Proceeding
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"Industry based on Knowledges"

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Animal Science Faculty of Andalas University
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KEYNOTE LECTURER

Nutritional Composition of Ruminant Forage Derived from Rice Crops (*Oryza Sativa* L.) that Applicated by *C. odorata* Compost

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Abstract

The study about Nutritional Composition Of Ruminant Forage Derived From Rice Crops (*Oryza Sativa* L.) that Applicated By *C.odorata* Compost had been conducted in the District Koto Tangah, Padang, West Sumatra began in June 2015 through October 2015. The study aimed to get good quality forage and yield in the cultivation of two varieties rice crops that applicated *C.odorata* compost. Varieties tested were Pandan Wangi and Cisokan. The experiment was arranged in the split plot design. The main plot there were 2 levels cutting rice forage, which was not cut (Po) and cut as high as 15 cm of the soil surface (P1). The subplot was *C.odorata* compost (CC) combined with recommendation fertilizer dose (RFD) consisting of 3 levels; B1. 5 Mg ha^{-1} CC + 100% RFD; B2. 7,5 Mg ha^{-1} CC + 75% RFD and B3. 10 Mg ha^{-1} CC + 50% RFD in three replications. Data were analyzed in variance at 5% significance level, and HSD test at 5% significance level. The parameters were ADF, NDF, crude Protein, crude fiber, cellulose, hemicellulose, lignin, silicates, plant height, maximum tillering, rice yield. The results showed that CC + RFD did not show different effects both on the growth and rice yield. Production of the highest forage obtained from Pandan Wangi rice crop reached 7,17 Mg ha^{-1}. Crude protein as much as 9.83% and 13,99%, crude fiber amounted to 18,31% and 20,15%, the rice yield as many as 6,29 Mg ha^{-1}; 4,21 Mg ha^{-1} for Pandan Wangi and Cisokan respectively.

Keywords: C.odorata compost, Pandan Wangi, Cisokan, ruminants forage

1.Introduction

For thousands of years, rice has been a staple food source for many Asian countries like Indonesia, China, Japan and India. It's wonderfully versatile and is used as a base for many dishes from curries and stir-fries, to sushi and even puddings! A grain of rice is a seed from a special kind of grass called *Oryza sativa*. This grass needs lots of rain as it grows, and then dry conditions before it is harvested. Rice is grown in water-logged fields known as 'rice paddies' across Asia, but also in a few European countries, like Italy and Spain. Once the rice is harvested, the grains are shaken from the grasses, and their rough brown husks removed. Generally every region in Indonesia, especially in West Sumatra, paddy fields spread out evenly providers everywhere. Demand for rice in Indonesia continues to increase every year, simultaneously with the increasing population. Likewise, in addition, people also need a rice protein supplied from ruminant origin meat is maintained. Until 2016, Indonesia still imports of ruminants such as cattle and rice. However the tendency imports also decreased in connection with the intensification of land use as source provider of rice yield and cattle feed.

In addition to rice, the Indonesian country also imports beef, in 2012 total beef imported Indonesia reached 40 338 tonnes

worth US $ 156.138 million. Total costs incurred for the import of rice and cattle amounted to 1101.738 million US $ or the equivalent of 11.01 trillion rupiah (*Redaksi PI., 2013;* http://finance.detik.com/read/2013/02/04/075031/2160062/4/selain-daging-ini-bahan-pangan-yang-dibeli-ri-dari-luar-negeri?f991104topnews); (Statistika, 2016). This proves that Indonesia still has not sovereigned to food and meat.

Indonesia mostly farmers also raise cattle. The big problem for farmers is to provide productive grasslands, so that available forage needs of cattle. In fact pasture land has undergone a massive conversion, among others; for the construction of complex industrial factories, housing and some other goals. So the pasture available was be very limited. May not be planted wetland grasses by farmers, but likely to cultivate paddy rice also take advantage of young rice crops to be used as fodder.

There is an interesting case of rice cultivation activities, namely the fresh forage can be cut and without disturbing the rice yield. However there are some things that must be considered, so that the production of forage and grain yields remain high. If cuts were made early, it will be obtained the small amount of forage, but if the cut will be done lately, this would be concerned obtaining harvests decline, so farmers failed to harvest. Therefore, it needs the right time in an effort to cut forage in rice cultivation. Forage fodder is grass forage or that have nutritional adequacy rate appropriate for ruminants, not all can be categorized forage grass fodder. For that farmers need to grow their own grass forages superior categorized as such. Some types of this forage was from Indonesia and many are imported from abroad and developed in Indonesia (Jamilah & Helmawati, 2015); (http://kesehatan-ternak.blogspot.com/2013/02/hmt-hijauan-pakan-ternak.html, 2015).

In addition to caring moment precise cutting, the primary need to live rice crops also should drawn attention. Fertilizer right should be carried out, among others, can be either organic manure and fertilizers. (Jamilah, Adrinal, Khatib, & Nusyirwan, 2011) reported that administration *C.odorata* compost can improve nutrient uptake, growth and development of paddy rice roots. Integration cultivation pattern is considered more efficient, and can optimize the limited wetland. Need to know the quality of forage, milled rice produced by cutting the beginning of flower primordia on two varieties of rice plants from application of *C.odorata* compost accompanied by artificial fertilizers in paddy fields.

The research objective is to get fodder and higher rice yield in the cultivation of rice and cattle integration of the two rice varieties by *C.odorata* compost and fertilizers.

2. Methodology

The experiments was conducted for five months started in June 2015 through October 2015 in the paddy field farmer in the Padang city, the type of soil is Ultisol. Varieties tested were Pandan Wangi and Cisokan. The experiment was arranged in the split plot design. The main plot there were 2 levels cutting rice forage, which was not cut (Po) and cut as high as 15 cm of the soil surface at the beginning of flower primordia (+ 47 hst) (P1). The subplot was *C.odorata* compost (CC) combined with recommendation fertilizer dose (RFD) consisting of 3 levels; B1. 5 Mg ha^{-1} CC + 100% RFD; B2. 7.5 Mg ha^{-1} CC + 75% RFD and B3. 10 Mg ha^{-1} CC + 50% RFD in three replications. Data were analyzed in variance at 5% significance level, and HSD test at 5% significance level. Recommendation fertilizer dose as 100 kg ha^{-1} urea + 50 kg ha^{-1} ZA, 150 kg ha^{-1} SP36 and 100 kg ha^{-1} KCl. Experiments conducted at SRI paddy in the pattern, 2 seeds in 1 planting hole, muddy, until the plant enters the flower primordia, a

spacing of 25 x 25 cm, and each plot size 2 x 2 m.

The parameters were ADF, NDF, crude Protein, crude fiber, cellulose, hemicellulose, lignin, silicates, plant height, maximum tillering, rice yield. Experimental data were analyzed using the F test 5% significance level, and conducted a further test HSD significance level of 5%, if the treatment significantly. The results of the analysis in the form of nutrient content in *C.odorata* Compost, nutrient content of forage fodder, not analyzed statistically, but compiled in table only.

3. Results and Discussion

Effect of fertilization on growth and yield of dry grain harvest is presented in Table 1. The interaction between fertilization and cutting can be seen in the production of dry grain harvest good varieties of rice Cisokan or at Pandan Wangi. Effect of fertilizer F2 (7.5 Mg ha^{-1} *C.odorata* compost + 75% of artificial fertilizers) influenced the plant height and yield of rice grain. Tillers per clum was higher for PandanWangi than Cisokan. Yield of Cisokan had not reduced significantly by cutting but decrease to Pandan Wangi. The lower dose of organic fertilizer or higher amounts of artificial fertilizers, the plants grow better.

This was because artificial fertilizer as a fertilizer that is easily soluble and available, able to provide nutrients than organic fertilizers. As explained by (K. Mengel, Kirkby, Kosegarten, & Appel, 2001); (Weil & C.Brady, 2016) many macro nutrient elements needed by plants to produce component parts of vegetative and generative plant. Therefore, the availability of elements of N, P and K were quite decisive outcome dry grain harvest. Fragrant Rice Cisokan and GKP together produce more than 6 Mg ha^{-1}. Even at Cisokan that cut to get forage will not give worst effect to yield. According to (Mengel, 1995) that nutrient uptake per acre increases rapidly from the 4 leaf stage to just prior to tasseling, and then stays at high levels until after pollination. During this period the crop is growing very rapidly and the demand for nutrients to support that growth is high.

Tabel 1. Plant height, maximum tillering and production of dry grain rice harvest Cisokan and Pandan Wangi.

Fertilizer	Plant height (cm)		Maximum tillering per clump		Yield of rice grain per plot (kg)			
					Cisokan		Pandan Wangi	
	Cisokan	Pandan Wangi	Cisokan	Pandan Wangi	P0	P1	P0	P1
B1	81.50aB	76.33bAB	29.67 bA	31.33 aA	2.63	2.18	2,78a	1,67b
B2	86.00aA	73.00bB	25.83 b B	30.50 aA	2.62	2.62	2,30a	1,67b
B3	80.50aB	78.50bA	24.83 bB	26.83 aB	2.37	2.75	2,40a	1,72b
average	82.67a	75.94b			2.54	2.52	2,49a	1,68b
average Mg /ha					6,35 a	6,29 a	6,24a	4,21b
CVA (%)	3,01					15,03		17,52
CVB (%)	6,08					**9,27**		11,82

The numbers followed by the same capital letter in the same column and numbers followed by the same small letters on the same line are not significantly different according HSD 5% significance level.

Explanation: B1, 5 t ha^{-1} *C.odorata* compost + 100% fertilizer; B2; 7,5 t ha^{-1} *C.odorata* compost + 75 fertilizer; B3. 10 t ha^{-1} *C.odorata* compost + 50% fertilizer; P0, not cut dan P1, cut at primordia age phase (47 days after planting.)

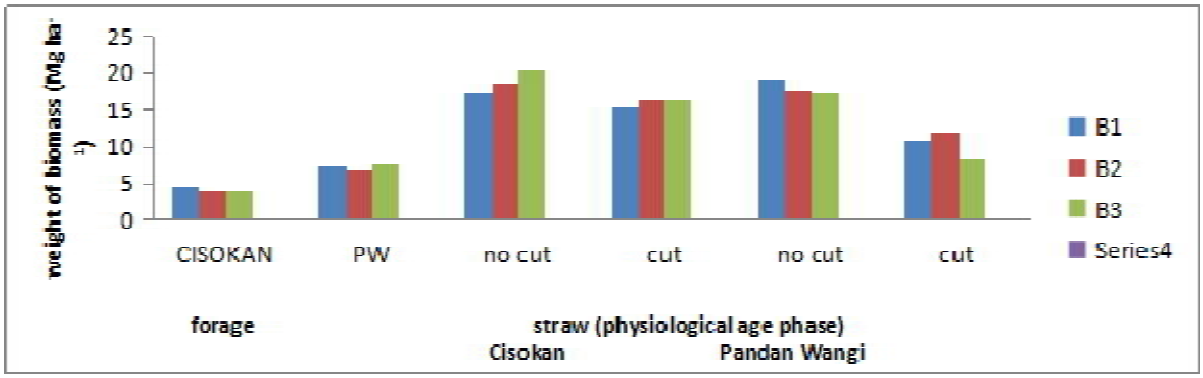


Figure 1. Effect of *C.odorata* compost + fertilizer to forage and straw weight of Cisokan and Pandan Wangi

2. Production and nutritional value of forage.

Giving compost and fertilizers showed no difference in the results of forage (Figure 1). Broadly speaking ruminant feed could be divided into two namely feed and feed reinforcing fibers, this fiber feed them grass and the amplifier is consentrate. Forage or Animal Feed should be cut at the right age, because if they are too old forage then the quality will be worse.

Pandan Wangi produced forage higher than Cisokan varieties. The results of the high forage is significantly affected by the maximum saplings in each variety. Plants that have a high maximum tillering forage will produce higher as well. Organic *C.odorata* compost gave effect longer and can improve soil fertility is inherently slow. Fertilizer is available and can be used again by the crops in the next growing season. It has been described by Brady (1984); Nyakpa *et al* (1988); Hakim (1985) that organic fertilizer, a natural fertilizer that can improve the quality of physics, chemistry and soil biological. Compost typically provide a longer effect than fertilizer. Manure can decrease the negative effects of the provision of artificial fertilizers and pollution are given excessive. This is because the organic fertilizer has carboxyl and phenolic capable of fixing metal ions that pollute the environment.

The results of the animal feed analysis, showed that the organic matter content, ash and crude fiber crude protein is generally higher than grass. This is due to rice crops that applicicated by compost and fertilizers are optimal, so it will affect nutrition. The results of the analysis of the nutrient content forage was presented in Figure 2 and 3.

In general, organic matter content, crude protein (CP) and crude fiber (SK) varieties Cisokan higher than Pandan Wangi. The forage of rice crops more nutritional content than elephant grass had CP reached 8,03% and CF reached 39,09% (Antonius, 2009). Nutrient content is also generally higher than the nutrients in rice straw either on Cisokan and Pandan Wangi. Jamilah et al., (2015) proved generally crude protein content in rice straw is only 50% compared to the content of the forage harvested at primordia age phase. When compared with the results of research (Sutardi *et al*., 1982; Zulbardi *et al*.,1983; Sitorus, 1989; Jackson, 1977) proving that the protein content of rice straw varies between 3-5%.

However, when compared to the crude protein and Crude Fiber contained in rice straw Cisokan and Pandan Wangi (Figure 2 and 3), then the quality of the straw was much lower than the grass, although the crude fiber content was still lower than the grass.

When compared with Antonius report (2009) that the dry matter content physiologically mature straw reaches 44.88%; 4.5% crude protein; 30,31% crude fiber. Rice bran contains 10.61% crude protein; 14.13% crude fiber and 91.31% dry matter. For

elephant grass, 20.23% dry matter; 8.71% crude protein and 28.35% crude fiber.

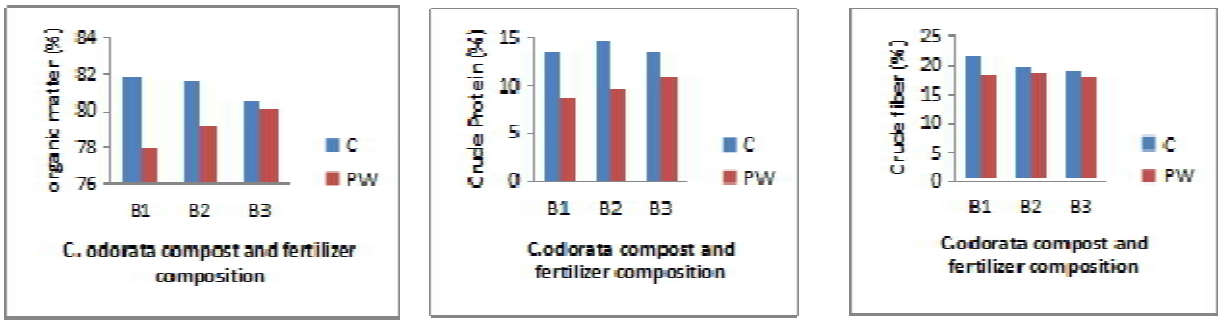


Figure 2. Organic matter content (BO), crude protein (CP) and Crude Fiber (CF) on two varieties of rice which be cut when primordia age phase

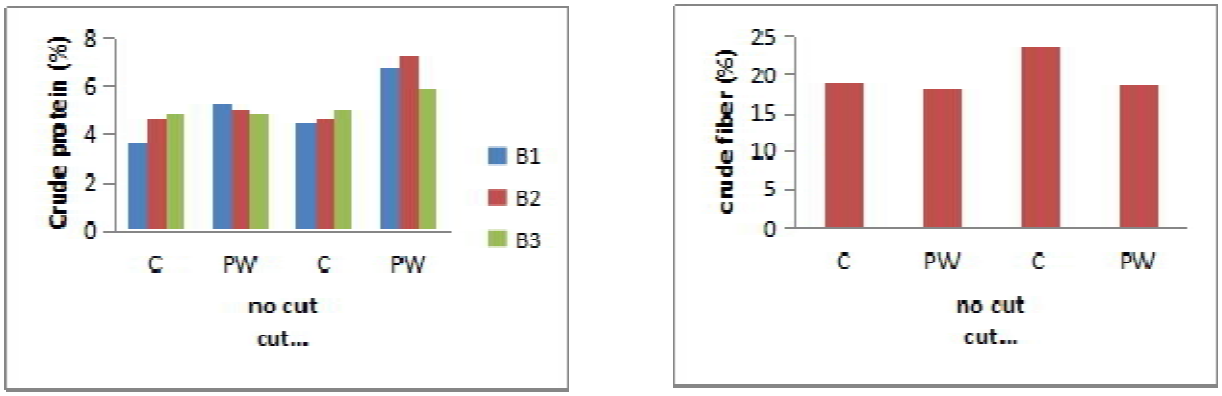


Figure 3. Crude protein (CP) and Crude Fiber (CF) of Cisokan (C) and Pandan Wangi (PW) of rice straw when physiological age phase

When compared to the crude protein of the rice plants were cut 47 days after planting (primordia age phase), with elephant grass plants, the rice plants are superior quality. Zulbardi (2000) showed that the levels of crude protein grass good quality ranges from 9%, while Zubaidah (2008) found ranged from 8.08 to 10.86%, still lower than the crude protein content of rice plant was cut 47 days after planting. Crude protein in forage origin of the rice plants are cut when the plant 47 HST containing 2-fold compared to the hay crop reached a mature age physiologically.

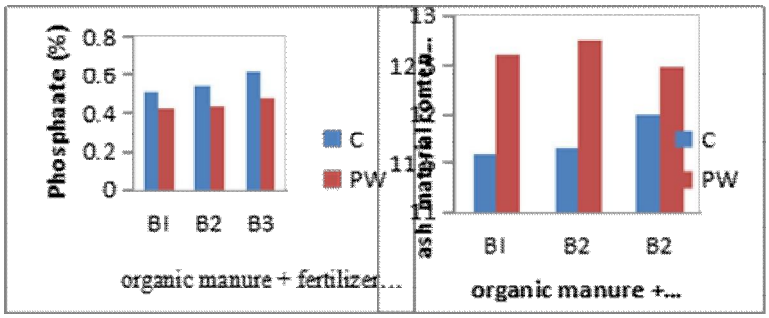
Ruminant livestock forage require materials with a value of at least 50-55% digestibility and crude protein (CP) approximately 8% (Thaliba, et al., 2000). When compared with the results of forage cultivation pattern integration of cattle and rice, the rice plants when the initial cut into the primordial interest (47 HST), PK reached 14% in plants Cisokan, and Pandan Wangi CP reached 10.94%, much higher quality to be used as ruminant feed.

The ash content of the mineral material content which does not include constituent organic material in the plant. The ash content is derived from the mineal elements absorbed by plants from the soil like elements K, Ca, Mg, Fe, Mn, Cu, P, and there is mention N also belong to it. The content of phosphorus and calcium are available from rice straw is also low. In addition to the low protein

content, rice straw also has a value of dry matter and organic matter is low, the row between 34-52% and 42-59% (Winugroho et al., 1983). This led to the low digestibility of dry matter intake low ability, which is only 2% of body weight (Jackson, 1977; Utomo et al., 1998). When compared with the results of research Zubaidah (2008), proving that the ash content in the elephant grass plants from 8.24 to 12.48% and Zulbardi (2000) reported at 10.29%. Production of organic matter, crude fiber, ash and phosphate were higher in plants fertilized with F1 treatment (5 Mg ha^{-1} compost fertilizer *C.odorata* + 100% fertilizer) compared to treatment plants that are fertilized F2 and F3 (Figure 4).

Cisokan rice plants and Pandan Wangi cut early when entering the flower primordia, able to produce up to 2.9 Mg of dry matter per hectare, organic material up to 2.4 Mg ha^{-1}. Varieties Cisokan more response from application of fertilizer F1, F2 and F3 compared, while Pandan Wangi more responses if given fertilizer F3. Cisokan on rice plants, in general production of the highest nutrient fertilization treatment results F1 (5 Mg ha^{-1} *C.odorata* compost + 100% artificial fertilizers), while Pandan Wangi higher nutrient content of F3 treatment outcome (10 Mg ha^{-1} compost *C.odorata* + 50% artificial fertilizers). Striking differences from the production of nutrients produced from forage varieties of different origin, caused also by the different plant ages. Cisokan an old plants longer than Pandan Wangi, so the ability of the recovery is more adequate than Pandan Wangi in producing top stover and establishment of rice plants flowering in time.

In Table 2 and 3, featuring content of NDF, ADF, lignin, silica, cellulose and hemicellulose in green forage. Van Soest analysis results indicate that rice Pandan Wangi values ADF and cellulose, higher than rice and Cempo Cisokan Red. Provision of fertilizer 5 t ha-1 compost C.odorata + 100% artificial fertilizers produce high levels of ADF and cellulose lower than if the compost increased the proportion of up to 10 Mg ha^{-1} of all varieties of rice. But conversely, the higher the composting C.odorata, hemicellulose content of silica and getting lower.



material in 2 rice crop varieties at primordial and hysiological age phase (%).

Figure 4. Phosphate a and Ash

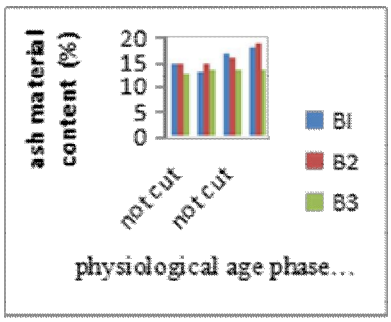


Table 2. ADF, NDF, Lignin and Silica of forage of Cisokan and Pandan Wangi at primordia age phase

Fertilizer	ADF (%)		NDF (%)		Lignin		Silica	
	Cisokan	Pandan Wangi	Cisokan	Pandan Wangi	Cisokan	Pandan Wangi	Cisokan	Pandan Wangi
B1	35.96	33.25	70.79	59.38	5.23	2.50	5.19	6.37
B2	37.12	40.30	69.17	64.70	9.75	3.37	5.86	6.98
B3	35.51	43.69	61.84	66.18	3.43	5.88	6.28	5.67

Table 3. Cellulose and hemicellulose of forage at primordia age phase

Fertilizer	cellulose (%)		hemicellulose (%)	
	Cisokan	Pandan Wangi	Cisokan	Pandan Wangi
B1	25.24	24.38	34.83	26.13
B2	21.51	29.96	32.05	24.40
B3	25.63	28.75	26.33	22.49

The content of cellulose in rice Pandan Wangi, higher indicates that the feed that comes of this rice has a better digestibility than other types of rice. When compared with the nutrient content of grass Ruzi developed by Hutasoit et al., (2009) prove that the NDF and ADF on grass Ruzi (*Brachiaria ruziniensis*) used is relatively young so it can deliver good nutrition, such as protein content is high (14%) , 50-61% NDF and ADF content ranges from 35-40% (Hutasoit, et.al., 2009).

The higher levels of silica in the feed will also complicate the digestibility for ruminants. Pandan Wangi have a silica content higher than Cisokan. The effect of compost is also something to do with the content of silica in the rice straw, the lower the composting, the higher silica content. According to (Laboratorium Team, 2013) if a low protein content causes the digestibility of only 40% result in a lower dry matter intake (less than 2% weight of livestock). It was clear, without adding concentrate was not possible to increase the production of livestock, may even be able to reduce the production. Another problem affecting the quality of hay is the high content of lignin and silica causing so low digestibility.

Conclusion

C.odorata Compost + FDR did not show different effects both on the growth and rice yield. Production of the highest forage obtained from Pandan Wangi rice crop reached 7.17 Mg ha^{-1}. Crude protein as much as 9.83% and 13.99%, crude fiber amounted to 18.31% and 20.15%, the rice yield as many as 6.29 Mg ha^{-1}; 4.21 Mg ha^{-1} by Pandan Wangi and Cisokan respectively.

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