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Empowerment of Japanese Ants Small Business by Hygiene and Management Training: A Case Study of Malang East Java Indonesia

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Abstract Japanese ant (*Tenebrio molitor*) has been known as alternative of diabetes treatment by lowering uric acid levels. The present status of scientific review of Japanese ant as an alternative medicine still unknown even breeding has been made up. Anang Jaya and Wariadi Enterprises were success example of small-scale breeder and seller of japanese ants. Good sanitation, hygiene in process and transport handling specific in capsule form has been offered. Here, major training about simple sanitation standard, nutritional composition and microbial content, as well as business management has been done. Result of physicochemical analysis showed that system in Japanese ant bred has higher protein content than beef (16-21%). Protein and fat content equals to 22.58% and 4.85%. Moreover, water content, ash, fiber, total dry matter, and rendement of Japanese ant powder respectively 3.02%; 4.32%; 0.16%; 96.98%; and 97%. Microbial analysis gave total reduction up to $3.1x10^5$ to the lower of 3.0×10^2. Improvement in management side by presence of a simple, centralized cash book was applied and managed by the Anang Jaya group might effects in clear cash flow calculations and better business profit sharing.

Keywords Japanese ants (*Tenebrio molitor*), Sanitation and hygiene, Capsule, Protein

1. Introduction

Japanese ant (*Tenebrio molitor*) is a type of insect which is in larvae stage become a caterpillar and general used as feed. This insect has been extensively reported could be an alternative medicine especially for diabetes, coroner, and some of chronic diseases treatment [1-3]. This high benefits may great influence the demand for Japanese ants in some product. Recently, the Japanese ant has been cultivated on bulk in some region. [2, 4, 5].

Figure 1. Tenebrio molitor

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The Japanese ant production continuously increases, Anang Jaya and Wariadi Enterprises being the success producer around East Java, Indonesia. They covered demand almost in Java and Bali. However the sanitation and hygiene system in production are becoming more important for their nutritional especially pharmacological characteristic [6, 7]. It is also important to remark the package with listed Nutritional such as primary metabolites of the Japanese Ant and pathway to the right storage.

Considering the importance of risk assessment in food and health management, stuff maintenance, and the existing poor knowledge about handling process in Anang Jaya and Wariadi breeder business, as well as the increase in alternative medicine intake recorded in East Java; this study was performed aiming to construct the new platform of Japanese ant-an alternative medicine offered since the consumer mostly ingest Japanese ants in life. Capsule was chosen as great idea to remake the package, because it was acceptable and considerable interest because of their organoleptic merit, medicinal properties, also in economic significance. It may great influence to expand the market. Construction and management training would be main focus in this project.

2. General Condition of Japanese Ants Business Group and Problems

Anang Jaya and Wariadi breeder business are located in

Malang City, which is be conducted by Mr. Anang and consists of 3 youth labor from Dinoyo, Sumbersari Malang. Mr. Anang has experienced to cultivated the bird and instruct the to be chirping bird. The most cultivated of chirping birds is canaries, followed by poksai, magpies, and spears. Mr. Anang labors are out-of-school youth and unemployment consist of 5 people between 30 – 40 years old which gain their capability as breeder and raised profit since they get down in business. Exchanging information by fellow sellers, join in singing bird communities, and fellow in bird race competition may give the best method to build chirping bird, and cultivate ornamental bird and japanese ant.

The agreement on both producers imply the synergize in terms of provision of seeds, breeders and sales of birds twitter of both since business have began, so that their business can survive. Both businesses quite productive and have great possibilities to develop into independent community business, otherwise assistance and business coaching in terms of production and business management need requirement.

The recently described preliminary surveys in Anang Jaya business, which found some deficiency due to maintenance equipment, how to handle Japanese ants during marketing and sales, and also business management aspects. The major difficulty of selling is about the service and marketing coverage. High demand of the product by the producer due to lacking facilities still be main problem. Nowadays, marketing has been constrained by the form of the product, the life form which still has to cultivate until consume by customer. They have to swallow the life form brewed with water, which is lead hesitate or beastly either for the consumers. As above mentioned that in preliminary survey result that for hygiene handling and information on the nutritional components contained in the Japanese ant product as alternative medicines in deficiency status.

The survey was also conducted on the consumer to know the superiority of Japanese ants produced by the Anang Jaya producer. Customers stated that Japanese ants produced by both producers have good quality, including the color of black or brown with the thick ± 1-2 cm. Consumers also expressed quite satisfied with the services of Mr. Anang and members due to existence of delivery orders almost in time, offer cheaper prices and help the preparation of Japanese ants in home. Therefore, appropriate technology much needed to construct the platform and made Japanese ant consuming could be easier. Scientific information about the consumption dozes and nutritional composition contained in Japanese ant product also be considered as one form of customer service so that will widespread the range of consumers and marketing areas.

3. Implementing Activities Method and Problem Solving

Advisory and technical guidance programs are carried out at the Anang Jaya and Wariadi breeder business synergistically and together. In this study, we evaluated and trained sanitation during breed of Japanese ant capsule-making process, and small business management training. Throughout the training, nutritional composition and microbial content of Japanese ants were analyzed. The stages of activities are:

1. Skill improvement of japanese ant encapsulated process
    a. Training of hygienic and sanitary breeding of Japanese ants,
    b. Training for making Japanese powder
    c. Training of manufacture of Japanese ant powder in capsule
2. Analysis of physicochemical composition and total microbial content of Japanese ants encapsulated
3. Business management training in small scale

Physical, chemical and microbiological analyzes of life and/or powdered forms of Japanese ant were carried out in the Laboratory of Process Engineering UNITRI and THP UB Malang Laboratory. Analysis of physical and chemical parameters based on the AOAC standard [8] which includes rendement, moisture content, ash content, fiber content, protein content, fat content and carbohydrate levels. Microbiological analysis of the product is total bacteria or Total Plate Count (TPC) [9].

4. Result and Achievement Indicators

4.1. Completed Program

Several problems related to the lack of information on sanitation and hygiene was found preliminary surveys. The weakness business management as follows:

1. Great sanitation has not implemented yet in handling process of Japanese ants
2. Vary mortality rate of Japanese ants producing are quite high
3. Living condition was chosen as marketing design and may not efficient
4. Information about superiority in terms of scientific and nutritional composition of the product does not exist yet
5. Simple financial management still may not be exist, so remain unclear and may have not transparency

Problem no. 1-5 due to a technical problem and requires assistance in improving product quality, including sanitary conditions among breeding, encapsulated process and packaging. Particularly for 5^{th} issue is a matter of business management. The existing problems may influence the credibility of the product, especially on the physical and chemical qualities, as well as low member revenues. Preliminary analysis is also performed on customers from both breeder partners, regarding on satisfaction of partner products and services. The results of consumer responses show that there are satisfied with the services and prices

offered by both partners in general. Affordable price as well as delivery order and preparation supplies at consumer homes has offered. Therefore, the problem-solving program which is done and has been achieved the target is directed towards performance indicator. It may lead increasing partner productivity and making the business more independent, as indicated of the improvement indicators in every activity stage. (Table 1).

Table 1. Achievement indicator program

No	Program and Indicator	
	Program	Indicator
I	Skill imrpovement of japanese ant encapsulated process	
A	Training of hygienic and sanitary breeding of Japanese ants	one type of training
B	Training for making Japanese powder	one type of training
C	Training of manufacture of Japanese ant powder in capsule	a. one type of training b. one type of japanese ant powder in capsule
II	Analysis of physicochemical composition and total microbial content of Japanese ants encapsulated	
A	Physical analyzes both life form and powder of japanese ant	The test parameter are follow: rendement, water content, ash content, and total fiber
B	Chemical analyzes both life form and powder of japanese ant	The test parameter are follow: protein, fat, and carbohydrates content
C	Microbial analyzes both life form and powder of japanese ant	The test parameter is Total Plate Count (TPC)
III	Improvement of Small Business Management	
A	Business management training in small scale	Simple cash book

4.2. Physicochemical and Microbial Analysis

The result of physicochemical analysis showed in Table 2 which is showed that protein content of japanese ants was 22.58% higher than chicken protein which equal to 18.20% [9] and 21.80% [11]. Protein content of Japanese ants indicated that it was include in standard limits of protein content that should be present in the meat of 23.20% [12]. Japanese ant crude fat equal to 4.85% which higher than chicken meat is 2.68-2.86% [13], whereas almost equivalent to the USDA requirement of 4.31% [12]. Water content, dry matter, ash content, and total fiber from both business groups which apply sanitary and hygienic system, respectively 3.02%; 96.98%; 4.32%; And 0.16%.

Regarding the microbial test, total reduction reached from $3.1x10^5$ to be $3.0x10^2$. Improvement from the management side is the existence of simple centralized cash book managed by Anang Jaya breeder business, so there is clear cash flow calculation and better profit sharing. Increase in income per each month reporting progress raised upto 50%.

Table 2. Physicochemical analysis of Japanese Ant product

Content	Value
Water content (%)	3.02
Dry Matter (%)	96.98
Ash (%)	4.32
Protein (%)	22.58
Crude Fat (%)	4.38
Total Fiber (%)	0.16

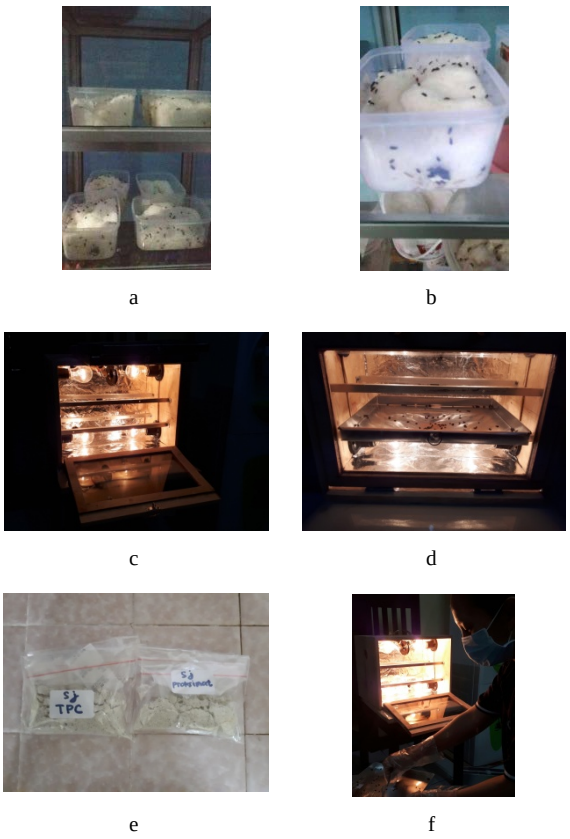

Figure 2. Japanese ant breeding (a, b). Dryer instrument of Japanese ant (c). Drying process of Japanese ant (d, f). Japanese ant powder (e)

5. Conclusions

The results of physicochemical analysis showed that Japanese ants which have been bred hygienically have excellent nutritional content, specifically for protein content is higher than the general beef protein (16-21%). The protein and fat content were 22.58% and 4.85%, while the water content, ash, fiber, total dry matter, and rendement of Japanese ant powder respectively were 3.02%; 4.32%; 0.16%; 96.98%; And 97%. Hygienic bred may caused Japanese ants has resulted in a total reduction of the microbial from the initial condition of $3.1x10^5$ to the lower of $3.0x10^2$. The improvement in the management side is the presence of a simple, centralized cash book managed by the

Anang Jaya breeder business, so that there are clear cash flow calculations and better business profit sharing.

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