THE USE OF STRAWMIX IN CATTLE FATTENING RATION*

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RINGKASAN

Penggunaan ransum yang mengandung jerami padi sebagai hijauan tunggal untuk penggemukan sapi.

Dua percobaan telah dilakukan untuk mempelajari penggunaan jerami padi sebagai sumber hijauan tunggal dalam ransum untuk penggemukan sapi, enam belas ekor sapi jantan muda berbangsa Frisian Holstein (FH) dan Australian Commercial Cross (ACC) digunakan dalam masing-masing percobaan yang diatur menurut rancangan acak lengkap dengan 4 macam hijauan sebagai tolokukur perlakuan : (1) rumput gajah sebagai kontrol, (ii) jerami padi tidak diproses, (iii) jerami padi diproses dengan urea, dan (iv) jerami padi diproses dengan CaO.

Pada kedua percobaan itu tidak ditemukan perbedaan nyata dalam kenaikan bobot badan harian rata-rata (ADG) antara perlakuan-perlakuan. Pada percobaan pertama ADG untuk perlakuan 1, 2, 3 dan 4 berturutan adalah 0.75, 0.78, 0.89 dan 0.78 kg, sedangkan pada percobaan kedua nilai-nilainya berturutan adalah 0.51, 0.48, 0.71, dan 0.62 kg per ekor. Secara rata-rata sapi jantan FH memberikan penampilan lebih baik sebesar 0.80 kg/ekor/hari, sedangkan ACC sedang-sedang saja (0.58 kg/ekor/hari).

Pada percobaan pertama tidak dijumpai perbedaan nyata dalam konsumsi bahan kering diantara perlakuan-perlakuan. Pada percobaan kedua, konsumsi bahan kering dari rumput gajah lebih kecil dibandingkan dengan campuran jerami padi. Sapi jantan FH memperlihatkan konsumsi bahan kering yang lebih tinggi (3.1% berat hidup) sedangkan untuk sapi jantan ACC hanya 2.5% berat hidup.

Efisiensi pakan tidak berbeda nyata diantara perlakuan pada kedua percobaan itu, yaitu 9.1, 8.0, 7.4 dan 8.4 kg bahan kering/kg ADG pada percobaan pertama, dan 13.9, 19.6, 11.8 dan 14.8 kg bahan kering/kg ADG pada percobaan kedua. Sapi jantan FH memperlihatkan efisiensi yang lebih tinggi (8.25%) dibandingkan dengan sapi jantan ACC (15.0%).

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SUMMARY

Two experiments were carried out to study the use of rice straw as the sole source of roughage in ration for cattle fattening. In each experiment 16 heads of young bulls, Frisian Holstein (FH), and Australian Commercial Cross (ACC), were arranged in a completely randomized design with 4 different roughages as treatment criteria : (i) elephant grass as control, (ii) unprocessed rice straw, (iii) urea treated rice straw, (iv) CaO treated rice straw.

No significant difference in weight gain among treatments in both experiments exists. In the first experiment the average daily gain (ADG) for treatment 1, 2, 3, and 4 was respectivelly 0.75, 0.78, 0.89, and 0.78 kg, while in the second experiment the ADG was respectively 0.51, 0.48, 0.71, and 0.62 kg per head per day. On the average the FH bulls performed superior gain of 0.80 kg/head/day while the ACC is moderate (0.58 kg/head/day).

In the first experiment no significant difference in dry matter consumption among treatments was obtained. In the second experiment the dry matter consumption of elephant grass was lower compared to strawmix. FH bulls show higher consumption of dry matter (3.1% of live weight), while the value of ACC bulls is only 2.5% live weight.

Feed efficiency is not statistically different among treatment in both experiments, namely 9.1, 8.0, 7.4, and 8.4 kg dry matter/kg ADG in the first experiment, and 13.9, 19.6, 11.8, and 14.8 dry matter/kg ADG in the second experiment. FH bulls show higher efficiency of 8.2% while ACC bulls is only 15.0%.

INTRODUCTION

Rice straw represents the most potential agricultural residue in Indonesia. The use of rice straw as a source of roughage for beef cattle and buffaloes has long been practiced in the traditional farming system and particular during the dry seasons.

Previous field observation showed that for intensive cattle production methods, such as cattle fattening and dairy cattle husbandry, the use of rice straw is considered appropriate for the conditions as follows :

(1) during dry seasons, especially the long ones which in Indonesia occurs every five years.
(2) high concentrate feeding where rice straw only functions as bulk
(3) high populated milkshed in the areas.

Dairy farmers are especially caution in the use of rice straw and this is the main reason to use beef cattle in the present experiments rather than dairy cattle.

The use of rice straw in the present experiments was based on considerations that its low nutrive

value is caused by : (i) its low content in nitrogen, minerals (except potasium), and vitamins (Bergner, 1981), the minerals are in the form of complex compounds which are insoluble and even inhibit digestion (Doyle, 1983), (ii) advanced process of ignification (Hogan and Leche, 1983, (iii) the cell wall is covered by silica crystals hardly penetrable to the enzymes of rumen microbes (Jackson, 1977).

Efforts have been made to improve the quality of rice straw and its utilization through physical, chemical, and biological treatments. Alkali treatment can increase straw digestibility (Coomble *et al.*, 1979, Willis *et al.*, 1980). Urea treatment is proven to increase digestibility, consumption and nitrogen content (FAO, 1983: Ibrahim, 1983). Alkali treatment does not enchance the availability of minerals (Doyle, 1983) and it even may create mineral imbalance which in turn reduce mineral absorption. With higher availability of energy the requirements for nitrogen and mineral are even increased (Hogan and Leche, 1982; Suwandyastuti, 1986).

Calcium hydroxide is cheap and easily available and therefore it was used in the present study. Winugroho (1984) reported that CaO treatment increased the digestibility of rice straw under in vitro condition.

MATERIALS AND METHODS

Two experiments were carried out to study the use of rice straw as the sole source of rouhage in rations for cattle fattening. The first experiment used Holsten Frisian bulls (average starting body weight of 189 kg) while the second used the so called Australian Commercial Cross (ACC) with dominant Brahman blood (average starting weight of 285 kg).

In each experiment 16 heads of bulls were arranged in a completely randomized design with 4 different roughages as treatment criteria :

(1) elephant grass control
(2) strawmix of unprocessed rice straw
(3) strawmix of urea treated rice straw
(4) straw of CaO treated rice straw.

The strawmix was formulated to have similar nutritive value to the elephant grass through supplementation of readily available carbohydrate, protein, minerals, and vitamins.

The concentrate feeding was designed to constitute 75% of the estimated total dry matter consumption of 2.5% of body weight. Roughages were served *ad lib.*, and the consumption was measured. Total rations were expected to contain 68% TDN and 10.5% crude protein.

The composition of igredients for strawmix, mineral and vitamin mixure, and concentrates are presented respectively in **Table 1**, **Table 2**, and **Table 4**. The chemical composition of strawmix, concentrates, and roughages are showen in **Table 3** and **Table 4** respectively.

Observations were made on : (i) weight gain, (ii) feed consumption, and (iii) feed digestion. Body weight is the average of three times weighing in three consecutive days. Digestibility was measured using lignin as internal indicator.

The experiment lasted for 4 weeks with 1 week as preliminary period and 3 weeks as collecting period.

Table 1. Feed Composition of Strawmix

Feed ingredients	Strawmix		
	I (Unprocessed)	II (Urea)	III (CaO)
	(%)		
Rice straw	60.0	60.0	60.0
Molasses	21.0	21.0	21.0
Rice bran	16.2	16.5	16.5
Urea	1.0	0.7	1.0
Limestone	0.3	0.3	0.0
Mineral & Vitamin	1.5	1.5	1.5
Total	100.0	100.0	100.0

Table 2. Minerals and vitamins mixture for strawmix

Ingredients	Amount
MgO	1.32 kg
$FeSO_4$	0.88 kg
$MnSO_4$	1.76 kg
$CoSO_4$	124.00 mg
$Co(NO_3)_2$	880.00 mg
KIO_3	928.00 mg
BHT	20.00 g
Vit A	37.80 g
Vit D_3	9.17 g
Vit E	75.00 g
NaCl	100.00 g
Bone meal	90.00 kg

Table 3. Chemical composition of strawmix

Items	Strawmix		
	I (Unprocessed)	II (Urea)	III (CaO)
	(% dry matter basis)		
TDN	52.6	52.2	52.6
Crude protein	9.0	9.5	9.2
Ca	0.50	0.50	1.91
P	0.44	0.40	0.44

Table 4. Feed composition of concentrates, as fed basis

Ingredient	Concentrate I	Concentrate II
	(%)	
Pollard	60.14	60.75
Yellow corn	13.20	13.34
Coconut oil meal	10.24	13.24
Kapok meal	13.10	10.43
Limestone	1.08	–
Bone meal	0.24	0.24
Mineral and vitamin mixture	2.00	2.00
Total	100.00	100.00

Concentrate II is for cattle which receive CaO treated rice straw.

Table 5. Chemical composition of concentrates and roughages

Items	(%)			
	Concentrate I	Concentrate II	Rice straw	Elephant grass
TDN	71.77	71.77	42	52
Crude protein	18.17	18.17	3.0	9.0
Ca	0.68	0.22	0.42	0.22
P	0.84	0.84	0.46	0.37

* calculated on dry matter basis

RESULTS AND DISCUSSION

Data on the average daily gains, for both experiments, are shown in Table 1. The total average weight gain of 0.80 kg/head/day for the first experiment (FH) is superior while 0.58 kg/head/day for the second experiment (ACC) is considered promosing moderate. Those figures are very close to the average daily gains experienced by the farms (PT Kariyama Gita Utama the site of these experiments) with about 4000 heads of beef cattle. The difference between breeds is not a matter of the growing phase of the cattle because in the same farm where these ecperiments were conducted, the results are almost consistent from time to time regardless of the body weight of cattle being fattened. These results are quite encouraging since Indonesia will promote FH bulls, as a by product of milk production, as the main source of better quality beef.

The strawmixes, processed and unprocessed, produce satisfactory gains not inferior to the standard elephant grass. This does mean that if the economy of the use of rice straw is favourable and the tedious process of making strawmix can be accepted, then rice straw provides an alternative as source of roughage. Although chemical treatment (urea and CaO) has been claimed to improve the digestibility of rice straw, the increase is not high enough to make an effective difference in weight gain. For any reason the rice straw contains low energy and besides, in high concentrate feeding, the rice straw constitutes only a smaller portion of the total energy consumption.

Although the average daily gain of cattle fed urea treated rice straw is much above the result obtained with the other treatments, the differences are not statistically significant and suggest that the variation within treatments is wide enough due to the blood variation among the different individual cattle of the Australian Commercial Cross.

In the first experiment (FH) no significant difference in total dry matter consumption was obtained, while in the second experiment total dry matter consumption of the rations with strawmix was higher compared to the treatment of elephant grass. It seems that in high concentrate feeding with roughage feed *ad lib.*, the high moisture content in elephant grass reduces the feed intake. This is especially true for the relatively lower consumption of feed, that is experiment 2 (see also **Table 9**).

Although the concentrate feeding was designed to constitute 75% of the total dry matter consumption of 2.5% of body weight, the results show that in the first experiment (FH) the dry matter consumption of conctrate represents only 57.9%, while in the second experiment it is higher

(69.1%). In the first experiment the FH bulls looked more robush in eating the allocated concentrate and the liberal provision of roughage. In fact the dry matter intake of FH bulls was 3.1% of body weight, compared to ACC bulls which was only 2.5% of body weight as expected. With the higher dry matter intake, the ratio of roughage to concentrate intake increase because the concentrate intake is kept constant at 75% of the total DM consumption of 2.5% body weight.

Data on the feed efficiency, expressed as ratio dry matter consumption per weight gain, are presented in **Table 10**. In both experiments no significant difference in feed efficiency was obtained among treatments.

This demonstrates that with proper supplementation, rice straw feeding could result in obtaining similar efficiencies as elephant grass as the sole source of roughage. Here again, the variation within treatments in the second experiment is very large due to the wide genetic variation of the Australian Commercial Crosses. The FH bulls show a higher feed efficiency of 8.2% while ACC bulls revealed a much lower effiency of 15.0%.

The levels of concentrate feeding in these experiments are considered as moderate, that is about 60% and 70% respectively in the first and in the second experiment. For higher levels of concentrate similar conclusions could be expected. However, for marginal level of concentrate feeding, a different phenomena could happen considering the adverse effect of high level rice straw feeding and the delicate nature of minerals and vitamins supplementation.

Table 6. Average daily gains

Treatment	FH	ACC
	(kg/head/day)	
Elephant grass	0.75, CV = 10.4%	0.51, CV = 33.2%
Strawmix I (unprocessed)	0.78, CV = 9.6%	0.48, CV = 50.9%
Strawmix II (urea)	0.89, CV = 19.7%	0.71, CV = 35.9%
Strawmix III (CaO)	0.78, CV = 20.7%	0.62, CV = 35.9%
Average	0.80, CV = 7.8%	0.58, CV = 18.0%

ACC = Australian Commercial Cross
FH = Frisian Holsetein

Table 7. Dry matter consumption [a)]

Treatment	FH	ACC
	(kg/head/day)	
Elephant grass	6.8	6.7[a]
Strawmix I (unprocessed)	6.2	8.0[b]
Strawmix II (urea)	6.4	8.3[b]
Strawmix III (CaO)	6.3	8.3[b]
Average	6.4	7.8

ACC = Australian Commercial Cross
FH = Frisian Holsten
a) = Differen letters in the same columm indicate highly signicant difference ($P < 0.01$).

Table 8. Persentage of roughage and concentrate from total ration consumption a)

Treatment	FH		ACC	
	Roughage	Concentrate	Roughage	Concentrate
	(%)			
Elephant grass	38.7a	61.3	19.6a	80.4
Strawmix I (unprocessed)	40.4a	59.6	33.1b	66.9
Strawmix II (urea)	47.3b	52.7	35.5b	64.5
Strawmix III (CaO)	42.0ab	58.0	35.2b	64.8
Average	42.1	57.9	30.9	69.1

a) On dry matter basis
b) Different letter in the same colum indicate highly significant difference ($P << 0.01$)

Table 9. Dry matter concumption per 100 kg body weight a)

Treatment	FH	ACC
	(kg)	
Elephant grass	2.9a	2.1a
Strawmix I (unprocessed)	3.0a	2.4ab
Strawmix II (urea)	3.7ab	2.8b
Strawmix III (CaO)	3.1	2.7
Average	3.1	2.5

a) Different letters in the same columm indicates significant difference ($P < 0.05$)

Table 10. Feed eficiency (Dry Matter Consumption/ADG)

Treatment	FH	ACC
Elephant grass	9.1, CV = 12.1%	13.9, CV = 26.9%
Strawmix I (unprocessed)	8.0, CV = 4.2%	9.6, CV = 37.6%
Strawmix II (urea)	7.4, CV = 17.9%	11.8, CV = 7.2%
Strawmix III (CaO)	8.4, CV = 21.3%	14.8, CV = 37.5%
Average	8.2, CV = 8.7%	15.0, CV = 21.9%

ADG = Average daily gain

CONCLUSIONS AND RECOMMENDATIONS

1. Rice straw, treated as well as untreated, can be used satisfactorily as sole source of roughage in ration for cattle fattening.
2. Complete supplementation with readily available energy, mineral and vitamins is the key of successfull utilization of rice straw.
3. The use of rice straw should be selective which depends on the availability and the relative price of higher quality roughage and level of concentrate feeding.
4. It is suggested to provide rational and complete information to the target farmers whenever the use of rice straw is to be promoted, to avoid among others urea toxixity.
5. The use of molasses blok containing suplementation of energy, protein, minerals and vitamins facilitates the right approach in promoting the utilization of rice straw.

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Appendix 1. Analysis of variance on average daily gain of the first experiment (FH)

Source of Variation	DF	SS	MS	F Table		
				F calc	0.05	0,1
Treatment	3	0.0458	0.0153	0.894	3.49	5.95
Error	12	0.2057	0.0171			
Total	15	0.2515				

DF = Degree of freedom
SM = Sum of squares
MS = Mean squares
F Clac = F calculated
FH = Frisian Holstein

Appendix 2. Analysis of variance on average daily gain of the second experiment (ACC)

Source of Varition	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	0.1322	0.0441	1.2082	3.49	5.95
Error	12	0.4382	0.0365			
Total	15	0.5704				

ACC = Australian Commercial Cross

Appendix 3. Analysis of variance on dry matter consumption of first experiement (FH)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	0.7208	0.2403	2.778	3.49	5.95
Error	12	1.0384	0.0865			
Total	15	1.17592				

Appendix 4. Analysis of varience on dry matter consumption of second experiment (ACC)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	7.3435	2.4478	6.5059*	3.49	5.95
Error	12	4.5153	0.3763			
Total	15	11.8588				

* = high significantly different ($P < 0.01$)

Appendix 5. Percentage of roughage consumption from total ration consumption of the first experiment (FH)[a)]

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	164.40	54.80	7.91**	3.49	5.95
Error	12	83.10	6.93			
Total	15	247.40				

a) Based on dry matter consumption
** High significantly different

Appendix 6. Percentage of roughage consumption from total ration consumption of the second experiment (ACC)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	680.4525	226.8106	14.00**	3.49	5.95
Error	12	194.3875	16.1990			
Total	15	874.8400				

** High significantly different

Appendix 7. Dry matter consumption per 100 kg body weight of the first experiment (FH)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	0.52095	0.1737	7.421**	3.49	5.95
Error	12	0.28095	0.0234			
Total	15	0.8019				

** Significantly different

Appendix 8. Dry matter consumption per 100 kg body weight of second experiment (ACC)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	1.1831	0.3944	4.983*	3.49	5.95
Error	12	0.9498	0.0792			
Total	15	2.1329				

* High significantly different

Appendix 9. Feed efficient (Dry Matter Consumption/ADG of first experiment (FH)

Source of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	6.1272	2.0424	1.3094	3.49	5.95
Error	12	18.7173	1.5598			
Total	15	24.8445				

ADG = Average daily gain

Appendix 10. Feed efficiency (Dry Matter Consumption/ADG) of second experiment (ACC)

SOurce of Variation	DF	SS	MS	F calc	F Table 0.05	F Table 0.01
Treatment	3	132.9346	44.315	1.6039	3.49	5.95
Error	12	331.5349	27.6279			
Total	15	464.4695				

Taksiran Kerugian Produksi Daging Akibat Infeksi Cacing Saluran Pencernaan Pada Ternak Domba

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RINGKASAN

Sebanyak 100 ekor domba jantan dan betina yang berasal dari Kotamadya dan Kabupaten Bogor dicatat berat karkasnya pada waktu penyembelihan di jagal dan contoh tinjanya diperiksa secara kuantitatif terhadap telur cacing saluran pencernaan. Terdapat korelasi negatif yang nyata ($r = 0{,}4126$; $dk = 3 : 76$; $P < 0{,}005$) dengan indeks deteminasi (r^2) 0,1702, antara jumlah ttgt di dalam tinja dengan berat karkas domba. Dari sampel dengan rata-rata berat karkas 16,3 kg terdapat 80% dengan rata-rata berat karkas 15,4 kg yang mengandung telur cacing nematoda, cestoda dan/atau trematoda. Hanya 20% yang negatif dengan rata-rata berat karkas 19,8 kg. Dari yang positif, 27% menderita infeksi tunggal nematoda, 7% cestoda, 8% trematoda, 9% infeksi campuran nematoda dan cestoda, 7% nematoda dan trematoda, 9% cestoda dan trematoda serta 13% infeksi campuran nematoda, cestoda plus trematoda. Dari infeksi tunggal yang berjumlah 38% dan infeksi campuran sebanyak 42% terdapat 56% infeksi nematoda, 38% cestoda dan 37% trematoda. Infeksi tunggal nematoda mengakibatkan penurunan berat karkas sebesar 21,72%, cestoda 9,60% dan trematoda 7,07% dibanding dengan berat karkas kelompok negatif. Infeksi campuran nematoda dan cestoda mengakibatkan penurunan produksi daging yang paling banyak (41,92%), disusul oleh infeksi campuran nematoda, cestoda plus trematoda (34,34%). Domba jantan mengalami infeksi yang lebih berat dengan persentase penurunan berat karkas yang lebih besar dibanding dengan domba betina. Helminthiasis, ditambah interaksi dengan faktor (-faktor) lain, mengakibatkan kerugian produksi daging dari ternak domba yang ditaksir antara 17,75 – 24,77% atau 3,2 – 4,4 juta kg atau Rp 7,68 – 10,56 milyar atau US$ 4,8 – 6,6 juta pertahun.

PENDAHULUAN

Ternak domba, yang potensil sebagai penghasil daging, kulit dan wool, mudah menjadi mangsa cacing saluran pencernaan. Kematian ternak pertahun akibat nematoda saluran pencernaan saja di Burma

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