CERTIFICATE

This is to certifity that

Eli Sahara Fitra Yosi, Rizkia Hartati, Febrinita Ulfa, Agil Maulidina, Sofia Sandi, Meisji Liana Sari, Rizki Palupi

Has a presented paper entitled

Potential of Chitosan and Coconut Oil Solution in Preserving the Physical Quality of Local Duck Eggs

In The 7th International Seminar of Animal Nutrition and Feed Science (ISAINI)
"Innovations in Livestock Nutrition for Food Sustainability and Security"
on October 23-24, 2024

Dean of the Faculty of Animal Science, Andalas University

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BOOK OF ABSTRACT

October, 23-24th 2024
Padang, West Sumatra, Indonesia

7th INTERNATIONAL SEMINAR OF AINI

"INNOVATIONS IN LIVESTOCK NUTRITION FOR FOOD SUSTAINABILITY AND SECURITY"

Department of Nutrition and Feed Science, Faculty of Animal Science, Universitas Andalas &
Indonesian Association of Nutritionist and Feed Scientist (AINI)

BOOK OF ABSTRACT

7TH INTERNATIONAL SEMINAR OF AINI & CONGRESS 2024
(ISAINI VII)
"Innovations in Livestock Nutrition for Food Sustainability and Security"

23 October 2024, Santika Premiere Hotel, Padang, Indonesia

Editor:
Simel Sowmen, Zurmiati, Robi Amizar,
Sepri Reski, Rizki Dwi Setiawan

FACULTY OF ANIMAL SCIENCE
UNIVERSITAS ANDALAS
PADANG - INDONESIA

FOREWORD
ORGANIZING COMMITTEE

Assalamu'alaikum Wr. Wb.,

The Honourable Rector of The University of Andalas,
The Dean Faculty of Animal Science, University of Andalas
Distinguish Guests, Seminar Participants, Ladies and Gentlemen,

It is with great pleasure and honor that I welcome you to the **7th International Seminar of the Indonesian Association of Nutritionists and Feed Scientists (ISAINI VII), held in the vibrant city of Padang, West Sumatra,** at **The Hotel Santika Premiere Padang on 23-24 October 2024**. This year's seminar coincides with the **61st Dies Natalis of the Faculty of Animal Science, Universitas Andalas**, marking a significant moment for our academic community.

ISAINI VII aims to provide a platform for scholars, researchers, and practitioners in animal science to exchange knowledge, share cutting-edge research, and explore new trends that will shape the future of livestock science in Indonesia and beyond. As we gather to discuss innovative solutions, particularly in addressing current challenges in animal production, nutrition, welfare, and sustainability, we continue our commitment to contribute to the nation's food security and the global livestock industry. This year, we gather under the theme **"Innovations in Livestock Nutrition for Food Sustainability and Security,"** a topic of paramount importance in today's world, where global food demands constantly increase and natural resources are under greater pressure than ever. The theme for this year's seminar, reflects the growing importance of integrating modern technological advancements with traditional livestock practices, especially in the context of the **Fourth Industrial Revolution and Society 5.0**. It also underscores the vital role of collaboration between academia, government, industry, and society in shaping the future of animal science.

We are privileged to have distinguished invited speakers joining us for this event. Their insights and expertise are pivotal as we navigate the challenges and opportunities within animal nutrition. I would like to extend our deepest appreciation to our honored speakers:

- Assoc. Prof. Yuwares Ruangpanit, Ph.D. (Kasetsart University, Thailand)
- Dr. Reza Abdul Jabbar (Large Scale Dairy Farm, New Zealand)
- Assoc. Prof. Tan Joo Shun (University Sains Malaysia)
- Dr. Roni Pazla (University of Andalas, Indonesia)
- Dr. Thomas Schonewille (Utrecht University, Netherlands)

Their contributions will enrich our discussions and offer innovative solutions for advancing livestock nutrition and ensuring food sustainability.

This seminar brings together experts, researchers, and practitioners from various renowned institutions across the globe, including UGM, UB, UNSRI, UINSUSKA, University of Palangkaraya, University Jendral Sudirman, University Kebangsaan Malaysia, University Malaysia Sabah, University Majalengka, University Muhammadiyah Mamuju, University Prima Nusantara Bukittinggi, University Maha Putra M. Yamin, University Brawijaya, University Sam Ratulangi, University Tamansiswa Padang, and our very own University of Andalas.

The blend of online and offline presentations will foster dynamic exchanges of knowledge, ideas, and innovations, ensuring that the discussions at this seminar will have a wide-reaching impact.

As the chairperson of this event, I sincerely hope that ISAINI VII serves as a platform for inspiring new research, forming meaningful collaborations, and sparking innovative solutions that will drive the future of livestock nutrition and contribute to global food security. Let us take this opportunity to learn, share, and work together toward sustainable and secure food systems for future generations.

Thank you for your participation, and I wish you all a fruitful and rewarding seminar.
Warm regards,

Dr. Ir. Rusmana Wijaya Setia Ningrat, M.Rur.Sc. IPU
Chairman of the Organizing Committee
7th International Seminar of ISAINI
Padang, West Sumatra, Indonesia

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CONFERENCE PROGRAM

The 7th International Seminar Of Animal Nutrition and Feed Science (ISAINI)
"Innovations in Livestock Nutrition for Food Sustainability and Security"

October 22, 2024 (Tuesday)

Time	Activities	PIC
06.00-7.00 PM	Arrive at Bapeda Sumbar Office	Committee
07.00 PM	Welcome Dinner	Committee
07.30 PM	Dance	Gov. Staff
08.00 PM	Welcome remarks by: - Dean of Faculty of Animal Science - Chairman of AINI - Governor of West Sumatera	MC
09.00 PM	Arrive at Santika Hotel	Committee

October 23, 2024 (Wednesday)

Time	Activities	PIC
08.00-08.30 AM	Registration	Committee
08.30-09.30 AM	Opening ceremony	MC
	National Anthem of Indonesia "Indonesia Raya"	UKS FATERNA
	Recitation of the Holy Quran	Student
	Opening Dance : Tari Pasambahan	UKS FATERNA
	Welcome remarks by: - Rector Universitas Andalas	MC
09.30-09.50 AM	Keynote speakers - Mentan RI	MC
09.50-10.45 AM	Invited speakers: 1. Assoc. Prof. Yuwares Ruangpanit, Ph,D (Kasetsart University, Thailand) 2. Assoc. Prof. Tan Joo Shun (University Sains Malaysia) 3. Dr. Thomas Schonewille (Utrecht University)	Moderator Prof. Maria Endo Mahata

10.45 – 11.45 AM	1. Dr. Reza Abdul Jabbar OLarge Scale Dairy Farm, New Zealand) 2. Dr. Roni Pazla (University of Andalas)	Moderator Prof. Yose Rizal
11.45 – 12.00 AM	AINI Partner Presentation: Cheil Jedang Indonesia (CJ Bio)	MC
12.00 – 01.30 PM	Break and Prayer	Committee
01.30 – 04.00 PM	Paralel Session	Committee
04.00 – 04.15 PM	Coffee break	
04.15 – 05.00 PM	Closing - Announcement of the best paper - Announcement of the next ISAINI - Closing remark by AINI Regional Chairman of West Sumatera Province	MC
05.00 – 05.50 PM	Congress AINI	General Secretary of AINI

October 24, 2024 (Thursday)
Field Trip: BPTU Padang Mangateh

Time	Activities	PIC
06.00-07.00 AM	Arrival of participants at the gathering point: Santika Hotel	Committee
07.00 AM	Departure from Padang	Committee
10.30 AM	Arrive at BPTU Padang Mangateh	Committee
12.00 PM	Lunch	Committee
01.30 PM	Head to Bukittinggi (Ngarai Sianok, Jam Gadang)	Committee
05.30 PM	Head to Padang	
06.30 PM	Dinner	Committee
07.30 PM	Head to Padang	
09.30 PM	Arrive at Padang: Santika Hotel	Committee

7TH INTERNATIONAL SEMINAR OF AINI & CONGRESS 2024

23 October 2024, Santika Premiere Hotel, Padang, Indonesia

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KEYNOTE SPEAKER
(Panel Session)

Sustainable Utilization of Pineapple Stem to Improve Poultry Gut Health

Yuwares Ruangpanit, Ph.D.
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Pineapple stem starch (PSS), a by-product from bromelain extraction, contains resistant starch, functional fiber and bromelain that can benefit broiler performance and gut health. Resistant starch and fiber in PSS have prebiotic function since they can undergo microbial fermentation, produce short chain fatty and, lower pH and suppress bacterial growth in the lower gut. Bromelain in PSS can prevent diarrhea by inhibition of cAMP and cGMP signaling pathways activated by bacterial toxins and enzymatic modification of the sites of glycoprotein receptor binding with E. coli located on the intestinal mucosa, preventing bacterial adhesion to intestinal cells. Bromelain has anti-Inflammatory effect by slowing down COX production in cultured cells and stimulate the production of inflammatory mediators. Our study conducted by offered broiler with 4 dietary treatments containing different level of PSS in starter, grower, and finisher, including, Control (0,0,0 % PSS), low (2.5, 5, 7.5% PSS), medium (5, 7.5, 10% PSS) and high (7.5, 10, 12.5% PSS), respectively. Pellet durability index and hardness diminished with higher PSS levels ($p<0.05$). Body weight gain and FCR improved only in broiler fed medium PSS ($p<0.05$) but not for overall growth performance (0-42 DOA). Feeding high PSS increased ($p<0.05$) cecal acetic acid at 21 DOA, propionic and butyric at 42 DOA, and improved jejunum morphology of broiler measured at 21 DOA ($p<0.05$). Feeding medium and high level of PSS reduced blood cholesterol and E. coli in cecal content of broiler ($p<0.05$). Feeding PSS at medium level improved growth performance and at medium and high level of PSS could improve gut health and blood lipid of broilers.

Fermentation technology: a gateway to probiotic and postbiotic development in animal nutrition

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Summary:
The role of fermentation technology is important in advancing biotechnology, with a particular focus on its applications in the animal feed industry. Fermentation technology is a bioprocess that utilizes microorganisms or cell cultures to convert raw materials into valuable products such as feed additives, biofuels, pharmaceuticals, and bioplastics. Various fermentation systems, including stirred tank, airlift, and solid-state bioreactors, are central to the process, underscoring their importance in large-scale production.
The use of fermentation has been shown to improve agro-industrial by-products like palm kernel cake and okara, enhancing their nutritional value through solid-state fermentation. By integrating enzymes and yeasts, these substrates are transformed into protein-enriched animal feed, offering a more sustainable and cost-effective solution for feed production.
Additionally, the growing significance of postbiotics in animal nutrition is explored. Data from experimental trials illustrate the positive impact of postbiotics, derived from *Lacticaseibacillus paracasei FD1*, on poultry growth performance and feed efficiency. Cage and field trials demonstrate improved average daily gain and feed conversion ratios, showcasing the potential of postbiotics as a next-generation feed additive.
The research underscores the broader implications of fermentation technology in addressing global challenges like food security, sustainability, and waste management, positioning it as a cornerstone for future innovations in the biotechnology sector.

Keywords: Fermentation technology, animal feed, probiotics, postbiotics, solid-state fermentation, biotechnology, sustainability.

Exploring mangrove leaves and fruits as feed and additives

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Abstract
Mangroves, particularly *Sonneratia alba* and *Rhizophora apiculata*, are widely found in tropical coastal areas and have significant potential as alternative sources of livestock feed. Regarding availability, Indonesia possesses a substantial expanse of mangrove forest that can be sustainably utilized. Mangroves contain essential nutrients, including fiber, protein, and tannins, making them a potential ruminant feed source. Mangrove leaves, such as those of *R. apiculata*, have been shown to contain approximately 13% crude protein, which can support livestock weight gain. However, *S. alba* fruit contains high tannins, inhibiting protein digestion if not processed first. To reduce tannin levels, various processing methods have been implemented, including fermentation with *Aspergillus niger* and soaking in lime water. Fermentation of mangrove fruit for 16 days has proven to reduce tannin content by up to 24.42%, significantly improving feed digestibility. However, this processing is yet to be optimal to position mangrove fruit as an alternative feed source. Due to its high tannin content, mangrove fruit is more suitable as a feed additive. Using mangrove fruit as a feed additive in livestock rations also helps reduce methane gas production in the rumen, indirectly reducing greenhouse gas emissions from the livestock sector. Through this approach, mangroves provide benefits to the livestock industry and promote the conversation of coastal ecosystems.

Keywords: Mangrove, *Sonneratia alba*, *Rhizophora apiculata*, tannins, fermentation, feed additive.

1. Feed and Climate Change

In vitro digestibility of dry matter, organic matter, and crude protein of *Indigofera zollingeriana* resulted of N, P, and K fertilization and inoculation of arbuscular mycorrhizal fungi fungies cv Glomus manihotis in peatland

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Abstract. This study aimed to determine the best dose of N, P, and K fertilization and Arbuscular Mycorrhizal Fungi (AMF) on *Indigofera zollingeriana* planted on peatland in terms of dry matter, organic matter, and crude protein digestibility respectively. This study used Randomized Group Design with 5 treatments and 4 groups. The treatments were P0 = 100% N, P and K fertilizer + 5 ton/ha manure; P1 = 100% N, P and K fertilizer + 5 ton/ha manure + 10 g AMF; P2 = 75% N, P and K fertilizer + 5 ton/ha manure + 10 g AMF; P3 = 50% N, P and K fertilizer + 5 ton/ha manure + 10 g FMA; P4 = 25% N, P and K fertilizer + 5 ton/ha manure + 10 g AMF. Parameters observed were dry matter digestibility (DMD), organic matter digestibility (OMD), and crude protein digestibility (CPD) by in vitro technique. The results showed that the application of different doses of N, P and K fertilizers on peatlands had a significantly different effect (P>0.05) on digestibility (DM, OM, and CP). Average DMD 54.89-61.85%, OMD 57.55-69.06%, and CDP 59.74-69.54%. The results of this study could be concluded that the application of FMA 10g to Indigofera planted in peatlands could be reduced the use of N, P and K fertilizers by 75% and maintain dry matter, organic matter and crude protein digestibility respectively.

Keywords: *Arbuscular mycorrhizal* fungi, digestibility, in vitro of fermentation, *Indigofera zollingeriana* legume, manure

Comparison effects of omega-3 with the combination of antioxidants and omega-3 to reduce stress response of lamb under hot tropical condition

A Nurlatifah[1], K Kustantinah[1]*, H Herdis[2], DA Astuti[3], Z Zuprizal[1], ND Dono[1], AJ Baskara[1], FA Pamungkas[2], and S Santoso[2]

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Abstract. This study aimed to comparing the effectiveness of fish as souce of Omega-3 with addition of vitamin E and selenium as antioxidant on Omega-3 on blood hematology, physiological response, antioxidant status of male lamb under hot tropical conditions. Twenty-four Garut lambs were allocated into three treatments and eight replications. The treatments included: control (C); C supplemented with 6% lemuru fish oil as source of omega-3 (CO); and CO supplemented with 500 IU of vitamin E and 0.50 ppm of selenium as an antioxidant (COA). The study lasted for 60 days. Lambs were fed Pennisetum puerperium grass and concentrate with a ratio of 30:70% based on dry matter. The experiment was conducted during the dry season, characterized by a THI (temperature humidity index) indicative of intense heat stress conditions. The results showed CO and COA led to a reduction in nutrient intake, heart rate, rectal temperature, neutrophil/lymphocyte ratio, and Malondialdehyde (MDA) compared to C. Consequently, there was a significant increase in lymphocyte, superoxide dismutase (SOD). Adding Omega-3 separately effective to reduce response stress compared to control. However, combining antioxidant on Omega-3 giving stronger effect. Thus, the combination of Omega-3 and antioxidant could serve more effective and beneficial for supporting lambs during hot months in tropical regions.

Kelakai (*Stenochlaena palustris*) production in peatland

R Anjalani[1], Kunstantinah[2]*, B Suhartanto[2], and A Kurniawati[2]
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Abstract. Kelakai (*Stenochlaena palustris*) is one of the ferns that grows in peatlands. One of the uses of kelakai by local communities is as feed. This study aims to explore the production of kelakai in peatlands. The measurement of kelakai production using the Actual Weight Estimate method. The variables observed were the fresh matter, dry matter , and organic matter production of kelakai. Data were analyzed using descriptive statistical methods. The results of the study showed that the total production of fresh matter, dry matter, and organic matter of kelakai fronds in peatland was 3.79 tons/ha, 1.13 tons/ha, and 1.04 tons/ha respectively. Exploration of kelakai needs to be studied further regarding its use as animal feed.

Nutritional status and milk production of lactating dairy cows with current feeding system in the dairy smallholders

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Abstract. This study aims to determine the nutritional status and milk production of Friesian Holstein in the lactation period with a current feeding system in dairy smallholders in Yogyakarta. This study used 20 lactating Friesian Holstein (in the 1 to 3 mid-lactation period). The cows were fed with forages and concentrate as the farmers usually offered (current feeding system). Water was given by *ad libitum*. Data collected were the composition of feed ingredients, nutrient intakes, and milk production. Samples were analyzed in the Laboratory of Dairy Science and Milk Industry, and Laboratory of Feed Technology, Faculty of Animal Science Universitas Gadjah Mada. The data obtained were analyzed descriptively. The results of the study showed that DM intake was 15.27±2.27 kg/head/day, and OM, CP, CF, EE, and TDN intake of each was 13.03±2.00, 1.93±0.34, 3.08±0.83, 0.39±0.07 and 9.45±1.29 kg DM/head/day. The average milk production is 16.5±1.9 L/head/day, production 4% FCM 15.6±1.7 kg/head/day, milk fat content 3.47±0.53%, and milk protein content 3.09±0.30%. Nutrient fulfillment data showed that DM intake was (+)1.38 kg/head/day, and CP, CF, and TDN intake of each was (+)0.20, (+)0.72 and (+)0.38 kg DM/head/day. Based on the results, it can be concluded that the nutrients in the feed (current feeding system, CFS) that the farmers usually offer prove that their ration has met the lactating dairy cow's requirement based on the nutrient balance.

2. Animal Nutrition and Green Environment

Rumen degradation evaluation of five macroalgaes from several location in Indonesia

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Abstract. We have collected four types of macroalgae taken from the coastal of Ambon i.e. Gracilaria spp, and Lombok Indonesia i.e. Caulerpa spp., Dictyota spp., and Padina spp.. All the algaes were analyzed for rumen microbial degradation by the in situ technique. Using two male fistulated Ongole Crossbreed cattles, approximately five g of each by replicate of two sample was put in a nylon bag and incubated on the rumen for 6,12,24,48,72 hours. Degradation correction was made by taken the sample solubility in water (0 h) also. We observed the disappearance of dry matter (DMD), and organic matter (OMD) prior to calculated Effective Disappearance of Dry Matter/ Organic Matter (EDDM/EDDOM), Potential Degradability of Dry Matter/Organic Matter (PDDMD/ PDOMD) and non-degraded fraction of Dry Matter/Organic Matter (UDMD/UOMD). The observation data's were fitted into non-linear intercept regression equations and revealed for the constants. Randomized Block Design (RBD) experiment design analysed by analysed of variance (ANOVA) with repeated measurement continued with Duncant multiple range test (DMRT) for post hock calculation. The DMD and OMD for 72 hours incubation were difference between the algae's ($P<0.05$). The highest values for DMD and OMD ($P<0.05$) achieved by Padina spp. i.e. 74.44 %, and 73.34 %, while the lowest was Caulerpa spp. for DMD ($P<0.05$) (58.96%) and Gracilaria spp. ($P<0.05$) (38.28%) for OMD. Consequently followed the results, Padina spp. also had the highest value for PDDMD (73.90%), PDOMD (75.38%), EDDMD (63.14%), and EDOMD (63.38%), while the lowest PDDMD and PDOMD were Caulerpa spp. (60.39%), Gracilaria spp. (40.04 %) respectively. Caulerpa spp. and Gracilaria spp. had the highest values for UDMD and UOMD i.e. 39.61% and 59.96%, while Padina spp. had the lowest UDMD (26.10%) and UOMD (24.62%) values. The conclusion was that rumen microbial degradation was different by the type of the microalgae's used in this research.

The effect of patchouli (*Pogostemon cablin* Benth.) essential oil on methane production and rumen fermentation in vitro

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Abstract. Several studies showed that the presence of essential oil (EO) in the rumen reduced methane production from enteric rumen fermentation. Still, some kinds of EO and certain levels adversely affect the fermentation in the rumen. This study investigated the impact of adding patchouli EO to the diet on in vitro rumen fermentation parameters and methane production. The diet consisting of elephant grass (*Pennisetum purpureum)*, rice bran, and wheat pollard in a ratio of 60:20:20 was used as a fermentation substrate in the in vitro rumen fermentation. Patchouli EO was mixed with the diet to get EO levels of 0, 25, 50, 75, and 100 µl/L of fermentation medium. Fermentation was conducted using the in vitro gas production technique for 24 hours at 39ºC. The results indicated that adding patchouli EO did not significantly affect pH, ammonia concentration, microbial protein, and number of protozoa cells. However, adding patchouli EO up to 75 µl/L significantly increased total VFA and propionate concentration ($P<0.05$). Methane production was not affected by patchouli EO addition even though the acetate: propionate ratio reduced at EO level 75 µl/L ($P<0.05$). In conclusion, patchouli EO up to 75 µl/L of fermentation medium has no adverse effect on rumen fermentation, increasing VFA, although methane does not reduce.

Intestinal histomorphology examination and growth performance of broiler chickens fed diets containing atung fruit seed meal (*Parinarium glaberrimum* Hassk.)

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Abstract. A study using 140 day-old New Lohmann broiler chickens was performed to investigate the effects of atung fruit seed meal (*Parinarium glaberrimum* Hassk.; AFSM) dietary supplementations on intestinal histomorphology and growth performance. Each bird in this study was offered a same basal diet with one of the following treatments: basal diet only, basal diet + 0,5% AFSM, basal diet + 1,0% AFSM, basal diet + 2,0% AFSM, and basal diet + 4,0% AFSM, based on 35 days examination. Each treatment was replicated four times, with seven birds per cage. Parameter data measured were histomorphological examination (villus length, crypt depth, villus length to crypt depth ratio) and growth performance (feed consumption, final body weight, body weight gain, feed conversion ratio). One-way arrangement of completely randomized design was used based to statistically investigate the responses. Data with significant differences were further separated with Duncan's test. Results indicated that dietary supplementation with 1-4% AFSM reduced crypt depth ($P<0.05$), increased villus length ($P<0.05$) and villus height to crypt depth ratio ($P<0.01$) on the jejunal cell wall, without affecting growth performance. Results indicated that dietary supplementations of atung fruit seed meal stimulated the growth of absorptive cell wall on the jejunum of broiler chickens.

Feed digestibility and milk yield of lactating Saanen-Etawah crossbred fed with seaweed and organic mineral

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Abstract. This research examined the effect of seaweed and organic mineral supplementation compared to rumensin on feed consumption, feed digestibility, and milk yield of Saanen-Etawah crossbreed. Sixteen, 5-month pregnant Saanen crossbred heifers weighing 39.5±2.36 kg were placed in individual pen and assigned to experiment using 4 treatments and four replicates in a completely randomized design. The treatments were T0: control feed, T1: T0+rumensin, T2: T0+2% seaweed, and T3: T2+organic minerals (Cr,Se and Zn). The treatments started for 4 weeks before parturition, and the feed consisted of 70% forage, 20% concentrate, and 10% tofu dregs. This research was carried out at CV. Abadi, Tegal Regency and at the Laboratory of Animal FeedStuff, Animal Science Faculty of Jenderal Soedirman University, Purwokerto, Indonesia. The results showed that the treatment feed influenced the intake of organic matter and the digestibility of dry matter and organic matter. Meanwhile, treatment feed did not influence the intake of dry matter. Significant effects of the treatment feed were found on the milk yield and milk components (fat, lactose, protein, total solids, and SNF). Conclusively, the supplementation of seaweed and organic minerals in dairy goat feed is the best treatment for increasing feed digestibility and increasing milk yield.

Supplementation of *Phaleria macrocarpa* fruit as saponin source on rumen protozoa population, nutrients digestibility of sweet corn straw in invitro methode

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Abstract. Saponin is a secondary metabolite compound that has antiprotozoal activity. The aims of this study was to determine the dose of *Phaleria macrocarpa* fruit supplementation as saponin source in sweet corn straw on rumen protozoa population and in vitro nutrients digestibility. The method was designed using in vitro randomized block design, 4 treatments and 4 groups as replications. The treatment were supplementation of *Phaleria macrocarpa* fruit with doses of 0%, 1%, 2%, and 3% in sweet straw. Treatment 1 (T1) = sweet corn straw without supplementation of *Phaleria macrocarpa fruit;* T2 = T1 + 1% *Phaleria macrocarpa fruit;* T3 = T1 + 3% *Phaleria macrocarpa;* T4 = T1 + *3% Phaleria macrocarpa.* The result showed that supplementation of *Phaleria macrocarpa* were significantly different on rumen protozoa population ($P<0.05$), but it was not significantly different ($P>0.05$) on digestibility of crude fiber, crude fat and nitrogen free extract. In conclusion that the dose of 3% *Phaleria macrocarpa* fruit can be used to decrease rumen protozoa population but it has not been able to increase the in vitro digestibility of nutrients.

Keywords: Nutrients digestibility, *Phaleria macrocarpa*. rumen protozoa, saponin, sweet corn straw

Nutrient Digestibility and Rumen Fermentation Characteristics with *Palisada perforate* (Bory) K.W.Nam supplementation on goat diet

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Abstract. In this study, a red macroalgae species, *Palisada perforate* (Bory) K.W.Nam, was processed as a supplement total mixed ration, which was used to evaluate their in vivo nutrient digestibility and rumen fermentation characteristics. Fifteen Kacang goats (body weight 16.85-31.80 kg) were used in this study and arranged in a complete randomized block design with three treatments and five replications. The treatments were control (total mixed ration without supplementation), supplementation *Palisada perforate* (Bory) K.W.Nam 2.5% OM, and 5.0% OM. The result showed that nutrient digestibility (dry matter (DM), ether extract (EE), crude fiber (CF), crude protein (CP), and nitrogen free extract (NFE)) did not affect (P>0.05) with *Palisada perforate* (Bory) K.W.Nam supplementation. Supplementing that seaweed at 5.0% OM increased (P<0.01) total VFA production, propionate proportion, and microbial protein synthesis. That treatment also decreased (P<0.01) acetate proportion followed by acetate and propionate ratio without affecting pH value and NH3 concentration. It is concluded that the total mixed ration supplemented with *Palisada perforate* (Bory) K.W.Nam 5.0% OM increased rumen fermentation characteristics

Characterisation of feed intake, growth performance, digestibility, and carcass traits in rabbits fed pellets containing pineapple leaf

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Abstract. Pineapple production in Malaysia generates a significant amount of nutrient-rich waste. This study aimed to assess the effect of pellets containing pineapple leaf on feed intake, growth performance, digestibility, and carcass characteristics of rabbits. Twelve male rabbits, aged 2 months, were divided into two groups : (i) control (commercial pellets) and (ii) T1 (pellets with pineapple leaf). Both groups had ad libitum access to feed and water for 56 days. The control group exhibited better growth (6.67 g/d/rabbit) and significantly higher intake of dry matter, crude protein, ether extract, ash, and organic matter ($p<0.05$). Digestibility of crude protein and ether extract were also better in the control group ($p<0.05$). No significant differences ($p>0.05$) were observed in carcass characteristics, meat chemical composition, pH, color, or mineral content between the two groups. Overall, commercial pellets improved feed intake and growth performance. Further studies are needed to optimize pineapple leaf incorporation in rabbit pellets for better results.

The effect of adhesive materials on the physical and chemical quality of pellets from a combination of cassava and *Indigofera zollingeriana* leaves

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Abstract. Cassava tubers and *Indigofera zollingeriana* leaves are one of the feed ingredients that have the potential to replace corn in poultry rations. This study aims to study the physical and chemical quality of pellets with a basic combination of cassava tubers and *Indigofera zollingeriana* with the use of different adhesives. The design used was a Completely Randomized Design consisting of 3 treatments and 6 replications. The treatments consisted of P1 (Use of 70% combination of cassava tuber flour, 30% *Indigofera zollingeriana*) P2 (Use of 70% combination of cassava tuber flour, 24% *Indigofera zollingeriana* + 6% tapioca) P3 (Use of 70% combination of cassava tuber flour, 27% *Indigofera zollingeriana* + 3% molasses). The parameters observed in this study were the physical quality of pellets (specific gravity, stack density, stack compaction density and color) and the chemical quality of pellets (water content, crude protein and chemical quality after storage period). The results showed that the treatment had a significant effect ($P<0.05$) on stack density and had no significant effect ($P>0.05$) on specific gravity and stack compaction density, and color. Then the treatment had no significant effect ($P>0.05$) on the physical quality of the pellets produced. The conclusion of making cassava tuber and Indigofera zollingeriana leaf pellets with the addition of molasses without the addition of adhesives gave the best results in physical quality and chemical quality of pellets.

Keywords: Cassava root, chemical quality, *Indigofera zollingeriana*, physical quality, pellets.

Characteristics of rumen fermentation with feed formulation using molasses in-vitro

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Abstract. This study aims to determine the effect of molasses use in ruminant livestock rations on rumen fluid characteristics in vitro. This study was conducted using a Completely Randomized Design experimental method with 3 treatments and 5 replications, the treatments consisted of: P0 = Ration formulation without molasses use, P1 = Ration formulation with 3% molasses use, P2 = Ration formulation with 6% molasses use. The variables observed were pH value, NH3 production and rumen fluid VFA production. The results of the study for pH value obtained P0 = 6.98; P1 = 6.94; P2 = 6.89. NH_3 production P0 = 10.02 mg / 100ml; P1 = 10.89 mg / 100ml; P2 = 11.42 mg / 100ml and VFA production P0 = 104.00 mM; P1 = 120.00 mM; P2 = 130.00 mM. Based on the results of the study, it was shown that the use of molasses in the ruminant livestock ration formula had no significant effect ($P>0.05$) on the pH, and had a significant effect ($P<0.05$) on the production of NH_3 and VFA in the rumen in vitro. Where the use of molasses up to 6% in the ration formulation can increase NH_3 production, VFA production and maintain the pH value of the rumen fluid.

Keywords: molasses, In vitro, feed formulation, pH, NH_3, VFA

Effect of N, P, and K fertilizer doses and the addition of arbuscular mycorrhizal fungi (FMA) on micro mineral content (mn, zn, fe, cu) in *Indigofera zollingeriana* in Mentawai Island

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Abstract. This study aims to obtain efficient doses of N, P, K fertilizers on the content of micro minerals (Mn, Zn, Fe, Cu) in Indigofera zollingeriana with the addition of FMA grown on ultisol lands. This study used the Randomized Group Design (RAK) method with 5 treatments and 4 replication groups. The treatments were P0 = 100% N, P and K fertilizer; P1 = 100% N, P and K fertilizer + 10 g FMA; P2 = 75% N, P and K fertilizer + 10 g FMA; P3 = 50% N, P and K fertilizer + 10 g FMA; P4 = 25% N, P and K fertilizer + 10 g FMA and replication groups based on different positions on the slope level of the land. Harvesting of Indigofera zollingeriana was done at the age of 120 HST. The observed variables were micro mineral content (Zn, Mn, Fe, Cu). The results showed that the doses of N, P, and K fertilizers with the addition of 10 g FMA gave very significantly different results ($P < 0.01$) on the content of micro minerals (Zn, Mn, Fe, Cu). The average Zn content was ranged from 0.49-1.66 mg/kg, Mn content 0.27 - 0.70 mg/kg, Fe content 2.70-3.48, and Cu content 0.50-1.08 mg/kg, rspectively. From the results of the study it could be concluded that the application of 25% N, P, and K fertilizers inoculated with 10 g FMA can increase the content of micro minerals (Mn, Zn, Fe, and Cu) in *Indigofera zollingeriana* in ultisol lands and the use of FMA is effective in reducing the dose of N, P, and K fertilizers up to 75%.

Keywords: Indigofera, peatland, micro mineral, arbuscular mycorrhizal fungi

3. Animal Nutrition and Feed Engineering

Efficacy of drinking water addition with fingerroot essential oil nanoemulsion on performance and egg quality in laying hens

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Abstract. Current research was aimed to determine production performance of laying hens, as well as egg physic-chemical traits of laying hens given drinking water added with finggerroot (*Boesenbergia pandurata*) essential oil nanoemulsion (NMATK). Material used in this study were self-nanoemulsifying drug delivery system (SNEDDS) of finggerroot essential oil, antibiotic tetracycline, 180 of 28 days laying hens, treatment diets, and full-facility poultry house. Parameter data observed were production performance, as well as egg egg physical and egg chemical quality. Each bird was offered one of the following 5 diet treatments: drinking water without any additive (negative control: P0), dringking water + 45 mg/l antibiotic tetracycline (positif control; P1), drinking water + 2.5 ppm NMATK (P2), drinking water + 3.5 ppm NMATK (P3), or drinking water + 4.5 ppm NMATK (P4). Data obtained were analized statistically using ANOVA, with One-way arrangement of completely randomized design. Results showed that addition of 2.5-4.5 ppm of NMATK in drinking water did not influence production performance but increased egg index, shell thickness, yolk protein ($P<0.05$), and reduced yolk cholesterol ($P<0.01$), and increased yolk color intensity. It might be concluded that addition of drinking water increased the physico-chemical quality of egg in laying hens.

Effect of supplementation of Lactobacillus culture derived from ensiled *Hymenache acutigluma* through drinking water on body weight, feed digestibility, and carcass characteristics of pegagan ducks

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Abstract. This study aimed to evaluate the effect of supplementing *Lactobacillus* culture isolated from ensiled *Hymenache acutigluma* (LHA) with different concentrations via drinking water on body weight, diet digestibility, digestive tract measurements, and carcass characteristics of Pegagan ducks. A total of 60 24-week-old Pegagan ducks were randomly divided into 5 groups with 4 replicates per group, consisting of a control group (LHA0) and groups receiving LHA solution in drinking water at concentrations of 1x 10^6 (LHA1), 10^7 (LHA2), 10^8 (LHA3), and 10^9 (LHA4) CFU/mL. Supplementation with LHA solutions improved the relative weights of the proventriculus, duodenum, jejunum, ileum, total small intestine, and pancreas ($P < 0.05$), as well as the density of the duodenum, ileum, and total small intestine ($P < 0.05$). Dietary organic matter and crude fiber digestibility increased linearly with increasing concentration of LHA solution ($P < 0.05$). LHA supplementation also improved whole carcass percentage and thigh slices ($P < 0.05$). The percentage of abdominal fat decreased linearly with increasing concentration of LHA solution ($P = 0.004$). In conclusion, administration of LHA solution with increasing concentration effectively increased the digestibility of dietary crude fiber and organic matter, improved digestive activity, increased carcass yield, and reduced abdominal fat.

Effects of whey on the quality of fermented total mixed ration

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Abstract. The present study was purposed to investigate the effect of whey as additive and moisturizer on chemical compositions and fermentation characteristics of fermented total mixed ration (FTMR). Whey was obtained as a by-product from cheese industry. Whey is an enrichment medium for probiotics. The FTMR used rice straw as a main ingredient. The other ingredients consisted of rice bran, copra meal, pollard, and molasses. To reach an optimum moisture for fermentation (55%), FTMR was moisturized using different ratio of whey and water: 0:2 (CON), 1:1 (T1), 2:1 (T3), and 2:0 (T4). The FTMR was fermented using complex microbes ((Effective Microorganism-4) into 3 kg mini-silo for 30 days. Each treatment using 3 silos as replication. The application of whey in all ratios had no effects on chemical compositions consisting of dry matter, organic matter, crude protein, ether extract, and crude fiber. In addition, pH, and concentrations of ammonia and lactate were not affected by whey applications. However, applications of whey improved the physical parameters, such as decreasing burning color and slimy texture of FTMR. In conclusion, the present study found that application of whey could not modify a fermentation process, but shown beneficial effects on physical parameters of FTMR.

The effect of adding *Saccharomyces cerevisiae* and sulfur mineral in ammoniated citronella waste basal ration to consumptions, nutrient digestibility, milk production, and milk quality of etawa crossbreed goat

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Abstract. Citronella waste (Cymbopogon nardus L. Rendle) is potentially used as a fiber source in livestock feed but contains a high lignin content. To enhance digestibility in livestock Feed, processing through ammoniation and supplementation with probiotics and minerals is required. Saccharomyces cerevisiae and mineral sulfur are essential probiotics and minerals for improving rumen microorganism balance and optimizing fiber-digesting microorganisms. This study aims to examine the effect of Saccharomyces cerevisiae and mineral sulfur supplementation on an ammoniated Citronella waste basal diet to optimize rumen bioprocesses, thereby enhancing intake, nutrient digestibility, milk production, and milk quality in Etawa crossbreed goats. The study employed experimental methods involving PE goats, grouped based on milk production into four groups, each receiving one of four treatments (P0, P1, P2, P3). The results indicate that supplementing S. cerevisiae and mineral sulfur had no significant effect on nutrient intake, yet it significantly improved nutrient digestibility. This combination also exhibited no significant impact on milk production and milk quality but substantially affected milk fat content. In conclusion, using a combination of 0.5% Saccharomyces cerevisiae and 0.3% mineral sulfur, along with including Citronella waste in the diet, can enhance the efficiency of nutrient utilization in crossbred Etawa goats.

Keywords: Etawa Crossbreed Goats; *Saccharomyces cerevisiae*; Mineral Sulfur; *Citronella* waste; nutrient digestibility; rumen bioprocess

Physical quality of broiler breast meat palm kernel cake fed palm kernel cake and enzyme supplementation

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Abstract. This study aimed to determine the physical quality of breast meat from broiler chickens fed by palm kernel cake (PKC) with enzyme supplementation. This study used 1,260 chickens with 7 treatments reared for 35 days with two kinds of mixed enzymes. Enzyme 1 consisted of mannanase 182 g/ton, NSPase 200 g/ton, and protease 130 g/ton feed while enzyme 2 consisted of mannanase 182 g/ton, NSPase 400 g/ton, and protease 260 g/ton feed. Feed treatments consisted of control (P0), addition of PKC 10% (P1), PKC 20% (P2), PKC 10% with enzyme 1 (P3), PKC 20% with enzyme 2 (P4), PKC 10% with enzyme 1 (P5), and PKC 20% with enzyme 2 (P6). The research data were the quality of broiler breast meat including moisture content, water holding capacity, cooking loss, tenderness, and meat pH. Data were analyzed using analysis of variance and followed by an orthogonal contrast test. The results showed that breast meat from broiler chickens fed PKC with enzyme supplementation increased water-holding capacity and tenderness, reduced cooking loss, and did not increase water content and pH. It was concluded that 20% PKC and 182 g/ton mannanase, 400 g/ton NSPase, and 260 g/ton protease enzymes had the best results.

Enhancing ruminant nutrition and reducing methane emissions with sutera gambir: a sustainable feed additive

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Abstrak. This study examines the use of gambir (Uncaria gambir) from the Sutera region as a novel supplement in ruminant feed rations to improve nutritional efficiency and reduce methane emissions. Gambir is rich in tannin and catechin compounds, which are known to be effective defaunation and antimetanogenic agents. The research utilized a Randomized Block Design (RBD) with four treatments and four replications: A (standard ration), B (ration + 0.5% Sutera gambir), C (ration + 1% Sutera gambir), and D (ration + 2% Sutera gambir). Key parameters measured were the digestibility of crude fiber, crude fat, nitrogen-free extract (NFE), and methane gas production. Analysis of variance and the DMRT test showed significant effects ($P<0.05$) across all parameters. Treatment D yielded the best results, with crude fiber digestibility at 58.09%, crude fat digestibility at 58.95%, NFE at 59.81%, and methane production reduced to 11.37 ml/g DM. These findings demonstrate that gambir not only enhances nutritional performance but also reduces methane emissions, promoting sustainability and efficiency in ruminant farming. This study highlights the potential of using local materials in more environmentally friendly livestock feed.

Keyword : Gambir (*Uncaria gambir*), Ruminant Feed Efficiency, Methane Emission Reduction, Tannin and Catechin Compounds, Sustainable Livestock Farming

Effect of tapioca starch as an adhesive in "complete feed wafers" based on fermented sugarcane tops and tithonia on the digestibility of crude fiber, crude fat, and NFE

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Abstract. This study aims to determine tapioca starch as an adhesive material for complete feed wafers based on fermented bagasse and tithonia diversifolia. Tapioca starch contains amylose which is very influential in making wafers. The advantages of processing feed into wafers include increasing density, reducing storage space, reducing transportation costs, making it easier to control, monitor and regulate animal feed intake, and consistent and guaranteed nutritional content. This study used a completely randomized design (CRD) with four treatments and four replicates, the treatments included: A: 60% forage: 30% concentrate + 10% tapioca starch, B: 60% forage: 25% concentrate + 15% tapioca starch, C: 60% forage: 20% concentrate + 20% tapioca starch, D: 60% forage: 15% concentrate + 25% tapioca starch. The variables measured were digestibility of crude fiber, crude fat, and NFE. The results of the analysis showed that the treatments had no significant effect (P>0.05) on the digestibility of crude fiber, crude fat, and NFE. This study concluded that the use of 10% tapioca starch as an adhesive was sufficient to maintain the digestibility of crude fiber, crude fat, and NFE. Crude fiber digestibility with a value of 57.14%, crude fat digestibility of 56.70%, and NFE digestibility of 61.07%.

Keywords: Digestibility, Sugarcane tops, Tapioca, Tithonia, Wafer

A study of hematological changes in growing goat fed on diets with limestone-urea mixture supplementation

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Abstract. The study examined the effect of limestone-urea mixture (LU) supplementation with different nitrogen (N): non fiber carbohydrate (NFC) ratio in the diet on hematological changes in growing goat. Twelve Jawarandu local male goats with body weight average of 20.83 kg and aged at 4-6 months old were randomly divided into four blocks based on their body weight and received three dietary treatments namely C12, LU12, and LU18. The diets were as follows: C12 with a 1:12 of N:NFC ratio and without LU supplementation; LU 12 with a 1:12 of N:NFC ratio and LU supplementation; and LU18 with a 1:18 of N:NFC ratio and LU supplementation. The LU was supplemented at 5% of total feed. The feeding trial period was conducted 12 weeks. Intake (g/d) were unaffected by treatments. Red blood cells were not different except erythrocyte and hematocrit values were higher ($P<0.05$) in UL12 group compared to C12 and LU18 groups. White blood cells also were not affected by supplementation of limestone-urea. In conclusion, the lack of significant difference in white blood cells may indicated that adding LU on diet were not exhibit signs of inflammation or stress in response to the goat.

Keywords: limestone-urea mixture, non fiber carbohydrate, hematological, goat

Potential use of onion peel powder as a feed additive on final body weight and carcass percentage of broiler chickens

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Abstract. This study aims to determine the effect of onion peel as a feed additive on the final body weight, percentage of carcass and other carcass parts including breasts, thighs and wings of broilers. The materials used were 189 day old chick with broiler (unsexing). The method used was a Complete Randomized Design (CRD) with 9 treatments and 3 replicates. The treatments were T0(-): commercial feed, T0(+): commercial feed + 0,1% zinc bacitracin, T1: commercial feed + 0,50% garlic peel, T2: commercial feed + 0,50% shallot peel, T3: commercial feed + 0,50% onion peel, T4: commercial feed + 0,25% garlic peel and 0,25% shallot peel, T5: commercial feed + 0.25 % garlic peel + 0,25% onion peel, T6: commercial feed + 0.25% shallot peel + 0.25% onion peel, T7: commercial feed + 0.167% garlic peel + 0.167% shallot peel + 0.167% onion peel). Data obtained from the results of the research were then analyzed using ANOVA (Analysis of Variance) in CRD, and will be continued with the Duncan's Multiple Range Test (DMRT). The results of this study showed that the addition of different onion peel powder as a feed additive did not have a significant effect (P>0.05) on final body weight, carcass percentage, chest percentage, upper thigh percentage, lower thigh percentage and wing percentage. Based on the research results, it can be concluded that the use of onion peel powder as feed additives has not been able to increase the carcass percentage of broiler chickens.

Keywords: onion peel, flavonoid, antioxidant, final body weight, percentage carcass of broiler

Use of processed afkir salted fish meal (pasfim) in beef cattle dietary with ammonized rice straw basis

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Abstract. This research aims to determine the effect of using PASFIM supplement in ammoniated straw-based rations on consumption/digestibility of nutrients, average daily gain (ADG), feed effi-ciency, protein efficiency ratio (PER). By using a 3 x 3 Latin Square (BSL) experiment design, three Bali beef cattle were each given three types of treatment rations (R), R1 = ration with 3% PASFIM; R2 = ration with 4% PASFIM; and R3 = ration with 5% PASFIM. The variables ob-served were nutrients consumption/digestibility, ADG, feed efficiency and protein efficiency ratio (PER). The results of the study showed that the use of PASFIM in the ration had a non-significantly different effect (P>0.05) on nutrient consumption/digestibility, ADG, Feed effi-ciency and PER. However, increasing the use of PASFIM generally causes an increase in pa-rameters, unless there was a decrease in nutrient digestibility. It could be concluded that the use of 4% PASFIM supplementation in the ration produced a relative good for nutrient consump-tion/digestibility, ADG, feed efficiency and PER.

Keywords: processed afkir salted fish meal, digestion, ADG, Feed eficiency, PER

Comparison effects of omega-3 with the combination of antioxidants and omega-3 to reduce stress response of lamb under hot tropical condition

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Abstract. The study aimed to examine the effect of lemna flour supplementation on dairy goat basal feed containing chromium mineral on milk protuction and milk component of dairy goat milk. The research was carried out in March – June 2024 at the Mendha Adhikara Dairy Goat Farm, Jln. Brawijaya, Banyumas Regency Central Java, Dairy Production Laboratory of Faculty of Animal Science, Jenderal Soedirman University. The material used was 18 female sapera goats (lactation 1, 2, and 3) with an average body weight of 40±3.56 kg, basal feed was given as much as 4% DM/ kg BW. The research method uses a random design of split plot pattern groups. The treatment consisted of: R0 as basal feed (40% concentrate + 60% forage) + Chromium 1.5 ppm and R1 (R0+lemna flour sp. 2%). The research data was analyzed by variance analysis and further tests using the Duncan Multiple Range Test. The results showed that the supplementation of 2% lemna flour in R1 had significant effect on increasing milk production and lactose, milk fat, protein, total solid production. In conclusion, supplementation of Lemna sp. in chromium basal feed in dairy goats can increase milk production and milk component of dairy goat milk.

Growth and production and Revenue Cost Ratio (RCR) of *Indigofera zollingeriana* sp. planted with N, P, and K supplements and inoculation of arbuscula micoriza fungi CV. Glomus manihotis in peatlands

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Abstract. This study aims to obtain efficient doses of N, P, and K fertilizers in Indigofera zollingeriana sp. plants inoculated with Arbuscular Mycorrhizal Fungi (FMA) cv. Glomus manihotis on peatland in terms of growth, production, and Revenue Cost Ratio (RCR). This study used Indigofera zollingeriana sp. seedlings aged 60 days which were nursed at the Edu Farm Faculty of Animal Science, Andalas University. The research used Randomized Group Design (RAK) method with 5 treatments P0 = 100% N, P, and K fertilizer, P1 = 100% N, P, and K fertilizer + 10 g FMA, P2 = 75% N, P, and K fertilizer + 10 g FMA, P3 = 50% N, P, and K fertilizer + 10 g FMA, and P4 = 25% N, P, and K fertilizer + 10 g FMA and 4 groups. The results showed that the doses of N, P, and K fertilizers + 10 g FMA a differed not significantly (P>0.05) on plant height ranged from 51,61 cm to 64,59 cm, leaf length ranged from 4,81 cm to 5,52 cm, leaf width ranged from 2,11 cm to 2,26 cm, stem diameter ranged from 0,48 cm to 0,63 cm, many leaves ranged from 229,21 leaf blade to 323,74 leaf blade, harvest production ranged from 4,68 tons/ha/harvest to 8,14 tons/ha/harvest to , dry matter production ranged from 1,16 tons/ha/harvest to 1,80 tons/ha/harvest, and Revenue Cost Ratio ranged from 0,07 ratio to 0,12 ratio respectively. From the results of the study it could concluded that the provision of fertilizer doses of N, P, and K as much as 25% inoculated with 10 g FMA is able to maintain the productivity of Indigofera zollingeriana sp. in peatlands. The addition of FMA inoculation to Indigofera zollingeriana sp. plants gave the same effect on growth parameters, production and Revenue Cost Ratio (RCR) and was able to reduce the use of N, P, and K fertilizers by 75%.

Keywords: FMA, Indigofera zollingeriana sp, Peatland, N, P, K Fertilizer

Effect of shelf life on the physical quality of sugarcane tops (*Saccharum officinarum L.*) and *Tithonia diversifolia* wafers as ruminant feed

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Abstract. This study aims to determine how long sugarcane tops and *Tithonia diversifolia* wafers can be stored. This study used a completely randomized design (CRD) with four treatments and four replications. The treatments consisted of P1 (15 days storage duration), P2 (30 days storage duration), P3 (45 days storage duration), and P4 (60 days storage duration). The variables measured were color, aroma, texture, density, water absorption and total fungal colonies. The data obtained from the study were analyzed using the analysis of variance method and the differences in the means of each treatment were further tested with the Duncan Multiple Range Test (DMRT). The results of the analysis showed that shelf life had a very significant effect ($P<0.01$) on color, aroma, texture, water absorption and total fungal colonies, but gave no significant effect ($P>0.05$) on wafer density. The results showed that 60 days of storage on sugarcane tops and tithonia diversifolia wafers can still maintain the physical quality of wafers in terms of color 3.8, texture 3.9, aroma 3.3, water absorption 71.8% and total fungal colonies 3.10 x 10^2 CFU/ml.

Keywords: Sugarcane shoots, titonia, wafers, storage duration, physical quality

Substitution of corn tumpi with dragon fruit peel: effects on goat growth and digestibility

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Abstract. This research evaluates the use of corn tumps and dragon fruit peel flour as alternative ingredients in complete feed for goats. The main objective is to analyze the chemical composition and test the effect of substituting corn tubi with dragon fruit peel flour on consumption, nutritional digestibility and performance of goats. A total of 12 male goats were used in a randomized block design with three treatments: P1 (50% corn tump without dragon fruit peel flour), P2 (45% corn tump and 5% dragon fruit peel flour), and P3 (40% corn tump and 5% dragon fruit peel flour). 10% dragon fruit peel flour). The results showed that the substitution of corn tumpi with dragon fruit peel flour significantly increased crude protein consumption, crude fiber, and crude fiber digestibility, while crude protein digestibility was not significantly affected. Feed with 10% dragon fruit peel flour (P3) provides the best results in consumption and digestibility, making it an optimal option for ruminant feed, especially goats. This can be seen from the daily weight gain in goats in the higher P3 treatment.

Protein quality, crude fat, and chitin of *Zophobas morio* caterpillar with different composition of cultivated media

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Abstract: The media commonly used to cultivate *Zophobas morio* caterpillar is commercial ration. Commercial ration have a relatively high price because of the effort to reduce costs; Commercial Ration (CR) media is substituted with Tofu Dregs (TD). This study aims to study the effect of cultivated media composition on the protein quality, crude fat, and chitin of *Zophobas morio* caterpillar. The method used is an experimental method with a Complete Randomized Design (CRD) with 6 treatments (different compositions of cultivated media) and 3 repeats. The treatments are A (100% CR), B (80% CR + 20% TD), C (60% CR + 40% TD), D (40% CR + 60% TD), E (20% CR + 80% TD) and F (100% TD). The observed modifiers were crude protein (%), crude fat (%), fresh production (g/500g media), chitin (%), and nitrogen retention (%). The results showed that differences in cultivated media composition had a significantly different effect ($P<0.05$) on crude protein, crude fat, fresh production, chitin, and nitrogen retention of *Zophobas morio* caterpillar. This study concludes that 100% tofu dregs media is the selected treatment for *Zophobas morio* caterpillar cultivation. This can be seen in crude protein 47.12%, crude fat 46.31%, fresh production 328.11g, chitin 12.54%, and nitrogen retention 63.27%.

Keywords: commercial rations; tofu dregs; protein quality; crude fat; *Zophobas morio* caterpillar.

Effect of inoculum type (Probion and *Phanerochaete chrysosporium*) and palm leaf fermentation duration on *in vitro* digestibility of coarse-grained fibers, coarse-fat, betn and characteristics of rumen fluids

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Abstract. Studies were conducted to obtain the best type of inoculum (Probion and P.chrysosporium) and fermentation time from palm leaf leaf fermentation. The palm leaf release (PDS) used in this study was a release with finely chopped leaves and palm fronds. This research method used the experimental method Random Draft Group (RAK) factorial pattern, where in factor A (inoculum type Probion 0.25% and *P. chrysosporium* 7%) and Factor B (fermentation length 14,21,28 days) with 6 treatments with 3 replicates. The observed variables were Degree of Acidity (pH), NH3 Concentration, and VFA Production. The results showed that PDS fermentation treatment using Probion and P. chrysosporium with different fermentation durations exerted markedly different effects (P 0.05) on Acidity (pH) and VFA Production, differing unnoticeably (P 0.05) on the digestibility of coarse fiber, coarse fat, and BETN digestibility. Based on the results of the study, it can be concluded that administration of probiotics with a fermentation time of 28 days gives good results against the Degree of Acidity (pH), NH3 Concentration, and VFA Production, while the best result against digestibility of coarse fiber, coarse fat, and BETN is, administration of *P. chrysosporium* for 14 days

Keywords: fermentation, rumen liquid characteristics, digestibility, *P. chrysosporium*, PDS, Probion

Lemuru fish oil microencapsulation: using gambir leaf residues as a coating material

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Abstract. Microencapsulation of Lemuru Fish Oil (LFO) has some encountered issues associated to its effective coating materials. Selecting the coating material to encapsulated oil is significantly important. Coating materials have been widely used for microencapsulation, yet there is lack of using local sources as solution. Gambir leaf residues (GLR) are local source which contained 15% of tannic acid (TA) (Ningrat, 2017) from Payakumbuh. In this study, the effect of GLR in different levels (3 (0,45% TA), 6 (0,9% TA), 9 (1,35% TA), 12% (1,8% TA) were investigated. The lowest of microencapsulation efficiency was found at the level of 3%. It similars with surfaced oil and encapsulated oil. The highest of encapsulation efficiency was found at 12% of GLR. Encapsulation efficiency was linear with surfaced oil and encapsulated oil. The result showed that encapsulated oil, surfaced oil and encapsulation efficiency were significantly different (P<0,01). Furthermore, the addition of 12% GLR were best treatment for microencapsulation of LFO.

Keywords: gambir leaf residues, microencapsulation efficiency, bioactive compound, lemuru fish oil

The effect of combining BMR mutant sorghum (*Sorghum Bicolor* L. Moench) and butterfly pea (*Clitoria ternatea* L.) on the *In Vitro* digestibility of crude fiber, crude fat, nitrogen-free extracts, and fiber fractions

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Abstract. This study aimed to evaluate the optimal combination of BMR mutant sorghum (Sorghum bicolor L. Moench) and butterfly pea (*Clitoria ternatea* L.) on the in vitro digestibility of crude fiber, crude fat, nitrogen-free extracts (NFE), and fiber fractions, including NDF, ADF, cellulose, and hemicellulose. The experiment utilized a completely randomized design (CRD) with three treatments (A: 70% BMR mutant sorghum + 30% butterfly pea, B: 60% BMR mutant sorghum + 40% butterfly pea, C: 50% BMR mutant sorghum + 50% butterfly pea) and three replications. The parameters observed included crude fiber (CF), crude fat (CF), NFE, NDF, ADF, cellulose, and hemicellulose. Data were analyzed using Analysis of Variance (ANOVA) and differences between treatments were further evaluated with Duncan's Multiple Range Test (DMRT). The results indicated that the combination of BMR mutant sorghum and butterfly pea significantly influenced the digestibility of crude fiber (56.61%-64.60%), crude fat (58.80%-65.84%), NFE (59.06%-65.89%), and the fiber fractions, including NDF (56.20%-63.98%), ADF (55.68%-63.90%), cellulose (57.32%-64.80%), and hemicellulose (57.73%-65.70%). The best treatment was found to be the combination of 70% BMR mutant sorghum and 30% butterfly pea, which resulted in crude fiber digestibility of 64.60%, crude fat digestibility of 65.84%, NFE digestibility of 65.89%, NDF digestibility of 63.98%, ADF digestibility of 63.90%, cellulose digestibility of 64.80%, and hemicellulose digestibility of 65.70%. These findings suggest the potential of this combination as an efficient feed to enhance fiber digestibility and other important components for ruminant livestock.

Keywords: BMR mutant sorghum, butterfly pea, digestibility, fiber fractions, in vitro, livestock feed

Silage quality of various forages including lowland ramie leaf (*Boehmeria nivea* L Gaud) with different additives

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Abstract. The research aims to determine the quality of silage of various types of forage including lowland ramie leaves with different additives. Forage material: lowland ramie leaves (100 meters above sea level) (R), a mixture of ramie-elephant grass (1:1) (RG) and elephant grass (G) 1500g (DW 60%) and additives molasses (M), rice bran (D) and cassava (S) as much as 5% (BK) of silage material. Using a completely randomized design (CRD) with a nested pattern with a main plot of forage type and additive as a subplot, repeated 5 times. The silage variables observed were pH, presence of mold, flavour, water content, ash, CF (crude fiber) and CP (crude protein). The 21 day ensilage results showed that the type of forage influenced the pH of the silage: 7.15 (R), 6.46 (RG) and 4.06 (G) ($P<0.01$) while the presence of molds and the flavour of the silage did not differ. The type of forage affects the water content: 62,71±2,68% (R), 70,99±3,02% (RG) and 80,81±1,61% (G) and ash: 29,40±1.61% (R); 25.42±2.96% (RG) and 16.71% (G) ($P<0.01$). Crude fiber: 28.63±5.98% (R), 24.44±4.33% (RG) and 22.59±3.97% (G) while CP: 11.74±1.56% (R), 11.83±1.38% (RG) and 9.00±1.18% (G) ($P>0.05$). The best water content and CF with rice bran additive (D) were 70.61 ± 8.51% and 20.44 ± 2.63%; the best ash was molasses (M) addditive: 30.49±4.77%; the highest crude protein was cassava additive (S) 11.83 ± 1.38%. Lowland ramie leaf silage and cassava additive showed the best protein content.

Keywords: ramie leaf, elephant grass, additive, silage

Growth, efficiency, and nutrient digestibility of broiler chicken as affected by different level of lauric acid, and crude fiber in the diet

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Abstract. This study was conducted to determine the growth, efficiency, and in vitro digestibility of feed substances in broiler rations, which consume different levels of lauric acid and dietary fiber. This research was conducted using a completely randomized design with a 3x2x4 factorial pattern. The first factor was the lauric level, namely 1.3, 1.95, and 2.6% and the second factor was the fiber level, namely 6 and 8%. Lauric acid levels were calculated based on the equivalent of 3% coconut oil commonly used in broiler feed. The rations were arranged according to treatment and there were 6 treatment combinations. Each treatment combination was repeated 4 times. The parameters measured in this study were the growth performance, and digestibility of protein, ether extract and feed crude fiber. The results showed that there were significantly differences between treatment combinations, so it could be concluded that the used of 1.95% lauric acid and 8% crude fiber level on the diet would have a best performance and digestibility value of protein, extract ether, and crude fiber on broiler chicken.

Effect of addition of noni fruit in the raw material composition of "cinnamononi" extract on protein efficiency ratio, nitrogen retention, and metabolic energy in broilers

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Abstract. The study aimed to determine whether increasing noni fruit in the composition of cinnamononi extract raw materials (a mixture of cinnamon leaves, noni leaves, and noni fruit) can match the protein efficiency ratio, nitrogen retention, and metabolic energy of broilers fed commercial rations. The study used 24 five-week-old broiler chickens with an average body weight of ± 1721 grammes. This study used a complete randomised design, four treatments, and five replicates. Treatments consisted of P1: Bravo 512 commercial ration without extract, P2: basal ration + cinnamononi extract composition 1:2:2, P3: basal ration + cinnamononi extract composition 1:2:4, and P4: basal ration + cinnamononi extract composition 1:2:6. The observed variables were protein efficiency ratio, nitrogen retention, and metabolic energy. The results and analysis of variance showed that increasing noni fruit in the composition of cinnamononi extracts had no significant effect ($P > 0.05$) on protein efficiency ratio, nitrogen retention, and metabolic energy but tended to have a significant effect ($P< 0.10$) on protein efficiency ratio. In conclusion, increasing noni fruit to 6 parts in the raw material composition of cinnamon extract through limited drinking water can match the protein efficiency ratio, nitrogen retention, and metabolic energy of broilers fed commercial rations.

Keywords: Broiler, cinnamon extract, protein efficiency ratio, retention, nitrogen, and metabolic energy.

4. Biotechnology in Animal Nutrition

Feed innovation to increase animal productivity: in review

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Abstract. Feed plays an important role in the livestock industry. Various innovations continue to be developed to create more effective and efficient feed. Good feed can increase livestock productivity, animal health and the quality of the products produced. The use of alternative feed ingredients sourced from local feed can reduce production costs. This research uses a data collection method in the form of a review of various research results. The research that has been carried out has shown that feed innovation can increase the efficiency of nutrient utilization so that it has a positive impact on livestock growth and production.

Keywords: innovation, technology, feed, livestock

Potential of yeast isolated from budu fish origin West Sumatra as direct-fed microbials for ruminant

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Abstract. The use of direct-fed microbials (DFM) in ruminants is becoming widespread. DFM helps manipulate the rumen microbial ecosystem, increasing productivity and stimulating livestock health. Yeast isolated from fermented fish (Budu) origin West Sumatra, Indonesia have the potential as DFM for ruminant livestock. This study was carried out in vitro using 4 treatments and 5 replications, namely T0: Control; T1: *Pichia kudriavzevii* CBS 5147; T2: *Pichia kudriavzevii* B-5P; T3: commercial yeast (*Saccharomyces cerevisiae*). The substrate consists of 70% elephant grass (*Pennisetum purpureum*) and 30% concentrate. The inoculum contains 1.5 x 10^{10} CFU/mL. The results showed that the T3 treatment showed the highest nutrient digestibility and ruminal fermentation products ($P<0.05$) compared to other treatments. Meanwhile, the rumen pH value was not significantly different between the 4 treatments, this indicates the stabilization of rumen pH due to the administration of yeast. T3 treatment also showed a significant reduction in methane gas production compared to other treatments. The results show that the use of yeast isolated from Budu fish native to West Sumatra, namely *P. kudriavzevii* B-5P, has the potential to be used as DFM for ruminant livestock in terms of feed digestibility, ruminal fermentation products in vitro.

Swiftlet's nest from *Aerodramus fuciphagus* as a substrate for probiotics as well as gut bacteria

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Abstract. The Swiftlet Nest industry has its own identity. Swiftlet's habitats are limited to humid tropical habitats in Southeast Asia. In Malaysia, the swiftlet nest sector supports the national economy. In this study, the swiftlet nest glycoprotein and digested glycopeptides were tested as a potential substrate for the growth of probiotic bacteria. For probiotic fermentation in the presence of carbon substrate, glucose, molasses, swiftlet nest in the form of intact glycoproteins, and digested glycopeptides were added to MRS broth media containing probiotics, respectively. The broth media was incubated at 37˚C for 24 hours. MRS broth without substrate was used as the control. The bacterial count was conducted on nutrient agar with a suitable level of dilution. For gut bacteria fermentation, the swiftlet nest non-digestible compounds were subjected to batch culture fermentation with the addition of diluted gut bacteria. Bacterial enumeration was done using the fluorescent in situ hybridization method. The swiftlet nest has the potential as a substrate for probiotic growth media in a hydrolysed form. The benefits of swiftlet nests on the growth of probiotics and beneficial gut bacteria, leading to health improvements, contribute to the sustainability of this industry.

Consortium of *Bacillus subtilis* and *Lactobacillus fermentum* as probiotic candidates to improve the utility of palm kernel meal as poultry feed

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Abstract: Palm Kernel Meal (PKM) has high nutritional value as poultry feed but its use is limited due to its high cellulose and mannan content. This study aims to obtain probiotics from a consortium of cellulolytic and manannolytic bacteria, namely *B. subtilis* and *L. fermentum* which can increase the utility of PKM in poultry rations. This study consists of several stages. This study used an experimental method with a completely randomized design with 7 treatments and 4 replications at the stage of measuring the enzyme activity of *B. subtilis*, *L. fermentem* and their consortium. At the stage of measuring the enzyme activity of the selected consortium at various levels of PKM media percentage, a completely randomized design with 3 treatments and 9 replications was used. In vivo test data as probiotics were analyzed descriptively. The last stage was measuring the enzyme activity of the bacterial consortium in various natural media using 4 treatments and 6 replications. The results showed that the consortium of *B. subtilis* and *L. fermentum* bacteria with a ratio of 1:1 produced cellulase, mannanase and protease enzyme activities of 11.91 U/mL, 17.05 U/mL and 9.32 U/mL, respectively. The consortium of *B. subtilis* and *L. fermentum* with a ratio of 1:1 in MRSB media added with 15% PKM, produced cellulase, mannanase and protease enzyme activities of 6.90 U/mL, 6.88 U/mL and 15.40 U/mL, respectively. This bacterial consortium had a resistance to bile salts of 62.84% at a bile salt concentration of 0.3% and 46.23% at a bile salt concentration of 0.5%. The resistance of the bacterial consortium to pH 2.5 after 3 hours was 70.60% and decreased to 68.10% after 6 hours of incubation. The bacterial consortium also had inhibitory power against pathogens as seen from the inhibitory power against *E. coli*, *S. enteritidis* and *S. aureus* of 15.07mm, 14.12mm and 17.12mm respectively. The consortium of *L. fermentum* and *B. subtilis* with a ratio of 1:1 had quite high cellulase, mannanase and protease enzyme activities in the natural medium of 70% coconut water + 30% shrimp wastewater.

Keywords: *B. Subtilis*, L. Fermentum, palm kernel meal, probiotic, poultry

Effect of commercial ration replacement with cassava peel-leaf mixture fermented in crumble ration form on broiler performance

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Abstract: This study aims to determine the effect of commercial ration replacement with a ration based on a mixture of Cassava Peel-leaf Mixture Fermented (CPLMF) with *Rhizhopus oligosporus* in crumble form on broiler performance. This study used 100 DOC broilers. The cages used were 20 box cages measuring 80 x 80 x 60 cm, equipped with a place to feed and drink and a 60 watt in candescent lamp. This study used an experimental method with a completely randomized design (CRD) with 5 treatments and 4 replications consisting of R1 (100% commercial ration), R2 (75% commercial ration + 25% CPLMF ration), R3 (50% commercial ration + 50% CPLMF ration), R4 (25% commercial ration + 75% CPLMF ration), R5 (100% commercial ration). The parameters studied were feed consumption, body weight gain, ration conversion, live weight, carcass percentage, abdominal fat percentage and crude fiber digestibility, nitrogen retention and protein consumption. The results showed that replacing commercial rations with rations based on a mixture of cassava peel-leaf fermented with Rhizopus oligosporus in the form of crumbles showed no significant effected (P>0.05) on feed consumption, body weight gain, feed consumption, live weight, carcass percentage, abdominal fat percentage and crude fiber digestibility, nitrogen retention and protein consumption. From the results of the study it can be concluded that a mixture of cassava peel- leaf fermented with Rhizopus oligosporus in the form of crumbles can replace commercial rations up to 100%. This can be seen from the consumption of rations 744.00, weight gain 382.53 ration conversion 1.94, live weight 1683.25 g/head, carcass percentage 75.81%, abdominal fat percentage 0.58%, digestibility of crude fiber 55.59%, nitrogen retention 55.57%, and protein consumption 23.45 g/head/day.

Keywords: Commercial rations, CPLMF, Crumble, Broiler Performance, *Rhizopus oligosporus*

The role of *Bacillus subtilis* in increasing the quality and nutritional content of sago pith

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Abstract. This study aims to obtain the composisition of substrat and fermentation time which has the increasing the quality and nutritional of Sago pith (SP) fermented. The substrate is a mixture of sago pith (SP) with cassava leaves (CL), Indigofera leaves (IL) and tofu dregs.(TD).The materials used in this study were sago pith, rice bran, *B. subtilis*, laboratory equipment and broiler chicken Cobb strain CP-707 as many as 30 chicks aged 4 weeks with a body weight of 1.5 kg. The research method used an experimental method using a completely randomized design (CRD) with a 3x3 factorial pattern with 3 replications. Factor A was the substrat composition of A1 (80% SP +20% CL), A2 (805% + 20% IL) and A3 (80% + 20 TD). Factor B was the duration of fermentation, consisting of B1 (2 days), B2 (4 days), and B3 (6 days). The observed variables were protease activity, selulose activity, crude protein content, crude fiber, crude fat and nitrogen retention, crude fiber digestibility. The results showed that there was a very significant interaction ($P<0.01$) between substrat composition and fermentation time on sellulose activity, protease activity, crude protein content, crude fiber, digesbility of crude fiber and nitrogen retention. From the results of the study it can be concluded that composition substrat 80% SP +20% CL and a fermentation time of 4 days gave the best results in terms of cellulase activity 3.55 U/ml, protease 8.36U/ml, crude protein content 24 .29%, crude fiber 6.15%, and nitrogen retention 57.25%, crude fiber digestibility 56.16%

Keywords: *B. subtilis,* Sago Pith, fermentation, Substrat composition, fermentation time

The utilization of *Glacilaria spp.* as a feed supplement in improving Livestock productivity

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Abstract. Indonesia has become a primary producer of seaweed cultivation with China and Japan. One of the popular seaweed for meals is red seaweed *Glacilaria spp*, which is often found and cultivated in Indonesian waters. The nutrient and organic compound contained in the seaweed varies greatly depending on habitat, the time of collection, and environmental factors like water temperature, light intensity, and nutrient concentration in the water. Numerous research studies have looked into the potential of *Glacilaria spp* as a source of nutrients such as proteins, minerals, lipids, and fiber, as well as organic compounds, such as antioxidants, vitamins, saturated and polyunsaturated fatty acids, amino acids, acetogenins, alkaloids, terpenoids, halogenated compounds, and polysaccharides. This study examines the literature on the potency of *Glacilaria spp* to find a deeper understanding of its role as a feed supplement for livestock productivity and the impact on CH_4 emissions. It may help develop new approaches to lowering greenhouse gas emissions while increasing animal production. The conclusion is *Glacilaria spp*. contains a range of nutrients and bioactive chemicals, which can be used to improve the productivity and health status of both monogastric and ruminant livestock.

Keywords: Seaweed, *Glacilaria spp*, nutrients, organic compound, feed supplement, livestock

The effect of dags attached to hides of feedlot cattle on the accuracy of infrared thermography

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Abstract. This study aimed to identify the effect of dags on the IRT-measurement of coat temperature of cattle. IRT images were obtained from 92 Angus steers with dags attached to their coats. The high-resolution raw images were manually analysed to find a point of visual colour separation in the raw images, where clean fur pixels could be distinguished from dag pixels. Linear regression and Bland-Altman analyses were used to examine the relationships between dag coverage and the IRT-detected temperatures of dag and fur pixels, and the IRT-detected temperatures all pixels in the image. The proportion of the image covered in dags had a negative effect on the mean temperature of the entire IRT image, reducing mean image temperature by ~0.5 °C for every 10% increase in dag coverage, although this had a low coefficient of determination (R^2 = 0.08, P = 0.05). Dags reduced the temperature of the entire thermal image by contributing pixels that were on average 1.95 ˚C cooler than the average pixel in the image, rather than by affecting the temperature of clean fur in the image. When it is possible to analyse the clean fur separately, the presence of dags did not significantly affect the IRT-detected temperature of the clean fur. However, when using the IRT-detected temperature results of an entire image, dags of mud attached to the fur in the image affected the accuracy of the IRT result.

Effects of probiotic on growth performance and internal organ development of broiler fed with different levels of soy milk waste

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Abstract. Soy milk waste (SMW) is a potential feed for poultry but are hampered by the relatively high cellulose and phytate content. Giving probiotics from LAB which produce cellulase and phytase enzymes is done to overcome this. This study aimed to evaluate the effect of giving SMW into the diet of broiler, with probiotic (*Lactobacillus casei* T22), on the performance and internal organs of broiler. This study used a completely randomized design with a 3x3 factorial pattern with 3 replications (6 chicks each). Factor A consists of A1: 15% soy milk waste, A2: 20% soy milk waste and A3: 25% soy milk waste. Factor B consists of B1: 10^8CFU/mL; B2: 10^{10}CFU/mL and B3: 10^{12}CFU/mL. The results showed that SMW can be used up to 25% in the ration consumed by administering probiotics at a dose of $3x10^{12}$CFU/mL, which results in increased performance. The combination of SMW and probiotics at various levels and doses does not affect the weight of internal organs but does affect abdominal fat. The conclusion is the use of up to 25% SMW in chicken rations accompanied by the administration of probiotic at a dose of $3x10^{12}$ can improve livestock performance and does not disturb internal organs.

The effect of providing fermented catfish waste in the ration on muscovy duck performance

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Abstract. The feed ingredients that make up the ration must have high nutrient content, be harmless, be cheap, be available, and not compete with human needs. For example, catfish waste (CW). This research was divided into two stages. Phase I research aims to obtain CW fermentation (CWF) that has the best quality. The research method was experimental with a Completely Randomized Design (CRD) with 5 treatments and 4 replications. Phase II research aims to determine the level of use of CWF as a source of animal protein in entog rations. The experiment was carried out using 100 Ciayumajakuning entogs allocated to RAL with 4 treatments repeated 5 times. Entogs are kept from 1 to 12 weeks of age. with treatment rations R0 (control ration + 0% CWF), R1 (ration + 8% CWF), R2 (ration + 16% CWF) and R3 (ration + 24% CWF). The results showed that the best CWF was M2 (CWF + 1% EM4 + 1% mole red guava) which contained 55.55+1.64% crude protein, 7.89+1.10% crude fat, fiber crude 12.7+1.22%, ash 64.8+2.80%, and metabolic energy 4582.5+34.26 kcal/kg. The best level of use of CWF in the ration, namely R2 (ration + 16% CWF) resulted in the following entog performance, ration consumption of 4931.20+0.24 grams, body weight of 2180.22+0.310, and ration conversion of 2.26. In conclusion, fermented catfish waste has a significant effect on improving the performance of muscovy duck.

Identification of cellulose and cyanide-degrading bacteria from soil in cassava waste disposal

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Abstract. Cassava waste has the potential to be used as livestock feed due to its abundant availability in West Sumatra. However, the utilization of cassava waste as feed is constrained by its high fiber content and cyanide levels, making its use less than optimal. Various physical and mechanical methods have not been effective and fermentation methods using bacteria or fungi have also proven ineffective to degradation cellulose and cyanide. Fermentation using microbes isolated from the soil where cassava waste is discarded could be more as these bacteria are naturally adapted to the environment where they grow, thus having the ability to degradation crude fiiber and cyanide. This research uses a qualitative method, with data presented in the form of images and tables. Bacterial identification was carried out macroscopically, microscopically, and biochemically. The research results indicated that two bacteria, HDT4 and HDT8, exhibited good capability in degrading fiber and cyanide. Macroscopic identification showed that both bacteria had white colonies, a mucoid shape, and were catalase and oxidase negative. Microscopic examination revealed that HDT4 and HDT8 were rod-shaped, Gram-positive bacteria, appearing purple with spores. In biochemical tests, HDT4 was found to be negative (-) for lactose, glucose, sucrose, and VP, but positive (+) for mannitol and MR. On the other hand, HDT8 was positive (+) for lactose, glucose, sucrose, MR, and VP, but negative (-) for mannitol. The findings of this research showed that HDT4 and HDT8 are different bacteria based on their biochemical properties, although they appear similar macroscopically and microscopically.

Keywords: Bacteria, HDT4, HDT8, microscopic, macroscopic, biochemical

Effectiveness of *Lactobacillus fermentum* CMUL-54 with use palm kernel cake (PKC) in improving performance and feed conversion in broiler chickens

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Abstract. The utilization of *Lactobacillus fermentum* in animal feed can reduce dependence on antibiotics which is a significant issue in the livestock industry due to increasing antibiotic resistance**.** The purpose of this study was to evaluate the effectiveness of using *Lactobacillus fermentum* CMUL-54 and BIS in improving performance and ration conversion in broiler chickens. The research design used was a factorial completely randomized design (CRD) with two factors. Factor A was probiotic dosage with three levels (A1: 0, A2: 10^{-10}, A3: 10^{-12}), and factor B was BIS level with three levels (B1: 0%, B2: 15%, B3: 25%). The results showed that the A3B3 treatment (probiotic dose 10^{-12} with PKC level 25%) gave the best results with an increase in body weight of 244,99 g/head/week, consumption ration of 751,39 g/head/week, and feed conversion of 3,06. The conclusion of this study is the combination of probiotic dose (10^{-12}) with PKC level (25%) can improve performance and ration conversion in broiler rations.

Probiotic *Pichia kudriavzevii* as biodetoxification of aflatoxin in ration to hematologic and histopathology broiler

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Abstract. This study aims to determine the effect of probiotic *Pichia kudriavzevii* in a corn-based ration containing aflatoxins on hematology and liver histopathology in broiler. This study used 100 DOC broiler strain Lohman strain MB-202 Platinum. The cages used were 100 x 70 x 70 cm in size, totalling 20 and each cage contained 5 chickens. This study used a completely randomized design (CRD) experimental method with 4 treatments and 5 replications. The treatments consisted of R0 (Control Ration); R1 (Ration with corn containing aflatoxins + 0.1% *Pichia kudriavzevii*); R2 (Ration with corn containing aflatoxin + 0.2% *Pichia kudriavzevii*); R3 (Ration with corn containing aflatoxin + 0.3% *Pichia kudriavzevii*). The variables observed were hematology and liver histopathology. The results showed that the treatment had no significant effect (P>0.05) on blood hematology. Based on liver histopathology, it can be seen in the image that the difference was very significant. From the results of this study, it can be concluded that the addition of 0.3% *Pichia kudriavzevii* probiotics gave the best results and could restore histopathology to its original state and *Pichia kudriavzevii* probiotics can bind aflatoxin in the ration almost 100 %.

Innovation In the Fermentation of Food Crop and Plantation Fiber Waste Using Rice Husk Ash Filtrate: Latest Perspectives in Biomass Utilization

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Abstract. Rice straw ash filtrate (RSAF) contains alkali oxides like potassium, sodium, calcium, and magnesium, which may influence fermentation, nutrient availability, and livestock feed characteristics. This study aimed to evaluate the effect of RSAF on the fiber content of agricultural and oil palm plantation waste. The experiment was conducted at the Nutrition and Feed Technology Laboratory, Faculty of Agriculture and Animal Science, Universitas Islam Negeri Sultan Syarif Kasim Riau, using a completely randomized design with 4 treatments and 4 replications. The treatments were P1: rice straw, P2: corn straw, P3: oil palm fronds, and P4: empty oil palm bunches, ensiled with 10% RSAF (based on dry matter) for 14 days at room temperature. Parameters measured included NDF, ADF, ADL, cellulose, and hemicellulose. Data were analyzed using ANOVA, with significant differences ($P<0.05$) tested by DMRT. The results showed that 10% RSAF significantly affected fiber fractions. It did not reduce NDF and ADF in any of the materials but did lower ADL in rice straw, reduce cellulose in rice and corn straw, and increase hemicellulose in corn straw. The best results were achieved with rice and corn straw fermented with 10% RSAF, which produced silage with the highest hemicellulose content.

Keywords: Rice straw, fronds, empty fruit bunches, oil palm, RSAF, anaerobic fermentation

Improving quality and nutrient content of soybean waste fermented with *Bacillus subtilis*

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Abstract: This study aims to obtain the composisition of substrat and fermentation time which has the increasing the quality and nutrient content of Soybean waste fermented (SWF). The substrate was a mixture of Soybean waste (SW) with cassava leaves (CL), Indigofera leaves (IL) and white leadtree leaves (WLL). The research method used an completely randomized design (CRD) with a 3x3 factorial pattern with 3 replications. Factor A was the substrat of type : A1 (80% SW +20% CL), A2 (80% SW+ 20% IL) and A3 (80% SW + 20 WLL). Factor B was the time of fermentation: B1 (2 days), B2 (4 days), and B3 (6 days). The observed variables were protease activity, selulose activity, crude protein content, crude fiber, and nitrogen retention, crude fiber digestibility. The results showed that there was a very significant interaction ($P<0.01$) between substrat of type and fermentation time on sellulose activity, protease activity, crude protein content, crude fiber, digesbility of crude fiber and nitrogen retention. From the results of the study it can be concluded that type of substrat 80% SW +20% CL and a fermentation time of 4 days gave the best results in terms of phytase activity 16.34 U/ml, cellulase activity 14.61 U/ml, protease 32.95U/ml, phitat content 0.33 U/ml, crude fiber 7.04%, crude protein content 29.78%, and nitrogen retention 57.45%, crude fiber digestibility 57.95%

Keywords: *B. subtilis,* Soybean waste, fermentation, type Substrat, Nutrient

The effect of moringa leaf extract supplementation in complete rations based on fermented citronella waste on the content and digestibility of fiber fractions

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Abstract. This study aimed to evaluate the effect of Moringa leaf extract supplementation as a natural antioxidant in complete rations based on fermented citronella waste on the content and digestibility of fiber fractions. The experimental design used was Completely Randomized Design (CRD) with 5 treatments and 3 replications. The treatments involved Moringa leaf extract supplementation at different doses: P0 (no extract), P1 (0.125% extract), P2 (0.25% extract), P3 (0.375% extract), and P4 (0.5% extract). Parameters measured included the content and digestibility of ADF (Acid Detergent Fiber), NDF (Neutral Detergent Fiber), cellulose, and hemicellulose. Results showed that increasing doses of Moringa leaf extract had no significant effect ($P>0.05$) on the content of fiber fractions but significantly affected ($P<0.01$) their digestibility. Average NDF content ranged from 59.56% to 61.59%, ADF from 33.27% to 34.54%, cellulose from 29.93% to 32.08%, and hemicellulose from 26.85% to 28.32%. Further analysis indicated that the digestibility of NDF, ADF, cellulose, and hemicellulose in P1 (0.125%) was significantly higher than in the other treatments. Increased extract doses tended to reduce digestibility, likely due to secondary metabolites in the Moringa leaf extract.

Egg quality of laying hens supplemented with fermented brown seaweed *Turbinaria decurrens* in their diets

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Abstract. This experiment was conducted to study the influence of supplementation of fermented brown seaweed *Turbinaria decurrens* in the diets on egg quality of laying hens. This seaweed was fermented with rice mediated local microorganism (LMO). Two hundred laying hens of the ISA-Brown strain at the age of 40 weeks with the egg production average of 80% were assaigned to this experiment in a completely randomized design with four treatments (0, 6, 12 and 18% brown seaweed *Turbinaria decurrens*) in the diets and five replicates. Measured variables were egg qualities (eggshell thickness, egg-shell strength, egg-shape indeks, egg yolk color, and egg yolk fat). The results showed that treatments did not significantly affect ($p>0.05$) egg-shell thickness, egg-shell strength, egg-shape indeks, egg-yolk color and egg-yolk fat of laying hens. Thus, brown seaweed *Turbinaria decurrens* fermented with rice mediated LMO can be used up to 18% or replacement for 75% rice bran and for 6.2% grinding yellow corn without adverse effects on egg quality.

Keywords: eggs quality, laying hens, local microorganism, *Turbinaria decurrens*

The additional effect of cinnamon leaf powder (*Cinnamomum burmanni* Ness ex. BI) as a source of cinnamaldehyde on *in vitro* gas and methane production

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Abstract. Ruminant farming produces massive amounts of methane which contributes to global warming, while methane production also indicates inefficient use of feed nutrients. Cinnamaldehyde can reduce methane production by binding to feed protein. One example of a source of cinnamaldehyde is cinnamon leaves. This study aimed to determine the effect of a natural bioactive compound in the form of cinnamaldehyde from cinnamon leaf using *in vitro* method for rumen fermentation on gas production and methane mitigation. The fermentation gas production method by Menke and Steingass was used in this research with an incubation period of 48 hours. The sample used was cinnamon leaf powder. The proportion of forage and concentrate is 60:40, where the concentrate consists of 90% wheat bran pollard and 10% soybean meal. The treatments applied in this research were different levels of addition of cinnamon leaf powder, namely levels of 0%, 1%, 2%, 3%, and 4% DM of feed. The observed parameters included gas production, digestible dry matter (DDM), digestible organic matter (DOM), as well as methane (CH_4) and carbon dioxide (CO_2) production. The data collected will be examined through one-way analysis of variance (ANOVA) followed by Duncan Multiple Range Test (DMRT). The results of the research showed the production of gas when adding cinnamon leaf powder with a percentage of 2% DM of feed showed the highest results ($P<0.05$) compared to adding other percentages. The addition of cinnamon leaf powder with a percentage of 2% DM of feed showed the lowest CH_4 and CO_2 production results compared to the addition of cinnamon leaf powder at other percentages ($P<0.05$). DDM and DOM values in the rumen showed the lowest results ($P<0.05$) due to the addition of cinnamon leaf powder at a percentage of 4% DM of feed compared to all treatments. The research brought out the conclusion that the addition of 2% cinnamon leaf powder which is equivalent to cinnamaldehyde of 32 mg/kg DM can increase gas production in the rumen and reduce CH_4 production also CO_2 production in the rumen *in vitro*.

Keywords: cinnamon leaves, cinnamaldehyde, global warming, methane mitigation

Enhancing stingless bee (*Heterotrigona itama*) colony development: the role of supplementary bee bread with different coating materials

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Abstract. This study investigates the effect of different bee bread coatings on developing stingless bee (*Heterotrigona itama*) colonies. The research was conducted at the Edu Farm, Animal Science Faculty, Universitas Andalas, Padang, using a Randomized Group Design with four treatments and three replicates. The study utilized 12 stingless bees (*Heterotrigona itama*) colonies in slim hives. The treatments included: A = Stingless bee bread in its natural propolis pot (control), B = Bee bread coated with Apis wax, C = Bee bread coated with soft propolis, and D = Bee bread coated with a mixture of Apis wax and hard propolis. The coating materials were all derived from the natural pot components of stingless bee colonies. Critical parameters measured were bee bread consumption, the increase in brood cell numbers, and the increase in bread pot numbers. The results showed nonsignificant variation ($P \geq 0.05$) across treatments for bee bread consumption (1.82±0.4 to 8.80±4.5), brood cell growth (80.33±42.1 to 273.69±178.4), and bread pot increase (1.33±1.5 to 24.67±4.4). These findings suggest that adding Apis wax, soft propolis, and mixed Apis wax + geopropolis coatings had similar effects to the control on colony development. The implications of these findings for the field of meliponiculture are discussed in detail in the full paper.

Keywords: kelulut, meliponiculture, bee bread, coating material, wax, propolis

Optimizing the placement of *Geniotrigona thoracica* colonies: a study of homing ability from different distances

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Abstract. As social insects, stingless bees play a crucial role in ecosystems and economies by contributing to honey production and serving as essential pollinators. *Geniotrigona thoracica* is one of the most widely cultivated in Indonesia due to its high productivity in honey and propolis production. This study investigates the return capability of worker bees from five *G. thoracica* colonies, which had been maintained for one year at the Edu Farm, Faculty of Animal Husbandry, Universitas Andalas. The research uses the translocation method to explore their ability to return from various distances (ranging from 200 m to 2000 m) and examines the relationship with food source availability. Results indicate that the optimal return distance is approximately 1000 m, with a marked decline in return capability observed beyond 1800 m. These findings are crucial for developing effective breeding strategies and optimizing habitat management for stingless bees, providing valuable insights into colony placement to enhance foraging efficiency and honey production.

Keywords: meliponiculture, homing ability, kelulut, galo-galo, stingless bees

Enhancing growth performance of kacang goats with galo-galo propolis supplementation

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Abstract. This study aims to evaluate the production performance of Kacang goats supplemented with stingless bee (galo-galo) propolis. Propolis, known for its antimicrobial and antioxidant properties, can potentially enhance animal health and productivity. The research was conducted using a randomized block with different levels of propolis supplementation (0, 3, 6, and 9 g propolis/kg ration) to observe its effects on the growth rate, feed intake, and slaughter weight parameters of 20 heads of yearling male Kacang goats. The results showed that propolis supplementation (9g/kg) significantly improved the goats' growth performance. These findings suggest that Galo-galo propolis can be used as a natural supplement to boost the production of Kacang goats, potentially contributing to more sustainable goat farming practices.

Keywords: Propolis, Kacang goat, daily gain, feed additive, feed conversion

Characteristics of rumen fermentation with feed formulation using molasses in-vitro

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Abstract. This study aims to determine the effect of molasses use in ruminant livestock rations on rumen fluid characteristics in vitro. This study was conducted using a Completely Randomized Design experimental method with 3 treatments and 5 replications, the treatments consisted of: P0 = Ration formulation without molasses use, P1 = Ration formulation with 3% molasses use, P2 = Ration formulation with 6% molasses use. The variables observed were pH value, NH3 production and rumen fluid VFA production. The results of the study for pH value obtained P0 = 6.98; P1 = 6.94; P2 = 6.89. NH_3 production P0 = 10.02 mg / 100ml; P1 = 10.89 mg / 100ml; P2 = 11.42 mg / 100ml and VFA production P0 = 104.00 mM; P1 = 120.00 mM; P2 = 130.00 mM. Based on the results of the study, it was shown that the use of molasses in the ruminant livestock ration formula had no significant effect ($P>0.05$) on the pH, and had a significant effect ($P<0.05$) on the production of NH_3 and VFA in the rumen in vitro. Where the use of molasses up to 6% in the ration formulation can increase NH_3 production, VFA production and maintain the pH value of the rumen fluid.

Keywords: molasses, In vitro, feed formulation, pH, NH_3, VFA

Extraction of alginate from *Turbinaria murayana* seaweed using different methods as a poultry feed additive

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Abstract. This study examines the effects of alginate extraction from *Turbinaria murayana* seaweed using different methods (acid, alkaline, and calcium) as a feed additive for poultry. The research employed a completely randomized design of three treatments and six replications. The treatments included different extraction methods: acid, alkaline, and calcium. The parameters measured were alginate yield, moisture content, dry matter, and ash content. The results showed that alginate extraction using different methods had a highly significant effect ($P<0.01$) on alginate yield, moisture content, dry matter, and ash content. The findings indicated alginate yields of 19.12% for the acid method, 33.96% for the alkaline method, and 48.58% for the calcium method. The alginate moisture content was 12.57% with the acid method, 9.05% with the alkaline method, and 6.86% with the calcium method. The ash content produced was 26.85% for the acid method, 57.82% for the alkaline method, and 61.01% for the calcium method. This study concludes that alginate extraction using the acid method is effective, with results meeting the Food Chemicals Codex (FCC) standards of an alginate yield >18%, moisture content <15%, and ash content between 18-27%.

Keywords: Alginate, Ash content, Dry matter, Moisture content, *Turbinaria murayana*

The potential of anthocyanins from *Clitoria ternatea*, *Hibiscus sabdariffa*, and *Coleus scutellarioides* flowers as feed additives to reduce fat in broiler chicken

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Abstract. Butterfly pea (*Clitoria ternatea*), roselle (*Hibiscus sabdariffa*), and miana plants (*Coleus scutellarioides*), flowers are potential sources of anthocyanins. Anthocyanins are water-soluble pigments with hypolipidemic (cholesterol-lowering), antioxidant, and anti-inflammatory properties. The mechanism by which anthocyanins degrade cholesterol involves inhibiting the HMG-CoA reductase enzyme at the cellular level, preventing the conversion of Acetyl-CoA into Mevalonate. Broiler chickens have a higher fat content compared to native chickens, making their consumption less suitable for individuals with dyslipidemia. The addition of feed additives to broiler diets is an effort to reduce their fat content. This study aims to determine the highest anthocyanin content from butterfly pea, roselle and miana. flowers as feed additive sources, based on flower type, solvent type, and maceration duration. The observed parameter is the total anthocyanin content (TAC). This study uses a completely randomized design with three factors (flower type, solvent type, and maceration duration) and three replications. The data were analyzed using analysis of variance (ANOVA), and Duncan's Multiple Range Test was applied to test for variation in the analysis. The results show that all three flower species have potential as feed additives for livestock, with the highest anthocyanin content.

Keywords: Anthocyanin, *Clitoria ternatea, Coleus scutellarioides, Hibiscus sabdariffa*, TAC

Rumen fermentation activity in ration based on a combination of palm oil waste *in vitro*

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Abstract. Experiments were conducted to determine the effects of substitution of fresh forage with a combination of palm oil waste on the total concentration of VFA, ammonia and methane gas production *in vitro*. The design of the experiments were a Completely Randomized Design (CRD) 4 x 4 with 4 treatments and 4 replicates. The treatments were as follows: P0 = 90% forage +10% rice bran, P1= 60% 0f forage + 30% Palm oil waste + 10% rice bran, P2 = 30% forage + 60% palm oil waste + 10% rice bran, P3 = 90% Palm oil waste +10 rice bran. The data were analysed by analysis of variance (ANOVA) using the SAS for windows. Filtered rumen fluid was mixed with buffer solution in ratio of 4 : 1 for rumen fluid and buffer solution respectively. Fifty millilitres of this mixture was transferred into a serum bottle (100 ml capacity) containing 1 g of feed sample. The bottle was sealed with rubber stopper and incubated for 72 h at 40°C. Incubation was done in triplicate. At the end of incubation period, the incubated inoculum was subsampled for analysis of volatile fatty acid (VFA), ammonia and methane gas production. The parameters observed were total VFA, ammonia concentration and methane gas production. The results showed that the treatments had a significantly effect ($P<0.05$) on the concentration of VFA, ammonia and methane gas production. The total VFA and ammonia concentration were significantly decrease with the increasing of palm oil waste in the ration. The highest total VFA and methane gas production were found in the P0 treatment (169.25 mM and 241.23 ml/g, respectively) and the lowest in the P2 treatment (93.65 mM and 95 ml/g, respectively). The P0 treatment was significantly different ($P <0.05$) with the P2 treatment while between treatments P0, P1, P3 and between treatments P1, P2 and P3 were not significantly different. However, the concentration of ammonia was increased with the increasing palm oil waste. The highest ammonia concentration was found in the P3 treatment (4.13 mM) and the lowest in the P1 treatment (1.13 mM), treatment P3 was significantly different ($P <0.05$) with the treatments of P0, P1 and P2. While the difference of P1, P2 and between treatments of P0, P2 were not significant. It can be concluded that an increase in the amount of palm oil waste in ration can decrease the concentration of VFA and methane gas production, while the concentration of ammonia increases with an increase in the percentage of oil palm waste in ration.

Keywords: In Vitro, VFA, Ammonia, methane gas, fermentation

Potential of synbiotic powder based on *lignochloritic* bacteria and its evaluation on rumen fermentation parameters in vitro

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Abstract. *Lignochloritic* bacteria have a high ability to degrade complex and synthetic organic compounds. Liquid probiotics based on *lignochloritic* bacteria can increase gas production, organic matter digestibility, microbial protein synthesis efficiency, NH3 and VFA production in vitro. In this study, reformulation was carried out by adding inulin as a carrier medium as well as a new prebiotic. The purpose of this study was to determine the potential of Synbiotic Powder products based on l*ignochloritic* bacteria through quality, life time and viability tests and their evaluation on digestibility, NH3 content, and the proportion of volatile fatty acids (VFA) in vitro. This study used a completely randomized design (CRD) method with analysis of variance (ANOVA). The treatment in the potential test was the concentration of isolate culture in the carrier medium, namely: P0 (0%), P1 (1%), P2 (2%) and P3 (3%). The treatment in the in vitro test was the level of synbiotics in the basal feed of Rice straw used, namely P0 (0%), P1 (0.5%), P2 (1%) and P3 (2%). The results of the study on the potential test showed that the treatment had a very significant effect ($P<0.01$) on cell growth, production and enzyme activity and the chemical quality of synbiotic powder and the best treatment was P3 (3%). The storage temperature treatment also did not affect the life time of synbiotics, including physical and biological quality. The results of the in vitro test study showed that the synbiotic level treatment had a very significant effect ($P<0.01$) on NH3 production but had no significant effect ($P>0.05$) on dry matter digestibility, organic matter and VFA production.

Keywords: Synbiotic, *Lignochloritic*, In-vitro, NH3, VFA

Evaluation of feed additive tannins and *Saccharomyces cereviseae* on rumen fermentation characteristics and nutrient digestibility: in vitro study

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Abstract. Gambir plant is one of the local plants found in West Sumatra, especially in Lima Puluh Kota regency. Gambir has the potential to reduce the population of metagenic bacteria and protozoa because of the catechin and tannin compounds contained in it. This study aims to obtain the most effective feed additive between tannins and DFM in beef cattle rations, as a methane reducing agent. Variables measured were dry matter and organic matter digestibilities, and NH3 production. The experimental design used was Randomised Group Design with 6 treatments and 3 replicates. Where the treatment consists of P0 = 40% napier grass + 60% Concentrate, P1 = 40% napier grass + 30% Concentrate + 30% Gamal, P2 = 40% napier grass + 30% Concentrate + 30% Gamal + 1% Gambir, P3 = 40% napier grass + 30% Concentrate + 30% Gamal + 2% gambir, P4 = 40% Napier grass + 30% Concentrate + 30% Gamal + 0.5% DFM, P5 = 40% Napier grass + 30% Concentrate + 30% Gamal + 1% DFM. The results of this study obtained Ph values ranging from 6,72 - 6,90. NH_3 production values ranged from 11,45 - 16,69 mg/100ml and dry matter digestibility obtained 50,43% - 60,12%.

Keywords: *Direct-fed microbials,* Feed Additive, Gambir, Methane

Chemical composition and in vitro rumen fermentation characteristics of brown (*Sargassum binderi*), green (*Kappaphycus striatum*), and red (*Gracilaria sp.)* seaweeds

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Abstract. Seaweed has potential as a feed supplement for ruminants due to its complete nutritional content, including protein, carbohydrates, fat, vitamins, minerals, and bioactive compounds. This study aimed to evaluate the potential of tropical seaweed from Indonesia as a feed supplement for ruminants based on chemical composition and in vitro rumen fermentation characteristics of three seaweed species, namely *Sargassum binderi* (brown), *Kappaphycus striatum* (green), and *Gracilaria sp.* (red). Brown seaweed was obtained from Sungai Nipah, Pesisir Selatan, West Sumatra, while green and red seaweed were obtained from Pallette Village, Taneteriattang Timur Subdistrict, Bone Regency, South Sulawesi. Parameters observed included chemical composition, rumen pH, Volatile Fatty Acid (VFA) production, and ammonia (NH_3) production. This study used a completely randomised design with three treatments and four replications. The data obtained were analysed using analysis of variance (ANOVA), and Duncan's Multiple Range Test was used to test for variation in the analysis. The results showed that all three seaweed species have potential as feed supplements for ruminants and red seaweed (*Gracilaria sp.*) has potential as a source of protein.

Keywords: seaweed, pH, VFA, NH_3

5. Functional Feed and Animal Health

Potential of chitosan and coconut oil solution in preserving the physical quality of local duck eggs

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Abstract. Egg can be preserved by soaking the eggs in a solution that has antibacterial properties. Chitosan and pure coconut oil are anti-bacterial materials. The purpose of this study was to extend the storage period and preserve the quality of eggs. This study used a completely randomized design with 5 treatments and 4 replicates, consisting of: T0 = without chitosan and coconut oil solution, T1 = soaked with 1% chitosan solution, T2 = soaked with 2% chitosan solution, T3 = soaked with 3% chitosan solution, T4 = soaked with 100% coconut oil solution. The observed variables were egg weight, white and yolk weight, white and yolk index, and yolk pH. The results showed that the treatments had a significant effect on weight loss and egg white weight ($P < 0.05$), but no significant effect on yolk weight ($P > 0.05$). In addition, the treatment also did not significantly affect the white and yolk indexes, as well as the white and yolk pH. In conclusion, treatment using coconut oil showed the best results in preserving the internal quality of duck eggs, which reduced the smallest egg weight by 1.26% and maintained the highest egg white weight by 43.98%.

Kandis acid extract (*Garcinia xanthochymus*) as acidifier in drinking water: impact on internal organs and digestive tract system of kampung chickens

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Abstract. The study was aimed to determine the effect of giving kandis acid extract in drinking water on performance, digestibility, and total microbes of native chickens. The research design used was a completely randomized design (CRD) consisting of 4 treatments and 6 replicates. The treatments used were P0 (control treatment without acidifier), P1 (kandis acid solution with pH 2.4), P2 (kandis acid solution with pH 3.4) and P3 (kandis acid solution with pH 4.4)Variables observed were internal organs and digestive tract system including pancreas, liver, gizzard, small intestine, duodenum, jejenum, and ileum. Data were analyzed by ANOVA and if it showed a significant difference, followed by Duncan's multiple range test. The treatment of kandis acid extract in drinking water had a significant effect ($P < 0.05$) on the percentage of liver weight on the treatment of kandis acid solution with pH 4.4. However, in the percentage of small intestine, duodenum, jejenum, ileum, pancreas, and gizzard, the significant difference between treatments was not obtained. Based on the results of the study, it can be concluded that the treatment of kandis acid does not have a significant effect on the internal organs and digestive tract system of native chickens.

Evaluation of digestibility, ecological profile, and number of rumen protozoa of urea multi-minerals molasses block (UMMB) with phytonutrient incorporation using the in vitro method

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Abstract. Urea multi-minerals molasses block (UMMB) with the incorporation of phytonutrients is believed to be an alternative feed supplement to increasing productivity and being more environmentally friendly. The study aimed to evaluates the incorporation of phytonutrients as constituent component of UMMB to improve rumen ecology, The research was conducted experimentally with in vitro method. The treatments consisted of P0 (basal feed + UMMB 1% without phytonutrients), P1 (basal feed + UMMB plus garlic powder), P2 (basal feed + UMMB plus turmeric powder), P3 (basal feed + UMMB plus curcuma powder), P4 (basal feed + UMMB plus ciplukan powder), and P5 (basal feed + UMMB plus pegagan powder). The variables were dry and organic matter digestibility, pH, VFA, N-NH3, and number of rumen protozoa. The results showed that P3 was the treatment with the highest dry and organic matter digestibility. Rumen ecological profile, consisting of pH, VFA, and N-NH_3 values showed unsignificant results. The number of rumen protozoa with the lowest value was discovered in P3. Based on the results, the incorporation of phytonutrients in UMMB does not affect the ecological of rumen, but affected to increasing nutrient digestibility and decreasing rumen protozoa.

Effect of using local rations as a substitute for commercial rations on growth performance and carcass of ULU native chickens

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Abstract. This study aimed to investigate the substitution of commercial rations with local rations on the performance of ULU native chickens. A total of 80 day-old chicks of ULU native chickens were used in this study, with a completely randomized design with 5 treatment groups and 4 replications. The treatment groups consisted of P0 (local ration), P1 (75% local ration + 25% commercial ration), P2 (50% local ration + 50% commercial ration), P3 (25% local ration + 75% commercial ration), and P4 (commercial ration). The observed variables included feed consumption, body weight gain, feed conversion, carcass percentage and commercial carcass slices of ULU native chickens. The results showed that the substitution of commercial rations with local rations from 25 to 100% had a significant effect on feed consumption, body weight gain and feed conversion ($P < 0.05$). In addition, the use of local rations significantly affected the percentage of carcass and commercial carcass slices of the breast, thigh, and wing ($P < 0.05$). The conclusion of this study is that the use of local rations up to 25% as a substitute for commercial rations for 10 weeks can optimally improve growth performance and carcass quality of ULU native chickens.

The effect of Zn mineral supplementation in feed, butterfly pea flower extract in drinking water, and carrot juice on 110-week-old laying hens

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Abstract. This study aimed to evaluate the effects of Zn mineral supplementation in feed, butterfly pea flower extract in drinking water, and carrot juice on performance, physical egg quality, blood MDA (malondialdehyde), and nutritional content of eggs from 110-week-old Lohmann laying hens reared for 3 weeks. The study used 24 laying hens and applied 4 treatments. The research used descriptive analysis methods. The treatments were control feed with regular drinking water (K0), Zn supplementation at 120 ppm with regular drinking water (K1), control feed with butterfly pea flower extract in drinking water (K2), and control feed with carrot juice (K3). Treatments K1, K2, and K3 were compared to K0. Zn mineral supplementation resulted in higher Zn content in egg yolks compared to the control feed, reduced blood MDA levels in hens given carrot juice compared to the control, and increased vitamin A content in egg yolks compared to the control. However, Zn, butterfly pea flower extract, and carrot juice supplementation did not affect the performance and egg physical quality of the laying hens.

Keywords: butterfly pea flower extract, carrot juice, laying hens, performance, physical egg quality

Black soldier fly larvae oil reduces lipogenesis in broilers fed low protein diets

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Abstract. Feeding low crude protein (CP) diets with supplemental crystalline amino acids offers a range of production, environmental and animal welfare benefits. However, LCP increases body fat of broiler. Black soldier fly larvae oil (BSFLO) is a rich source of lauric acid which has reported to inhibit lipogenesis and reduce body fat. A 3 x 2 factorial study was conducted to evaluate the effect of BSFLO addition on performance, blood plasma biochemistry, carcass quality, gene expression of fat metabolism, and litter quality of broilers fed low CP diets. A total 288 broilers were divided into 6 treatments consisting of three CP levels (200, 185, or 170 g/kg) and two oil sources (BSFLO and crude palm oils). Each treatment consisted of 6 replicates, with10 chickens each. The results showed that reduction of crude protein (CP) level by 15 g/kg had no significant effect on body weight and feed intake ($P>0.05$) but decreased feed efficiency ($P=0.001$). Further reduction of dietary CP level by 30 g/kg reported inferior performance response ($P<0.05$). The inclusion of BSFLO significantly improved feed efficiency ($P<0.001$) and effectively counteracted the negative impact of LCP diet on feed efficiency ($P=0.008$). Reducing dietary protein by 30 g/kg increased fat pads ($P=0.033$). However, BSFLO significantly reduced fat pads to the same level as the control ($P=0.049$). Reducing CP in the diet increased blood cholesterol ($P=0.002$), HDL ($P<0.001$), and LDL ($P=0.002$). Addition of BSFLO decreased blood triglyceride ($P=0.026$) and cholesterol ($P<0.001$). BSFLO reduced ($P<0.001$) the expression of genes involved in lipogenesis (ACC, FAS, SREBP-1) and cholesterol synthesis (HMGR) in 0 g/kg and 15 g/kg CP reduction. Conversely, ACC, FAS, SREBP-1, and HMGR ($P<0.001$) expression were increased with the reduced LCP diet. The expression of CPT-1 and PPARα genes increased in 30 g/kg CP reduction ($P<0.001$) with BSFL oil addition ($P<0.001$). In conclusion, the study shows that the BSFLO significantly reduced body fat by down-regulating the expression of the genes associated with lipogenesis. In addition, BSFL oil enhanced feed efficiency in broilers fed low crude protein diets.

The utilization of Binahong leaf infusion water (*Anredera cordifolia*) on the blood picture of Balitnak Village Chickens (KUB-1) which are kept in open cages

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Abstract. This study aims to determine the effect of giving Binahong leaf (*Anredera cordifolia*) infusion water on hemoglobin levels, leukocyte counts, and leukocyte differentials of KUB-1 chickens kept in open cages. Binahong leaf infusion water was given to 100 chickens aged 4-12 weeks, kept in open cages measuring 100x60x40 cm/unit. The cages were divided into 20 units, each containing 5 chickens. The research method was an experimental method, using a Completely Randomized Design (CRD) with 5 replications and 4 treatments of Binahong simplicia infusion water (0; 0.25; 0.75; 1.25 grams/kg BW/week), soaked in 25 ml of water at a temperature of 90oC for 15 minutes. The results showed that giving Binahong leaf infusion water up to 1.25 g/kg BW/week had no significant effect (P>0.05) on the blood picture of KUB-1 chickens. From the research results, it was concluded that giving infused water with Binahong leaves did not provide the best results for the blood picture of KUB-1 chickens kept in open cages.

Keywords: Binahong Leaf Infusion Water, KUB-1 Chicken, Leukocyte Differential, Hemoglobin, Leukocyte

Effect of binahong leaf infusion on the prevalence of digestive tract nematodes in KUB-1 chickens raised in the backyard

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Abstract This study aims to obtain a dose of binahong (*Anredera cordifolia*) leaf infusion that was effective against the prevalence of digestive tract nematodes in KUB-1 chickens reared in the back-yard. This study used 100 KUB-1 chickens kept in litter cages until 2 weeks of age. Then the chickens were kept in 20 cage units each 100x60x40cm/unit each unit was filled 5 chickens until 12 weeks of age. The feed was commercial feed. The designed of experiment was a completely randomized design (CRD), 4 treatments, 5 replicates. The treatment was infusion water of binahong at each dose (0; 0.25; 0.75; and 1.25 grams/kg bw/week) soaked with 25 ml of water at 90°C for 15 minutes. The results of the study found prevalence 100%. Nematode egg species were *Ascaridia galli, Capillaria* sp and *Heterakis gallinarum*. Administration of binahong infused water 1.25 g/kg bw/week reduced the prevalence of *Capillaria* sp and *Heterakis gallinarum* by 55% and 10%, respectively. The level of infection was moderate. Administration of 1.25 g/kg bw/week significantly ($P<0.05$) reduced helminth egg count. Fecal Egg Count Reduction Test level was 76.96%. Conclusion the administration of water infusion of binahong leaf 1.25 g / kg bw / week has not been effective as an anti-nematode but can reduce the number of worm eggs. The level of infection becomes mild.

Keywords: Infusa water, *Anredera cordifolia*, Nematoda, KUB-1 chicken, egg worm

The effect of using brown seaweed *Padina australis* in diets on the total colony count of bacteria in the small intestines of broiler chicken

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Abstract. *Padina australis* contains bioactive compounds such as saponins, fucoidans, alkaloids, tannins, phenolics and their derivatives (flavonoids), B-carotene, fucoxanthin, alginate, which have antimicrobial properties against pathogenic bacteria. This study aimed to determine the effect of brown seaweed *Padina australis*, with reduced salt and crude fiber content on the total colony count of bacteria in the small intestines of broiler chicken. This study used a Completely Randomized Design (CRD) with brown seaweed *Padina australis* levels of 0, 5, 10, and 15% in broiler chicken diets, with each treatment repeated five times. The parameters measured were the total of *Lactobacillus* sp, *Escherichia coli*, and *Salmonella* sp colonies in the small intestines of broiler chicken. The results showed that the use of *Padina australis* significantly ($p<0.05$) reduced the total of *Escherichia coli* and *Salmonella* sp colonies in the small intestines. However, had no significant effect ($p>0.05$) on the total of *Lactobacillus* colonies in the small intestines of broiler chicken. In conclusion, *Padina australis* in broiler chicken diets could be used up to 15% to reduce the total of *Escherichia coli* and *Salmonella* sp colonies and maintain the total of *Lactobacillus* colonies in the small intestines of broiler chicken.

Keywords: Broiler, fermentation, immersion, Padina australis, total of bacterial colonies

The potential of coconut haustorium (*Cocos nucifera* L.) phytobiotics as antimicrobial for poultry

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Abstract. This study aims to explore the potential of coconut haustorium (*Cocos nucifera* L.) as an antimicrobial phytobiotic for poultry through phytochemical contains to determine the active compounds. The research method involved measuring the levels of saponins, flavonoids, phenols, tannins, and alkaloids using UV-Vis spectrophotometry. The analysis results showed that coconut haustorium contains 1099.89 mg/100g of saponins, 3115.37 mg/100g of flavonoids, 4440.03 mg/100g of phenols, 3708.80 mg/100g of tannins, and 27.87 mg/100g of alkaloids. The test results indicate that coconut haustorium contains active compounds with potential as an antimicrobial agent for poultry. In conclusion, coconut haustorium has potential as a natural phytobiotic for poultry, with its bioactive compounds supporting its role in enhancing poultry health and reducing dependence on synthetic antibiotics. Further development is needed to understand its doses, mechanisms of action and field applications.

6. Forage and Crop Science

Profile of macro minerals in forages and volcanic soils in the eruption-impacted areas: potential effects on mineral status of grazing cattle in volcanic mountains

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Abstract. The eruption of active volcanoes spews ash and other volcanic materials composed of various chemicals and minerals. The mineral composition of volcanic soils in the eruption-impacted areas might vary depending on magma formation, eruption characteristics, local environmental conditions, and farming practices, resulting in different effects on forage plants and livestock animals. The present research aimed to study the mineral status of soil and forages in Indonesia's eruption-impacted areas of active volcanic mounts and to discuss the possible effects of its deficiency in grazing cattle. Samples of soils and forage plants were collected in the eruption-impacted areas of five active volcanoes located on five different islands: Agung Mount (Bali), Gamalama (North Maluku), Lokon (Noth Sulawesi), Merapi (Central Java), and Sinabung (North Sumatra). Samples were taken at three distances from the eruption centers: near, moderate, and far. The samples were analyzed for the macro minerals of calcium (Ca), phosphor (P), magnesium (Mg), potassium (K), sodium (Na), and sulfur (S). Results found that mineral concentration soils and forages varied among the volcanoes. The soils' Ca, Mg, Na, and S varied from 0.38-0.87, 0.07-0,71, 0,09-0,14, and 0.01-0.07%, respectively. The potential P and Mg ranged from 48.83-174.87 and 23.99-39.97 mg/100 g, respectively. Forage plants had a high content of K (1.55-4.21%), favorable concentration of Ca (0.52-0.76 ppm), Mg (0.26-0.39%), and S (0.12-065%), but low in P (0.09-0.36%) and Na (0.09-0.12%). Except for P and S, there was quite a low correlation between soil minerals and the forages. In conclusion, the mineral concentration of soil and forages in the eruption-impacted areas varied amongst the volcanoes. The mineral composition of forages was less correlated with those in the soil. The essential minerals more likely to be deficient for cattle grazing in eruption-impacted areas are P and Na.

Keywords: active volcanoes, eruption, mineral status, volcanic soil, wild forage

Nutritional profile and silage quality of avocado seed meal as herbal feed additive enriched with molasses

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Abstract. Avocado seed meal, a part of the avocado plant that is rich in antioxidants and various other nutrient and non-nutrient substances, has great potential to be utilized as an herbal additive in animal feed. This study aims to determine the effect of molasses addition on the nutrient profile and quality of avocado seed meal silage. The control treatment (P1) used plain avocado seed flour, while the experimental treatments (P2, P3, P4, and P5) incorporated increasing molasses concentrations of 1%, 1.50%, 2%, and 2.50% of dry matter, respectively. All treatments were silaged for 30 days at room temperature. Key parameters measured were nutrient content, temperature, pH, fungal growth, physical and fresh silage quality, dry matter, dry matter loss, and Fleigh value. The data obtained were analyzed based on analysis of variance, differences in parameter values between treatments were further tested with DMRT at the 5% significance level. Results indicated that molasses significantly enhanced the silage's nutrient content and improved its physical and fresh quality by optimizing temperature, reducing dry matter loss, and increasing Fleigh value ($P<0.05$). The conclusion of this study suggests that adding 2.50% molasses can produce the highest-quality avocado seed meal silage as an optimal herbal feed for livestock.

Germination rate of several tree leguminosa on ultisol soil

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Abstract. Ultisol soil is famous for its low nutrient content, so efforts are needed to increase the nutrients of ultisol soil to achieve an increase in plant production. One of them is by planting tree leguminos, tree legumnosa is a long-lived or perennial plant and tree leguminosa also has the ability to form nodules. With the potential of tree leguminos, it will provide efficiency in increasing soil nutrients ultisol. For this reason, the germination rate of tree leguminosa on ultisol soil is required. The medium used is ultisol soil and sand, with a ratio of 1 : 1. The research was carried out descriptively using 5 types of leguminosa, namely red kaliandra; white kaliandra; red turi; white turi and gamal. Each leguminosa uses 16 seeds. The results of the experiment from the germination of tree leguminosa were obtained from 16 lamtoro seeds, 8 germinated seeds, 7 germinated white kaliandra, 6 germinated red kaliandra, and 3 germinated white turi, while none of the gamal seeds germinated. The seeds that germinate the fastest are red kaliandra and lamtoro which are the 2nd and 3rd days.

Keywords: tree leguminosa, germination rate, soil ultisol

Characteristics of lamtoro nodules (*Leucaena leucephala*) at 5 months in ultisol soil

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Abstract. This study aims to determine the effectiveness of the root nodules of lamtoro plants (*Leucaena leucephala*) at the age of 5 months, namely in advanced vegetative vases. The medium used is ultisol soil. The formation of root nodules proves the existence of symbiosis between rhizobium bacteria and leguminosa. The method used was a descriptive method using 15 plants. The measured parameters are the number of root nodules, the size of the root nodules, the location of the root nodules, the shape of the root nodules, the color of the root nodules, and the percentage of effective root nodules. As a result, the number of root nodules varies, the size of the root nodules is irregular, the location of the root nodules on the branches, the shape of the root nodules varies, the color of the root nodules is brown. The effectiveness of root nodules decreases at the age of 5 months, the root nodules are already brown, indicating the occurrence of sanescen. In conclusion, at the stage of advanced vegetative growth, nutrient intake is needed either by fertilization or through inoculation

Keywords: lamtoro (*Leucaena leucechopala*), effectiveness of root nodules, soil ultisol

Enhanced growth and nodulation of *Clitoria ternatea* using cow dung bokashi

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Abstract. The study was designed to determine the most effective dose of cow dung bokashi in compasrison to inorganic fertilizers for promoting the growth and nodulation of *Clitoria ternatea*. The research utilized a complete randomized design with five treatments; P0: inorganic fertilizer, P1: 5 ton/ha bokashi, P2:10 ton/ha bokashi, P3: 15 ton/ha bokashi, and P4: 20 ton/ha. The observed variables were plant height, root length, number of root nodules, and active nodules percentage. The results revealed that the treatment had a significant effect on all variables. These findings have practical implications, suggesting that the 20 ton/ha dose of bokashi can produce similar plant growth results to inorganic fertilizers and enhance to inorganic fertilizers nodulation in Clitoria ternatea, thereby offering a sustainable alternative.

Keywords: Bokashi, *Clitoria ternatea*, cow dung, growth, nodulation

Assessing the impact of defoliation age on growth and production of king grass in ultisol soil

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Abstract. King grass production in Indonesia can be increased by extending the defoliation period because king grass is short day plant so its vegetative growth is longer. This study aims to determine the optimal defoliation age in terms of growth and production of king grass (*Pennisetum purpuphoides*) at the first harvest in ultisol soil. Treatments include A: defoliation 60 day after planting (DAP); B: defoliation 90 DAP; C: defoliation 120 DAP. Parameters observed were growth of king grass (plant height, number of tiller and number of leaf) and fresh production of king grass. This research was conducted experimentally using a completely randomized design (CRD) consisting of three treatments with four replications. The results showed that treatments on growth had a very significant effect ($P<0.01$) on plant height, number of tillers, number of leaf and fresh production. Based on the results of the study, it can be concluded that the optimum growth and production of king grass cultivated in ultisol soil is at the age of 90 DAP defoliation, with plant height is 279.86, number of tiller is 12.26, number of leaf is 14.56 and fresh production is 60.28 ton/ha/harvest.

Keywords*:* Defoliation age, King Grass, *Pennisetum purpuphoides,* Ultisol

Administration of rabbit urine POC concentration on the production of odot grass (*Pennisetum purpureum* cv. Mott)

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Abstract. This research aims to determine the effect of giving rabbit urine POC on odot grass production such as plant height, leaf width, fresh production, number of tillers, and leaf length. Forage is the main feed component most needed by ruminant livestock, and in general forage can be divided into 3 groups, namely grass (Gramineae), legumes (Leguminoseae) and non-grass. Feed is the most important factor in livestock raising, the success or failure of a livestock business is largely determined by the feed provided. One of the forages for livestock is odot grass, where odot grass can be reproduced using a vegetative method, namely by using the branches that grow best. This research used the experimental method with a completely randomized design (CRD) consisting of 5 treatments and 4 groups as replications. The treatments that will be given are as follows: P1: No rabbit urine fertilizer, P2: Pure rabbit urine (10%), P3: POC rabbit urine (10%), P4: POC rabbit urine (15%), P5: POC urine rabbit (20%). The variables observed were fresh production (kg), plant height (cm), number of tillers (stems), leaf width (cm), leaf length (cm). The results and discussion of the results of this research show that the highest results were in treatment P5 (20% POC rabbit urine) where fresh production of odot grass was 2.5 kg per hill, plant height 120.5 cm, number of saplings 27.75 stems, leaf width 4.75 cm and leaf length 69.5 cm. Conclusion: Giving rabbit urine POC showed no significant effect on fresh production and plant height but had a very real effect on the number of tillers, leaf width and leaf length of odot grass.

Keywords: POC, Odot Grass, Urine, Rabbits, Production


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