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Quality and nutritive value of maize silage prepared from different hybrids

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SUMMARY - Seven hybrids bred for grain production grown on the same location. At ensiling the hybrids differ in maturity and in composition: dry matter, crude protein, ether extract, starch, sugars, NDF, ADF, AL and potassium contents. The silages were stored in laboratory silos in two repetitions. In silage in vitro digestibility by Tilley and Terry was determined. The quality in all silages except the hybrids 5 and 7 was very good. All silages had high pH - above 4. The content of ammonia was less than 0,3 g/kg DM but in the hybrid 7. In vitro digestibility was not correlated with crude fibre, NDF, ADF or ADL contents.

RESUME - "La composition et la valeur nutritive de l'ensilage de divers hibrides de maïs". Nous avons produit sept hybrides cultivés pour la production de grains, sur un même emplacement. Lors de l'ensilage, les hybrides se sont différenciés en ce qui concerne leur maturite et leur composition: matière sèche, protéines, matière grasse, amidon, sucres, NDF, ADF, ADL et potasse. Nous avons realisé l'ensilage à deux reprises dans des silos de laboratoire. Dans les ensilages, nous avons mesuré la digestibilité in vitro selon Tilley et Terry. A l'exception des hybrides 5 et 7, la qualité de tous les ensilages était tres bonne. Tous les ensilages avaient un pH élevé, au-dessus de 4. La teneur en ammoniac était inférieur à 0,3 g/kg, sauf chez les hybrides 7. La digestibilite in vitro n'était pas en relation avec la teneur en cellulose, NDF, ADF ou ADL.

Introduction

In Yugoslavia in 1988, 103.000 ha were sown by maize for silage which yielded on average 22.5 t of fresh mass per ha. Till now there were no maize hybrids specially bred for silage production available in Yugoslavia. The nutritive value of silage was normally estimated on the base of the proximate analysis and tabular digestibility coefficients (DLG tables)

Material and methods

Seven maize hybrids grown on the same location were ensiled. At the time of ensiling the hybrids differ in the maturity and in the proportion of the green leaves. Hybrids 5 and 7 were in the dough - dent stage, hybrids 1, 4 and 6 were at the end of the dough dent stage and hybrids 2 and 3 were at the beginning of the physiological maturity of the grain. Hybrid 5 still had all green leaves, while hybrids 1, 2, 4, and 7 had green leaves above the cob, and hybrid 6 had only a few green leaves on the top. Thesilages were stored in plastic silos (40 cm diam. and 50 cm high) in two repetitions. Maize was cut before the ensiling with harvester. The chopped plant and silages of the all hybrids were analysed by the proximate analysis and starch, sugar, NDF, ADF and ADL content was determined as well. By the NDF determination the residual starch was not removed with an amylase preparation. The content of Ca, P, Mg, K, Na, Zn and Mn was determined only in plants, while pH, ammonia and lactic, acetic, propionic and butyric acids as well as in vitro digestibility (Tilley and Terry, 1963) were determined only in silages. In vitro digestibility of dry and organic matter was determined in three repetitions, each of them in two parallels.

Results

The composition of maize plant is shown in Table 1 and the composition of maize silages in Table 2. The dry and organic matter digestibilities are shown in Table 3.

Table 1. The composition of maize (g/kg DM).

HYBRID	1	2	3	4	5	6	7
Dry matter g/kg	377.3	373.9	398.9	377.8	339.8	438.8	366.0
Crude protein kg	67.7	66.7	68.1	64.2	69.2	66.5	74.8
Ether extract kg	29.4	32.4	27.6	30.7	26.0	29.7	30.5
Crude fiber	191.7	207.9	200.0	186.6	183.1	219.5	202.9
Crude ash	37.0	36.2	36.4	34.6	38.6	45.6	55.6
NFE	674.2	656.8	667.9	683.9	683.1	638.7	636.2
Starch	329.5	308.4	312.6	378.4	336.1	332.4	314.6
Sugars	73.3	56.1	42.7	51.3	70.6	28.4	63.7
NDF	456.7	468.0	492.8	418.0	396.0	462.5	426.9
ADF	219.3	239.3	244.1	207.2	198.4	259.2	232.7
ADL	22.7	22.7	23.6	21.4	16.0	24.9	21.4
P	2.04	2.01	2.07	1.95	1.90	2.06	2.59
Ca	1.52	1.73	1.83	1.67	2.25	2.30	2.57
Mg	1.72	1.81	1.83	1.67	2.25	2.30	2.57
K	10.91	11.86	10.56	8.18	11.57	13.26	14.44
Na	0.14	0.18	0.15	0.18	0.12	0.18	0.16
Zn	19.9	21.1	20.9	17.6	23.3	22.2	24.8
Mn	27.4	28.5	26.0	21.1	26.2	34.0	30.6

Table 2. The average composition of maize silages (g/kg DM)

HYBRID	1	2	3	4	5	6	7
Dry matter g/kg	353.9	379.4	379.9	368.5	341.6	440.5	361.5
Crude protein	72.3	71.5	72.8	68.3	69.3	66.1	81.0
Ether extract	27.2	2.1	28.5	30.1	33.8	33.0	38.8
Crude fiber	214.9	212.8	220.9	212.6	182.3	231.4	189.5
Crude ash	38.5	34.7	37.5	38.4	34.2	40.8	45.0
NFE	647.1	656.0	640.2	650.7	680.5	628.8	645.6
Starch	286.9	301.1	282.8	282.5	340.1	324.4	334.3
Sugars	6.2	3.8	7.3	10.8	6.7	0.0	6.7
NDF	547.2	533.8	530.5	496.6	478.6	509.3	516.6
ADF	246.8	244.0	249.0	233.8	197.9	257.1	216.7
ADL	23.6	24.1	27.8	27.8	18.4	24.6	17.5
Lactic acid	15.4	12.9	15.4	11.0	15.9	16.3	16.9
Acetic acid	3.0	2.3	2.8	3.0	4.8	3.0	4.3
Butyric acid	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Propionic acid	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Points after Flieg	99.0	99.0	99.5	97.0	94.0	99.5	96.0
Ammonia	0.2	0.3	0.3	0.2	0.2	0.3	0.3
p^H	3.9	3.9	3.9	3.9	3.7	3.9	3.8

Table 3. Average in vitro digestibility of maize silage.

Hybrid	Dry matter digestibility	Standard deviation	Organic matter digestibility	Standard deviation
1	75.3	2.0	75.2	2.1
2	76.7	2.4	76.9	2.8
3	76.6	1.9	76.9	1.9
4	75.2	1.4	75.0	1.6
5	75.3	1.5	75.1	1.9
6	75.9	2.9	75.7	3.1
7	76.3	2.1	76.1	2.3
Standard 1	75.8	0.8	75.5	0.8
Standard 2	68.9	1.2	69.5	1.4

The hybrids differ in composition, in the content of dry matter, crude protein, ether extract, starch, sugars, NDF, ADF, ADL and potassium.

The quality of silages estimated according to Flieg were in all silages except the hybrids 5 and 7 very good. All silages had high pH - above 4. The content of ammonia was less than 0.3 g/kg DM, except in the hybrid 7. In vitro digestibility was not correlated with crude fibre, NDF, ADF and ADL contents.

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