same time, *Crotalaria juncea* is characterized by rapid growth of vegetative organs, a high level of biomass production, and the ability to adapt well to conditions with low soil fertility [3, 8].

Materials and styles. The research was carried out in laboratory and field conditions, with phenological observations and biometric measurements "Metodika Gosudarstvennogo sortoispytaniya selskohozyaystvennykh kultur", "Methods of conducting field experiments", "Methods of conducting field experiments on *Crotalaria* (*Crotalaria juncea* L.)"; agrochemical properties of soil "Metody agrokhimicheskikh analizov pochv i rasteniy"; microbiological properties of soil "Metody pochvennoy mikrobiologii i biokhimii"; agrophysical properties of the soil were carried out on the basis of methodological manuals such as "Metody agrofizicheskikh issledovaniy".

Field experiments were conducted in the conditions of alluvial meadow soils of the Moynaq district of the Aral region of the Republic of Karakalpakstan (Table 1).

ТАЖРИБА ТИЗИМИ

Options	Seed treatment with biostimulants, l/t	Standards of application of NPK fertilizer in the form of suspension, kg/ha
Option 1	-	-
Option 2	Geogumat (1,0)	NPK – 0,5
Option 3		NPK – 1,0
Option 4		NPK – 1,5
Option 5	Fertilife (7,0)	NPK – 0,5
Option 6		NPK – 1,0
Option 7		NPK – 1,5

In the experiment, seeds were sown before sowing with Geogumat and Fertilife stimulants in the recommended rates, and in the budding and flowering phases of the growing season, NPK - 20% liquid fertilizer in the form of a suspension of 0.5; 1.0; Effects of

foliar feeding on growth, development and yield of *Crotalaria* and soil properties were studied at the rate of 1.5 kg/ha.

Results and discussion. Soil salinity is one of the main agricultural problems faced by farmers in the Aral region. The effect of *Crotalaria* plant on soil salinity in improving the productivity of degraded, saline soils in the soil-climatic conditions of Moynaq district was studied.

According to these data, the soil salinity level was determined at the beginning of the initial period of operation of the soil of the experimental field.

According to the received data, the dry residue in the 0-30 cm soil is 2,365; HCO_3^- —0.024; SO_3^{2-} —0.027; Cl^- —0.021; SO_4^{2-} —1,495; the sum of components is 2.097%, the type of salinity is X-S, the degree of salinity is strongly saline, and the dry residue in the 30-50 cm soil composition is 1.242; HCO_3^- —0.024; SO_3^{2-} —0.024; Cl^- —0.039; SO_4^{2-} —0.716; the sum of components is 1.163%, the type of salinity is S-x, the degree of salinity is average.

At the end of the implementation period, when soil analyzes were carried out according to options, the dry residue in the 0-30 cm soil layer was 0.062-0.108; HCO_3^- —0.002-0.006; SO_3^{2-} —0.003-0.005; Cl^- —0.001-0.003; SO_4^{2-} —0.020-0.058; the sum of components decreased to 0.235-0.614%,

Тупроқларнинг шўрланиш даражасига стимуляторлар қўллаш ҳамда ўғитлар меъёрини таъсирин

Options	Soil layer, cm	Dry residue	Alkalinity		Cl^-	SO_4^{2-}	The sum of teh components, Salinity type, %	Шўрланиш	
			HCO_3^-	CO_3^{2-}				типи	даражаси
Initial indicator	0-30	2,365	0,024	0,027	0,021	1,495	2,097	X-C	кучли
	30-50	1,242	0,024	0,024	0,039	0,716	1,163	C-x	ўртача
End of validity period.									
Option 1	0-30	2,303	0,024	0,027	0,021	1,475	1,862	C-x	ўртача
	30-50	1,231	0,024	0,024	0,039	0,706	1,057	C-x	ўртача
Option 2	0-30	2,284	0,022	0,024	0,020	1,458	1,727	C-x	ўртача
	30-50	1,209	0,022	0,022	0,035	0,691	1,026	C-x	ўртача
Option 3	0-30	2,262	0,020	0,024	0,018	1,442	1,611	C-x	ўртача
	30-50	1,197	0,020	0,023	0,034	0,683	1,010	C-x	ўртача
Option 4	0-30	2,257	0,018	0,022	0,018	1,437	1,483	C-x	ўртача
	30-50	1,192	0,018	0,022	0,034	0,678	0,898	C	кучсиз
Option 5	0-30	2,288	0,022	0,025	0,020	1,462	1,735	C-x	ўртача
	30-50	1,211	0,022	0,025	0,037	0,695	1,029	C-x	ўртача
Option 6	0-30	2,266	0,022	0,025	0,020	1,448	1,619	C-x	ўртача
	30-50	1,201	0,022	0,025	0,036	0,687	1,016	C-x	ўртача
Option 7	0-30	2,260	0,020	0,024	0,020	1,442	1,488	C-x	ўртача
	30-50	1,197	0,020	0,024	0,036	0,683	0,902	C	кучсиз

if the level of salinity has changed from strong salinity to medium salinity, and in the layer of 30-50 cm dry residue - 0.011-0.050; HCO_3^- —0.002-0.006; SO_3^{2-} —0.001-0.002; Cl^- —0.003-0.005; SO_4^{2-} —0.010-0.038; the sum of components decreased to 0.106-0.265%, and the degree of salinity varied from moderate to weak salinity.



Initial view of the experimental field and after crotalaria planting

When crotalaria plant seeds are treated with geohumate stimulator and NPK - 20% liquid fertilizer at the rate of 1.5 kg per hectare, plant growth and development, yield is higher than other options in option 4, dry residue in 0-30 cm soil layer -0.108; HCO₃—0.006; SO₃-2-0.005; Cl - 0.003; SO₄-2 - 0.058; the sum of components - reduced to 0.614%, the degree of salinity is from strong to moderate salinity and dry residue in the 30-50 cm layer is -0.050; HCO₃ - 0.006; SO₃-2 - 0.002; Cl - 0.005; SO₄-2 - 0.038; it was found that the sum of components decreased to 0.265%, and the salinity level changed from moderate to weak salinity.

Initial view of the experimental field and after crotalaria planting

Summary. In order to reduce the salinity of the soil in the island regions of the Republic of Karakalpakstan, it is recommended to treat the seeds of the non-traditional leguminous crop *Crotalaria* (*Crotalaria juncea* L.) with a Geohumat stimulator, and feed it with NPK - 20% liquid fertilizer at the rate of 1.5 kg per hectare during the budding and flowering phases of the growing season. will be done.

LIST OF USED LITERATURE:

1. Ayzman R.I., Krivoshekov S.G., Omelchenko. - Osnovy bezopasnosti jiznedeyatelnosti i pervoy meditsinskoy pomoshchi. - Novosibirsk: Siberia. University Press. 2005, - 464 p.
2. Cook. C.G and White G.A. "Crotalaria juncea: a potential multi-purpose fiber crop". In J. Janick (ed.), Progress in new crops. ASHS Press, Arlington, VA. 1996. P. 389- 394

3. Fontanetti, A.; Carvalho, G. J.; Gomez, L. A. A.; Almeida, K.; Moraes, S. R. G.; Teixeira, C. M. Adubação verde na produção orgânica de alface americana e repolho. *Horticultura Brasileira*, v. 24, no. 2, p. 146-150, 2006.
4. Gerhardt Karen E., Xiao-Dong Huang Bernard R. Glick and Bruce M. Greenberg Phytoremediation and Rhizoremediation of Organic Soil Contaminants: Potential and Challenges. *Plant Science* 176.1: 2009. Rr.20-30.
5. Negmatova S.T., Nurullaeva M.Sh. The role of *Crotalaria juncea* L. in increasing soil fertility. *Agricultural magazine of Uzbekistan*. #7.2020. 32 p.
6. Reeves D. W., Mansoor Z., Wood C. W. "Suitability of sunn hemp as an alternative legume cover crop." //In *Proceedings of the New Technology and Conservation Tillage*. University of Tennessee Agricultural Experiment Station, Tennessee. 1996. 96 (7): R. 125-130
7. Tatyane Martins Silva¹, Gabriela de Medeiros Macêdo and others. Phytoremediation Potential of *Crotalaria juncea* Plants in Lead-Contaminated Soils. *Journal of Agricultural Science*; Published by Canadian Center of Science and Education. 2021. Vol. 13, No. 12; Rr. 27-34.
8. Vargas, T. O.; Diniz, E. R.; Santos, R. H. S.; Lima, C. T. A.; Urquiaga, S.; Cecon, P. R. Influência da biomassa de leguminosas sobre a produção de polho em dois cultivos consecutivos. *Horticultura Brasileira*. 2011 29, no. 4, Rp. 562-568
9. Yaqubov G.Q., Negmatova S.T., Nurillaeva M. The role of *crotalaria* (*Crotalaria juncea* L.) plant in improving soil meliorative conditions. Collection of lectures of the International scientific-practical conference on "Integrated management and improvement of degraded soils for food security: new approaches and innovative solutions" April 22-International Earth Day. 2023 260-265 p.