Research on the Behavior of two Autochthonous Varieties of Alfalfa under the Conditions of Tormac Plain

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Abstract

Being considered as the "queen of fodder plants" due to its great fodder and economic value, alfalfa (Medicago sativa) is one of the traditional legumes species cultivated in our country. The fodder value of this species is reflected by a series of distinguished nutritional characteristics, such as a balanced energy-caloric intake, high protein and vitamin content and high degree of consumption and digestibility. Also, alfalfa is widely used in the nutrition of most animals, in different forms, such as: soilage (green mass), hay, silage, granules or mixed fodder. At the same time, this species also presents great importance from an economic point of view, due to many advantages, such as: high productions obtained, great ecological plasticity, special agro-biological properties, the ability to enrich the soil in nitrogen and being a main component of the green conveyer for the feed of milk cows and young taurine. The importance of alfalfa for the agricultural sector of our country is major. This can also be quantified through the continuous development activity of new autochthonous varieties, such as Mihaela and Dobrogea (4AG07), which show increased resistance to drought and to common diseases, as well as an improved productive potential. By cultivating these two Romanian varieties (Mihaela and Dobrogea) in the pedo-climatic conditions of the Tormac Plain, considered as a favourable area for this culture, this research paper aims to identify the production capacity, respectively the harvest of green mass and hay, obtained by two mowns, without the application of irrigation. Following the research undertaken in the two experimental years, 2020 and 2021, on a vertic preluvosol type of soil with a medium loamy-clay texture and good physical, hydrophysical and chemical properties, the productions of soilage and hay were high, making this crop profitable for the farmers from the studied area.

Keywords: alfalfa, autochthonous, hay, productions, soilage

1. Introduction

Both known as alfalfa or lucerne, the species *Medicago sativa* it is a perennial plant from the botanical family of *Leguminosae (Fabaceae)*. It has always been considered as the *"queen of fodder plants"* due to its excellent fodder and economic value [1, 2].

Originary from Asia, this species is cultivated around the world for animal feed on more than 30 million hectares, due to distinguished chemical and nutritional properties such as a very high protein content, a balanced energy-caloric intake, good vitamin content, as well as two important characteristics regarding the quality of a fodder - high degree of consumption and digestibility.

Alfalfa is widely used in the nutrition of most animals, in different forms, being one of the most important sources of soilage (green mass) and hay, but also being used as silage, granules or mixed fodder.

Also, from a agro-biologically and economic point of view, the species presents good characteristics, as high resistance at drought and frost, high regeneration capacity after mowns, high ecological plasticity and production capacity, as well as the ability to enrich the soil in nitrogen and

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main component of the green conveyer for the feed of milk cows and young taurine [1, 2, 3].
In our country, the cultivation of this species is considered as being traditional, quantified through the continuous development activity of new autochthonous varieties, suitable for Romania's pedo-climatic conditions [2, 4].
In the historical Banat area, the research unfolded in recent years indicated high production results obtained in the Tormac Plain, located north of Barzava River, which has a mean altitude of 155m in the eastern side and going to 135-110m to the west, thus connecting the Arenis Hills and the Timis Low Plain. Next to the Gataia Plain, it makes up the area of some of the highest plains in the sub-hillock zone of Timis County. Next to the Moravita Plain, it makes up the physical and geographical subunits located between the Timis, Poganis, and Barzava Rivers that are distributed in ten administrative-territorial units occupying an area of approximately 90,000 hectares from the surface of the research area [5].
With the aim of obtaining good high-quality productions, alfalfa must be cultivated on fertile deep soils, with ground water at a depth over 3m. Thus, such requirements are almost all met in the area where the research took place (Tormac River Plain), where the soil (vertic preluvosoil soil with medium loam texture) has relatively good physical and chemical properties and the ground water is found at a depth above 10m.
The most known Romanian alfalfa varieties are considered to be *Fundulea, Luxin, Triumf, Gloria, Teodora, Cezara, Magnat, Primola, Mădălina, Sandra, Roxana*, but also new varieties such as *Mihaela and Dobrogea (4AG07)*. [2, 6] These last two Romanian varieties have shown through research, increased resistance to drought and to common diseases, as well as a improved productive potential, even without the use of irrigation systems, that remains an issue for the agricultural sector of our country.

2. Materials and methods

For analyzing the production capacity (soilage and hay), while taking into account the climatic and soil conditions in the Tormac Plain, two Romanian varieties were cultivated - Mihaela and Dobrogea (4AG07). They have a good resistance to low temperatures during the winter and to drought during the summer months.
The research material included two authochtonous varieties, which were cultivated in the pedo-climatic conditions of the Tormac Plain. The two varieties were studied under identical technology conditions, on a vertic preluvosoil type of soil with a medium loamy-clay texture and good physical, hydrophysical and chemical properties [7].
The basic physical and chemical properties of the soil on which the research took place are presented in Table 1, as it follows.

Table 1. The basic physical and chemical properties of the soil

Physical properties	Chemical properties
texture – medium loam (0-210 cm)	soil reaction - neutral (0-180 cm)
total porosity – very low (0-98 cm)	humus reserve – very big (0-50 cm)
apparent density – very high (0-98 cm)	
wilting coefficient - medium (0-33 cm)	nitrogen index - medium (0-40 cm)
- high (33-98 cm)	- low (40-65 cm)
field capacity – medium (0-98 cm)	

Source: Archive - Timisoara Office of Pedological and Agrochemical Studies

For presenting the climatic properties of the two reference years, which were 2020 and 2021, data on the average monthly temperature and precipitation, as well as the multiannual data were taken over from the Banloc Weather Station, which is representative for the research developed (Table 2). As shown in data from the table below, the climatic conditions of the two studied years are considered favorable for alfalfa cultivation.

Table 2. The average monthly temperature and precipitation

Average monthly temperature (°C)												
Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2020	0.5	4.69	7	11.7	15.4	20.2	22.1	23.5	19.5	12.6	6	5.2
2021	2.6	4.2	5.0	8.7	15.5	22.3	25.4	21.8	17.1	10.2	7.0	2.8
Multiannual average	-0.6	1.74	6	11.3	16.4	19.5	21.2	20.6	16.5	11.2	5.8	1.2
Average monthly precipitation (mm)												
Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2020	18	50.2	51.9	4.6	59	128.8	72.4	32.2	43.2	107	7.5	46.8
2021	66.9	31	31.6	29.8	56.6	18.6	77.2	43.8	17.8	32.2	69	121
Multiannual average	30.6	30.1	36.1	41.9	55.6	71.8	47.6	48.2	35.7	33.2	37	38.2

Source: Banloc Weather Station

The research method consisted of a bifactorial experience, in the years of 2020 and 2021, when 2 mowns of soilage were harvested, after which, the dry mass, respectively the hay, was calculated.

Factor A – the cultivated variety

A1 – the Mihaela variety

A2 – The Dobrogea (4AG07) variety

The Mihaela alfalfa variety is a newer authochtonous variety of blue alfalfa, characterized by high productions, very good quality of soilage and hay, high adaptability and ecological plasticity. Also, this variety is known to be cultivated on large plain areas in our country, because its very good resistance to the higher temperatures and drought that can occur during the summer [8].

The Dobrogea (4AG07) variety is another authochtonous variety of alfalfa, with very good characteristics such as: high productions potential, resistance to drought, fall, as well as resistance to common disseases. A specific feature of this variety is known to be the very good regenerative capacity, which is reflected in the increased productions [9].

Factor B – crop fertilization

B1 – manure 35 t/ha, 0 kg N and 0 kg P2O5

B2 - manure 35 t/ha, 30 kg N and 60 kg P2O5

In connection to the technological elements, we must mention the following matters: in crop rotation, the precursor plant was autumnal wheat; the soil works were deep ploughing, 25 cm in depth, as well as some works of soil grinding and levelling; seeding took place in later summer, which was August 27, the rows were 35 cm apart, and the seeding quantity was 17 kg seed per hectare.

3. Results and discussion

Table 3. shows the production data obtained of soilage and hay, of the two varieties (Mihaela and Dobrogea), cultivated with two different fertilization variants, obtained in the pedo-climatic conditions of the Tormac Plain, in the two years studied (2020 and 2021).

In order to be able to compare the productions obtained with the control variant - the general average production, the total production resulting from mown 1 and 2 (soilage and hay) of each variant was calculated.

Regarding the cultivated varieties, a higher production capacity can be found in the case of the Dobrogea (4AG07) variety, in both analyzed variants. The general average production of the analyzed variants in the two years of research has been of 42.61 t/ha soilage and 10.98 t/ha hay.

As regards the Mihaela variety, we found a total production of soilage of 42.12 t/ha, 10.54 t/ha hay respectively, which are 99% and 96% of the general mean production of the two versions. The lowest production level was registered in year 2021, in the fertilization version with manure only, which led to a total production of 38 t/ha soilage, which was 8.4 t/ha hay, a fact caused mainly by the particularly low precipitation level in June, when a deficit of over 53 mm by comparison to the multiannual values. As regards the obtained crops, the highest value was 48.2 t/ha soilage, with 12.1 t/ha hay, was in the version of year 2020 fertilized with manure combined with nitrogen and phosphorus, when there was excessive precipitation in the months of May and June.

The Dobrogea (4AG07) variety mostly maintained its production level in the two fertilization versions used, but with an increased crop for soilage and dry mass (hay). For year 2020, the better resilience to drought made for the total production of that variety, in the organic and additional fertilization version, with nitrogen and phosphorous, to surpass 50 t/ha soilage and 14.9 t/ha hay, being the version with the highest level of production among all those analyzed.

The total production difference between the two varieties, Dobrogea and Mihaela is 0.81 t/ha soilage, which means 0.22 t/ha hay.

The general average production of the eight versions analyzed in the two years (2020 and 2021) was 42.61 t/ha soilage, thus resulting approximately 11 t/ha.

Table 3. Sinthesis of the production of soilage and hay obtained in the years of 2020-2021

Sinthesis of the production of soilage and hay obtained in the years of 2020-2021												
Cultivated variety	Research year	Fertilization	Production t/ha				Production difference compared to the average t/ha		Total production t/ha		% compared to the general average	
			Mown 1		Mown 2		Mown 1 + Mown 2		Mown 1 + Mown 2		Mown 1 + Mown 2	
			Soilage	Hay	Soilage	Hay	Soilage	Hay	Soilage	Hay	Soilage	Hay
Mihaela	2020	manure 35 t/ha 30 kg N and 60 kg P2O5	25.8	6.1	22.4	6.1	9.74	1.1	48.2	12.1	113%	110%
		manure 35 t/ha 0 kg N and 0 kg P2O5	21.4	5.1	19.3	4.9	2.21	-0.98	40.7	10	96%	91%
	2021	manure 35 t/ha 30 kg N and 60 kg P2O5	23.9	6.6	18.4	4.7	3.81	0.32	42.3	11.3	99%	103%
		manure 35 t/ha 0 kg N and 0 kg P2O5	20.5	4.3	17.5	4.1	-0.49	-2.58	38	8.4	89%	77%
Average production of the variety t/ha			22.90	5.60	19.23	4.94	3.63	-0.44	42.12	10.54	99%	96%
Dobrogea (4AG07)	2020	manure 35 t/ha 30 kg N and 60 kg P2O5	27.5	8.1	23.3	6.8	12.31	3.92	50.8	14.9	118%	136%
		manure 35 t/ha 0 kg N and 0 kg P2O5	22.2	6.1	20.2	5.2	3.91	0.32	42.4	11.3	100%	103%
	2021	manure 35 t/ha 30 kg N and 60 kg P2O5	24.4	6.8	17.3	4.9	3.21	0.72	41.7	11.7	98%	107%
		manure 35 t/ha 0 kg N and 0 kg P2O5	19.7	4.1	17.1	4	-1.69	-2.88	36.8	8.1	86%	74%
Average production of the variety t/ha			23.45	6.28	19.48	4.48	4.44	-0.22	42.93	10.76	99%	96%
General average production of soilage and hay			Control						42.61	10.98	100%	

4. Conclusions

Through this reasearch, we can conclude that alfalfa remains one of the most important fodder species used for the feed of animals in our country, due to its very good characteristics such as: high productions, very good quality of soilage and hay, high adaptability, ecological plasticity and very good regenerative capacity.

Following the research undertaken in the two experimental years, 2020 and 2021, on the pedo-climatic conditions of the Tormac Plain and without the use of irrigation, the productions of soilage and hay from two mowns were high, making this crop profitable for the farmers from the studied area.

Among the two autochthonous varieties studied, the Dobrogea (4AG07) variety presented a higher production capacity, which demonstrates a superior resistance of the variety to drought conditions, as well as a higher regeneration capacity of the variety, compared to Mihaela variet.

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