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Dangerous Hydrometeorological Phenomena Observed in Lower Amudarya Region

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Abstract. This article reports on the eco-biological and salt-accumulating properties of alfalfa (Medicago sativa) local "Tashkent-2009", "Kyzilkesak" and introduced "Scepter" varieties.
As a result of our research, the possibility of haloaccumulation of the researched plants increases as follows: "Sceptra" → "Kyzilkesek" → "Tashkent-2009"; and it was found for the first time that the salt tolerance index decreases in the manner of Tashkent-2009→Kyzilkesek→Sceptra. Among alfalfa varieties studied on the basis of haloaccumulation indicators, "Tashkent-2009" adaptation to saline soils was noted.
The results of the obtained chemical analysis show that it is appropriate to use all varieties and samples of alfalfa in phytoremediation, depending on the haloaccumulation capabilities of plants and the amount of chlorine ions in them. Also, these fodder plants have characteristics of maintaining their salinity tolerance in other soil conditions, which indicates that their salinity tolerance is a stable genetic trait.
Keywords: phytoremediation, growth and development, haloaccumulation, salt tolerance, fodder crops, legumes, Medicago sativa, alfalfa varieties "Tashkent-2009", "Sceptra", variety "Kyzilkesek", mineral salt elements, HCO-3, Cl-, SO-24, Na+, K+, Ca+2, Mg+2 ions.

Abstract: analysis of meteorological indicators observed in the Republic of Karakalpakstan and assessment of dangerous hydrometeorological phenomena affecting agricultural crops.
Key words: dangerous hydrometeorological events, drought event, autumn and spring cold snap, high summer air temperature

Introduction In recent years, dangerous hydrometeorological events have been increasing in the Lower Amudarya region, one of the main reasons for which is the drying up of the Aral Sea. Dangerous hydrometeorological events have a negative impact on agriculture, economy, transport, logistics and other areas. The number of dangerous hydrometeorological events in the lower Amudarya region, such as drought, high summer air temperature, spring and autumn frost, strong wind (above 15 m/s), and dust storms, is increasing year by year. The drying up of the Aral Sea causes an increase in dangerous hydrometeorological events in the Lower Amudarya region. The Aral Sea provided the Lower Amudarya region with natural balance and water resources. The presence of the Aral Sea preceded the region's ecological decline, and the Aral Sea served as a source of climate-moderating water, mitigating extreme weather changes not only in the Aral region but also in Central Asia. The Aral Sea influenced the softening of cold air masses entering the region from the northwest in winter, and the moderation of hot and dry air masses in summer. As a result of the drying up of the Aral Sea, it can be observed that the recurrence of dangerous hydrometeorological events has increased in Central Asia, in particular in the Lower Amudarya region. As a result of climate change, the average amount of precipitation has decreased, the extreme values of summer air temperature have increased, and the periods of black frost are

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moving from year to year. The climate of the Lower Amudarya region, like the climate of the plains of the Central Asian region, is distinguished by its continentality and severe aridity due to its location in the center of the huge continent of the region. Continentality is manifested in sharp changes of meteorological elements during the day and throughout the year. Drought is characterized by very little precipitation and very dry weather conditions in summer [1, 3]. In recent years, dangerous hydrometeorological events such as dust storms are frequently repeated in Central Asia. One of the main reasons for this is the drying up of the Aral Sea as a result of drought events. Dust storms are worsening as air pollution from Moynaq city to other regions

The north-western part of Uzbekistan is one of the regions with the least annual rainfall in the Central Asian region. The average annual precipitation in the area varies around 100 mm. As for the whole region of the plain part of Central Asia, the main part of the annual precipitation falls on the cold season of the year, and there is almost no precipitation in the summer. Only in its northern part, in Ustyurt, Karakalpakstan and along the Aral Sea, most of the annual precipitation falls in summer. The study of dangerous hydrometeorological phenomena is of great importance in the development of the agricultural economy in the region, in the development of measures related to the provision of public health and food safety. From this point of view, monitoring of these dangerous hydrometeorological phenomena, studying the trends of their indicators change is one of the urgent issues [4, 5]. The issues of studying the sypoptic processes and dangerous hydrometeorological phenomena of Central Asia and assessing their impact on agricultural crops have been considered in the scientific researches of many scientists. Among them, N.A. Agaltseva, V.A. Bugaev., G.E. Glazirin ., T.A. Ososkova, A.V. Paku., Ye.V. Petrova., Ye. R. Semakova., L.E. Skripnikova, T.Yu. Spektorman, G.N. Trofimov, V.O. Usmanov, V.F. Usmanov, L. Babushkin., J. Matmuratov., V. Chub., V. Karnauxova., F. Muminov., F. Rakhmanova., A. Alautdinov., G. Kholboev., O. Sultashova and other scientists studied .

Materials and methods.Meteorological stations operating in the Republic of Karakalpakstan were also studied. Currently, continuous meteorological observations are carried out at 10 meteorological stations in the Republic of Karakalpakstan. It should be noted separately that all of these meteorological stations are equipped with automatic monitoring devices. It transmits all their tracking data to the Uzgidromet center and other necessary places in the online system.

Table 1

Information about meteorological data

Meteorological station (MS)	MS Located district, city	Meteorological observations have begun yil	Latitude	Longitude	Height above sea level m
Nukus	Nukus shahri	1874	42.27	59.32	75.0
Kungrad	Kungrad	1934	43.05	58.56	60.2
Jaslik	Kungrad	1951	44.06	57.30	127.0
Karakalpakiya	Kungrad	1941	44.57	55.50	130.0
Aktumsik	Moynoq	2000	45.08	58.18	173.8
Chimbay	Chimbay	1926	42.56	59.46	64.7
Muynak	Muynak	1928	43.45	59.02	53.8
Taxiatash	Taxiatash	1952	42.21	59.35	75.6
Taxtakupir	Taxtakupir	1986	43.01	60.17	59.8
Bustan	Ellikqala	2008	41.50	60.56	92.9

*Based on Uzgidromet data

The Republic of Uzbekistan is located in the central part of the Eurasian continent at 37-45° north latitude, 56-73° east distance, on the northern border of subtropical and temperate climate regions. The territory of the republic is 447.7 thousand km2, of which 78.8% is located in the plains, 21.2% in the mountain and sub-mountain areas. Its territory belongs to the arid zone of Central Asia. Four-fifths of the country's territory is located in the semi-deserts and deserts of Central Asia, bordered by mountain systems in the southeast and east. We can see that the amount of precipitation in the region decreases from year to year, severe droughts, excessive heating of the air temperature in summer, and the large amount of

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evaporation compared to the arrival of water in the region has increased significantly in recent years [2, 11, 12]. It is summarized on the basis of observation data of more than 50 hydrometeorological stations of Uzbekistan, including Tashkent, Fergana and Samarkand stations with a series of observations of more than 100 years. In general, the climate of Uzbekistan belongs to the dry continental type. The average July temperature in the plains ranges from 26°C in the north to 30°C in the south, with a maximum of 45-47°C. The average temperature in January drops to 0°C in the south, to -8°C in the north, and in some years the minimum temperature reaches -38°C (Ustyurt plateau). Precipitation falls mainly in the winter-spring period. The amount of annual precipitation in the plain reaches 80-200 mm, in the foothills 300-400 mm, and on the western and southwestern slopes of the mountain ranges 600-800 mm [6,7,8].

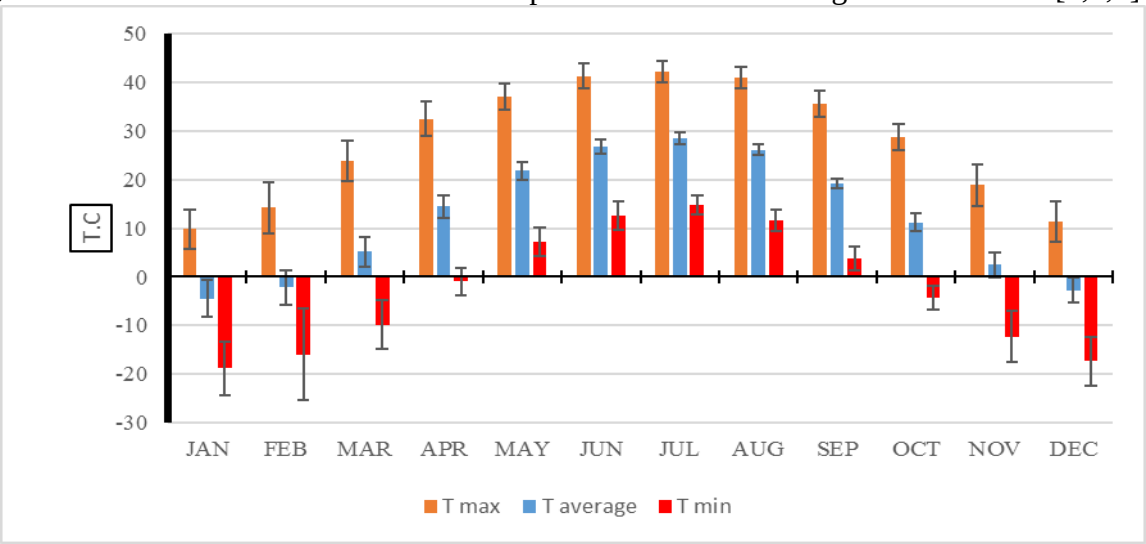

Figure 1. Average,maks,min temperature of Kungrad district in 1990-2022

The meteorological indicators observed at the Bustan weather station located in the Republic of Karakalpakstan, including the maximum and minimum average monthly air temperatures, are presented in tables and graphs. The maximum air temperature in the summer months of 2008-2021 was observed at the Bustan weather station, 45.9 ^{0}C in 2021. During the base period, the maximum air temperature in autumn was equal to 42.3 ^{0}C and occurred in 2010. The maximum air temperature in the selected weather station in winter was 34.2 ^{0}C and was observed in 2013. As a result of observations at the Bustan weather station, the maximum air temperature in spring was 43.9 ^{0}C and was recorded in 2021. The minimum air temperatures observed at the Bustan weather station in 2008-2021 were analyzed according to the seasons. According to it, the minimum air temperature in winter was -25.3 ^{0}C and was observed in 2012. The minimum air temperature in the summer months was 0.1 ^{0}C and occurred in 2021.

The minimum air temperature in the autumn season was recorded at the selected weather station -19.7 ^{0}C and was observed in 2016. In 2008-2021, the minimum spring temperature at the Bustan weather station was -14.9 ^{0}C and occurred in 2011. As a result of the analysis, it was found that the average air temperature observed in Bustan weather station located in the Republic of Karakalpakstan in 2008-2021 was equal to 14.1^{0}C.

As a result of the research, we selected Kegeili, Moynaq, Kangirot, Nukus, Chimboy, Karauzak regions of the Republic of Karakalpakstan as research objects. The subject of the research is the analysis of data from meteorological stations located in the Republic of Karakalpakstan.

As a result of the research, we selected the coordinates of the power data access viewer site of Kegeyli district and obtained the relevant hydrometeorological data, including: average air temperature, maximum and minimum temperatures, wind speed at a height of 10 m, and maximum and minimum speeds.

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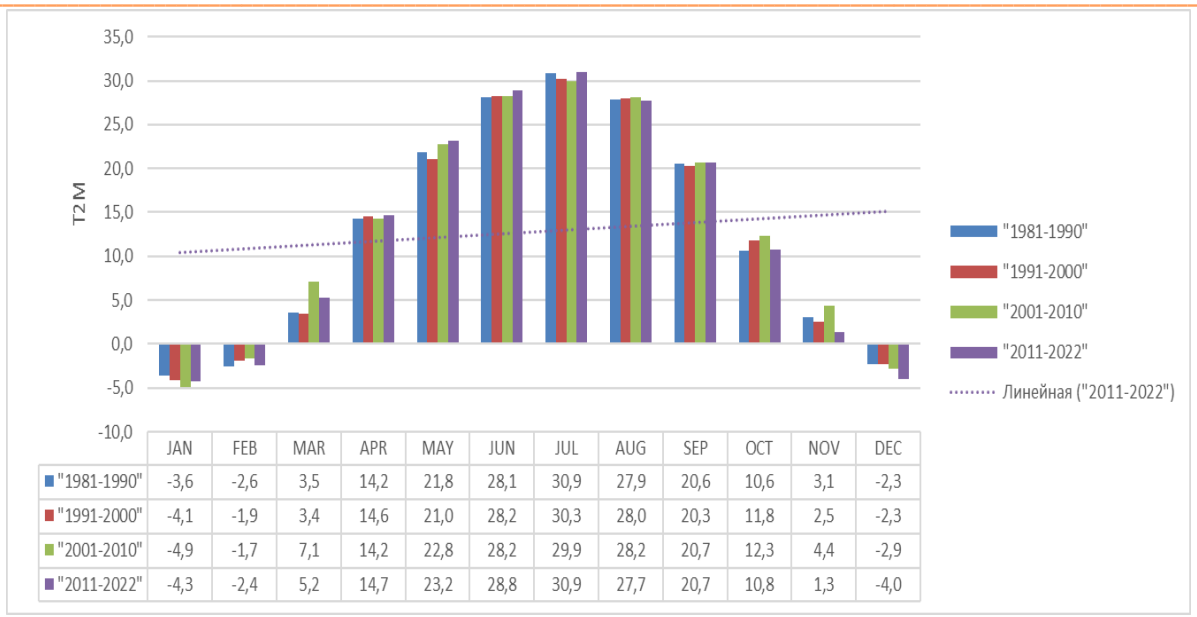

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
"1981-1990"	-3,6	-2,6	3,5	14,2	21,8	28,1	30,9	27,9	20,6	10,6	3,1	-2,3
"1991-2000"	-4,1	-1,9	3,4	14,6	21,0	28,2	30,3	28,0	20,3	11,8	2,5	-2,3
"2001-2010"	-4,9	-1,7	7,1	14,2	22,8	28,2	29,9	28,2	20,7	12,3	4,4	-2,9
"2011-2022"	-4,3	-2,4	5,2	14,7	23,2	28,8	30,9	27,7	20,7	10,8	1,3	-4,0

Figure 2. Average ten-year air temperature of Kegeili district in 1981-2022

The average hourly air temperature in the Kegeili district of the Republic of Karakalpakstan for the years 1991-2022 was analyzed (https://power.larc.nasa.gov/data-access-viewer/) via the website. As a result of the research, the average temperature of the ten years in Kegeili region was recorded as -3.6^{0}C in January in 1991-1900. Accordingly, in 1991-2000, the average ten-year air temperature in January was -4.1 ^{0}C. The average ten-year air temperature in Kegeili region in 2001-2010 was -4.9 ^{0}C in January. As a result of observing hydrometeorological data in Kegeili region of the Republic of Karakalpakstan, we can come to the following conclusion. That is, when we compare the base period with the current period, we can see that the average air temperature in January is rising by -3.6^{0}C, -4.1 ^{0}C, -4.9 ^{0}C. During the research, we can see that the average January air temperature increases by -1.3^{0}C. There are many reasons for this, such as anthropogenic factors in land use, drying up of the Aral Sea, global climate change, and the lack of water resources and atmospheric pollution. Following this situation, an increase in dangerous hydrometeorological phenomena is observed in the region. In particular, early spring and late autumn cold snaps, drought in the region and a decrease in underground water reserves, atmospheric air pollution and high summer temperatures (400C) are changing from year to year. Kegeili district is a district in the Republic of Karakalpakstan. Border area with Chimbay, Nukus, Karaozak Bozatov districts. 0.94 thousand km^2. Kegeili district is mainly engaged in agriculture. In this regard, it is necessary to study dangerous hydrometeorological phenomena in Kegeili district. As a result of these studies, information about dangerous hydrometeorological phenomena is important for the agricultural, economic, and livestock industries to make predictions for the coming years. As a result of the research, we can see that the amount is increasing in Kegeili district as a result of comparisons with other months.

Summary. The natural geographical conditions of the Lower Amudarya, where the Republic of Karakalpakstan is located, including its geographical location, topography and geology, were studied in general. The drying up of the Aral Sea and the ecological situation caused by it were highlighted. Air temperatures and atmospheric precipitation observed at weather stations located in the Republic of Karakalpakstan were studied based on the data of recent years. In the last three decades, the summer air temperature in the Lower Amudarya has increased by 2-2.5^{0}C, and the winter air temperature has decreased by 1-2^{0}C, the frequent recurrence of black frosty days in autumn and spring, the decrease of relative humidity in the air, the increase of windy days with dust and rain, frost-free days. it was studied that the period was shortened.

References

1. Matmuratov D. Agroclimaticheskie usloviya Severo-Zapadnogo Uzbekistana. Nukus, Karakalpakstan, 1989

ISSN NO: 2771-8840
Date of Publication: 08-12-2023

2. Rakhmanova F. F. Agroclimaticheskaya otsenka termicheskikh resursov vegetatsionnogo perioda s uchetom uslovii sozrevaniya korobochek hlopchatnika v Uzbekistane // Trudy SANIGMI. - 1988.
3. Reyzvich O. N. Agroklimatecheskie osnovy fitomelioratsii osvoeniya pustyn // Problemy osvoeniya pustyn. - 1989
4. Chub V.E. Climate change and its influence on hydrometeorological processes, agroclimatic and water resources of the Republic of Uzbekistan. Tashkent: Voris publishing house, 2007.
5. Qaldibaevich, I. A., Jumabay O'g'li, A. T., Janabergenovich, G. N., Saparbay O'g'li, K. N., & Joldasbayevna, A. U. (2022). ASSESSMENT OF HAZARDOUS HYDROMETEOROLOGICAL PHENOMENA AFFECTING AGRICULTURAL CROPS. *British Journal of Global Ecology and Sustainable Development*, *10*, 125-131.
6. Imanmurzaev Adilbek Qaldibaevich, Abdullaev Tozabek Jumabay O'g'li, Ganiev Nurman Janabergenovich, Khudaybergenov Nurlan Saparbay O'g'li, & Amangeldieva Umida Joldasbayevna. (2022). ASSESSMENT OF HAZARDOUS HYDROMETEOROLOGICAL PHENOMENA AFFECTING AGRICULTURAL CROPS. British Journal of Global Ecology and Sustainable Development, 10, 125–131. Retrieved from https://journalzone.org/index.php/bjgesd/article/view/149
7. Qaldibayevich I. A. et al. Qishloq xo 'jaligi ekinlariga ta'sir etuvchi xavfli gidrometeorologik hodisalarni baholash //ГЕОГРАФИЯ: ПРИРОДА И ОБЩЕСТВО. – 2022. – №. 2.
8. Турдимамбетов, И. Р., Отеулиев, М. О., Иманмурзаев, А. Қ., & Ходжаев, С. С. (2022). Аҳоли турмуш сифатининг таркибий тузилиши. Science and Education, 3(11), 1285-1293.
9. Иманмурзаев, А. Қ., & Базарбаев, Н. А. (2023). ОЦЕНКА ОПАСНЫХ ГИДРОМЕТЕОРОЛОГИЧЕСКИХ ЯВЛЕНИЙ, ВЛИЯЮЩИХ НА СЕЛЬСКОХОЗЯЙСТВЕННЫЕ КУЛЬТУРЫ,(НА ПРИМЕРЕ РЕСПУБЛИКИ КАРАКАЛПАКСТАН). Экономика и социум, (3-1 (106)), 336-343.
10. Abdullaev, T., Sultashova, O., Aleuov, A., & Imanmurzaev, A. (2023). Agroiqlimiy resurslarning Qoraqalpog'iston Respublikasi hududlari boyicha taqsimlanishi.
11. Abdullaev, T., Xudaybergenov, N., Kalmurzaev, J., & Imanmurzaev, A. (2023). Qishloq Xo'jaligiga ta'sir etuvchi xavfli gidrometeorologik hodisalarni baholash (Qoraqalpog'iston Respublikasi) misolinda.