

ABSTRACT

of the thesis work made by Akhylbekova Balzhan Akhmetbekkyzy under the topic “Herbage formation under the impact of grazing on steppe zone pastures in Arshaly district of Akmola region” submitted for the degree of Doctor of Philosophy (PhD) on Specialty 6D080100 – “Agronomy”.

Relevance of the research topic.

Natural pastures of the Republic are an important source of cheap fodder production. Pasture lands in Kazakhstan occupy 183.9 million ha, being the predominant type of land that determines the ecological and economic condition of the Republic.

Pasture resources in the Republic are characterized by two main problems. On the one hand, there is a gradual deterioration of productivity and quality of pasture fodder. On the other hand, there is a significant concentration of agricultural livestock on a limited territory.

There is an annual increase in over-intensive exploitation of watered pastures, especially near rural settlements and watering sources as a result of aimless use of pasture resources and increase in numbers of farm animals. As a result, pasture load has increased, yields have decreased, and the feed capacity of pasture lands has decreased due to overcrowding and unsystematic grazing.

Desertification and land degradation is not only an economic but also a global environmental problem of the whole mankind, and this process can be observed on all continents. The ecological balance is disturbed due to climate change and improper management of pasture load, as well as lack of proper rotation of livestock. It leads to a decrease in fodder reserves, degradation of pasture grounds, wind erosion and the growth of non-edible vegetation that animals do not consume. Desertification processes intensify over vast areas. Approximately 76.1% of lands in Kazakhstan are considered sensitive to desertification, with medium and high sensitivity. Besides, according to the data provided by FAO, the area of degraded lands in Kazakhstan is more than 50 million hectares, of which 38% is pastures. According to the Agency of the Republic of Kazakhstan on the use of land resources in the country, the amount of land that has reached the extreme degree of degradation by 2004 was determined at 26.6 million hectares, and in 2023 - 27.1 million hectares.

At the same time, pasture location in different soil and climatic zones makes them very difficult for performance of a large amount of work to survey pastures in the Republic and for development of a system of pasture resources management and technology for their rational use. Natural fodder lands in the administrative and territorial districts of the Republic are located unevenly - some districts have excess pastures with low density per unit area, while there is a lack of pastures and the load of livestock on them exceeds the established standards in other districts.

In this regard, it becomes extremely important to develop effective and scientifically-based systems of pasture resources management and to develop measures to restore pasture lands.

Purpose of the thesis research.

The purpose of the presented thesis work is to study the formation of herbage under the impact of grazing on the steppe zone pastures in the of Arshaly district of Akmola region.

Objectives of the study:

- to perform a comparative analysis of the current state of pasture lands and to assess the load on cattle pastures based on permissible norm in rural areas of Arshaly district of Akmola region;
- to assess agro-climatic indicators of Arshaly district of Akmola region;
- to study the impact of grazing on water-physical properties of soil in natural forage lands of steppe zone;
- to determine the botanical composition of the herbage in the steppe zone pastures of Akmola region and their dynamics by seasons of the year;
- to study the impact of grazing on the species composition of the herbage;
- to determine the yield of pastures at different levels of grazing;
- to assess the nutritive value of pasture mass by seasons of the year;
- to determine the economic efficiency of grazing technology on the steppe zone pastures of Akmola region.

Research Methods.

Geobotanical survey of pastures was performed under the methodology of experimental works on hayfields and pastures. Pasture mass during the geobotanical survey of pastures was determined by mowing method according to the methodology of hayfield and pasture yield accounting during expeditionary works. Raw mass was weighed separately at each replicate site and then placed in standardized gauze bags for drying. Before mowing, projective cover was noted at each site using the Ramensky method. Collection of statistical data was made according to statistical collections of the Statistics Agency of the Republic of Kazakhstan, as well as statistical reports provided by the Ministry of Agriculture of the Republic of Kazakhstan. The meteorological conditions of the research period were analyzed based on data obtained from Arshaly weather station. Two methods were applied for more objective assessment of agroclimatic resources. They are calculation of hydrothermal coefficient (HTC) under the method of Selyaninov G.T. and bioclimatic potential (BCP) based on the method of D.I. Shashko The reserves of productive moisture in the meter layer of soil were determined by thermostat-weight method.

Statistical processing of data was made using SPSS and Excel programs. The Shapiro-Wilk and Kolmogorov-Smirnov tests were performed to check the obtained data by repetitions and variants of the surveyed sites for normal distribution.

Levene's test ($p > 0.05$) was performed to determine the homogeneity of data variance. The effect of pasture use methods on yield, projective cover and herbage height in the plots with haphazard grazing and with pasture rotation (U1, U2 and U3) was analyzed using one-factor ANOVA analysis of variance. Duncan's criterion was used for multiple comparisons. All statistical analyses were performed using SPSS 23 (SPSS, Los Angeles, CA, USA, 2016).

Calculations of forage deficit in the studied pasture area and the need for additional pasture area, development of optimal pasture rotation scheme taking into account pasture loads were performed with the use of scientific and methodological manual on grazing loads on restored and degraded pastures, rules of rational pasture use, as well as the methodology for measures to combat pasture degradation and desertification.

Main points to be defended:

- geobotanical survey of pastures in rural districts of Arshaly district of Akmola region;
- assessment of the impact of grazing on the species composition of herbage and different levels of grazing on the yield and nutritive value of pasture grass;
- economic efficiency of pastures at different levels of grazing.

Description of the main results of the study.

- geobotanical survey of pastures was performed for the first time in the last 30 years on dark chestnut shallow soils of the steppe zone in Akmola region and the load of cattle on pastures was calculated;
- the impact of grazing on water-physical properties of soil of natural fodder lands of steppe zone was studied;
- the botanical composition of the herbage in the steppe zone pastures of Akmola region and their dynamics by seasons of the year under the impact of grazing were determined;
- yield of pastures at different levels of grazing was determined;
- nutritive value of pasture mass by seasons of the year was assessed;
- economic efficiency of grazing technology on pastures of the steppe zone of Akmola region was determined.

Justification of the novelty and importance of the results obtained.

Geobotanical survey of pastures was performed for the first time in the last 30 years on dark chestnut shallow soils of the steppe zone in Akmola region, and about 70 plant species belonging to 21 botanical families were identified. The Shannon-Weaver biodiversity index showed that year-round unsystematic grazing reduces the richness and biodiversity of plants in pastures. The optimal grazing load using an effective grazing rotation scheme was determined.

The recommendation on rational use of pastures by seasons of the year, load, fodder reserve, pasture rotation with application of digital technology is developed. The developed methodology and pasture rotation schemes will allow agricultural

producers, peasant and private farms in Arshaly district of Akmola region to increase the yield up to 0.9 tons per hectare and adhere to the norm and load of pastures for further preservation of pasture yield and prevention of degradation in comparison with haphazard grazing.

Relevance to science development directions or state programs.

The work was performed within the framework of NTP “BR06249209-OT-20 Development of intensive technologies in the branches of animal husbandry”, under the Project: “Development of effective technologies in the branch of beef cattle breeding”, under the measure: “Develop recommendations on rational use of pastures with application of results of field research and digital technologies in Akmola region”. The share of doctoral student's participation in this topic is 70%.

Description of the doctoral student's contribution to each publication.

During the thesis work the doctoral student personally participated in setting up and conducting ground research. She fulfilled the set research goals and objectives. She conducted geobotanical surveys and phenological observations of rangeland plants through the seasons of the year. The doctoral student fully participated in laboratory analyses, analyzed the results of research correctly applying research methods, achieved the set objectives by observing and taking into account the objects of research. All the results of the conducted research and conclusions presented in the thesis were formulated with the direct participation of the doctoral student. The author took an active part in the discussion of the results obtained and in the publication of articles in domestic and foreign publications.

3 articles were published in journals included in the database Scopus with a percentile of 79 (Q1), 92 (Q1) and 45 (Q3), 3 articles in the publications recommended by the Committee on Quality Assurance in the field of science and higher education of the Ministry of Science and Higher Education of the Republic of Kazakhstan under the thesis materials: 1) multidisciplinary scientific journal of A. Baitursynov Kostanay State University “3I - Intellect - Idea, Innovation” (Kostanay, 2020); 2) scientific-practical journal of West Kazakhstan Agrarian-Technical University named after Zhangir Khan. Baitursynov "3I - Intellect, Idea, Innovation" (Kostanai, 2020); 2) scientific-practical journal of the Zhangir Khan West Kazakhstan Agrarian-Technical University “Science and education” (Uralsk, 2020); 3) Bulletin of Science of the S. Seifullin Kazakh Agrotechnical University (Astana, 2022). The results of the study were reported at international scientific-practical conferences: Seifullin readings - 16: Youth science of new formation - the future of Kazakhstan (Nur-Sultan, 2020); Actual scientific research in the modern world (Pereyaslav, 2020); Seifullin readings - 18: “Youth and science - a look into the future” (Astana, 2022), in the international conference “AGBIOL 2023: V. International agricultural, biological & life science conference” Turkey, Edirne (2023).

Scope and structure of the thesis.

The work consists of 93 pages of computer text, including introduction, 3 sections, 20 subsections, conclusion, list of used sources and 9 appendices. The list of used sources consists of 122 titles. The text of the thesis is illustrated with 15 tables, 16 figures.