

The Physical Quality Of Complete Feed Of Modified Granules Made From Legumes And Swamp Forage For Goat Feed

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Abstract. This study was conducted to investigate the physical quality of complete feed of modified granules made from mixture legumes and swamp forage. Swamp forages was used are kalakai (*Stenochlaena palustris*) and purun tikus (*Heleocharis dulcis* Burm) which high of crude fiber were mixed by indigofera as protein source, rice brand, molasses, tapioca, and salt. Before being tested, the quality of physical properties was tested, which included weight, diameter, bulk density, angle of repose, compacted bulk density, modulus of fineness (mash). Based on the test results obtained that there are differences ($P < 0.05$) type of swamp forage to the physical quality of complete granule feed. Complete granule feed with kalakai can be obtained rough categories of 11.78%, moderate 81.05% and smooth 7.17%. Bulk density for coarse granule is 0.26 g/ml, medium granule is 0.38 g/ml, and fine granule 0.385 g/ml. Compacted bulk density for coarse granule is 0.30 g/ml, medium granule is 0.295 g/ml, fine granule 0.32 g/ml. Coarse granule diameter 21.97 mm, medium granule 15.4 mm and fine granule 3.80 mm. Angle of repose for coarse granules 27.8° , medium granule 34.4° , fine granule 57.8° . Complete granule feed with forage swamp material purun tikus can be obtained rough categories of 24.46%, moderate 70.07% and smooth 5.40%. Bulk density for coarse granule is 0.28 g/ml, medium granule is 0.272 g/ml, fine granule 0.286 g/ml. Compacted bulk density for coarse granule is 0.341 g/ml, medium granule is 0.389 g/ml, fine granule 0.347 g/ml. Coarse granule diameter 7.30 mm, medium granule 5.80 mm and fine granule 3.80 mm. Stack angle for coarse granules 35.0° , medium granule 44.2° , fine granule 58.3° . Feed ingredient of swamp forage kalakai and Purin tikus have an effect on the physical quality of complete granule feed.

Keywords : *physical quality, complete feed, granule, swamp forage*

Introduction

The efforts to utilize local food sources become very important to improve feed efficiency. One source of forage that is abundant in swamp areas and has not been widely used as goat feed ingredients is forage swamps. The presence of swamp forage is more often regarded as weeds because it can cause silting and cause a reduction of water and large nutrients. Production of dry swamp material with harvesting systems 2-3 times a week produces 44 tons / ha/year (Fahriyani and Eviyati, 2008); (Badjoeri and Lukman 2002), but swamp forage is generally high in crude fiber and tannin. To be able to meet nutritional needs in order to obtain high productivity, the use of a combination of swamp grass and legume which is high in crude protein content as goat feed given the relatively low protein content of tropical swamp grass ranges

from 4-9%, while the protein requirement of goat ration reaches 14% (Fahriyani and Eviyati, 2008), Some goat feeding that is commonly done is in fresh form. However, giving this model has limited storage capacity, livestock will choose certain parts according to their preferences, and nutritional needs have not been fulfilled and concentrate must be given. This activity is certainly not practical and not efficient, and not optimal. Today there are many new breakthroughs by giving goat feed in the form of complete feed, so the limitations can be reduced. The form of complete feed can be in the form of pellets or cube wafers, but this form is hard enough to affect feed quality and will have an impact on palatability, quality of feed, storage limit, and digestibility. The quality of animal feed consists of physical, chemical and biological qualities. Physical quality is the basic nature of feed which is strength, feed integrity, shelf power and palatability. The physical quality of feed includes: moisture content, weight, diameter, stack angle, material smoothness, bulk density, and compacted bulk density. The physical properties of feed are the basic properties of feed, so that by knowing the physical properties of feed it can determine the maximum storage limit of feed and the integrity of feed so that the nutritional quality of feed can still be maintained.

Materials And Method

Produce complete feed granules. In the manufacture of complete feed granules several stages of the Producing process follow by reducing the size of the material to be uniform, mixing feed ingredients, wetting, screening, , separation of granule particles and drying. The ingredients used are 50% indigofera legume, 20% swamp forage, 10% starch flour, 16% rice bran, 2.5% molasses, 1.5% salt. Granulator machine used has dimensions 2500 x 2400 x 2000 mm, capacity 250 kg / hour, electric motor 3 hp specifications dimensions 2500 x 2400 x 2000 mm capacity 150 kg / hour, slope angle 50 degrees, frame UNP 80, Thick Cylinder Plate 2 mm, Material Stainless steel, transmission Gear Box, V-Belt Pulley, Electric Dynamo Drive 1 Pk, 750 Watts / Solar Motor 5.5 PK.



Figure 1. Granulator machine used in the production of complete granule feed



Figure 2. Complete granule feed mixture swamp forage with legume

Bulk Density (BD). Measured by pouring feed ingredients into a measuring glass in a measuring cup using a funnel and teaspoon to a volume of 100 ml. The measuring glass containing the ingredients is weighed. On every entry of material that must be the same both way and height in pouring. During pouring material must be avoided from material shocks. As for the calculation of stack density is by dividing the weight of the material by the volume of

space it occupies. Density unit the stack is g/ml. The glass containing the ingredients is weighed. On every entry of material that must be the same both way and height in pouring. During pouring material must be avoided from material shocks. As for the calculation of stack density is by dividing the weight of the material by the volume of space it occupies. Density unit the stack is g/ml (Khalil, 1999); (Qomariah, 2004).

Compacted Bulk Density (CBD) The measurement is almost the same as the measurement of bulk density, but the volume of material is read after compacted by shaking the measuring glass by hand for 10 minutes (Khalil, 1999)

Modulus of Fineness (MF). The material is measured by inserting 300 g of ingredients in a device consisting of a filter that has a hole that fits the mesh size. The amount of sample that passes in each mesh is calculated from the calculation: Conversion Value = % sample x no agreement (np). The agreement number (np) is the number given to each. The filter is sequential from 1 to 7 (from the largest mesh). Total value conversion divided by one hundred is the amount of smoothness (MF). The MF value determines the large category of material particle size, with provisions MF values > 4.1 - 7.0 are coarse categories, MF value > 2.9 - 4.1 medium category MF values 0 - < 2.9 are fine (Khalil, 1999).

Average Diameter (inch) = 0.00041 x 2MF and average diameter (cm) = average diameter (inc) x 2.54

Water Contents. Water content was measured by calculating the difference in weight of material feed ingredients before drying the oven with weight after drying the oven for 24 hours at 60° (AOAC, 1999).

Angle of Repose. The measurement is done by pouring about 300 g of feed ingredients vertically. the angle formed is measured (Khalil, 1999).

Statistical Analysis

The data are expressed as mean $\pm$ SEM. A one way analysis of variance (Anova) with Tukeys multiple Comparison test was applied to dermine differences among the treatmen using SPSS statistical software (version 16.0). Differences wit P value 5% were considered to be statistically significant (Steel, R G D and J H Torrie, 1993)

Results

The effect of physical quality of complete feed of modified granules made from legumes and swamp forage for goat feed shown in table 1 and figure 3 and 4

Table 1. Physical Quality of Complete granules Feed with different swamp forage materials and particle

No	Physical Quality	Swamp forage					
		Kalakai (<i>Stenochlaena palustris</i>)			Purun Tikus (<i>Heleocharis dulcis</i> Burm)		
		Coarse	Medium	Fine	Coarse	Medium	Fine
1	Water content (%)	11,04 $\pm$ 1,42	10,92 $\pm$ 2,18	10,83 $\pm$ 2,07	11,54 $\pm$ 1,37	10,32 $\pm$ 1,17	10,38 $\pm$ 2,19
2	Diameter (mm)	2,197 $\pm$ 0,23 ^a	1,540 $\pm$ 0,04 ^b	0,380 $\pm$ 0,02 ^c	0,730 $\pm$ 0,07 ^c	0,580 $\pm$ 0,03 ^c	0,280 $\pm$ 0,03 ^c
3	Angle of Repose (°)	27,8 $\pm$ 4,56 ^a	34,4 $\pm$ 6,2 ^a	47,8 $\pm$ 6,7 ^b	35,0 $\pm$ 5,32 ^a	44,2 $\pm$ 4,70 ^b	48,3 $\pm$ 3,92 ^b
4	Bulk Density (g/ml)	0,260 $\pm$ 0,02 ^a	0,380 $\pm$ 0,02 ^b	0,385 $\pm$ 0,03 ^b	0,280 $\pm$ 0,03 ^a	0,272 $\pm$ 0,03 ^a	0,286 $\pm$ 0,02 ^a
5	Compacted Bulk Density (g/ml)	0,300 $\pm$ 0,015 ^a	0,295 $\pm$ 0,17 ^a	0,320 $\pm$ 0,02 ^a	0,341 $\pm$ 0,02 ^b	0,389 $\pm$ 0,03 ^b	0,347 $\pm$ 0,06 ^b
6	Modulus of fineness (%)	11,78a $\pm$ 2,13 ^a	81,05b $\pm$ 8,74 ^c	7,17 $\pm$ 1,92 ^a	24,46 $\pm$ 8,15 ^{bc}	70,07 $\pm$ 16,92 ^b	5,47 $\pm$ 1,03 ^a

abc Values in the same row with different superskrips indicate significant difference at P<0.05



Figure 3. Comparison of Physical Complete Feed Granule Of Different Swamp Forages (mean $\pm$ SEM) n=36)

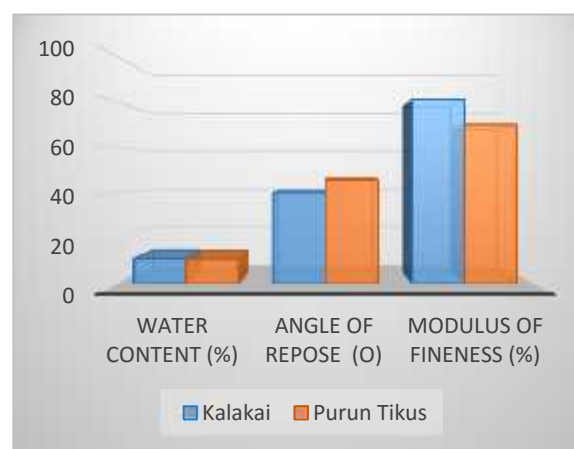


Figure 4. Comparisson Angle of Repose, MF Highest Finenes Percentage and Water Content (mean $\pm$ SEM) n=36)

This type of swamp forage causes differences in physical quality in the manufacture of granular complete feed. For the percentage of granular fineness there are similarities where both produce the most portion of medium. There are similarities between the two swamp grasses where the stack density, stack compaction density follows an increasing trend from coarse to fine granules. There is a trend that is precisely the opposite between the diameter of the granule and the stack angle on both types of swamp forage. This type of swamp forage causes differences in physical quality in the manufacture of granular complete feed. For the percentage of granular fineness there are similarities where both produce the most portion of medium. There are similarities between the two swamp grasses where the bulk density, compacted bulk density follows an increasing trend from coarse to fine granules. There is a trend that is precisely the opposite between the diameter of the granule and the stack angle on both types of swamp forage. This type of swamp forage causes differences in physical quality in the manufacture of granular complete feed. For the percentage of granular fineness there are similarities where both produce the most portion of medium. There are similarities between the two swamp grasses where the bulk density, compacted bulk density follows an increasing trend from coarse to fine granules. There is a trend that is precisely the opposite between the diameter of the granule and the angle of repose on both types of swamp forage. This type of swamp forage causes differences in physical quality in the manufacture of granular complete feed. For the percentage of granular fineness there are similarities where both produce the most portion of medium. There are similarities between the two swamp grasses where the bulk density, compacted bulk density follows an increasing trend from coarse to fine granules. There is a trend that is precisely the opposite between the diameter of the granule and the angle of repose on both types of swamp forage.

Discussion

Complete granule feed is modified goat feed see figure 4. This feed still provides a portion of forage legumes, swamp forages and other energy sources. But still the use of starch is used in addition to carbohydrate sources as well as adhesive so that the form of granule can be maintained. Forage of kalakai swamps (*Stenochlaena palustris*) and purun mice (*Heleocharis*

dulcis Burm) have high crude coarse fiber content, ie 23.6% and 28.09% respectively (Results of UGM Laboratory Analysis of Fapet, 2018). Besides that it contains tannins which range from 2-16% (Rostini et al. 2014) tannin which can bind to proteins. The existence of these nutrients will affect the physical quality of granule feed. The purun tikus texture is softer if it has undergone a grinding process, in contrast to the more rough kalakai forage which affects the diameter of the granule. Seen in terms of the percentage level of fineness of complete feed granules it turns out that both have medium smoothness. Where the granule feed comes from forage is much greater (80.07% vs 70.07%). Granule from forage after being compacted was lower than that of complete granule feed from purun tikus. This shows that there are cavities in the granule so that other parts can fill the space which is the bulk density so that it looks density. Another factor that can influence stack density is product diameter (Kartasudjana, 2001); (Suadnyana, 1998). Products that have a diameter of 3 mm are more easily broken than pellets with a diameter of 6 mm. That can influence factor stack density is product diameter (Suryanagara, 2006). Products that have a diameter of 3 mm are more easily broken than pellets with a diameter of 6 mm (Suryanagara dan Pramadita, 2006). The existence of swamp grass in the manufacture of complete granule feed provides a new innovation that physical modification of feed will have an impact on the use of feed that is better, longer lasting and provides more complete nutrition. Both swamp forages are able to be modified into complete feeds without providing characteristics of far different physical properties. There needs to be further testing of biological properties to see the level of goat's preference for complete granule feed.

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