Study of varieties of meadow clover by economically valuable characteristics

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Abstract. The article evaluates the source material of clover according to a complex of economically valuable features. Perennial varieties of meadow clover with high winter hardiness, fodder and seed productivity, tolerance to major diseases have been studied. It was revealed that all the studied varieties are adapted to the conditions of the foothill zone of North Ossetia.

1. Introduction
In North Ossetia, where relatively low soil fertility is combined with unfavorable climatic conditions, the main role in increasing the production of high-protein feed, preserving and improving soil fertility belongs to clover. Of paramount importance in the development of clover sowing belongs to the variety. The contribution of new varieties and hybrids to the increase in the size and quality of the crop is estimated at 20-70%. In the XXI century, not only the productive, but also the environment-forming, including the soil-protecting and soil-improving role of varieties is significantly increasing [1-2].

In North Ossetia, the most relevant breeding work is to create a new generation of clover varieties that combine early ripening with winter hardiness, adapted to environmental stress factors, characterized by stable yield and quality of feed mass, seed productivity, tolerance to the most harmful diseases (cancer, root rot).

On the basis of the introduction of the studied species, the methods of selection and transfer of useful plants from one condition of existence to another are studied. At the same time, there is a knowledge of the laws of plant organisms with the development of methods of development and use in the national economy. Especially important indicators of forage varieties are their adaptation, high competitiveness and seediness of inflorescences [4;7].

In the conditions of the North Caucasus region, the need for seeds of perennial legumes is quite high. However, it is not fully satisfied. The reason for the insufficient provision of seed material is the lack of seed farms with a high level of agriculture. Therefore, special attention should be paid to the issues of herb seed production and the creation of new varieties adapted in specific regions [3].

The main indicators of high productivity of fodder grass varieties of the hay-pasture type for the foothill zone of the Central Caucasus, the steppe zone of the Central Caucasus are their adaptive abilities, a combination of high competitiveness with productivity, longevity and winter hardiness [5-6].
2. Materials and methods
The experimental sites are located at the experimental base of the SCNIIGPSH VNC RAS, Mikhailovskoye village, in the foothill zone of the RSO - Alania.

All records and observations are carried out according to the generally accepted VIC methodology: accounting for the green mass in the budding-flowering phase, the number of internodes, foliage, plant height, the number of heads on stems, the number of flowers in the heads, the percentage of seeds formed. The pubescence of stems correlating with high protein quality is determined. The quality of the feed mass, plant disease resistance, seed yield, winter hardiness and competitiveness of each sample in a mixture with cereal and grass components are taken into account. The main marker feature in breeding will take into account the length of the corolla tube as a marker feature for pollination activity and seed formation [8-9].

It is planned to make the following observations and records of each breeding sample in the nurseries:

- Phenological observations by the method of ocular assessment. The beginning of the phase is the period when 10-15% of plants entered it. If 70-75% of plants have entered it, the phase is considered complete.
- The height of the herbage and the length of generative shoots according to the phases of plant development at 10 points of the plot.
- Leafiness - the ratio of the mass of leaves to the total weight of the aboveground mass.
- In plant samples, the main elements of nutrition will be determined: nitrogen - by the Kjeldahl method, phosphorus - by the vanadium-molybdenum method on a flame photometer.
- In the soil samples, the nitrate according to Grandvalle ammonia solution according to Konev, mobile phosphorus and exchangeable potassium in one extract according to Chirikov will be determined.
- Dynamics of accumulation of aboveground mass - by mowing.
- In all phases of development, the features of the symbiotic activity of legumes and their antioxidant activity will be taken into account.
- Mathematical processing of the research results is carried out by the method of dispersion analysis according to B.A. Dospekhov [11].

3. Results
Modern evolutionary theory proceeds from the processes of the environment and the reaction of plants to respond to their change. The basis of the production of any agricultural crop production is the variety. It is he who determines the basic requirements for cultivation technologies: productivity, energy efficiency, environmentally safe quality, environmental protection.

Future varieties should be adapted to the conditions of the intended zone of their growth, meet the specified parameters for productivity, stability, immunity and have stable yields under unstable hydrothermal regimes.

Meadow clover (Trifolium pratense L.) it is cultivated in almost all regions of our country and is used in agricultural production not only as a source of high-energy protein animal feed, but also as an excellent precursor of wheat, flax, potatoes, rye and other crop rotation crops. Its role in the biologization of agriculture is great – in preserving and increasing soil fertility by enriching them with symbiotic nitrogen, protecting them from water and wind erosion. The determining value in the realization of the potential of any crop belongs to the variety. In recent years, intensive breeding work has been carried out to create new highly productive varieties of meadow clover using modern breeding methods and including promising sources of source material in the breeding process. One of the reasons for this unsatisfactory state in clover breeding is the low efficiency of selection, which is the main method of the breeding process. At the same time, the weak point of almost all breeding programs is the lack of a modern scientific approach to planning and methods of implementing the intended goals.
Clover is an important forage bean, widely cultivated in most regions because of its characteristics: high germination energy, rapid growth and tolerance to acidic and humid conditions. It is also used as a green manure crop due to its high nutrient content, partly due to symbiosis with nitrogen-fixing bacteria of the genus Rhizobium [10].

The conducted studies revealed (table 1) that all varieties are well adapted to the growing conditions in this region, the shoots were friendly. The period of the beginning of flowering in all varieties fluctuated in 2019 from 09.06 to 16.06.; in 2020 from 08.06 to 17.06. and in 2021 - 10.06-15.06.

The period from spring regrowth to flowering in cultivars ranged from 47 to 54 days in 2019; 42-47 days in 2020 and 48-52 days in 2021. The beginning of flowering of meadow clover varieties was marked on June 8-17, therefore, forage harvesting from this crop in the conditions of the foothill zone of North Ossetia can begin from the second decade of June.

The nutritional value of the fodder mass of meadow clover depends to the maximum extent on the varietal characteristics and is calculated by the content of digested organic substances in it, primarily raw protein.

| Varieties       | The date of the beginning of flowering | The period from spring regrowth to flowering, days |
|-----------------|----------------------------------------|-----------------------------------------------|
|                 | 2019 | 2020 | 2021 | 2019 | 2020 | 2021 |
| Dargavs         | 14.06 | 10.06 | 11.06 | 54   | 47   | 51   |
| Nart            | 13.06 | 12.06 | 14.06 | 55   | 45   | 49   |
| Mountain Saniba | 15.06 | 14.06 | 15.06 | 53   | 43   | 52   |
| Dar’yal         | 16.06 | 17.06 | 10.06 | 52   | 42   | 48   |
| Meteor          | 14.06 | 16.06 | 12.06 | 54   | 47   | 51   |
| Vladikavkazskij | 13.06 | 11.06 | 10.06 | 50   | 43   | 52   |
| Vityaz          | 10.06 | 10.06 | 11.06 | 49   | 45   | 51   |
| Dymkovskij      | 9.06  | 8.06  | 12.06 | 47   | 47   | 49   |

The conducted studies have shown (table 2) that the varieties presented in the experiment differed in the content of crude protein in dry matter.

Winter hardiness is an important characteristic of the variety for the conditions of the foothill zone of North Ossetia. The winter of 2019-2021 was quite warm, which contributed to the fact that all varieties wintered well (92-95%).

Also an important element of the productivity structure is the height of plants. In the first mowing, on average for 3 years, the height of plants varied from 51.2 to 58.4 cm, the tallest were the varieties of Nart, Vityaz, Vladikavkaz. During the second mowing, the average plant height for 3 years was 45.7-52.3 cm.

The collection of dry matter from the Mountain Saniba variety was 9.0 t/ha, which exceeded 1.1 t/ha in comparison with the Vladikavkaz variety, which showed the least results (7.9 t/ha).

The foliage of plants is the most important indicator characterizing the quality of feed, due to the fact that the leaves and inflorescences significantly exceed the nutritional value of the plant stem.

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The foliage of plants is the most important indicator characterizing the quality of feed, due to the fact that the leaves and inflorescences significantly exceed the nutritional value of the plant stem. The foliage of plants varied by varieties at the first mowing from 48.1% to 59.4%, at the second mowing from 55.2% to 66.8%. The highest indicators were in the variety "Mountain Saniba".

According to the results of the evaluation of the herbage for 2 years (2020) of life in the flowering phase, the lesion of varieties with leaf diseases was weak, at the level of standards: anthracnose – 2 points, ascochitosis and mosaic – 1 ... 1.5 points; by the 3rd year of life, due to the multi-axis use of herbage and, as a consequence, the weakening of plants, the intensity of ascochitosis and mosaic in most varieties increased to 2 points; anthracnose damage in three varieties (Dymkovskij, Vladikavkazskij, Mountain Saniba) increased to moderate degree (2.5 points), the manifestation of the
disease in the remaining varieties was observed at the level of 2 years of life, i.e. to a weak degree (2 points) (table 3).

Table 2. Characteristics of varieties and varietals according to economically valuable characteristics of meadow clover varieties, 2019-2021.

| Specifications          | Dargavsk | Vityaz | Nart | Meteor | Vladikav | Dymkovskij | Mountain Saniba | Dar'yal |
|-------------------------|----------|--------|------|--------|----------|-------------|----------------|---------|
| Yield of green mass, t/ha | 35.3     | 32.7   | 33.2 | 29.3   | 31.4     | 33.8        | 30.6           | 34.3    |
| Plant height, cm:       |          |        |      |        |          |             |                |         |
| - 1 slope               | 54.7     | 55.2   | 58.4 | 49.3   | 54.8     | 53.2        | 51.2           | 54.3    |
| - 2 ukos                | 48.3     | 51.2   | 52.3 | 45.7   | 48.1     | 47.1        | 49.3           | 47.5    |
| Crude protein content in dry matter, %: |          |        |      |        |          |             |                |         |
| - 1 ukos                | 15.32    | 14.33  | 16.27| 15.94  | 16.54    | 13.63       | 17.42          | 15.73   |
| - 2 ukos                | 17.53    | 17.84  | 18.48| 17.15  | 17.67    | 15.82       | 19.74          | 18.52   |
| Winter hardiness, %     | 94       | 93     | 93   | 92     | 95       | 94          | 92             | 92      |
| Foliage of plants, %:   |          |        |      |        |          |             |                |         |
| - 1 ukos                | 53.2     | 49.3   | 54.1 | 51.7   | 59.4     | 48.1        | 55.4           | 52.3    |
| - 2 ukos                | 64.3     | 59.5   | 65.9 | 58.4   | 65.2     | 55.2        | 66.8           | 63.7    |
| Collection of crude protein, t/ha | 1.25    | 1.32   | 1.27 | 1.18   | 1.22     | 1.24        | 1.30           | 1.19    |
| Collection of dry matter, t/ha | 8.8     | 8.3    | 8.4  | 8.1    | 7.9      | 8.5         | 9.0            | 8.6     |

Table 3. Results of accounting for diseases of meadow clover, 2019-2021.

| Variety          | Anthracnose  | Ascochitosis | Mosaic | Development of the disease, % |
|------------------|--------------|--------------|--------|--------------------------------|
|                  | 2y. of l.    | 3y. of l.    | 3y. of l. | 2y. of l.    | 3y. of l. |
| Dar'yal          | 2            | 2            | 1      | 1               | 1         | 2         | 15.1    | 19.5    |
| Dargavs          | 2            | 2            | 1      | 1               | 1         | 1         | 1.5     | 17.3    | 22.6    |
| Nart             | 2            | 2            | 1      | 2               | 1.5       | 2         | 16.6    | 21.8    |
| Mountain Saniba  | 2            | 2.5          | 1      | 2               | 1         | 2         | 10.2    | 16.7    |
| Meteor           | 2            | 2            | 1      | 1               | 1.5       | 2         | 16.3    | 23.8    |
| Dymkovskij       | 2            | 2.5          | 1      | 2               | 1         | 1         | 13.4    | 24.4    |
| Vityaz           | 2            | 2            | 1      | 1               | 1         | 1         | 15.5    | 22.9    |
| Vladikavkazskij  | 2            | 2.5          | 1      | 2               | 1         | 1         | 12.9    | 19.7    |

4. Discussion
The Mountain Saniba variety was the richest in terms of the content of crude protein in dry matter – 17.42% in the first mowing and 19.74% in the second mowing, which exceeded the Dymkovskij variety by 3.79% at the first mowing and 3.92% at the second mowing.

According to the results of the analysis of the root system affected by rot in the 2nd year of life, the varieties of meadow clover were with a weak degree of disease development – 10.2... 17.3%. At the 3rd year of life (2021), all the studied varieties showed average resistance to root rot damage: 16.7...24.4%.
5. Conclusion
All the studied varieties are adapted to the conditions of the foothill zone of North Ossetia. Thus, according to the content of crude protein in dry matter, foliage, collection of dry matter from a hectare for 3 years, the Mountain Saniba variety was distinguished. The vegetation period of the studied varieties varied on average 42-54 days over three years, which is optimally suited for forage harvesting in our region.

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