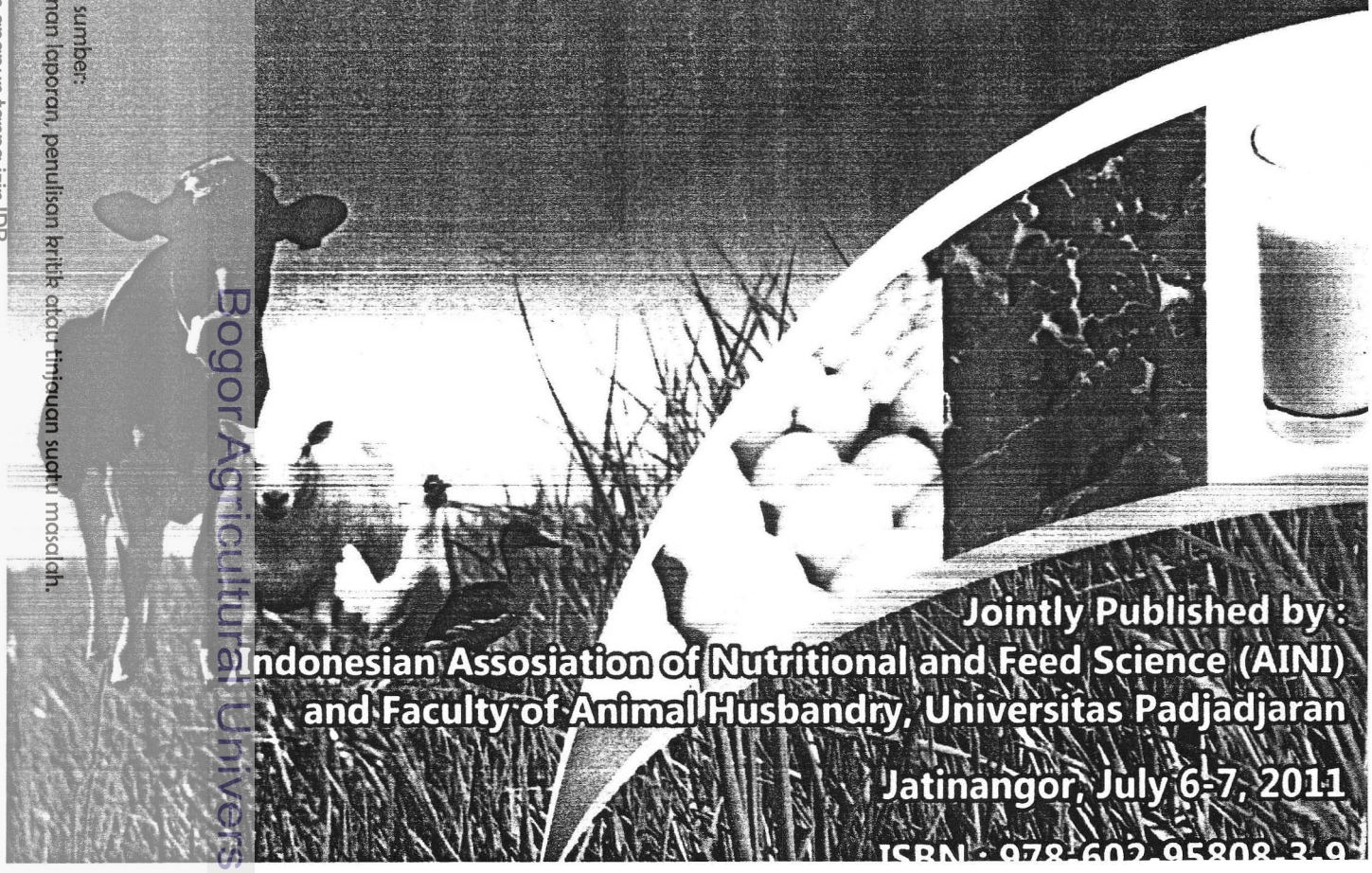
Proceeding

The 2nd International Seminar

Feed Safety for Healthy Food

AINI publication No. 01/2012



Jointly Published by :
Indonesian Assosiation of Nutritional and Feed Science (AINI)
and Faculty of Animal Husbandry, Universitas Padjadjaran

Jatinangor, July 6-7, 2011

ISBN : 978-602-95808-3-9

Proceeding

The 2nd International Seminar
"Feed Safety for Healty Food"

Technical Editors :
Secretariat of The International Seminar
"Feed Safety for Healty Food"

Bogor Agricultural University

Proceeding

The 2nd International Seminar
"Feed Safety for Healty Food"

Keynote Speaker :

Director General of Animal Husbandry and Animal Health

Main Speakers :

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Prof. Abdul Razak Alimon (Malaysia)

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Proceeding

The 2nd International Seminar "Feed Safety for Healty Food"

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ISBN : 978-602-95808-3-9

FOREWORD

We thank the Almighty Allah, the Most Gracious and the Most Merciful that the proceedings of the 2nd International Seminar, the 8th Biannual Meeting and 3rd Congress and Workshop of AINI with the theme "Feed Safety for Healthy Food" organized by Indonesian Association of Nutrition and Feed Science, Faculty of Animal Husbandry, Universitas Padjadjaran on 6 - 7 July 2011 have been completed.

These activities were to collect variety of scientific information with the purpose to collect scientific information about feed for a healthy food, to produce a draft policy on a national feed system and to make a scientific forum for Academics, Researchers, Practitioners of animal husbandry, Health and Policy makers. Scientific papers that were presented either in oral or poster stated in the proceedings.

Thanks go to all those who have provided both moral support or material so that this seminar can be carried out and the proceeding can be issued.

Jatinangor, 5 March 2012

Committee

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THE EFFECT OF PRE-CONDITION AND WATER SOLUBLE CARBOHYDRATE SOURCES ADDITION ON NAPIER GRASS SILAGE QUALITY

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ABSTRACT

A research to improve Napier silage quality through precondition and addition of several water soluble carbohydrate (WSC) sources prior to ensiling had been done. Bruising and wilting pre-condition were tested as pre-condition to chopped Napier grasses, while WSC sources like rice brand, cassava waste meal and KPSBU concentrate were examined as additives. Dry matter (DM) content of silage and pH were used to calculate Fleigh Value (NF), NH_3 and VFA were determined to describe degradation of protein and organic matter. WSC was also measured to estimate the amount of substate available for LAB fermentation. The results showed that preconditions were necessary to produce high quality Napier grass silages. All WSC sources produced high quality Napier grass silages (NF > 80) with the highest NF was found in silage added with cassava waste meal. The amount of 20% additive is better than 30% (w/w fresh substances). Wilting without bruising resulted the highest NF but if the fresh Napier grass to be used, bruising was necessary.

Keywords: additive, bruising, Napier grass, silage, wilting

BACKGROUNDS

The scarcity of grass availability in one hand and the improvement of milk price on the other hand forced dairy farmer to provide forage of vary quality at disregard price. The farmer even planting the grass at conservation areas to extend forage production which is ofcourse harmful to the environment. An effort to better secure forage availability through conservation such as silage technique is needed.

Silage is a forage conservation technique using lactic acid bacteria (LAB) fermentation anaerobically. Ensilaged forage is able to be used years. Silage technique make possible to conserve extra production of rainy season's forage, harvesting forage at the right time which make possible of maximum yield per hectare, importing forage in large quantities from far distance (transportation efficiency) and to conserve seasonal available agricultural byproduct.

Silage is the main forage fed to dairy cattle in temperate area. In Nederland, Germany and Denmark, silage was account to 90% of forage fed to dairy cattle (Elferink and Driehuis, 2000). Although, silage technology are well known to tropical

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animal nutritionist (Mannetje, 2000), but its application were limited especially at small scale farming.

There are several constrains of applying silage technique to tropical forage such as low concentration of WSC that are needed to produce good quality and high buffering capacity which led to massive protein proteolysis (Woolford, 1984) and low DM (< 30%) which provide more sophisticated environment to harmful microorganism such as clostridia than LAB (Titterton, 2000) exist in tropical forage. Therefore, pre-condition (wilting, bruising and chopping) and addition of WSC sources which are technically suitable and locally available are needed to produce high quality tropical forage.

MATERIALS AND METHODS

To choose the appropriate pre-condition and adding WSC sources prior to ensiling, characteristic tests of the forage were tested using methods explained below:

Materials

About 3 kg of Napier grass were used for 3 replication of physical characteristic tests and their nutrional contents measurements. Cassava waste meal, rice bran and concentrate produced by KPSBU cooperative (mako) were used as additives. About 1 kg of each additive was taken from KPSBU feedmill using representative sampling technique.

Methods

Forage and and the silage additive were studied for their physical characteristics (stamms length and diameter) and nutritional contents (DM-, N- and WSC-contents) using Naumann and Bassler (1997). Based on their physical characteristics, then precondition were applied and WSC sources were added prior to ensiling.

Ensiling procedures

About 2 kg of pre-conditioned forage were put into polybag 30 x 40 cm. The forage were fed layer by layer with WSC source to achieve homogenous mixture. Air from the bag were removed with help from commercial hand vaccuum pump. The bag was then closed with plastic yarn. The bag were then put into plastic container to avoid rodent from digging them and to cover them from direct sunlight. Anaeobic fermentation were let for 45 days at room temperature.

Silage Quality determination

Silage produced were qualified based on their proximate compositions, intensity of protein and organic matter degradations, pH, WSC, aerobic stability and Fleigh number. Proximate composition were determined using Naumann and Bassler (1997) procedures. Protein degradations to produce volatile N were measured using micro diffuse Conway technique and organic degradation to produce volatile fatty acid (VFA)

were analyses using steam distillation methods. Both micro diffusi Conway and steam distillation method were followed General Laboratory Procedure (1969). Silage pH were measured using Hanna Co digital pocket pH meter. WSC content of silages were analysed spectrophotometrically from total sugar concentration.

Aerobic stability were measured by putting the silage on 500 ml polyethylene bottle without compacting. Upper side of the bottle were left open and a conventional thermometer were stack to the centre of the silage. The bottle were put in room temperature. Temperature changes in the thermometer were record every 8 hours. Aerobic deterioration were determined if the different between room and its environment temperature were more than 2°C (Nishino et al., 2007).

Fleigh number (FN) were calculated using Gurbuz and Kaplan (2008) formula. The formula was FN = 220 + (2 × % BK – 15) – (40 × pH). Silage with NF less than 20% were useless, 25 -- 40 were quite good, 55 – 60 were moderate, 60 – 80 were good, while 80 – 100 were very good.

Experimental Design and Data Analyses

The experiment used completely random design with 3 replication for each treatment. The data were analysed using varian analysis followed by contras orthogonal.

RESULTS AND DISCUSSIONS

Characteristic of Napier grass and WSC sources used were shown in table 1.Physical characteristics of Napier grass showed that the length and diameter size of Napier grass were unappropriate for silage making. Therefore, bruising and chopping should be applied to Napier grass prior to ensiling.

Table 1: Physical and chemical characteristics of Napier grass and its additives

	Length (cm)	Diameter (cm)	DM (%)	Protein (% DM)	WSC (% DM)
Napier grass	150 - 200	0.4 – 1.5	25.36	14.46	2.70
Rice bran			89.20	17.00	9.54
Mako			86.16	13.42	8.67
Cassava waste meal			85.63	4.46	6.03

DM content of the grass were 25.4%, higher than that was assumed (20%). It caused by the harvesting were done in drought season. In that season, DM content of grass usually higher than in rainy season. However, the content still below 30%, the proper content to produce good quality silage. Therefore, wilting or addition of absorbent were necessary to fulfill 30 – 40% of required DM content in grass to produce good quality silage.

Chemical analyses showed that Napier grass contained moderate amount of protein (14.5%). There was no need to add protein source to the grass prior to ensiling.

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WSC content of the grass, however, less than 4%. It was far below of the sufficient level for optimal growth of LAB (> 10%). Therefore, addition WSC source addition to produce high quality silage. Addition of Mako, rice bran or cassava waste meal which were available locally (at KPSBU cooperative) and contained higher WSC (6 – 9.5%) was expected to improve silage quality.

The effect of several additives application prior to ensiling time on Napier grass silage quality were shown in table 2.

Table 2: The effect of different source of WSC on Napier grass silage quality

Additives	DM (%)	pH	NH_3 (mM)	VFA (mM)	WSC (% DM)
Rice bran	28.11	4.08	1.05	141.13	0.95
Mako	21.14	3.64	1.61	25.51	0.91
Cassave waste meal	23.04	3.56	1.28	39.11	2.82

DM of Napier grass was range from 21% to 28%. Addition of rice bran increased DM of Napier grass silage better than mako and cassava waste meal. The pH values of the silage were below 4.08 which were shown good quality silages. Application of cassava waste meal lowered pH better than mako and rice bran. Although cassava waste meal contained the lowest level of protein, but Napier grass silage added with cassava waste meal produced higher NH3 concentration in compare to the rice bran added silage. The results showed that massive degradations of protein occured in the cassava waste meal added silage. However, organic degradation were higher in the rice bran added silage. Concentration of WSC left in the silage were low (< 2.82).

Aerobic deterioration were measured based on aerobic stabiliy using the same method used by Nishino et al. (2007). It was defined that aerobic deterioration was occured if the difference between silage and its environment temperature is higher than 2 °C. unfortunately, the results of this experiment were not convincing caused by the unappropriate thermometer sensitivity used. The thermometer could not measured the changes accurately. However, physical observation showed that up to 2 weeks, there were no silage deterioration occured.

Fleigh number (FN) of the silage were shown in figure 1. According to Gurbuz and Kaplan (2008) classification, the silage were very good quality with NF > 80%. Addition of cassava waste meal produced the highest NF.

ISBN : 978-602-95808-3-9

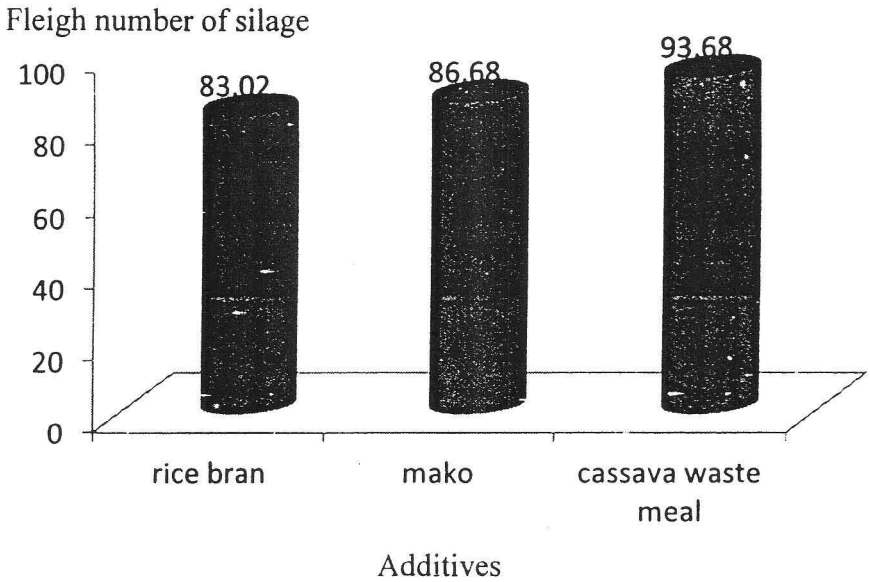

Figure 1. Fleigh number of Napier grass silage affected by several additives

The effect of pre-condition such as bruising and wilting on silage quality were shown in table 3. DM content of bruising silage were slightly higher than non bruising one. Higher DM content of silage could led to higher pH (cause by higher buffering capacity), degradations of protein and organic matter of a silage. Higher buffering capacity could also have an impact to massive proteolysis activity (Woolford, 1984; Elferink & Driehuis, 2000).

Table 3: Napier grass silage quality as affected by pre-conditions

Parameters	Bruising		Wilting	
	Bruising	Non bruising	wilting	Fresh
DM (%)	23.24	24.22	21	18.72
pH	5.17	4.7	4.4	4.60
NH_3 (mM)	2.28	2.022	1.005	1.33
VFA (mM)	142.83	10.202	61.21	98.62
WSC (% BK)	1.26	1.32	2.32	4.38
NF	29.81	50.44	56	43.44

Wilting increased silage DM, reduced pH,protein and organic matter degradations. WCS content left in the silage were also lower because of their used by LAB to lower pH. Wilting avoided spoilage (such as clostridia) development (Elferink and Driehuis, 2000). However, prolong of wilting which caused extensive reducing of water contents (DM > 50%) made the material difficult to ensile (Staudacher et al., 1999) because of limited water available for osmo toleran LAB (Kaiser and Weiss, 1997).

Fleigh number of the silage as affect by bruising and wilting showed that only wilting could produced good quality silage (NF > 55). The low NF in this experiment were caused by low DM content of the Napier grass used.

ISBN : 978-602-95808-3-9

On experiment of bruising and wilting interaction using Napier grass with higher content of DM resulted in higher silage qualities as shown in Table 4.

Tabel 4: Effect of pre-condition interaction on silage quality

Parameters	Bruising		Non Brusing	
	Fresh	Wilting	Fresh	Wilting
DM	23.58	29.48	29.51	27.74
pH	3.79	4.00	4.20	3.76
NH_3	3.88	4.72	7.22	4.47
VFA	66.88	118.11	27.79	53.81
WSC	3.10	2.36	2.11	5.24
NF	85.56	88.96	81.02	95.08

Silage produced in this experiment were much better than previous one. Value of pH and DM content of the silage closed to good silage value. Wilting without bruising produced the highest FN, but if fresh Napier grass to be used, bruising should be applied for better silage quality.

CONCLUSIONS

Based on Napier grass and additives characteristic used in this experiment, it can be concluded that pre-condition (bruising, chopping and wilting) were needed prior to ensiling. Bruising and chopping were needed to lessen the length and reduced diameter sizes of the grass. While wilting and application of additives were needed to increase DM content that are needed to produce good quality silage. Additive application were also needed to supply WSC which were low in the Napier grass. All additives produced very good Napier grass quality (NF 80 – 100). Wilting without bruising produced the highest NF value . However, if wilting could not possible to be done, then bruising is suggested to be applied to as pre-condition for Napier grass prior to ensiling.

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