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Addition To Green-Based Feed Preparations With Fermentation Technology Innovation Good Ruminant Feeding Practices

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Abstract

Improving ruminant feed quality is an important factor in increasing livestock productivity and health. To improve feed quality, accompanying forage-based ruminant feed preparation with fermentation technology innovation is the focus of community service activities. This community service is carried out using the lecture or counseling method which is attended by breeders and prospective breeders as well as stakeholders (village officials). Accompanying forage-based ruminant feed preparations with a fermentation technology approach is intended to optimize the nutrition and microbial content in the feed, thereby increasing the availability of nutrients and digestion of livestock, with impact factors on growth, animal health, and milk production. Fermentation technology innovations can improve feed quality by increasing nutritional content, reducing anti-nutritional ingredients, and increasing nutritional availability for livestock without depending on or being influenced by changes from the rainy season to the dry season.

Keywords: *fermentation technology, forage, nutrient availability, and ruminant feed.*

1. INTRODUCTION

a. Nutritious ruminant feed

Nutritious ruminant animal feed is a key factor in maintaining the health and productivity of livestock. Ruminants, such as cattle, sheep, and goats, have unique digestive systems, which enable them to digest and utilize forage and fiber feed ingredients efficiently. However, to ensure optimal health and productivity, ruminant feed must contain balanced and adequate nutrition (Prasetyo, 2019).

Nutritious ruminant feed must contain important components such as protein, carbohydrates, fat, vitamins, minerals, and fiber. Protein is an important nutrient for the growth and maintenance of body tissue, while carbohydrates and fat provide the energy necessary for activity and production. Vitamins and minerals are required in small amounts but are essential to maintain normal body function (Grant & Ferraretto, 2018). Fiber, as contained in forages, aids in digestion and maintains a healthy ruminant digestive tract.

However, the available ruminant animal feed often has low nutritional quality. Forages used as feed sources often have low nutritional content, especially in terms of protein and energy. Apart from that, forage can also contain anti-nutritional ingredients, such as tannin and lignin compounds, which can inhibit the digestion and absorption of nutrients by livestock. To provide nutritious ruminant feed, various strategies have been developed. One promising strategy is the use of feed supplements containing necessary nutrients, such as additional protein or fortified minerals and vitamins (Wahyudi, 2019). In addition, fermentation technology has also been used to improve the quality of ruminant feed by optimizing nutrition and reducing anti-nutritional ingredients in forage.

Understanding the importance of nutritious ruminant animal feed and the challenges faced in providing it, it is hoped that this article can provide useful insights for farmers and other stakeholders in efforts to improve the health and productivity of livestock.

b. Forage fermentation technology

Fermentation technology has become a popular approach to improving the quality of animal feed. One fermentation technology that is widely used is the use of EM4 (Effective Microorganisms 4). EM4 is a mixture of microorganisms consisting of lactic acid bacteria, yeast, and other beneficial microorganisms. Fermentation technology using EM4 has been proven effective in improving the quality of animal feed by optimizing nutrition and reducing anti-nutrient ingredients in forage.

The use of EM4 in fermenting forage for animal feed has several benefits: 1) assisting in the forage fermentation process by accelerating the production of organic acids, such as lactic acid which is useful in lowering the pH in animal feed, thereby creating an environment that is favorable for microorganisms that produce digestive enzymes; 2) EM4 has the ability to destroy anti-nutrients (tannin and lignin compounds) in forage. These anti-nutrients can inhibit digestion and absorption of nutrients by livestock. EM4 can decompose and convert anti-nutrients in forage into compounds that are more easily digested and beneficial for livestock.

Tannins are polyphenolic compounds and are commonly found in many forage plants. At high concentrations, tannins can inhibit the absorption of nutrients such as protein and carbohydrates. However, in some cases, tannins can be converted into beneficial compounds such as hydrolyzed tannins, which can improve the health of livestock digestive tracts. Some forages that contain protein antinutrients (trypsin and α-amylase inhibitors) can inhibit the digestion of proteins and carbohydrates (Ogunade et al., 2018). However, by increasing the temperature during the fermentation process, these inhibitors can be inactivated, thereby increasing the availability of nutrients for livestock. Phytates in grains and some forages can bind minerals such as calcium, phosphorus, and iron, thereby inhibiting mineral absorption by livestock; with fermentation treatment that increases organic acid compounds, phytate is hydrolyzed into simple forms (inositol phosphate and organic phosphate); Phosphorylated phytate (mono and inositol diphosphate) which is more easily absorbed by the livestock digestive tract (Yuliyati et al., 2018).

The description above can be used as a basis for formulating problems related to innovation in forage fermentation technology into animal feed that is nutritious and free of anti-nutritional compounds, as well as for research development activities and community service. Short-term goals as targets: 1) Increase public awareness about environmental issues related to seasons in terms of providing sustainable animal feed; 2) Increasing community participation in solving problems in their environment. Medium-term goals: 1) Building community capacity to overcome the problems they face through training, education, or skills development; 2) Encourage active community participation in decision-making that affects life activities at the local, regional, and national levels; 3) Building sustainable partnerships with village-owned enterprises, relevant business entities and banks in business development. Long term goals: 1) Creating sustainable social change by addressing the root of the problem and improving the social and economic conditions of society; 2) Improve the quality of life of society as a whole through developing infrastructure, community services, and access to important resources.

2. METHODOLOGY

Regarding the problems and plans for developing ruminant farming in Jatipuro village, Karanganyar district, the role of applicable innovative technology, improving the skills of farmer breeders and high performance supported by a reliable management system is really needed. Village-owned enterprises as the closest partner becomes a visionary and/or futuristic partner, so that the goals of the farming community can be achieved according to plan.

In the framework of solving the problem of providing sustainable ruminant feed from season to season and identifying steps for forage-based ruminant feed supplies, the formulation of assistance with success criteria needs to be structured in such a way between stakeholders at the village level. This community service is carried out using the lecture or counseling method which is attended by breeders and prospective breeders as well as stakeholders (village officials).

3. RESULT AND DISCUSSION

Potential solutions in the form of innovations in ruminant forage fermentation technology resulting from assistance need to be disseminated widely to other ruminant breeders and/or prospective breeders. Implementing innovative forage fermentation technology for ruminant feed can involve the following steps: 1) Identifying types of forage that are suitable for the fermentation process and selecting forage that has good nutritional content and is accessible in the sense of being available at the village level; 2) Prepare forage raw materials by cutting them into appropriate sizes, because this will simplify the fermentation process and increase efficiency; 3) Addition of microbial inoculant rich in lactic acid bacteria or yeast to the prepared forage; 4) Packaging and storing forage that has been mixed with microbial inoculant in appropriate containers, such as: plastic drums, airtight plastic bags and silos; 5) Ensure fermentation conditions remain optimal for the growth of desired microbes and prevent the growth of pathogenic microbes, by monitoring temperature, humidity and pH regularly; 6) Quality testing and nutritional analysis of fermented feed, to ensure that the feed has good nutritional quality and meets the needs of ruminant livestock.

Implementing innovative forage fermentation technology for ruminant animal feed requires collaboration between breeders, animal nutrition experts and researchers. With these steps, it is hoped that fermented feed can provide significant benefits in improving nutritional quality and feed efficiency for ruminant livestock. Examples of forages that are suitable for the fermentation process in making ruminant animal feed are as follows: 1) Green grass (eg elephant grass, king grass, setaria grass), commonly used as raw material for making animal feed, because it has good nutritional content and is easily accessible by breeders; 2) Rice straw is rice plant residue after harvest which is often ignored, even though through the fermentation process it can be converted into feed that is more nutritious and easily digested by ruminants; 3) Cassava leaves, which have a high protein content and by fermenting the protein can be increased and more easily digested by livestock; 4) Rice bran is a by-product of the rice milling process, rich in fiber and energy, but low in protein; through fermentation, rice bran can increase its protein content and become a more nutritious feed; 5) Agricultural waste such as vegetable and fruit waste can be used as raw material in making animal feed; Through fermentation, this agricultural waste can be converted into more nutritious feed and reduce unused agricultural waste.

Composition of ingredients and techniques for making silage:

1) Elephant grass or other forage, 100 kg

2) Molasses, 3 liters
3) EM4, 1.5 liters
4) Fine bran, 5 kg
5) Groats, cassava, cassava or tofu dregs, 3 kg
6) Water, 25 liters
7) Prepare a plastic drum, plastic bag, or silo
8) and tools: bucket, tarpaulin, shovel, jerry can, bucket, and stirrer.

The EM4 to be used which is contained in the factory-packaged bottle is in a dormant state, so it needs to be activated, in the following way: 3 liters of molasses, mixed with 25 liters of water and 1.5 liters of EM4, and incubated for ± 24 hours; This step makes EM4 active and ready to be used in fermentation as a decomposer microbe.

Silage-making techniques:

1) Elephant grass or forage with a water content of 65% (equivalent to 85 kg of loss from 100 kg), and cut into 5 - 10 cm pieces manually or mechanically using a chopper;
2) Mix the grass/forages, bran, groats, cassava or cassava evenly;
3) Mix the active EM4 evenly;
4) Put the mixed material into a plastic drum, airtight plastic bag, or silo and compact it without any air gaps;
5) Animal feed ingredients are inserted until they exceed the surface of the container or silo, and compacted so that there is no possibility of shrinkage of the contents;
6) There is no space between the lid and plastic drum tube/plastic bag/silo and the surface of the feed material;
7) Place it in a dry place and not be exposed to sunlight; and
8) Silage is ready to be used as ruminant feed after 15 – 20 days.

Silage quality assessment*

silage assessment criteria	very good	good	currently	bad
mushrooms	none	a little	more	lots
odor	sour	sour	less sour	rotten
pH	3.2 – 4.2	> 4.2 – 4.5	>4.5 – 4.8	> 4.8

* (Yuliyati et al., 2018)**;** (Grant & Ferraretto, 2018)**.**

Other criteria, physically, the color of the silage remains green, the texture of the grass is still clear, and it is not moldy, slimy, or lumpy. Analysis of breeders' needs for feed per cow in a fattening program from fermented forage involves understanding the nutritional needs of cows in the fattening phase, the benefits of fermented forage, and breeders' preferences regarding the use of this feed.

Benefits of fermented forage

1) Improve the nutritional quality of feed, including increasing protein content, reducing crude fiber, and increasing nutrient availability.
2) Increase feed digestibility, so cows can utilize nutrients more efficiently.
3) Improved rumen health, which helps maintain a healthy balance of rumen microbes, and is important for good digestion and overall cow health. Benefits of fermented forage:
4) Improve the nutritional quality of feed, including increasing protein content, reducing crude fiber, and increasing nutrient availability.
5) Increase feed digestibility, so cows can utilize nutrients more efficiently.
6) Improved rumen health, which helps maintain a healthy balance of rumen microbes, and is important for good digestion and overall cow health;

(Ogunade et al., 2018); (Grant & Ferraretto, 2018).

Feed measurements for sheep, goats, or cattle*

1) Morning
   - Forage is around 10 – 20% of livestock weight
   - Concentrate around 1 – 2% of livestock weight
2) During the day
   - Alternative feed is around 2% of daily feed requirements
3) Afternoon
   - Forage 10 – 20% of sheep weight

Notes:

- Daily feed requirements = 0.02 x (morning feed + afternoon feed)
- Supplement feed is 1% of the total ration.

*(Prasetyo, 2019).

4. CONCLUSION

Alhamdulillah, for His grace and blessings, assistance in making forage-based ruminant feed with innovative fermentation technology in Jatipuro - Karanganyar village which is oriented towards good ruminant feeding practices has been completed well. Conclusions from activities to pay attention to 1) Fattening cattle require feed that is rich in energy to support optimal growth and weight gain; 2) Protein is an important nutrient for the growth of muscle and body tissue in cows; 3) Fiber is needed to maintain cow's digestive health and prevent digestive problems such as rumen acidosis; 4) Sufficient mineral and vitamin requirements to support optimal growth and health; will be achieved with innovation in fermentation technology for forage-based feed ingredients and additional ingredients.

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AUTHOR CONTRIBUTIONS STATEMENT

Division of writer duties in this activity: The first writer coordinates all activities with member writers, and creates the main outreach material; The second author is tasked with helping explain forage materials, especially the provision of setaria and kolonjono grass from a cultivation aspect; The third author was tasked with helping to explain the independent manufacture of decomposer microbes from previously made silage products.

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