

Silage Quality of Father Components from Seed Corn Production

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Abstract: Considering the fact that higher corn silage production can be achieved using father components as a by-product in seed corn production, the paper was aimed at analyzing silage quality of pollinator inbred lines in such production. The research was carried out in 1995 and 1996, with the following inbred lines used: 21 NS, 115/II NS, ZPPL 196 and ZPPL 80.

The ratio of mother and father component was 4:2 meaning that pollinator shared one third of the seeded surface. Harvest of pollinator inbred lines was done by hand at the stage of milk-wax maturity of corn. Corn plants were cut well on a stationary cutter and green matter was turned into silage which was packed in polyvinyl sacks.

The contents of raw proteins, raw cellulose, raw fat matter, raw ash, non-nitrogen extractive matter (NEM) were determined by means of chemical analyses. Net energy for lactation (NEL) and net energy for meat production (NEM) (in MJ/kg dry matter) were calculated. Besides the content of nutritional matter, pH value of the silage, the contents of free and bound acetic acid, free and bound butyric acid and lactic acid, were also determined. Based upon a relative ratio between these acids, silage quality was assessed after Flieg. The results indicated that corn pollinator inbred lines silage had a high nutritional and energetic value.

Inbred lines pollinators represent a good quality and a cheap source of bulky forages, the use of which may, without big investment, reduce costs of corn hybrid seed production. Also, a more rational land use and good supplies of bulky forages would be ensured, as a route towards field crop and livestock production intensification.

Key words: corn, inbred line, silage, quality

Introduction

Corn (*Zea mays* L.) is known to represent one of the most important plant species in and out of the country. Not only large areas under corn but also a wide range of its use are the evidence of its significance. Corn is used for human and domestic animals diet and industrial processing, too. In the diet of domestic animals, corn may be used in different ways: as a silage from entire plant, its parts, but most commonly for seed production as a component of concentrated fertilizers. Entire plants are being increasingly used in corn growing in and out of the country. Thus, corn has become one of the most significant energetic fodder which may provide for the main part of meal in winter and summer diet of milking cows, breeding heads and fattening bullocks (Dukic et al., 1994).

Corn is grown on around 29000 hectares for silage production in Yugoslavia (data from FGY, 1966). From 1990-1995, average yields were differing ranging from 13.4 t/ha to 22.9 t/ha. Bearing in mind the significance of corn as a fodder, the EU countries' growing corn areas for silage purposes account for more than 47% (Eisele, 1988) whereas it is still insufficiently cultivated for silage production and inbred lines are not used in this regard at all in Yugoslavia. The reason for this is, among other things, an insufficient knowledge of the corn pollinator inbred lines value as by-products significant in domestic animals diet.

Therefore, it seemed to be of some interest to study some of the silage quality components of those corn pollinator inbred lines being cultivated most often.

The paper was aimed at analyzing the silage quality of the pollinator inbred lines as byproduct in corn seed production. These studies would thus help use father components for silage and a more rational land use and irrigation system, as well. Silaging of the pollinator inbred lines would diminish costs on the corn hybrid seed production and raise good quality and cheap forages production, which would help livestock production advancement, too.

Material and Methods

Researches were carried out in 1995 and in 1996 on the farm PP "Kljajicevo" from Kljajicevo. The experiment was set up by randomized split block design with three replications. The surface of the elementary plot was 70m² (7m x 10m).

Inbred lines of the Crop and Vegetable Institute from Novi Sad and those from the Maize Institute "Zemun Polje" from Zemun Polje were used for studying silage quality of the corn grain pollinator inbred lines:

- Inbred line 21 NS, FAO group 500;
- Inbred line 115/II NS, FAO group 400;
- Inbred line ZPPL 196, FAO group 100, and
- Inbred Line ZPPL 80, FAO group 500.

The inbred lines under study are used as pollinators for seed production of the leading NS and ZP corn grain hybrids.

Inbred lines seeding proceeded manually in the second decade of April, 1995 and in 1996. After emergence, crops were thinned up to the final plant pattern. The ratio of mother and father components was 4:2, meaning the pollinator shared one-third of the seeded surface.

Researches proceeded without irrigation. Cultivation practices, including fertilization and crop protection were commonly applied as is the case with seed corn grain cultivation. Father components were collected by hand at the milk-wax maturity stage of corn grain separately for each inbred line. Corn grain plants were minced on a stationary cutter and the silage, previously made from green matter, packed in polyvinyl sacks.

Silage quality was determined using standard methods for chemical analyses of dry matter (DM): content of raw proteins (RP), followed by that of raw cellulose (RC), raw fat matter (RFM) and raw ash (RA).

The results of chemical analyses were used to calculate values of nitrogen free extractive matter (NEM), net energy for lactation (NEL), that for meat growth and production (NEM) (MJ/kg DM). The values of NEL and NEM were calculated following the instructions of Obradovic (1990).

Chemical analyses were used to determine silage pH, the content of free and bound acetic acid, that of free and bound butyric acid and that of lactic acid. On the basis of their relative ratio, silage quality was assessed after Flieg (cited by Cobic, 1984).

The obtained results on silage chemical analysis were statistically processed using the analysis of variance (ANOVA). The significance of the differences between the treatments were found by t-test.

Results and Discussion

Ensiling represents the mode of plant conservation aimed at good conserving of ensilaged feed nutritional value with the minimal losses. The less changes in the properties of initial ensiling matter take place, the better silage quality will be. During ensiling process, raw proteins and other nutritional matter become more soluble, hence a greater energy (Vuckovic and Kovcin, 1994). This is the main reason that prompted us to study chemical composition of the grain corn pollinator inbred lines ensilage as well as the entire and individual ensilage acidity.

Content of dry matter and chemical quality of grain corn pollinator inbred lines ensilage are shown in table 1.

Content of dry matter - In 1995, the highest content of dry matter was established in inbred line ZPPL 196(28.4%). Inbred lines ZPPL 80 and 115/II NS were found to contain 26.5% and 24.8% dry matter, respectively. The lowest content of dry matter was recorded in the silage obtained from inbred line 21 NS (23/1%).

In 1996, the highest content of dry matter was found in inbred line 21 NS (29.3%), followed by that of 115/II NS (26.3%) and ZPPL 80 (22.4%). The lowest content of dry matter was revealed in ZPPL 196 (21.0%), (tab. 1).

Tab. 1 Content of dry matter (%), chemical composition (% DM) and NEM share in ensilage of grain corn pollinator inbred lines, in 1995 and 1996

Year	Inbred line	DM	% DM				Share
		%	S P	S C	S M M	S P e	B E M
1995	ZPPL - 196	28,40	7,56	26,38	2,48	3,26	60,32
	21 NS	23,10	7,91	28,73	2,25	5,98	55,13
	ZPPL - 80	26,50	9,78	26,08	2,69	4,72	56,73
	115/II NS	24,80	8,74	28,57	2,58	4,15	55,96
	Average	25,70	8,50	27,44	2,50	4,53	57,04
	C V (%)	8,84	11,63	5,12	7,50	25,17	4,01
1996	ZPPL - 196	21,00	6,17	24,74	1,77	4,02	63,30
	21 NS	29,30	9,08	29,99	1,75	4,23	54,95
	ZPPL - 80	22,40	7,63	24,74	1,62	4,24	61,77
	115/II NS	26,30	7,34	25,53	1,95	4,58	60,60
	Average	24,75	7,56	26,25	1,77	4,27	60,16
	C V (%)	15,24	15,84	9,60	7,66	5,43	6,05
Average 1995/96		25,23	8,03	26,85	2,14	4,40	58,55
CV (%)		11,61	14,13	7,43	19,54	17,60	5,68
LSD 0,05		4,99	1,48	1,84	0,71	0,95	3,52
0,01		7,62	2,15	2,68	1,04	1,38	5,12

In 1995, average content of dry matter for all inbred lines was 25.7%, with variation coefficient VC = 8.84%, whereas in 1996, it amounted to 24.5%. In 1996, the higher differences in dry matter content of inbred lines, as denoted by variation coefficient VC = 15.24%. For both study years, the average content of dry matter in ensilage amounted to 25.23%.

Andrieu (1976) thought the grain corn conserving quality to be satisfactory when dry matter content ranged from 20-40%. Giardini et al., (1976) reported about results obtained from 24 experiments with entire grain corn plant being ensilaged. These results suggest the existence of a highly positive correlation between dry matter content and the processes taking place in silo mass during ensiling. With the increase in dry matter content, the losses in dry matter decrease as does the content of reducing sugars, whereas pH increases in ensilage.

Content of raw proteins- The content of raw proteins in ensilage of the grain corn pollinator inbred lines was found to range from 6.17-9.78%. In 1995, the highest content of raw proteins was recorded in the ZPPL 80 inbred line (9.78%), followed by 115/II NS (8.74%) and 21 NS (7.91%). The lowest content of raw proteins was recorded in ZPPL 196 (7.56%), (tab. 1).

In 1996, the highest content of raw proteins was registered in 21 NS (9.08%). The content of raw proteins in the ZPPL 80 inbred line was 7.63%, in the 115/II NS inbred line - 7.34%, and the lowest content of raw proteins was found in the ZPPL 196 inbred line (6.17%).

In both years, the average content of raw proteins was found to be 8.03%, with variation coefficient VC being 14.13%. These results are in strong

agreement with those obtained by Cobic et al., (1984) emphasizing that grain corn plant had a relatively low content of raw proteins (8-10% DM), which enabled it to be as readily as in high quality manner ensilaged without additives. According to studies of Sibalic et al., (1985), the content of raw proteins in the five NS grain corn hybrids, was found to range from 7.27-9.47%.

Content of raw cellulose- Silage performed from four inbred lines is characterized by a high content of raw cellulose. In 1995, the highest content of raw cellulose was determined in the silage of inbred line 21 NS (28.73%), which is significantly higher compared to ZPPL 80 (26.08%) and ZPPL 196 (26.38%). In 1996, the inbred line 21 NS with 29.99% of raw cellulose marked its considerably higher content compared to the other inbred lines (tab. 1.).

The average raw cellulose content in both years was 26.85%, which is in agreement with the results of Zujovic et al. (1993). These authors emphasized the chemical content of grain corn hybrid silage: of oil, opaque-2 and of ZP 704 hybrid. Thus, the content of raw cellulose in the silage of the ZP 704 hybrid, oil and opaque-2 hybrids was 28.04%, 24.02% and 23.75%, respectively.

Content of raw fat matter - In 1995, it was found to range from 2.25% (21 NS) to 2.69% (ZPPL 80) in the grain corn inbred lines silage. Raw fats contained in the silage of the ZPPL 196 inbred line and those contained in 115/II NS one accounted for 2.48% and 2.58%, respectively (tab. 1).

In 1996, it was found out that the silage of the 115/II NS inbred line contained raw fats most (1.95%), that of ZPPL 196 less (1.77%) and that of 21 NS least (1.75%), with their lowest content established in ZPPL 80 (1.62%). In 1996, the average content of raw fat matter for all the inbred lines amounted to 1.77% (tab. 1.)

Low variability recorded in 1995 and in 1996 ($VC = 7.5\%$ and $VC = 7.6\%$) denotes a fairly uniform raw fat matter content in the silage, whereas a high variation coefficient in both years ($VC = 19.54\%$) was the consequence of the lower raw fat matter content in 1996 (1.77%) than that recorded in 1995 (2.5%) (tab. 1).

According to Koljajic et al. (1993), the content of raw fat matter in the silage of grain corn matter was recorded to be 1.99%, while Negovanovic et al. (1993) found it to be 4.63%, 4.58% and 3.92% in the grain corn hybrids ZPSC 599, ZPSC 677 and ZPSC 704, respectively.

Content of raw ash - In 1995, its highest content was reported to be in the silage of inbred line 21 NS (5.98%), followed by that in ZPPL 80 (4.72%) and by that in 115/II NS (4.15%). Its lowest content was determined in the ZPPL 196 inbred line (3.26%). The inbred line 21 NS was found to have a significantly higher content of raw ash compared to the other lines (tab. 1).

In 1996, raw ash contained in the silages of the pollinator inbred lines ranged from 4.02% (ZPPL) to 4.58% (115/II NS) (tab. 1).

The average content of raw ash recorded in 1995 amounted to 4.53 % and that recorded in 1996 to 4.27%. In both years, the average raw ash content was found to be 4.40%. A high coefficient of variation ($CV = 25.17\%$) was most likely the consequence of the highly remarkable difference existing between the contents of raw ash in inbred lines 21 NS (5.98%) and ZPPL 196 (3.26%). In

1996, silages of inbred lines had a uniform raw ash content, hence the low coefficient of variation ($CV=5.43\%$) (tab. 1.).

NEM share - Grain corn plant represents a carbohydrate nutrient with a suitable ratio between structural and non-structural components. Such a ratio ensures a good fermentation of the nutrients in the ruminants' first stomach and is therefore highly advantaged to the other forage silages.

NEM share in the grain corn inbred lines silage was found to amount from 55.13 (21 NS) to 63.30% (ZPPL 196). In 1995, its highest share was determined in the ZPPL 196 inbred line silage (60.32%) and the lowest one in the 21 NS one (55.13%). In 1996, the highest NEM-share was determined in the ZPPL 196 inbred line (63.30%), followed by that in ZPPL 80 (61.77%) and that in 115/II NS (60.60%), whereas the lowest NEM share pertained to 21 NS inbred line (54.95%). In both years, ZPPL 196 inbred line had a significantly higher NEM share than the other lines did. In 1995, all the inbred lines were found to have the average NEM share of 57.04%, which is by 3.12% less than average for 1996 (55.13%). Apparently, the lower NEM share in the grain corn inbred lines silage was most likely the result of a higher fat and protein share in green matter in 1995 (tab. 1).

Similar results on NEM share in the grain corn silage were obtained by Zujovic et al.(1993), reporting that ZP 704 inbred line silage had 53.7% NEM. Negovanovic et al. (1993) found the average NEM share in three ZP grain corn hybrids to be 67.25%.

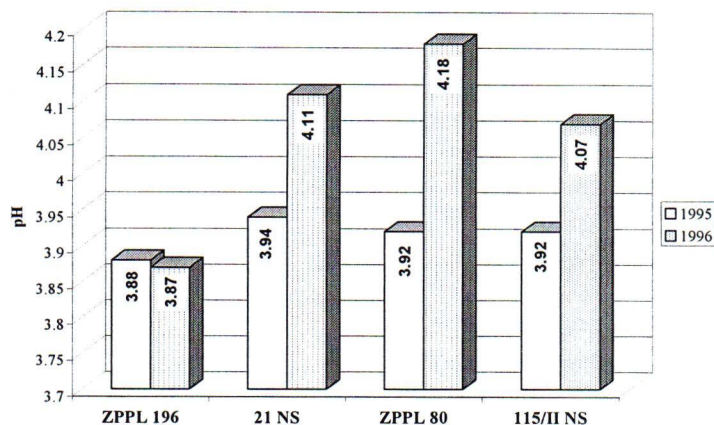
Silage pH value- In addition to chemical composition and organoleptic properties (color, odor and structure), the degree of acidity (pH) and content of organic acids occurring over the silage process deserve special mention. pH value of the silage represents one of the best criteria for silage quality assessment. Thus, in 1995, the silage obtained from father components of the seed grain corn production indicated pH from 3.88 (ZPPL 196) to 3.94 (21 NS). However, in 1996, grain corn pollinator inbred line silage had a higher pH compared to that in 1995. Thus, the highest pH was determined in the ZPPL 80 inbred line (4.18), succeeded by that in 21 NS (4.11) and that in 115/II NS (4.07). The lowest pH pertained to ZPPL 196 inbred line (3.87) (Fig. 1).

These pH values of silage are likely to incite fairly desirable processes during fermentation and conservation of plant nutrients. According to Cobic (1984), carefully prepared silage may have pH to range from 3.5 to 4.2. The same authors cited that silage with $pH > 5.0$ seemed insufficiently acid, while that with $pH < 2.0$ was however too acid.

Content of organic acids in the silage - is assumed to be an essential indicator of silage quality, with special significance of milk, acetic and butyric acids due to their influence on the course of fermentation.

Lactic acid - its presence in silage denotes the fermenting extent and initial matter richness in proteins. In 1995, lactic acid content in grain corn inbred lines silage ranged from 2.17% (ZPPL 196) to 2.71% (115/II NS). In 1996, the silage of the grain corn father components averaged somewhat lower content of lactic acid. Its highest content was determined in the ZPPL 196 inbred line (1.4%) and the lowest one in 115/II NS (0.7%) (tab. 2).

Fig. 1 pH value of grain corn pollinator inbred lines in 1995 and in 1996



As cited by Cobic et al., (1984), a good grain corn silage may provide lactic acid content from 1.5-6.5%. Negovanovic et al. (1993) found ZP corn hybrids silage to contain 2.32-2.75% lactic acid. Thus, the finding on lactic acid contained in grain corn pollinator inbred lines silage was in full agreement with current results as well as with those of Bacvanski et al. (1985) and Golobo et al., (1988).

Acetic acid- appears at the onset of green matter fermentation due to oxygen presence and undesirable bacterial effects. Higher share of acetic acid may give rise to a lower silage consumption. Thus, acetic acid contained in inbred lines silage was found to range from 0.28% (ZPPL 196) to 0.70% (115/II NS). In 1995, its highest total content was established in the silage of the inbred line 21 NS (0.62%), followed by that in ZPPL 80 (0.60%) and that in 115/II NS (0.54%). The lowest content of acetic acid pertained to the ZPPL 196 inbred line (0.28%). In 1996, the content of acetic acid was found to range from 0.45% (21 NS) to 0.70% (115/II NS), (tab. 2.).

Tab. 2 Content of acids (%) in the silage of grain corn pollinator inbred lines in 1995 and in 1996

Year	Inbred line	Lactic acid	Free		Total	
			Acetic acid	Butyric acid	Acetic acid	Butyric acid
1995	ZPPL 196	2,17	0,23	0,00	0,28	0,00
	21 NS	2,21	0,55	0,00	0,62	0,00
	ZPPL 80	2,60	0,60	0,00	0,60	0,00
	115/II NS	2,71	0,51	0,00	0,54	0,00
	ZPPL 196	1,40	0,50	0,18	0,55	0,18
1996	21 NS	1,23	0,41	0,00	0,45	0,06
	ZPPL 80	1,00	0,42	0,06	0,53	0,06
	115/II NS	0,70	0,83	0,04	0,70	0,04
	L S D	0,05	0,22	0,09	0,22	0,09
		0,01	1,95	0,33	0,33	0,13

Butyric acid - is an undesirable component of grain corn silage. No butyric acid existed in grain corn pollinator inbred lines silage during 1995, whereas it did exist in 1996 being reported in ZPPL 196 (0.18%), ZPPL 80 (0.06%) and in 115/II NS (0.04%), (tab. 2).

According to Cobic et al. (1984), the content of butyric acid in the silage should be less than 0.05%, whereas Pejic (1994) noticed that the silage with 0.5% butyric acid might unfavorably affect the course of fermentation and therefore be completely useless. It appeared that butyric acid content in ZPPL 196 inbred line was due to a roughly cut green matter during silage preparation, which caused insufficiently compacted silage. In addition to poor silage compactness, as the main reason for the onset of butyric acid, silage material pollution with soil particles and a rather weak acidity were also reported to favor its occurrence (Cobic et al., 1984)

Silage quality assessment - based upon the relative content of lactic, acetic and butyric acid, silage quality (according to Flieg - cited by Cobic et al., 1984) has been calculated and presented in tab. 3.

In 1995, grain corn inbred lines silage seemed outstandingly good. The best score (100) was achieved by the ZPPL 196 inbred line silage, followed by those of ZPPL 80 and 115/II NS with 98 and that of 21 NS with 96 points recorded. Such a good silage quality was due to a suitable ratio between lactic and acetic acid and absence of butyric acid, as well. Relative share of lactic acid ranged from 78.09% (21 NS) to 88.57% (ZPPL 196), and that of acetic acid from 11.43% (ZPPL 196) to 21.91%(21 NS), (tab. 3.).

Tab. 3. Relative share of acids (%) in the silage of pollinator inbred lines and silage quality assessment by Flieg in 1995 and in 1996

Year	Inbred Line	Relative share (%)			Points	Quality Assessment
		Lactic Acids	Butyric Acids	Acidic Acids		
1995	ZPPL 196	88,57	0,00	11,43	100	very good
	21 NS	78,09	0,00	21,91	96	very good
	ZPPL 80	81,25	0,00	18,75	98	very good
	115/II NS	83,38	0,00	16,62	98	very good
	Average	82,82	0,00	17,07	98	
	C V (%)	5,31	0,00	24,93	1,7	very good
1996	ZPPL 196	65,73	8,45	25,82	43	moderate
	21 NS	73,21	0,00	26,79	92	very good
	ZPPL 80	62,89	3,77	33,34	50	moderate
	115/II NS	54,88	2,44	42,68	48	moderate
	Average	64,17	4,88	35,20	58	
	C V (%)	1,8	64,72	38,43	39,4	moderate
$\bar{x}$ (1995 i 1996)		73,50	4,38	26,14	78	
C V (%)		15,64	64,72	51,35	33,2	good

The silage quality in 1996 was worse than that in 1995. The 21 NS inbred line scored 92 points and had a very good silage quality, whereas the other inbred lines had a moderate silage quality with 43-50 points recorded. Such a lower silage quality of inbred lines was due to the presence of butyric acid, whose relative share ranged from 2.44% (115/II NS) to 8.45% (ZPPL 196). In 1996, the ratio between lactic and acetic acid became less suitable. The relative share of acetic acid, ranging from 26.79% (21 NS) to 42.68% (115/II NS) was increased, whereas the share of lactic acid ranged from 54.88% (115/II NS) to 73.21% (21 NS) (tab. 3).

Energetic value of grain corn inbred lines silage - In addition to nutrient content, it is necessary to determine the energetic value of the nutrient. Effects of utilizing metabolic energy depend on whether the nutrient is used for reproductive growth, growth and fattening or for milk production. Therefore, the energetic value of the nutrients to be used for ruminant nutrition may be expressed as a net energy of lactation (NEL) or as a net energy for growth and meat production (NEM).

The energetic value in 1 kg of the green dry matter and in grain corn inbred lines silage, is given in tab. 4.

Tab. 4. Energetic value of the grain corn pollinator inbred lines silage (MJ/kg dry matter)

Year	Energetic value	ZPPL 196	21 NS	ZPPL 80	115/II NS	$\bar{x}$
1995	NEL	5,58	5,95	6,15	5,42	5,77
	NEM	5,57	6,04	6,30	5,35	5,81
1996	NEL	5,52	5,29	5,57	6,01	5,59
	NEM	5,51	5,19	5,56	6,16	5,60
$\bar{x}$	NEL	5,54	5,62	5,86	5,71	5,68
	NEM	5,54	5,61	5,93	5,75	5,70

In 1995, the highest NEL of the silage was recorded in ZPPL 80 (6.15), somewhat lower in 21 NS (5.95) and in ZPPL 196 (5.58) and the lowest one in 115/II NS (5.42). Regarding NEM values, the inbred lines ranked likewise. In 1996, the silage of inbred lines ranged from 5.29 (21 NS) to 6.01 (115/II NS), or from 5.19 (21 NS) to 6.16 (115/II NS) NEM units (tab. 4).

Based upon results of Djukic et al. (1994), 7.33 NEL or 7.86 NEM units were determined in 1 kg of dry matter of the 21 NS inbred line green matter. Obravec (1990) found out that at its milk-wax maturity stage, grain corn green matter contained 6.23-6.26 NEL and 6.39-6.42 NEM units, respectively. The same author reported that at its milk-wax maturity stage grain corn silage contained 5.39 NEL or 5.37 NEM units.

Comparing these with the other authors' results, the silage of father components may be considered to have a lower energetic value than that of grain corn hybrids in light of grain corn pollinator inbred lines energetic value.

Conclusion

Based upon quality analysis of grain corn pollinator inbred lines silage from grain corn seed production, the following conclusions may be drawn:

- The silage of the father components from the grain corn seed production had a suitable chemical composition. The content of RP ranged from 6.17-9.78%, that of RC from 25.53-29.99%, that of RFM from 1.62-2.69% and that of RA from 3.26-5.98%. NEM share of the silages studied ranged from 54.95-63.3%, with significant differences existing in RC, RA and NEM contained in the silage of the inbred lines.

- The grain corn pollinator inbred lines silage was found to have pH ranging from 3.87 to 4.11, with a good ratio between lactic, acetic and butyric acids, hence silage quality was assessed as of moderate or of good quality.

- Silages of grain corn pollinator inbred lines are characterized with a high energetic value, with an evidence of 5.29-6.15 NEL and 5.19-6.30 NEM units being recorded.

- Based upon the obtained results, inbred lines pollinators, as a by-product in grain corn seed production, may be considered as a good quality and a cheap source of the fodders of the high nutritive value.

Bearing in mind the total surfaces under seed grain corn in Vojvodina and possible yields as well as the silage quality of father components, pollinator inbred lines silage may be recommended for use in everyday nutrition or as a basis of winter diet of milking cows, breeding head and fattening bullocks. Without too much investment and with existing facilities for silage collection and preparation, this way of green matter production is likely to ensure lower costs of grain corn seed production, more rational land use good bulky fodder supplies, as a path to be routed towards a more intensive crop field and forage production.

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KVALITET SILAŽE OČINSKIH KOMPONENTI IZ SEMENSKE PROIZVODNJE KUKURUZA

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Rezime

Povećanje proizvodnje kukuruzne silaže može se ostvariti korišćenjem očinskih komponenti kao sporednog proizvoda iz proizvodnje semenskog kukuruza. Stoga, cilj rada je bio da se izvrši analiza kvaliteta silaže inbred linija oparašivača iz semenske proizvodnje kukuruza. Istraživanje je obavljeno u 1995. i 1996. godini, a korišćene su inbred linije: 21 NS, 115/II NS, ZPPL 196 i ZPPL 80.

Odnos redova majčinske i očinske komponente je bio 4 : 2, što znači da oparašivaču pripada jedna trećina posejane površine. Žetva inbred linija oparašivača je obavljena ručno u mlečno-voštanoj zrelosti zrna. Biljke kukuruza su sitno iseckane na stacionarnoj sečki i od zelene krme je napravljena silaža u polivinilskim vrećama.

Hemijskim analizama utvrđen je sadržaj sirovih proteina, sirove celuloze, sirovih masnih materija, sirovog pepela, bezazotnih ekstraktivnih materija (BEM). Izračunata je neto energija za laktaciju (NEL) i neto energija za rast i proizvodnju mesa (NEM) (u MJ/kg suve materije). Pored sadržaja hranljivih materija, utvrđena je pH vrednost silaže, zatim, sadržaj slobodne i vezane sirćetne kiseline, sadržaj slobodne i vezane buterne kiseline i sadržaj mlečne kiseline. Na osnovu relativnog odnosa ovih kiselina izvršena je ocena kvaliteta silaže po Fligu. Dobijeni rezultati pokazuju da silaža inbred linija oparašivača kukuruza ima visoku hranljivu i energetske vrednosti.

Inbred linije oparašivači predstavljaju kvalitetan i jeftin izvor kabaste stočne hrane, čijim korišćenjem bi se, bez posebnih ulaganja, smanjili troškovi proizvodnje hibridnog semena kukuruza. Takođe, racionalnije bi se koristilo zemljište i obezbedile bi se značajne rezerve voluminozne stočne hrane, što je put ka intenziviranju ratarske i stočarske proizvodnje.