Physical Properties and Palatability of Cassava Peel Wafer Complete Ration for Sheep

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ABSTRACT

Cassava peel is waste product from cassava plant which have high carbohydrates that can be used such as source of energy for cattle. Percentage of cassava peel has 0.5-2% from total weight of fresh cassava and inside cassava peel has 8-15%. The usage of forage and agriculture by product increased with feed processing technology as wafer ration complete. The aim of this experiment was evaluate physical characteristic of wafer ration complete for sheep. The parameters observed were water content, water absorption, swelling and density. Analysis data that used were Completely Randomize Design, with four treatments and three replications. The treatments were R1 (70% concentrate + 0% cassava peel + 30% field grass), R2 (70% concentrate + 10% cassava peel + 20% field grass), R3 (70% concentrate + 20% cassava peel + 10% field grass) and R4 (70% concentrate + 30% cassava peel + 0% field grass). The results were subjected to ANOVA and Contrast Orthogonal Test (Steel and Torrie, 1993). The result of this experiment indicated that treatment has significantly influenced to water content, water absorption, swelling and density. The average of water content was 10.060-13.137%, average of water absorption was 82,490-169,780%, average of swelling was 35.697-102.295%, average of average density was 0.855-0.870 g/cm^3, and palatability wafer ration complete was 769-866 g/day/head. It concluded that cassava peel is able to be utilized field grass until 30% in wafer ration complete for sheep.

Key words: wafer complete ration, cassava peel, sheep, physical properties and palatability

INTRODUCTION

Quality and quantity of feed is sometimes constraint which need effort to requirement of maintenance, growth, and animal production, thus it need to look for some alternative raw material sources which do not compete with human requirement, having nutrient, cheap price, easy to get and safe consumed for animal. Agricultural waste, plantation and agro industrial can be processed to become feed, example: sugar cane sprout, cassava peel, coffee peel, bagasse, rice bran, copra meal and tofu waste (Mariyono, 2007).

Cassava production in Indonesian reaches 16,723,257 tons (Badan Pusat Statistik, 2002). Percentage of total peel waste is 0.5 - 2% of total weight fresh cassavas and inner skin wastes 8-15% (Grace, 1977) and if it converted by inner cassava skin amount that can be utilized as much as 2,508,489 tons of cassava production at Indonesian.

Cassava as feedstuff has many weaknesses for example low palatability and low cyanide acid contents (HCN) then constitutes curb factor in good usage for animal and human. Normal HCN content on cassava as weight as 15-400 ppm HCN/kg heavy fresh and human consumption cannot be more than 1 mg HCN/kg body weight per day (Balagopalan *et al*., 1988). One of the methods to remove or decrease of HCN on cassava is by soaking into deep water, boiling and drying on the sun shines or hot weather.

Efficiency increasing of foodstuff utilization has to be done through various technologies. Technology can be used for applying and increasing utilization of foodstuff. The utilization of field grass or agricultural waste can be increased by processing technology which is mixing between field grass or agricultural waste and concentrate to be wafer complete ration. Wafer complete ration has physic of compact type then it provided easy for handling and transportation, that inside of have food nutrition completes.

Garut sheep is a local sheep from Indonesia that spread widely in West Java, particularly in Garut regency which the sheep population reaches 337.036 head. Garut sheep has high

profilic, having good potency to be developed as source of meat and has been made region tourism affinity (Mansjoer *et al*., 2005). According to Syukur (2006), molasses can be used as binding and raw materials of feed or to be processed to become single cell protein and amino acid. Molasses has BETN'S content of high dry matter (Bata, 2008).

The aim of this experiment was to know and study cassava peel as supplementary field grass in wafer complete ration of sheep palatability and to evaluate physical characteristic (water content, water absorption, swelling and density).

MATERIALS AND METHODS

Equipment that was used with weights capacity 1, 2, 5 kg, analytic weights, Chopper, Hammer mill swing's type, meter skidders, pressing machine wafer (temperature 120^0C, pressure 12 kg/cm ^{2}, up to 10 minutes).

Grass source that was used was field grass and agricultural waste, to replace as inner cassava peel. Raw material for concentrate were corn, rice bran, soybean meal, onggok, coconut meal, copra meal, molasses, urea, Na_2SO_4 and $CaCO_3$.

Palatability of wafer complete ration that was utilized by Garut local sheep as much 12 head, with body weight around 30-40 kg. Housing of sheep that was utilized has footage 120 cm, wide 80 cm and high 186 cm. That housing made from wood which completed with feed bucket with wide 40 cm and high 45 cm.

Formulation of Wafer Complete Ration

Ration that was utilized in this research consisting of grass source and concentrate with compare 30:70%. Ration formulation was arranged by using trial and error methods that crude protein content more than 20%. Nutrient composition ration adjusted by sheep requirement with body weight around 30-40 kg. Formulation and Nutrient Composition of The Wafer Complete Ration on Table 1 and 2.

Data Analysis

Data Analysis that used was Completely Randomize Design, with four treatments and three replications. The results were subjected to ANOVA and Contrast Orthogonal Test (Steel and Torrie, 1993). The treatments were R1 (70% concentrate + 0% cassava peel + 30% field grass), R2 (70% concentrate + 10% cassava peel + 20% field grass), R3 (70% concentrate + 20% cassava peel + 10% field grass) and R4 (70% concentrate + 30% cassava peel + 0% field grass).

The parameters observed of wafer complete ration were:

1. Water content (AOAC, 1984)
2. Density (Widarmana, 1997)
3. Water absorption and swelling (SNI, 1991)
4. Palatability

Palatability test of wafer complete ration utilized by Garut local sheep as much 12 head, with body weight around 30-40 kg. Feed application during 2 days and final stage of this test were weight and measuring rest one hour of wafer complete ration that was used (Edney, 1982):

Consumption (kg) = total application–feed rest.

Table 1. Formulation of The Wafer Complete Ration(%)

Raw materials	R1	R2	R3	R4
Cassava peel	0	10	20	30
Field grass	30	20	10	0
Corn	6	6	6	6
Rice bran	8	8	8	8
Onggok	5	5	5	5
Soyabean meal	26	26	26	26
Coconut meal	14	14	14	14
Copra meal	4	4	4	4
Molasses	5	5	5	5
$CaCO_3$	1	1	1	1
Na_2SO_4	0.5	0.5	0.5	0.5
Urea	0.5	0.5	0.5	0.5
Total	100	100	100	100

Table 2. Nutrient Composition of the Wafer Complete Ration

Nutrition Composition	Treatment			
	R1	R2	R3	R4
Crude Protein (%)	22,27	22,18	22,08	21,99
Crude Fibre (%)	15,69	13,33	10,97	8,60
Fat (%)	4,07	4,46	4,85	5,24
Ash (%)	7,90	7,39	6,86	6,33
BETA-N (%)	50,33	52,38	54,43	56,48
TDN	69,25	72	74,75	77,50
Phosphorus (%)	0,59	0,60	0,62	0,64
Phosphor (%)	0,52	0,53	0,53	0,54

Note: R1 = 70% Concentrate* + 0% cassava peel + 30% field grass; R2 = 70% Concentrate* + 10% cassava peel + 20% field grass; R3 = 70% Concentrate* + 20% cassava peel + 10% field grass; R4 = 70% Concentrate* + 30% cassava peel + 0% field grass

RESULTS AND DISCUSSION

Water Content

Water content is percentage of water that can declare for to base wet or dry weight (Syarief and Halid, 1993). Water content of wafer is total water that remains stay in intra cellular cell cavity and particle squire since pressing process. Statistics Analysis (Table 3.) shows that conduct gives influence that significant (P<0.01) water content. Verma *et al.* (1996) report that water content as 8-12% is optimum.

Table 3. The Average of Water Content (%)

Treatment	Water Content (%)
R1	11.150 ± 0.544[a]
R2	13.137 ± 0.908[b]
R3	12.877 ± 0.710[b]
R4	10.060 ± 0.448[a]

*highly significant (P<0.01).

Ortogonal's contrast test showed that water content on conduct R1 was not significant with R4, but R1 was really significant with R2 and R3. Wafer content determined by particle water rate before wafering process, total contained water in binder and secretor water amount of binder system when get heat energy on pressing processes that as pressure and temperature of wafering process.

Density

Wafer density determines dimension stability and physical performance of wafer complete ration (Jayusmar *et al*., 2002). Density value of wafer complete ration is in Table 4. Statistics Analysis shows that treatment was significant (P>0,05). Average of density value is around 0,855 until 0,870 g/cm^3 which the highest density value is R1 and the lowest is R4. Density value tends to decrease with using cassava peel. It was caused by field grass that had crude fiber content higher than cassava peel, it decreased the absorbing ability of wafer.

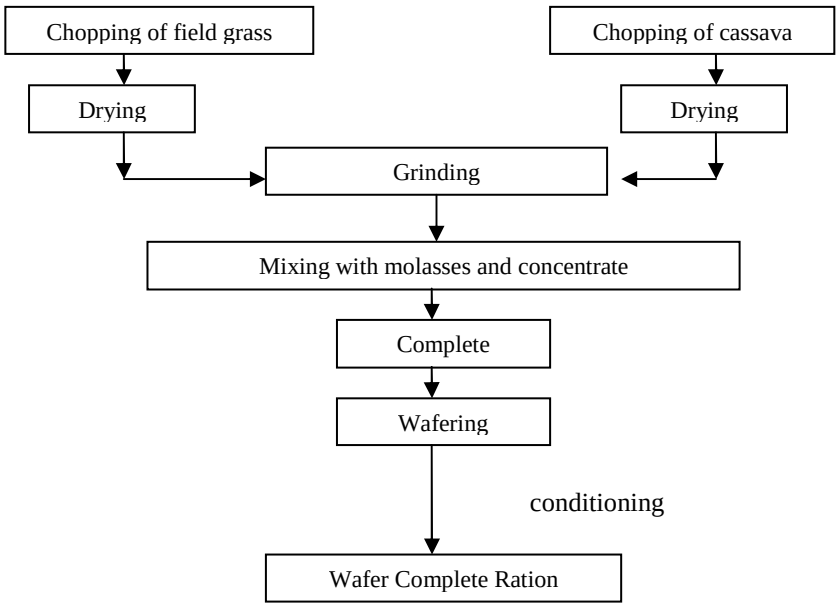
Table 4. The Average of Density (g/cm^3)

Treatment	Density (g/cm^3)
R1	0.870 ± 0.004[b]
R2	0.866 ± 0.005[b]
R3	0.861 ± 0.005[b]
R4	0.855 ± 0.012[b]

*highly significant (P<0.01).

Wafer complete ration that has high density will give texture that thick and hard, so edge out in stored good handle and also shocking at the moment transportation and is estimated more long-lasting deep stored (Trisyulianti *et al.*, 2003). Wafer with high density will be difficult to consume by sheep then it should be added by water prior to consume by sheep, because usually animal prefer to choose soft feed or wafer with low density. According to Djalal (1984) wafer density can cause of particles formation.

Diagram Process of Wafer Complete Ration



Water Absorption and Swelling

Water absorption is parameter that shows to ability to absorb water in surround to get tied up with material particle (Jayusmar *et al*., 2002). Swelling is parameter that shows wafer ration complete can swell if absorb water and gets to be utilized to predict in as much as which wafer complete ration if mix with saliva in animal (Rakhma, *et al.* , 2003). In this research, water absorption character was added water content on wafer complete ration while that wafer is soaked deep water up to 5 minutes.

Value of water absorption and swelling can be seen on Table 5. Statistics Analysis showed that treatment was really significant (P<0.01) to water absorption and swelling. Average value of water absorption is around 82,490% until 169.780% with the highest on R1 and the lowest on R4. Average value of swelling is around 35.697% until 102.295% with the highest on R1 and the lowest on R4.

Orthogonal's contrast test at each treatment give in contrast influence with water absorption that tending decrease in step at the increase cassava peel, also that swelling. Water absorption time and swelling on R4 different from R1, R2 and R3. Quantitatively, R4 cannot measured water absorption and swelling because of wafer example test while soaked by water will destroy, but qualitatively, R4 more crumbly strikes by water compare with R1, R2 and R3.

According to Djalal (1984) there are several factors that regard absorption water which are (1) blank space volume that can keep all water between particles, (2) mark sense capillary channel that link room one by the other blank space, (3) particle extents that can't be covered by pastes and (4) in its paste penetration to particle.

Table 5. The Average of Water Absorption and Swelling (%)

Treatment	Water Absorption (%)	Swelling (%)
R1	169.780 ± 10.698^{d}	102.295 ± 4.386^{d}
R2	134.420 ± 10.090^{c}	75.369 ± 7.276^{c}
R3	113.126 ± 6.360^{b}	55.310 ± 4.890^{d}
R4	82.490 ± 7.775^{a}	35.697 ± 1.575^{d}

*Really significant (P<0.01).

Palatability

Wafer or feed application has substance nutrient composition that needed with exact total, that feed shall also measure up as safe as to be consumed, palatable, economic and gets nutrient rate that adequately to meet the need it. Palatability is sensed of raw material or feed that alone so regarding in height feed consumption (Scot *et al.*, 1982). Palatability on wafer complete ration of sugar cane sprout and field grass more preferred by FH cows than bagasse and also sprout and bagasse combine (Retnani *et al* , 2009). Palatability test of wafer complete ration on each conduct can be seen on Table 6.

Table 6. Range of Palatability Test Result of Wafer Complete Ration

Treatment	Dry Matters Consumption (g/head/day)	% Sheep Weight (30-40 kg)
	769-819	1.7-1.9
R2	794-821	1.8-2.4
R3	829-851	2.3-2.5
R4	849-866	2.4-2.6

Consume dry matters (g/head/day) on each treatment R1, R2, R3 and R4 were 769-819; 794-821; 829-851 and 849-866. R4 treatment had highest consumes dry matters of wafer complete ration and the lowest on R1 treatment. It shows that cassavas peel purpose until level 30% preferred by sheep because the increase of cassava peel purposes will impact to increase the wafer consumption.

Dry matter consumption in this research among 1,7% until 2.6% of body weight. This value was lowest compared to standard requirement sheep as 3% of body weight (NRC, 1985). It was caused by the sheep in this research was unhabitual consumption wafer, which previously it consumes conventional feed, i.e. field grass or concentrate.

CONCLUSIONS

The treatment has significantly influence water content, water absorption, swelling and density. The average of water content was 10.060-13.137%, average of water absorption was 82.490-169.780%, average of swelling was 35.697-102.295%, average of average density was 0.855-0.870 g/cm^{3}, and result of palatability was 769-866 g/day. It concluded that cassava peel is able to be utilized field grass until 30% in wafer complete ration for sheep.

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