The 6th ISTAP
International Seminar
on Tropical Animal Production

“Integrated Approach in Developing Sustainable Tropical Animal Production”

PROCEEDINGS

October 20-22, 2015
Yogyakarta Indonesia

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PREFACE

On behalf of Faculty of Animal Science, Universitas Gadjah Mada, I am pleased to present you the 6th International Seminar on Tropical Animal Production (ISTAP) which is held on October 20 – 22, 2015 at Auditorium drh. Soepardjo, Faculty of Animal Science UGM, Yogyakarta. Under the main theme “Integrated Approach in Developing Sustainable Tropical Animal Production”, we expect that information and ideas on animal production systems in the tropics and its related problems will be shared among participants, thus we can elaborate an integrated approach in developing sustainable tropical animal production. I believe, this can be achieved since more than 250 animal scientists, researchers, students, and producers from more than 15 countries join this seminar.

In this moment, I have to address my great thanks to all people who have contributed for the success of this seminar. First, to all participants, thank you for your contributions, time, and efforts in participating in all sessions in this seminar. We also would like to extend our gratitude to the reviewers and editors for dedicate their expertise and precious time in reviewing and editing the papers. I deeply appreciate the hard work of all members of the Steering Committee, Organizing Committee, and students of Faculty of Animal Science UGM for making this seminar achieved a great success!

I hope all of you enjoy the seminar and Jogja as well!

Dr. Cuk Tri Noviandi

Editor in Chief
REPORT FROM ORGANIZING COMMITTEE

Dear all of the scientists, delegates, participants, ladies and gentlemen,

Praise be to The Almighty for His Merciful and Beneficent to raise up this memorable moment for all of the scientists and delegates from all over the world who were interested in Animal Science field to meet up together.

On behalf of all the members of Board Committee, it is my great pleasure and honor to welcome all of you and impress thankful, and present a high appreciation for your participation in joining the 6th ISTAP in Yogyakarta, one of the Special Region in Indonesia where culture and tradition live in harmony with the modern nuance and educational spirit makes it a beautiful venue of this seminar.

During this event, we have distinguished scientists from all over the world to present plenary papers Livestock Management, Production, and Environment; Feed, Land, and Landscape for Sustainable Animal Production; Livestock Industry and Technology; Economics, Social, and Culture in Livestock Development; and Special issue on Halal Food, Safety and Regulation. It is noted that around 200 scientists as well as livestock producers, companies, graduate and postgraduate students from 15 countries attend the seminar; and more than 160 research papers will be presented. We can see great enthusiasm of all the scientists to solve livestock problems as well as to share valuable information and knowledge for human prosperity all over the world.

The 6th ISTAP Program consists of scientific and technical programs as well as social and cultural activities. The scientific and technical programs offer 4 plenary sessions, field trip, and many scientific sessions (both oral and poster presentation). The social and cultural programs of the 6th ISTAP are very important as the scientific and technical programs since the promotion of friendship and future scientific cooperation are also central to this seminar. Opening Ceremony offers you the Seminar Program a glance. Participants will attend a warm invitation from Dean Faculty of Animal Science UGM in a Welcome Dinner that will give you the most memorable moment to attend. Field trip activity offers a wonderful sightseeing to the most spectacular natural landmark in Yogyakarta, Merapi Lava Tour and Ulen Sentalu Museum. We do hope that you will not miss any of these wonderful opportunities.

Closing Ceremony will be held on October 22nd, 2015, immediately after the last session of presentation. The 6th ISTAP award will be announced for some participant as an appreciation for their valuable research.

Finally, on behalf of 6th ISTAP Committee, I wish all of the participants having a great achievement of success and fulfill the expectation as well as enjoying the interaction with all scientists participating in the seminar.

High appreciation I may acknowledge to the Rector of Universitas Gadjah Mada and Dean Faculty of Animal Science UGM, who have concerned to facilitate the seminar site host.

Special thank to the Steering Committee, Scientific Committee, Reviewers and Editorial Boards for their great contribution to make the seminar successfully organized.

Terima kasih (Thank you).

Sincerely Yours,

Prof. I Gede Suparta Budisatria, Ph.D
Chairman
The Organizing Committee of the 6th ISTAP
WELCOME ADDRESS

Selamat pagi (Good morning)

Dear Rector of Universitas Gadjah Mada, all of Invited Speakers, honorable guests, all of delegates, participants, distinguished guests, Ladies and Gentlemen

Attendants of The 6th ISTAP,

It is my great pleasure and honor to extend a warm welcome to all of you at The 6th International Seminar on Tropical Animal Production, which be held on October 20 – 22, 2015 at Auditorium drh. Soepardjo, Universitas Gadjah Mada, Yogyakarta Indonesia. This seminar is proudly organized by Faculty of Animal Science Universitas Gadjah Mada.

The contribution of this seminar to the development of national food security is truly significant for introducing of new scientific knowledge and equipments that is much needed in Indonesia to maintain a safe and secure environment and to look at more effective ways to meet future challenges. We can see great enthusiasm of the entire participant to present their latest research as well as to share valuable information and knowledge for human prosperity all over the world.

In these 3 days of seminar, we have invited some Plenary Speakers and Invited Papers who are qualified as scientists and bureaucrats in animal science field to share their valuable information and knowledge. Other participants can deliver their precious research through oral and poster presentations.

Finally, on behalf of Faculty of Animal Science, we would like to extend our sincere gratitude to the Minister of Rural, Rural Development, and Transmigration, Republic of Indonesia, Mr. Marwan Jafar, for his generosity to be with us here to give Keynote Speech. Then, it is our great honor and pleasure to have qualified scientists and bureaucrats as Plenary Speakers and Invited Papers to share their valuable knowledge during the plenary and concurrent sessions. Moreover, special thank you is for the Steering Committee, Scientific Committee, Reviewers and Editorial Boards for their great contribution to make the seminar a great success. Also, we would like to congratulate and deliver high appreciation to the Organizing Committee as the organizer for their great contribution and generous efforts to make the seminar successfully organized.

And to all of the participants, I hope that this seminar will always success and bring some acknowledgement for all of us. Also, I wish all of the participants having a great achievement of success and fulfill the expectation as well as enjoying the interaction with all participants.

With all of our hospitality, we will try our best to make your brief visit to our country become a wonderful and memorable moments.

We are looking forward to meeting you all in the future event.

Wish you all a very pleasant and most enjoyable stay in Yogyakarta, Indonesia, beside you scientific journeys.

Terima kasih (Thank you).

Sincerely Yours,

Prof. Dr. Ali Agus
Dean Faculty of Animal Science UGM
OPENING REMARKS

Dear all of Scientists, distinguished guests, delegates, participants, Ladies and Gentlemen,

On behalf of Universitas Gadjah Mada, I am happy to welcome you and present a high appreciation for your participation in joining the 6th International Seminar on Tropical Animal Production hosted by the Faculty of Animal Science UGM in Yogyakarta from 20 – 22 October 2015.

Under the theme of “Integrated Approaches in Developing Sustainable Tropical Animal Production”, we do hope that this seminar concludes with shared ideas and best practices, technology, and global networks that are required to increase animal production. The increase of animal production as one source of food is crucial to feed the world given that the population is expected to increase from 6 billion to about 8.3 billion in 2030. According to FAO (2008, 2009), the consumption of animal food increased from 10 kg/per annum in 1960, 26 kg/per annum in 200, and it is expected to be 37 kg/per annum. Animal production is an integral part of food production and contributing for the quality of human food supply. Animal and agricultural production is an important component in the integrated farming systems in developing countries as this produces high quality foods, provides job opportunities in rural areas, as well as enriching livelihood.

As a tropical country with high animal biodiversity, Indonesia and other tropical countries, have a variety number of indigenous and local animal genetic resources and germ plasm. This variety of animal germ plasm could be explored and developed not only for animal and food production but also for animal conservation. Apart from being exploited as food resources, it is therefore important to consider animal conservation. Conservation will protect the genetic potency of local bred and their family, and the domesticated animal bred, and this would secure our future food resources.

In these 3 days of seminar, we believe those aforementioned issues will be discussed, and technical solution as well as recommendation will be provided to solve the existing problems in tropical animal production.

Finally, on behalf of Universitas Gadjah Mada, we would like to congratulate and thanks to the Faculty of Animal Science UGM as the organizer for their great efforts to make the seminar successfully organized. To all of participants, I wish all of you have a great discussion and interaction with other scientists participating in the seminar as well as enjoying your time in Yogyakarta.

Thank you

Prof. Ir. Dwikorita Karnawati, M.Sc., Ph.D.
Rector of Universitas Gadjah Mada
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Production of Stingless Bees (Trigona sp.) Propolis in Various Bee Hives Design

Agussalim¹, Nafiatul Umami², Erwan³

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²Faculty of Animal Science Universitas Gadjah Mada, Yogyakarta Indonesia
³Faculty of Animal Science Universitas Mataram, Mataram Indonesia

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ABSTRACT: Trigona sp. is a group of stingless bees that live socially and in colony at the trunk of trees or woods, bamboo hole, sugar palm stalks and in soil. Variation in the habitat causes these bees colonies cannot be well-grown and reduce the propolis production. The aim of the research was to determine the production of stingless bees (Trigona sp.) propolis in various bee hives design. This research was started from September to October 2014 in Papak, Genggelang Village District of Gangga, North Lombok Regency West Nusa Tenggara Province. Material of the research was stingless bees (Trigona sp.) as much as 25 colonies taken from sugar palm stalks. Transfer of stingless bees colonies from the stalks to 5 bee hives design (35 x 17.5 x 13.5 cm; 35 x 20 x 15.5 cm; 35 x 20 x 17.5 cm; 37.5 x 20 x 20 cm; 40 x 20 x 20 cm) was performed at night and placed on the nest for about 2 months of the beekeeping process. The research result showed that production of stingless bees (Trigona sp.) propolis in various bee hives design are 20.40 ± 2.07 g; 19.00 ± 2.92 g; 30.80 ± 14.62 g; 21.80 ± 6.30 g and 18.20 ± 7.29 g respectively and did not significantly different (P>0.05). Production of stingless bees (Trigona sp.) propolis is not affected by the bee hives design but affected by the productivity of bee queen, population of workers bee, colony size of bees, activity exit and entrance hives of workers bee. It can be concluded that design 35 x 20 x 17.5 cm resulting higher production of propolis than the other design.

Keywords: Stingless bees of Trigona sp., production of propolis, bee hives design

INTRODUCTION

Trigona sp. is a group of stingless bees that live socially and in colony at the trunk of trees or woods, bamboo hole, sugar palm stalks and in the soil (Michener, 2007; 2013; Erwan and Yanuartati, 2012). The habitat has been described in the Qur’an Surah An-Nahl verse 16:68, which means “and your Lord inspired to the bees, “take for yourself among the mountains, houses, and among the trees and (in) that which they construct”. The variation of habitat causes stingless bees of Trigona sp. are not widely known by general societies especially beekeepers because the limitation of science and knowledge, so the mastery of beekeeping process, transfer and multiple of colonies was very low. It has an impact on difficulty of controlling colony health and development, difficulty of harvesting propolis and damage the hive structure, so causes reduce the propolis production.

Trigona sp. a produces small amount of honey, but it produces propolis in higher quantity than the other bees or genus Apis (Michener, 2007; 2013). Propolis (bee glue) is a sticky dark colored material or resinous substance collected by honeybees from living plants, mix with wax and used in construction their nest (Bankova et al., 2000). Resin is used by female bees primarily during nest construction, often serving both as protection and a building material, as well as a biologically active compound (Roubik, 1989). Utilization of propolis by stingless bees Trigona sp.
to construct the entrance to protected from pests, bacteria and viruses.

Production of propolis stingless bees of *Trigona* sp. affected by activity exit and entrance hives of workers bee, productivity of queen bee, availibility resin from plants and bee hives design. The solution for the problems in the native habitat by modifying the bee hives design using dry wood boards. The bee hives design that was used to provide comfort the stinglees bees of *Trigona* sp. to produce propolis, so to increasing the production of propolis. Information of propolis production on the stingless bees of *Trigona* sp. especially in various bee hives design is still very less. The aim of the research was to determine the production of stingless bees *Trigona* sp. propolis in various bee hives design.

**MATERIALS AND METHODS**

This research was done from September to October 2014 in Papak, Genggelang Village District of Gangga, North Lombok Regency West Nusa Tenggara Province. Material of the research was stingless bees of *Trigona* sp. as much as 25 colonies taken from sugar palm stalks. The bee hives design made from dried wood boards of borok (local name) that box shaped, while the nest made from the bamboos which consists of five racks with the size was 250 x 250 x 300 cm. In addition, the nest was direction to the source of food, so easier the worker bees to taken a food.

This research using complete randomized design with five treatments bee hives design and five replications (number of bee hives design). The bee hives design size are 35 x 17.5 x 13.5 cm as a control (Erwan and Yanuartati, 2012), 35 x 20 x 15.5 cm, 35 x 20 x 17.5 cm, 37.5 x 20 x 20 cm and 40 x 20 x 20 cm.

Transfer of stingless bees *Trigona* sp. colonies form the stalks to five bee hives design performed at night to avoid stress, so easier to transfer process. The colonies that the transfer was queen bee, five tablespoon of brood contain eggs and larvae, drones, and bee workers. The bee hives has been filled by stingless bees colonies placed randomly in the nest for about two months the beekeeping process. In addition, during the beekeeping process will be controlling once a week from pests especially ants.

The dependent variable was production of propolis, while the independent variables are activities exit and entrance of worker bees, temperature and humidity environment. Porduction of propolis was measured after two months of beekeeping process and taken from honey wrap and on the wall of bee hives. Propolis to be measured was raw propolis and not yet extraction. Production of propolis weighed on digital scales Shuma brand with a precision 1 gram which is expressed in unit of gram. For the activities exit and entrance of workers bee was count for 5 minutes every bee hives at Monday, Wednesday, and Friday which start at 08.00 to 11.00 am and 14.00 to 17.00 pm. The activity calculation using the two hand counters at a distance 1 meter from the entrance, so that the bee workers can be seen clearly. For the temperature and humidity environment was measured using thermo-hygrometer every Monday, Wednesday, and Friday which start from 08.00 am to 18.00 pm.

Data of propolis production, activities exit and entrance of workers bee was analyzed using variance analysis (Steel and Torrie, 1993) with the help of Statistical analysis software (SAS Inc. 2000), while the data of temperature and humidity environment was analyzed with descriptive analysis.

**RESULTS AND DISCUSSION**

Propolis (bee glue) is a sticky dark colored material or resinous substance collected by honeybees from living plants, mix with wax and used in construction their nest (Bankova *et al.*, 2000).
2000; Tautz, 2008). Resin is used by female bees primarily during nest construction, often serving both as protection and a building material, as well as a biologically active compound (Roubik, 1989). Stingless bees of *Trigona* sp. utilization of propolis are to construct the nest, entrance to protected from pests, bacteria and viruses, honey and pollen wrap. Production of propolis, activities exit and entrance of worker bees *Trigona* sp. research result can be seen in Table 1.

**Table 1.** Production of propolis, activities exit and entrance workers bee of *Trigona* sp.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Bee hives design (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35x17.5x13.5</td>
</tr>
<tr>
<td>Production of propolis (g)<strong>s</strong></td>
<td>20.40±2.07</td>
</tr>
<tr>
<td>Activities exit workers bee</td>
<td>37.76±16.40</td>
</tr>
<tr>
<td>(times/5 minutes)<strong>s</strong></td>
<td>38.96±14.20</td>
</tr>
</tbody>
</table>

Stingless bees of *Trigona* sp. workers to collect resin from plants start at the first day after the colonies transfer from sugar palm stalks to bee hives design. The resin collecting by workers bees used to produce propolis as honey and pollen wrap, construct the nest and entrance. It was shown by the activities of workers bee was very active in covering gaps on the bee hives design using propolis and can be enclosed with a week. The covering of gaps is aimed to create the comfort condition in bee hives, so expected improve the production of propolis. The research result showed *Trigona* sp. was started to collect resin in out the nest for about 06.00 to 06.15 am with temperature about 23 to 34°C and humidity about 68%. The *Trigona* sp. incoming or entrance to the bee hives for about 18.00 to 18.15 pm with temperature about 29 to 30°C and humidity about 54%. It indicates that the activity for collect resin from plant by workers bee was requirement 12 hours.

The research result showed that production of propolis, activities exit and entrance stingless bees of *Trigona* sp. in various bee hives design was varies, but did not significantly different (P>0.05). It was showed that production of propolis was not affected by the bee hives design, but affected by activities exit and entrance of worker bees, productivity of queen bee and availability of resin from plants. The higher activities from the workers bee showed higher production of propolis in bee hives or otherwise. Production of propolis that higher to be found on bee hives 35 x 20 x 17.5 cm with mean 30.80 ± 14.62 g, while the lower production to be found on bee hives 40 x 20 x 20 cm with mean 18.20 ± 7.29 g. The high of production propolis in bee hives 35 x 20 x 17.5 was caused by activities exit and entrance workers bee that higher with mean are 48.62 ± 18.24; 50.14 ± 18.37 times per bee hives for 5 minutes, respectively. It indicates that the exit activities of worker bees to collect the resin from plants and incoming into the colony to produce propolis, so improving production propolis than other bee hives design (Table 1). The lower production in bee hives 40 x 20 x 20 cm was caused activities of workers bee preoccupied by creating and caring for eggs as a candidate for a new queen bee, though the activities exit and entrance bee hives that higher than other design (Table 1). It condition was caused by queen bee in the bee hives was fled and occur in the first weeks after transfer colonies from stalks to bee hives.

The production of propolis was optimal because supported by temperature for about 26 to 35°C with humidity about 46 to 60%, so this condition was comfort zone for improving the production of propolis. Tautz (2008) explained that honeybees keep the temperature of the brood combs containing the pupae at about 35°C, so improve the growth and development of bees. The
entrance activity of workers bee indicates the amount of resin can be collecting from plants, while the exit activity indicates the number of workers bee to collect resin and the colored materials. Sihombing (2005) explained that production of propolis affected by productivity of queen bee, population of workers bee, and resin source of plants.

CONCLUSIONS

The conclusion of the research that bee hives design 35 x 20 x 17.5 cm resulting production of propolis, activities exit and incoming of worker bees higher than the other design with average 30.80 g, 48.62 and 50.14 times per 5 minutes, respectively.

REFERENCES

CERTIFICATE

AGUSSALIM

has participated as ORAL PRESENTER at the 6th International Seminar on Tropical Animal Production "Integrative Approach in Developing Sustainable Tropical Animal Production" at Faculty of Animal Science Universitas Gadjah Mada, Yogyakarta-Indonesia.

October 20th - 22nd, 2015

Dean of Animal Science Universitas Gadjah Mada

Prof. Dr. Ali Agus

Chairman Organizing Committee

Prof. Dr. Gede Suparta Budisatria, Ph.D.