Influence of sowing time on the yield of fodder grasses

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Influence of sowing time on the yield of fodder grasses

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Abstract. Cultivated alfalfa is a species native to the Middle East and the most abundant food species in the world. In much of the dry steppe zone of Western Kazakhstan, it is the most important legume fodder crop grown for hay, dehydrated feed, pellets and silage. Alfalfa is also particularly important for restoring soil fertility: without the cost of nitrogen, residues increase soil organic matter, the root system mobilizes nutrients deep in the soil profile and soil, improves structure, water permeability and water retention. In addition, alfalfa requires only a small amount of herbicides and pesticides and no N-fertilization. This is consistent with EU policy and public concern about the environmental impact of agricultural activities. Alfalfa hay fields have also been shown to be highly beneficial for enriching biodiversity. Its high protein content meets the demands of the feed market, especially after the problems caused by the use of concentrates of animal origin, currently banned in the EU. The process of growth and development of plants is directly related to the biological characteristics of their development. All available phenological observations of the growth and development of crops provide an assessment of the conditions that ensure their productivity. The peculiarities of the growth and development of plants, caused by the deficiencies of at least one of the conditions of their vital activity, lead to a delay, and sometimes to a cessation of their growth. In this regard, the intensity of growth, and with this the level of their fodder significance, can serve as indicators of their provision with the necessary living conditions.

1. Introduction

In the former Ural region (West Kazakhstan region), the content of protein and fodder unit in hay is much higher than in Almaty, and fiber is the opposite [1]. Using pulse labeling of 13C organic stocks in taproots, it was found that 61% of the retained 13C was used for root respiration within 30 days of regrowth after defoliation, while only 5% was recovered by regrowth of legumes. In connection with this topic, the experience of French and Spanish researchers working on natural Spanish populations of alfalfa named Milgas deserves special interest. Livestock raising is a traditional component of Mediterranean agricultural systems and is now also the best way to use depleted marginal areas for agriculture, landscape maintenance and leisure.

The experience of alfalfa shows that this shoot growth after defoliation is largely dependent on the availability of nitrogen reserves rather than stocks [3]. In difficult times of legume development, such as spring growth or regrowth after defoliation, nitrogen uptake [3] or symbiotic fixation [8] is negligible. Under these conditions, the supply of root nitrogen became the main source mobilized for the regrowth of shoots. Several observations using 15N labeling during regrowth after cutting indicate [3] that the nitrogen stores of the taproot (mainly soluble proteins and amino acids) have been mobilized and have contributed greatly to the provision of nitrogen necessary for the maintenance of early leaf regrowth. Observations of seasonal fluctuations in nitrogen and carbon stocks in the taproots of alfalfa [10] showed that nitrogen concentrations increased markedly in autumn, and there was a huge decrease in root development of shoot growth in the pre-spring period. Among various amino acids and soluble proteins, they significantly accumulated in autumn and were widely mobilized from taproots when the meristem reactivated in spring [12]. Likewise, the regrowth of shoots after the summer harvest of feed caused a large decrease in the reserves of amino acids and soluble proteins from the taproots. Alfalfa (Medicago sativa L.) yield depends on crop management (sowing date, harvest frequency, fertilization, irrigation, etc.) and flora conditions (eg soil availability, water scarcity, photoperiod, temperature, plant diseases) ... These factors induce distinctive changes in resource availability and alter plant endogenous factors (levels of organic stock of roots, number of active meristems) that are required for rapid growth of shoots in spring or regrowth after defoliation. In the last decade, numerous studies have revisited the widely held belief that the total amount of non-structural carbohydrates in roots (mainly starch) determines the growth potential of alfalfa in spring or after defoliation [11].

In the short term, the main direction of an effective and key component in the results of the fodder issue of animal husbandry should be to increase yields through the use of methods for creating highly productive sown fodder areas, including land free of grain crops.

2. Materials and methods

Since during regrowth there is a significant decrease in the content in the roots in comparison with the reserves of N and. others have long been thought to play a key role in shoot growth. However, recent studies have shown that C and N stocks can serve different purposes for shoot regrowth and plant survival after defoliation. A significant reduction in the reserves of root systems is primarily associated with the use of carbohydrates in the respiration of roots and stubble.

3. Results

The main cultivation of the soil for grass consisted of shallow flat-cut cultivation, carried out by KPG-250, in the spring harrowing was carried out with Zig-Zag tooth harrows in two tracks.

Sowing was carried out in the early spring period - on April 24, with a Wintershteger seeder with a seeding rate of 2.5 million viable seeds per hectare for both crops. During the harvesting period, grain samples were taken to determine the physical purity and moisture content, followed by bringing the yield data to existing standards.

The harvesting of crops for green mass was carried out in the phase of their booting - the beginning of earing in the ryegrass and in the earing of alfalfa. The calendar was cleaned from July 20 to September 5.

By regulating the semi-cover methods of culture, the main methods of tillage and sowing, the wheatgrass showed different activity in its growing season. In the experience of the next year, the life of these plants, planted in their original form, fluctuated by about 62.7-75.6%. Phytocenosis of wheatgrass with alfalfa was 32.6-41.1%, with alfalfa - 43.6-49.2%. The presence in the phytocenosis of wheatgrass containing alfalfa reduced the percentage of grasses in all studied variants of the experiment to a minimum of 3.8-4.2%. The coenotic content of wheatgrass in this variant was 37.7-40.4%.

The hay harvested in the former Ural region contains: protein 13.5%, feed units, respectively, 53.0 and 51.6 per 100 kg.

The protein digestibility rate was the same - 55%.

Consequently, in the West Kazakhstan region, conditions for the accumulation of nutrients in plants were better. Like the green mass, the nutritional value of hay harvested earlier in the growing season of the wheatgrass was higher than that of the later one. This pattern is also inherent in the digestibility of hay. The yield of alfalfa in the fall was 7.3% lower than in the spring. In pure sowing of alfalfa during spring sowing, the number of plants in the first year of life was 198.4 pcs / m^2, in the second - 141.5; on the third - 135.4; on the fourth - 129.2 pcs / m^2, and in the fall - 173.1, respectively; 141.5; 122.1; 121.9 pieces / m^2.

Table 1. Productivity of forage crops of the spring sowing period.

Cultures	Indicators	Years 2018	2019	2020	2021
Agropýron	Number of plants, pcs/m^2	187.1	157.3	142.0	137.2
	Height of plants, cm	10.2	73.4	82.4	94.7
	Productivity of greenness, quintals/ha	-	65.4	66.9	68.7
Medicago sativa L.	Number of plants, pcs/m^2	198.4	141.5	135.4	129.2
	Height of plants, cm	42.4	71.2	73.3	67.3
	Productivity of greenness, quintals/ha	54.1	125.8	96.2	87.4
Agropýron + Medicago sativa L.	Number of plants, pcs/m^2	244.5	166.3	157.5	147.1
	Height of plants, cm	38.3	83.3	68.2	64.5
	Productivity of greenness, quintals/ha	36.2	137.7	129.1	114.2
	Least significant difference $_{095}$ quintals/ha	-	3.4	4.8	4.2

Table 2. Yield of forage crops for the autumn sowing period.

Cultures	Indicators	Years 2018	2019	2020	2021
Agropýron	Number of plants, pcs/m^2	152.1	135.2	130.0	126.3
	Height of plants, cm	9.6	70.9	80.3	84.3
	Productivity of greenness, quintals/ha	-	49.3	57.3	61.4
Medicago sativa L.	Number of plants, pcs/m^2	173.1	141.5	122.1	121.9
	Height of plants, cm	27.0	57.6	59.4	70.4
	Productivity of greenness, quintals/ha	42.3	111.2	119.4	90.2
Agropýron + Medicago sativa L.	Number of plants, pcs/m^2	180.6	163.2	151.0	137.6
	Height of plants, cm	30.0	76.2	70.7	75.2
	Productivity of greenness, quintals/ha	30.2	128.0	120.2	110.6
	Least significant difference $_{095}$ quintals/ha	-	4.7	4.3	3.8

In the early-spring sowing period, the number of shoots at intervals of life was 187.1 pcs / m^2; 157.3; 142.0; 137.2, respectively in autumn - 152.1 pieces / m^2, 135.2; 130.0; 126.3pcs / m^2. Shoot growth in the spring was within -10.2-94.7 cm and in the second - 9.6-84.3 cm. the profitability of the useful share in the mass at the early sowing period was 65.4–68.7 c / ha higher than in the autumn - 49.3–61.4 c / ha.

4. Discussion

At the present stage of agricultural production, the expediency of cultivating certain forage crops is determined by the following main factors:

- The productivity of crops, which ultimately determines the receipt of a conditionally net income from a fodder hectare;
- The agrotechnical value of crops, which consists in preserving natural fertility and in reducing soil contamination;
- The ecological role and influence of cultivated crops.

In turn, the productivity of crops is determined by the rationality of using the available soil and climatic possibilities, as well as by reclamation methods for improving the water regime of the soil. In this case, it is possible to accumulate more moisture in the soil and use it more productively.

5. Conclusion

In wet spring conditions, the receipt of seedlings of wheatgrass does not depend on the reception of the main soil cultivation. The slow development of the wheatgrass in the first years of his life is associated with his biological characteristics. In the second year of life, its coenotic composition in crops of a pure species consisted of 51.3-53.2%, in the third year - 51.0 and only in subsequent years - 98-100% with the formation of the corresponding density of the stalk. To reduce the percentage of forbs (weediness) in crops and to increase the productivity of wheat fields in the early years of life, it is advisable to supplement the sifting of wheat grass with alfalfa. The productivity of crops of such grass mixtures increases 3.6-5.2 times in the second year of use and 1.3-2.8 times in the third year. With the loss of leguminous grasses from the phytocenosis, the productivity of the wheatgrass in these variants for the fifth and subsequent years of life does not decrease in comparison with the variants of its pure sowing.

The best results are obtained when sowing wheatgrass + alfalfa at the end of September, when the autumn precipitation beginning to fall with the soil temperature is most successfully combined, with a sufficient amount of warm time to reach the autumn tillering phase. In this state, the wheatgrass overwinters well. In dry autumns, winter sowing takes precedence.

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