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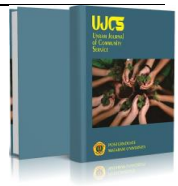

Application of Red Guava Waste MOL as a Bioactivator in Dairy Goat Feed

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Abstract: Utilization of organic waste as an active ingredient in the manufacture of Local Microorganisms (MOL) is an environmentally friendly innovation that supports efficiency and sustainability in the livestock sector. This study aims to examine the application of MOL based on red guava waste (Psidium guajava L.) as a bioactivator in the formulation of dairy goat rations. Red guava waste MOL was formulated through anaerobic fermentation process and applied as an inoculant in rations based on local ingredients. Observations were made on ration fermentation quality (pH, odor, texture), ration consumption rate, and milk production performance of dairy goats. Results showed that the use of red guava waste MOL increased ration fermentation efficiency, improved palatability, and contributed to increased feed consumption and milk production. In addition, this approach also adds value to fruit waste management and supports sustainable farming practices. The application of MOL from red guava waste proved to be a potential bioactive solution in the development of fermented rations for dairy goats. Conclusion the application of MOL from red guava waste is proven to be effective as a bioactivator in dairy goat rations.

Keywords: MOL, Red Guava Waste, Bioactivator, Fermented Ration, Dairy Goats.

Introduction

Salman Farm is a dairy goat farm located in a semi-rural area with good access to local markets and supporting facilities. The founder is Muhammad Dimyati, S.Pt. In 2010, he initially raised meat goats, but due to high market demand for goat milk, he switched to dairy goat farming in 2020. The farm is intensively managed with a focus on goat milk production as the main commodity, while also serving as a place of learning and practice for students.

Livestock conditions and management are as follows Livestock population: ±60 dairy goats (predominantly Saanen and Sapera breeds). Feed management: A combination of local forage, concentrates, and simple fermented feed. Milk production: Average of 1–1.5 liters/head/day (Adiwinata dan Susana, 2021). Livestock health: Generally good, but there are still challenges in controlling internal parasites and reproductive efficiency (Arief dan Budhiarta, 2020).

Advantages (Potential) include Livestock Resources: Goats that are healthy, productive, and docile enough for field practice (Astuti dan Nugroho, 2019). Learning Environment: Facilities such as pens, milking areas, and pasture land are available for student practice. Partnerships: Salman Farm is open to collaboration with universities, communities, and young farmer training programs. Market: There are regular customers for fresh goat milk, including households and herbal shops (Badan Pusat Statistik, (2023).

Challenges and problems include high feed costs: Still dependent on commercial feed, especially concentrates. Waste management is not yet optimal: Organic waste such as manure and forage residues are not fully utilized (Dewi dan Cahyono, 2018). Variability in milk production: Production tends to fluctuate due to suboptimal nutrition management. Operational human

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resource limitations: Daily management still relies on limited personnel.

Salman Farm partners are 17 people who are new to goat farming or goat farmers who frequently visit and learn about dairy goat farming at Salman Farm. These farmers come from various villages in the Majalengka Regency, including 4 from Buahkapas Village, 3 from Payung Village, 3 from Rajagaluh Village, 4 from Rajagaluh Kidul Village, 1 from Sindangpano Village, and 2 from Bobos Village. Salman Farm's role for its partners includes providing a network of farmers who are ready to participate in the dairy goat program, serving as a center for training and dissemination of modern farming technology, providing collective barn infrastructure and demonstration feed gardens, organizing the distribution and marketing of goat milk produced by partners, and encouraging the regeneration of young farmers through partnerships with village youth organizations.

The objectives of the partnership include a broad and widespread membership base in the Majalengka goat farming center, active institutions supported by relevant agencies, access to small farmers who need further guidance, infrastructure and human resources ready to support the dairy goat development program, and a commitment to environmentally conscious and sustainable farming.

The hope is to establish an integrated community goat milk business system, improve the welfare of small farmers and rural youth, transfer technology from Salman Farm to the farming community, and create a model of private sector-community collaboration that can be replicated in other regions.

Development Opportunities in the form of innovation Local Fermented Feed: There is great potential for the application of MOL (local microorganisms) from fruit waste, such as red guava, to reduce costs and increase the nutritional value of feed (Dirjen Peternakan dan Kesehatan Hewan, 2021). Product Diversification: The development of processed goat milk products such as yogurt, kefir, and milk soap as economic added value (Kementerian Riset, Teknologi, dan Pendidikan Tinggi, 2023). Education and Research: Farms can be maximized as field laboratories for students for research, agribusiness practices, and community service. Educational Agrotourism: Opportunities to develop educational visit programs and community training on dairy goat farming.

The main problems in dairy goat farming are high feed costs and dependence on commercial feed (Syamsuddin dan Ma'ruf, (2020). On the other hand, there is a lot of local fruit waste, such as red guava, that has not been optimally utilized. Red guava has the potential to be a source of local microorganisms (MOL) rich in lactic acid bacteria, which can act as bioactivators in the feed fermentation process (Wahyuni, 2022).

Through this approach, the student team sought to develop MOL from red guava waste to be fermented into dairy goat feed at Salman Farm, as an innovative step to support sustainable milk production and reduce feed costs (Widianingrum, et al, 2021).

This community service activity, entitled "Application of Red Guava Waste MOL as a Bioactivator in Dairy Goat Feed at Salman Farm," has broad benefits for partner communities, students, and the surrounding environment:

1. For Partner Communities (Salman Farm Farmers), among other things, providing alternative solutions in the provision of low-cost but highly nutritious fermented feed, thereby increasing the efficiency of livestock businesses. Increasing farmers' knowledge and skills in making and applying MOL from local fruit waste. Helping to increase goat milk productivity naturally without synthetic chemicals.
2. For students, this includes enhancing soft and hard skills through direct involvement in community empowerment. It serves as a contextual learning platform based on problem-solving related to animal husbandry, appropriate technology, and social entrepreneurship. It strengthens students' understanding of their role as agents of change in the development of sustainable agriculture and animal husbandry.
3. For universities, this includes supporting the implementation of the Tri Dharma Perguruan Tinggi (Three Pillars of Higher Education), particularly in the field of community service. Building sustainable cooperation networks between campuses and the business world (smallholder farming). Becoming a base for the development of applied research and technological innovation based on local wisdom.
4. For the environment, this includes reducing organic waste (rotten guava fruit) that has the potential to pollute the environment by processing it into useful products. Encouraging the creation of environmentally friendly and ecologically-minded livestock farming.

Problems

Salman Farm, as a partner in this activity, is a small-scale dairy goat farm that has great potential to support local food security through goat milk production. However, in practice, farmers face several major obstacles that hinder the efficiency and sustainability of their businesses, namely:

1. High feed costs
   The commercial concentrate feed currently used is quite expensive and is the largest component of daily operational expenses.

2. Suboptimal utilization of local waste
   The abundant red guava waste in the surrounding environment is not being utilized, resulting in waste and the potential for environmental pollution.
3. Limited knowledge among farmers regarding feed fermentation technology
   Farmers are not yet accustomed to utilizing bioactivator technologies such as MOL to independently improve the quality of livestock feed.
4. Milk production is not yet stable
   Milk productivity still fluctuates due to variations in feed quality and a suboptimal nutrition system.

Solutions through PKM Activities

Through this PKM-PM activity, the student team offers an appropriate and educational technology-based approach as a solution to the above problems, namely:

1. Production and training of MOL applications from red guava waste
   Red guava waste is fermented into MOL, which is rich in microorganisms, which is then used as a bioactivator in fermented feed.
2. Application of MOL-based fermented rations
   Rations based on local forage and agro-industrial waste are fermented with MOL to increase nutritional value, shelf life, and palatability.
3. Assistance and education for farmers
   This activity includes direct training and ongoing assistance so that farmers are able to produce and apply the technology independently.
4. Monitoring the impact on milk production
   Evaluations are conducted to assess improvements in production and efficiency, so that the results can be used as a basis for further development.

This activity is expected not only to solve technical problems in farming, but also to encourage the creation of a more economical, independent, and sustainable model of dairy goat farming based on local resources.

Method

The implementation method for this PKM activity was designed to be participatory, educational, and applicable, so that it could have a direct impact on the partner (Salman Farm). The activity schedule:

The activity will be carried out in the following main stages:

1. Initial Preparation and Coordination by conducting a preliminary survey to map the condition of the cages, the types of feed used, and the problems faced by farmers. Establishing a cooperation agreement with Salman Farm partners through an initial meeting (kick-off meeting). Preparation of tools and materials such as fermentation buckets, scales, MOL ingredients (red guava waste, brown sugar, EM4/rice washing water), and forage ingredients.
2. Production of Red Guava Waste MOL by collecting red guava waste from the surrounding environment. Crushing the fruit and mixing it with fermentation ingredients (brown sugar + EM4/rice washing water). Storing the solution in a closed container for 7–14 days for anaerobic fermentation. The fermentation results are filtered and stored in bottles as ready-to-use MOL.
3. Formulation and Application of Fermented Feed includes preparing local forage (e.g., elephant grass, cassava leaves, rice bran). Adding MOL as a bioactivator in the feed fermentation process. Fermentation is carried out in closed plastic bags for 3–5 days. Once ready, the feed is gradually given to dairy goats while monitoring consumption and health conditions.
4. Educate and assist farmers by conducting training on MOL production, feed fermentation, and alternative feed management. Provide modules and practical guidelines so that farmers can continue to innovate independently after the activity ends. Hold discussions and question and answer sessions to gather input from farmers as a form of capacity building (Figure 1).

Figure 1. Educate and assist farmers

5. Monitoring and Evaluation by recording feed consumption, increases in milk production, and the physical condition of goats. Interviews and observations with partners to assess understanding and sustainability of activities. Compiling activity reports, documentation, and publishing activity results in the form of scientific articles or social media.
6. Dissemination of Results, including presenting activity results to the university, partners, and the general public. Providing recommendations for further development and the potential for replicating activities to other farms.

MOL and Fermented Ration Innovation Technology Flow Chart (Widianingrum et al., 2021):

Figure 2. MOL and Fermented Ration Innovation Technology Flow Chart

a. MOL Production and Characteristics
Guava waste MOL shows optimal fermentation results after 7 days with characteristics of a fresh sour smell, pH between 3.5–4, and no slime. This indicates good microbial activity as a bioactivator.
b. Application in Feed Fermentation
Feed fermented with MOL exhibits a softer texture and a more palatable aroma for goats. Palatability increases, as evidenced by a 15% increase in feed consumption.
c. Impact on Milk Production
After 14 days of treatment, there was an average increase in daily milk production of 12%. In addition, farmers reported that the goats were healthier and their manure was more solid.
d. Social and Environmental Impact
Partners experienced an increase in capacity in organic waste processing and feed innovation. Guava waste that was previously discarded is now utilized, reducing the potential for environmental pollution.

Result and Discussion

1. Pretest

Distribution of pretest participants' understanding categories in the PKM activity "Application of Red Guava Waste MOL as a Bioactivator in Dairy Goat Feed" in Figure 3.

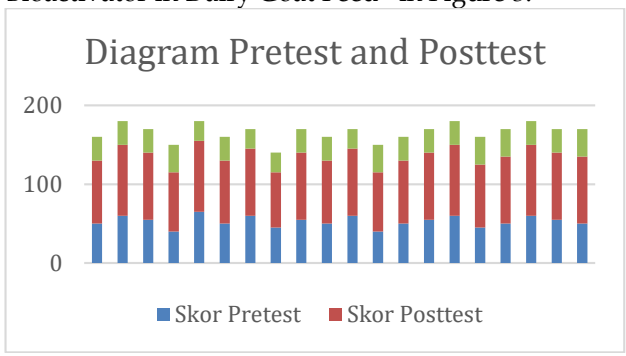

Figure 3. Diagram Pretest and Posttest

Based on Figure 1, most participants (100%) did not fully understand the concept and application of red guava waste MOL in dairy goat feed. The majority were in the low to moderate category. This indicates the need for intensive assistance and the provision of applicable material during PKM activities.

2. Implementation of Activities

The production of red guava molasses has been researched by Widianingrum. Its use has been applied to entog feed, broiler chickens, and waste composting in Panyingkiran. However, red guava waste molasses has not yet been applied in dairy goat feed. Dairy goats are very fond of fermented feed, as evidenced by their high feed consumption and high milk production. This activity involves the application of red guava waste molasses as a bioactivator in dairy goat feed.

This PKM activity promotes appropriate technology that is simple, inexpensive, and applicable, namely the utilization of red guava waste as a source of Local Microorganisms (MOL) to improve the quality of dairy goat feed through the fermentation process.

A. Key Technology:
Red Guava Waste MOL. MOL is a solution produced from the fermentation of organic materials containing beneficial microorganisms (such as lactic acid bacteria, yeast, and fungi) that play a role in the decomposition and fermentation processes.

Red guava waste was chosen because it contains natural sugars, vitamin C, and antimicrobial compounds that accelerate the growth of beneficial microorganisms. MOL is used as a bioactivator to accelerate the fermentation process of goat feed, improve digestibility, and extend feed shelf life.

B. Innovation:
Cost-Effective and Environmentally Friendly Fermented Feed. Pomegranate waste, which was previously unused, is processed into a high-value material in the livestock feed system. The feed is made from local forage and bran, then fermented with MOL to increase nutrient content and reduce feed costs. This innovation contributes to creating a sustainable farming model by reducing waste, lowering production costs, and naturally increasing goat milk productivity.
Innovative Added Value includes local wisdom: utilizing local agricultural waste. Low cost: MOL ingredients are easily available and inexpensive. Simple and proven technology: easy for farmers to apply. Double impact: solves waste problems while improving livestock performance.

C. MOL Production Results:
The resulting MOL has a sweet-sour fermentation aroma, brownish color, and does not contain mold. This indicates successful anaerobic fermentation (Figure 4).

Figure 4. Guava Waste MOL

D. Application in Rations:
Fermenting feed using red guava waste MOL results in a softer feed texture, no foul odor, and is preferred by livestock (Figure 5).

Figure 5. Dairy Goat Feed

E. Livestock Response:
Feeding fermented feed resulted in a ±15% increase in feed consumption compared to regular feed. Livestock showed improved activity and firmer manure, indicating good digestion (Figure 6).

Figure 6. Aplication of Red Guava Waste MOL as a Bioactivator in Dairy Goat Feed

The use of organic waste as a base material for Local Microorganisms (MOL) is an effective and environmentally friendly strategy in supporting the sustainability of livestock businesses. Red guava waste, which is often discarded, has great potential as a source of nutrients and substrate for the growth of fermentative microorganisms. In this Community Service activity, red guava waste MOL was applied as a bioactivator in the fermentation of feed ingredients for dairy goats.
The results of the observation show that feed fermented using red guava waste MOL has an improved aroma, softer texture, and does not produce a foul odor. This indicates that

fermentation is proceeding well, as indicated by the dominance of beneficial microorganisms such as Lactobacillus sp., Saccharomyces sp., and other lactic acid bacteria (National Standardization Agency, 2017). This process produces bioactive compounds such as organic acids, enzymes, and vitamins that help improve feed digestibility (Hastuti, R. A., & Widodo, E, 2020).

The application of fermented feed to partner dairy goats showed a positive response. Farmers stated that goats were more eager to consume fermented feed than conventional feed (Indriani, R., & Kartika, S., 2021). In addition, there are indications of increased milk production, although no quantitative laboratory measurements have been carried out in this activity. Farmers also reported that the goats' feces were more solid and did not have a pungent odor, indicating an increase in digestive efficiency (Purbowati, E., & Priyanto, R., 2015).

From an economic perspective, the use of red guava waste MOL reduces feed production costs (Ministry of Agriculture of the Republic of Indonesia, 2016). MOL is made from materials available in the surrounding environment, without requiring high costs. The manufacturing process is also relatively easy for farmers to carry out, even with only brief training. This reinforces the value of sustainability and independence for farmers in managing their livestock feed efficiently (Lestari, D., & Handayani, E., 2018).

In general, this activity has succeeded in educating partners about the importance of feed source diversification and the use of local waste to support an integrated livestock system. Red guava waste MOL has proven to be a potential bioactivator in feed fermentation, which not only improves ration quality but also helps maintain livestock health and cost efficiency (Safitri, T., & Yuliani, L., 2020).

However, further quantitative and controlled research is needed to measure in detail the effect of MOL on feed nutritional value, milk production performance, and the health status of dairy goats. Follow-up activities also need to strengthen technical assistance to farmers so that this technology can be adopted widely and sustainably.

F. The SWOT analysis of Salman Farm's dairy goat farm.

Strengths:

a) Specialization in Dairy Goats:
Salman Farm has a clear focus on dairy goat farming, which provides advantages in terms of milk production efficiency, livestock management, and the use of supporting technology.

b) Strategic Location:
Located in Heuleut Village and Buah Kapas Village, Majalengka, this location is still beautiful, close to natural feed sources and clean water, and has access to local and regional markets.

c) Professional and Educational Management:
Salman Farm not only functions as a business unit, but also as a place of education and learning for students, the community, and Karang Taruna partners, thereby increasing its social value and branding.

d) Application of Appropriate Technology:
The use of MOL bioactivators from red guava waste and innovative fermented feed demonstrates an environmentally friendly approach and production cost efficiency.

G. Weaknesses:

a) Limited Business Scale:
Livestock capacity and milk production are still relatively small, resulting in weak competitiveness against large producers.

b) Dependence on Local Labor:
Although this presents an opportunity for empowerment, the skills of local human resources sometimes do not meet modern livestock management standards, requiring regular training.

c) Limited Business Capital:
Investment in the development of modern barns, automatic milking machines, and milk processing is still limited.

d) Marketing is Not Yet Diversified:
Sales of dairy products still depend on the local market, with minimal digital branding strategies and distribution partnerships.

H. Opportunities:

a) High Demand for Goat Milk Products:
Goat milk products are increasingly in demand due to their health benefits, especially for consumers with lactose intolerance.

b) Partnerships with Youth Organizations and Farmer Groups:
The potential for developing socio-economic partnerships at the village level opens up opportunities for expansion in production and distribution.

c) Government Program Support:
Assistance programs for farmers, such as KUR, leading livestock programs, and training from the agriculture/livestock service can be utilized.

d) Potential for Derivative Products:
Opportunities for product diversification such as goat milk soap, yogurt, cheese, and organic fertilizer from livestock waste.

I. Threats:
a) Climate Change and Extreme Weather:
Drought or extreme rainfall can disrupt the availability of forage and the comfort of livestock.
b) Livestock Diseases:
Outbreaks of infectious diseases such as brucellosis and mastitis can reduce productivity and cause losses.
c) Fluctuations in Feed and Product Prices:
Dependence on market prices can affect profit margins.
d) Competition with Cow's Milk Products and Imports:
Competition with cheaper cow's milk products and imported products can reduce market share.

3. Posttest

The posttest results showed a significant increase in participants' understanding. All participants were in the high category, indicating that the PKM material successfully improved participants' competence and knowledge regarding the application of red guava waste in dairy goat feed.

Conclusion

The application of MOL from red guava waste has been proven effective as a bioactivator in dairy goat feed. This innovation not only improves feed quality and milk production but also provides a solution to organic waste problems. This PKM activity has successfully empowered partners and raised awareness of sustainable farming practices.

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References

Adiwinata, R., & Susana, W. (2021). Pemanfaatan Mikroorganisme Lokal (MOL) dalam Fermentasi Pakan Ternak. Yogyakarta: Deepublish.

Arief, H., & Budhiarta, K. (2020). Aplikasi Pakan Fermentasi untuk Meningkatkan Produktivitas Kambing Perah. Jurnal Ilmu Peternakan Terapan, 5(2), 78–85.

Astuti, D. A., & Nugroho, A. A. (2019). Teknologi Tepat Guna Pakan Fermentasi dalam Usaha Ternak Rakyat. Jurnal Pengabdian Peternakan, 3(1), 12–19.

Badan Pusat Statistik. (2023). Statistik Peternakan dan Kesehatan Hewan 2022. Jakarta: BPS RI.

Dewi, R., & Cahyono, B. (2018). Pemanfaatan Limbah Buah sebagai Pakan Alternatif Ternak Ruminansia. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner, 108–114.

Dirjen Peternakan dan Kesehatan Hewan. (2021). Outlook Komoditas Peternakan: Susu. Jakarta: Kementerian Pertanian RI.

Hastuti, R. A., & Widodo, E. (2020). Pengaruh Fermentasi terhadap Nilai Nutrisi dan Palatabilitas Pakan Kambing. Jurnal Ilmu Ternak Terapan, 3(1), 15–21.

Indriani, R., & Kartika, S. (2021). Pemanfaatan Limbah Buah Jambu Biji (Psidium guajava L.) sebagai Sumber Nutrisi dalam Bioteknologi Pertanian. Agrosains, 23(3), 44–50.

Kementerian Pertanian Republik Indonesia. (2016). Teknologi Pembuatan MOL dan Aplikasinya pada Pertanian Terpadu. Jakarta: Direktorat Jenderal Peternakan dan Kesehatan Hewan.

Kementerian Riset, Teknologi, dan Pendidikan Tinggi. (2023). Pedoman Program Kreativitas Mahasiswa (PKM). Jakarta: Direktorat Pembelajaran dan Kemahasiswaan.

Lestari, D., & Handayani, E. (2018). Pembuatan MOL dari Limbah Buah dan Penerapannya pada Fermentasi Pakan Ternak. Jurnal Bioteknologi Peternakan, 6(2), 88–95.

Purbowati, E., & Priyanto, R. (2015). Pakan Fermentasi dan Pengaruhnya terhadap Kualitas Produksi Susu Kambing Perah. Buletin Peternakan, 39(4), 236–243.

Safitri, T., & Yuliani, L. (2020). Biokonversi Limbah Organik Menjadi Pakan Fermentasi Menggunakan MOL. Jurnal Sains Peternakan Indonesia, 15(1), 67–74.

Syamsuddin, N., & Ma'ruf, R. (2020). Peran Bioaktivator MOL dalam Meningkatkan Efisiensi Usaha Ternak. Jurnal Agroinovasi, 7(1), 45–52.

Wahyuni, S. (2022). MOL dari Limbah Buah Tropis: Peluang dalam Peternakan Rakyat. Jurnal Teknologi Peternakan Berkelanjutan, 4(2), 134–141.

Widianingrum, D., Imanudin, O., & Kholik, A. (2021). Aplikasi Pemanfaatan Limbah Jambu Biji Menjadi Mol sebagai Bioaktivator Pengolahan Sampah Organik di Desa Panyingkiran. BERNAS: Jurnal Pengabdian Kepada Masyarakat, 2(4), 982-988.