Elimination of desert pastures degradation through creation of perennial crop areas in Uzbekistan

Sohib Islamov[1], *Normamat* Namozov[1,*], *Munisa* Saidova[1], and *Dilrabo* Kodirova[1]
[1]Tashkent State Agrarian University, 100140, Tashkent province, Uzbekistan

Abstract. This article addressed effective agronomic practices used to cultivate promising varieties of desert forage plants suitable for soil-climatic conditions in order to improve the condition and increase the productivity of degraded desert pastures. The results of field research on the selection, collection, reproduction of seeds of perennial forage plant species with high productivity, resistant to drought and saline soils in the desert, and the restoration of the flora of degraded areas were also widely covered. The results of phenological observations showed that the highest germination and perfect seed count among desert forage crops was observed in kochia and agropyron, accordingly, was 31-32 seed germination and 60-65 perfect seed number, and seed purity and weight, agropyron crop also gave the highest results. The purity of seeds for agropyron crop was 62%, the smallest indicator referenced to haloxylon, accounted for 30%.

1 Introduction

Currently, around the world, scientific researches are being carried out in the field of improving the ecological condition of pastures degraded and low-yielding sandy desert soils, and the cultivation of food crops [1, 8]. In particular, implementation of new eco-friendly technologies is seen as promising solution towards identifying changes in soil cover as a result of degradation in pastures with sandy desert soils, eliminating the negative impact on the soil by studying the Phyto indicators of desertification, preventing the process of degradation in pastures by planting promising varieties of desert forage plants [3, 4, 9]. It is stated that the main reasons for the decline in pasture productivity are climate change, lack of regulation of pasture use for grazing, lack of new livestock management systems, declining forage species in pastures, irrigation of pastures, amelioration and adequate application of mineral fertilizers and seed production [2]. It can be said that all of these are factors that lead to pasture degradation and seriously impede the rapid development of the sector [1, 5]. It is known that the development and rational use of a set of agro-technological measures for the cultivation of desert forage crops in a specific ecological environment, including saline soils or natural desert pastures, is one of the most

* Corresponding author: n.ch.namozov@yandex.com

important issues of scientific and practical research. In this regard, analysis of germination, growth, normal development of seeds of these crops, accumulation of nutrient mass and seed production is very important, in order to develop agro-technological measures the cultivation of desert fodder crops.

When planting various desert forage crops, it is important to choose the right area, first of all, degraded and exposed areas can be selected and planted in areas with sparse vegetation cover, while timely quality tillage is important. Factors that characterize the aridity of the desert-climate high air temperature, dryness of the air, very low rainfall, very rapid drying of the soil surface, extreme climate change in the spring require the right choice of optimal timing of sowing. From the seeds sown at the right time, the right amount of grass is harvested. The best time to plant desert forage crops is December-February [7]. Vegetation thickness of desert forage crops kochia, agropyron, haloxylon, salsola, saltbushes, mangrove, wormwood, etc.), the viability of seedlings and adult plants is four times a year. In the spring, during the emergence of seedlings, during the flowering period in the summer, during fruit set, and in the fall - after the seeds are fully ripe. Natural pastures, which are distributed in arid conditions, have a number of unique features, as they are specific to the existing pastures in each specific area [3, 6, 7, 10]. The main ones are:

-The food resources of the Karakul areas (Uzbekistan) are seasonal in terms of use;

-Pasture food reserves are highly variable over years and seasons;

-One of the important conditions for the efficient use of pastures is their supply with a source of water (wells, pipes, boreholes, taps) ;

-The need to temporarily relocate livestock from the main grazing areas to other areas or other pastures due to a shortage of fodder due to inclement weather.

Preliminary research showed that a number of studies was conducted in the field of preserving dessert pastures, and main factors influencing desertification, however, there is still necessity for further study of how to save dessert pasture, especially through the use of perennial crops. Therefore, this research focused on developing ways to restore the flora of degraded areas by creating perennial forage shrub seedlings in desert soils in order to preserve pastures and increase their productivity.

2 Materials and methods

2.1 Study area

In this research, Aydar farm in Forish district of Jizzakh province (Uzbekistan) was selected as a study area (Fig. 1), where several types of forage crops, such as male grass, kochia, agropyron, haloxylon, salsola were planted, in order to create perennial forage seedlings growing in sandy desert soils.

Fig. 1. The process of preparing the study area for planting

2.2 Field experiment

Field experiment was used as method in this research. In this case, all, the natural, soil-climatic conditions of the region, the peculiarities of desert forage plants were taken into account. In fact, the correct selection and designation of agro-technical measures was an important factor in the timely and quality implementation of the planned work. Therefore, it was considered preventing the degradation of desert pastures and improve their natural condition, to ensure the germination and growth of seeds of various desert forage plants in sandy desert soils, as well as to achieve high nutrient mass accumulation - site selection, soil tillage and desert forage crops. It was identified that appropriate agro-technical measures, such as placement, optimal timing of sowing of desert forage crops, seed consumption standards, norms of seed consumption were depended on the ecological and biological, economic suitability, cleanliness and fertility characteristics of plant seeds [1, 2, 4, 5].

Furthermore, once the seedlings began to germinate, the field germination of seeds, the number and retention dynamics of seedlings, the development of adult plants, and the formation of the root system were determined. In the first year of vegetation, the height of the plants was measured, in subsequent years (from 2 years) the length of the buds on the bushes was measured for each plant type. The yield of fodder mass was taken into account by continuous mowing of the entire area. After drying, the selected samples were divided into stems, leaves and seeds (forage mass structure), after which the seed yield per plot and hectare was determined.

2.3 Laboratory experiment

Based on field experience, a laboratory experiment was conducted to re-examine the performance of crops. In this case, the laboratory experiment was intended to determine the growth of crops sown in the field and the number of perfect seeds. For the experiment, crops, such as kochia, agropyron, haloxylon, saltbushes were planned.

3 Results and discussion

According to the results of phenological observations (Table 1), the highest germination and perfect seed count among desert forage crops was observed in kochia and agropyron, and the average was 31-32 seed germination and 60-65 perfect seed number.

Table 1. Phenological observations on the growth and development of desert forage plants (2020)

Crop type	Germination of seedlings	The first branching	Main branches	Average hight (cm)			Plant thickness (thousand pieces / ha)		
				April 3	May 2	June 1	April 3	May 2	June 1
Kochia	April 3	May 2	June 1	7±0.4	10.0± 0.9	20.0± 4	10350	8860	8800
Agropyron	April 3	May 2	June 1	5.0±0. 1	11.0± 2.6	21.0± 3.7	16020	14000	12850
Haloxylon	April 7	May 6	June 1	5.0±0. 3	10.3± 2.0	20.5± 2.6	125	123	74
Salsola	April 7	May 6	June 1	5.5±1	9.0±1	17±3	155	140	95

In terms of seed purity and weight. agropyron crop also gave the highest results. In this case. the purity of seeds by type of agropyron crop was 62%. the smallest indicator referenced to haloxylon accounted for 30% (Table 2).

Table 2. Quality indicators of seeds of desert forage crops

Crop type	Sample Weight (gr)	Seed weight (gr)	Seed purity (%)	Number of seeds (pcs)	Seeds weight, (gr)		
					Number of Iterations		
					1	2	3
Saltbushes	5	2.15	51	549	4.0	4.4	3.9
Kochia	2	0.9	48	479	1.38	2.1	1.74
Agropyron	5	5	62	405	3.95	4.0	3.9
Haloxylon	2	2	30	185	2.51	2.5	2.71

The desert food crops selected for this research, such as kochia, sorghum, and krascheninnikovia, are among the most productive, highly resistant to the external environment, highly viable, and satisfactorily digestible phytomeliorants for almost all desert areas (Table 3).

Table 3. Fertility and perfect seed count of desert forage crops under laboratory conditions

Crop type	Sown seeds, (pcs)	Sprouted seeds			Observation time for growth	Perfect number of seeds, (pcs)		
		Number of iterations				Number of iterations		
		1	2	3		1	2	3
Saltbushes	50	27	22	28	12.01.20-07.02.20	56	54	60
Kochia	50	30	29	33	12.01.20-07.02.20	62	60	57
Agropyron	50	29	33	34	12.01.20-07.02.20	70	65	63
Haloxylon	50	25	25	26	12.01.20-07.02.20	46	39	43

Widespread use of forage crops such as sorghum, krascheninnikovia, kochia, haloxylon, agropyron in year-round use in desert pastures: the research results highly recommended to sow the seeds of desert forage plants, tailwort 7 kg/ha, sorghum 9 kg/ha, krascheninnikovia 6 kg/ha, saxaul 5-6 kg/ha, kochia 3-4 kg/ha, agropyron 3-4 kg.

4 Conclusion

In general, in improving the condition of desert pastures, it is necessary to implement a number of complex measures, such as the development of agro-technical measures aimed at restoring, maintaining, increasing and protecting the fertility of sandy desert soils, eliminating the process of soil degradation by predictive methods. These, in turn, serve as a scientific basis for maintaining, increasing and protecting the fertility of pasture soils, as well as the efficient and rational use of land on farms specializing in desert-pastoral animal husbandry.

The outputs of the research showed that for seed purity and weight, agropyron crop also gave the highest results, whereas the purity of seeds for agropyron crop was 62%, the smallest indicator referenced to haloxylon, accounted for 30%. Widespread use of forage crops such as sorghum, krascheninnikovia, kochia, haloxylon, agropyron in year-round use in desert pastures: the research results highly recommended to sow the seeds of desert forage plants, tailwort 7 kg/ha, sorghum 9 kg/ha, krascheninnikovia 6 kg/ha, haloxylon 5-6 kg/ha, kochia 3-4 kg/ha, agropyron 3-4 kg.

References

1. A. Tokbergenova, L. Kiyassova, S. Kairova, Polish Journal of Environmental Studies, **27**(5), 125-134 (2018)
2. A.S. Manaenkov, L.P. Rybashlykova, Arid Ecosystems, **10**(4), 358-367 (2020)
3. N.A. Boboqulov, A. Rabbimov, A. Toshmurodov, In: Materials of the Republican scientific-practical conference, **2**, 40-44 (2013)

4. L.A. Gafurova, In: Materials of the Republican scientific-practical conference, **2**, 27-35 (2013)
5. M.M. Makhmudov, L.A. Gafurova, G.M. Nabieva, In: The role of environmental assessment of agricultural land in the development of regions and protection of the ecological balance, **1**, 26-28 (2015)
6. O.KH. Otakulov, In: Materials of the Republican scientific-practical conference, **2**, 7-9 (2013)
7. A.E. Tangirov, Collection of scientific-practical seminar reports, **1**, 453-456 (2016)
8. S. Khasanov, *Assessment of desert extension and soil salinity in Mirzachul Steppe, Uzbekistan*, 93 (2019) doi.org/10.13140/RG.2.2.14288.33287
9. S. Isaev, I. Begmatov, G. Goziev, S. Khasanov, In IOP Conference Series: Materials Science and Engineering, **883**(1), 012080 (2020)
10. I. Aslanov, S. Khasanov, Y. Khudaybergenov, M. Groll, Ch. Opp, F. Li, E. Ramirez Del-Valle, In GI 2021, **227**, 02005 (2021) doi.org/10.1051/e3sconf/202122702005