

# Evaluation of Organic Sudangrass for Feed Value, Silage Quality and Palatability in Korea

Jong Duk Kim<sup>1</sup>, Keum Seob Shim<sup>1</sup>, Jong Cheol Joo<sup>1</sup>, Hyun Jiun Lee<sup>1</sup>, Gyeong Hyeop Jeon<sup>1</sup>, Young You Youn<sup>1</sup>, Eung Yong Oh<sup>1</sup>, and Hyo Won Lee<sup>2</sup>

## 유기 수단그라스의 사료가치, 사일리지 품질 및 기호성 평가

김종덕<sup>1</sup>, 심금섭<sup>1</sup>, 주종철<sup>1</sup>, 이현진<sup>1</sup>, 전경협<sup>1</sup>, 윤영유<sup>1</sup>, 오응용<sup>1</sup>, 이효원<sup>2</sup>

1. 천안연암대학 축산계열 (Division of Animal Husbandry, Cheonan Yonam College, Cheonan 330-709 Korea, E-mail. yasc@yonam.ac.kr, Internet. www.yonam.ac.kr)
2. 한국방송통신대학교 농학과 (Dept. of Agricultural Science, Korea National Open University, Jongro-ku, Seoul 110-791 Korea. E-mail. kyowon@knou.ac.kr, Internet. www.knou.ac.kr)

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### ABSTRACT

*The main nutritional problem of sorghum×sudangrass hybrid (Sorghum bicolor×Sorghum sudanese) silage is low quality and palatability. This experiment was conducted to evaluate whether organic corn grain and crushed rice addition of sorghum×sudangrass hybrid silage increases forage quality of the silage. The sorghum×sudangrass hybrid silages with added corn grain and crushed rice were similar to conventional corn silage in moisture content. However organic sorghum×sudangrass hybrid silage had low pH values. Silage added with gain and byproduct had higher crude ash, acid detergent fiber (ADF) and neutral detergent fiber (NDF) contents than control corn silages, while its non-fiber carbohydrate (NFC) and total digestible nutrients (TDN) showed the opposite results. Lactic acid, butyric acid and lactic percentage of total organic acid (L/T) of sorghum×sudangrass hybrid silages were higher than those of corn silage, but acetic acid was higher than control. In vitro dry matter digestibility (IVDMD) of corn silage was higher than other sorghum silages. Feed intake of sorghum×sudangrass hybrid silage added with crushed rice was highest among silages. Therefore, these data indicate that crushed rice and corn grain added sorghum×sudangrass hybrid silage could be recommended as the most effective treatment for increasing silage quality and palatability.*

### INTRODUCTION

Sorghum×sudangrass hybrid can be one of the most popular annual summer forage crops because it is cultivated as a following crop in double cropping systems in Korea. However, sorghum×sudangrass hybrid is difficult to make good silage from grass due to the high moisture content at harvest. Sorghum×sudangrass hybrid is also difficult to preserve as direct-cut silage because the high moisture content causes excessive fermentation during ensiling. It is often not possible to wilt the forage or harvest to the desired dry matter content. If the forage is too wet, absorbent materials can be added to increase the ability of the ensiled mixture to hold water. Agricultural products or byproducts can be added at the time of ensiling to minimize losses of effluent and they have the additional advantage of increasing forage quality and feed intake. The main nutritional problems of sorghum×sudangrass hybrid silage are low quality and feed

intake. Agricultural products or byproducts as a silage additive may increase forage quality and feed intake of sorghum×sudangrass hybrid silage. This experiment was conducted to evaluate the effect of corn grain and crushed rice as an additive on forage quality of sorghum×sudangrass hybrid silage.

## **MATERIALS AND METHODS**

Fresh sorghum×sudangrass and corn (*Zea mays*) hybrids were obtained from Animal Husbandry Extension Farm of Cheonan Yonam College (Cheonan, Korea). The sorghum×sudangrass hybrid was harvested at first heading stage, and corn was harvested at yellow stage. Sorghum×sudangrass and corn hybrids ensiled whole or chopped to a theoretical length of 3cm using a small forage chopper.

The experiment was a randomized complete block design. The three treatments used were: corn silage as a control (T1), sorghum×sudangrass hybrid silage added with corn grain (T2) and, sorghum×sudangrass hybrid silage added with crushed rice. The samples were weighed and dried for 72 h by forced-air drying oven at 65 °C. The dried samples were reassembled and ground through a Wiley mill using a 1mm screen.

The pH was measured with a pH meter after macerating a 10-g sample of silage in 100 ml of distilled water. Lactic acid, acetic acid and butyric acid were measured by high liquid chromatography and gas chromatography. The crude protein (CP) was determined by the Kjeldahl method (AOAC, 1990), ADF and NDF were measured by the method of Goering and Van Soest (1970), and IVDMD was determined by the method of Moore (1970), respectively. Values of non-fiber carbohydrate (NFC) and total digestible nutrients (TDN) were calculated for forage samples from equation. Corn and sorghum×sudangrass hybrid silages were provide by fresh form, and offered as libitum to dairy cattle. During the experiment period, individual feed intake was measured during 10 minutes.

Data were analyzed with analysis of variance (ANOVA) procedures using the SAS Statistical Software Package (1999). The mean separation among treatment means for hybrid, planting date, and harvest stage was obtained by using the Least Significant Difference (LSD) test. Effects were considered in all statistical calculations for P-value < 0.05.

## **RESULTS AND DISCUSSION**

An attempt was made of evaluated the feed value of using corn grain and crushed rice as additive of sorghum×sudangrass hybrid silage (table 1). There is no difference in moisture and crude protein (CP) contents between corn and sorghum×sudangrass hybrid silages ( $p>0.05$ ). Corn silage was lower than other sorghum×sudangrass hybrid silages for ether extract (EE), NDF and ADF contents, while its NFC and TDN contents showed the opposite results.

Sorghum×sudangrass hybrid silage added with corn grain and crushed rice lowered pH values effectively, while the control corn silage had a high pH value. There is no significant difference in total organic acid. However, sorghum×sudangrass hybrid silage added with byproducts had higher lactic acid and lactic acid percentage of total organic acid than corn silage (Table 2).

Table 1. The chemical composition of corn and sudangrass silage for organic forage (%)

Treatment	Moisture	CP	EE	CA	NFC	NDF	ADF	TDN	WSC
Corn silage	72.2	9.0	2.8	6.0	31.0	52.0	37.0	62.4	6.06
Sudangrass silage I	76.6	9.1	3.4	8.7	23.0	59.1	44.0	57.0	7.59
Sudangrass silage II	74.5	8.1	2.0	9.4	30.7	54.1	43.8	56.3	10.50
Mean	74.4	8.8	2.7	8.0	28.3	55.0	41.6	58.6	8.05
LSD(0.05)	NS	NS	0.32	0.16	2.86	3.87	3.72	3.14	1.14

Sudangrass silage I=added with corn gain, Sudangrass silage II=added with crushed rice, CP=crude protein, EE=ether extract, CA=crude ash, NDF=neutral detergent fiber, ADF=acid detergent fiber, NFC=non-fiber carbohydrate, TDN=total digestible nutrients, WSC=water soluble carbohydrate.

Table 2 also summarizes the palatability of silage for dairy cattle. *In vitro* dry matter digestibility (IVDMD) of corn silage was higher than sorghum×sudangrass hybrid silages. The fresh and dry matter intake of sorghum×sudangrass hybrid silages added with crushed rice was higher than others among all the treatments.

Sorghum×sudangrass hybrid silage added with corn grain and crushed rice can be recommended as the most effective treatment for increasing forage quality and palatability of sorghum×sudangrass hybrid silage.

Table 2. The organic acid, *in vitro* dry matter digestibility (IVDMD) and feed intake of corn and sudangrass silage for organic forage

Treatment	pH (1:10)	Organic acid (%)					IVDMD (%)	Feed intake (kg/animal/10 min.)		
		Lactic	Acetic	Butyric	Total	L/T		Fresh	DM	index
Corn silage	3.65	8.17	6.78	0.07	15.02	54.4	60.1	2.74	0.52	2
Sudangrass silage I	3.51	11.80	2.53	1.81	16.13	73.1	54.6	3.13	0.42	2
Sudangrass silage II	3.56	9.96	2.31	1.70	13.97	71.4	54.8	3.55	0.55	1
Mean	3.57	9.98	3.87	1.19	15.04	66.3	56.4	3.14	0.50	
LSD(0.05)	0.09	1.19	0.73	0.18	NS	2.24	2.84	1.26	0.11	

Sudangrass silage I=added with corn gain, Sudangrass silage II=added with crushed rice, L/T=lactic acid percentage of total organic acid, DM=dry matter.

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