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STRUCTURE AND PRODUCTIVITY OF MULTICOMPONENT AGROPHYTOCENOSES FOR CASPIAN ARID ZONE

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ABSTRACT

The results of the study of soil moisture reserves during the growing season showed that they are maximal in April. By this time the first meter of soil rangelands it is 98.2 mm, for the first option agrophytocenoses - 109.5 mm, the second - 112.3 mm, the third - 156.6 mm. Comparison of the amount of moisture produced from phytocoenoses products allowed the calculation of production rates of water that make for a natural pastures 1500-4900, for the first option - 465-910, the second - 450-760, the third - 640-700 kg of water to create 1 kg of dry matter .

INTRODUCTION

Arid regions of Russia, covering a vast area, have great economic value and have an exceptional natural resource potential. The total area of drylands by a factor of aridity 0,11-1,00 over 120 million hectares. Here lived and worked about 30 million people, produces more than half of the total produced in the Russian Federation, grain, meat, milk, vegetables, fruits and berries.

Currently, the land fund of the arid regions of Russia is critical that more than half plane agricultural lands subject to erosion and desertification. Area wind-eroded ploughed field annually increases on 400-500 thousand ha. The high concentration of population, industrial and agricultural production ¬ duction led to a sharp deterioration of ecological conditions (Zvolinsky, Kulik, Pavlovsky, 2000).

In the semidesert and desert zones dominated by Russia (47% area) forage high lands with yields 0.15-0.35 t / ha. 30% of the area - with a yield of 0.35-0.40
t / ha, 11% - with a yield 0.2-0.4 t / ha and 7% - with a yield of 0.4-0.7 t / ha.

As a result of degradation of arid ecosystems, a new quality of the environment, which can be defined as an environmentally strained and destabilized, which is a qualitatively new phase in the evolution of the biosphere. Negative environmental factors (weather, exogenous) lead to the destruction of land erosion, to decrease their soil fertility. Numerous botanical and geographical and ecological phytocenological studies in the arid zone, suggest that the formation of the modern floristic composition and structure of vegetation affect soil and climatic conditions and anthropogenic, pyrogenic and biogenic factors.

Among the anthropogenic factors influencing the successional processes of vegetation, highlight the cutting of trees and shrubs and half-shrub plants, plowing and irregular grazing, not restored.

The interaction of all these factors contribute to the formation of the arid zones ephemeroid and ephemeroid-sagebrush vegetation, with lower productivity, which ultimately pushes out of the bushes and shrubs plant communities, leading to an increase in the number of weeds, poisonous plants.

If you currently do not take effective measures to improve the environmental situation of the Caspian Sea an arid zone, there may occur a large-scale ecological catastrophe, with consequences that adversely affect the other regions of European Russia.

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Therefore, in today's natural and economic and environmental conditions of the Caspian Sea the rational and environmentally sound natural resources associated with the development and practical implementation of farming systems to a new generation of adaptive landscape basis, where measures to improve productivity and resistance to erosion of major natural lands in the region - the steppe pastures - must occupy prime location and highly productive conservation tillage should be formally incorporated into the natural ecosystem of the region.

In order to restore species diversity, enrich the soil organic matter, preventing the development of erosion processes, vegetation stabilization of disturbed landscapes, increase productivity, recommended the establishment of perennial pasture reclamation agrophytocenoses using a variety of life forms and species of host plants.

Tier complementarity provides a more complete exploration of spatial ecological niches and, consequently, the intensification of the use of environmental resources (Shamsutdinov Ibragimov, 1983).

The principle of complementarity tier is implemented by sowing seed mixtures of host plants of different life forms and species, differentiating in the process of pasture ecosystems ecotone on different temporal and spatial (both aboveground and underground spheres) ecological niches.

In papers Z.Sh. Shamsutdinova (1998, 2000), Z.Sh. Shamsuddinov, IO Ibragimov (1983) has been experimentally substantiated the proposition that a more complete mastery of fundamental ecological niches and intensifying the use of environmental resources is achieved in the pasture ecosystems, which are modeled on the type of zone biogeocenotic structures. It is in these pasture ecosystems of the most complete realization of the principle of mutual complementarity of host plants on the basis of differentiation of niches. The interaction between the members of the grassland ecosystem of life forms, species, ecotypes, varieties of fodder plants, selected on the basis of the block diagrams of zonal types biogeocenoses, according to their ecological and biological phytocenotic compatibility, as a rule, there is synergistic (cooperative) effect.

The question about the environmental complement of species in plant communities was first discussed, L.G. Ramensky. He distinguished between seasonal or phenological addition, raznogodichnoe mutual complement, mutual complement the use of external resources. Based on the concepts of modern ecology and phytocenology, K.A. Kurkin (1983) developed a new methodology based on the principle of mutual complementarity of species and showed the fruitfulness of this approach in dealing with the creation of productive meadow mixtures.

The overall productivity of the ecosystem depends not only on individual adaptive potential of plant organisms, but, obviously, more integral adaptive potential ecosystem as a whole formed by the interaction effect of varieties, ecotypes, species and life forms of food plants that are part of the ecosystem. In determining the direction and ways to develop methods of biological restoration of degraded rangelands through the development of adaptive agrophytocenoses most important task is to study the mechanism of interaction of life forms, species, ecotypes, varieties of food plants in their joint growth. This allows maximum use of emerging "cooperative" interaction effects microgroups.

In order to maintain productivity in arid zones cenosis with changing environmental factors is necessary to identify species of food plants, dedicated to different conditions, but perform the same function in ecosystems, and are capable of mutual substitution to changing environmental conditions. Similar examples can be found in natural plant communities of arid zones. N.T. Nechayev indicates that the grouping of different types of desert sedge: tolstostolbikovoy sedge and sedge and swollen in Badkhyz Karabil give in different years, similar in quality and quantity of the total phytomass. These communities are based on the type of eco-functional aggregations of closely related species, when two or more species act as environmental cenosis amount of species, a functionary of exhibitors for each state of the environment. Thus, when abruptly changing weather conditions, the foothills and piedmont plains, effective mixture of prostrate, soups east, spreading sagebrush (Shamsutdinov, 1975, 1979; Shamsutdinov, Ibragimov, 1983).

MATERIAL AND METHODS

From the above follows that the conditions for arid areas should create multi-component mixtures of host plants with the inclusion of a functionally similar role to cenotical species. When you create a multicomponent agrophytocenoses we used the best on the complex ecological and biological and economic characteristics of the samples and ecotypes of forage plants, concentrated in the collection and breeding nurseries Caspian arid forage plants of the gene pool. The long period of active vegetation of introduced shrubs and subshrubs (up to 230 days) and lack of summer depression can smooth out seasonal fluctuations in amplitude and forage stock pasture forage nutritive value when used as components of the pasture agrophytocenoses.

Therefore, based on the teachings of the types of adaptive strategies, differentiation of ecological niches and complementary species, ecotypes and cultivars in multispecies communities and feed the results of our joint Research Institute of the All-Russian Research Institute of forage and agroforestry research, developed the principles of adaptive biogeocenotic ecological restoration of biodiversity and productivity of degraded grazing, which should be considered as a reasonable basis of pasture in the arid zones.

When you create a multicomponent agrophytocenoses we used the best on the complex ecological and biological and economic characteristics of the samples and ecotypes of forage plants, concentrated in the collection and breeding nurseries Caspian arid forage plants of the gene pool. Field experiments were laid with the following composition and ratio of forage plants in the test agrophytocenosis:

Option 1 - winterfat white, prostrate prostrate summer cypress, kamforosma in the ratio 1:2:3 Lessing, respectively;

Option 2 - winterfat white, prostrate summer cypress, kamforosma in the ratio 1:2:3 Lessing and desert wheatgrass sown between rows;

Option 3 - winterfat gray, prostrate summer cypress, kamforosma in the ratio 1:4:3 Lessing and aisles sown seed mixture of desert wheatgrass, wheatgrass slender and bulbous bluegrass, astragalus;

Option 4 - natural pasture (control).

Seeding rate subshrubs were determined at the rate of 40-50 thousand individuals subshrubs to 1 hectare. Sowing grass species was determined by the rate of 30% of the normal sowing their crops to create monocomponent.

RESULTS AND DISCUSSION

By the beginning of the growing season were favorable hydrothermal conditions, which was one reason for the high field germination of seeds of exotic species (80%) and very high survival rate of seedlings. Autumn records showed that during the growing season death of the plant did not exceed 15%, significantly below the values of this parameter in comparison with the observations of other years, and data references. In addition, favorable environmental conditions contributed to the intensive development of spontaneously recorded and preserved in the soil seeds. In variants of the experiment in the first year there were 15 species of plants. The most numerous of them are knot-grass, stag sand, smooth brome, Mortuk wheat, wormwood Lerch, bulbous bluegrass, grasses, crucifers, small beans. According to the results of spring registration in the amount of phytomass are much higher than the yield of exotic species. In the first version of 2.05 t / ha of the total phytomass, they accounted for 78% in the second - from 2.6 tons / ha - 62% and the third - from 4.98 t / ha - 80% (Table 1).

Table 1. Comparative characteristics of productivity options agrophytocenoses

Option	The above-ground phytomass, t / ha dry matter				Underground phytomass, t / ha dry matter	
	may		october		october	
	only	shrubs	only	shrubs	only	shrubs
1	2	3	4	5	6	7
The first year of vegetation						
1	2,05	0,45	1,05	0,61	—	0,45
2	2,60	0,97	1,62	1,21	—	0,61
3	4,98	1,00	2,02	1,42	—	0,74
4	0,80	—	1,15	—	1,52	—
The second year of vegetation						
1	1,57	1,32	1,94	1,86	—	1,26
2	1,71	1,50	1,91	1,89	—	1,38
3	1,88	1,58	2,28	2,10	—	1,31
4	0,38	—	0,25	—	1,40	—
The third year of vegetation						
1	2,24	2,03	2,72	2,56	—	1,56
2	2,39	2,15	2,96	2,61	—	1,58
3	2,58	2,20	3,14	2,92	—	1,61
4	0,39	—	0,27	—	1,46	—

Of course, having a highly competitive compared to being introduced plants, they significantly affect the productivity of the latter. But by the end of the growing season most of the crop phytomass agrophytocenoses formed already sown species, they accounted for 58.1%, 74.7% and 70.3% respectively

In absolute terms in the autumn harvest phytomass accounting was the most productive third option (2.02 t / ha), then - the second (1.62 t / ha) and first (1.05 t / ha). Comparison of options agrophytocenoses with natural grassland (1.15 t / ha) showed that in the first year of life after sowing agrophytocenoses surpass it in terms of productivity by 0.37 - 0.87 t / ha.

In the second year, amid worst drought productivity of natural pastures averaged 0.35 t / ha, and agrophytocenoses - from 1.57 to 1.88 t / ha. Moreover, to autumn forage stock on natural pastures decreased to 0.25 t / ha, whereas the experimental crops, he was 1,91-2,28 t / ha, with most of the crop (90%) formed an ecologically

For the third year of vegetation the majority of the harvest agrophytocenoses formed at the expense of dwarf shrubs that are drought has less effect than in the herbaceous vegetation and sagebrush. Therefore, in the third year of life agrophytocenoses productivity was 9-10 times higher than natural pastures. Accounting for the height of grass plant communities showed that the most intense regrowth among different dwarf shrubs winterfat, a somewhat less rapid growth characteristic of prostrata and lags far behind them kamforosma.

In the third year of life, when there was a relative stabilization of the species composition and structure options coenosis height grasses essential to an average of: winterfat - 50,8-54,1 cm; prostrata - 48,2-48,8 cm; kamforosmy - 34 7-35,1 cm; wormwood - 20,4-25,3 cm; from the herbaceous component with maximum depth differed grass wheatgrass long - 83.4 cm; desert wheatgrass - 67,6-68,2 cm and Poa bulbosa - 31, 9-33,1 cm (Fig. 1).

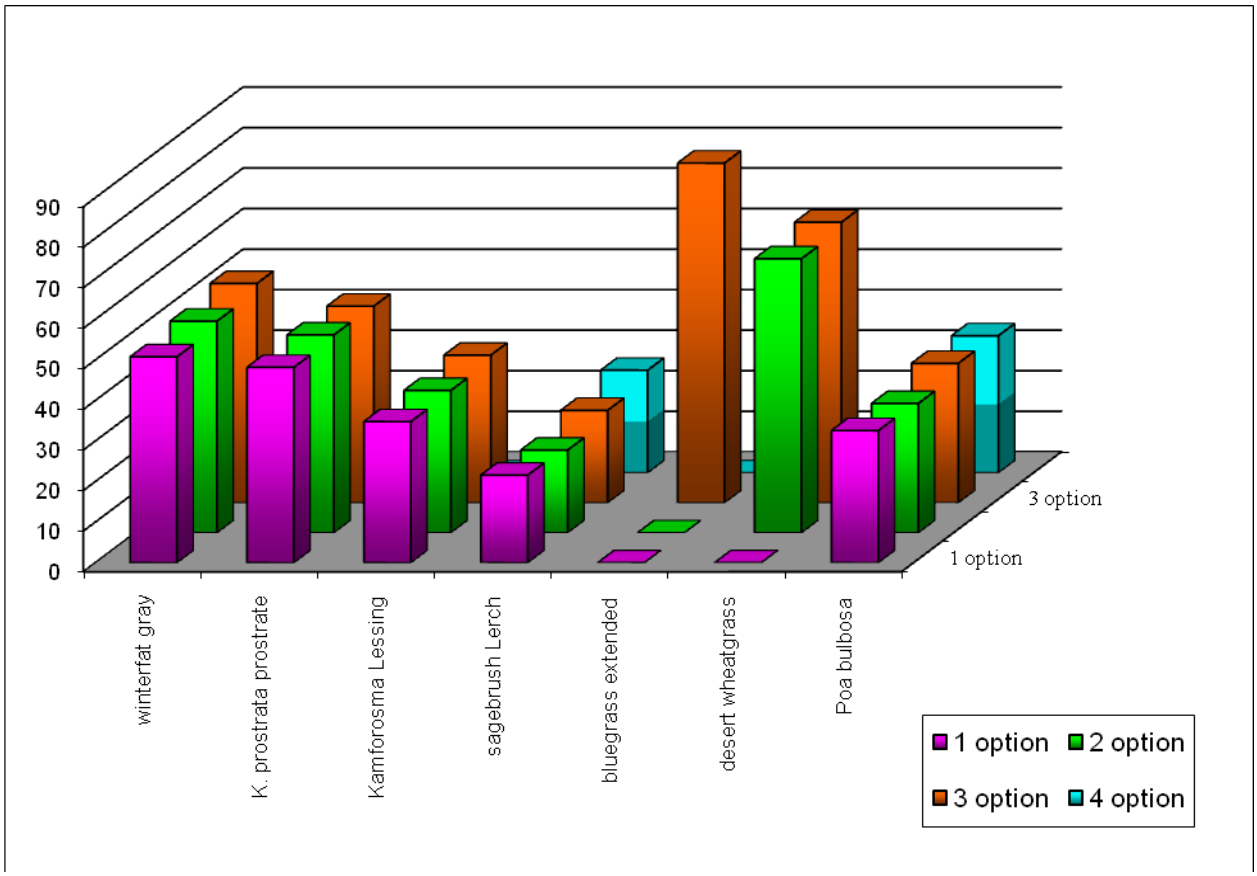

Figure 1. Height of grass in the main components of cenosis experimental variants

Based on these data, significant differences in height of dwarf shrubs in the first two options cenoses not. Tall and winterfat kamforosmy in the third variant can be attributed to large compared to other options for soil moisture content at which react more sensitive to this factor and winterfat kamforosma. To the same extent it applies to the sagebrush and grasses.

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Comparison of the amount of moisture produced from phytocoenoses products allowed the calculation of production rates of water that make for a natural pastures 1500-4900, for the first option - 465-910, the second - 450-760, the third - 640-700 kg of water to create 1 kg of dry matter . More efficient use of soil moisture agrophytocenosis due, apparently, with the following circumstances: firstly, the absence of a sharp decline of physiological activity and activity with the onset of xerothermic period, which are characteristic of sagebrush-ephemeral formations, and secondly, a large saturation and a more even distribution root mass in the vertical profile in comparison with natural coenoses, in which about 80% by weight of the roots are concentrated in the first meter of soil. In the lower layers of soil, particularly in the second meter layer, holds about one third of the amount of moisture that the plants with deeply penetrating root system can be used directly.

Thus, for the conditions of the Lower Volga is the third version of the best grazing agrophytocenoses created from a mixture of gray winterfat, prostrate, kamforosmy Lessing with perennial grasses, as it exceeds the productivity of the first two options at approximately equal value, the use of the stored moisture in the soil.
This option can be taken as the base for semi-arid zone of the Lower Volga region. However, taking into account the diversity of edaphic, conditions coenotical zone, as well as earmarked agrophytocenosis, the

composition and structure of constructed ecosystems can be changed. By varying the ratio of life forms and species coenosis can regulate seasonal stocks phytomass.

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