Optimizing Demand for Pollen Substitute for Beekeeping in Indonesia

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Abstract. Pollen substitute are an artificial honey bee feed that is useful for increasing the productivity of honey bee colonies, especially during famine. The use of pollen substitute in Indonesia is currently very limited. This study aimed to derive information from honey bee breeders and stakeholders regarding the resources and demand for pollen substitute in increasing honey bee productivity in Indonesia. Qualitative descriptive analysis was conducted with focus group discussion and distribution of a questionnaire related to understanding of pollen substitute and willingness to pay for pollen substitute. The results of the focus group discussion stated that pollen substitute are one way to reduce production costs and increase honey bee productivity. Around 75% are willing to buy pollen substitute at a higher price for the benefits they offer. 16.7% and 58.3% of the respondents are willing to buy pollen substitute at 5% and 2%, respectively, of the price per kg of honey sold at harvest.

Keywords: Beekeeping; pollen substitute; productivity

1 Introduction

Pollen which is the main source of protein and lipid in honeybee feed is essential in producing a more resilient bee phenotype [1]. Nursing bee need pollen to produce royal jelly. Research results showed that nursing bee physiology and tolerance to parasites are affected by pollen quality [2]. The problem of bad weather conditions and unavailability of flora throughout the year in a particular location has been recognized by researchers, beekeepers and the concept of beekeeping or migration has been developed to overcome this problem. However, beekeeping is not easy. Thus, pollen substitute become an alternative for honey beekeeping [3]. Pollen substitute cannot replace natural pollen because natural pollen nutrition is the best for honeybee [4].

Pollen substitute have long been used in a massive scale by several countries to boost the productivity of honeybee colonies. Beekeepers in the U.S. routinely feed the colony a pollen-replacement food when they believe the honeybee are sufferring from a nutrient shortage or if the incoming resource is believed to be of low quality or insufficient [5]. The use of pollen substitute has also been reported in the European Union [6]. In Indonesia, pollen substitute have not been widely adopted. However, a systematic approach is needed in research on the use of pollen substitute in an effort to improve the nutritional management of honey bees and ultimately benefit honey beekeepers economically [7].

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This study aimed to derive information from beekeepers as well as honeybee stakeholders regarding resource and demand for pollen substitute in increasing honey production in Indonesia.

2 Method

The study used descriptive qualitative analytical methods to obtain information about the demand for pollen substitute in honey beekeeping. The first method was a focus group discussion (FGD) on Optimizing Honey Production by Increasing Bee Productivity through Pollen Substitute. The second method was the distribution of a questionnaire about pollen substitute understanding and willingness to pay for pollen substitute.

The FGD was carried out with invited speakers as practitioner of the honey processing industry of PT Haldin Pacific Semesta, beekeeper who live in the city of Solo, Central Java, and academics and researchers from Universitas Nasional Jakarta. The FGD was conducted by a zoom meeting with a capacity of 100 people. Invitations were made in the form of flyers which were distributed through social media. The FGD was held on 28 October 2021, at 09.00 – 12.00 AM.

The questionnaire to determine Willingness to Pay for Pollen Substitute Products contained closed and open questions which were distributed via Google Form to FGD participants. It consisted of demographic questions (four questions); description of honey beekeeping business (four questions); knowledge of pollen substitute (six questions); willingness to pay for pollen substitute (two questions) and advice on pollen substitute. The questionnaire remained open for a week. The data were processed using a univariate analysis in the form of percentages.

3 Result and Discussion

3.1 Focus Group Discussion

The Focus Group Discussion was attended by 100 registered participants with professions as beekeepers, workers in apiculture, academics, honey traders, workers in the honey processing industry, and staff from government institutions such as the Ministry of Environment and Forestry, Forestry Service and Non-Governmental Organizations. The study was conducted using descriptive analytical methods to obtain information regarding the demand for pollen substitute from beekeepers.

The FGD results were recommended for developing pollen substitute as follows:

1) In the honey processing industry, there were at least three requirements that must always be met, namely quantity, quality and price. Quantity to ensure an adequate supply of honey to keep the production process running. Quality to keep the product in accordance with food safety standards. Price to achieve competitive cost manufacturing goods to ensure the survival of the company.
2) The three requirements represent the gap between upstream (apiculture) and downstream (honey processing industry). In terms of quantity, there was still a huge demand from the honey processing industry that can be met. In terms of quality, many Indonesian bee keepers had not met the purity requirements. In terms of price in the honey processing

industry, the price of honey from Indonesian beekeepers still could not compete with imported honey, including from China.

3) There was an agreement between stakeholders, beekeepers, honey traders and honey processors that both upstream and downstream various parties must be able to survive while gaining a decent profit. For this reason, it is necessary to find a solution to the problems that arise so that the existing gap can be overcome. Two of them are by reducing production costs and increasing productivity.
4) One of the initiatives to reduce production costs and increase productivity is to use pollen substitute in beekeeping practice. Pollen substitute was not a new thing since it was already widely used in beekeeping practices abroad. It was just that in Indonesia it had not been widely utilized.
5) The target of this pollen substitute procurement program is to reduce production costs, especially the cost of moving to find pollen. Procurement of pollen substitute or fulfillment of demand for pollen would accelerated the development and productivity of honeybee colonies.
6) For information, to move 300 – 400 colonies of honeybee from one location to another in one month costs up to IDR 60.000.000 or around IDR 150.000 to IDR 200.000 per colony/per month. Meanwhile, during the dearth of nectar and pollen there was no income from honey production.
7) With pollen substitute, production costs were reduced, productivity was increased, and prices were reduced without reducing the profits of farmers.
8) By doing so, it was hoped that beekeeping conditions in Indonesia can improve, along with that the honey processing industry can also produce honey with better quantity, quality, and price.
9) Furthermore, Indonesian honey is expected to be able to compete in the international market.

In many countries around the world, various pollen substitute for honey bees had been developed by mixing different ingredients and tested by beekeepers and workers in commercial apiculture [3]. Pollen substitute have to be available in sufficient quantity and quality to improve the health of honeybee colonies [8].

Research on pollen substitute in Indonesia has begun several years ago [9], [10]. [11], and a number of unpublished studies. However, the research conducted has not yet resulted in a product that can be marketed and used by farmers in Indonesia. Recommendations from the FGD regarding the production of pollen substitute in Indonesia must be implemented in collaboration between researchers at universities, beekeepers, and industry. Pollen substitute have been considered and developed to maintain egg laying, brood rearing and foraging activities that can maintain an adequate bee population in the colony [3].

3.2 Analysis of Demand for Pollen Substitute and Willingness to Pay

Sixteen respondents returned the questionnaire, 87.5% of them were male, 75% of them were college graduate, aged between 28 - 48 years and 43.8% of them were farm owners. In beekeeping business, 18.8% of them have an average income of more than Rp. 5,000,000 per month with an average production of more than 600 kg of honey per month (12.5%). Annually, most honey was harvested in March, April and September; and honey was the least harvested in January, November and December.

In terms of respondents knowledge about pollen substitute, 56.3% of them were aware of pollen substitute prior to the FGD, and 33.3% of them knew about pollen substitute from researchers and 44.4% of them knew about it from the internet or social media. The price of

pollen substitute per kg was known to be less than IDR 25.000/kg and the most expensive was IDR 75.000/kg. Around 81.3% of the respondents claimed that pollen substitute are important for the health and productivity of bee colonies, and 62.5% of the respondents expressed their interest in purchasing pollen substitute during the food source shortage with the beekeeper group having the highest motivation (56.3%). Around 75% of the respondents were willing to buy pollen substitute at a higher price for the benefits. Around 16.7% of the respondents were willing to buy pollen substitute at 5% of the price of honey per kg sold at harvest and 58.3% of the respondents were willing to buy pollen substitute at 2% of the price of honey per kg sold at harvest.

In Indonesia, pollen substitute was not yet fully known by beekeeping stakeholders. Therefore 43.7% of respondents did not know about pollen substitute before participating in the FGD. From an economic perspective, raising honeybee had not become their primary source of income because only 18.8% of beekeepers had incomes above IDR 5,000,000 IDR or above the average minimum wage in Indonesia. This gap could also be observed in the average amount of honey harvested above 600 kg honey per month, only obtained by 12.5% of beekeepers. However, beekeeping was estimated as a profitable business [12]. Economically, the beekeeping business could provide relatively large profits for honey farmers directly and for its contribution to the regional economy [13]. The beekeeper's income depended on the number of hives of the honeybee colony. The more the number of hives, the better the cost of goods sold, BEP, B/C ratio [14].

From the knowledge or explanations as well as discussions in the FGD, most of the respondents known the benefits of pollen substitute and would bought pollen substitute during the dearth period by reducing the profit by up to 5% of the price per kg of honey harvested. In dearth periods, migration was not an easy task, it took a lot of money, labor, and a lot of risk of loss of colonies [15]. Appropriate provision of pollen substitute increased number of brood cell and number of bees found higher, bee longevity, colony weight, number of honeycomb frames and greater honey production, and higher pollination efficacy [3], was able to prevent colony abscond and increased productivity [11].

4 Conclusion

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References

[1] Crone, M. K., & Grozinger, C. M. (2021). : Pollen protein and lipid content influence resilience to insecticides in honey bees (Apis mellifera). The Journal of experimental biology, jeb.242040.

[2] Di Pasquale, G., Salignon, M., Le Conte, Y., Belzunces, L. P. Decourtye, A., Kretzschmar, A., Suchail, S., Brunet, J. L., & Alaux, C. (2013).: Influence of pollen nutrition on honey bee health: do pollen quality and diversity matter?. PloS one.8(8). e72016.
[3] Paray, B. A., Kumari, I., Hajam, Y. A., Sharma, B., Kumar, R., Albeshr, M. F., & Khan, J. M. (2021).: Honeybee nutrition and pollen substitutes: A review. Saudi Journal of Biological Sciences, 28(1), pp. 1167-1176.
[4] Manning, R. (2018).: Artificial feeding of honeybees based on an understanding of nutritional principles. Anim. Prod. Sci. 58, pp. 689–703.
[5] Fleming, J. C., Schmehl, D. R., & Ellis, J. D. (2015).: Characterizing the impact of commercial pollen substitute diets on the level of Nosema spp. in honey bees (Apis mellifera L.). PLoS One, 10(7), e0132014.
[6] Haefeker, W. (2021). Pollen supplements and substitutes in the EU feed market: a product/market survey for bees and other animal species. EFSA Supporting Publications, 18(2), 6461E.
[7] Noordyke, E. R., van Santen, E., & Ellis, J. D. (2021).: Tracing the fate of pollen substitute patties in western honey bee (hymenoptera: Apidae) colonies. Journal of Economic Entomology, 114(4), pp. 1421-1430.
[8] Brodschneider, R., and Crailsheim, K. (2010).: Nutrition and health in honey bees. Apidologie 41, pp. 278–294.
[9] Widowati, R., Basukriadi, A., Oetari, A., Anwar, E., & Sjamsuridzal, W. (2013).: The effect of pollen substitutes on the productivity of Apis cerana in Indonesia. Bee World, 90(3), pp. 72-75.
[10] Wijayati, N., Hardjono, D. S., Rahmawati, M., & Kurniawati, A. (2019).: Formulation of winged bean seeds as pollen substitute for outgrowth of honey bees (Apis mellifera L). In Journal of Physics: Conference Series, 1321 (2), 022040. IOP Publishing.
[11] Widowati, R., Mariandayani, H. N., Rahayu, I. L., Sjamsuridzal, W., Basukriadi, A., & Oetari, A. (2020).: Soybean Dregs as Main Ingrediens of Pollen Substitute for Apis Cerana Honey Bees. International Journal of Modern Agriculture, 9(4), pp. 541-555.
[12] Setiawan, A., Sulaeman, R., Arlita, T. (2017).: Strategi Pengembangan Usaha Lebah Madu Kelompok Tani Setia Jaya di Desa Rambah Jaya Kecamatan Bangun Purba Kabupaten Rokan Hulu. Selodang Mayang: Jurnal Ilmiah Badan Perencanaan Pembangunan Daerah Kabupaten Indragiri Hilir, 3(3), pp.183 – 190.
[13] Tirajoh, S., Malik, A. (2013).: Potensi Pengembangan Dan Kapasitas Tampung Usaha Ternak Lebah Madu Di Kabupaten Jayawijaya Papu. In Prosiding Seminar Nasional Akselerasi Pemanfaatan Teknologi Pertanian Spesifik Lokasi Mendukung Ketahanan Pangan dan Kesejahteraan Petani Nelayan. pp. 314 – 320.
[14] Qoilidiyah, A. D., Ali, U., & Dinasari, I. (2021).: Analisis Usaha Lebah Madu (Apis mellifera) di Kecamatan Gunung Wungkal Kabupaten Pati Jawa Tengah. Dinamika Rekasatwa, 4(02), pp. 180-186.
[15] Kumar, R., Agrawal, O.P. (2014).: Comparative performance of honeybee colonies fed with artificial diets in Gwalior and Panchkula region. J. Entomol. Zool. Stud., 2 (4) (2014), pp. 104-107