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"Development of animal health and production for improving the sustainability of livestock farming in the integrated agriculture systems"

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Foreword

The proceeding is a produced from papers collected during the the Mini Workshop of Southeast Asia Germany Alumni Network (SEAG) on the topic of : "Development of Animal Health and Production for Improving the Sustainability of Livestock Farming in the Integrated Agriculture Systems" held in Bogor-Indonesia on April 25-26th, 2005

Nineteen selected papers were presented in this proceeding from 33 participants which coming from 13 universities in Indonesia and 1 from Thailand.

We would like to highly appreciate and deeply thanks to DAAD for the financial support as a main sponsorship in this Mini Workshop that it made the program very successfully conducted. The same thing is also going to SEAG-Indonesia who fully supported this event as one of their scientific program.

Finally, we would like to thanks to all Steering and Organizing Committee who work very hard for the symposium including the preparation and finalization of this proceeding.

Preface

In the development of integrated animal health and production for improving the sustainability of livestock farming in the integrated agriculture systems several factor has been involved. For the sustainability in the animal health sector, three main issues has been recognized, there were 1) strategic animal diseases (13 animal diseases), 2) animal and environment health and 3) improvement of reproductive performance in order to increase the livestock population. To solving the problem of animal health, the main factor that should be prioritises is an animal health technology which including development and implementation of indigenous knowledge; phytomedicine, vaccine technology, bio-security and others related factors.

In the livestock production sector, the main focus is on the sustainability of integrated livestock production. The other problem is the condition of low consumption on the animal protein; animal protein is the essential food substance that cannot be substitute by other non-animal protein. The important component for the development of livestock production are good reproduction and breeding system, development and implementation of local resource of animal feed, restructuring of livestock industry, post harvest technology, veterinary public health (food safety) including market regulation.

In the integrated agriculture, agro-sylvo-pastoral (ASP) system is to believe as one activity that could reduce poverty, increasing farmer income as well as increasing the condition of environment. The strategy that will be implement is the establishing of the ASP institution, implementation of good management and local knowledge as well as improving the productivity. The problem that still inhibit on the implementation of ASP is that there are some differences in the perception on ASP between the sector of agriculture, animal husbandry and forestry, therefore the same perception between the three sectors in the integrated using of forest for agriculture and livestock activities, including the reclamation of former mining land, plantation and fresh water fisheries should be taken as a priority.

There are 4 important points resulted from the Miniworkshop :
1. Recommendations resulted from the Miniworkshop will be deliver to the policy maker, farmers and others related institutions.
2. The points resulted from the Miniworkshop is hoping could be used as a recommendation in the Livestock and Animal Health Regulation that now is on the way of preparation and debate in the Parliament.
3. Action plan from this Miniworkshop will be taken on the kind of proposal and will be submit to the central and local government as well as international institution especially in the Germany or others countries and will be coordinated by the SEAG Coordinator as one of SEAG activity.
4. The next propose activity will be a miniworkshop on the "Development and Implementation of Indigenous Knowledge" in Manado or Kupang on the middle of 2006 or 2007.

Organizing Committee

January, 2006

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Physiological Status of Indoor Sheep in the Tropical Rain Forest (HPGW) Environment

Agik Suprayogi[1] and D.A. Astuti[1]

Abstract

As an attempt to improve the animal health and production, agrosilvopastural (ASP) system has been introduced in the tropical countries. ASP system usually was established as a pasture of animals in the agriculture land or forestry environment, otherwise development ASP system with indoor animal in the tropical rain forest environment are still scare. Establishing of the animal production system in the tropical forest environment has a certain consequence related to the influence of physiological status and animal health. The objective of the study is to evaluate the physiological status of indoor sheep in the Gunung Walat Education Forest (HPGW)-IPB, Sukabumi-west Java-Indonesia which has tropical rain forest climatic type. Ten Javanese thin-tailed ewes, average body weight of 25 kg, in the indoor stable system were feed and water ad libitum under 24 hours continues monitoring of stable humidity and temperature. Measurement of hearth rate, respiration rate, and body temperature were carrying out to the each ewe in the morning and afternoon. This study reveals that the average humidity in the stable a day in the HPGW-IPB is (97.52 ± 4.87) % rel. and average temperature a day is (22.26 ± 1.62) ^oC. The consequence of bioclimatic condition is directly to the physiological status of the ewes, such as hearth rate by (71.00 ± 10.51), respiration rate by (29.25 ± 5.39) and body temperature by (38.73 ± 0.56) ^oC. The average humidity a day in the stable shows uncomfortable for the animal health and production system, although the stable temperature is still comfortable enough. The condition is dominantly influenced by density and diversity of vegetation in the tropical rain forest. The high humidity in the stable affects enhancing of respiration rate of the ewes, although hearth rate and body temperature tend to the normal physiological value.

Keywords: Animal physiology, bioclimatic, sheep, forest

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Introduction

Utilization of natural resource and enhancing its added values denote as a new strategy to overcome the national crisis of food and industry material in Indonesia. Kinds of agribusiness formation have already executed to optimize the benefit of the natural resource in the forest land area. Therefore the forest land use management has to be encouraged to increase an added values and sustainability of forest natural resource. One of forest land use management is Agrosilvopastural (ASP) system. ASP system is the forest land use management which integrates between forest wood, crop and animal production. The integration has to be maintained as an attempt to gain the sustainable productivity and the most important it should be mutual and synergistic interaction to maintain the sustainable environment (Buck *et al.*, 1999).

The existence of the animal production activities in its ecosystem (forest environment) has been paid an attention in the veterinary and animal sciences fields. It due to the consequence of possible environment stress occurred, although the existence of animal could maintain the sustainability of agriculture and forest production through the utilization of animal excreta. A-biotic environment are the key factor for emerging physiological stress on the animal, especially temperature, humidity, rain fall (Yousef, 1984; Chantalakhana and Skunmun, 2002), wind, and sun radiation (Randall, 2002).

Animal production activities using the ASP system have to be directed on the maintaining of environment condition to be comfortable climate for animal (Singh, 2003). Optimum sheep productivity in the tropical region known that it could be reached on the temperature of $13^0C - 18^0C$ and humidity of 60 - 70% rel. (Dowell, 1972). The range of effective environment temperature which an animal can be reached optimum productivity without changing its basal metabolism to maintain constant body temperature (Thermoneutral Zone) is $10^0C - 20^0C$ (Collier, 1985) and critical temperature with decreasing feed intake and milk yield in cattle occurred above 30^oC (McDowell, 1981). Williamson and Payne (1977) reported that the ideal microclimate for livestock in the tropic was temperature of $18^0C - 21^0C$ and humidity of 50% rel. – 60% rel.. Disturbance of health and production occasionally emerge on the suffering animal caused by heat and humidity stress (Singh, 2003). The microclimate in the region could influence the physiological condition of the animal. French (1970) reported that sheep and goat placed in the heat stress environment for long time could affect the thin performance, it caused by reduce body fat and fall of fur. Body temperature regulation on the mammalian and poultry are always controlled under constant level (homeotermis) for maintaining optimal physiological condition (Sturkie, 1981). The homeiotermis could be meintained due to the balancing of metabolism heat production and heat loss to the environment (Cunningham, 2002). Air temperature and solar radiation affect the ability of animal to lose heat by convection, conduction, radiation; while relative humidity influences evaporative heat loss (Coiller, 1985).

The *Gunung Walat Education Forest* (HPGW)-IPB, located in Sukabumi-west Java-Indonesia on the 726 m above sea level altitude, with the kind of planted and wild canopy forest vegetation. *Agathis lorantifolia* (damar), *Pinus merkusii* (tusam), *Schima wallichii* (puspa), and *alpingia excelsa* (rasamala) are available dominant plantation in HPGW (Eli, 2002). The altitude and available vegetation condition in HPGW lead to influencing the microclimate in the region because of high level sun radiation absorption in the region (Yousef, 1984). Establishment of animal production system in the region (HPGW) pastures (outdoor) or caged (indoor) system has certain

consequence related to its influence of the physiological status and animal health. Up to now, still lack of information according to the physiological status of animal under influencing microclimate condition in tropical rain forest climatic type.

The objective of the study is to evaluate the physiological status of indoor sheep (hearth rate, respiration rate, and body temperature) in the HPGW-IPB, which has tropical rain forest climatic type.

Materials and Methods

The measurement of parameters such as hearth rate, respiration rate, and body temperature were conducted on the 10 Javanese thin-tailed ewes which average body weight of 25 kg. Simultaneously, the measurement of climatology dates also was executed in HPGW region on day and date of 19.03.2005. All sheep were caged in the indoor system approximately 75 m^2 wide which canopy forest vegetation surrounding such as *Agathis lorantifolia* (damar). This stable is made by concrete wall and flour, corrugated asbestos roof, and approximately 3.25 m high from flour to the roof. Sheep were fed with 60% of mix grass and 40% of soy bean curd waste in different amount depend on body weigh.

Measurement of physiological parameters

Some physiological parameters such as hearth rate (beat/minute), respiration rate (inspiration/minute), and body temperature (^{o}C) were measured using stethoscope, movement of thorax wall, and body thermometer respectively in this study. The measurement was carried out two times a day in the morning (08.00 – 09.00) and in the afternoon (17.00 – 18.00).

Measurement of climatology parameters

Two important parameters such as environment temperature (^{o}C) and humidity (%rel.) in the indoor and outdoor were measured using automatic term-hygrograph for 24 hours. Recorded graphs obtained was analyzed and calculated to know the averages of temperature and humidity per day.

Results and Disccusion

This study reveals that heart rate and body temperature on indoor sheep in HPGW region are still in the normal range of physiological status which respectively is (70.80 $\pm$ 10.65) beat/min and (38.73 $\pm$ 0.56) inspiration/min. Otherwise, abnormal respiration rate values of the sheep occurred (above level from normal values) in this study, (29.25 $\pm$ 5.39) inspiration/min. The physiological status of the indoor sheep in HPGW region can be seen on Table 1.

Table 1. The physiological status of the indoor sheep in HPGW region

Physiological Parameter	Values of Sheep in HPGW	Normal Values of Sheep*	Status
Heart Rate (beat/min)	70.80 $\pm$ 10.65	70 - 80	Normal
Respiration (inspiration/min)	29.25 $\pm$ 5.39	15 - 25	Abnormal
Body Temperature (^{o}C)	38.73 $\pm$ 0.56	39,2 - 40	Normal

*: Smith and Mangkoewidjojo (1988)

The microclimate condition in HPGW region at the time are measured in the indoor system and outdoor system, which shows that humidity in both systems are extremely in above level from ideal humidity for animal in the tropic, respectively are (96.40 $\pm$ 6.95)% rel. and (94.92 $\pm$ 8.07)% rel.. Similar conditions with environmental temperature which indicate the slightly above level from thermoneutral zone, respectively are (22.64 $\pm$ 1.25)$^{\circ}$C and (26.24 $\pm$ 2.44) $^{\circ}$C. The microclimate condition in HPGW at the time compared to the thermoneutral zone and ideal humidity for animal in the tropics showed in the Table 2.

Considering of the physiological and microclimate dates above, respiration rate abnormality occurring on the indoor sheep could be caused by high humidity level in the HPGW environment. Therefore the vapor pressure gradient are limited, consequently it influences evaporative heat lose. According to the homeiotermis for mintaining optimal physiological condition, the respiration rate have to be increased. Air temperature in the HPGW are still convenience for survival especially in the indoor system, although the dates show the slightly above lavel than thermoneutral zone. In the HPGW microclimate condition, the indoor sheep extremely suffering by humidity stress and its reveal the uncomfortable for enrichment poductivity. The high humidity level in HPGW could be occurred might be as a concequency of density and diversity of vegetation in HPGW tropical rain forest.

Table 2. The microclimate condition in HPGW compared to the thermoneutral zone and ideal humidity in the tropic

Bioclimatology Parameter		Values in HPGW	Thermoneutral Zone ($^{\circ}$C)	Ideal Humidity in the Tropic (% rel.)
Indoor System	Temperature ($^{\circ}$C)	22.64 $\pm$ 1.25[a]		
	Humidity (% rel.)	96.40 $\pm$ 6.95[a]	$(10 - 20)$[1]	$(60 - 70)$[2] $(50 - 60)$[3]
Outdoor System	Temperature ($^{\circ}$C)	26.24 $\pm$ 2.44[b]		
	Humidity (% rel.)	94.92 $\pm$ 8.07[a]		

Means with different superscripts (a, b) in the same column are significantly different (P<0.05)
[1]: McDowell (1981)
[2]: Dowell (1972)
[3]: Williamson and Payne (1977)

Conclusion

Physiological status of indoor sheep in the tropical rain forest (HPGW) environment show the extremely suffering by humidity stress, therefore respiration rate abnormality could be occurred. This microclimate condition indicate the uncomfortable for enrichment productivity on the animal production system, but the average humidity and

temperature in the indoor sheep still convenience for survival. The condition is dominantly influenced by density and diversity of vegetation in the tropical rain forest.

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The Role of Reproductive Health Management on Dairy and Beef Cattle Farming System

Mohamad Agus Setiadi [2]

Abstract

The reproductive efficiency in both dairy and beef cattle farm are strongly influenced by the percentage of cattle that can calve each year. On the other hand that reproductive efficiency will be achieved by one calf per cow per year. It is therefore it is only a short time that the animal should be pregnant again after calving. Many factors can contribute in achieving these goals such as reproductive health management and recording system. Each an individual reproductive disorder and mismanagement will prolong calving interval that will hamper in achieving reproductive efficiency. The farmer normally are not aware with the reproductive disorder since the animal is not visibly ill, still have a normal milk production, normal growth, good appetite and even the animal still can help the farmer in the field. Therefore it is necessary some basic reproductive knowledge should be mastered by the farmer such to identify some signs of reproductive disorder and to do best management by keeping a good recording system. Unfortunately reproductive efficiency approaching 100% is not possible even with the best management. However, poor management can result in drastic decreases in reproductive efficiency. In conclusion, good management and records are useful tool as early warning system to identify and to eliminate some reproductive disorders to improve reproductive efficiency.

Key words : *Reproductive health, management, cattle, efficiency*

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Introduction

Indonesia is a still the largest imported of live beef cattle from Australia (Anonimous, 2004). This data indicated that in one side Indonesia has a potential as big market for meat consumption since it has big population and on the other side it is represent that the reproductive efficiency on farm animals is not fully achieved. Based on these data, the increasing animal population is very urgent to fulfill meat consumption.

To increase the number of animal population several factors could be involved. One of the factors that involve in increasing animal population is reproductive health management. Approach of the reproductive management involve of collaboration between veterinarian and farmer as client. It is therefore that the objective of reproductive health management is to maximize client profit (Rawson, 1986). This goal will be realized if the results of the program can increase the number of animal that can calve per year, decrease of the number of reproductive failures, increase the number of quality herd replacement, increase of the herd number in peak production yearly. Criteria such as interval to first estrus, interval to first breeding, days open, first service conception rate, service per conception, calving interval and others are often used as measures of the reproductive efficiency (Rice, 1986).

Beef cattle are not as intensively managed and many beef operations with low input – low output management used only the number of calves weaned or sold as their measure of reproduction and production. A cow must have a calf every 12 months to be an efficient production unit. The very nature of a beef cow's reproductive physiology is a major obstacle to that 12 month goal. The gestation period average is 283 days, so a cow must become pregnant by 80 days after calving to produce a calf every 12 months.

Dairy Cattle Reproductive Health Management

Reproductive health is crucial problem that should be overcome to achieve an optimal reproductive efficiency. However, neither farmer nor owner could not well managed to know all reproductive failures. Reproductive disorders are not always visible clearly. Due to this problem, the overcoming of reproductive disorder as soon as possible has restriction since no visibly ill of animal, have a still good appetite even that animal can still work in field.

Reproductive failures manifestation have a variation, such the animal has not shown estrus cycle (anestrus), have a weak estrus sign, have a frequent estrous (nymphomania) even that animal have a normal estrus cycle such in repeat breeder cow. Due to difficulties to detect the reproductive disorder, the minimum of knowledge of physiological sign and abnormal sign should be mastered by the farmer or livestock keeper to eliminate economical loses as early as possible. Although it is impossible the farmer or livestock keeper know all the reproductive disorder sign, but a minimum knowledge are necessary to achieve reproductive efficiency. It is therefore that knowledge of reproductive health management should be learned.

Beef Cattle Reproductive Health Management

As mentioned before, that beef cattle are not as intensively managed. It is therefore, it is high risk in beef cattle management to face reproductive failure. Due to poor management system, the possibility of reproductive disorders are met in beef cattle.

Additionally, beef cattle almost shown a weak estrous sign. Therefore, every phase of breeding, calving and nursing must be managed at maximum efficiency to avoid loss of beef production and high reproduction goals must be set to achieve production goal (Rice 1986).

Approach of Reproductive Health Management

The objective of an organized approach to reproductive management initiated and directed by the veterinarian is to maximize client profit. This goal will be realized if the results of the program are able to increase the number of quality herd replacements, decrease the number reproductive failures and in crease the percentage of the herd in peak production at any given time (Rawson, 1986).

Some guidelines for measuring reproductive efficiency are necessary in order to determine the effect of management practices. Some criterions are normally used :

a. Service per conception
Service per conception is determined on a herd or flock basis by dividing total service by the number pregnancies. Although service per conception has a little value for a large population of animals, but is valid measurement for a single herd or an individual female

b. Calving Rate
Calving rate is calculated by dividing the total number of cows bred by the number that calved. This measurement of reproductive efficiency is frequently inflated by culling known open females after the breeding seasson and using reminder in the calculation (Bearden and Fuquay, 1997).

c. Nonreturn rate
 The Nonreturn rates is the percentage of the females that do not return to estrus or receive a second service within a designated time interval. Nonreturn rates are always higher than actual pregnancy rates because some non pregnant cows are not reinseminated. Some are bred naturally and some are culled or die without being re inseminated. Even though Nonreturn rates are relative, they do provide valuable information on males used in artificial insemination.

Several essential steps in application reproductive health management to achieve an optimal reproductive efficiency are:

a. Client Education
The client must be made aware that all increase in reproductive efficiency, hence profit, depend on improving his management skills. It therefore minimum knowledge in reproductive and health management should be mastered by farmer or livestock keeper.

b. Routine examination of all eligible animals
The following animals should be checked routinely such as (1). 14 days or more after abnormal calving, (2). Cow with abnormal discharges,(3). Cow with abnormal estrous cycles, (4). not observed in estrus after 60 days calving, (5). Any cow bred or more times, (6). All cow bred 32 days or more ago that did not return to estrus to check pregnancy

c. Collection and processing data

A simple and accurate method of collecting and processing herd reproductive information must be established. A complete set of record is absolutely essential for good reproductive management. Records which should be kept are: (1). Permanent identification, (2) parturition date, (3) date of first estrus after parturition and all subsequent estrous dates, (4) breeding dates with identification of service sire, (5) results of preliminary pregnancy checks between 35 and 40 days post breeding, (6) results of final pregnancy check at 60 days, (7) calculated due date, (8) date to turn dry in dairy cattle, (9) actual parturition date and (10) identification sex and disposition of offspring (Bearden and Fuquay, 1997)

d. Assessment of reproductive performance

Evaluation of the herd reproductive data enables one to establish a herd baseline. The terminal indicator of herd reproduction is the calving interval. When large number animals are inseminated at the incorrect time, the estrus detection rate is poor, this generally reflecting a poor standard of herd management (Noakes, 1996). It is therefore accurate diagnosis of estrus is essential for proper timing of breeding.

e. Establishment of herd reproductive goals

Some reproductive goals must be achieved by well management such as: (1) a 12 month calving interval, (2) 85 days open, (3) 1.6 service per conception, (4) 60% first service conception rate, (5) 85% of cows observed in estrus and recorded by 60 days fresh, (6) 90% cow bred between 60 and 84 days post partus and (7) 90% of heifers calving at 24 month of age.

f. Implementation of management changes to obtain goals

After reproductive summary has been produced and evaluated management changes may be necessary to reach acceptable goals. Records are absolutely essential for early detection of reproductive problem. Early detection is necessary for two reasons: (1) problems are much easier to correct when detected early and (2) problem corrected early results in less loss of reproductive time and money (Bearden and Fuquay, 1997). Evaluation of the reproductive summary allows attention to be focused on problem areas such as cow nutrition, lactation nutrition, calving environment, periparturient procedures, breeding management, estrous detection, timing of insemination, insemination techniques, bull management, venereal disease or heifer management (Rawson, 1986).

g. Monitoring herd response

The key to success in a complete reproductive program is frequent continous monitoring of current values. Regular re-evaluation of calving interval, days open, first service conception rate, service per conception, days to first service and age at first freshening provide basis for recommendation and management changes made in pursuit of maximal productivity.

Conclusions

To achieved an optimal reproductive efficiency a minimum knowledge of reproductive health management to detect reproductive failures must be mastered by a farmer or livestock keeper. Therefore, the collaboration between farmer or livestock keeper with the veterinarian are required in achieving reproductive efficiency.

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Tripartite Cooperation: A Model for Developing the Sustainability of Peranakan Etawah Goat Production In Indonesia

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Abstract

A model for developing the sustainability of Peranakan Etawah goat production in Indonesia by tripartite cooperation presented in this paper. Tripartite cooperation involving university, local government, and industry/community could build partnership for addressing local and national strategic issues that in turn improves national competitiveness. University, local government and industry have to commit of funding that reflects its commitment for running the project and its sustainability. In term of developing the sustainability of Peranakan Etawah Goat production, Jenderal Soedirman University put up collaboration with the Peranakan Etawah Goat Ras Kaligesing Breeders Association and Local Government Purworejo. Design of a model of tripartite cooperation consist of objectives, justification, methodology, and expected results are discussed.

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Introduction

The improved credibility is essential for educational development. Therefore, the credibility has to be sustained by several approaches such as developing cooperation with local government and industry. Improved credibility enable the university to increase its role in the community. The role is widely open since government policy on decentralization and autonomy of local government. On the other hand, autonomy provides more opportunity to local government to improve its capability in managing human and natural resources for sustainable development in its area. These clearly stated in the Undang-undang No. 18/2003 tentang Sistem Nasional Penelitian Pengembang dan Penerapan IPTEKS. This Act states that: *"Pemerintah Pusat dan PEMDA wajib mengalokasikan anggaran yang memadai untuk memacu akselerasi P3 IPTEK. Badan Usaha diminta mengalokasikan sebagian pendapatannya untuk meningkatkan kemampuan perekayasaan, inovasi dan difusi teknologi dalam meningkatkan kinerja produksi dan daya saing barang atau jasa yang dihasilkan".*

The university does not only play essential role in government policy development but also in industrial development. The expertise available in the university should be employed for the shake of industry and government's interest. Hence, competences should be developed by means of tripartite cooperation between university, government, and industry. This initiative so called "tripartite cooperation initiative for sustainability of quality improvement (TCI-SQI).

In line with New Paradigm of Higher Educational 2003-2010, involvement of university in cooperation with local government and industry is strongly encouraged. The cooperation involving three parties (tripartite cooperation) could build partnership for addressing local and national strategic issues that in turn improves national competitiveness.

The main goal of Tripartite Cooperation Initiative for Sustainability of Quality Improvement (TCI-SQI) is to establish knowledge based community. The support provided through this project should be used for establishment or development of existing cooperation so that the goal and objective of the cooperation can be achieved. The support should be in such a way that it will create a significant added value and positive impact to the proposing parties (university, local government, and industry). University, local government and industry have to commit of funding that reflects its commitment for running the project and its sustainability. The proposing project should demonstrate their commitment in the program by a formal statement signed by respective rector, head of local government, and head of industry.

Project Proposed

Title
Improving Village Breeding Centre of Peranakan Etawah (PE) Goat and Local Government Policy

Objectives

The overall objective of the project is to contribute to the sector of livestock development in Indonesia especially to increase Peranakan Etawah (PE) goat population and to increase income of smallholder by improving keeping management and improving local government (regencial) policies on development of Peranakan Etawah Goats. The specific objectives of the project are (1) to establish a centre of information and technical services for local small-scale goat enterprises; (2) to conduct studies focused on policy reform, alleviating goat farmer's welfare, and PE trafficking and trading in order to conserve PE genetic resources in Kaligesing (3) to train local farmers with innovative technologies and skills (i.e. oestrus synchronization and artificial insemination, forage preservation technology); (4) to produce recommendations to the local authority relating to the development of Peranakan Etawah Goats in Purworejo Regency, and (5) to provide farmers with high quality does, bucks and forages.

Justification
The action of the project is intended to reform animal husbandry and breeding system management of PE resulting in increasing goat productivity that in turn improve income of small scale goat enterprises. Activities such as seminars and studies on policy reform, alleviating goat farmers welfare and local regulation focused on PE trafficking and trading will be conducted. The output of the activities will be submitted to the local authority as recommendation to improve local government policy. The improved local government policy will be favourable to PE development. Establishment of Information and Technical Service Centre and training on innovative applicable technologies are expected to encourage farmers to conduct better management practices. Thus, this will lead to increase productivity and generate more income.

Methodology

The project will be implemented through comprehensive trainings, seminar-cum workshop and studies followed by grant awarding to raise farmer's motivation. The training is addressed to groups of small-scale goat enterprises (farmers). The methods of training will be in the form as follows: Informal demonstration within the community, Practical and brief and take place in a familiar setting, Learning by doing, Regular meeting of a group and during a special organized training course, in small neighborhood groups, and larger village groups.

Expected results

The situation of target groups will be improved over two activities, namely; (1) training on animal husbandry and breeding management; (2) training on group dynamics; using qualified expert and graduates from European universities. Besides, farmers will be provided with: (1) centre of information and technical services; (2) high quality bucks

and doe; and (3) good quality forages. Improved technical and management capacities finally result in increasing farmer's welfare.

The contents of government policy on the development of Peranakan Etawah will be reviewed in the seminar. The participants of seminar are expected to be able to identify less conducive policy and to recommend changes if necessary.

Technical and management capacities of the farmers will be improved over management training on animal husbandry and group dynamics expected to better group management (i.e. its motivation, functioning, organizing, planning, actuating and controlling), in addition to financial management, grant award will strengthen small-scale goat enterprises and group capital. The grant will be awarded in the form of high quality does and bucks. Those who receive does and bucks are subjected to breed them. The offspring breeding management along with group dynamics. Training on animal husbandry and breeding management will lead to better husbandry practices (breeding system, feeding, husbandry daily routine and diseases control) whereas training on are then distributed to other new groups. Thus, the grant will foster the establishment of new groups in the area. Finally, number of high quality does and bucks in the area will be increased.

Conclussion

The sustainability of Peranakan Etawah goat production could be developed by a model of Tripartite cooperation between university, local government and industry. The role of parties involved in cooperation in achieving the goal and objective must be taken as one of the prime evaluation criteria in providing support of this project. Monitoring and evaluation is the important part of program management in order to assure that the project implementation could meet with the designed target. Monitoring and evaluation scheme should clearly describe and promote the efficiency and effectiveness of resource utilization during program lifetime. In the proposed project, evaluation will be conducted three times a year (four monthly evaluation). Each evaluation period using progress report that explain the achievement of each activity, i.e. training, seminar, and studies. Evaluation will be based on judgment between baseline indicators, target and its level of achievement.

In Vitro Anti-Proliferation and Anti-Invasion Activities of the Combination Between Recombinant Canine Interferon (rCaIFN) with *Luffa cylindrica* Seed Methanol and Chloroform Extracts on MCM-B2 Derived Tumor Cell Line In Collagen Gel Medium

Bambang Pontjo Priosoeryanto[4], Gunanti[5], Hernomoadi Huminto[4] and Ros Sumarny[6]

Abstract

In vitro antiproliferation and anti-invasion activity of the combination between recombinant canine interferon (rCaIFN) and Luffa cylindrica seed methanol and chloroform extracts on MCM-B2 tumor cell lines was studied. The dose of the extract was 100 ppm for the chloroform extract and 350 ppm for the methanol extract, while the dose of rCaIFN was 10^4 IU/ml. The highest anti-proliferation activity of the methanol extract-rCaIFN combination was 84% while the chloroform extract-rCaIFN combination was 60%. The anti-invasion activity was detected on the semi solid medium of collagen gel system. There was an inhibition on the invasion activity of tumor cell to pass the collagen gel on both extract combinations even there was a variation on the inhibition capacity among them. The methanol extract gave the highest inhibition of the cell invasion activity. The ability of the inhibition of cell invasion activity was similar to that of anti-proliferation activity. The result of the present study indicated that the combination of Luffa cylindrica and rCaIFN have a synergetic effect on the inhibition of cell invasion and we concluded that this combination give a promising hope for the tumor disorders treatment. The mechanisms of this combination activity is still unclear and under investigation.

Key words: Anti-invasion, anti-proliferation, canine interferon, in vitro, tumor cells line, Luffa cylindrica

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Introduction

A tumors or neoplasm can be defined as a disturbance of growth characterized by excessive, abnormal and uncontrolled proliferation of transformed or altered tissue at one or more primary points within the host, and frequently at one or more metastatic sites. In the course of spontaneous development of tumor in human and animals, groups of neoplastic cells may be present for years before a tumor. Even after the neoplastic growth becomes detectable, it may remain at relatively stable size and degree of invasiveness for prolonged periods of time before its full malignant potential is manifest.

Interferon (IFNs) has a broad range antiviral immunomodulatory and anti-proliferation effects. In human case, the anti-tumor effects have led to the clinical use of IFN in a variety of diseases (Johnson *et al*, 1994). Recombinant canine interferon (rCaIFN) was produced in a recombinant Baculovirus system by using silkworm (*Bombyx mori*) (Priosoeryanto *et al,* 2000). Anti-proliferation and anti-invasion activities of rCaIFN has been clarified in our previous study (Gunanti *et al,* 2004)

Organics substances isolated from plants are known as metabolite substances. These natural metabolites are widely use in the medical, pharmacy, agro-chemistry and chemical industries (Harborne, 1996). In some Asian countries, metabolites derived from several plants are use for the alternative treatment or traditional medicine for some disorders in human and animals. Our previous studies (Harran *et al,* 2001; Priosoeryanto *et al,* 2001; Tumilisar *et al,* 2001) showed that some plants extracts had an in vitro anti-tumor activitiy by inhibited the tumor cell proliferation.

Indonesia is a tropical country which rich of medicinal plants. Indonesia Drug and Food Control Agency indicated that medicinal herbs were produced in Indonesia by 326 manufacturers and were used not less than 180 medicinal and aromatic plants. The total of raw materials consumption annually reach about 6.223 tons. The Agency was also counted that 45 important drugs in the USA are originated from tropical medicinal and aromatic plants, in fact, 14 plants species are coming from Indonesia. The big number of medicinal and aromatic plants species grow in Indonesia is an indicator that the land and climate conditions of Indonesia very potential for the cultivation development of medicinal and aromatic plants.

The aim of the present study is to elaborate the anti-invasion activity from *Luffa cylindrica* seed methanol and chloroform extracts combined with rCaIFN on the MCM-B2 tumor cell line in vitro, in order to find the potential anti-tumor drugs for medical purposes.

Materials and Methods

Extraction of the Plants
The extracts of *Luffa cylindrica* seed were prepared using methanol and chloroform according to the method of Anonymous, (1985). Briefly, 50 grams each of *Luffa cylindrica* seed powder were macerated using 500 ml of chloroform or methanol and kept for 5 days, and were then filtered. The wastes were dissolved into a sufficient amount of chloroform or methanol and were filtered until the total volume of extracts was 100 ml. The extracts were evaporated to get the desired concentrated filtrates and

were kept until use. Working concentrations of each extracts were made by dilution the extracts until the tested concentration was achieved.

Brine Shrimp Lethality Test
Ten larvae of *Artemia salina* on 12 vials each were used (3 concentrations of extracts and one control with 3 replicates). After 24 hours of extracts treatment, the dead *Artemia salina* was counted (Meyer *et al,* 1982). The data were processed statistically using Probit Test.

Anti-proliferation Activity Assay
The MCM-B2 cell lines (Priosoeryanto *et al*, 1995a) were cultured with the density of 10^3 cell/ml on the 24-well dish using a growth medium comprises from DMEM and 10% FCS (Priosoeryanto *et al*, 1995a; 2000). The tested dose of each extracts was determined after the LC_{50} of each extracts were recognized. The extracts were added to the culture dish (3 holes for each dose). For the control positive, anti-tumor commercially drugs Vinblastine was used. After the confluence of cell growth was achieved on the control negative dishes, the cells were harvested and the average of the total number of cells on each dishes were counted using a hemacytometer with Trypan Blue dye. The data were then analyzed to determine the anti-proliferation activity level.

Collagen Gel and Anti-invasion Assay
Collagen type I derived from porcine tendon (Cell matrix IA) was used. The gel was prepared according to the manufacturer recommendation and was then added with DME/F-12 medium, FCS and antibiotic. Collagen gel were stored in petri dishes with 0.3 cm in thick and kept in 37^oC, with 5% CO_2 for polimerization. After the gel was polimerized, single tumor-cell solution were added to the surface of the gel. Growth and invasion activities of the tumor cells were observe daily using phase-contrast microscope.
Data Analysis
All quantitative data were statistically analyze, while qualitative data were describe naratively according to Priosoeryanto *et al,* (2000).

Result and Discussion

Brine Shrimp Lethality Test
The LC_{50} for each plant extracts were 66.8287 ppm for chloroform extract and 141,22 ppm for methanol chloroform extract of *Luffa cylindrica*. Based on the LC_{50} we decided to use the dose for anti-proliferation and anti-invasion assays of the extract was 100 ppm for the chloroform extract and 350 ppm for the methanol extract.

Anti-proliferation Activity
The anti-proliferation activity was detected in all extracts combination with rCaIFN. In general, this anti-proliferation activity on the combination form was more higher compared to the extracts or rCaIFN alone. The degree of this activity on both extracts combination was varied. The highest anti-proliferation activity of the methanol extract-rCaIFN combination was 84%, while the chloroform extract-rCaIFN combination was 60% (Figure 1 & 2).

Figure 1. Anti-proliferation activity of combination between rCaIFN-Chloroform and rCaIFN-Methanol extracts of *Luffa cylindica* on MCM B2 cell lines.

There is no report on the activity of combination of IFN with plant extracts in order to treat tumor dissorder, even activity of the combination between IFN with comercially anti-tumor drugs has been reported before. Several inverstigator indicated that there was an increasing of anti-tumor activity on the combination between IFN with some anti-tumor substances such as Decarbazine, Vincristin, Bleomycin dan Lomustine (Pyrhoenen *et al,* 1992), Fluorouracil (Raderer and Scheihauer, 1995), Cisplatin and Retinoic Acid (Arbaje *et al,* 1993), Doxorubicin (Kardinal *et al,* 1993). On the other hand, apllication of IFN combine with other cytokines such as interleukin-2 (Escuider *et al,* 1993), tumor necrosis factor (Lasek *et al,* 1995) has been reported, and seem to increase the effect of anti-proliferative activity of IFN.

Priosoeryanto *et al,* (1994) indicated that cat interferon (recombinant feline interferon /rFeIFN) effectively suppressed the proliferation and colony-forming ability of feline cell lines in vitro. It was also shown that rFeIFN had activity against some canine neoplastic cell lines with dose-dependent and cell type-specific pattern (Priosoeryanto *et al,* 1995b; Tateyama *et al,* 1995). However, alteration of the cell components including receptor(s) for rFeIFN during prolonged culture might affect the sensitivity for rFeIFN in the various cell lines

Our previous study showed that natural canine interferon (CaIFN) or the recombinant (rCaIFN) (Priosoeryanto *et al,* 2000) singly or in combination with anti-tumor drugs such as Vincristin dan Doxorubicin were effectively inhibited the in vitro cell proliferation of the tumor-derived cell lines.
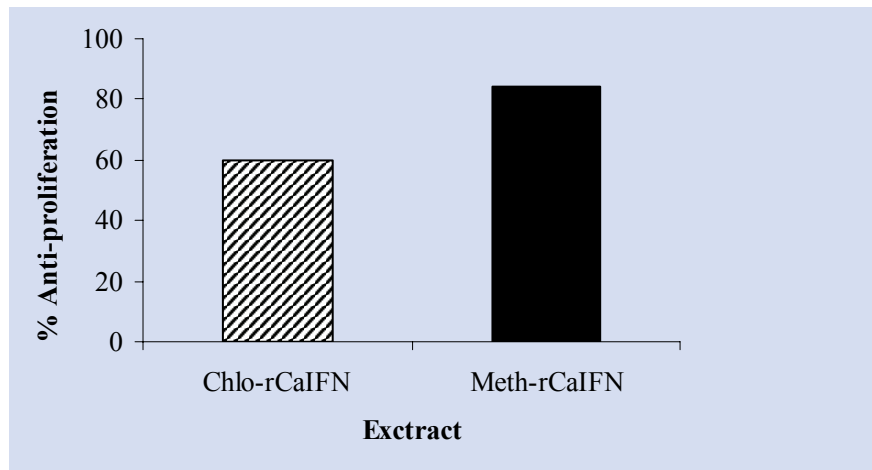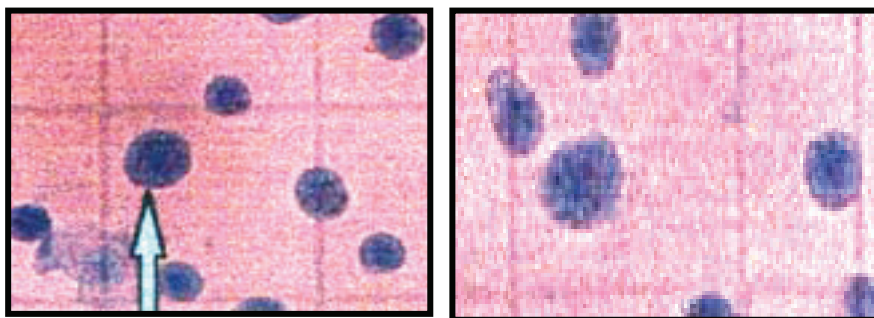
Figure 2. Anti-proliferation activity of combination between rCaIFN-Chloroform (left) and rCaIFN-Methanol (right) of *Luffa cylindrica* extracts on MCM B2 cell lines. Dark colour of round cells was a dead cell. (Hemacytometer with Tryphan Blue dye exclusion).

The method of cell growth on collagen gel in order to study the in vitro invasion mechanism has been done by several researcher previously (Liotta, *et al*, 1983; Nabeshima *et al*, 1986).   Observation on the invasion inhibition effect of MCM-B2 cells on the collagen gel system showed that in general there was an inhibition activity of the extracts comibned with rCaIFN (Figure 3). The level of this activity was varied among these two combinations even the methanol extracts-rCaIFN combination gave the highest inhibiton effect compared to the chloroform extract-rCaIFN. Our previous study using leaf extract of *Mussaenda philippica* also indicated the anti-invasion activity of MCM-B2 and K-562 derived-tumor cell lines on collagen gel system (Priosoeryanto *et al,* 2004).
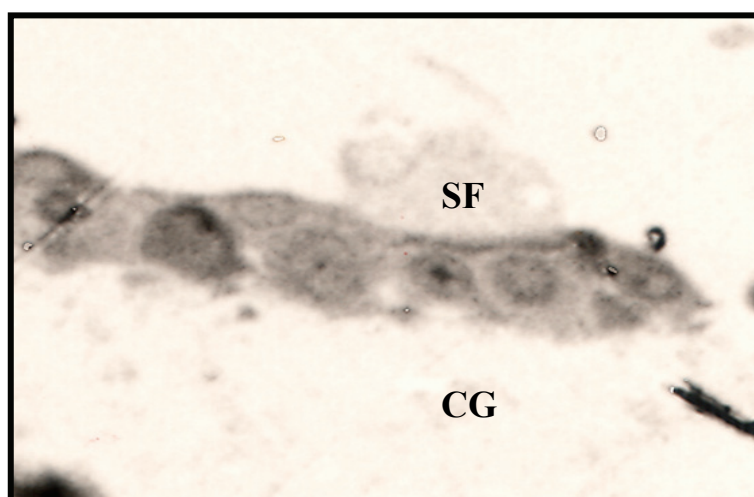
Figure 3. Anti-invasion activity of combination between rCaIFN-Methanol of *Luffa cylindrica* extracts on MCM B2 cell lines. The tumor cells were failed to penetrate to the collagen gel and were still on the surface of the gel. SF = surface, CG = Collagen gel. (Tryphan Blue dye exclusion).

Invasion is a process where one tumor cell type penetrated to the surrounding tissue where the cell type of the tissue is different from the invader tumor cell. Invasion is a complex and multi-step mechanisms involving several biochemistry and cellular factors of the host. Invasive carcinoma usually triggered by a step related to the infiltration process on the basal membrane that consisted of collagen and non-collagen fibers. Degradation of the collagen fiber plays an important role in the destruction of the proteins in the basal membrane (Priosoeryanto *et al,* 2004).   Most invasive and metastatic tumor cells posses these activity by produced several proteases enzymes.

Extracellular matric in the animal tissue is a mechanical barrier functioned as a mechanical inhibitor of the tumor cell invasion to the surrounding tissue. The invasion process is started with the degradation of extracellular matric by some proteolitic substances that produced and secreted by tumor cells (Liotta *et al,* 1982; 1983).

Agressiveness and in vitro morphology of the tumor cells may influenced by the strength and structure of the surrounding tissue where the tumor growth, especially the present of extracellular matrix.

Morphologically, Enami *et al,* (1985) investigated that there was a correlation between collagen gel concentration and the collagen gel strenght by comparing the gel concentration of 0,1 dan 0,63%; increasing the gel concentration is also increased the gel strenght. In contrast to the cultured cell on petri dish using solution medium, growth of MCM-B2 cell on 10.1% collagen gel resulted the pattern of cell colonies as duct-like structure (Priosoeryanto *et al,* 1995b). Our study indicated that cell grwoth on collagen gel more suitable for observation of cell characteristics which mimicking the in vivo condition, therefore collagen gel system is an appropriate assay for study proliferation, differentiation and invasion of tumor cell.

The present study showed that tumor cell proliferation and invasion were inhibited by the *Luffa cylindrica* exctracts combined with rCaIFN, this phenomenon indicated that there is a sinergism effect of both substances. We suggest that these extracts plants in combination with rCaIFN could be developed and use for treatment of tumors disorders. Further study on the isolation and identification of the bioactive compound of these two plants as well as toxicity and safety on animal model should be conducted before field application.

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Immunoglobulin Titer of Suckling Kids as a Result of   Colostrum Intake

Daisy D.S.J. Tambajong[7]

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Abstract

This study is concerned with the supply of newborn kids with antibodies via colostrums. Twenty kids were assigned to three groups, the first of which received Colostrum within the first hour after birth, the second and third after 4h and 8h, respectively. The first four feedings took place at 4h intervals, the amount fed being 57.5 g/kg body weight. IgG_1, IgG_2, IgA and IgM concentrations were assessed in the blood of the mother, in milk and in the blood of the kids. In each treatment group the serum concentration of all immunoglobulin rose soon after the first uptake of colostrums. It peaked after 24h, waning gradually until the end of the third week. The highest mean IgG_1 concentration was reached in the group receiving Colostrum immediately after birth (Group 1), the lowest in Group 3 (53.8, 45.3 and 36.6 mg/ml for Groups 1, 2 and 3, respectively). IgG_2 and IgA concentrations also reached a maximum by 24h in all groups. After that they dropped to a low at 21 days. Thereafter, IgG_2 titers started rising again, surpassing the initial maximum by day 56 p.p.. IgA titers remained below the assay base line. Highest IgG_2 and IgA concentrations were arrived in the kids of Group 2 (0.4 mg/ml for IgG2 and 0.9 mg/ml for IgA., whereas the kids of Groups 1 and 2 reached maximum values of 0.3 and 0.7 mg/ml for IgG_2 and IgA, respectively. Maximum IgM concentrations were reached 20h p.p. (3.9 mg/ml) in Group 1 and 24h p.p. (3.7 mg/ml) in Group 2. They were maintained at that level until 40h p.p.. Kids of Group 3 reached maximum concentrations of 4.2 mg/ml at 32h p.p., subsiding soon thereafter. The concentrations in maternal blood serum of IgG_1, IgG_2 and IgM showed a slight, statistically non-significant decrease until 12 hours after parturition. The IgA concentration remained unchanged in the range of 0.2 to 0.3 mg/ml. The concentrations of the four immunoglobulins in maternal milk showed a distinct decrease immediately after parturition. Within the first 48h they dropped by 90 to 96% and remained at a very low level.

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Introduction

Colostrum is milk that produce from the first days post partum and ether physically or chemically differ from the normal milk. It contains Albumin and Globulin, whereas this globulin reacts in specific ways to antigen, so it calls antibody. Antibody is one of the most important parts of the immune system, so that this globulin is known as Immunoglobulin (Kielwein 1979; Clancy 1998). The role of Colostrum to the neonatal is as physiological nutrient, laxatives and immunologic component (Herbort 1990).

Kids were born without any immunological protection, while the goats as well as sheep and cows are mammals with an *epitheliochorialis* placenta, which enable immunoglobulin transfer from the mother to the fetus, although the immunoglobulin is already reach the udder 12 to 14 days before partum (Michel and Stief 1985). Because of that, the immunological status of the neonatal take place first after the immunoglobulin and the immune cells transfer from the mother via colostrum (Al-Jawad and Lees 1985; Klobasa and Werhahn 1989; Larson 1980; Vihan 1988). These two materials will immediately afterward absorbed and distributed to the blood stream of the newborn (Klobasa and Werhahn 1989; Larson 1980). Since is already known that the cow's as well as the sow's colostrum contain enzymes inhibitor that hammed the proteolysis enzyme produced by the digestive tract, so would the immune protein directly absorbed and be used by the newborn (Fellenberg and Horber 1980).

The colostrum intake from the newborns differs according to the quantity and the way it distributed. Schlolaut (1969) recommended 300-500 ml pro lamb, while Penning (1971) suggest that 200 ml pro lamb should be sufficient. Halliday and Williams (1976) fed the newborn with 30 g/kg body weight colostrum in 6 hours interval, and stated that one time distributed as inefficient. In contrary, Logan et al. (1978) fed the newborn once soon after birth with 50 ml/kg body weight. It is understood, that the absorption rates of the immunoglobulin under the normal condition hang on the first colostrum intake (Stott *et al*. 1979; Klobasa and Werhahn 1989; Ducker and Fraser 1976) whereas there is a time limit of the absorption and the highest point is soon after birth (Kruse 1983).

Materials and Methods

Twenty kids with birth weight of 3.1 kg (SEM 0.1) were used for this experiment. Immediately after birth and licked by the does, kids were assigned to three groups, the first of which received colostrum within the first hour after birth (0h), the second and the third after 4h and 8h, respectively.

The first four feeding (Colostrum from the own mothers) took place at 4h intervals, the amount fed being 57.5 g/kg body weight. After that the kids suckled up to wean.

Blood sample was taken before Colostrum intake. The first twenty four hours took place at 4h intervals, then up to 48h at 8h intervals. The next samples were taken at 3d, 7d, then once a week up to wean (56d). Blood and milk sample were taken from the mother for the first 48h at 12h intervals.

The blood sample after overnight at 4^0C, were centrifuged at 1125 g and 4^0C for 20 minutes, before by -20^0C kept. The milk samples were centrifuged 1620 *g* and 4^0C for 20 minutes. Lab powder was given to the skim milk that heated in water bath (38^0C).

After the incubation for 3h would the casein centrifuged at 1610g for 20 minutes. The Supernatant then be centrifuged again at 1610 g for 10 minutes, before at -20^0C kept.

Immunoglobulin (IgG$_1$, IgG$_2$, IgA dan IgM) were assessed by Radial Immune Diffusion (RID) according to Mancini *et al.* (1965), modified by Klobasa (2000). Analysis of variance were used to analyst the data, using Statistical Analysis System (SAS Inst. Inc., Version 6.12, 1993) and were the group of Colostrum intake p.p. (0h, 4h and 8h, respectively) and the blood sampling time as fixed effect.

Result

1. Immunoglobulin Titer in blood serum of the kids during the 8 weeks suckling periods

All the Immunoglobulin (IgG$_1$, IgG$_2$, IgA dan IgM) titer from the 3 groups (0h, 4h and 8h p.p., respectively) rose as soon as the colostrum introduced, then gradually decreased up to wean. Table 1 showed the IgG$_1$-titer for the 8 weeks suckling period. Since the IgG$_1$ concentration from these three group seemed to be parallel, however the first group (0h) reached maximum earlier at 24h p.p. than the group 2 and 3 (32h p.p.). The maximum concentration of 53.8 mg/ml for group 1 was higher, in compare with 45.3 and 36.6 mg/ml (group 2 and 3, respectively). After day 35, there were no different found.

Table 1. IgG$_1$ concentration (mg/ml) in blood serum of the kids during 8 weeks suckling period (Mean ± SEM)

Time after birth	Colostrum intake					
	0h (Group 1; n=7)		4h (Group 2; n=7)		8h (Group 3; n=6)	
	Mean	SEM	Mean	SEM	Mean	SEM
0h	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
4h	7,9 [a]	2,0	0,0 [a]	0,0	0,0 [a]	0,0
8h	29,2 [bA]	5,4	10,2 [bB]	2,6	0,0 [aB]	0,0
12h	41,2 [bcA]	6,7	29,0 [bA]	8,2	8,0 [bB]	0,6
16h	50,2 [cdA]	5,6	38,5 [cdA]	9,5	23,1 [bcB]	2,3
20h	52,9 [cdA]	6,0	42,5 [cdAB]	9,9	30,0 [cdB]	3,6
24h	53,8 [dA]	7,1	44,4 [dAB]	9,7	34,6 [dB]	3,4
32h	49,1 [cd]	7,2	45,3 [d]	9,0	36,6 [d]	5,2
40h	45,9 [cA]	5,9	39,7 [cdAB]	8,6	31,6 [cdB]	4,4
48h	40,7 [bcA]	4,5	36,4 [cAB]	8,7	26,9 [cB]	6,7
3d	32,0 [bc]	4,2	30,3 [b]	7,2	20,4 [bc]	3,0
7d	23,2 [b]	2,9	21,1 [b]	5,2	14,8 [b]	1,7
14d	17,4 [b]	2,6	15,3 [ab]	3,3	10,7 [ab]	1,3
21d	11,2 [a]	1,4	10,9 [b]	2,2	7,7 [a]	0,7
28d	8,8 [a]	0,9	8,1 [a]	1,3	6,3 [a]	0,5
35d	7,2 [a]	0,8	6,5 [a]	0,8	5,8 [a]	0,5
42d	6,2 [a]	0,6	6,5 [a]	0,9	5,6 [a]	0,5
49d	6,1 [a]	0,5	6,1 [a]	0,7	6,5 [a]	0,7
56d	6,4 [a]	0,6	6,8 [a]	0,5	6,6 [a]	0,7

[abcd] value in column (p<0,05, t-Test).
[AB] value in rows (p<0,05, t-Test).

Table 2. IgG$_2$ concentration (mg/ml) in blood serum of the kids during 8 weeks suckling period (Mean ± SEM)

| Time after birth | Colostrum intake | | | | | |
| | 0h (Group 1; n=7) | | Time after birth 0h (Group 1; n=7) | | 0h (Group 1; n=7) | |
	Mean	SEM	Mean	SEM	Mean	SEM
0h	0,0 ^{a}	0,0	0,0 ^{a}	0,0	0,0 ^{a}	0,0
4h	0,1 ^{ab}	0,0	0,0 ^{a}	0,0	0,0 ^{a}	0,0
8h	0,2 ^{bA}	0,0	0,1 ^{abA}	0,0	0,0 ^{aB}	0,0
12h	0,3 ^{bcA}	0,0	0,2 ^{bA}	0,1	0,1 ^{abB}	0,0
16h	0,3 ^{bc}	0,0	0,3 ^{bc}	0,1	0,2 ^{b}	0,0
20h	0,3 ^{bc}	0,0	0,4 ^{cd}	0,1	0,2 ^{b}	0,0
24h	0,3 ^{bc}	0,0	0,4 ^{cd}	0,1	0,3 ^{bc}	0,0
32h	0,3 ^{bc}	0,0	0,4 ^{cd}	0,1	0,3 ^{bc}	0,0
40h	0,3 ^{bc}	0,0	0,4 ^{cd}	0,1	0,2 ^{b}	0,0
48h	0,2 ^{b}	0,0	0,3 ^{bc}	0,1	0,2 ^{b}	0,0
3d	0,2 ^{b}	0,0	0,2 ^{b}	0,1	0,2 ^{b}	0,0
7d	0,2 ^{b}	0,0	0,2 ^{b}	0,0	0,1 ^{ab}	0,0
14d	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0
21d	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0
28d	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0	0,1 ^{ab}	0,0
35d	0,1 ^{ab}	0,0	0,1 ^{ab}	0,1	0,2 ^{b}	0,1
42d	0,2 ^{b}	0,1	0,2 ^{b}	0,1	0,3 ^{bc}	0,1
49d	0,3 ^{bc}	0,1	0,3 ^{bc}	0,1	0,4 ^{cd}	0,1
56d	0,5 ^{c}	0,1	0,5 ^{d}	0,1	0,6 ^{d}	0,2

^{abcd} value in column (p<0,05, t-Test).
^{AB} value in rows (p<0,05, t-Test).

In contrary with the IgG$_2$, group 2 tends to be higher in concentration in compare with the other groups (0.4 mg/ml vs. 0.3 mg/ml), although the maximum concentration of group 1 is reached earlier than the others (12h p.p. vs. 20h p.p.). This maximum is maintained until 40h p.p. for group 1 and 2, but up to 3d for the group 3, and then gradually decreased up to 28d. After that, the IgG$_2$ – titer then renew increased and reached maximum of 0.5 for group 1 and 2 and 0.6 mg/ml for group 3 (Table 2).

Table 3. IgA concentration (mg/ml) in blood serum of the kids during 8 weeks suckling period (Mean ± SEM)

Time after birth	Colostrum intake					
	0h (Group 1; n=7)		**4h** (Grup 2; n=7)		**0h** (Grup 1; n=7)	
	Mean	SEM	Mean	SEM	Mean	SEM
0h	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
4h	0,2 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
8h	0,4 [bA]	0,1	0,3 [bA]	0,1	0,0 [aB]	0,0
12h	0,5 [bcA]	0,1	0,6 [cA]	0,2	0,3 [bB]	0,0
16h	0,6 [cAB]	0,1	0,8 [cdA]	0,2	0,5 [cB]	0,1
20h	0,7 [c]	0,1	0,8 [cd]	0,2	0,6 [cd]	0,1
24h	0,6 [cA]	0,1	0,9 [dB]	0,2	0,7 [dAB]	0,2
32h	0,7 [c]	0,1	0,9 [d]	0,2	0,7 [d]	0,1
40h	0,6 [c]	0,1	0,8 [cd]	0,2	0,6 [cd]	0,1
48h	0,6 [c]	0,1	0,7 [c]	0,2	0,6 [cd]	0,1
3d	0,3 [b]	0,0	0,4 [b]	0,1	0,3 [b]	0,1
7d	0,2 [a]	0,0	0,2 [b]	0,0	0,2 [ab]	0,0
14d	0,1 [a]	0,0	0,1 [ab]	0,0	0,0 [a]	0,0
21d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
28d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
35d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
42d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
49d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
56d	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0

[abcd] value in column (p<0,05, t-Test).
[AB] value in rows (p<0,05, t-Test).

At the beginning the IgA-titer more like the IgG_2-titer, whereas the sooner the kids with colostrum served the earlier the maximum concentrations reached. Group 1 reached maximum at 20h p.p. where group 2 and 3 after 24h p.p. Although group 1 is earlier in reaching the maximum concentration, group 2 reached the maximum concentration of 0.9 mg/ml, and was higher than group 1 and group 3 (0,7 mg/ml). After the maximum concentration is reached, the concentrations of all groups dropped off gradually up to 21d and stayed at this minimum untill weaning (Table 3).

IgM concentration increased drastically soon after colostrum intake and lessen, that could be seen in Table 4. Group 1 reached the maximum of 3.9 mg/ml at 20h p.p, keep on at this concentration up to 40h p.p. then lessen to 1.1 mg/ml on 21d. The maximum concentration of group 2 reached at 24h p.p. by 3.7 mg/ml, retained to this concentration until 40h p.p. and then decreased to 1.0 mg/ml on 21d. Group 3 reached the maximum level by 4.3 mg/ml at 32h p.p., and like group 1 and 2 sink to minimum level at 21d p.p. From 21d forward, the concentration of IgM renews to rise and reached 1.9 mg/ml on 56d for group 1 and 2.1 mg/ml for group 2 and 3.

Table 4: IgM concentration (mg/ml) in blood serum of the kids during 8 weeks suckling period (Mean ± SEM)

| Time after birth | Colostrum intake | | | | | |
| | 0h (Group 1; n=7) | | 4h (Grup 2; n=7) | | 0h (Grup 1; n=7) | |
	Mean	SEM	Mean	SEM	Mean	SEM
0h	0,0 [a]	0,0	0,0 [a]	0,0	0,0 [a]	0,0
4h	0,6 [a]	0,1	0,0 [a]	0,0	0,0 [a]	0,0
8h	2,2 [aA]	0,4	0,8 [aB]	0,2	0,0 [bB]	0,0
12h	3,3 [bA]	0,5	2,2 [bB]	0,5	1,2 [cB]	0,4
16h	3,6 [cdA]	0,5	3,0 [bcAB]	0,7	2,2 [cB]	0,3
20h	3,9 [d]	0,6	3,4 [c]	0,7	3,0 [d]	0,4
24h	3,9 [d]	0,4	3,7 [c]	0,8	3,8 [d]	0,5
32h	3,9 [d]	0,5	3,5 [c]	0,7	4,2 [d]	0,5
40h	3,9 [d]	0,6	3,5 [c]	0,7	3,9 [d]	0,6
48h	3,6 [cd]	0,5	3,0 [bc]	0,6	3,5 [d]	0,6
3d	3,2 [b]	0,5	2,6 [b]	0,5	2,5 [cd]	0,4
7d	2,2 [a]	0,2	1,9 [b]	0,4	1,9 [c]	0,3
14d	1,3 [a]	0,1	1,1 [ab]	0,1	1,4 [bc]	0,2
21d	1,1 [a]	0,1	1,0 [a]	0,1	1,0 [b]	0,1
28d	1,3 [b]	0,1	1,2 [ab]	0,1	1,3 [bc]	0,1
35d	1,5 [b]	0,1	1,5 [ab]	0,1	1,7 [c]	0,2
42d	1,7 [b]	0,1	1,6 [ab]	0,1	1,8 [c]	0,2
49d	1,7 [b]	0,1	2,0 [b]	0,2	1,9 [c]	0,2
56d	1,9 [b]	0,1	2,1 [b]	0,2	2,1 [c]	0,2

[abcd] Value in the colum (p<0,05, t-Test).
[AB] Value in the row (p<0,05, t-Test).

2. Immunoglobulin concentration in doe milk and serum during lactation

Table 5 present the four Immunoglobulin classes in milk during the 8 weeks suckling period from the does.

Table 5. IgG$_1$, IgG$_2$, IgA dan IgM concentration (mg/ml) in the milk of the does during 8 weeks suckling period (Mean ± SEM)

Time	IgG$_1$ Mean	SEM	IgG$_2$ Mean	SEM	IgA Mean	SEM	IgM Mean	SEM
0h	137,5 [a]	7,9	59,3 [a]	4,6	2,9 [a]	0,6	7,9 [a]	0,7
12h	77,7 [b]	8,7	43,3 [b]	4,0	1,4 [b]	0,2	6,5 [a]	0,9
24h	39,2 [c]	8,7	15,6 [cd]	3,3	0,8 [bc]	0,2	2,8 [b]	0,7
36h	11,3 [d]	3,3	5,7 [de]	1,3	0,4 [bc]	0,1	1,0 [bc]	0,2
48h	5,2 [d]	1,0	2,4 [e]	0,6	0,3 [b]	0,0	0,6 [bc]	0,1
3d	2,5 [d]	0,3	0,8 [e]	0,1	0,2 [c]	0,0	0,5 [c]	0,1
7d	1,6 [d]	0,2	0,6 [e]	0,1	0,3 [c]	0,0	0,4 [c]	0,0
14d	0,9 [d]	0,1	0,4 [e]	0,0	0,3 [bc]	0,0	0,1 [c]	0,0
21d	0,8 [d]	0,1	0,3 [e]	0,0	0,3 [bc]	0,0	0,0 [c]	0,0
28d	0,7 [d]	0,1	0,3 [e]	0,0	0,3 [bc]	0,0	0,0 [c]	0,0
35d	0,6 [d]	0,1	0,3 [e]	0,0	0,3 [c]	0,0	0,0 [c]	0,0
42d	0,6 [d]	0,1	0,3 [e]	0,0	0,3 [bc]	0,0	0,0 [c]	0,0
49d	0,7 [d]	0,1	0,3 [e]	0,0	0,3 [bc]	0,0	0,0 [c]	0,0
56d	0,7 [d]	0,1	0,3 [e]	0,0	0,4 [bc]	0,0	0,0 [c]	0,0

All the Ig-classes decreased drastically in 36h p.p. The IgG$_1$ concentration sank to 93% (137.5 to 11.3 mg/ml), after 48h just about 4% from the beginning and up to weaning in very low concentration. The IgG$_2$, IgA and IgM were also decreased in 48h p.p. (59.3 to 2.4 mg/ml, 2.9 to 0.3 mg/ml and 7.9 to 0.6 mg/ml, respectively). All the Ig's stay at very low concentration up to weaning.

The concentration of these all 4 Immunoglobulin in mother serum during the lactation period is presented in Table 6. During the 24h p.p. the concentration of IgG$_1$ ranged between 12.7 – 14.7 mg/ml, from 3d increased, and reached maximum (24.3 mg/ml) at the end, whereas IgG$_2$ decreased lightly from 6.6 to 5.9 mg/ml during 12h p.p. The concentration of IgA ranged between 0.2 and 0.3 mg/ml during lactation, while IgM firstly decreased, but after d14 gradually increased up to weaning.

Tabel 6. IgG_1, IgG_2, IgA dan IgM concentration (mg/ml) in the blood serum of the doe during lactation

Waktu	IgG_1		IgG_2		IgA		IgM	
	Mittel	SEM	Mittel	SEM	Mittel	EM	Mittel	SEM
0h	14,7 [ab]	1,7	6,6	0,8	0,2	0,0	3,6	0,3
4h	13,3 [a]	1,5	6,4	0,8	0,3	0,0	3,3	0,3
8h	13,4 [a]	1,3	6,4	0,7	0,3	0,0	3,2	0,3
12h	12,7 [a]	1,2	5,9	0,5	0,2	0,0	3,0	0,3
3d	15,7 [ab]	1,3	7,0	0,6	0,2	0,0	3,3	0,3
7d	16,7 [ab]	1,6	7,5	0,6	0,2	0,0	3,3	0,3
14d	17,8 [ab]	1,7	7,8	0,7	0,3	0,0	3,1	0,2
21d	19,3 [ab]	1,7	8,3	0,6	0,3	0,1	3,1	0,2
28d	21,9 [ab]	1,8	9,1	0,7	0,3	0,1	3,2	0,2
35d	22,3 [ab]	1,8	9,4	0,8	0,3	0,0	3,4	0,3
42d	23,2 [ab]	1,8	9,9	0,8	0,3	0,1	3,5	0,3
49d	24,2 [b]	1,8	10,1	0,8	0,3	0,1	3,6	0,4
56d	24,3 [b]	1,5	10,3	0,8	0,3	0,1	3,7	0,3

Discussion

The given colostrums for 230g/kgs body weight is due to the amount of milk that kids could suckle during the first days after birth (Tambajong and Holtz 1998). This amount, according to Mellor and Murray (1986) is sufficient while the kids during 18h after birth need 180-210 ml Colostrum/kgs body weight.

From the data could be seen that, before Colostrum intake there is no indication of Immunoglobulin in kid's serum proven. This result is similarly with the result from Halliday and Williams (1976) and Klobasa and Werhahn (1989) that lambs were born without Immunoglobulin. Ig-concentration increased soon after the colostrums intake, reach maximum between 24h and 32h p.p. In order to the group 3, that even after 32h p.p. the concentration of Igs still increase showed that the transfer from doe to the newborn continued. Belated colostrums intake to 8h p.p. influenced the IgG_1 concentration. This result is similar with Khalaf *et al.* (1979), whereas lambs that after 9h p.p. became his first colostrum showed lower Ig concentration in compare with control.

All the Igs-classes in milk and serum of the does during the lactation have their own characters. The higher concentration in milk during the first hours after partum showed that there are some amounts of Ig were transfer to the kids.

Conclusion

Kids were born without any immunological protection, because of that, the immunological status of the neonatal take place first after the immunoglobulin intake from the colostrum.

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Studies on Indigenous Sheep Productivity Under The Tropical Rain Forest Area

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Abstract

Integrated Farming System is being introduced to the forest system. There is a problem about animal in the forest which will destroy the ecosystem. But actually, animal will give manure as an organic fertilizer to the trees while on the other hand forest also produce leaves which can be fed by animal as a roughage and naturally forest can change the environment condition such as temperature and humidity to the comfortable animal living. Good management to take care the animal will solve the problem above. One of them is animal has to kept in semi intensive system. Gunung Walat Education Forest of IPB is stand near by Sukabumi, West Java, which surrounding by Damar, Agathis and Pinus trees dominantly   while Kaliandra, King grass, mix grass and Leucaena are in between as an animal feeding plant. The average daily temperature and humidity there is 25 ^{o}C and 80 % rel, respectively. This research was aimed to evaluate productivity of indigenous sheep which kept on postal cage in Gunung Walat Education Forest area. Two activities were designed using 50 head of growing sheep for 45 days of fattening and 24 head of pregnant ewes for breeding observation. Animal were fed with 60% of mix grass and 40 % of soy bean curd waste in different amount depend on BW. After 45 day monitoring, the average body weight gain of fattening sheep were around 62 g/d, from 20,31 kg early BW became 23,10 kg in the final observation. Breeding studies showed that they had single, twin and triplet, while percentage of died lamb was 18 % from total 32 head. After two months lactation, ewes were super ovulated (SO) with hormone Prosulvine in order to the next pregnancy. Percentage of pregnancy using SO technique was found 75 %. It is concluded that animal under the tropical rain forest could survive although the productivities were not optimum.

***Key word :** , Indigenous, Fertilizer, Soy bean curd waste and Super ovulation*

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Introduction

In the tropical country we can find a wide range of agricultural production systems. However, the majority of the farmers can be found in resource poor and low external input production environment, so that traditional grazing systems are being or have been replaced by mixed farming systems.

Changes in economic condition are the major driving force for change in animal production systems. A systems approach is needed to assess disciplinary research focused on production level of individual animals and sustainability prospects of new technologies within the context of farming systems (Udo, H. 2002). Farming systems have to intensify due to population growth and economic development. In smallholder systems livestock technologies have had good impact on production and productivity at farm level. The other important aspect is good environment such as feeding, climate and management. Villarreal (2001) classifies chickens as short-term capital. They provide only a small saving account, but can be fast available. Pigs and small ruminants are more mid-term capital, while cattle are a long-term security.

In Indonesia a lot of model mix farming system has been developed, like paddy mix with fish, broiler under the fish system, ruminant under the coconut plantation and cow surrounding bananas plantation. There is no information about small ruminant production under the tropical forest area. This research was aimed to evaluate productivity of indigenous sheep which kept on postal cage in Gunung Walat Education Forest area.

Material and Method

This study was done in Gunung Walat Education Forest, is about 70 km from Bogor, which maintained by IPB. The climate show that average room temperature in door of pens is around 22 o C with humidity is about 98% rel, while out of door average temperature is around 25 oC with humidity is about 80%. Individual pen has 2 x 2 m square was cleaned everyday while animals were fed twice a day with mix grass (3 kg/head) plus soybean curd waste and water was given *ad libitum*. Each farmer has four ewes for breeding while for fattening they got ten kids. During the study, animals were measured of heart rate, respiration rate and body temperature before, during and after data collection for knowing the physiological status.

1. *Fattening Program*
Fifty local sheep in weaning age with average 20.31 kg of BW were used for fattening. They divided into 5 groups where each farmer has ten sheep. In the beginning of this study, animal were weighted and gave albendasol as an antiparasite. Mix grass and soybean curd waste was given 10 % of BW with ratio of 60 : 40 %. The room temperature and humidity were measured everyday. After 45 days, the animals were weighted again to find the final bodyweight.

2. *Breeding Program*
Twenty four of local pregnant ewes (25 kg) were used in this program and they divided into six groups (farmer). Each farmer with four pregnant ewes has same feeding program with fattening group but different amount of DM feed depend on BW. The parameter were litter size, number of kids and number of death.

After two months of lactation, twelve ewes were synchronized with prosulvin in order to get same estrus. Slime detector was used for detection of fertile status and get ready to mate. After one month from mating, animals were palpation manually to make sure that they had already pregnant. Presentations of pregnancy was calculated from ratio total pregnant ewes with total synchronized ewes.

Result and Discussion

Data of fattening program showed that there were no significant different between groups and they had average gain around 2.79 kg while ADG were around 61.99 g/head/d. Detail data is showed in Table 1.

Table 1. Average of BW and gain of growing sheep during 45 days in HPGW

Group	Init.BW	Final BW	Gain (kg)	ADG (g/d)
1	20.15	22.0	1.85	41.11
2	19.40	24.35	4.95	110
3	20.55	23.60	3.05	67.77
4	20.75	22.95	2.20	48.88
5	20.70	22.60	1.90	42.22
Average	20.31 ± 0.56	23.10 ± 0.91	2.79 ± 1.29	61.99 ± 28.88

The low performance of those sheep caused by high of humidity and limited of sunlight so that they were deficiency of vitamin D. Another problem was low quality of forages or mix grass which grow surrounding the Gunung Walat Education forest. Climate and feeding are important environment which is effect to the performance.

Astuti (1988) reported that sheep under the semi intensive farming system using concentrate and monensin as a feedstuff could have ADG around 100 – 150 g/d. While Ristianto (1991) showed that sheep fed with paddy straw plus concentrate can grow with 52 g/d. The zone humidity optimum for living sheep is 60 – 80 % rel with environmental temperature around 25 – 30 °C. Rees *et al.* (1986) reported that thin tail of Sumatra sheep under the rubber trees environment and fed with level of concentrate (0; 0,6; 1 and 1,4 of BW) could grow with 37, 48, 57 and 64 g/d while the puberty happened in 10, 9, 8 and 7 month.

Table 2. Number of Kids and percentage of death Kid in HPGW

Farmer	Numb. of ewes (head)	Numb of Kid (head)	Litter size 1	2	3	No. of death (head)
1	4	7	1	3	-	1
2	4	6	2	2	-	-
3	4	5	3	1	-	-
4	4	6	1	1	1	3
5	4	5	3	1	-	2
6	4	3	1	1	-	-
Total	24		11	9	1	6

Tabel 2 showed that genetic of those local sheep was quite good because there were a lot of ewes which has twin litter size (43%) and triplet was 5%. Nevertheless the low quality of ration caused the low nutritional status of pregnant ewes and high number of death weaning kids (18,75 %). Abortion cases also happened and caused number of ewes died.

Table 3 showed that percentage of pregnancy around 75 %, that means local ewes could receive hormone treatment easily.

Table 3. Persentage of pregnancy through Synchronization technique

Farmer	Numb. of Ewes	Numb of Pregnancy	% of Pregnancy
1	4	3	75
2	4	2	50
3	1	1	100
4	2	2	100
5	1	1	100
6	-	-	-
Total	12	9	75

Feed supplement should be given to increase reproduction performance. In the initial pregnancy, quality of feed was not so affected to the fetus development, but in the last three semester of pregnancy, lactation period and weaning period supplementation of protein should be given in order to reduce mortality (Leng, 1990). Protein metabolized requirement for growing sheep (20 – 25 kg BW) with average of ADG 100 g/d is 24 g/d. Supplementation of Protein metabolized for pregnant ewes in the last three weeks of partus was 19,2 g/d (for singlet), 32,2 g/d for twins and 43,2 g/d for triplet (AFRC, 1998). Total protein requirement will be twice following the pregnant status and in order to support of developing fetus.

Conclusion

The data of sheep during six months fattening and breeding in tropical rain forest area with high humidity showed that :
1. Sheep fed with mix grass plus soybean curd waste has ADG around 61 g/d Kingggrass should be planted sorounding of the forest
2. High humidity and indoor system with high concentration of ammonia caused high percentage of death (18 %), so it is suggested that sheep should be grassed in the open area
3. Percentage of pregnancy using synchronization program was 75 %

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The Solubilization of Macrominerals and Ruminal Degradation of Selected Tropical Tree Legumes

Idat Galih Permana[9] and Despal[9]

Abstract

A research to study about macromineral solubilities and biodegradation of some tree legumes by rumen microbes has been conducted. The legumes of Pterocarpus indicus (PI), Sesbania gradiflora (SG), Gliricidia sepium (GS), Callyandra callotyrsus (CC) and Leucaena leucocephala (LL) were used in this experiment. The oven dried (60°C) and ground samples of the legumes were measured of their in vitro macrominerals solubilities, biodegradation, bioavailability, and fermentation products. The macro-minerals (Calcium (Ca), phosphorus (P), magnesium (Mg) and sulfur (S)) solubilities were determined using atomic absorption spectrophotometer (AAS). The gas production was measured using Hohenheim method. The ruminal DM degradation and gas productions rates were calculated using formula y = a + b(1-e^{-ct}) according to Ørskov and McDonald (1979). The results showed that biodegradation and cumulative gas production of selected tree legume were relatively the same. However, the gas production rate of SG and GS were significantly higher. There was no difference on VFA production, but SG produced more NH$_3$ than other tree legumes. Ca was more soluble than other macrominerals. The Ca and Mg solubility of LL were siginifcantly higher, while PI was a good soluble P source. GS is a good protein source and can be mixed with other legume as mineral supplement.

Key Words: *tree legume, solubility, macrominerals, degradation,*

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Introduction

Legume which is adaptable in a wide range climate, soil condition and heavy grazing (Khamseekhiew, 2001) is normally used as protein sources to increase the quality of grasses in ruminant ration. According to Underwood and Suttle (1999), legume is not only higher in protein content than grass, but also macro-minerals especially calcium (Ca). The high concentration of macro-mineral contents leads to a mineral supplementation function of tree legume for ruminant ration in tropical region (Sutardi *et al*., 1994).

In ruminant, minerals are not only required for the host animal but also for the activity of rumen microbes. The minerals are used for cellulolytic microbe activities, osmotic pressure, buffering capacity as well as for reduction potential in the rumen (Duran and Kawashima, 1990). Therefore, mineral requirements assess in ruminant nutrition need both the quantity and bioavailability of the minerals.

In situ technique is commonly used to evaluate the mineral availability in the rumen. A modified *in vitro* technique measures the extent and the rate of macro-minerals release (especially Ca and P) in the rumen where most of organic matter digested.

The aim of this research was to study the solubility of macro-minerals (Ca, P. Mg and S) and their relationships to the potential DM degradability, gas production and production of VFAs and NH_3 of selected trees legumes using *in vitro* technique.

Materials and Methods

Tree Legume Samples

Five tree legumes namely *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Callyandra callotyrsus* (CC) and *Leucaena leucocephala* (LL) were used in this experiment. The samples were cut about 10-30 cm from growing point, dried at 60^oC and ground through 2 mm sieve and then stored for further analysis.

Proximate Analysis

The proximate nutrient compositions (dry matter = DM; ash; crude protein = CP; ether extract = EE; and crude fibre = CF) of tree legumes were determined according to the AOAC (1984) procedures. Organic matter (OM) was resulted by subtracting ash from dry matter, while nitrogen free extract (NFE) is calculated by subtracting ash, CP, CF and EE from 100%.

Macro-mineral solubility

The solubility of macro-minerals was determined in both legume and residue of ruminal undegraded part. Measurement of Ca and P were done after they were digested with nitric and perchloric acids. The prepared solutions were analyzed for Ca, Mg and S using an Atomic Absorption Spectrophotometer, and for P using a UV-Visible Spectrophotometer.

Ruminal DM Degradation

Ruminal DM degradation was determined according to a modified method of Tilley and Terry (1963). Rumen liquid was collected from a slaughterhouse. The samples (1 gram) were placed in 50 ml fermentor tubes and suspended anaerobically with 8 ml of rumen fluid, 12 ml of phosphatecarbonate buffer. All samples were prepared in duplicates. The

suspension was incubated at 39°C for 3, 6, 12, 24, 48 hours. Every 12 hours the tubes were gassed with CO_2 to keep an aerobic condition. After the specified incubation time the tubes were open and centrifuged at 3,000 rpm for 15 min. The supernatant were collected and the residues were filtered with filter paper and washed with boiled water. After that, the residues were dried at 60°C for 48 hours. Samples in tubes without fermentation (0 h) were washed and dried in similar manner as the above samplesn as a control.

Gas Production

Gas production was analyzed using Hohenheim Gas Method (Close and Menke, 1986). Samples (230 mg) legumes were put in syring glasses and then 30 ml of suspension of rumen fluid and buffer were added. The samples were incubated in a 39°C water bath for 3, 6, 12, 24 and 48 hours. The gas produced at each sequence is read. The cumulative gas productions were calculated following method of ∅rskov and McDonald (1979).

Total VFAs and NH_3

Total VFAs of supernatan were analyzed using steam destilation method, while NH_3 were analysed using Micro Diffusion Conway method.

Statistical Analysis

Cumulative gas production and ruminal DM degradation rate were evaluated mathematically as a function of incubation time according to the formula of ∅rskov and McDonald (1979). The equation was $P = A + B (1 - e^{-Ct})$, where P was actual degradation at time t, A was water soluble fraction, B was the insoluble but potentially degradable fraction in time t, C was degradation rate of B (% h^{-1}) and t was incubation time (h).

The data were subjected to analysis of variances using the general linear model procedure and the differences between means were continued by contrast analysis of the SPSS package program.

Results and Discussion

Chemical composition of tree legumes

The chemical compositions of tree legumes were shown in Table 1. Nutrient compositions of the legumes were not significantly different. The CP content of tree legumes varied from 21.5 – 26.2%, where the CP of LL was slightly higher than others. The Ca contents ranged from 1.1% for SG to 2.1% for PI. The P content of the tree legumes ranged from 0.30% for SG to 0.43% for LL. In general, Ca and P contents of measured legumes (1 – 2% and 0.3 – 0.4%) were higher than average of Ca and P grasses (< 0.8% and < 0.3%) reported by Sutardi (1986). This found was in line with Serra *et al.* (1996).

Ruminal Dry Matter Degradation

The ruminal DM degradation of selected tree legumes were shown in Table 2. The data showed that at first 3 hours of incubation, all legumes were degraded in the same level, while at 6 to 24 hours the DM degradation tree legumes showed different pattern

(P<0.05). After 48 hours, the DM degradation of all legumes was not significantly different.

Table 1. Chemical composition (% based on DM basis) of *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Leucaena leucocephala* (LL) and *Callyandra callotyrsus* (CC).

The soluble (A), the

water fraction

Parameter	Legumes				
	PI	SG	GS	LL	CC
Organic matter (OM)	92.54	90.52	91.20	91.89	94.88
Crude protein (CP)	23.95	26.18	21.46	25.50	21.50
Ether Extract (EE)	1.58	1.65	2.39	3.39	1.66
Crude fibre (CF)	27.64	27.07	22.81	20.69	22.37
NFE	39.38	35.62	44.53	42.31	49.35
Calsium (Ca)	2.01	1.14	1.68	1.50	1.18
Phosphorus (P)	0.40	0.30	0.31	0.43	0.36
Magnesium (Mg)	0.45	0.46	0.47	0.50	0.45

insoluble fraction (B), the potential degradation and the degradation rate of the all legumes were not significantly different. The potentially degradability of the legumes as source of CP and macro minerals were the same.

Table 2. Ruminal DM degradation (%) of *Pterocarpus indicus (PI)*, Sesbania gradiflora *(SG), Gliricidia sepium (GS), Leucaena leucocephal*a *(LL)* and *Callyandra callotyrsus (CC).*

Parameter	Legumes				
	PI	SG	GS	LL	CC
Ruminal DM degradability					
3 hours	16.28	17.00	17.72	18.04	17.37
6 hours	17.36^b	19.72^a	22.23^a	21.05^a	17.67^b
12 hours	25.70^b	28.36^a	29.01^a	26.50^b	23.85^b
24 hours	33.63^a	34.63^a	33.12^a	29.98^b	29.66^b
48 hours	39.39	42.04	41.50	40.12	37.67
DM degradability parameter (%)					
A	10.58	11.86	14.42	16.44	14.03
B	31.59	32.55	29.34	35.05	31.87
(A+B)	42.17	44.31	44.76	51.49	45.90
C (% h^{-1})	0.052	0.053	0.049	0.023	0.028

Means in the same row with different superscripts are significantly different (P<0.05)

Although the solubility and actual degradation of DM had relatively equal value, however their availability and release in the rumen had different pattern. This pattern is become important in relation to maintain sufficient supply of degraded DM products for rumen microbes.

Gas Production (*in vitro*)

Carbon dioxide and methane (major part of total gas produced in rumen) is a waste product of ruminal fermentation. In this experiment, the cumulative gas production was measured using Hohenheim Method. The cumulative gas productions of selected tree legumes were shown in Table 3. The highest cumulative gas production after 24 is produced after incubation of SG (23.7 ml) while the lowest is produced the by CC (12.7 ml). After 48 hours of incubation, legume GS produced slightly higher (28.2 ml) than others.

Table 3. In vitro gas production (ml) of *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Leucaena leucocephala* (LL) and *Callyandra callotyrsus* (CC).

Parameters	Legumes				
	PI	SG	GS	LL	CC
Cumulative Gas production (ml)					
3 hours	3.8	4.0	6.0	4.5	3.8
6 hours	7.6	9.5	10.2	6.9	5.5
12 hours	13.7	16.9	16.6	11.1	8.4
24 hours	21.4	23.7	23.6	16.7	12.71
48 hours	27.9	27.0	28.2	22.2	17.6
Gas production parameter (ml)					
A	0.45	0.00	1.46	1.53	1.60
B	26.4	27.9	28.3	24.9	34.3
(A+B)	36.9	27.9	29.8	26.4	35.9
C (% h^{-1})	0.05[b]	0.10[a]	0.07[a]	0.04[b]	0.04[b]

Means in the same row with different superscripts are significantly different (P<0.05)

The gas production rate (C) of SG and GS were significantly higher than PI, LL and CC (P<0.05), however, the potential gas production (A+B) for all legumes was not significant (P>0.05). The gas productions correspond with ruminal DM degradation as describe above.

VFAs and NH$_3$ production

Total VFA production at 12 hours incubation varied from 39.98 to 96.82 mM (Table 4). The total VFA concentration measured was lower than the optimum level (110 mM). At 12 hours GS and SG produced total VFA was relatively higher than others. It showed that organic matter of GS and SG is highly degraded in short time. This fact was supported by DM degradation and gas production pattern.

Table 4. The production of total VFA and NH$_3$ of *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Leucaena leucocephala* (LL) and *Callyandra callotyrsus* (CC) after 12 and 24 hours incubation.

Parameter	Legume				
	PI	SG	GS	LL	CC
Total Volatile Fatty Acids (mM)					
12 hours	60.94	86.51	96.82	43.88	39.98
24 hours	52.75	52.94	69.89	83.65	72.20
NH$_3$ production (mM)					
12 hours	12.28[b]	28.83[a]	8.30[c]	6.30[d]	2.51[d]
24 hours	19.91[b]	39.55[a]	13.33[c]	11.30[d]	3.49[d]

Means in the same row with different superscripts are significantly different P(<0.05)

Although at the first 12 hours incubation of LL and CC produced total VFA relatively lower than other legumes, however the total VFA production was higher after 24 hours of incubation. The data showed that rumen microbes need more time to degrade of LL and CC and categorized as slow degraded tree legumes.

Ammonia (NH$_3$) is a product of protein degradation by rumen microbe. The CP content of SG was higher than other legumes. The CP content correlated with the NH$_3$ production. As shown in Table 5, the ammonia concentration after 12 hours incubation varied from 2.51 mM for CC to 28.83 mM for SG. After incubation for 24 hours the concentration increased in dependent manner. The indication was agreed with ∅rskov (1982): the NH$_3$ production depends on protein solubility, protein content, time incubation and pH rumen. The optimum concentration for microbe growing was 6 - 21 mM (McDonald *et al*., 1995).

The correlation between degradation rate of selected tree legumes with production of VFAs and NH$_3$ were shown in Table 5.

Table 5. Relationship between degradation rate with production of VFAs and NH$_3$

	Coefficient Correlation
Correlation degradation rate with	
▪ VFAs (12 h)	-0.518
▪ VFAs (24 h)	-0.831
▪ NH$_3$ (12 h)	0.935
▪ NH$_3$ (24 h)	0.931

The result showed that the degradation rate was inversely correlated with VFAs production but positively NH$_3$ production. The faster degradation rate, the more ammonia was produced.

Macro Mineral Solubility

The percentages of macro mineral solubilization (Ca, P, Mg and S) were shown in Table 6. Generally the solubility of Ca was higher than P, Mg and S. The data showed that the solubilities of Ca and P at 6 and 24 hours incubation were significantly different (P<0.05). The Ca solubility of LL was the highest, while the P solubility of PI was higher than others. The solubility of Mg of selected tree legumes was not significantly different. However, the solubilities of CC and LL tended to be higher than PI and GS. The data of S presented the ruminal insoluble S. CC tent to less insoluble S part in compare to other legumes.

Table 6. The solubility of Ca, P, Mg and S of *Pterocarpus indicus* (PI), *Sesbania gradiflora* (SG), *Gliricidia sepium* (GS), *Leucaena leucocephala* (LL) and *Callyandra callotyrsus* (CC) after 6 and 24 hours incubation.

Parameters	Legumes				
	PI	SG	GS	LL	CC
Ca (%)					
6 hours	80.44[c]	ND	94.87[b]	96.91[a]	95.49[b]
12 hours	85.08[d]	ND	96.12[c]	97.85[a]	97.32[b]
P (%)					
6 hours	98.44[a]	ND	76.59[b]	74.97[b]	76.55[b]
12 hours	93.93[a]	ND	81.83[b]	83.37[b]	83.45[b]
Mg (%)					
6 hours	61.36[b]	ND	57.62[b]	67.36[a]	62.48[b]
12 hours	77.61	ND	74.98	79.36	79.60
S (mg residue /g sample)*					
6 hours	1.400	ND	1.610	1.093	0.890
12 hours	1.295	ND	0.755	1.011	0.587

Means in the same row with different superscripts are significantly different (P<0.05)

Conclusions

Although, ruminal DM biodegradation and cumulative gas production of PI, SG, GS, CC and LL were not significantly different, however, the degradation pattern oraganic matter (total VFA) distinguished a different rate of degradable material available for rumen which should be taken into consideration by using them in a ration formulation. The Ca and Mg solubility of LL was higher than other legumes. However, PI was a good soluble P source. Generally, SG is a good protein source and can be mixed with other mineral supplement legume.

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The Study of Phytochemistry of Java Ginseng Compare to Korean Ginseng

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Abstract

In asian countries, the Korean ginseng (Panax schinsen) has been well known as a tonic, treatment for Diabetes Mellitus, effective to develop energy, sex ability, to cure eyes and hearing to develop brain efficiency and to long life, however, due to the expensive market price, Indonesian are looking for other treatments through medical plants such as java ginseng. In Indonesia, Korean ginseng has long been used by people as a tonic and in Indonesia, there are many vegetables and herbs that have been wide by used as traditional medicine plants since ancient times. One of traditional medicines is Java ginseng (Talinum paniculatum Gaertn) which belong to Porticulaceae family. Java ginseng is a kind of herbal with 70 – 80 cm height. Java ginseng origin is from American tropics. There are twoKinds of species Talinum paniculatum Gaertn and Talinum triangglukosare Gaertn. Pharmacological effect of ginseng is adaptogen. The compound of adaptogen is able to increase energy, more concentration, sex ability and also has the characteristic to normalize body activity. The purpose of this study is to compare the contains through the phytochemistry screening method between Java ginseng and Korean ginseng. Results show that Java ginseng has active compounds such as tannin, alkaloid, saponin and flavonoid. Korean ginseng has active compounds such as terpenoide, alkaloid, saponin and flavonoid, It can be conclude from this study seem that Java ginseng has the same active compounds with Korean ginseng except tannin and terpenoid.

Keywords: Lifestock, traditional medicine,

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Introduction

Many people especially in Asian countries are turning to herbs as adjuncts to other treatments because herbal remedies are seen as less expensive and less toxic.

In Indonesia, Korean ginseng has long been used by people to guard against Diabetes Mellitus, rheumatism, fever, insomnia. According to Tenney (1996), ginseng is a medicinal plant which can use as a tonic and adaptogenic. The compound of adaptogen is able to increase energy, more concentration, sex ability, and also has the characteristic to normalize body activity (Gunawan,2000).

Korean ginseng has been famous for the effectiveness but very expensive. The high price of Korean ginseng in Indonesia has caused Indonesian are looking for other alternative by using Java ginseng. In Indonesia, there are many vegetables and herbs that have been wide by used as traditional medicine plants since ancient times. Syamsuhidayat dan. Hutapea (1991), described 145 kinds of traditional medicine plants based on their pharmacological, clinical, nutritive, and economic value. Among them is the Ginseng Java (*Talinum paniculatum* Gaertn) which belong to *Porticulase* family.

The form of Java Ginseng is the same with the Korean Ginseng. According to Sugiastuti *et. al*. (1996) in Ismatika (1999), Java Ginseng has active compounds such as steroid, saponin, and tannin. At least two similar active compounds with Korean Ginseng have been found, which is terpenoid and steroid. There are many kinds of ginseng which grow in Korea and China are known as *Panax Japonica* from Japan, and Java Ginseng (Som Java) from Indonesia. Ginseng is not synthetic medicine is unharmed but effective traditional natural herb. The part use of the medicine is the root which has the warm characteristic, sweet, and bitter taste (Ried, 1995).

The early research show ginseng can cure fatigues after working hard, beside that ginseng has the power as stimulant tonic, be freshener even for men's spirit.
According to government (1999), Korean Ginseng contains of 50 active compounds which have been investigated among other ginseonida, N-nonacosana, neolovene, panaxic acid, and panaxin. Ginteonida is active ginseng compound which have many benefit.

The purpose of this study is to compare of the contains between extract Java Ginseng (*Talinum paniculatum* Gaertn) and extract Korean *Ginseng (Panax ginseng)* (Figure 1).

Java Ginseng

Panax Ginseng

Figure 1. The leave of Java Ginseng and root of Panax ginseng

Materials and Methods

Alkaloid test
 3 ml ethanol extract Java Ginseng and Korean Ginseng, both of ethanol extract added with 3 ml HCl 2 M, heated for five minutes. After cool then it were added NaCl. Filtrat were treated with Meyer, Dragendorf, and Wagner test.

Saponin test
 1 ml extract Java Ginseng and Korean Ginseng, both of them added aquadest heated about five minutes, then shake.

Flavonoide test
Both of ethanol extract + 0,5 ml HCl heated on water bath about fifteen minutes.

Tannin test
 Both of ethanol extract + 5 ml aquades + $FeCl_3$

Terpenoide test or steroid
 evaporated of 2 ml ethanol extract + ether. Filtrat were treated with Lieberman Burhard

Results

Table 1. The result of Phytochemistry of Java Ginseng and Korean Ginseng:

	Active Compounds	Java Ginseng	Korean Ginseng
1	Alkaloid		
	- Dragondorf	+	+
	- Mayer	+	+
	- Wagner	+	+
2	Saponin	+	+
3	Flavonoide	-	+
4	Tannin	+	+
5	Terpenoide	-	+

+ = there is secondary metabolite
 -   = there is no secondary metabolite

Table 2. The result of Phytochemistry of Java Ginseng and Korean Ginseng:

	Java Ginseng		Korean Ginseng	
	Result	Observation	Result	Observation
Saponin	+	stable foam	+	stable foam
Flavonoide	-	yellow coloured	+	red coloured
Alkaloid				
- Dragendorf	+	orange precipitated	+	orange precipitated
- Mayer	+	white precipitated	+	white precipitated
- Wagner	+	chocolate precipitated	+	chocolate precipitated
Tannin	+	precipitated	+	chocolate precipitated
Terpenoide	-	yellow coloured	+	red coloured

Conclusions

Result shows that Java Ginseng contains tannin, alkaloid, and saponin; while Korean Ginseng contains tannin, alkaloid, saponin, terpenoide, and flavonoide Table 1 & 2).

Except for terpenoide and flavonoide, results of this study from other metabolites confirm that Java Ginseng is readily available in Indonesia. And for further studies, need to be carried out to evaluate extraction of active compounds, definition of structure and potential for synergism or antagonism within the compounds and or other drugs. And also capsule formation of the active compounds for medicinal porposes.

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Essential Oils as a Multi-function Feed Additive (MFA) to Improve Broilers Performance, Metabolism, Dung Consistency and Efficiency of Production

Maria Ulfah[12]

Abstract

Since the serious dangers of using antibiotic performance enhancers can no longer be advocated with regard to human health and well-being, essential oils can be considered as natural alternatives to antibiotic performance enhancers. A specific formulation of essential oils reinforced with their active compounds has been combined into a form suitable for use as a feed additive called multi-function feed additive (MFA). Recently there are insufficient scientific result data to clarify the effectiveness-oriented mixture of essential oils. The aim of this study is to investigate further effects of MFA on broiler performance, dung consistency, and efficient production. A total of 36.000 female Ross day old chicks, with a mean body weight of 45.00 g, were randomly assigned to a control (basal diet) and a test group (basal diet and MFA included a mixture of 18 mg/kg oregano + 18 mg/kg cinnamon +18mg/kg thyme + 18 mg/kg eucalyptus oil). The MFA was used in concentration of 1000, 750 and 500 mg/kg feed mixture during 1-11; 12-35 and 36-42 days of experimental period, respectively. The results indicated that broilers receiving MFA had a higher average daily gain (p<0.05) than control (49.6 vs 48.5 g/bird). Birds in the test group slaughtered approximately 1 day earlier than those in control (41 vs 42 days)). Prolongation of the age of reaching the time to slaughter followed by the higher average feed intake of the control than treated group (3.75 vs 3.68 kg/bird). The improvement of feed conversion rate of test group was significantly higher (p<0.05) than those in control (1.77 vs. 1.86). Inclusion of MFA allowed for a better remarkably excreta condition, a higher N retention (40.3 vs 41.8 g/bird), a lower loss rate (4.60 vs 2.10 %) and a higher profit per m^2 floor area[13] (42.84 vs 43.75 US dollar). The results clearly demonstrated that the MFA had a positive effect on broiler performance. The MFA also improved the economic framework conditions of broilers production since the performance improvement in growth was accompanied by a distinct reduction in feed and loss rate. MFA are a very good example of livestock production promoting both economics and ecology with synergetic effects.

Key words: *Essential oils, broiler, growth performance, metabolism, dung consistency, profit, Multi-function Feed Additive, broiler*

Introduction.

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[13] 15 birds/ m^2 floor area

Since the stricter conditions and intensified constraints regarding management and feeding can not always be adopted by higher rates of return, there is growing pressure on farms to stabilize successful result in livestock improvement. At the same time, consumer demands are becoming more and more important as a part of the definition for the safety and quality of feed for animal production. The use of antibiotics performance enhancers in animals has been banned because it could contribute to the emergence of antibiotic-resistant microorganism and drugs residues in animal products that could be transmitted to humans and result in infections that could be difficult to treat resistant for treatment. Therefore new products have been developed in order to replace antibiotics. Essential oils, however, are known to posses natural antibacterial activity and other characteristics that could be useful in value-added animal protein production. They are products, generally of rather complex composition, comprising the volatile principles contained in the plants, such as spices and herbs, with characteristic of aroma and flavor. Some essential oils, e.g. oregano (AeschbacH *et al.*, 1994; Gill, 1999; Sivropoulou *et al.*, 1996), cinnamon (Chang, *et al.*, 2001; Dedl and Elssenwenger, 2000), thyme (Hammer *et al.*, 1999) and eucalyptus oils (Harkenthal *et al.*, 1999), have been shown to have anti-microbial activities.

A specific formulation of essential oils reinforced with their active compounds has been combined into a form suitable for use as a feed additive called multi-function feed additive (MFA). Yet essential oils not only influence the microbe population, but also in the same time the biochemical enzymatic processes of digestion and the biochemistry of intermediary metabolism (Günther and Ulfah, 2003). So if the potential mode of action of essential oils in animals can also be shown under practical conditions, we have the opportunity to cover the safety of feed for an optimal digestion and health of the animal as well as the health of the consumer in economical and accepted way. Recently there are insufficient scientific result data to clarify the effectiveness-oriented mixture of essential oils. Therefore the aim of this study is to investigate further effects of MFA on broiler performance, dung consistency, and efficient production.

Materials and Methods.

Studies on altogether of 36.000 Ross day old chicks, with a mean body weight of 45.00 g. The tests ran in the conventional section from the first day of life onwards and extended for 42 test days. The environmental temperature was maintained between $30^{o}C$ during the first 7 days, $27^{o}C$ during 7-15 days, $24^{o}C$ during 15-25 days and gradually decline up to $21^{o}C$ during the remaining days. The climatic conditions comprised a relative atmospheric humidity above 60%.

The Completely Randomized Design (CDR) was used in these experiments. The grouped broiler are based on the differences combination of feeding treatment arranged as control (basal diet) and treatment (Basal diets and compound feed with MFA included a mixture 18 mg/kg oregano oil + 18mg/kg cinnamon oil + 18mg/kg thyme oil + 18 mg/kg eucalyptus oil). Therefore there were 18.000.00 birds respectively in control and test group. The MFA was used in concentration of 1000, 750 and 500 mg per kg feed mixture during 1-11; 12-35 and 36-42 days of experimental period, respectively. The feed was provided *ad libitum*. The MFA was provided by a chemical company EXTRA-VIT GmbH, Werl, Germany. There is ongoing quality control via distillation, gas chromatography and thin-layer chromatography supplemented by continuous test processes with broilers. Throughout the experiment, the birds were served three kind of basal diets, namely starting diet (day of 1-12), growing diet (day of 13-30) and

finishing diet (day of 31-42). The composition and the nutrients composition of basal diet were presented in Table 1 and 2 respectively. Then weight measurements, physical faecal condition, N retention and profit were determined.

Table 1. Composition of basal diet of broilers

Ingredients (%)	Starter diet	Grower diet	Finisher diet
Corn	35.00	22.00	18.00
Wheat	30.50	25.22	39.69
Triticale	-	8.00	8.00
MEGA soya pellet 49	27.90	21.50	19.70
Rape extract	-	6.00	1.00
Rape seed	-	-	5.00
Nut (*Carum carvi*)	-	8.00	2.80
Plant fat	2.90	6.00	2.80
Ca-Na-P	1.75	1.61	1.23
Monodicalciumphosphate	0.20	-	-
Salt	0.15	0.14	0.17
Liquid lysine	0.39	0.27	0.38
Methionine	0.26	0.245	0.22
L-Threonine	0.20	0.01	0.02
Vitamin mixture	0.09	0.09	0.08
Xylanase	0.25	0.03	0.03
Other	0.14	0.16	0.11

Table 2. Nutrients composition of basal diet

Components(%)	Starter diet	Grower diet	Finisher diet
Crude protein	21.18	20.72	19.56
Crude fat	5.24	7.99	6.79
Starch	41.81	38.58	42.25
Crude ash	5.41	5.19	4.72
Sugar	3.99	4.21	4.03
NFE	53.57	51.13	54.09
Methionine	0.50	0.54	0.50
Methionine + Cystine.	-	0.91	0.86
Threonine	0.77	0.76	0.70
Tryptophane	0.25	0.25	0.23
Calcium	0.95	0.90	0.80
Phosphor	0.73	0.68	0.600
Natrium	0.16	0.15	0.14
Kalium	0.85	0.83	0.77
Energy[j]	12.58	12.95	12.94

[j] MJ ME / kg;

Results and Discussion

The results of the experiment showed that all the parameters examined were influenced positively as shown in table 3.

Generally without antibiotic growth promoters, contemporary broiler production could be done, however together with a better FCR, the average daily weight gain of broilers that consumed MFA based on oregano, cinnamon, thyme and eucalyptus oils, has been significantly improved ($p < 0.05$) by 2.80%. The essential oils assisted in returning the microbial population within the gastrointestinal tract to more balanced levels, impact on the enterocytes of the lumen, and improve overall feed intake when normally the stressed birds would not consume as much feed. Thus, they are classified as "antimicrobial additives" and as "growth promoters". According to NRC (1994), antimicrobial feed additives are included in the diets to improve growth, efficiency of feed utilization and livability.

Table 3. Influence of MFA based of essential oils on broiler performance, faecal score, loss rate and efficiency of production (a, b = $p < 0.05$)

Parameter	Control Group	Treatment Group
Number of broilers	18.000	18.000
Initial weight, g	45.00	45.00
Final weight, g	2.071 (100%)	2.129 (102.80%)
Daily weight gain, g	48.50[a]	49.60[b]
Total weight gain, g	2.036 (100%)	2.084 (102.35%)
Fattening period, day	42	41
Feed intake, kg	3.75	3.68
Average daily feed intake, g/day	89.29[a]	89.76[b]
Feed conversion ratio (FCR), kg/kg	1.86[a] (100%)	1.77[b] (95.10%)
Number of losses, bird	828	378
Mortality rate, %	4.60 (100%)	2.10 (74.90%)
Carcass, kg/m^2 floor	31.00 (100%)	33.0 (106.5%)
N-retention, g/bird	40.3	41.8
Dung consistency	Moist	Dry
Profit per m^2 floor area, US dollar	42.84 (100%)	43.75 (102.1%)

Broilers in the treatment group slaughtered approximately 1 day earlier than those in control group. Prolongation of the age of reaching the time of slaughter followed the higher total feed intake of the control group. However, the broilers fed MFA had significantly higher ($p < 0.05$) average daily feed intake than broilers fed basal diet. A further clear effect of essential oils also concerns on FCR, i.e. the use of nutrients and feed energy. The inclusion of MFA tended ($p < 0.05$) to improve the FCR. Since production costs in poultry fattening are determined to over 60% by feed costs, the improvement in FCR leads to a further increasing of the profitability. As a result of enhanced nutrients digestibility, the use of MFA lead to improvements in feed utilization. MFA therefore reduce the output of environmentally polluting nutrients.

Essential oils also lead to a secured reduction of the loss rate in broiler fattening from 4.60 to 2.10 %. The essential oils thus promote infection protection, act as "an anti-stress agent" and make a major contribution to improving the profitability in poultry production. This is in agreement with MIRELES (2001) and MIRELES *et al.* (2001), that feed additive significantly result in lower mortality, better weight gain, feed conversion and bone strength due to the immune-derived inflammatory response. Moreover, WHEELER and FIELDS (1993) found that plant materials have been shown to contain components with anti stress and immunomodulatory activity, thus reduced mortality by 50%.

Conclusions.

The essential oils can be classified as multi-function feed additives (MFA) due to some improvement resulted when they are administered into monogastric animals diets in term of feed intake, feed conversion rate, growth performance, faeces condition and animal health improvement. MFA are a very good example of livestock production

promoting both economics and ecology with synergetic effects. MFA as biological-plant feed additives are in line with modern requirements for healthy and risk-free agricultural production. Further studies, however, should be done to investigate the effectiveness-oriented mixture of essential oils on the regulation of the intestinal microbial flora, enzyme activities, carcass quality and their modulation against odor of waste animal.

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The Growth of *Trichantera gigantea* as Effect of Fertilization and Different Stem Cutting

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Abstract

Trichantera gigantea is one of non legume multipurpose trees comes from Colombia and grown well in Vietnam. Trichantera gigantea grow well without any fertilization. This experiment aimed to reveal the response of Trichantera gigantea as effect of fertilization and different stem cutting. The experiment was designed in Factorial Randomized Completely Design with 2 factors. The first factor was fertilization; P0 = no fertilizer and P1 = 30 t/ha manure. The second factor was different stem cutting; S1 = lower part of stem (brown stalk), S2 = middle part of stem (green stalk), and S3 = upper part of stem (growing point). Visual observation found that the first bud grew at the sixth-day after planting in pots with upper part of stem (S3). At the ninth-day, bud started to appear in pot with middle part of stem (S2) and pot with lower part of stem (S1) started to grow bud at the eleventh-day. Fertilization (P1) gave a significantly different (P<0.05) response on number of buds, number of leaves, and fresh shoot dry matter shoot production if it compared to pot without fertilization (P0). Meanwhile, different stem cutting did not affect (P>0.05) the growth of Trichantera gigantea in general. There was no interaction between fertilization and different stem cutting. It could be concluded that Trichantera gigantea gave a good response to fertilization (manure). Cultivate Trichantera gigantea with different stem cutting gave relatively the same response.

Keywords: Fertilization, growth, manure, stem cutting, Trichantera gigantea

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Introduction

Multipurpose trees is one of internal inputs in agriculture which play an important role in mixed farming systems in providing multi useful products such as wood and fuel (stem) and potential forage (leaves) for livestock. Multipurpose trees have been used traditionally as protein sources for livestock in smallholder farmers. In addition, legumes and some non-legumes multipurpose trees have capability to fix free-living nitrogen at atmosphere. According to Preston (1995), the role of multipurpose trees in mixed farming systems is as source of protein for pigs, ducks, sheep, and buffaloes (the leaves), as media for synthesis of ammonia through the action of symbiotic microorganism attached to, or in free living association with, the root layer, to control erosion, and to provide construction material and firewood. The characteristics of multipurpose trees that are sought by farmer relate to the need to minimize inputs and maximize outputs. Farmers need high yield, ease of harvesting and pest and diseases resistance of multipurpose trees.

Trichantera gigantea (Nacedero) is one of non-legumes multipurpose tree but can fix free-living nitrogen in the root zone through the action of mychorrhiza or other microorganism in soils (Suheang, 2003). This tree is apparently native to the Andean foothills of Colombia and it is used as shade for coffee, as live fence, and as feed for animals (Keir, et al., 1997).It has a vigorous regrowth even with repeated cutting and without fertilizer. The yield higher with cutting at the height of 1 – 2 m above the ground. Besides, the other advantage of *Trichantera* is its leaves can fed directly to pigs. The result of some experiments showed that *Trichantera* could be a source of protein supplement for monogastrics (pigs) and can replace 75 % of soybean meal in gestation period (Moog, 2001).

Growth capability of the plant is affected among are by mineral nutrient in soils and plant material. The availability of nutrient in soils is close related to fertilization. Fertilization can be done by using organic and an organic fertilizer. Organic fertilizer such as manure (from sheep) is often used by farmers in rural area. Manure contains good N, P, and K element. Manure have a good impact on physical and chemical composition of soils (Sutanto, 2002). This will lead to well-growth and production of forage plant. Besides, manure is one of friendly-environment inputs.

Plant material which will be used for plant propagation can be produced by two basic methods of plant propagation are sexual (seed) and asexual (vegetative) reproduction. *Trichantera* which was introduced into Vietnam from Colombia in 1990 does not produce viable seed and must be propagated by asexual reproduction (Nguyen Ngoc Ha and Phan Thi Phan, 1995). One of most common methods of asexual propagation is cutting (stem cutting). A cutting is a vegetative plant part which is severed from parent plant in order to regenerate itself, thereby forming a whole new plant. Cutting should be taken from healthy, disease free plant, preferably from upper part of the plant. According to Evans and Frank (1999) in general, cutting from lateral shoot often better than cutting from terminal shoot.

Based on this explanation, so this experiment was conducted to reveal the growth response of *Trichantera gigantea* as effect of fertilization and different stem cutting.

Materials and Methods

This experiment was conducted at Sipin Ujung, Jambi City in wood-construction house with plastic roof. Observation was done during 3 months planting (harvesting at the age of 3 months).

Stem cuttings of *Trichantera gigantea* were used as planting material. It was taken from plant stock at the age of 7 months old. Stem cuttings were 20 centimeters long and contain 2 nodes. This experiment was done by growing *Trichantera* in pot with 10 kg capacity.

This experiment was design in Factorial Randomized Completely Design with 2 (two) factors. The first factor was fertilization, includes P0= no fertilizer and P1= 30 t/ha manure (from sheep). The second factor was stem cuttings, include S1 = lower part of stem (*brown stalk*), S2 = middle part of stem (*green stalk*), and S3 = upper part of stem (*growing point*). There were 6 combinations of treatments with four replication. The overall of experiment units were 24 units.

The observation was the growth response of *Trichantera gigantea* which include vertical height of plant, number of bud and leaves, and fresh and dry matter (total leaves and stems) shoots production.

Collected data were analyzed by Analyzes of Variance (ANOVA) based on Factorial Randomized Completely Design with 2 (two) factors. The difference among the treatment will be tested by Multiple Duncan's Test (Steel and Torrie, 1993).

Results and Discussion

Visual observation found that the first bud grew at the sixth-day after planting in pots with upper part of stem (S3). At the ninth-day, bud started to appear in pot with middle part of stem (S2) and pot with lower part of stem (S3) started to grow bud at the eleventh-day. This is predicted that upper part of stem is the growing point of the plant. Here is found the meristematic tissue and phytohormone; auxin, so the initial growth of upper part of stem (S3) faster than middle (S2) and lower (S1) part of stem. Gardner, *et al*., (1991) stated that the growth is located at terminal, lateral, intercalary meristematic tissue. Terminal meristematic tissue has high cell activity and produces hormone by itself. Dwidjoseputro (1994) added that growth hormone (auxin) is formed in meristematic tissue at terminal shoot like buds, terminal buds, and leaves.

Vertical Plant Height, Number of Buds, and Number of Leaves.

The appearance of buds in each unit of experiment reflected that plant grew and the root systems started to work. The observation of plant growth in this experiment includes vertical height of plant, number of buds and leaves (Table 1), and fresh shoots production. (Table 2).

Table 1 showed that fertilization gave significant effect on number of buds and leaves. On average, fertilization also gave higher vertical height of plant than plant without fertilization. Fertilization by using organic fertilizer from manure (from sheep) caused additional mineral nutrient at P1 if it compared to P0 (no fertilization). This is predicted

that mineral nutrient which is contained in organic fertilizer from manure can increase chemical soil properties like N, P, and K. According to Sutanto (2002), in general solid material from manure (from sheep) contains more nitrogen than phosphorous and kalium. This condition will lead lower rate of photosynthesis in P0 compared to P1, so the growth of buds and leaves less than in P1. Marschner (1995) said that the rate of photosynthesis in plant tissue and organ can be limited by supply of photosynthate from leaves. In plant, suffering nitrogen deficiency may decline elongation rates of leaves.

Middle part of stem (green stalk)~(S2) showed the highest number of leaves than lower (S1) and upper (S3) part of stem. This is related to reserved energy (carbohydrate), mineral nutrient, and nitrogen in each stem cutting. The middle part of stem (S2) has balance proportion of carbohydrate, mineral nutrient in cuttings, and nitrogen. This will accelerate the growth of plant, especially for initial growth (root formation) and number leaves. According to Rochiman and Setyati (1973) that factors which affect the successful asexual (vegetative) propagation by stem cutting among are mineral nutrient in cuttings, reserve energy content, and nitrogen. Rini Widianto (1992) said that older stem is not good for cuttings because older stem is very difficult to form root. It will take a long time to form root. Meanwhile, transpiration is very fast in younger stem. It will cause the weakness of cutting and finally die. Evans and Frank (1999) added that cutting from lateral shoots often root better than cuttings from terminal shoots.

In this experiment, there was no interaction between fertilization and different stem cutting.

Table 1. The Average of Vertical Height of Plant, Number of Buds and Leaves of
Trichantera gigantea as Effect of Fertilization and Different Stem Cutting

Fertilization	Stem Cutting			Average
	S1	S2	S3	
Vertikal Plant Height (cm/pot)				
P0	53.80	51.35	49.98	51.71
P1	55.65	57.33	51.27	54.70
Average	54.73	54.24	50.55	
Number of Buds (/pot)				
P0	9.25	6.50	8.00	7.92b
P1	15.00	13.50	9.25	12.58a
Average	12.13	10.00	8.63	
Number of Leaves (leaves/pot)				
P0	42.00	38.50	43.75	41.42b
P1	79.50	84.00	55.00	72.83a
Average	60.75	61.25	49.38	

Note: a,b Means within the same column are statistically different ($P<0.05$)

Shoots Production

Accumulation of fresh and dry matter is indication of growth characteristics. The average of fresh and dry matter shoots production of *Trichantera gigantea* as effect of fertilization and different stem cutting showed in Table 2.

Table 2. The Average of Fresh and Dry Matter Shoots Production of *Trichantera gigantea* as Effect of Fertilization and Different Stem Cutting

Fertilization	Stem Cutting			Average
	S1	S2	S3	
Total Fresh Shoots Production (g/pot)				
P0	75.13	70.95	108.07	84.72b
P1	192.50	190.68	197.23	193.47a
Average	133.81	130.81	152.65	
Total Dry Matter Shoots Production (g DM/pot)				
P0	13.29	8.71	12.49	11.49b
P1	27.32	26.04	28.30	27.22a
Average	20.30	17.37	20.39	

Note: a,b   Means within the same columns are statistically different ($P<0.05$)

In general, the treatment of fertilization significantly ($P<0.05$) affected fresh and dry matter shoots (total leaves, and stems) production of *Trichantera gigantea*. This is caused by supply of mineral nutrient in P1 as effect of fertilization accelerate the plant growth. Fresh and dry matter shoots production were the growth result from vertical height of plant, number of buds and leaves. Marschner (1995) said that the increase of N availability will accelerate the growth of shoots (leaves and stem) and root, but usually the growth of shoots higher than the growth of root. There was no interaction between fertilization and different stem cutting in this experiment..

Conclusion

This experiment found that *Trichantera gigantea* give a good response to fertilization. Cultivate *Trichantera gigantea* with different stem cutting gave relatively the same response.

It was found no interaction between the treatment of fertilization and different stem cutting.

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Evaluation of Nutrition and Organoleptic Physical Quality for Pellet Using Some Levels of Seaweed (*Sargassum sp*)

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Abstract

Seaweed represent as one of nature resource which not exploited in an optimal fashion yet. Sargassum sp has permanent potential upon feed as carbohydrate source. This research aim to study the influence of using some Sargassum sp.'s level toward pellet by combining conditioning and non-conditioning method headed for nutrition's quality and organoleptic physical quality. Yellow corn, rice bran, oil cake coconut, oil cake soy, fish meal, seaweed (Sargassum sp) and premix were used for pellet composing. Factorial model based on completely (block) randomized design was employed through out the experiment. Two factors have been evaluated (i) the level of Sargassum sp's addition (0; 5; 10 and 15%), and (ii) the method of pellet composing (conditioning and unconditioning). Data were subjected to ANOVA. Duncan and t-test was used for further analysis. Parameter observed including proximate component, durability, colour and texture of pellet. The results show the existence of real interaction (p<0,05) among treatments to the content of dry matter, ash, crude protein, crude fiber and Nitrogen of Free Extract. The increasing of nutrient quality presented by the content of dry matter, ash, crude fat and Nitrogen of Free Extract. Furthermore, the content of crude fiber and crude protein were significantly decreasing (p<0,05). Use of Sargassum sp toward pellet yield the brown to black colour, medium to harsh texture with 86,67; 89,16 and 91,41% level of durability. While control yield light brown colour, fine texture by 92,52% durability level. Conclusion indicates that the use of Sargassum sp may not be able to improve the quality of organoleptic physical yet. The evaluation of nutrition quality concluded the increasing of dry matter content, ash, crude fat and Nitrogen of Free Extract while crude protein and crude fiber content decreasing.

Keywords: pellet quality, seaweed, nutrient evaluation, organoleptic physical

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Introduction

Indonesia is an archipelagic country by 70% of its region in the form of territorial water which has coastline's length more than 81.000 km. The territorial water assorts of nature resources. One of the nature sources owning economic value and good quality of nutrition is seaweed. In general, seaweed in Indonesia exploited as food, traditional drug and raw material of cosmetic. Seaweed has a high carbohydrate content and represent as a source of both some vitamin and mineral (iodine, natrium and calcium) that playing a part in growth process.

Sargassum sp is a type of seaweed from the class of *Phaeophyceae* (brown seaweed). Its production in Indonesia reaches about 100.000 ton. Refer to its potency; *Sargassum sp* has a wide chance to use as an alternative feed. The previous researches informed that *Sargassum sp* content water, ash, crude protein, crude fat, crude fibre and nitrogen free extract in the level of 12,59; 51,30; 3,97; 22,90; 0,89 and 20,94%, respectively. Suptijah (2002) reported that generally seaweed contents mineral and vitamines in the form of K, Mg, Cl, Ca, P, Na, Fe, I, Vitamin A, B complex (B1, B2, B3, B5, B6, B12), and C. In general, nutrient content of seaweed is carbohydrate 39-51%; protein 17,2 - 27,13%; fat 0,08% and ash 1,5%. It placed *Sargassum sp* as the second quality of seaweed in according with the result of its nutrient quality which is relatively lower than seaweed in general. Furthermore, this condition support *Sargassum sp* to be used as an alternative feed without any competition with human needs.

Class of *Phaeophyceae* contents carbohydrate in the form of polysaccharide named alginate. Alginate is polysaccharide representing especial component from membrane rubber brown seaweed and represent the important compound at cell wall (Winarno, 1990). Alginate having effects as emulsifier, stabilizer, suspension and dissolve in cold water (deMan, 1997). Refer to its function, it can be expected by alginate to assist the pelleting process, especially at its function as stabilizer and emulsifier. The existence of the pellet would be better and provide the benefit in the digestive tract of the livestock.

This research aim to study the influence of conditioning and the use of various levels *Sargassum sp* in pellet diet upon proximate component. Observation to colour, texture and durability of pellet used as supporting data. The research's result is expected to serve the information about alternative substance of raw material of diet which can improve the quality of ransom. Hypothesis of the research is, with the treatment of conditioning and addition of *Sargassum sp*'s level will improve the nutrient quality of pellet diet.

Methods

The research was done from January until April 2004 in the laboratory of Animal Nutrition and Feed Science and the laboratory of Technology and Feed Industry in the Department of Animal Nutrition and Feed Science, Faculty of Animal Agriculture, Diponegoro University. Materials used in this experiment were yellow corn, rice brand, coconut meal, fish meal, soybean meal, seaweed (*Sargassum sp)* and premix. Feed formulation based on iso energy (2500 – 2700 Kcal/kg) and iso protein (16 - 17% DM). *Sargassum sp* added on the level of 0, 5, 10, and 15% of total diet. Chopper, pelleter,

grinder, pail, stop watch, thermometer, instrument of proximate analysis and "tumbling can" which was modified, were used as the equipments for collecting data.

Factorial model based on completely (block) randomized design was employed through out the experiment. Two factors have been evaluated (i) the level addition of *Sargassum sp* (0, 5, 10 and 15% of total diet), and (ii) the conditioning treatment cover the treatment by conditioning and unconditioning treatment. Data were subjected to ANOVA using parameter obtained (water content, ash, crude protein, crude fat, crude fiber and nitrogen free extract). Colour, texture and durability observed physically organoleptic to get the supporting data.

This research cover 3 phases, that is: preparation phase, phase of feed formulation and pellet making, and also phase analyze. This phase started by taking fresh *Sargassum sp* from Bandengan coast, Jepara which was cleaned later on and then run dry to aerate and also hereinafter milled by using grinder. Milled *Sargassum sp* that in form of flour, then analyzed to know the proximate content.

Feed formulation was using trial and error method (Table 1). Raw materials used in the feed formulation were yellow corn, rice brand, coconut meal, fish meal, soybean meal, premix and seaweed (*Sargassum sp* on the addition level of 0, 5, 10, and 15%). Pelleting phase was beginned after the mixing process completed (homogeny). The mixtures were divided into two parts for the second factor treatment (conditioning and unconditioning). The addition of hot water onto the mixtures was needed until it can be formed to become the lump. Next phase is pelleting by using extruder which was modified from meat grinding moved by electromotor 1,5 HP with the speed of 75 rpm. Pelleting process with treatment of conditioning procedure much the same with unconditioning treatment. After the mixture mixed with *Sargassum sp*, then it steamed at temperature 60 - 80°C during 30 minutes. Steaming process was using the boiler which its filter pillowed by puncture plastic.

Table 1. Mathematical feed formulation by the addition of *Sargassum sp*

		Level of *Sargassum sp*			
	Substances	0% (T0)	5% (T1)	10% (T2)	15% (T3)
			kg		
1	Yellow Corn	27	26	25	24
2	Rice Brand	40	39	37	36
3	Coconut meal	20	18	16	10
4	Fish meal	5	5	5	5
5	Soybean meal	7	6	6	9
6	*Sargassum sp*	0	5	10	15
7	Premix	1	1	1	1
Nutrition Value					
ME (Kcal)		2797,00	2719,26	2635,25	2558,63
CP (%)		17,45	16,54	16,00	16,27
CF (%)		5,286	5,668	6,08	6,087
F (%)		8,626	8,242	7,747	6,897
Ca (%)		0,258	0,2778	0,2720	0,269
P (%)		0,9379	0,9022	0,8592	0,8263

Analysis phase was using proximate analysis to know the content of water, ash, crude fiber, crude protein, crude fat and nitrogen free extract (AOAC, 1975). Data were subjected to ANOVA by using MS Excel program and Costat to find out the effect of treatment upon the objects. Further test was using Duncan test.

Results and Discussion

The effect of treatment upon the enhancing of dry matter, ash, crude fat and nitrogen free extract in the pellet content.

Covariant analysis showed the significance ($p < 0,05$) interaction between conditioning treatment and the addition of *Sargassum sp* level to the degradation of dry matter content (Table 2). Combination treatment of T3K1 informed the lowest result (86,19%). This tendency is caused by the effect of water absorption during conditioning – gelatinization process started by water imbibitions and then followed by swollen granular (Meyer, 1982).

Table 2. The average of dry matter pellet

Level of *Sargassum sp*	Conditioning		Averages
	K0	K1	
	--------------	% ------------	
0% (T0)	89,97[a]	88,08[cd]	89,02
5% (T1)	89,17[b]	87,54[de]	88,35
10% (T2)	88,48[c]	86,89[ef]	87,68
15% (T3)	86,74[fg]	86,19[g]	86,47
Averages	88,59	87,18	

*) Superscript on difference columns and rows show significance of treatment effect ($p < 0,05$)

The increasing of water content will automatically decreases its dry matter content. Refer to Walker (1984), during conditioning the decreasing of dry matter content was affected by the increasing of water content and the evaporation of organic matter. Besides, the contribution of water content from *Sargassum sp* (12,59%) along with its level addition and conditioning treatment caused the decreasing of pellet dry matter.

 Covariant analysis showed the significance (p<0,05) interaction between conditioning treatment and the addition of *Sargassum sp* level to the increasing of ash content (Table 3). Ash content minerals compound which was measured by burning the organic matter (Anggorodi, 1994). The ash content was absolutely permanent because there was no addition nor reduction of ash component during conditioning. Moreover, its decreasing was caused by the reduction of both dry matter and organic matter during conditioning.

Table 3. Averages of pellet ash content (100% of DM)

Level of *Sargassum sp*	Conditioning K0	Conditioning K1	Average
	------------- % DM ------------		
0% (T0)	$8,17^g$	$9,71^f$	8,94
5% (T1)	$10,92^e$	$11,81^{cd}$	11,37
10% (T2)	$11,59^d$	$12,10^c$	11,85
15% (T3)	$13,32^b$	$14,35^a$	13,84
Average	10,99	11,99	

*) Superscript on difference rows and columns show significance effect of treatment (p<0,05)

According to Walker (1984) that during conditioning the dry matter degraded and some of organic matter evaporated. Dry matter consisted of organic and inorganic substance so that the reductions of organic substance will hence its inorganic substance thereby the ash proportion also enhancing. Contribution of *Sargassum sp* (ash content of 51,30% in DM) level addition in the feed formulation and conditioning treatment cause the improvement to ash content. The highest ash content have seen at the combination of treatment T3K1 in equal to 14,35% of DM.

Result of research concerning interaction between conditioning treatment and adding level of *Sargassum sp* to fat content show that there is no interaction between treatments (Table 4). However each treatment inform the significance effect (p<0,05) to fat content.

Lipid is a group of compound which is insoluble in water but dissolve in ether, chloroform and benzene (Anggorodi, 1994). The content of lipid was determined by proximate analysis through extracting the soluble feed organic (Sutardi, 1980). Refer also to Anggorodi (1994), the extraction will cause anything that dissolve in ether such as carotenoid, steroid and fat soluble vitamins (A, D, E, K) counting as crude fat, then the result will be higher. *Sargassum sp* content derivate of lipid (sterol) and also vitamins A, B and C which dissolve in organic dissolver such as ether and benzene. It will count as crude fat. The level addition of *Sargassum sp* provided contribution upon the increasing of crude fat content.

Table 4. Averages of crude fat content in pellet (100% of DM)

Level of *Sargassum sp*	Conditioning		Average
	K0	K1	
	------------- % DM -------------		
0% (T0)	4,52	3,06	3,79[c]
5% (T1)	4,84	4,11	4,48[b]
10% (T2)	5,16	4,66	4,91[ab]
15% (T3)	5,35	5,07	5,21[a]
Average	4,97[a]	4,23[b]	

*) Superscript on difference rows and columns show significance effect of treatment (p<0,05)

Data in Table 4 present that crude fat content decreasing along with conditioning treatment. Unconditioning fat content (4,91% of DM) is higher than conditioning fat content (4,22% of DM). Because, fat content during conditioning at temperature of 60-80°C will melt and effect to the reduction of total crude fat content.

Calculation concerning of conditioning treatment and addition level of *Sargassum sp* to enhance the quality of nitrogen free extract present on Table 5. Covariance analysis show the significance effect of interaction (p>0,05) to nitrogen free extract content. It is caused by pelleting treatment which may cause the change of cellulose into cellubiosa. As according to Komar (1984), evaporation treatment at high temperature and also by hulling process during pelleting may destroy the cell wall and cause the destruction of ligno-cellulosa linkage (turning cellulose structure into cellubiosa). Refer to Winarno (1986), nitrogen free extract consisted of monosaccharide compounds, disaccharide, oligosaccharide and polysaccharide. So, the level addition of *Sargassum sp* that content high enough carbohydrate will also increase the content of nitrogen free extract on the diet.

Table 5. Average of nitrogen free extract in pellet diet (100% of DM)

Level of *Sargassum sp*	Conditioning		Average
	K0	K1	
	------------- % DM -------------		
0% (T0)	56,08[cd]	58,87[a]	57,48
5% (T1)	57,52[b]	57,05[b]	57,29
10% (T2)	55,88[cd]	57,41[b]	56,65
15% (T3)	55,64[cd]	56,54[bc]	56,09
Average	56,28	57,47	

*) Superscript on difference rows and columns show significance effect of treatment (p<0,05)

The effect of treatment upon the decreasing of crude protein and crude fiber in pellet diet

Result of covariance analysis indicate that there are significance effect of interaction (p<0,1) between addition treatment of *Sargassum sp* level's and conditioning treatment (Table 6). Table 6 shows the decreasing of crude protein content in the pellet diet along with addition of *Sargassum sp* level's and conditioning treatment. This condition is

possibled because of conditioning treatment which destroy the protein. According to deMan (1997), heating at the temperature of 55-75°C will cause of protein denaturation. Protein denaturation can be interpreted by a change or modification of protein molecule structure without covalent bond resolving (Winarno, 1986).

Table 6. Averages of crude protein content in pellet diet (100% of DM)

Level of *Sargassum*	Conditioning		Average
sp	K0	K1	
	------------- % DM -------------		
0% (T0)	17,49[a]	17,04[a]	17,27
5% (T1)	16,74[ab]	16,68[ab]	16,71
10% (T2)	16,32[bc]	16,33[bc]	16,32
15% (T3)	15,53[cd]	15,62[c]	15,57
Average	16,52	16,41	

*)Superscript in difference columns show significance effect of treatment (p<0,1)

Temperature above the heat of protein denaturation enabled to the protein damage. Protein content at *Sargassum sp* only equal to 3,97% of DM so that level enhanced in the diet therefore will cause the degradation of protein rate. Considering that crude protein contribution with the level of 15% *Sargassum sp* becoming progressively little on the diet, so it will reduce the proportion of protein content especially after pelleting process. The lowest crude protein rate have been seen at combination treatment T3K0 which is equal to 15,53% of DM.

Result of covariance analysis show the significance effect of interaction between conditioning treatment and addition level of *Sargassum sp* upon the reducing of crude fiber in the pellet diet (Table 7).

Table 7. Average of crude fiber content in the pellet diet (100% of DM)

Level of	Conditioning		Average
Sargassum sp	K0	K1	
	------------- % DM -------------		
0% (T0)	12,29[a]	11.32[b]	11,81
5% (T1)	11,42[ab]	10.34[c]	10,88
10% (T2)	11,05[b]	9.50[e]	10,28
15% (T3)	10,16[cd]	8,42[f]	9,28
Average	11.23	9.89	

*)Superscript on difference rows and columns show significance effect of reatment (p<0,1)

The lowest crude fiber content performed on the combination treatment of T3K1 in equal of 8,42% of DM. The reducing was caused by pelleting process which destroy the cell wall especially ligno-cellulose bond through grinding phase. Refer to Komar (1984), water evaporated on high temperature treatment may break up the ligno-cellulose bond and its structure.

Conditioning treatment which has interaction with the level addition of *Sargassum sp* cause the reducing of crude fiber. *Sargassum sp* content of carbohydrate in the form of polysaccharide consists of alginate. Alginate is polysaccharide representing especial component from membrane rubber brown seaweed and represent the important

compound at cell wall (Winarno, 1990), so that the enhancement of level *Sargassum sp* in the diet will increase nitrogen free extract and decrease crude fiber, proportionally.

Physical organoleptic evaluation of pellet

Control (92,52%) shows the highest durability level compare to T1 (86,67%), T2 (89,16%) and T3 (91,41%). Pellet durability is influenced by the ability of gelatinization process from substance which content starches. Use level of *Sargassum sp* in amount of 15 % resulted better effect of gelatinization than use level of *Sargassum sp* 5% and 10%, respectively. It because *Sargassum sp* content high level of carbohydrate (57,11 % of DM). However, as rice brand also act to be the source of carbohydrate in the control treatment, then it provided the highest effect of gelatinization which results the best durability level among the treatments. Control treatment produced more amylum than other treatments. Since, amylum is the component which takes a part in the gelatinization process, more higher content of nitrogen free extract and its amylum will present harder and better durability of pellet (Meyer, 1973).

Addition of 15% *Sargassum sp* in the pellet diet present softer texture in comparison with use of *Sargassum sp* 5 % and 10 %. Though do not show the significance difference with control. It because of *Sargassum sp* that own alginate. Alginate's content in *Sargassum sp* reach 8-32% of DM. Alginate represent the special component from brown algae rubber (Phaeophyceae) whose representing polymer from acid uronat. Alginate's function among other things is as balancer and emulsifier (Winarno, 1990). The size of colloid from alginate assists to improve nor repair the performance and softness from yielded pellet. Furthermore, alginate is able to dissolve salt in water so that with the ratio arrangement / level from *Sargassum sp* it may influence the performance of pellet especially from the view of its texture. Refer to Parker (1988) crude fibre will cause the difficulty of pellet pressured effect, but in certain quantity it may strengthen substance of pellet. Duration of conditioning process may also influence the pellet texture. Because, conditioning treatment can degrade the rate of fat (Haris and Karmas, 1986), while fat be capable of improving the appearance of pellet texture (Tjokroadikoesoemo, 1986). High water content earns also the reducing appearance of pellet texture. Parker (1986) recommended the optimal water content for gelatinization process during conditioning phase is 15- 18%. Above that level (more than 20%) may bother gelatinization process which makes pellet texture tend to stringy and fibrous.

Compared to control, addition of *Sargassum sp* yield the darkened brown pellet which possibility cause of Maillard reaction. Starch in nitrogen free extract causes the polimeration reaction between sugar and amino acid which is coming from the effect of the heating substance (Winarno, 1997). Refer to Meyer (1982) heating process above 60°C be able to cause the sugar of aldehyde and sugar keton that react with amino acid or peptide to form the brown colour. Besides, pellet brown colour is also enabled by high temperature and water content during conditioning. They may possibly speed on the Maillard reaction that arising of colour change.

Conclusion

Based on research's result can be concluded that the increasement was provided to water content, ash, crude fat and nitrogen free extract of pellet diet. Reducing of pellet quality was showed by the decreasing of crude fiber and protein content.

Using of *Sargassum sp* produces dark brown to light brown colour of pellet. Besides, it also produces hard to soft texture. In addition, the best level of durability reached by the level addition of 15% *Sargassum sp*. However, control still provided the best performance of physical organoleptic evaluation. It produced light brown colour along medium to soft texture of pellet.

Acknowledgment

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The effect of GnRH and ProstaglandinF$_{2\alpha}$ Application to Progesterone Profile of Dairy Cow during 60 days Postpartum

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Abstract

A study on The effect of GnRH and ProstaglandinF$_{2\alpha}$ Application to The Progesterone Profile of Dairy Cow during 60 days Postpartum has been conducted. The study was to determine whether GnRH, ProstaglandinF$_{2\alpha}$ (PGF$_{2\alpha}$) or combination GnRH and PGF$_{2\alpha}$ treatment could influenced skim milk progesterone profile, which enhance ovarian activity in postpartum dairy cow. It is hoped that by this treatments the interval to first ovulation and estrus could be reduce, and frequency of ovulation and percentage of estrus expression could be increased.

Key words : GnRH, PGF$_{2\alpha}$, ovarian activity, dairy cattle

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Introduction

Protein crisis caused the unbalanced between the growth of the population and the increased of food as a protein source. This was because of many problems come from animal reproduction and the increased of animal population especially dairy cattle tends to decline.

Hormonal treatment was used for animal reproduction problem in many developing countries, but not in Indonesia. The big problem in Dairy Cattle in Indonesia was the calving interval which more then 14 month, and the cause of this problem is because first estrus and first ovulation postpartum always delayed.

Many cattle have been postpartum silent heat and it is about 77% dairy cattle without estrus symptom or silent heat (Dobson and Kamonpatana, 1986). Because of that, the farmer have not been mated the cattle in the correct time. This caused the calving interval longer than normal.

Based on that reason, a research on effects of GnRH and ProstaglandinF$_{2\alpha}$ Application to Progesterone Profile of Dairy Cow during 60 days Postpartum with radioimmunoassay technique should be done.

The objectives of this research were to decrease interval between partus to first ovulation and first estrus postpartum, which would be improve the reproductive status of dairy cattle with analysis of progesterone profile at skim milk during 60 days postpartum.

Materials and Methods

Twenty cows were randomly assigned to four treatments groups including Control group, which was contain respectively 5 cows in each group. Cows (n= 5) in group I received 200 μg GnRH i.m. on days 10 – 14 postpartum, in group II received 15 mg PGF$_{2\alpha}$ i.m. on days 20 – 24 postpartum, and group III received combination of both. The control group (n=5) did not receive hormonal treatments.

Rectal palpations to determine the ovarian activity were conducted every week after calving to monitor morphology of the corpus luteum. Radioimmunoassay (RIA) was used to determine the profile of progesterone in skim milk. Through progesterone profile in this skim milk, optimal time of postpartum to conception (artificial insemination or natural mating) could be predicted.

Data were statistical analyzed by *Multivariet* and completely randomized design. The differences between groups were used *Univariet* T-Test and Duncan test.

Results and Discussion

GnRH and or PGF$_{2\alpha}$ to Progesterone Profile skim milk
The average of progesterone profile was increased after all hormonal treatments. This condition could be compared with control group as shown in figure 3. In control group the concentration of Progesterone always constant from day 2 until day 36 postpartum and it was < 1 ng/ml. Analysis with *Multivariet* and followed with *Univariet* T-test shown that the treatment was significantly influenced compared with control group.

That was meant there were significant influences from the GnRH and or PGF$_{2\alpha}$ to the progesterone profile in milk.

The result could be predicted that first ovulation and estrus postpartum from every treatment groups. It could be predicted that interval between partus to first ovulation and partus to first estrus postpartum from that cows as shown in Table 1.

Table 1. Interval partus-first ovulation, ovulation frequent and maximum corpus luteum morphology during 60 days postpartum

Treatment Group	Interval Partus-Fisrt Ovulation p.p (days)	Ovulation frequent	Maximum Corpus Luteum morphology p.p.
I (GnRH)	14	3	day 24
II (PGF$_{2\alpha}$)	26	2	day 34
III (GnRH + PGF$_{2\alpha}$)	12	3	day 20
Control	56	1	day 66

Table 1. shown that first ovulation postpartum could be late in control group than treatment groups (Group I – III). The result mean that the big problem from the cow comes from reproductive problems and the feeding played role in that condition. There are close relationship between feeding especially during pregnancy with involution of uterus   postpartum beside of breed and management.
Table 2. shown interval partus to first estrus postpartum, percentage of estrus expression during 60 days postpartum and estrus cycle.

Table 2. Interval Partus-First Estrus postpartum, Percentage of Estrus expression during 60 days postpartum and Estrus cycle

Treatment Group	Interval Partus-Fisrt Estrus p.p (days)	Estrus expression during 60 days p.p. (%)	Estrus cycle (day)
I (GnRH)	26	40	22 ± 4
II (PGF$_{2\alpha}$)	22	60	23 ± 1
III (GnRH + PGF$_{2\alpha}$)	24	60	23 ± 1
Control	54	20	54

Table 2. shown that hormonal treatment caused the first estrus postpartum earlier than control group and the average of estrus cycle shorter than control group. Meanwhile many cattle have been silent estrus but by milk progesterone analysis could be predicted that estrus occur.

Application of GnRH
In the group I, GnRH treatment day 10-14 postpartum caused the first ovulation and estrus postpartum as shown in Table 1 and 2. Day 14 the progesterone profile in milk increased. Likewise in day 28 the concentration of progesterone was increased. The result could be predicted that the first ovulation and first estrus postpartum occurred.

Hafez and Hafez (2000) mentioned that GnRH stimulate the secretion of FSH and LH from adenohypophise. Treatment of GnRH caused the development of follicle and

influenced of the follicle de Graaf. By the rectal palpation technique, in day 24 corpus luteum reached a maximum morphology. In addition Hafez and Hafez (2000) stated that maximum corpus luteum occurred between day 8 – 14 post ovulation. In relation with that, it could be assumed that in day 14 ovulation occur.

Progesterone concentration analysis shown in day 14 was 0.174 ng/ml and then increase until peak concentration in day 20, but the ovulation not yet occurred.   This situation is always occurring by cattle where follicle and corpus luteum developed together without ovulation (Stadium Bifase).   In that stage, the concentration of progesterone decrease.   The same condition in day 40 postpartum followed by the second estrus at day 44 postpartum.   In Figure 1 shown at day 14 progesterone concentration decreased, it means corpus luteum developed with basal concentration until peak concentration at day 10-14 after ovulation (Hafez and Hafez, 2000).   This research shown that concentration of progesterone maximum at day 24 and followed by a dramatic decreased at day 26 (concentration progesterone < 1 ng/ml).   This could be assumed that first estrus postpartum occurred at day 26, although there are clinical expressions of estrus.   This problem happened because of many cattle in this research are silent heat.   Dobson and Kamonpatana (1986) said 77 % cattle were first estrus without symptom (silent heat).
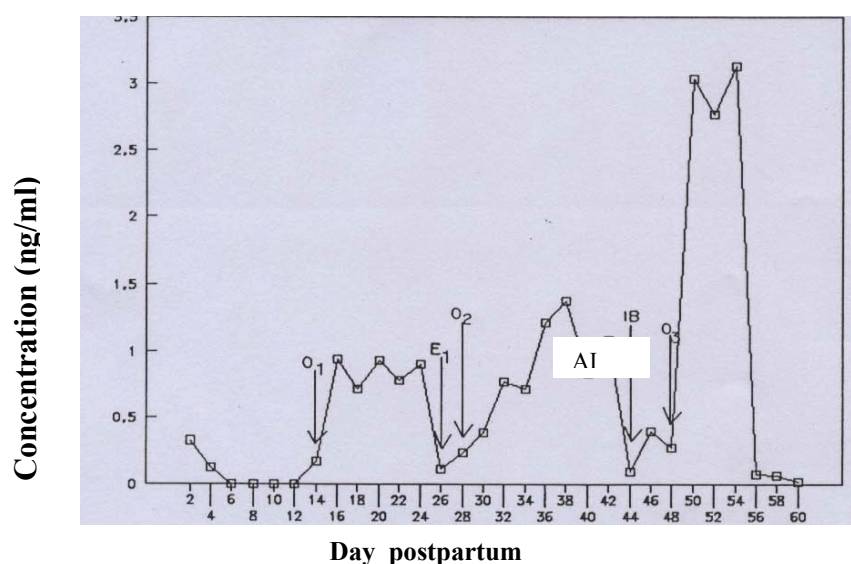

Figure 1. Average of Progesterone Profile in skim milk in group 1 (GnRH)

Application of PGF$_{2\alpha}$

Same result with GnRH treatment, application of PGF$_{2\alpha}$ was influenced to first estrus postpartum and the expression of first estrus during 60 days postpartum compared to control group (Tabel 2).

Two days after estrus at day 26 ovulation occurred (Figure 2).   PGF$_{2\alpha}$ is responsible for removing (regressing) the progesterone producing at corpus luteum (CL) on the ovary. A crucial step in bringing cattle into heat is CL regression.   Recipients that are mid-cycle (days 6 – 16) will respond to the PGF$_{2\alpha}$ injection and show heat or estrus approximately 60 hours later (Curtis, 1991).
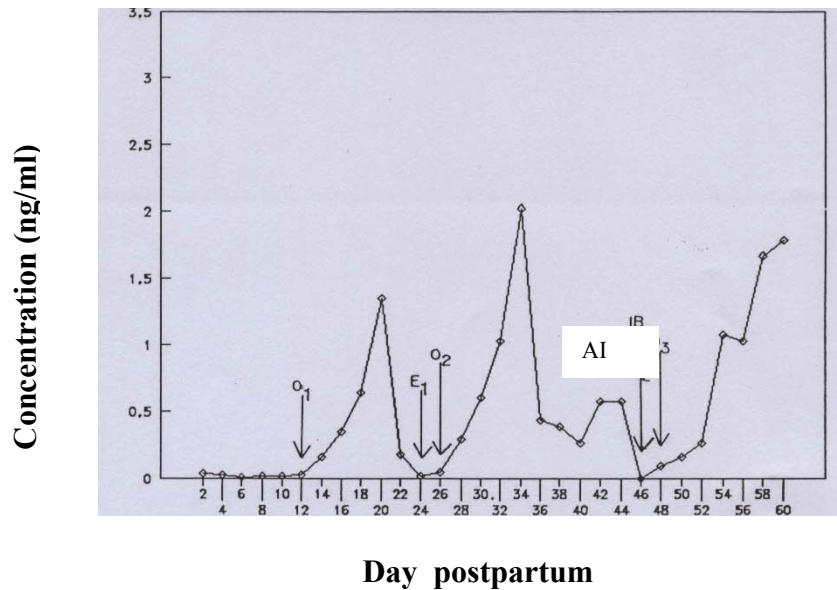
Figure 2. Average of Progesterone Profile in skim milk in group 2 ($PGF_{2\alpha}$)

Application of combined GnRH and $PGF_{2\alpha}$

Result of this research shows that application of combined GnRH and $PGF_{2\alpha}$ significantly influenced to first estrus and first ovulation postpartum. This treatment caused of development of follicles and stimulate ovulation in the short time postpartum (Table 1 and 2). This situation means that hormonal treatment could be manipulated reproductive system in cattle especially for silent heat problem.

The result obtained was that postpartum interval to first ovulation was shorter in treated groups (group I, 14 days; group II, 26 days; and group III, 12 days) compared to control group (56 days, $p < 0.05$) (Figure 3 and 4). Likewise, frequency of ovulation was increased in treated groups as compared to the control group ($p < 0.05$)

Postpartum interval to first estrus was shorter in treated groups (group I, 26 d; group II, 24 d; and group III, 24 d) as compared to control group (54 d, $p < 0.05$).
The percentage of estrus increased (60 %) in group II and III, but no significant difference was found between group I and the control group (40%). The result in this research indicated that the suitable time for natural mating or artificial insemination (AI) is after second ovulation postpartum, which could be as 22 – 23 days after first estrus.
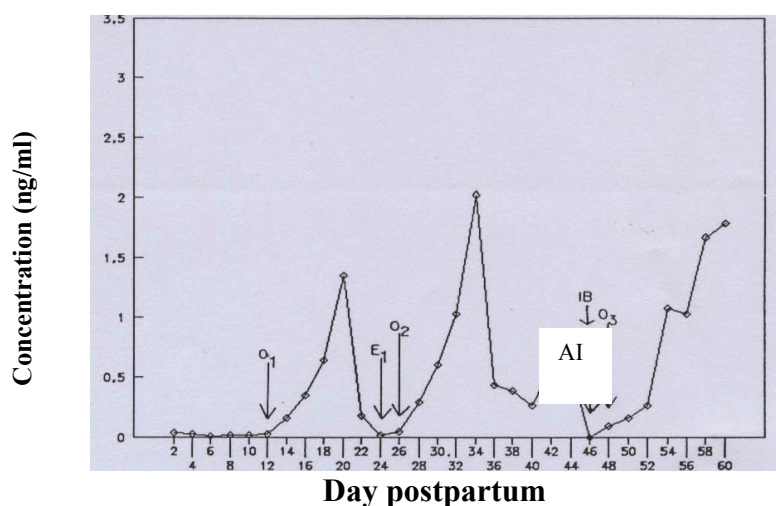
Figure 3. Average of Progesterone Profile in skim milk in group 3 (GnRH + PGF$_{2\alpha}$)
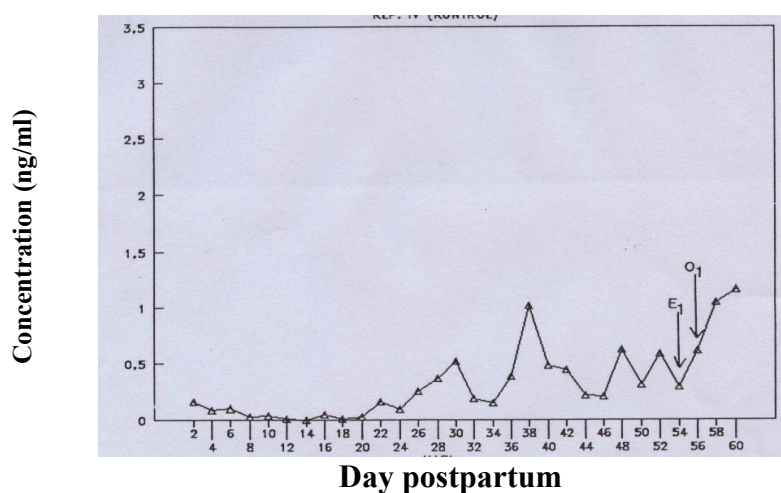

Figure 4. Average of Progesterone Profile in skim milk in control group
O : Ovulation; E : Estrus; AI : Artificial Insemination

Conclusions

Combined of treatment with GnRH and PGF$_{2\alpha}$ enhance ovarian activity in the postpartum cows and resulting in improved reproductive performance.

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Estimation Of Effective Scenario in Selection For Milk Yield Using Fixed Regression Test Days Model - FRTDM On Fries Holland Dairy Cattle (Local-FH)

Sri Bandiati Komar Prajoga[17]

Abstract

This research was conducted at PT. Naksatra Kejora, Temanggung, Middle of Java on October 2004. The objectives of this study were to estimate response to selection, relative efficiency of repeated measurement selection compared with single record, and relative efficiency of indirect selection for 305 days milk yield base on Test Day (TD). The data comprised 130 cumulative records (305 days records) and 1,950 TD records of 130 first lactation and 1,950 TD records of second lactation, which were progeny of 21 sires and 100 dams. Variance component, heritability and genetic correlation were estimated by Restricted Maximum Likelihood (REML) using Animal Model, Bivariate Animal Model and Repeated Measurement with the Program of VCE 4.2. Breeding Values of milk yield were estimated by Best Linier Unbiased Prediction (BLUP) for PEST program. Fixed effect was lactation and year season. Response to selection of milk yield 305 days was 49.468 kg, when intensity of selection was 39% for 91 cows and 47% for 10 bulls. Either for correlated response was 61.262 kg for the same intensity. The relative efficiency of indirect selection for 305 days record base on test day record was 1.23. The relative efficiency of repeated measurement selection was 0.82. According to this research, selection of milk yield 305 days could be carried out based on 49 days milking (TD$_3$), more effective if the economic aspect was taken also as selection criteria, and repeated measurement selection was not suggested.

Key words: *Single Trait Selection, Respond to Selection, Relative Efficiency of Indirect Selection, Relative Efficiency of Repeated Measurement Selection, Fries Holland Dairy Cattle.*

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Introduction

The dairy cattle holder of PT. Naksatra Kejora was established in 1956 as a swadaya business, which started only as a Santa Maria Rowoseneng meditation centre. The existence of dairy cattle cultivation was direct import from Holland, but now it cannot be existed because of the economic situation. As a problem solving, the company tried to select the available dairy cattle. However, increasing the genetic quality is not easy, especially money and time problems.

Selection usually determined as an activity of keeping the good cattle to breed, and culling the cattle with low quality. In quantitative genetic, selection is an effort to increase the frequency of gene characteristic that we expect. To do the selection, there are some needed parameters genetic, which are heritability, breeding value, and genetic correlation.

Parameters genetic above can be estimated if the data of recording for all cattle are available. Some methods can be used for doing this recording, such as: complete daily recording method that is done in 305 days, and recording method that is done in occasional days (Test Day-TD). The last method offers an easy recording, simple, flexible and not expensive because they only need to record once in 30 days or once in 21 days, for example.

In the way of choosing the most efficient and cheapest selection concept, it is need to estimate some concept so that the company can reach the targets, which are the money profit, improvement of genetic quality and shorter selection time. The last can make the company get lost if it cannot reach that third target.

There are 3 concepts that will be tested in this research: **First**, direct selection for milk yield 305 days. **Second**, selection that uses repeated measurement for first lactation and 2nd lactation. In addition, **the last**, indirect selection to milk yield 305 days based on Test day. The company should choose the most effective one, because all concepts above have positive and negative sides.

Besides the value of heritability (h^2) and genetic correlation (r_g) that give the influences to selection process, the intensity of selection also becomes very important to reach the genetic progress. Intensity of selection (z/p) is the index which is got by dividing height of the ordinate at point of truncation (z) with the cattle proportion which is selected (p), can be seen on table (Falconer and Mackay, 1996).

Intensity of selection in animal breeding should have sire and dam candidates, so the total intensity of selection, which is combine intensity between bulls and cows, will be got.

In the same level of intensity of selection will be estimated which one is more effective, throughout the checking: if the result of multiplication of TD selection accuracy ($\sqrt{h_{TD}^2}$) with genetic correlation (r_{g305}) is bigger than the accuracy of milk yield 305 days ($\sqrt{h_{305hari}^2}$), so that the selection will be better for indirect selection and the result will be more than 1 (one) (Falconer and Mackay, 1996).

Either with the same level of intensity of selection , if the result of multiplication between heritability of repeated measurement with phenotype standard deviation is bigger than the result of multiplication for single measurement with phenotype standard deviation, so that selection using repeated measurement will be better than the single and the value will be more than 1 (one). Cameron (1997) said that repeated measurement would increase the accuracy of selection $\sqrt{h^2}$.

The objective of this research is to find out which concepts of selection that will produce the good genetic quality of cattle, so that the programs can be run as early as possible to save money and time.

Material and Method

The object of this research is 130 Fries Holland cows as progeny from 23 sires and 100 dams, which cover first and second lactation and recorded from 1989 until 2003 in PT. Naksatra Kejora. The data taken from this research is used as material. The research method used is analytic descriptive. The data taken based on milk yield 305 days and Test Day in first and second lactation with 21 days as the Day Interval Milk - DIM. The reason of this DIM is consideration for milk production graphic per TD is closer to curve of milk production.

TD recording is done as below: TD1 is milk production that is recorded on 7th day, TD2 on 28th day, TD3 on 49th day and so until TD15 that takes time on 301st day (assumed as 305th day).

Data tabulation to prepare the analysis, has been anticipated for missing data and it is coded -1, meanwhile for missing information of parents is coded 0. Fixed effects are lactation and year season. In Fixed Regression Test Day Model – FRTDM, recording is analyzed as the same character in making milk production curve and used as covariate. Milk production curve that is used is Ali and Schaefer curve (1987). The model as follow:

$$y_{ijkl} = H_i + L_j + \sum_{m=1}^{4} b_{jm} x_m + a_k + pe_k + e_{ijkl}$$

Where:

       Y_{ijkl} = observation on animal ijkl
       H_i = fixed effect of the i level of environment (Herd Year-season)
       L_j = fixed effect of j lactation
       a_k = breeding value of animal k
       pe_k = random permanent environment effect animal k
       e_{ijkl} = random residual effect associated with observation
       $\sum_{m=1}^{4} b_{jm} x_m$ = 4 covariates from regression of Ali and Schaeffer,

With formula:
$Y = a + bx_1 + c\,x_2 + d\,x_3 + f x_4$

Where:
a,b,c,d,f = Coefficient regression
x_1 = DIM/t, t is constant, fixed in 305 days

x_2 $= (DIM/t)^2$
x_3 $= \ln(t/DIM)$
x_4 $= \ln2(t/DIM)$
DIM   = Day Interval Milk for 7 days, 28 days, 49 days,…………., 301 days.

The estimation of variance component and correlation genetic with repeated measurement, Animal Model, Bivariate Animal Model use REML, and the program used Variance Component Estimation – VCE 4.2 (Groeneveld, 1998)
Breeding value is estimated by BLUP for PEST programs.
The statistic formula for repeated measurement is
$Y = X\,b + Z\,u + W\,pe + e$

Where:
Y   = vector of observations
X   = design matrix connecting the observations to fixed effects
Z   = design matrix connecting the observations to random effects
W   = design matrix connecting the observations to permanent environments effects
b   = vector of fixed effects
u   = vector of random effects
pe   = vector of permanent environment effects
e   = vector random residuals

With Mixed Model Equations:

$$
\begin{bmatrix} X'X & X'Z & Z'W \\ Z'X & Z'Z + A'\alpha_g & Z'W \\ W'X & W'Z & W'W + I\alpha_{pe} \end{bmatrix}
\begin{bmatrix} \hat{b} \\ \hat{u} \\ \hat{pe} \end{bmatrix} =
\begin{bmatrix} X'Y \\ Z'Y \\ W'Y \end{bmatrix}
$$

Where: $\alpha_g = \dfrac{\sigma_e^2}{\sigma_g^2} = \dfrac{I-r}{h^2}$, and $\alpha_{pe} = \dfrac{\sigma_e^2}{\sigma_{pe}^2} = \dfrac{I-r}{r-h^2}$ (Lynch and Walsch, 1999)

The statistic formula for *Bivariate Animal Model:*

$Y_1 = X_1\,B_1 + Z_1\,U_1 + e_1$ dan $Y_2 = X_2\,B_2 + Z_2\,U_2 + e_2$

Where:
Y_1 and Y_2 = vector of observations of character Milk Yield $TD_{(1-5)}$ and 305 days
X_1 and X_2 = design matrix connecting the observations to fixed effects of character Milk Yield $TD_{(1-5)}$ and 305 days
Z_1 and Z_2 = design matrix connecting the observations to random effects of character Milk Yield $TD_{(1-5)}$ and 305 days
b_1 and b_2 = vector of fixed effects of character Milk Yield $TD_{(1-5)}$ and 305 days
u_1 and u_2 = vector of random effects of character Milk Yield $TD_{(1-5)}$ and 305 days
e_1 and e_2 = vector random residuals of character Milk Yield $TD_{(1-5)}$ and 305 days

with Mixed Model Equations::

$$\begin{bmatrix} X_1'X_1r^{11} & X_1'X_2r^{12} & X_1'Z_1r^{11} & X_1'Z_2r^{12} \\ X_2'X_1r^{21} & X_2'X_2r^{22} & X_2'Z_1r^{21} & X_2'Z_2r^{22} \\ Z_1'X_1r^{11} & Z_1'X_2r^{12} & Z_1'Z_1r^{11}+A^{-1}g^{11} & Z_1'Z_2r^{12}+A^{-1}g^{12} \\ Z_2'X_1r^{21} & Z_2'X_2r^{22} & Z_2'Z_1r^{21}+A^{-1}g^{21} & Z_2'Z_2r^{22}+A^{-1}g^{22} \end{bmatrix}\begin{bmatrix} \hat{b}_1 \\ \hat{b}_2 \\ \hat{u}_1 \\ \hat{u}_2 \end{bmatrix} =$$

$$\begin{bmatrix} r^{11}X_1'Y_1 + r^{12}X_1'Y_2 \\ r^{21}X_2'Y_1 + r^{22}X_1'Y_2 \\ r^{11}Z_1'Y_1 + r^{12}Z_1'Y_2 \\ r^{21}Z_2'Y_1 + r^{22}Z_1'Y_2 \end{bmatrix}$$

g^{11} Is element of G_a^{-1} and r^{11} is element of R_e^{-1} (Mielenz and Schuler, 1999).
$\hat{u}$ = Solution of Breeding Value

The estimation of intensity of selection by dividing the height of phenotype normal curve ordinate with the proportion of selected cattle, you can see on the table. Intensity of selection of selection (i = z/p, where i = intensity of selection, z = height of of the ordinate at point of truncation, p = proportion of selected cattle, Falconer and Mackay, 1996)

The estimation of response to selection for milk yield 305 days by multiplying the total intensity of selection with milk yield 305 days heritability and standard deviation (R_2 = $i\,h^2\,\sigma_p$, where: R_2 = response to selection, h^2 = heritability, i = total intensity of selection [(i bulls + i cows)/2}, σ_p = phenotype standard deviation)

Correlated response can be estimated by multiplying total intensity of selection with the accuracy of selection for milk yield 305 days, accuracy of TD records, genetic correlation between milk yield 305 days and TD and Phenotype standard deviation (CR_2 = $i\,h_1\,h_2\,r_{g12}\,\sigma_{p2}$, where CR_2 = response to selection of milk yield 305 days, i = total intensity of selection [(i bulls + i cows)/2}, h_1 = accuracy of individual selection for TD records ($\sqrt{h_1^2}$); h_2 = accuracy of individual selection for milk yield 305 days ($\sqrt{h_2^2}$); r_{g12} = genetic correlation between milk yield 305 days and TD , σ_{p2} = phenotype standard deviation (falconer and Mackay, 1996).

Relative efficiency of indirect selection is estimated by dividing correlated response to selection with respon to selection of milk yield 305 days, or the result of deviding between intensity of selection multiplies with accuracy of selection of TD multiplies and intensity of selection with accuracy of selection of milk yield 305 days, then multiplied with genetic correlation between them both (Falconer and Machay, 1996).

$$Q = \frac{CR_2}{R_2} = \frac{ih_1}{ih_2}\,r_{g12}$$

Relative efficiency of repeated mesurement selection is estimated by dividing repeated mesurement selection with singgle record selection, in the same intensity of selection (Falconer and Machay, 1996).

$$Q = \frac{R_n}{R} = \frac{ih_n^2 \sigma_{pn}}{ih^2 \sigma_p}$$

Where::

i = total intensity of selection [(i bulls + i cows)/2}; h_n^2 = heritability of repeated mesurement records ; h^2 = heritability of singgle record; σ_{pn} = phenoypic standard deviation of repeated mesurement records produksi susu catatan berulang; σ_p = = phenoypic standard deviation of singgle record.

Result and Discussion

Milk production at PT. Naksatra Kejora is recorded everyday, but in this case the recording is divided in two ways, complete recording 305 days with total 130 records, and TD with total 1866 TD records from first lactation and 1807 records from second lactation , recording started from TD_1 until TD_{15}, come from productive 130 cows.
After all data get tabulated and given code according to REML, then it can be provided in first data description structure as a result from Excel, as written on table 1 :

On table 1 above, in first lactation the complete TD only found (130 records) on TD_1, TD_2, TD_3, TD_4, TD_6 and TD_7. In second lactacion wich have a complete TD is only TD_1, where as another TD is on the range of 129 records until 82 records in lactacion 1 and 85 records in lactacion 2. But, there is no obstacle in the analysis process. The highest average milk production in lactacion 1 can be found on TD_3 (13.31 kg) on 49th day and in lactacion 2 found in TD_3 also (15.16 kg) and continuely go down until the lowest on TD_{15} (1.10 kg) on 301st day in lactacion 2 with amount 5.84 kg.

The highest deviation standard occurs on TD_3 (2.80 kg) and in lactation 2 also on TD_3 (2.90kg) whereas, the lowest is on TD_{15} (1.38kg) and in lactation 2 (2.06 kg) also occurs on TD_3. For the better data should't have the big deviation standard, so the selection process won't loose so much catlle. But, to selcet a group of catlle with the big Coefficient Variation-KV of data will give the effective result, if only not less than 10% or closer to 0, because the genetics progress will be very small and intend to reach the selection plateau.

Table 1. TD record of Milk Yield on the First and Second Lactation

First Lactation				Second Lactation			
TD	n	Average (kg)	KV (%)	TD	n	Average (kg)	KV (%)
TD_1	130	11.84 ± 2.57	21.75	TD_1	130	13.65 ±2.77	20.32
TD_2	130	12.02 ± 2.61	21.70	TD_2	129	13.85 ±2.67	19.25
TD_3	130	13.31 ± 2.80	21.02	TD_3	129	15.16 ±2.90	19.12
TD_4	130	10.88 ± 2.37	21.79	TD_4	129	12.57 ±2.64	20.97
TD_5	129	10.33 ± 2.31	22.37	TD_5	128	11.59 ±2.34	20.55
TD_6	130	9.96 ± 2.25	22.63	TD_6	128	10.91 ±2.36	21.60
TD_7	130	9.35 ± 2.06	22.06	TD_7	126	10.27 ±2.35	22.86
TD_8	128	8.80 ± 1.98	22.49	TD_8	123	9.72 ±2.33	24.00
TD_9	129	8.26 ± 1.91	23.13	TD_9	123	9.14 ±2.28	25.00
TD_{10}	127	7.86 ± 1.76	22.52	TD_{10}	123	8.73 ±2.40	27.47
TD_{11}	126	7.37 ± 1.86	25.23	TD_{11}	122	7.98 ±2.41	30.13
TD_{12}	127	6.74 ± 1.74	25.18	TD_{12}	118	7.49 ±2.16	28.82
TD_{13}	124	6.13 ± 2.04	33.35	TD_{13}	113	6.88 ±2.32	33.72
TD_{14}	114	5.61 ± 1.80	32.05	TD_{14}	101	6.34 ±2.21	34.95
TD_{15}	82	5.10 ± 1.38	26.99	TD_{15}	85	5.84 ±2.06	35.36

Where:
TD = Test Day; Sd = Standard deviation; KV= Coefficient Variation; n = Total data.
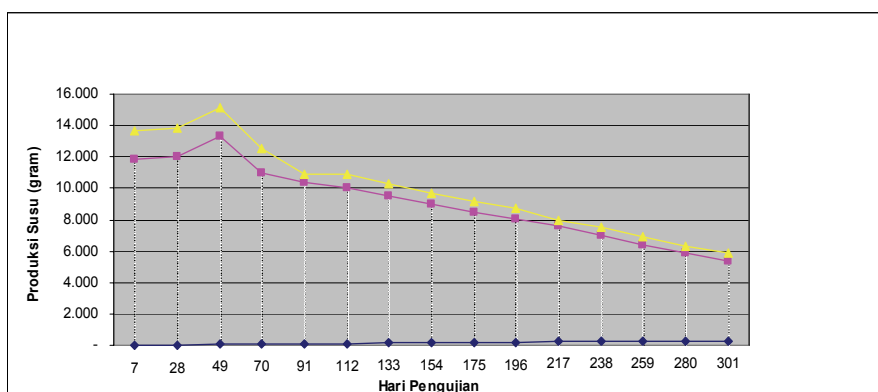

Figure. 1. Milk Yield TD records of First and Second Lactations

Illustration 1 shows that prodution graphics based on TD will be alike Gamma curve of milk production, so that Ali and Schaeffer (1987) said that to use fixed regression Test Day Model, it has to be completed by four covariates in the formula. The ilustration of milk production above is in the the line with Swalve's statement (1995), that the peak production from both the lactation (1 and 2), occur on 49th day after birth or occurs in TD_2-TD_3. More suitably, Tilman and friends (1984) said that after the birth of cow, milk prodution will increase in 45th day until 60th days then decrease slowly to the end of the lactation.

Tabel 2 shows that the analysis result from 15 TD records only be shown until TD_4 because according to the selection purpose, not to waste so many production cost. So that can be pointed wich TD is the most efficient to do the selection. In a line with falconer and Machay (1996), that to wait the selection process the correlated recording character, it needs big budget for measurement then selection has to be done with correlated indication.

The highest heritability value among TD records is on TD_3 (0.295 ± 0.153) included the high category, according to Dalton's (1981). The reason, in the beginning the milking cows produce milk, the genetics factor takes the important play, then slowly the cattle will adapt with the environment and get decreased until TD_4 (0.136 ± 0.046). If the selection is held , than the taken heritabilty will be the high among TD, for the effectiveness of the process.

Tabel 2: Heritability, Accuracy of Selection and Genetic Correlation

TD	Heritability (h^2)	Accuracy $(\sqrt{h^2})$	r_g (TD-305 days)
TD_1	0.228 ± 0.173	0.477	0.779 ± 0.235
TD_2	0.192 ± 0.128	0.438	0.620 ± 0.370
TD_3	0.295 ± 0.153	0.543	0.865 ± 0.120
TD_4	0.136 ± 0.046	0.368	0.894 ± 0.120
305 days	0.151 ± 0.120	0.388	1
Singgle Record (L1)	0.277 ± 0.086		
Repeated measurement (L1 and L2)	0.214 ± 0.069		

The decision will be made not only based on the heritability value, but also the genetics correlation between both the variables, if selection will be done indeirectly. The heritability of the two process of recordings and genetics correlation should be known. The point is agreed by falconer and Machay (1996) who come to public with the experiment called double selection experiment.

Table 2 also shows that the value of selection accuracy will follow the value of heritability from TD_1 (0,4770) – TD_4 (0.368). Because the selection accuracy is the base

from hetability value ($\sqrt{h^2}$). This value is needed in counting the corrlated response and the indirect selection relative efficiency for milk yield 305 days based on TD records.

The genetics correlated value between milk yield 305 with TD recording can be seen on Table 2. This genetic correlation is needed to select the cattle indirectly. The value shows the tightness relationship between this two model of recording that get the influence by the breeding value. The genetics progress in TD recording will give the progress of genetics to the milk yield 305 days. The genetics correlation value of TD_4 recording with 305 days recording provides the highest value (0.894±0.120), including the high positive category. On the otherhand, the lowest occurs on TD_2 (0.620±0.370), suitable with Legates and Warwick, 1990. According to the result above , the conclusion is indirect seletion for milk yield 305 days can be done on TD_3 because TD_3 has the genetics corelation value 0.865±0.120 and the high heritability value (0.295 ± 0.153)

Unfortunatly, the heritability of repeated mesurement records is lower than heritability of singgle record. Repeated mesurement records used for reducing the variance of entvironment, but in case of Nasatra Kejora there was error prediction variance estimation, where the genetic variance is lower than the variance of environment The total variance is phenotypic variance. So, the heritability of singgle record is 0.277 ± 0.086 higher than heritability of repeated mesurement (0.214 ± 0.069)

Breeding value is the value from cattle genetics quality for a certain character that is given relatively based on the individu in population. The estimation of this value is the main factor to evaluate the excelent cattle genetics because a half of the value will be given to the next generation. The research result shows that the highest breeding value in cows is 3.217 kg more than the average of population production . For the lowest is 2.649 kg under the average (-2.649kg) in BLUP for PEST program, this value has the possition of positive and negative and if zero (0) is equivalent the average. Based on the analisys there were 91 cows that were more than the average and selected as the dams.

There are 10 heads of selected bulls based on their breeding value that were over the population average. The highest is 2.101 kg and the lowest is −1.853 kg. Obviously, the genetics potency for milk production character for bulls is lower than the cows. According to this ranking, will be selected some cattle that will get involved in the process, to gain the intensity of selection value.

The intensity of selection is the average of deviation for all selected cattle in one phenotypic standard deviation unit. In simply, intensity of selection is excess average of selected cattle in the population average. It depends on number of selected cattle. If selection involves big number of cattle, it will make intensity of selection and genetic progress run slowly. It refers to Kinghorn (1992) that the intensity of selection inversely proportionate with the number of the selected cattle.

Intensity of selection used in this program is 0.965 from 39% (91 cows) and 0.806 from 47% (10 bulls). The average intensity of selection is 0.598.

Table 3 shows that the proportion of selected cattle affects the response to selection. The more proportion of selected cattle will decrease intensity of selection, the more response to selection will decrease as well. The highest response (95.082 kg) is reached at 10% (23 heads) selected cows and 10% (2 heads) selected bulls, in ratio 2 bulls: 20

cows. However, it is recommended that the ratio for cattle is six bulls: 20 cows to avoid inbreeding. In this research the similar ratio value used is 30% (6 heads) for bulls and 10% (23 heads) for cows, which has response to selection 80.577 in range (Table 3)

Table 3. Estimation of Respond to Selection for Milk Yield of 305 days Records in Difference Intensity of Selection

			Proportion of Cows (%)			
			10	20	30	39
	(%)	n (head)	23	46	69	91
Proportion of Bulls (%)	10	2	95.082	85.250	78.546	73.351
	20	4	86.647	76.814	70.111	64.915
	30	6	80.557	70.725	64.021	58.826
	40	8	75.585	65.753	59.049	53.854
	47	10	71.200	61.368	54.664	49.468

The table above shows that proportion for 39% (91 cows) and 47% (10 bulls) are the prediction of next generation genetic progress with the lowest value of response to selection 49.468 Kg.

All cattle involved on the table above have a higher Breeding Value over the population's average. However, it is different in the real practicing. In a group of cattle is not allowed to involve more males, so only 2 – 4 bulls which have the highest breeding value among them will be selected to mate 91 cows by using AI (Artificial Insemination) and will be replaced after 2 years, so the genetic progress that will be reached on next generation is in between 73.351 Kg – 64.915 Kg.

Response to selection will be showed on the next generation, and it will take time so long to wait until 305 days ahead, therefore; we can predict it by estimating the correlation response between 305 and Test Day. It needs to be considered for saving budget to do the direct selection because of feeding a few non-productive cattle.

The estimation of correlated response between milk yield of 305 days records and Test Day is a result of multiplying the total intensity of selection, accuracy of Test Day, accuracy of milk yield 305 days, genetic correlation between the two recording model and standard deviation.

The objective of Selection program based on correlation trait is to enhance the selection accuracy. Based on that genetic parameter for those models, it is possible to predict if response to selection based on first indicator (TD) can estimate response to selection of milk yield 305 days. Table 4 below shows correlated response in different intensity of selection.

Table 4. Estimation of Correlated Respond to Selection for Milk Yield between 305
Days Records   In addition, TD Records in the Same   Intensity of Selection

			Selected Cows (%)			
	(%)	n (head)	10	20	30	39
			23	46	69	91
Selected Bulls (%)	10	2	117.749	105.573	97.271	90.837
	20	4	107.303	95.127	86.825	80.391
	30	6	99.762	87.586	79.284	72.850
	40	8	93.605	81.428	73.126	66.692
	47	10	88.174	75.998	67.696	61.262

The table 4 above shows that the highest value of correlated response is 117.7498 Kg on proportion 10% (23 cows) and 10% (2 bulls). Correlated response with highest intensity gives higher response than direct selection on milk yield 305 days (Table 3). If we refers to recommended ratio for cattle as can be seen on table 4, which is six bulls: 20 cows, the similar proportion we can use is 30% (6 bulls) and 10% (23 cows), which has correlated response 99.762 Kg.

On the table 4, proportion 39% (91 cows) and 47% (10 bulls) is a prediction for genetic progress for the offspring with the lowest value of correlated response 61.262 Kg. Genetic progress on TD_3 will occur on 305 days of milk yield, more better than direct selection (Table 3).

The research result shows that the main key to run indirect selection program is the value of TD heritability must be higher than heritability of milk yield 305 days. Therefore; the accuracy for TD records will be higher than milk yield 305 days and the expected procedure will be reached by maximizing the variation of selected cattle with the average of other cattle and minimizing the heritability by decreasing the environment variance as well.

Relative efficiency of indirect selection is estimated whether direct selection on milk yield 305 days is better than indirect selection based on TD_3 to select milk yield 305 days. Indirect selection relative efficiency got by dividing correlated response with response to selection of milk yield 305 days, and simplified by dividing the heritability of TD_3 with milk yield 305 day's and multiplied with genetic correlation between TD_3 and milk yield 305 days.

Relative efficiency of indirect selection was 1.24. It means indirect selection was better 24% than direct selection. The value was not too big if we compares with quantity aspect, but if we observe further that earlier selection would save time and could minimize the interval of generation, and also will save money because we do not have to feed unproductive cattle.

The value of selection accuracy and genetic correlation indicates the accuracy level of procedure of selection, that is: 1. maximizing phenotypic variance of selected cattle with other phenotypic average in population, 2. maximizing heritability by decreasing environment variance. In conclusion, indirect selection will be done if only it is better than direct selection.

Response to selection of single records is the result of multiplication between intensity of selection, heritability and standard deviation. The result is showed on table 5 below.

Table 5. Estimation of Respond to Selection for Milk Yield TD records of First Lactation in The   Same   Intensity of Selection

			Selected Cows (%)			
	(%)		10	20	30	39
		n (head)	23	46	69	91
Selected Bulls (%)	10	2	0.989	0.887	0.817	0.763
	20	4	0.901	0.799	0.729	0.675
	30	6	0.838	0.736	0.666	0.612
	40	8	0.786	0.684	0.614	0.560
	47	10	0.740	0.638	0.569	0.514

Table 5 shows that the highest value of response to selection are 0.989 Kg, reached on the intensity 10% (2 bulls) and 10% (23 cows). Meanwhile, the lowest value of response to selection is reached on the intensity 47% (10 bulls) and 39% (91 cows). The management system in PT Nakastra Kejora uses six bulls to mate 100 cows, but if we use all selected cattle based on breeding value as seen on table 5, the progress that will be reached for the next offspring is 0.514 Kg.

To enhance the accuracy of selection, we can use repeated measurement records in this research the repeated measurements are first lactation and second lactation. Cameron (1997) said that by adding the number of data it would increase the heritability because the variance of environment can be minimized, and so the accuracy of selection will increase as well. In fact, this research is inappropriate with his statement; because the analysis result of repeated measurement heritability is lower than single one. Further, Cameron (1997) said that it occurs because an error in estimating variance component, which is caused by non-additive variance and environment variance that too high. Therefore, on Table 6 there are the estimation results of response to selection using repeated measurement, and the way out to obtain effectiveness in the program of selection runs well.

Table 6. Estimation of Respond to Selection for Milk Yield TD records of First and Second Lactation in the Same Intensity of Selection

			Selected Cows(%)			
			10	20	30	39
	(%)	n (head)	23	46	69	91
Selected Bulls (%)	10	2	0.815	0.731	0.673	0.629
	20	4	0.743	0.659	0.601	0.557
	30	6	0.691	0.606	0.549	0.504
	40	8	0.648	0.564	0.506	0.462
	47	10	0.610	0.526	0.469	0.424

Table six shows that respond to repeated measurement selection in the same intensity of selection is 0.815 kg lower than single record selection. The differential genetic progress is 0.174 kg in compare to single record selection.
The relative efficiency between repeated measurement records selection and single record selection was 0.82; it means repeated measurement selection was not better than single record selection.

The selection using the repeated measurement record at PT. Naksatra Kejora is not profitable because besides the accuracy of selection doesn't get higher than the single recording, the process takes so long time to collect data as much as possible. This is in a line with Anang's opinion (1998).

Conclusion and Suggestion

The response to selection of milk yield 305 days in the lowest intensity is 49.468 kg with the using of 10 bulls and 91 cows. The highest is caught for 95.082 kg for the using of 2 bulls and 23 cows. At the same intensity the correlated response between milk yield 305 days and TD_3 (49th day), 61.262 kg as the lowest and 117.749 kg for the highest. The relative efficiency value of indirect selection for milk yield 305 days according to TD_3 is 1.23. Response to selection for milk yield single record gets the highest is 0.989 kg and the lowest is 0.514 kg. Whereas; the highest response to selection for milk yield repeated measurement, records are 0.815 kg and 0.424 kg. The relative efficiency value with single record to repeated measurement is 0.82.

It will be better to have the good result of indirect selection, if the result of multiplying between the accuracy of selection TD with genetic correlation bigger than the accuracy value 305 days. The selection process with repeated measurement is not suggested, especially for the economy aspect.

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Traditional Agroforestry Systems As An Alternative To Rehabilitate Unproductive Lands In Kalimantan

Yudi Firmanul Arifin[18]

Abstract

Agroforestry systems have been loosely defined as tree plus any other crop or as combining trees with food crops. Kalimantan has by far the long history of traditional agroforestry, because most of the society in Kalimantan have livelihood as the farmer and they live in the villages. Kalimantan has also a problem with unproductive lands. This paper based on result of research in Central Kalimantan and study of literatures. The agricultural activities of farmers in Kalimantan are divided into swiddens cleared for dry land rice and vegetables, fruit tree gardens, some vegetables crops and fruits around the house and livestock. The swiddens are cleared annually from secondary forest or imperata area. Some swiddens are cropped a second year, some area planted by banana or other trees after the first year rice harvest. The other system is some area planted by rattan or rubber trees after the first rice harvest. Normally agriculture is primarily of subsistence with little surplus available for sale. Agroforestry solves low production and land degradation problems and so contributes to the restoration of productivity and the creation of sustainability. All activities are managed traditionally among family without legal institution, so they do not have chance to advocate their rights, such as: price of products, rights of land.

Key words: Agroforestry, forest, agriculture, garden

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Introduction

Alang-alang (*Imperata cylindrica*) in Indonesia is a perennial grass and one of the most important weeds in tropical Asia. In Indonesia the total area of grassland mainly dominated by *I. cylindrical,* is 10 million hectares, with further 20 million hectares of land with bush/scrub cover associated with shifting cultivation (Tjitrosoedirdjo, 1993). According to Forestry Statistics of Indonesia 1996/1997, the total area of critical lands (usually was dominated by *I. cylindrical* grass) was 12,517,632 ha of which 3,759,257 has was inside forest land and the remaining 8,758,375 ha outside forest land.

Indonesia has by far the longest history of traditional agroforestry, because most of the society in Indonesia have livelihood as the farmer and they live in the villages. The general definition of agroforestry is Land-use systems and practices in which woody perennials are deliberately grown on the same land management unit as crops and or animal husbandry, either in some form of spatial arrangement or in a time sequence, and in which there is a significant interaction between the woody perennials and the crops or animals (Weidelt,1999). Agroforestry production systems is concepts, principles and practices in the use of land resources for combined and sustainable production of forest and agriculture crops and livestock (APAN, 1993). The swiddens are cleared annually from secondary forest or *alang-alang* area. Some swiddens are cropped a second year, some are planted with banana or other trees after the first year rice harvest (Anyonge, 1996).

Methods

This paper was based on result of research with a diagnostic survey method in rattan gardens and study of literatures of agroforestry concepts in Kalimantan.

The diagnostic stage consist of silvicultural survey toward ten percent of each rattan garden was sampled systematically and socio-economic survey with interview.

Traditional Agroforestry Systems in Kalimantan

1. Tumpangsari
Timber estates and companies (both private and state owned) establishing plantations also facilitate access to their plantations for rice cultivation in the early stages of tree seedling growth.

The tumpangsari assists the growth of *Acacia mangium* in several ways by suppressing the growth of the *alang-alang,* the fertilizer used for the crops also benefits the trees, the rice or other crops provide ground cover so keeping the soil moist and reducing wind erosion (Anyonge,1996). The alternative mechanized weeding and occasional fertilizing cost more money in term of labor and machinery, and also leaves the soil exposed to the element.

2. Traditional rattan gardens in Central Kalimantan
2.1 The land-use system

Most of the inhabitants in upper Barito are Dayak people, who earn their livelihood from shifting cultivation. Every year, a new area of forest is cleared for culivation, because the soil fertility decreases after one year of agricultural activities.
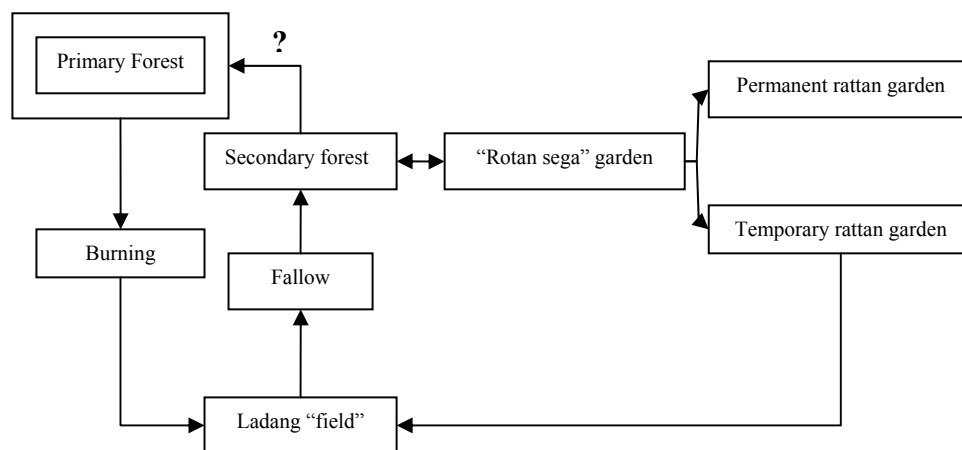
Figure 1.

Land-use systems on ultisol soil in Central Kalimantan

The "slash and burn" activities are organized in a form of cooperation and continue yearly. The annual cultivated area is about one to two hectars per family. Burning is carried out after drying up of woody vegetation about one month after girdling. At the beginning of the following rainy season (August/September) the young rice plants are set and after five months the rice harvest takes place (January/February).

Calamus caesius is the only cultivated rattan species for "dry" conditions in the lowland within the temporary as well as the permanent rattan gardens. It is planted after rice harvest or after the first year of rice cultivation before the area is left fallow. Under these conditions rattan plants are coexisting with fast-establishing pioneer trees and shrubs.
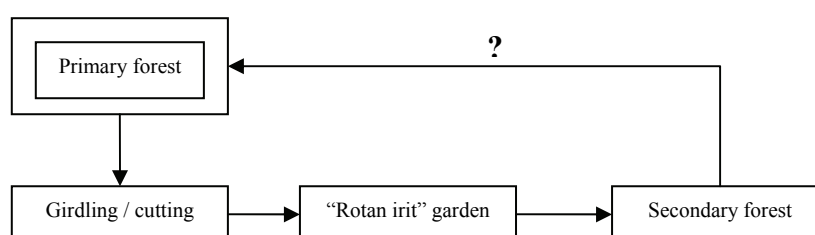

Figure 2. Land-use systems on alluvial soils in Central Kalimantan

Calamus trachycoleus is exclusively cultivated in the wetter parts of the lowland, along river banks. These areas have never been used for agriculture because of frequent inundations (May/June). Each farmer can manage between 1 – 3 ha.

Permanent rattan garden is the type where the farmers cultivate exclusively *Calamus caesius*. Planting of *Calamus caesius*, a cluster-forming rattan species is carried out by local people after the first year of rice harvest.

Rattan cultivation is practised in two ways: a) direct sowing and b) planting of seedlings (wildlings). The mature seeds as well as wildlings are collected in rattan gardens.

The maintenance of rattans species in permanent rattan garden is very important in order to increase their growth. This maintenance is concentrated on the commercial species *Calamus caesius*. Girdling of big trees to improve the light conditions for rattans and the ground-clearing of competitive plants are the most important activities.

Cultivation of rattan starts with the land clearing eleminating shrubs and grasses, such as *Melastoma malabathica, Trema orientalis* and *Blumea* sp.. Pioneer tree species such as *Vitex pubescens, Eugenia* sp.*, Macaranga* sp. grow parallel with rattan plants.

The first harvest usually commences 7 – 10 years after planting, when the mature sprouts have reached a length of 10 – 20 metres. But, generally, the quality and quantity output is higher after 12 years when the sprouts has grown to a length of three, four or five "tatak" (1 tatak = 6 m). After 12 years, the quality of canes usually declines, because their luster decreases. Harvesting is usually carried out during the dryer months from April to October, when the rattan gardens are not flooded.

Table 1. The traditional management system of rattan in permanent rattan garden

Year	Activities	Information
Et	Shifting cultivation	- Land clearing in dry season - Burning before beginning of rainy season - Planting of rice (August/ September) - Harvesting of rice (Februar)
Et + 1	Cultivating of rattan *Calamus caesius*	- Clearing of grass and shrubs - Cultivating of rattan (direct sowing or planting of wildlings) - Spacing of rattan 4 x 4 m, sometimes irregular
Et + 1,5	Maintenance of rattan	- Ground-clearing of competitive plants
Et + 8 or Et + 9 *)	1st. Harvesting of rattan *Calamus caesius*	- Rattan 10 – 20 m length - The harvesting is carried out in dry season
Et + 10 or Et + 11 *)	- 2nd. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season
Et + 12 or Et + 13 *)	- 3rd. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season
Et + 14 or Et + 15 *)	- 4th. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season

Note: Et = time of shifting cultivation   *) If buyer exist

The management system of permanent rattan garden and temporary rattan garden is similar. The main difference is the period of rattan stocking, in temporary rattan gardens only 10 – 15 years, and the location of this rattan garden near river sites. The

farmer cultivate exclusively the rattan species *Calamus caesius* after the first year of rice harvest. But at river near garden edges, rubber trees (*Hevea brasiliensis*) are planted.

The resources of *Calamus caesius* with sprout length >5 m in temporary rattan gardens are lower than in permanent rattan gardens. In average it contains 28 clumps/ha which sums up to about 228 sprouts/ha. The resources of rattan gardens in upper Barito are not in optimum, because the maintenance is not intensive, so the growth of rattan is suppressed (Arifin, 1995) and the rattan production is low as well. The clumps of *Calamus caesius* require a regular thinning, to encourage the development of new sprouts and to increase the growth of residual individuals (Manokaran, 1984). The maintenance of rattan gardens in upper Barito is neglected actually, because of the decline of market prices for rattan (Arifin, 1995).

Tabel 2. Traditional management system of temporary rattan gartens in Central Kalimantan

Year	Activities	Information
Et	Shifting cultivation	- Land clearing in dry season - Burning before beginning of rainy season - Planting of rice August/ September) - Harvesting of rice (Februar)
Et + 1	Cultivating of rattan *Calamus caesius* and *Hevea brasiliensis* (tree)	- Clearing of grass and shrubs - Cultivating of rattan (direct sowing or planting of wildlings) - Spacing of rattan 4 x 4 m, sometimes irregular - Cultivating of rubber trees at the edge of garden
Et + 1,5	Maintenance of rattan and rubber trees	- Ground-clearing of competitive plants
Et + 8 or Et + 9 *)	- 1st. Harvesting of rattan *Calamus caesius* - Taping of rubber trees	- Rattan 10 – 20 m length - Rubber tree can be taped daily, especially in dry season
Et + 10 or Et + 11 *)	- 2nd. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season
Et + 12 or Et + 13 *)	- 3rd. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season
Et + 14 or Et + 15 *)	- 4th. Harvesting of rattan *Calamus caesius*	- Rattan sprouts ≥ 20 m length - Harvesting in dry season
Et + 16	Rice field `Ladang´ again	- Land clearing in dry season - Burning before beginning of rainy season

| | - Planting of rice (August/ September) | |

Note: Et = time of shifting cultivation   *) If buyer exist

Temporary rattan gardens are dominated by pioneer tree species, such as *Vitex pubescens, Macaranga* sp., *Artocarpus anisophyllus, Artocarpus integer.* Most of them can be used as rattan supporting trees, except *Macaranga* sp.. *Vitex pubescens* is the best rattan supporting tree, because it grows fast, has strong stems and low crowns.

Table 3. Traditional management system of rattan in `rotan irit´-gardens of Central Kalimantan

Year	Activities	Information
Et	- Land clearing - Cultivating of rattan *Calamus trachycoleus*	- Girdling of big trees - Cultivating of rattan (direct sowing or planting of wildlings) - Spacing of rattan 4 x 4 m, sometimes irregular
Et + 0,5 or Et + 1	- Maintenance of rattan	- The ground-clearing from grass and shrubs or other competitive plant
Et + 8 or Et +9 *)	- 1st. Harvesting of rattan *Calamus trachycoleus*	- Rattan 10 – 20 m length - Harvesting in dry season
Et + 10 or Et + 11 *)	- 2nd. Harvesting of rattan *Calamus trachycoleus*	- Rattan sprouts $\geq$ 20 m length - Harvesting in dry season
Et + 12 or Et + 13 *)	- 3rd. Harvesting of rattan *Calamus trachycoleus*	- Rattan sprouts $\geq$ 20 m length - Harvesting in dry season
Et + 14 or Et + 15 *)	- 4th. Harvesting of rattan *Calamus trachycoleus*	- Rattan sprouts $\geq$ 20 m length - Harvesting in dry season

Note: Et = time of shifting cultivation
*) If buyer exist

Calamus trachycoleus develops diffuse open clusters, whereas *Calamus caesius* has dense clumps which sprout out of ground stolons. Due to growth habits of *Calamus trachycoleus* intraspecific competition is obvious. Therefore, the clumps of *Calamus caesius* require a regular thinning, to encourage the development of new sprouts and to increase the growth of residual individuals (Menon, 1980). The juvenile individuals of *Calamus trachycoleus* especially need a through clearing of the canopy and undergrowth. After establishment *Calamus trachycoleus* does not require any futher attention.

Resources of *Calamus trachycoleus* and *Calamus caesius* in `rotan irit´-gardens can reach 5601 sprouts/ha and 259 sprouts/ha, respectively. The first harvest is the same with *Calamus caesius*, usually commences 7 – 10 year after planting, when the mature stems have reached a length of 10 – 20 metres. Some tree species in `rotan irit´-gardens can be used as rattan supporting trees, such as *Mallotus muticus, Syzygium* sp*., Diospyros* sp. Here a relative small number of tree species is found, *Mallotus muticus* is very dominant.

3. The *Dukuh* in South Kalimantan
Dukuh is one of traditional agroforestry systems in South Kalimantan which it found almost all villages in Karang Intan Sub-district, Banjar District. This system formed about 170 years ago.

Dukuh is tree groups with dominated by fruit trees, but the distribution of trees is unevenly. It located on the areas after shifting cultivation or called *dukuh gunung* (forest gardens) and also sometimes around the settlements or called *dukuh rumah* (home gardens. Dukuh has important role for local people as one of source of income. Diagram 1 shows the processes of Dukuh formed.

Villages which located *Dukuh* were scrubs or *alang-alang* areas and only a little areas of forest caused economic problem they use these areas for cultivation. Based on diagram 1, *Dukuh* formed on five different stages, namely :
1. *Dukuh* formed from natural forest with selection process by society
2. *Dukuh* formed from scrubs and *alang-alang* areas with integrated cultivation both fruit tree and rubber tree
3. *Dukuh* formed on the unproductive cultivation areas after five years cultivated by rice
4. *Dukuh* formed after the unproductive rubber gardens
5. *Duku*h located in home gardens around settlements.

Three kinds of fruit tree are dominant *Durio zibethinus* Murray (durian*), Lansium domesticum* Coor (langsat) and *Artcapus integer* Miq (cempedak). These fruits have commercial value and support income for local people.
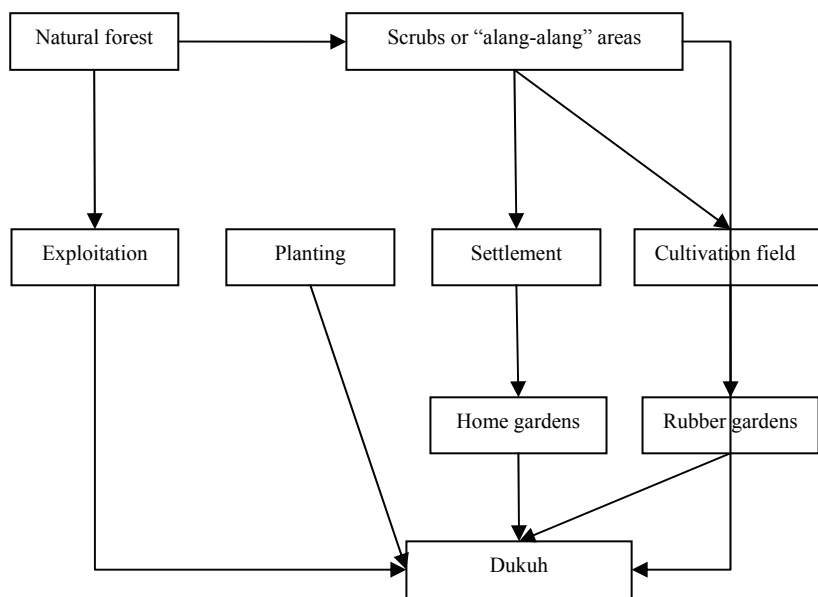
Figure 3. Diagram of *Dukuh* formed processes (Hafizianor, 2002)

Tabel 4. Fruit trees in *Dukuh*

No.	Local name	Botanical name	Family name
1.	Durian	*Durio zibethinus* Murray	Bombaceae
2.	Langsat	*Lansium domesticum* Coor	Meliaceae
3.	Cempedak	*Artocarpus integer* Mig	Moraceae
4.	Rambutan	*Nephellium lappceum*	Sapindaceae
5.	Kapul	*Bacaorea* sp.	Euphorbiaceae
6.	Rambai	*Soneratio caseolaris*	Euphorbiaceae
7.	Kopi gunung	*Anacolosa frutescens* Blume	Olaceae
8.	Kelapa	*Cocos nucifer* L.	Palmae
9.	Petai	*Parkia speiosa*	Mimosaceae
10.	Sukun	*Artocarpus oltilis* Fosberg	Moraceae
11.	Jambu Biji	*Psidium guajava* L.	Myrtaceae
12.	Sawo	*Diospyros digyana* Jacq.	Ebenaceae
13.	Gandaria/ramania	*Bouea macrophylla* Griffith	Anacardiaceae
14.	Pisang	*Musa paradisiacal*	Musaceae
15.	Kasturi	*Mangifera delmiana*	Malvaceae
16.	Nenas	*Ananas comosus*	Bromeliaceae
17.	Lada	*Piper nigrum* L.	Piperaceae

Souce : Hafizianor, 2002

Every tree of durian, langsat and cempedak can produce among 200-300 fruits, 100-200 fruits and 100-200 kg, respectively. The product of *Dukuh* contribute income of each family of 31.07 %.

Normally each family has 0.2 – 0.5 ha of *Dukuh* area or 1.27 ha on an average. They cultivate the area with durian, langsat and cempedak. Every fruit season can be obtained income of Rp. 2,000,000 – Rp. 14,000,000 from fruit sale.

3.2. The Lembos of East Kalimantan
Lembos in his detailed dissertation Agung Sardjono (1990) describes the lembos of the Dayak Banuaq near Barong Tongkok, Middle Mahakam. He distinguishes 4 kinds of lembos:

1) The *lembo ladang* is a typical forest garden, usually situated at some distance from the settlement, often surrounded by secondary forest. It always borders on cultivated fields. Besides a variety of domesticated fruit trees, we find here still a high number of original forests trees many of which yield useful products others not.

2) The *lembo lamin* is a traditional house garden near the larger longhouses (lamin=longhouse). They were established by the families living inside the longhouse. Every family has the right to use the portion of the garden behind its segment of the *lamin*. Nowadays since the longhouse communities often are beaking up into individual houses some of the community gardens are degrading or abondaned.

3) The *lembo-rumah*: since many of the traditional longhouse communities have fallen apart and many Dayaks are settling in individual houses, they also have developed a correspondingly modern form of house garden. In this limbo besides the traditional forest species we find already many new and

economically attractive species for sale. In openings also perennial and annual garden plants are cultivated.

4) The *lembo-jalan*: along paths and roads we often find planted fruit trees and other useful trees in a matrix of second growth species.

5) *Lembo transmigrasi* : this variation of a *lembo* is rather similar to Javanese house gardens and hardly contains any local wild or semi-wild species.

Conclution

Traditional agroforestry systems in Kalimantan are an alternative to rehabilitate unproductive land after shifting cultivation or *alang-alang* or scrubs area. This traditional system is useful not only for rehabilitation of land and to keep ecological function, but also source of income.

Normally, the traditional agroforestry systems do not have the legal institution to advocate the local society rights, but they have only rules of the games.

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Chemical Composition of *Calliandra calothyrsus* Leaves and its Acceptability to Indonesian Ettawah Crossbred Goats

Yusuf Subagyo[19]

Abstract

Callliandra calothyrsus is a versatile leguminous shrub or tree well known and widely used in Indonesia, because it is easy to cultivate and has multiple uses. The high production potential and high crude protein (CP) content of Calliandra calothyrsus makes it a ready source to cheaply satisfy ruminant protein requirements. However, C. calothyrsus contains secondary plant compounds (SPC) which may diminish its potential value as high quality feed. The objectives of this experiment were to determine the nutrient content of C. calothyrsus leaves and to gauge the acceptability of fresh C. calothyrsus leaves to goats. The nutrient content of C. calothyrsus leaves was analysed using the Weende system according to AOAC (1990). The acceptability of fresh C. calothyrsus leaves to goats was gauged using three male Indonesian Ettawah Crossbred goats (Peranakan Ettawa, PE). The goats, 12 months old and weighing average 14 kg, were obtained from the animal market in Purwokerto, Central Java, Indonesia. The animals were kept in individual cages and fed fresh C. calothyrsus leaves ad libitum for 21 days trial. The feed intake and general health condition were monitored. The result of proximate analysis showed that the C. calothyrsus leaves contain a high level of crude protein (more than 20 %) and many other components. The mean chemical composition of C. calothyrsus was crude protein (CP) 20.94 %, crude lipid (CL) 2.93 %, crude fibre (CF) 24.38 %, and Ash 4.65 %, respectively. There were no health problems during the trial, and the C. calothyrsus was highly palatable to the goats. The average dry matter intake of the three goats during this experiment were as follow: Goat A 62.10 g dry matter / kg $^{0.75}$, Goat B 64.30 dry matter / kg $^{0.75}$, Goat C 62.60 dry matter / kg $^{0.75}$, respectively. From this research, can be concluded that: a) The C. calothyrsus leaves has potential as protein source for animals, because the content of protein was more than 20 %, and b) The C. calothyrsus leaves can be fed to goats, because no detrimental effect appeared when it was given as a sole diet. The feed intake of fresh C. calothyrsus to goats when given as a sole diet was 63.17 dry matter / kg $^{0.75}$, which shows that these leaves were highly palatable to goats.

Key words: Calliandra calothyrsus, chemical composition, acceptability

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Introduction

There is an abundance of feed materials from shrub and tree in tropical and sub tropical regions. Much of it is however under-utilised in ruminant feeding systems. The importance of these forages in animal feeding is due to their abundance, accessibility, protein content, protein quality, energy content, minerals and vitamins (Ramirez, 1997). The legume forages are becoming valuable in extensive (Kibria *et al.*, 1994) and crop livestock production systems which are important to goat production (Ramirez and Torez, 1997). However, some browse species may contain anti-nutritive factors that reduce intake and digestibility of nutrients such as protein (Reed, 1985) and may be toxic (Jones, 1979).

Tree legume forages supply relatively cheap sources of protein for livestock. Due to their high nitrogen content, they could be satisfactory substitutes for the more expensive protein supplements in ruminant feeds. Feeding tree legumes to cattle has resulted in increased intake and live weight gains (Abdulrazak *et al.*, 2000).

Leucaena leucocephala is one of the shrub legumes that has been widely promoted for use in tropical and subtropical environments because of its capacity for rapid regrowth following defoliation and its ability to produce large quantities of highly nutritious and highly palatable forage. Its use has led to sustenance of high daily live weight gains in animals without the use of expensive concentrate (Palmer and Ibrahim, 1996).

Unfortunately, most of the soils where smallholder farmers are found in Indonesia are infertile and acidic and not suitable for growing *Leucaena* unless considerable quantities of lime are applied. This problem of lack of adaptation and susceptibility to attack by the psyllid insect *Heteropsylla cubana* has negatively affected *Leucaena* adaptation in the smallholder sector of Indonesia. While it is reported that the incidence of psyllid infestation is declining, researchers are evaluating the potential of other shrubs that are resistant to this insect attack and can grow on the more acidic soils.

Calliandra calothyrsus has been identified as a candidate to complement or replace the cultivars of *L. leucocephala* presently in use (Palmer and Tatang, 1996). *C. calothyrsus* has been used in developing tropical countries under a cut-and carry system where *Leucaena* has been devastated by the psyllid (Partridge, 1989). This shrub legume is receiving more attention in the tropical regions not only due to the problem of psyllid devastation in *Leucaena*, but also because it can grow in high rainfall areas and on acidic soils.

Callliandra calothyrsus is a versatile leguminous shrub or tree well known and widely used in Indonesia, because it is easy to cultivate and has multiple uses. More than 170 000 ha of eroded, poor or abandoned lands have been planted with *C. calothyrsus* in Java (Hermawan *et al.*, 1996). Advantages of using tree fodders such as *Calliandra calothyrsus* in Indonesia is its ready availability on farms (Devendra, 1988).

The high production potential and high crude protein (CP) content of *Calliandra calothyrsus* makes it a ready source to cheaply satisfy ruminant protein requirements. However, *C. calothyrsus* contains secondary plant compounds (SPC) which may diminish its potential value as high quality feed. The most important SPC in *Calliandra* are tannins.

This study was set up to with the overall objective to evaluate the chemical composition of *C. calothyrsus* and to evaluate the acceptability and intake of *C. calothyrsus* as a sole diet.

Materials and Methods

Materials
a. The *C. calothyrsus* leaves were obtained from Baturraden Forest Timur (PERUM PERHUTANI/KESATUAN PEMANGKUAN HUTAN BANYUMAS TIMUR), following identification by a botanist from Herbarium Bogoriense Puslitbang Biologi, LIPI, Bogor.
b. Three male Indonesian Ettawah crossbred goats (Peranakan Ettawa, PE), 12 months old and weighing average 14 kg.

Methods
a. Determination of nutrient content
The nutrient content of *C. calothyrsus* leaves was analysed using the Weende system according to AOAC (1990). Samples were analysed for crude protein, crude fibre, crude lipid, crude ash, and dry matter. Protein was calculated from nitrogen (N) measured by the micro-Kjeldahl method, while crude fat was determined by subjecting the samples to petroleum ether (boiling point 40 - 60°C) extraction using Soxhlet apparatus. Ash was determined by incineration in muffle furnace at 500º C for 4 hours.

b. Acceptability of *C. calothyrsus* leaves by goats
The main aim of this trial was to assess the acceptability and intake of *C. calothyrsus* leaves by goats and to test whether *C. calothyrsus* leaves were toxic to goats. Three male Indonesian Ettawah crossbred goats (Peranakan Ettawa, PE), 12 months old and weighing average 14 kg, were obtained from the animal market in Purwokerto, Central Java, Indonesia. The animals were kept in individual cages in the animal house of the Experimental Farm of Animal Husbandry Faculty, University of Jenderal Soedirman (UNSOED), Purwokerto, Central Java, Indonesia. One day after arrival the goats were directly fed fresh *C. calothyrsus* leaves ad libitum for 21 days trial. Water was available freely. The feed intake and general health condition were monitored.

Results and Discussions

A. Chemical composition
The chemical composition of the *C. calothyrsus* in this experiment is presented in Table 1. The result of proximate analysis showed that the *C. calothyrsus* leaves contain a high level of crude protein (more than 20 %) and many other components.

Table 1. Chemical composition of *C. calothyrsus* leaves

Sample	CP	CL	CF	Ash
CC1	20.57	2.90	23.89	4.90
CC2	21.01	3.20	25.50	4.99
CC3	21.79	2.80	26.76	4.94
CC4	19.44	3.00	21.75	4.29
CC5	20.93	2.75	24.50	4.40
CC6	19.18	2.90	23.89	4.35
Average	20.49	2.93	24.38	4.65

Note : CC, *C. calothyrsus*; CP, crude protein; CL, Crude lipid; CF, Crude fibre;

The mean chemical composition of *C. calothyrsus* on dry matter basis was: 20.94 %CP, 2.93 % CL, 24.38 %CF, and 4.65 % Ash, respectively. The evaluation of *C. calothyrsus* using proximate analysis suggest its potential use as protein supplement, due to the high crude protein content (more than 20 %).

The main chemical feature that attracts nutritionist to evaluate *C. calothyrsus* as a potential feedstuff for ruminant in the tropic is its high crude protein (Salawu *et al*., 1999). Wide variations have however, been reported in the chemical composition of the plant depending on soil fertility (Palmer and Schlink, 1992; Duguma *et al*., 1994; Jackson *et al*., 1996) and stage of growth or age (Kaitho *et al*., 1993; Dzowela *et al*., 1995). Similar variations in chemical composition have been reported for some other tropical browses like *Glicirida sepium* and *Leucaena leucocephala*. In general older leaves contained less crude protein, more fibre and more ash than the young leaves. Kaitho *et al*. (1993), reported that leaves harvested at 12 weeks had more crude protein, less fibre and less ash than leaves harvested at 24 or 28 weeks.
Tangendjaya *et al*. (1992) reported that there was a wide range in the protein content in *C. calothyrsus*, depending on the age of leaves (not including rachis / rahilleae) which were analysed. The content of protein in young *C. calothyrsus* leaves (one week of age) was very high (39,28 %), and at older age (10 weeks) the content of protein decreased (28.3 %). The content decrease because in old leaves the content of fibre and many other components increase, so the proportion of protein to all other component become lower. Further, differences could be due to the soil fertility, but they may also be due to differences in accessions, or even species of *C. calothyrsus* since there is a degree of taxonomic confusion within the genus (Netera et al., 1992).

In common with several other tree genera on the acid soils of south of Sumatra, the foliage of *C. calothyrsus* contained adequate levels of potassium, calcium and magnesium for animal production (Blair et al., 1988), although it was poor in both phosphorus (0.11 %) and sodium (0.01 %).

The fibre contents measured in *C. calothyrsus* show very wide variation; the rank is between 24 and 74 %. This depends on the analysed sample. When the leaves contain much more stalk or petioles, the measured fibre content is higher too (Tangendjaya *et al*., 1992).

Chamberlain (2001) noted that the variation in chemical composition and DM characteristics observed between provenances may be associated with differences in leaf anatomy, with provenances having low leaflets to petiole ratios having high cell wall, lignin and tannin contents and consequently lower digestibilities and potential nutritive values.

B. Acceptability
There were no health problems during the preliminary test, and the *C. calothyrsus* was highly palatable to the goats. The average dry matter intake of the three goats during this experiment was 63.17 g dry matter / kg $^{0.75}$. The detailed result of this experiment is given in Table 2.

Table 2. Average feed intake and health condition of Indonesian Ettawah crossbred goats fed fresh *C. calothyrsus* leaves as sole diet during 21 days

| Goats | Feed intake (g / kg$^{0.75}$ DM) | | | | Health condition |
	1st week	2nd week	3rd week	Average	
Goat A	57.94	60.23	68.13	62.10	good
Goat B	54.16	66.25	72.50	64.30	good
Goat C	56.56	64.36	66.87	62.60	good

There was no problem in acceptability of *C. calothyrsus* to goats. The health condition of all goats during this experiment was always good, even their hair was more flash compared to before it was fed.

The average consumption of *C. calothyrsus* of all goats during this experiment increased from 1st week to 3rd week. The low level of feed intake in the first week could be because they had never eaten *C. calothyrsus* leaves before this experiment, so that it took time to adapt to the new feed. But after that, the consumption of *C. calothyrsus* leaves increased from week to week.

This present study is in agreement with Aguwa and Lawal (1987) who reported that there was no toxic substances in *C. calothyrsus* leaves. Tangendjaya and Wina (1992) also reported that although the content of tannin in *C. calothyrsus* is high, there is no report of tannin toxicity to animals in Indonesia. On the contrary, small amounts of tannin may be beneficial to animals.

Although there is no toxic substances in *C. calothyrsus* leaves, however, there are conflicting reports whether the high concentrations of condensed tannin may be responsible for reduced palatability and digestibility of wilted or dried material of certain provenances of *C. calothyrsus*. However, it appears that feeding it as a supplement instead of as sole diet feed will avoid these problems.

Only few studies have been made with which these results can be compared, but dry matter intakes for fresh *C. calothyrsus* as a sole feed to goats recorded in the present study (63.17 g dry matter / kg $^{0.75}$) are almost similar to the results of dry matter intake of Merino reported by Palmer and Schlink (1992). However, Tangendjaya *et al.* (1992) reported that thin tail sheep can eat 68 – 82 g dry matter / kg $^{0.75}$ when fed *C. callothyrsus* as a sole diet. They suggested that only fresh browse be used to determine the nutritive values of fodder tree leaves in future. However, other workers have found that when fresh or dried *C. calothyrsus* was used as a supplement for sheep (20 – 25 % DM intake), there was no significant effects of drying on nutritive values (Norton and Anh, 1997).

Norton and Waterfall (2000) found that the consumption of dry matter intake of goats when given dried *C. calothyrsus* leaves as a sole diet was 45.6 g dry matter / kg $^{0.75}$. Palmer and Schlink (1992) also reported that the consumption of Merino sheep when offered dried *C. calothyrsus* as a sole diet was 37 g / kg $^{0.75}$. Tangenndjaya *et al.* (1992) noted that Merino sheep can eat 46 – 51 g / kg$^{0.75}$ dried *C. calothyrsus* leaves.

Based on this present study, can be concluded that there was no acceptance problems of *C. calothyrsus* when fed to goats, no toxin in the *C. calothyrsus*, and it has been shown to be highly palatable for goats

Conclusions

The *C. calothyrsus* leaves has potential as protein source for animals, because the content of protein was more than 20 %.

The *C. calothyrsus* leaves can be fed to goats, because no dentrimental effect appeared when it was given as a sole diet. The feed intake of fresh *C. calothyrsus* to goats when given as a sole diet was 63.17 dry matter / kg $^{0.75}$, which shows that these leaves were highly palatable to goats.

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