Structure Of Alfalfa Harvest Depending On Pre-Sowing Treatment Of Seeds With Grivlag (GVG) Growth-Regulating Substance

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Abstract. This study reflects the change in the dynamics of the yield structure of alfalfa hybrid of the Bazhena variety (*Medicago varia Martin*) of the first year of life when seeds are treated with the Grivlag organic growth-regulating substance. According to the studies, the most leafy were alfalfa plants, the seeds and shoots of which were treated with the growth substance (22.92 g), which is on average 5.02% more for three cuttings than the weight of leaves in the control (21.65 g). However, the weight of stems in the experimental variant (35.5 g) also increased by 14.12% in comparison with the control (31.15 g). In the sum of three cuttings, the average total weight of experimental plants exceeded the weight of control plants by 12.0% ($p<0.05$). Since the mowing fell on the phase of the beginning of alfalfa flowering, a comparison was made of the weight of inflorescences. The weight of inflorescences in the experiment was 5.02 g, which is 22.90% more than the weight of inflorescences in the control (3.87 g) ($p<0.05$). The results obtained indicate a positive effect on the overall growth of the aerial part of those plants that were treated with the Grivlag growth substance.

1 Introduction

Currently, a wide range of growth substances and biostimulants is presented to crop production all over the world, ranging from low-hazard and safe for products and the environment, to completely natural, so-called biostimulants. The goal of creating all these biological products is the same - to obtain products with higher yields and increase quality indicators without harming the environment and at the same time gaining economic efficiency.

Scientists have invented, tested and studied a large number of growth substances and biostimulants in order to identify the most effective and suitable for production [1-3].

Live bacteria that produce useful substances can also be considered growth stimulants. Thus, cytokinin is required for initiation of alfalfa nitrogen fixation nodules caused by rhizobia, and for slowing down leaf senescence caused by drought stress, it was found that some free-living rhizobia produce cytokinin. The study combined two strains of

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Sinorhizobium that overproduce cytokinin. As a result, after severe drought stress, most alfalfa plants inoculated with these strains survived, and the nitrogenase activity in their root nodules did not undergo obvious changes [4].

The so-called nanohumus obtained from lignite can also serve as a soil improver and growth regulator. Alfalfa (Medicago sativa L.) was used to study its effect. The positive effect of the humic product on the properties of the soil and the growth of alfalfa in the field was manifested after 2 years of application. A single application at the beginning of each growing season gave better results than divided into two applications. These results provide important practical conclusions for the further use of humic material as a soil improver and growth regulator [5, 6].

2 Materials and methods

The conducted studies correspond to the requirements of generally accepted methods [7, 8].

The object of the study is the influence of the growth substance on the change in the structure of the alfalfa crop.

The subject of the study is alfalfa of the Bazhena variety *(Medicago varia Martin)* and the growth substance Grivlag.

The experiment was established on the territory of the experimental field of the Krasnodar Research Centre for Animal Husbandry and Veterinary Medicine on April 20, 2022, on a plot with a total area of 100 m^2 (50 m^2 - experimental plot, 50 m^2 - control). Hybrid alfalfa of the Bazhena variety *(Medicago varia Martin)* was sown.

Characteristics of plants: height - 130-140 cm, semi- and upright bushes, average bushiness - 45-50 stems, stems are thick, medium coarseness, slightly pubescent, without wax coating. The foliage is above average, uniform (49-55%). The weight of 1000 seeds is 1.8-2.2 g.

The average period from spring regrowth to full ripeness of seeds is 112–114 days, from the first cutting to full ripeness of seeds 76–78 days.

The root system is powerful rod-branched. Winter hardiness is high. The potential yield of fodder mass in rainfed conditions is 97.0 tons per hectare, seeds 0.49 tons per hectare. Protein content is 22%, fiber - 32% [9].

The sowing rate of alfalfa in the experiment was 2 g/m^2, the experimental seeds were treated with an aqueous solution of Grivlag growth substance (GVG) at a concentration of 0.02 ml of Grivlag per 1 liter of water 24 hours before sowing. Spraying the seeds with a solution was carried out from a hand-held device for spraying liquids into small drops (sprayer), then these seeds, distributed as thinly as possible over the paper, were covered with a dense linen cloth and remained in this state at room temperature (19-20° C) for 24 hours.

The seeds in the control variant were treated with clean water from a sprayer in the same volume. Within 24 hours, the moisture on the surface of the alfalfa seeds was partially absorbed by the seed, and the other part evaporated into the air, so the seeds were dry to the touch. The seeds were sown manually, by continuous sowing; the depth of seed placement was 1.5-2 cm.

The soils are represented by leached low-humus heavy loamy chernozem with pH = 7.06 (water extract), with the content of labile phosphorus - 33.7 mg/kg, labile potassium – 323 mg/kg, ammonium and nitrate nitrogen in total - 19 mg/kg and humus - 3.16% in the arable horizon. In the third decade of April, rains were observed, so mass seedlings of alfalfa were noted on 05/02/2022.

The first selection of alfalfa plants was carried out on June 25, 2022 in the phase of a single flowering of alfalfa. The second selection was on July 29, also in the single flowering phase and in the same phase on August 26.

The selection was carried out as follows: 30 stems of alfalfa were randomly cut from the control and experimental plots at a height of 10 cm from the soil level. Then the green mass was disassembled into leaves, stalks and inflorescences (crop structure) and individually weighed, the length of each stalk individually measured, then all data (for three cuts) were statistically processed.

Grivlag growth substance (GVG) is a complex energized fertilizer with a complex chemical composition, up to 40% of which is occupied by sodium salts of petroleum acids, which are cyclic monobasic acids [10]

3 Research results

The summary data on the structure of the crop for three cuttings of the hybrid alfalfa of Bazhena variety of the first year of life are presented in Table 1.

Table 1. The structure of the yield of Bazhen alfalfa without presowing seed treatment.

Cutting number	Total weight, g	Weight of leaves, g	Weight of stems, g	Weight of inflorescences, g	Weight of leaves from the total, %	Weight of stems from the total, %	Weight of inflorescences from the total, %
1	49.15	18.90	29.65	0.60	38.45	60.33	1.22
2	66.6	26.75	33.35	6.50	40.17	50.08	9.76
3	54.25	19.30	30.45	4.50	35.58	56.13	8.29

The largest total weight (66.6 g), weight of leaves (26.75 g), stems (33.35 g) and inflorescences (6.50 g) was in the second cutting of the first year of plant life. The smallest weight in all respects was noted in the first cutting of the first year of life (total weight 49.15 g, weight of leaves - 18.90 g, stems - 29.65 g and inflorescences 0.60 g).

The largest percentage of leaves from the total weight of plants was also in the second cut (40.17%), the largest percentage of the weight of stems from the total was observed in the first cut (60.33%). The structure of the alfalfa yield from the experimental plot is presented in Table 2.

Table 2. The structure of the yield of Bazhen alfalfa in the first year of life, treated with the Grivlag growth substance.

Indicators	Cutting number		
	1	2	3
Total weight, g	53.90	78.65	57.90
Weight of leaves, g	20.10	26.95	21.70
Weight of stems, g	32.55	41.10	33.00
Weight of inflorescences, g	1.25	10.60	3.20
Weight of leaves from the total, %	37.29	34.27	37.48
Weight of stems from the total, %	60.39	52.26	56.99
Weight of inflorescences from the total, %	2.32	13.48	5.53

In the experimental variant, as well as in the control one, the total weight prevailed in the second cut (78.65 g). The weight of leaves (26.95 g), stems (41.10 g) and inflorescences (10.60 g) in the second cutting significantly exceeded these indicators compared to the first and third ones.

The sum of leaves from 30 random plants in the second cut of the control and experimental plots is shown in Figure 1 as an example.

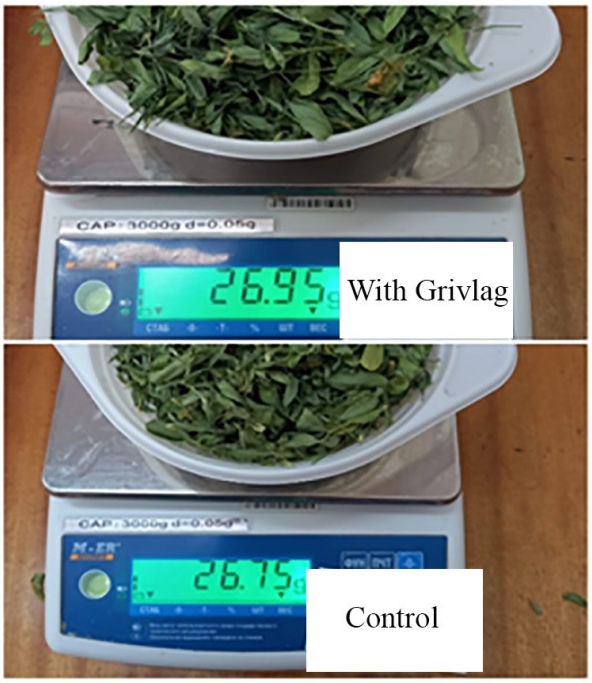

Fig. 1. The weight of leaves of alfalfa of Bazhena variety of the first year of life in the second cutting.

Table 3 shows the statistical processing of the yield structure for three cuttings of alfalfa of the Bazhena variety in the first year of life.

According to preliminary data, it can be noted that the increase in the total weight of the aerial parts of alfalfa plants increased in all cuttings in the experimental variant - 63.48 g, which is 12.0% more than in the control (56.67%) ($p<0.05$). This trend was repeated in the determination of individual parts of plants. Thus, the weight of leaves in the experimental variant (22.92 g) is 5.87% more than in the control (21.65 g). The weight of stems in the experiment (35.55 g) exceeded the weight in the control (31.15 g) by 14.12%. An increase in the weight of stems in forage production is a negative factor, since the stem is an indigestible fiber - lignin, the content of which in the feed leads to a deterioration in the quality of the main feed (hay or haylage).

Table 3. Comparison of the average values of the yield structure for three cuts for the first year of alfalfa life, depending on the treatment of seeds with the Grivlag growth substance.

Variant	Total weight, g	Weight of leaves, g	Weight of stems, g	Weight of inflorescences, g
Control (without treatment)	56.67±2.18	21.65±2.55	31.15±1.12	3.87±0.23
Experiment (with pre-sowing treatment of seeds with Grivlag)	63.48±2.67*	22.92±2.07	35.55±2.78	5.02±0.35*

Note: * - $p<0.05$

Alfalfa is a perennial forage crop, the study of the crop structure of which is necessary for three years.

Fig. 2. The structure of the yield of the first year from the second cut.

However, with an increase in the total weight of the plant, a proportional increase in the weight of the stems is a natural phenomenon, given that the weight of the leaves also increased.

Figure 2 shows the structure of the yield of the first year from the second cut.

The beginning of flowering in the experiment and control occurred, judging by the weight of inflorescences, unequally. That is, the plants from the seeds treated with Grivlag began to bloom earlier than the control ones; accordingly, it can be concluded that the treatment contributed to the acceleration of the reproductive phase of the development of alfalfa plants. The weight of inflorescences in the experiment was 5.02 g, which is 22.90% more than the weight of inflorescences in the control (3.87 g) ($p<0.05$).

4 Discussion

The results of studying the structure of alfalfa harvest depending on pre-sowing treatment of seeds growth-regulating substance reflects the change in the dynamics of the yield structure of alfalfa hybrid of the Bazhena variety (*Medicago varia Martin*) of the first year of life when seeds are treated with the Grivlag organic growth-regulating substance. The results obtained indicate a positive effect on the overall growth of the aerial part of those plants that were treated with the Grivlag growth substance. Our results are consistent with the work of other authors (J. Tiwari et. al., 2022; D. FaccinR. M. Di Piero, 2022). Various structural and functional aspects of humic substances creates the framework of sustainable agriculture.

5 Conclusion

In the sum of three cuttings, the average total weight of experimental plants exceeded the weight of control plants by 12.0% ($p<0.05$). Also in the experimental variant, the average weight of leaves (by 5.02%), stems (14.12%).

The weight of inflorescences in the experiment was 5.02 g, which is 22.90% more than the weight of inflorescences in the control (3.87 g) ($p<0.05$).

The flowering rate of alfalfa inflorescences has increased, which is also an important aspect in the further study of this growth regulating substance.

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