INFLUENCE OF SOME TECHNOLOGICAL FACTORS ON PRODUCTIVITY OF MAIZE SILAGE IN THE CONDITIONS OF DEPRESSION JIJIA - BAHLUI

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Abstract

Maize silage growing provides an energy feed for dairy cows. Corn silo, with a relatively high energy content, is also well suited for low-cost rations for fattening cattle. The suitability for silage of maize depends on several factors including: cultivated hybrid, climatic conditions, harvesting time, relations between all these factors, but also its energy value at the time of harvesting. Corn production in developing areas is low compared to developed countries, one of the causes being the sowing density. The research was conducted in 2017 in the pedoclimatic conditions corresponding to the depression Jijia - Bahlui. Three experimental factors were, as followed: the influence of sowing density, the distance between the rows and the hybrid on dry matter production (DM) in order to obtain the best quality silo. The results obtained showed that under the experimental conditions of 2017 year, the highest DM production (29.61 Mg·ha^{-1}) was obtained at the H3 hybrid at the sowing density of 100000 plants·ha^{-1} and the distance between rows of 50 cm. The production increase compared to the control by 86.7%. The H2 hybrid at the density of 100000 plants·ha^{-1} and the distance between rows of 70 cm obtained the lowest DM production (12.33 Mg·ha^{-1}) the difference compared to the control variant was 22.3%.

Keywords: maize hybrids, density, dry matter production

INTRODUCTION

Maize silage provides an energy feed for dairy cows. This is most important for high-quality production and for farms facing problems related to the production or purchase of high-quality feed. Maize silage, with a relatively high energy content is also well suited for use in low-cost ratios for cattle fattening (Roth G.W. and Heinrichs A.J., 2017). The silage obtained from maize plants is characterized by a stable fermentation due to a dry matter content of more than 200 g·kg^{-1}, high carbohydrate concentration and low buffering capacity (Fisher L.G. and Burns J.C., 1985).

The suitability for silage of maize depends on several factors including: cultivated hybrid, climatic conditions, harvesting time, relations between all these factors, but also its energy value at the time of

harvesting (Ceclan, 2010; Vîntu *et al*., 2010).

The importance of this type of feed is motivated by a number of peculiarities, such as: stimulates a high production capacity for dairy cows and it has high consumption in both green and fermented forage (Pinter *et al*., 1990). Due to the richness of the carbohydrates content can be easily fermented, it also has a great ecological plasticity that allows it a wide area of spreading (Baciu and Ciocan, 1991). Silk maize hybrids are the „*pillars of resistance*" of cattle farms, ensuring a high green mass production with high digestibility and low levels of cell walls (Cox *et al*., 2013). Also, maize silage offers a high palatability feed (Oliveira *et al*., 2017).

There is a series of correlations between plant density and production. Thus, this factor modifies some parameters such as: number of leaves, leaf angle, leaf edge length and upper leaf area, staygreen effect (Mansfield and Mumm, 2013).

MATERIAL AND METHOD

The studies were conducted in 2017 in Moldavian forest steppe. From the administrative point of view, the area under study is located in the Iasi county, on the coordinates (47°02' north latitude and 27°22' east longitude).

From the climatic point of view, the territory belongs to the temperate-continental climate zone under the influence of Atlantic and Euro-Asian anti-cyclones. The year of experience was characterized by normal weather conditions, no extreme weather phenomena were recorded during the whole vegetation period of the experience. The soil corresponds to the forest steppe zone types and is a cambic chernozem, formed on clay deposits.

The research was concerning at the influence of sowing density and distance between rows at three different plant densities on the silage maize production on three maize hybrids.

In order to attain the proposed objectives, a polyfactorial experience was set up. The experiment was established, with a design type 2x3x3, arranged in subdivided plots in three replications, which have a 22,4 m^2. The factors were as follows: A - distance between rows, with two graduations (a_1 - 70 cm between rows and a_2 -50 cm between rows), B - cultivated maize hybrid, with three graduations (b_1 - H1, b_2 - H2 and b_3 - H3) and C - plant densities, with three graduations (c_1 - 70000 plants·ha^{-1}, c_2 - 83000 plants·ha^{-1} and c_3 - 100000 plants·ha^{-1}).

The precursor culture was maize, the experience being in the second year of research in the same location. In the autumn, a basic fertilization of 200 kg·ha^{-1} ($N_{18}P_{46}$)

was carried out and in the pre-sowing seedbed was fertilized throughout the experiment with 200 kg·ha^{-1} of urea (N_{46}).

The hybrids used were H1 - FAO 450, H1 - FAO 480 and H1 - FAO 550. Major phenomena that could have led to the compromise of the experience were not recorded. On the emergence of plants there was a slight attack on the *Tanymecus dilaticollis* Gyll., the most affected being the H1 hybrid.

The date of sowing was 2nd of May 2017, and the harvest date was 25th of August 2017.

RESULTS AND DISCUSSION

From the study conducted resulted, the analysis of the influence of the distance between the rows on dry matter production (table 1), showed that by decreasing the nutrition space to 50 cm between maize plants rows there was an insignificant increase of the dry matter production, of only 9.5% compared to the control, being recorded at 19.34 Mg·ha^{-1}.

Table 1

Influence of distance between maize plants rows on dry matter production

Experimental plot	DM production (Mg·ha^{-1})	Diferences		Statistical significance
		Mg·ha^{-1}	%	
a_1 - 70 cm between rows (c)	17.66	Control	100	Control
a_2 - 50 cm between rows	19.34	1.69	109.5	ns
	LSD 5%	*2.38*		
	LSD 1%	*3.95*		
	LSD 0.1%	*7.39*		

The influence of the genotype (hybrid) on dry matter production is shown in table 2. As with green mass production, dry matter production is most strongly influenced by the studied hybrids. Thus, the H3 hybrid recorded the highest production of dry matter, of 25.76 Mg·ha^{-1}, with a production increase compared to the control of 60.6%.

Of hybrids tested, hybrid H2 recorded the lowest dry matter yield of only 13.70 Mg·ha^{-1}, the difference from the control hybrid (H1) being insignificant.

Table 2

Influence of maize hybrid on dry matter production

Experimental plot	DM production ($Mg \cdot ha^{-1}$)	Diferences		Statistical significance
		$Mg \cdot ha^{-1}$	%	
b_1 - H_1 (control)	16.04	Control	100	Control
b_2 - H_2	13.70	-2.34	85.4	ns
b_3 - H_3	25.76	9.72	160.6	***
	LSD 5%	*2.79*		
	LSD 1%	*4.63*		
	LSD 0.1%	*8.66*		

The analysis of the influence of the sowing density on the production of dry matter (table 3) highlights the fact that, with the increase of the nomber of plants·ha^{-1}, there is a decrease of the production of dry matter, the values obtained oscillating between 17,8 Mg·ha^{-1} at the density of 83000 plants·ha^{-1} and 19.01 Mg·ha^{-1} at the density of 70000 plants·ha^{-1}.

The effect of the interaction betwen distance between rows, maize hybrid and, plant densities on dry matter production is shown in table 4.

Table 3

Influence of sowing density on dry matter production

Experimental plot	DM production ($Mg \cdot ha^{-1}$)	Diferences		Statistical significance
		$Mg \cdot ha^{-1}$	%	
c_1- 70000 plants·ha^{-1} (c)	19.01	Control	100	Control
c_2- 83000 plants·ha^{-1}	17.87	-1.13	94.0	ns
c_3- 10000 plants·ha^{-1}	18.62	-0.39	97.9	ns
	LSD 5%	2.75		
	LSD 1%	4.56		
	LSD 0,1%	8.52		

Table 4

Influence of interaction between experimental factors on dry matter production

Experimental plot			Dry matter production ($Mg \cdot ha^{-1}$)	Diferences		Statistical significance
				$Mg \cdot ha^{-1}$	%	
a_1 - 70 cm between rows (c)	b_1 - H_1 (c)	c_1 - 70000 plants·ha^{-1} (c)	15.86	Control	100	Control
		c_2 - 83000 plants·ha^{-1}	14.36	-1.51	90.5	ns
		c_3 - 10000 plants·ha^{-1}	16.11	0.24	101.5	ns
	b_2-H_2	c_1 - 70000 plants·ha^{-1}	14.18	-1.68	89.4	ns
		c_2 - 83000 plants·ha^{-1}	13.72	-2.14	86.5	o
		c_3 - 10000 plants·ha^{-1}	12.33	-3.54	77.7	ooo
	b_3 - H_3	c_1 - 70000 plants·ha^{-1}	25.66	9.79	161.7	***
		c_2 - 83000 plants·ha^{-1}	24.08	8.22	151.8	***
		c_3 - 10000 plants·ha^{-1}	22.61	6.75	142.5	***
a_2 - 50 cm between rows	b_1 - H_1	c_1 - 70000 plants·ha^{-1}	18.71	2.85	117.9	**
		c_2 - 83000 plants·ha^{-1}	14.90	-0.96	94.0	ns
		c_3 - 10000 plants·ha^{-1}	16.28	0.42	102.6	ns
	b_2-H_2	c_1 - 70000 plants·ha^{-1}	14.24	-1.63	89.7	ns
		c_2 - 83000 plants·ha^{-1}	12.98	-2.88	81.9	oo
		c_3 - 10000 plants·ha^{-1}	14.76	-1.11	93.0	ns
	b_3 - H_3	c_1 - 70000 plants·ha^{-1}	25.39	9.53	160.1	***
		c_2 - 83000 plants·ha^{-1}	27.19	11.33	171.4	***
		c_3 - 10000 plants·ha^{-1}	29.61	13.75	186.7	***
			LSD 5%	*1.71*		
			LSD 1%	*2.29*		
			LSD 0,1%	*3.02*		

Average dry matter yields ranged from 12.33 Mg·ha^{-1} to the interaction of $a_1b_2c_3$ (70 cm between rows x H2 x 100000 plants·ha^{-1}) and 29.61 Mg·ha^{-1} at the interaction between $a_2b_2c_3$ (50 cm between rows x H2 x 100000 plants·ha^{-1}).

Unfavorable interactions with sowing plant densities and with the distance between rows were recorded in the H2 hybrid, with the dry matter being inferior to the control.

From the data obtained, it emerges that the H3 hybrid has had a major effect on the production of dry matter in all interactions, the differences being very significant compared to the other studied factors.

CONCLUSIONS

Increasing the sowing density, and the use of some hybrids, such as H2 hybrid at the density of 100000 plants·ha^{-1} in this study, reduces the nutritional value of the feed by lowering the dry matter content and production.

Sowing maize plants at a distance of 50 cm between rows, compared to 70 cm between rows, has increased the production of dry matter.

The results obtained showed that under the experimental conditions of 2017 year, the highest dry matter production (29.61 Mg·ha^{-1}) was obtained at the H3 hybrid at the sowing density of 100000 plants·ha^{-1} and the distance between the rows of 50 cm, the production increase compared to the control being 86.7%. The H2 hybrid at the density of 100000 plants·ha^{-1} and the distance of the 70 cm rows obtained the lowest dry matter production (12.33 Mg·ha^{-1}), the difference from the control variant 22.3%.

It was noticed that with the increase of sowing density, the percentage of plants with breeds decreases, with differences between hybrids.

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