Research on the Production Capacity of Barley Fodder Varieties Laverda and Sue Ellen, in the Conditions of the Low Plain of Timis

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Abstract

Part of the annual cultivated grasses from the botanical family of Gramineae (Poaceae), barley (Hordeum Vulgare) is considered as a important cereal crop worldwide, especially regarding its use in animal feed, as beeing known for its many benefits, such as a well-balanced energy and calories intanke and its high protein content.

The large scale use of cereals in human and animal nutrition presents a series of special advantages, such as the possibility of long-term preservation of the quality of the grains, the easy forms of transportation, the multitude of uses, or the potential of cultivating these species in various geo-pedo-climatic conditions. Thus, all these advantages have determined the very high share of cereals globally, not only in terms of the agricultural sector, but also in terms of the world trade.

In animal feed, barley occupies a special place, especially in cattle feed, as it could be consumed in different forms: grains (concentrates), green fodder, hay, coarse fodder, or autumnal mash, is cultivated in a mixture with peas or autumnal sleet.

Due to their particular characteristics, such as very good tolerance to the main foliar diseases and high tillering capacity, the new fodder barley varieties have determined the wide spread of this crop, as one of the main cultivated cereal species, known for its reliable and constant productions and which, together with the two-row barley, exceeds 50 million cultivated hectares worldwide.

Keywords: barley, fodder, productions, varieties

1. Introduction

Cereals, including barley, are considered as the eldest known and cultivated plants by humans, both for their own food, as well as for the animals's feed. These motives have determined the vast areas cultivated with cereals globally.

Barley has great ecological plasticity and is a fully mechanized crop, which determines its cultivation on large areas, both around the world, as well as in our country [1].

In animal feed, barley is considered particularly valuable and it is being used in multiple forms, such as grains (concentrates), green fodder, hay and coarse fodder. Mixed with the pea or the autumn pea, it forms the autumnal mash, known for its special nutritional qualities [2-6].

Given that the palea covering the barley grain are thinner than in the case of other cereals, by grinding barley a high-quality flour is obtained, which has a lower cellulose content, thus being used for fodder recipes meant for raising young poultry and livestock with the aim of reaching a growth increase with low specific consumption.

At the same time, the barley straw is particularly important because it surpasses the nutritional

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value of the wheat, oat, and ryes straws and can be used under the form of an adequate fibrous feed. The malt sprouts and beer starter have an adequate feeding value and contribute to stimulating the milk production in cows [1-3].

Barley and two-rowed barley are cultivated on approximately the same areas as wheat; the difference is the fact that barley has a fastest germination period and thus, lower temperature requirements. Given all these traits, the species can be cultivated in very cold environments (Polar Circle area) or at high altitudes (Tibet, Nepal, Punjab, etc). [1, 3, 5]

The world consumption of barley and two-rowed barley is estimated to over 147 million tons. As well, the world consumption of fodder barley is increasing as consequence of the lower productions of fodder wheat in some East-European countries, as well as of the amplified development of cattle in those countries.

In our country, autumnal barley is cultivated in steppe and forest-steppe areas, while spring two-row barley is found in cool and humid areas. Also, geographically, in Romania, the largest barley cultivation areas are considered to be the Western Plain, Southern Oltenia and Muntenia, the Bărăganu Plain, Dobrogea, as well as the forest-steppe areas of Moldova and Transylvania [3].

In Romania, the total barley and two-rowed barley production from the last twenty years varied by comparison to the average production and ranged from 867 thousand tons in 2000, then dropped to 531 thousand tons in 2006, and gradually increased to 1209 thousand tons in 2007; it continues to fluctuate.

Given an increase in the areas cultivated with barley and two-rowed barley, as well as in the hectare yield, after 2010 the barley production increased in Romania and ranged between 1329 thousand tons (2010) to 1906 thousand tons (2017). According to the data published by the Ministry of Agriculture and Rural Development (Tempo online data), the area cultivated with barley and two-rowed barley in 2019 was 448.8 thousand hectares, with an average production/hectare of 4183 kg and a total production of 1879.9 thousand tons [7].

2. Materials and methods

The main objective of the research carried out in the agricultural years of 2019-2020, 2020-2021 and 2021-2022 has been represented by finding the most suitable fodder barley variety, among the two analyzed - Laverda and Sue Ellen - belonging to the Saaten Union company, in terms of the production capacity, in the climate and soil conditions of the Low Plain of Timis.

The research material includes two varieties of autumnal barley, known among the farmers of the studied area, cultivated on an Aluviosoil type of soil, with loamy/loamy-sandy texture, with a good reserve of humus [8, 9].

Thus, two autumnal barley varieties were studied as research material, respectively, the new fooder barley variety Sue Ellen created by the Saaten Union company and the Laverda variety created by the same German company, which presents high production capacity, distinguished qualities, as well as good resistance to the main diseases [10, 11].

The research method has involved the following monofactorial experience:

Cultivated varieties:

- the Sue Ellen variety
- the Laverda variety

Agricultural years:

- agricultural year of 2019-2020
- agricultural year of 2020-2021
- agricultural year of 2021-2022

The research took place on soil of Aluviosoil type of soil eutric gleyc pelic type, very deep, medium-clay/medium loam, developed on mild-fine non-carbon fluviatile materials (loam-like). According to OSPA Timisoara, the main properties of this soil type are presented in Table 1.

The cultivation technology employed for the two varieties was intensive by the use of modern highly-performant machines for processing the soil and for the other works on applying fertilizers, seeding, maintenance works, and harvesting.

In crop rotation, the precursor plant to autumnal barley was the autumnal rape crop, which is deemed as a good precursor plant for that culture and is highly cultivated in the research area.

Table 1. Soil properties

Soil properties				
Physical and hydro-physical properties				
Texture	Total porosity	Apparent density	Field capacity	Degree of compaction
medium - 0-27 cm	very big - 0-14 cm	very small - 0-14 cm	medium - 0-69 cm	no compaction - 0-14 cm
fine - 27-155 cm	medium - 14-27 cm	medium - 14-27 cm; 40-69 cm		low compaction - 14-27 cm; 40-69 cm
	small - 27-69 cm	big - 27-40 cm		medium compaction - 27-40 cm
Chemical properties				
Soil reaction	Humus soil reserve	Degree of base saturation in the processed horizon (Ap)	Mobile p content in the processed horizon (Ap)	Mobile K content in the processed horizon (Ap)
neutral - 0-27 cm low-alkaline - 27-69 cm	high - 0-50 cm	alkaline	high	high

Source: Archive - Timis Office of Pedological and Agrochemical Studies

3. Results and discussion

The grain productions of the two autumnal barley varieties, namely Sue Ellen-extra-early and Laverda - semi-early, are recorded in Table 2 and Figure 1.

According to the information in the table and in the diagram, we drafted an analysis of the three agricultural years while considering the factors that influence the quantitative yield of the genetic material used for the research.

In the first section of the information recorded, the production results of the two varieties Sue Ellen and Laverda are presented; they were cultivated in the exact same agricultural conditions, on the same type of soil, which was one with medium natural fertility, of alluvial clay/loam type, characteristic to the research area, but which helps grow high crops after fertilizers are applied, thus leading to productions sometimes higher than in the case of cernozem type of soil, known as one the soils with the highest natural fertility.

Also, we presented the productions obtained by the two varieties, on each agricultural year and the general average production that was obtained in the three agricultural years when they were cultivated.

Thus, a superiority of the Sue Ellen variety is observed in all cultivation variants, compared to Laverda variety. Regarding this matter, an explanation could be given by a genetic difference of the two species, involving the production capacity, since the cultivation conditions were identical-soil type, climatic conditions, cultivation technology or precursor plant.

Table 2. Production results in the Low Plain of Timis in the 2019-2020, 2020-2021, 2021-2022 agricultural years

Cultivated crop	Precursor plant	Cultivated varieties	Agricultural year	Productions obtained (kg/ha)	Difference from the average production (kg/ha)	Productions from the avarage (%)
Autumnal barley	Autumnal rape	Sue Ellen	2019 - 2020	7042	-300	95.9%
			2020 - 2021	8110	768	110.4%
			2021 -2022	7242	100	98.6%
		Laverda	2019 - 2020	6985	-513,75	95.1%
			2020 - 2021	7858	516	107%
			2021 -2022	6813	-529	92.7%
Avarage production of the variants (kg/ha)				7342	Blank	100%

Source: Our own research

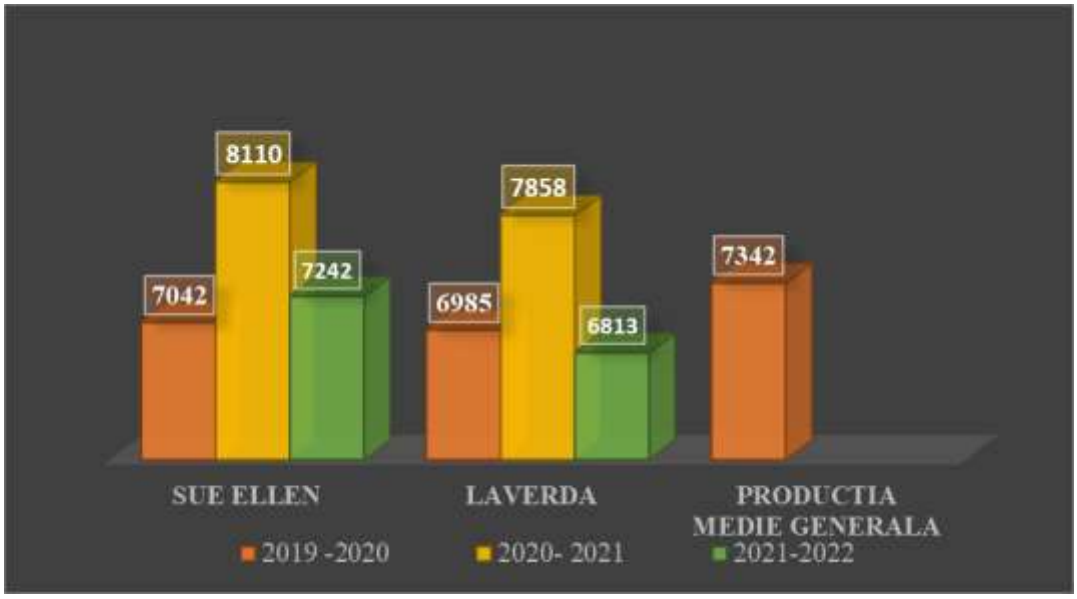

Figure 1. Production results in the Low Plain of Timis in the 2019-2020, 2020-2021, 2021-2022 agricultural years

In the agricultural year of 2019-2020, the value of barley production from the Sue Ellen autumnal barley variety was 300 kg/ha lower by comparison to the general average production. That was due to the fact that in the fall of 2019, when that crop was created, the soil moisture was low, which influenced the germination of seeds and their springing.

The agricultural year of 2020-2021 was very good for the autumnal barley production considering the climate during the fall and during the vegetative phase. These conditions were favorable to vegetative development and echoed in the obtained barley crop, which was 8110 kg/ha, meaning 768 kg/ha above the general average production of the varieties (7342 kg/ha); it indicates a crop increase of over 10%.

The productions in the 2021-2022 agricultural year were above those in 2019-2020, but lower than those of 2020-2021, by almost 800 kg. However, considering some lower precipitation in the fall of 2021 and in the grain-formation period, those 7242 kg/ha indicate a good crop that was obtained on a natural medium fertility soil.

In connection to the results obtained from the second variety cultivated during the same period and in the same climatic and soil conditions, we found overall lower productions.

The production results that we analyzed for the first agricultural year point out to a difference of -514 kg/ha by comparison to the average production of the two varieties, and in 2021-2022 by 529 kg/ha below the general average.

The agricultural year that was most favorable to the autumnal barley crop, for the Laverda variety, was 2020-2021, when the crop was 516 kg/ha higher by comparison to the blank value, meaning 7858 kg/ha; thus, it indicates a crop increase of over 7%. After analyzing the agricultural year from a climate point of view, for the Laverda variety we found two years with similar conditions, deemed satisfactory (2019-2020 and 2021-2022), and the 2020-2021 agricultural year was deemed good.

From the calculation of average grain productions, made for each variety from the reference period, it can be observed that, for the Sue Ellen variety, the average is 7465 kg/ha, and for Laverda 7219 kg/ha. The production difference of 246 kg/ha is in favour of the Sue Ellen variety, which showed its production capacity better in the climate and soil conditions of the Timiș Low Plain.

4. Conclusions

The three agricultural years were different regarding the monthly averages of temperatures and precipitation during the vegetation period, the most favorable for both cultivated varieties being the agricultural year 2020-2021, when the harvest was around 8000 kg/ha.

The climate and soil conditions in the researched area, are favorable for the autumn barley crop. The varieties tested, Sue Ellen and Laverda, during the three agricultural years, on a soil with good fertility, proved to be adequate for cultivation, justified by the good harvests obtained.

The variant with the highest grain production was recorded in the agricultural year of 2020-2021, for the Sue Ellen variety - 8110 kg/ha, and the lowest, in the case of the Laverda variety - 6813 kg/ha, in the year 2021-2022.

The average grain production of the six variants analyzed was 7342 kg/ha, being considered very good and profitable for the conditions in the researched area.

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