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Plant breeding

DETERMINATION OF FEED QUALITY AND MALLOW ORGANIC RESIDUES

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Abstract

In this article, the quality of forage in pastures and meadows of the Ganja-Kazakh region was determined. *Malva* L., a species of the genus found in the Ganja-Kazakh region, introduced *Malva erecta* Presl. The number of remains of representatives of the Duzkalkhan species in the branches, the chemical composition of the green mass and roots were investigated. The main indicators of the chemical composition characterizing the importance of the feed include the content of dry matter, wet protein, nitrogen-free extractive substances, lipids, wet fibre, macroelements, ascorbic acid, carotene, etc. Given that the soil biomass of five sorghum species has been studied, the chemical composition of their seeds, plucked and harvested residues depending on a number of factors – duration, sowing method, effect of fertilizers, interaction of components, harvesting period, and annual conditions. The amount of uprooted stubble is reduced to a greater extent than mowed stubble. The nutritional value of a plant significantly depends on the content of nutrients, mineral elements and vitamins in the dry mass. The bud formation phase has less dry matter in the total above ground biomass compared to the flowering and fruiting phases. In terms of species, *Malva sylvestris* (Forest mallow) had the most dry matter in this period, and *Malva nicaeensis* (Turkmen mallow) had the least amount of dry matter. The amount of organic remains is highest in *Malva pusilla* species, and the smallest in *Malva nicaeensis* species, in contrast to roots.

Key words: feed quality, organ residues, nutritional value, chemical composition

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Introduction. In the flora of Azerbaijan, there are 10 species belonging to the genus Malva. These species are constantly in the spotlight due to their importance as both food and feed, so their cultivation is essential [1, 2]. The feeding qualities of *Malva* L. species were studied and the species found in pastures and meadows were identified. The number of remains of representatives of the studied species when used for food purposes, the chemical composition of green mass and roots in all phases of development was studied. To determine the amount of nutrients in a species, it is necessary, in addition to above ground biomass, to study organic residues in plowed and cut soils [3, 4].

Species *Malva* L. (Malvaceae Juss.) are distinguished by the presence of a large amount of organic matter as high-yielding plants. This indicator includes the timing and methods of planting, planting rates, plant nutrition areas or planting density, mineral fertilizers, species and varietal characteristics, etc. [5–8].

Methods. In the study areas the forage quality of *Malva* L. *Malva nicaeensis* All. – Turkmen mallow, *Malva pusilla* Sm. – Small mallow, *Malva parviflora* L. – Small-flowered mallow, and *Malva sylvestris* L. Caucasian *Malva erectus* Presl., obtained from the flora of Azerbaijan (village Agbulag, Ismayilli region), was determined using various methods found in the literature [9–12]. Under the *Malva* plant, soil samples were taken 3 times at a depth of 0–50 cm in the spring, summer and autumn seasons, microbiological analyses were carried out, and the dynamics of bacterial contamination by season was studied. The studies were carried out according to the general rules adopted in botany, microbiology and soil science. Biochemical methods have been used to study the dynamics of the forage quality of plants [13–15].

Results. As a result of the research, *Malva nicaeensis* All. is one of the species of the genus Malva found in the Ganja-Kazakh region of the Lesser Caucasus in the studied areas and in the valleys. *Malva pusilla* Sm. – Small malva, *Malva parviflora* L.– Small-flowered malva and *Malva sylvestris* L. Another supply of forest mallow seeds was received from Agbulag village of Ismayilli region. At this time, various methods found in the literature were used. As for the above ground biomass, the amount of crushed mallow species increases from the budding phase to the fruiting phase [16, 17]. In the species, the mass of total residues of turbidity increases from the beginning of generative development to the end of the fruiting phase in comparison with the roots. In the budding phase, harvested remains of mallow species can increase from 4.39 t/ha to 11.36 t/ha. *Malva erecta* is the most productive and outperforms the other species. The total amount of residues ranged from 53.7% to 57.9%. Of the local species, *Malva pusilla* (Small mallow) has more organic residues in cutting areas, and *Malva nicaeensis* (Turkmen mallow) has less organic residues. The amount of organic residues in the roots is from 42.1 to 46.3%. In contrast to the roots, its percentage is the highest in *Malva pusilla* and the lowest in *Malva nicaeensis*. The mass of organic residues in the flowering phase ranged from 7.17% to 17.33%, depending on the species.

The mass of organic residues increased from 2.58 t/ha to 5.97 t/ha compared to the budding phase. The total amount of organic residues in *Malva erecta* is also 2.35 t/ha for *Malva parviflora* (Little-flowered mallow), 4.29 t/ha for *Malva nicaeensis* (Turkmen malva), 6.50 t/ha for *Malva sylvestris* (Forest malva) and up to 10.16 t/ha more than *Malva pusilla* (Small mallow). Compared with the previous phase, the proportion of turbidity in the removed residues increases by 1.4–2.5%, while the proportion of roots, on the contrary, decreases accordingly (Table 1).

T a b l e 1

Number of harvested residues of *Malva* species for the period of use for food, t/ha (2012–2013)

Type	Crop residues, t/ha	Total			
		Straw		Roots	
		t/ha	%	t/ha	%
Development phase – bud formation					
M. erecta	11.36	6.25	55.0	5.11	45.0
M. parviflora	4.90	2.78	56.7	2.12	43.3
M. nicaeensis	4.39	2.54	57.9	1.85	42.1
M. sylvestris	8.03	4.38	54.5	3.65	45.5
M. pusilla	8.76	4.70	53.7	4.06	46.3
Development phase – blooming					
M. erecta	17.33	9.96	57.5	7.37	42.5
M. parviflora	14.98	8.37	55.9	6.61	44.1
M. nicaeensis	13.04	7.21	55.3	5.83	44.7
M. sylvestris	10.83	6.31	58.3	4.52	41.7
M. pusilla	7.17	4.27	59.6	2.90	40.4
Development phase – fruit formation					
M. erecta	21.78	12.89	59.2	8.89	40.8
M. parviflora	19.17	11.21	58.5	7.96	41.5
M. nicaeensis	17.04	9.71	57.0	7.33	43.0
M. sylvestris	13.74	8.23	59.9	5.51	40.1
M. pusilla	9.44	5.68	60.2	3.76	39.8

The mass of organic residues reaches its maximum value near the fruit formation phase and exceeds the previous phase by 126–132%. The superiority of *Malva erecta* (Duzgalkhan malva) is evident. The amount of organic residues in it is 2.61 t/ha from *Malva parviflora* (Small-flowered mallow), 4.74 t/ha from *Malva nicaeensis* (Turkmen mallow), 8.04 t/ha from *Malva sylvestris* (Forest mallow), *Malva pusilla* (12.34 t/ha more than Malva). The amount of organic residues in the proportion of straw in hay residues continued to increase. Compared to the flowering phase, the percentage of straw increased by 0.6–3.2%, while in the roots, on the contrary, it decreased by the same amount. In plants, closer to the matura-

tion of the seeds, the aerial part and the roots of the species begin to dry. In this regard, although the dry matter does not decrease, the mass of organic residues decreases. Among the labour-intensive species in the accumulated remains, the upright mallow (Duzgalkhan mallow) prevails over all the others. Mallow is upright and small-flowered, like high-yielding late-ripening hibiscus species, in different years, even when collecting seeds, they have viable roots, and then they can grow back and produce a new crop of grass. The buds dry out faster than the roots, so their proportion in organic matter is usually reduced compared to the fruiting and flowering phase. When the species mature, their above ground parts begins to dry out completely. Thus, there is a greater decrease in the amount of stolen remains compared to collected remains. Mowed and straw residues quickly rot and mineralize. Thanks to strong, deep roots, it softens the lower part of the soil for plowing, loosens it and enriches it with nutrients. It significantly improves the structure, aeration, microbiological composition of the soil, increases the biological activity of the soil as a whole. The nutritional value of fodder plants significantly depends on their chemical composition. On the other hand, the chemical composition of the plant, together with the productivity of the above ground biomass, is the main characteristic that determines the productivity of the species. The main indicators of the chemical composition that characterize the nutritional value of a plant include the content of dry matter, wet protein, nitrogen-free extractives, lipids, wet fibre, micro and macroelements, ascorbic acid, carotene. Given that the studied species are new fodder plants, in our experiments, the above ground biomass, seeds, harvested and harvested remains of five mallow species were determined by a number of factors – duration, planting method, fertilizer effect, interaction of components, harvesting period, annual conditions, etc. We studied the chemical composition depending on it. Their valuable chemical composition can be attributed to the important characteristics of mallow species. This is primarily due to the fact that it is rich in protein, nitrogen-free extractives (NFE), ash, vitamins and macronutrients.

T a b l e 2

Chemical composition of the green mass of mallow species in the phase of bud development percentage of absolutely dry mass (2012–2013)

Indicators	*M. erecta*	*M. nicaeensis*	*M. pusilla*	*M. sylvestris*	*M. parviflora*
Dry mass, %	14.83	14.00	14.23	16.61	16.03
Protein	25.56	24.56	24.88	23.08	22.60
NFE	39.24	42.34	40.81	41.19	42.92
Lipids	3.93	3.19	4.07	5.75	3.93
Cellulose	15.52	16.20	15.21	15.56	16.48
Ash	15.75	13.71	15.03	14.42	14.07
Ascorbic acid	280.66	260.27	275.38	352.63	253.39

The total above ground biomass in the bud phase contained less dry matter than in the flowering and fruiting phases. In terms of species, the driest matter during this period is *Malva sylvestris* – forest mallow, and the least *Malva nicaeensis* – Turkmen mallow. The amount of dry matter in *Malva sylvestris* is 0.58% more than in *Malva parviflora* – small-flowered mallow, 2.38% *Malva pusilla* – small mallow, 1.78% *Malva erecta* – Duzgalkhan mallow and 2.61% *Malva nicaeensis* – Turkmen mallow (Table 2).

In spring Actinobacterias, Proteobacterias and Firmicutes are dominant. In summer Acidobacterias, Firmicutes and Proteobacterias are dominant (Fig. 1, 2).

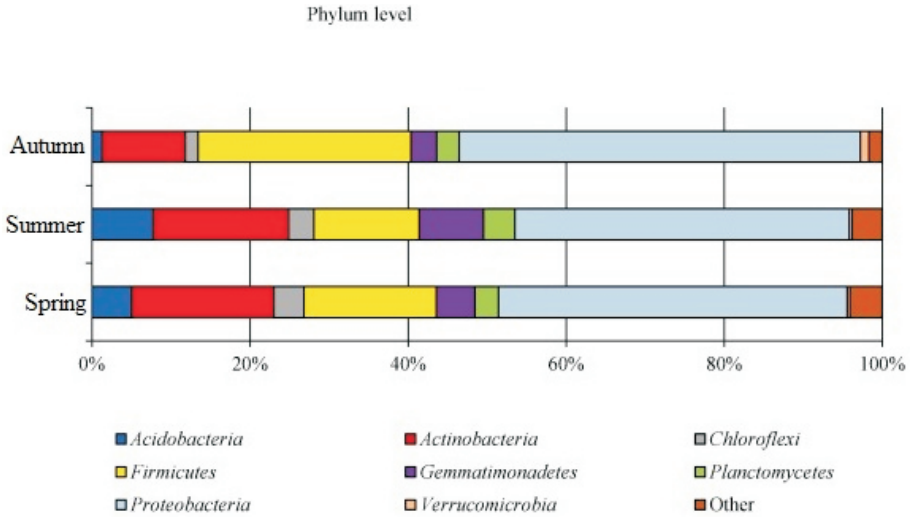

Fig. 1. Prevailing bacterial phyla in the soils under *Malva* L.

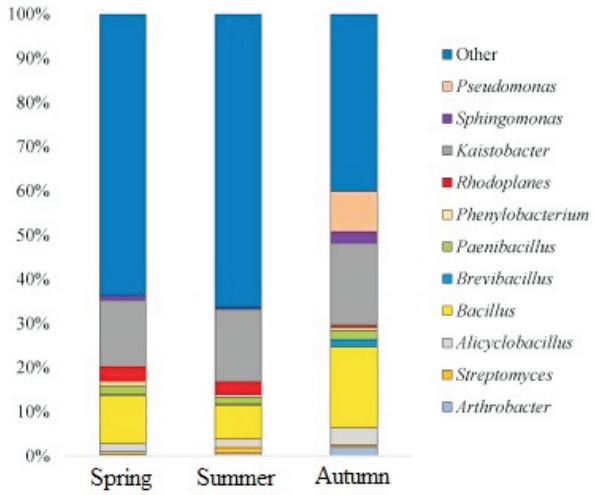

Fig. 2. Relative abundance of bacteria level in the soil

These species are most valuable at the beginning of the development phase – the budding phase. At the same time, although the composition of the feed contains relatively less dry matter, it is very watery and rich in protein and ash. The dry matter content is an important indicator for evaluating the nutritional value of mallow. As is well known, the dry mass contains nutrients, minerals and vitamins. Therefore, the nutritional value of a plant depends significantly on its quantity.

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