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ARE WHOLE-CROP SILAGES OF CEREALS AND CEREAL-LEGUME INTERCROPS A GOOD ALTERNATIVE FOR MAIZE SILAGE?

Eva Wambacq (eva.wambacq@hogent.be)¹, Valérie Claeys¹, Dorien Van Wesemael² & Joos P. Latré¹

¹ Research Centre AgroFoodNature, School of Bioscience & Industrial Technology, University of Applied Sciences & Arts, Ghent, Belgium
² Animal Sciences, Flanders Research Institute for Agriculture, Fisheries & Food, Merelbeke-Melle, Belgium



INTRODUCTION

Maize cultivation is facing severe challenges (e.g. extreme weather conditions, more stringent regulations, etc.), increasing the need for alternative forages. **Whole-crop silage (WCS)** of cereals in pure stand or intercropped with legumes show potential :

- harvest earlier in the season → less prone to heat and drought stress during summer
- nitrogen fixing ability of legumes → possible to reduce fertilizer supplementation
- denser crop than maize → less weed development and less need for herbicides

→ Need for evaluation of the silage fermentation characteristics and the nutritional value of these WCSs for ruminants

MATERIALS & METHODS

In June-July 2023, an ensiling trial with microsilos (2.75 l content; n=4) was performed with different crops harvested as WCS. After an ensiled period of 90 days, pooled samples per treatment were analyzed for silage characteristics and feeding value. The following crops were ensiled:

- 2 barley varieties (*Hordeum vulgare*; Hv)
- 2 intercrops barley (*H. vulgare*) x pea (*Pisum sativum*; Ps)
- 2 intercrops triticale (x*Triticosecale*) x pea (*P. sativum*)
- 4 triticale varieties (x*Triticosecale*; Tr)
- 1 intercrop triticale (x*Triticosecale*) x faba bean (*Vicia faba*; Vf)
- 1 intercrop wheat (*Triticum aestivum*; Ta) x faba bean (*V. faba*)
- 2 méteils 1st: triticale + pea + oats (*Avena sativa*) + vetch (*Vicia sativa*)
- 2nd: triticale + pea + oats + rye (*Secale cereale*)



Figure 1. Microsilo.

RESULTS & CONCLUSION

Some important silage fermentation characteristics and nutritional value parameters are presented in Table 1.

Table 1. Silage fermentation characteristics and nutritional value parameters: dry matter content (DM), pH, ammonia fraction (NH₃-N/total N), ratio of lactic acid to acetic acid (LA/AA), butyric acid (BA), alcohols (Alc., i.e. sum of ethanol, propanol and butanol), crude protein (CP), starch, crude fibre (CF), net energy for lactation (NEL), true protein digested in the small intestine (DVE*) and rumen-degradable protein balance (OEB*) (*Tamminga et al., 2007).

CROP	DM	pH	NH ₃ -N/ total N	LA/ AA	BA	Alc.	CP	Starch	CF	NEL	DVE	OEB
	<i>g kg⁻¹ FM</i>	-	<i>ratio</i>	<i>ratio</i>			<i>g kg⁻¹ DM</i>			<i>MJ kg⁻¹ DM</i>	<i>g kg⁻¹ DM</i>	-
Hv VGold	433	4.44	8.76	4.82	4.58	28.9	85	380	224	5.44	44	-21
Hv Hylona	421	4.85	8.60	4.10	8.03	37.3	79	275	243	5.51	42	-26
Hv-Ps 130-40	387	4.67	11.46	4.95	17.9	31.3	70	274	223	5.77	41	-32
Hv-Ps 100-50	377	4.66	10.76	7.36	14.9	32.6	84	235	253	5.44	43	-22
Tr-Ps Eleac-Asteroid	315	4.35	15.31	5.97	26.4	10.5	113	110	325	4.83	42	6
Tr-Ps Lumaco-Asteroid	301	4.21	15.09	6.42	2.84	5.54	122	139	319	5.02	48	9
Tr Eleac	555	4.97	12.18	2.11	3.46	13.8	76	357	258	5.27	41	-28
Tr Lumaco	521	5.12	15.51	3.77	6.19	13.1	72	298	277	5.01	36	-28
Tr Kasyno	473	4.91	19.81	6.08	10.5	16.3	83	247	243	5.71	43	-22
Tr Temuco	524	5.01	14.38	5.92	5.57	12.7	85	248	256	5.65	46	-24
Tr-Vf Eleac-Tundra	468	5.02	15.95	3.65	9.57	16.4	80	277	254	5.41	40	-23
Ta-Vf Extase-Tundra	497	5.07	17.21	3.42	8.16	10.2	72	277	268	5.21	37	-28
méteil 1	423	4.43	11.06	4.92	0.17	3.02	142	130	323	4.81	55	16
méteil 2	485	4.62	9.19	6.23	11.7	4.98	85	175	290	5.25	43	-23

The ensiling process successfully acidified the WCSs, but the ammonia fraction was quite high for several crops. Butyric acid and alcohol levels were also high, indicating a sub-optimal fermentation process. This offers possibilities for silage additives. Regarding feeding value, NEL contents were lower than maize silage (with an average NEL of 6.89 MJ kg⁻¹ DM) for all tested crops. Maize silage (with an average DVE content of 53 g kg⁻¹ DM and an average OEB of -41) outperforms nearly all tested WCSs on DVE protein value. On the other hand, méteils and triticale-pea combinations had a positive OEB. Triticale varieties Kasyno and Temuco were the best performing crops from the ensiling trial, but it can be concluded that WCSs of cereals and cereal-legume intercrops can't live up to the high standards set by maize silage.