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COMPARISON OF QUALITY AND PRODUCTION BY DIFFERENT SILAGE MAKING METHODS OF BARLEY CULTIVATED IN THE PADDY AFTER RICE HARVEST

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Abstract

The objective of this study was to compare whether the productivity and production cost of whole crop barley was affected by silage making methods at early bloom stage in the rice field. In nutritive value, quality and palatability of silage, baled silage making method was a little higher than that of crushed silage making. On the other hand, in terms of dry matter and total digestible nutrient(TDN) production cost, proper work capacity at about 15 ha or more was desirable when making baled silage. In this case, the estimated dry matter production cost and TDN cost per ha was US$ 42, US$ 210 in baled silage making, and US$ 42, US$ 209 in crushed silage making, respectively.

Keywords: baled and crushed silage making, whole crop barley, silage quality, cropping after rice harvest, production cost

Introduction

About 58.2 percent(1.16 million ha) of the arable land of South Korea in 1997 was paddy fields for rice production. This means that we have a great potential for forage production by using welldrained fields, amounting to about 386 thousand ha. Recently, baled silage making method for animal feedstuffs has been widely adopted in developed countries like EU, etc (Andrighetto etc, 1988; Bevre, 1988; Howe, 1987; Takano, 1982). It is known as one man role bale wrapping system. Unlike the crushed silage making, it reduces labor and cost, but decreases yield and quality of silage in accordance with materials used (Kim et al., 1991). Many researches on the use of barley as whole crop have been carried out. The results have revealed that the productivity and quality of barley as roughage was high(Kim et al., 1994).

This study was carried out to find out the nutritional value and production cost of barley cultivated in the paddy after rice harvest by using different silage making methods from May 1998 to Oct. 1999.

Material and Methods

This trial was carried out at a farmer's paddy field after rice(about 8 ha) located in Hwasung county, Kyounggi province. Barley (var. Olbori) of 150kg/ha was seeded during 22th to 25th Oct. by using 54ps tractor-attached drill seeder (16x5cm, 12 row). compound fertilizer at 600kg/ha (N 10%-P_2O_5 14%-K_2O 10%) was used as basal and 160kg /ha of urea as supplemental. Growth condition after winter season was favorable and the booting stage was around 28^{th} ~29^{th} April. Time of making silage was 25^{th} May, which was the 27^{th} day after booting. At that time, stem length was 101cm, 4.3cm of panicle length, 43,420kg/ha of green yield and 12,650kg/ha of dry matter yield, respectively. In crushed silage making, grass harvester (cutting width : 70-80cm) was used. In baled silage making, cutting, tedding, baling and wrapping were done in turn. Black wrapper with 25μm thick, 500mm wide, 1,800m long (integrated packaging reservior Co., Australia) was used for baled silage.

After 60 days of silage making, about 500g of each sample was taken by Uni-Forage Sampler (STAR QUALITY SAMPLER Co., Canada) were analyzed the chemical composition(AOAC, 1991), NDF and ADF content (Georing & van Soest method, 1970). Also pH by pH Meter (HI 9024 ; HANA instrument Inc., UK) and lactate content by Barker & Summerson method were measured. Atomic absorption of the chemical compositions was measured through the Spectrophotometer (UVIDEC-600, Jesco Co., Japan). Other organic acids were analyzed by gas chromatography (V-3800, Varian Co., USA).

Results and Discussion

A summary of chemical composition of silages from different silage making methods is shown in Table 1, as well as silage yield, quality and palatability. Ratio of crude protein and ashes of crushed silage was high , while NDF and ADF contents were low. Lactate content of crushed silage was higher than that of baled silage. Also TDN yield of crushed silage was a little higher than that of baled one. Quality grade of crushed and baled silage were good and fair, respectively. Consequently, palatability of the latter was a little better than the former. However, these results did not support the observations reported by Kim et al(1991) that quality of baled silage was better than that of crushed silage. low productivity and quality of baled silage could be due to loss of grains when harvesting baled silage. Table 2 shows the estimated dry matter and TDN production cost based on work capacity. Proper work capacity of making baled silage, which has been known as one man role bale wrapping system which reduces labor and cost of making silage, was about 15ha or more. Making of crushed silage would be desirable at 15ha or less. As a results, two silage making methods of barley were a little different in quality and quantity, but baled silage making was more desirable in Korea owing to shortage of labor.

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Table 1 - Chemical compositions, TDN yield, quality and palatability of baled and crushed silage.

Silage making method	CP	EE	CF	Ash	NFE	NDF	ADF	PH	Acetate	Butyrate	Lactate
	-------------------------------%-----------------------------								---------------%, mg equiv.-------		
Baled silage	5.99	2.48	31.5	11.6	48.5	65.7	39.3	5.16	22	14	64
crushed silage	6.54	2.31	26.2	17.2	47.5	64.2	37.0	4.69	25	4	71

	TDN yield (kg/ha)	TDN* (%)	Quality Grade	Palatability**
Baled silage	7,370	58.3	3(Fair)	+++
Crushed silage	7,600	60.1	2(Good)	‡

*TDN % - 88.9 – 0.779 X ADF %

**Palatability - +: Poor(50% or less); ++: Fair (60~70%); +++: Good (70~80%); ‡: Excellent (80% or more).

Table 2 - Estimated dry matter and TDN production cost based on the number of working day and work area.

Work day	Work area/day(ha)									
	2		3		4		5		6	
	baled	crushed	baled	Crushed	baled	crushed	baled	crushed	baled	crushed
3	54.5 (272)	49.1 (245)	47.4 (238)	44.7 (225)	43.8 (221)	42.9 (215)	42.0 (210)	42.0 (209)	40.2 (203)	41.1 (205)
5	46.5 (231)	43.8 (222)	42.0 (210)	42.0 (209)	40.2 (199)	41.1 (204)	38.4 (193)	40.2 (200)	37.5 (189)	39.3 (197)
7	42.9 (213)	42.0 (211)	39.3 (198)	40.2 (203)	38.4 (191)	39.3 (198)	37.5 (187)	39.3 (196)	36.6 (183)	38.4 (194)
9	40.2 (203)	41.1 (205)	38.4 (191)	39.3 (199)	37.5 (186)	39.3 (196)	36.6 (182)	38.4 (194)	35.7 (180)	38.4 (192)
10	40.2 (199)	41.1 (204)	37.5 (189)	39.3 (197)	36.6 (184)	39.3 (195)	35.7 (181)	38.4 (193)	35.7 (179)	38.4 (192)

( ) - TDN production cost in US$/ton