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# Integrated Technology in Marketing Bee Products: A Systematic Review on Its Role in Traditional Medicine

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Bee products have been widely known by the public as having medicinal properties. Various uses of bee products are also used as a mixture of traditional medicine. The marketing of bee products cannot be separated from the integrated technology of the process manufacture preparations as products or additional as traditional medicine. The marketing process using technology has also developed. This article will discuss the update of technology to support the marketing of bee products as traditional medicine. Methods of data collection using the search system Scopus, ScienceDirect, Garuda, WoS by using a systematic narrative review with related themes. Based on this study, the results or descriptions show that the presence of integrated technology in marketing bee products can increase consumer interest as a marketing strategy as traditional medicine. The impact of technological advancements on consumer behaviour, marketing strategies, and production processes. This can be a reference for producers in determining marketing strategies for bee products in this technological era.

**Keywords:** bee product; technology; traditional medicine

## I. INTRODUCTION

Honey bees produce products that are highly marketable and have various benefits for humans (Hristov *et al*., 2020). Honey is a commonly consumed bee product. In addition, other bee products, including royal jelly, propolis, pollen and bee bread are also considered as natural supplements because of their high nutritional value and beneficial effects on human health (Basa *et al*., 2016; Hassoun *et al*., 2022).

These bee products in the development of traditional medicine have an important role. Its health benefits as well as additional components in herbal combinations make it excellent. The main trend in the development of traditional medicine is not only in terms of cleanliness but also technology that can process standardised bee products and also promotions in its marketing (Nikam *et al*., 2012).

While technology serves as a valuable tool in the marketing of bee-derived traditional medicine, it introduces a range of challenges that need to be carefully managed. These challenges include misinformation, consumer distrust, regulatory issues, environmental concerns, and the ethical use of cultural knowledge. Addressing these problems requires a holistic approach that integrates scientific validation, ethical marketing practices, sustainability, and respect for indigenous cultures. Ultimately, the goal should be to ensure that the use of technology in promoting bee products is done in a way that benefits both consumers and the beekeeping communities, while preserving the authenticity and ecological balance of the products.

There has been little discussion regarding the influence of technology in the marketing of bee products. This review aims to present the current implementation of honeybee product research in relation to product development from the aspects of authentication research, counterfeit detection, bioactivity, packaging to marketing. This updated information can be applied further in comprehensively

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assess of technology that needs to be developed from various aspects in marketing bee products as traditional medicines.

## II. METHOD

In this study, the literature review method was used by searching for articles in the database using keywords, the source of the data obtained was in the form of national and international research journals published in the last 10 years. After that, screening and analysis is carried out on the suitability of the article title with the research objectives so that the relevant journal or article is obtained. Scopus, WoS, Science Direct and Garuda was used as database resources.

## III. RESULT AND DISCUSSION

### *A. Bee Product as Traditional Medicine*

Bee products such as honey, propolis, bee pollen and royal jelly has been widely known to have medical advantage traditionally (Faqihi & Taha, 2022). It has been described in previous report that bee pollen has the properties of antidiabetic, anti-obesity and antihyperlipidemic effect (Pai, Shivappa & Surendra, 2018). Clinically bee pollen and propolis has been tested against prostatitis disease due to its anti-inflammatory properties (Kustiawan *et al.*, 2023). In addition, bee pollen also could exhibit anti-cancer activity via various mechanisms for instance, stimulating apoptosis, inhibit the cell proliferation and reducing tumour growth (Elumalai *et al.*, 2022; Yang *et al.*, 2022).

The combination of various bee product also indicates positive effect for health care benefit. The combination of bee pollen and honey as well as bee pollen and propolis showed the synergistic effect on prostatitis condition. The combination of bee pollen, dry propolis and royal jelly powder has been reported to have hypotensive and hypoglycaemic effect and in long term use can promote immunity and health. Furthermore, the possibility to combine bee product with other medical plant extract also give positive pharmacological effect, for instance, the combination of bee pollen and *Gynostemma pentaphyllum* extract has hypotensive, antidiabetic effect as well as promoting immunity and inhibit cancer growth. The use of bee product traditionally and empirically proven to have health benefit (Mărgăoan *et al.*, 2019). However, the future challenge of scientific proof, research and development, product manufacturing, and also marketing approaches need to be developed (Figure 1). In the next section of this article, we discuss about the technological and marketing approach on bee products.

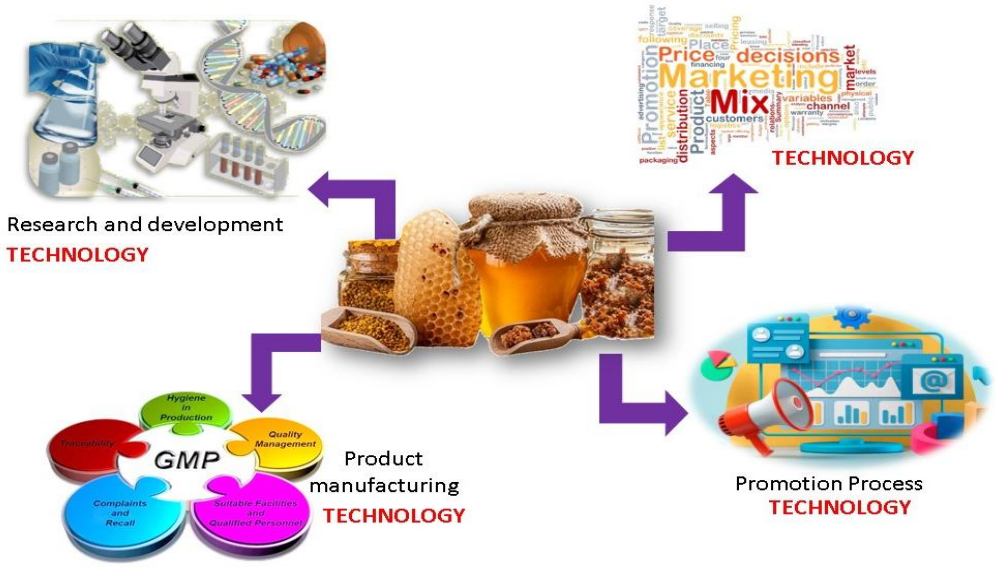


Figure 1. Integrated technology in bee product (Source: Author, 2024)

### *B. The Development of Bee Cultivation*

The method of beekeeping can vary significantly depending on the technology used, with the two primary types being modern beekeeping (using man-made hives) and traditional methods (such as the use of log hives). Both methods have unique advantages, challenges, and implications for the environment, the bees, and the beekeepers (Heard, 2016).

In recent years, some beekeepers have chosen to blend elements of both methods, incorporating modern tools with traditional practices to create more sustainable, productive, and bee-friendly beekeeping systems. This hybrid approach may represent the future of apiculture, balancing productivity with ecological responsibility.

### *C. Integrated Technology of Bee Product Research and Development*

The development of research on bee products is currently increasing. Not only limited to its function as a healthcare support, but also research related to its sustainability in nature is a priority. Urban development that reduces green land cover is a problem. Bee is one of the most important pollinator for wild and agriculture plants. The research on sustainability while maintaining bee production is important to preserve diversity in pollinator animal (Papa *et al*., 2022).

One of the problem related to the sustainability and production capacity of bee product is the decrease of the bee colony. This phenomenon is called colony collapse disorder (CCD) in which there is a disappearance of worker bee and the bee queen is left behind with abundance of food supply and immature bee (Evans & Chen, 2021). The CCD was hypothesised caused by multiple factors including excessive use of pesticide, genetically modified organism in agriculture, decreasing of biodiversity and monoculture crops. There is a reciprocal relationship between the biodiversity and the honey bee wellbeing. More researches should intent to reveal the optimum condition between the bee keeping farm and the biodiversity and ecosystem surround it (Oluwaseyi, Mustapha & Oluwaseyi, 2022; Jacobs *et al*., 2006).

As previously described the bee product also provide a medicinal benefit. The active compound of bee products is highly affected by geographical location and the variation of plant around it (Bankova, Trusheva & Popova, 2021; Kustiawan, Aziz & Yuliawan, 2022). The research on finding and purifying the active compound is important to proof scientific relevance of bee product as modern medicine (Giampieri *et al*., 2022). One of the approaches to screen the activity of various active compound of bee product is using computational analysis. This way we can virtually predict the pharmacological effect of active compound against designated target i.e enzyme and receptor, which has biological relevance in a disease. Another research and development regarding the bee product is the innovation of product preparation and formulation. The aim of product preparation or formulation is to facilitate the drug delivery, so the active compound can reach the target organ. One of the innovation of drug delivery and formulation is the development of nanoparticle (Salvati & Poelstra, 2022). Nanoparticle technology allow the active compound to pass through biological barrier in relatively easy compared to the traditional formulation (Kustiawan *et al*., 2024). With the research on formulation, the bee product will be able to give its optimal pharmacological effect. To summarise the bee product research and development involving technology can be divided into several sections (Table 1).

Table 1. Classification of technological interventions in bee product research

| Components | Invention | References |
|---|---|---|
| Sustainability in nature | Artificial bee hive | (Oluwaseyi, Mustapha & Oluwaseyi, 2022; Mohammad & Jawhar, 2022; Handur & Deshpande, 2023) |
| Product preparation | Nanoparticle preparation | (Lu et al., 2021; Vaishampayan & Rane, 2022) |
| Active compound and quality | Computational design | (Kekeçoğlu, M., Çaprazlı, T., Samancı, A. E. T., Samancı, T., & Önder, 2022; Zarei *et al*., 2022) |

The application of technology standards in the development of traditional medicine, especially bee products, has the prospect of increasing (Chen, 2022). Now people are developing not only research focused on one type of bee, but also other promising types such as stingless bees (Qu *et al*., 2022; Kiprono *et al*., 2022).

There are many things that can be studied in the research of bee products, not only the exploration of the nature but also its modification to the stability of the product (Ejigu, Gebey & Preston, 2009). The development of integrated technology in researching the biological aspects of the benefits of traditional medicine is one of the important prospects in the future (Witte, 2022). The development of honey bee cultivation management is also directed in the context of improving the local community's economy (Gemeda, 2014).

### *C. Integrated Technology of Bee Product Manufacture*

The manufacturing technology of bee product has been influenced by various variable (Alamgir, 2018). Utility and machinery hygiene is the most basic development in manufacturing. It is important for company and manufacturer to comply to good manufacturing process (Nikam *et al*., 2012). One other aspect of manufacturing technology is halal certification, which is very important in many countries especially Muslim majority country.

The manufacturing process of bee product is depending on its preparation form and composition, for instance drying step is essential for processing many bee products due to its water content. The drying process of bee pollen product can be conducted by traditional and advanced drying techniques. The traditional drying technique such as freezing, solar drying and drying with hot air are the most used technique for bee pollen (Ahmed *et al*., 2022). The solar drying has the advantage to not change the antioxidant properties and phytochemical composition of bee pollen, meanwhile drying with hot air in a chamber has an effect on bee pollen quality such as morphological, physicochemical and phytochemical composition change.

However, in the drying with hot air technique has several advantage i.e. less drying time, more sanitary equipment, lower microbial contamination, and easier to control the drying condition such as drying temperature. Freeze drying method is suitable for royal jelly processing to preserve its quality. Advanced drying method such as microwave and infrared drying has been used for bee pollen drying process. Microwave drying method has more efficient drying process compared to the traditional method as it dry faster and obtain better quality of product (Faleiros-Quevedo & Francoy, 2022). Standardisation of active compounds in monofloral and multifloral bee products will be different in terms of handling in the manufacturer (Escriche *et al*., 2022).

Other aspect of manufacture technology of bee products is quality control of its chemical composition (Faleiros-Quevedo & Francoy, 2022; Vimolmangkang *et al*., 2022). Extraction and separation process is essential to obtain the beneficial phytochemical composition of bee products. One of the functional content of bee products is phenolic compound, it has the ability to catch the free radical species and exert antioxidant activity (Kurrey *et al*., 2022). The phenolic compound is obtained mainly via solvent extraction such as combination ethanol and water. The quality control of total phenolic compound has been conducted using different method. The simplest method to detect phenolic compound is Folin-ciocalteu method which is measure by UV-vis readout. The more complex method is using HPLC and LC-MS to get more detail on phytochemical structure. GC-MS is employed to determine the chemical composition of raw propolis (Kasote, Bankova & Viljoen, 2022).

Dosage forms of bee products such as propolis are also currently implementing the best technological developments to maintain the quality of the active compounds in them (Dvykaliuk, Adamchuk & Pylypko, 2022).

### *D. Integrated Technology of Bee Product Promotion*

The world is not only agro-climatically diverse, but is also a centre for the diversity of various plant species and animal resources including honeybee races. Geographical racial differences of honey bees are found in different countries and have been studied by scientists. The relationship between bee species from one country to another is generally quite far (Boyacioglu, Samanci & Samanci, 2022). This is caused by differences in seasons, bee food sources and geographical location.

The basic promotion of bee products began with its claims as health supplements and other benefits as functional foods and cosmetics. Packaging aesthetics is also one of the

important marketing innovations of bee products (Chirilli, Molino & Torri, 2022).

Many things are considered by consumers in buying bee products and their derivative products. This can be seen in Figure 2.


Figure 2. Things in promotion that are considered by consumers in buying bee products

The first consideration is if the origin of the product is clear, because this is related to the taste and the type of bee used. Consumers who already believe in a brand, will definitely have a tendency to repurchase from the same brand. Information technology intervention using barcodes as origin tracing is one of the promising prospects in this business. Agricultural product quality safety traceability and barcode systems have become a worldwide trend. The traceability platform can also be applied to bee products, which can be used to identify all aspects of raw material sourcing according to global standards. An integrated bee product traceability system that involves all processes along the supply chain can be implemented to increase consumer confidence in bee products by making traceability data accessible to consumers. In this bee product traceability platform, the barcode system is very important and because of its application at all stages of the platform traceability, packaging and infrastructure of the standard barcode system becomes very important. Bar-coding standardisation of bee product data content is required starting from material collection, purchasing, processing and selling. The adoption of a barcode system and traceability platform offers a strong guarantee for the safety of the quality of bee products and increases the competitiveness of bee products in the international market (Turban *et al.*, 2015).

The packaging process and packaging display are also important aspects for developing the technology. Premium packaging is currently starting to be excellent. Environmentally friendly packaging materials have also become an important issue in international sales. This increases producer innovation in global competition. Promotions that show the production process and standardised quality in production are also an attraction for consumers.

In addition to the issue of halal products, which are the main criteria for sales in countries that are predominantly Muslim and consumptive, such as Indonesia. The use of celebrities to review products for consumption is a market strategy that has quite a big influence (Lu *et al.*, 2021; Vaishampayan & Rane, 2022)

The market strategy has significantly changed in the last 20 years since the use of the internet for marketing. This then changes people's buying and selling behaviour (Laudon & Traver, 2013). Today, in order to appeal to Generation Z, sellers have to get even more creative. The direction of product marketing research and development is the bottom

Table 2. The development of promotional techniques using technology as one aspect of consumer decision-making

| Era | Methods | Developed system | Advantages | Weakness | Influence to Consumers | References |
|---|---|---|---|---|---|---|
| Marketing 1.0 1950-1960 | Conventional | information system through mass media | The use of mass media as a marketing medium is able to reach people at various social levels because nowadays computer technology is still relatively expensive | Product-driven concept where first make the product, then find a way to sell it hard so that consumers are positioned as buyers without paying attention to the emotional side of the buyer. A new prospective buyer will know of a product only if he buys, sees or hears an advertisement for a product from the mass media | Consumers do not always find the products they really need and want, consumers are forced to buy something advertised in the mass media. | (Yang, 2022) |
| Marketing 2.0 1960-2000 | Conventional | Information system through mass media, e-mail, and spam messages via e-mail or mobile phone short messages | The reach of marketing is wider than just using mass media such as newspapers, magazines, posters and pamphlets | Products advertised via radio or spam messages rarely get attention due to the absence of product visuals | The customer-driven concept makes consumers more loyal to a product | (Handayani & Martini, 2014; Alam, 2022) |
| Marketing 3.0 1995-2000 | Ecommerce at Invention stage (online/digital) | Static Ads on Company Website | Companies can expand their market segmentation and reach more consumers | Product images and information are still limited to static images due to bandwidth limitations and web technology at that time | The emergence of a consumer community that contains information about a product that consumers do not get in the actual market. From the seller's point of view, the emergence of a monopoly by who first introduced the product, because that company will be widely known. | (Alzoubi et al., 2022) |
| Marketing 4.0 2001-2006 | Online | E-commerce with more complex services such as shipping and financial services. Not only selling goods as well as feedback facilities on the company's website | People get more choices in meeting their needs related to payment services | In this period there are many frauds because the payment system is still not fully secure and at this time there is no shopping security standard | The ease of making buying and selling transactions between buyers and sellers began to be felt by consumers from outside the region and even outside the country. However, not a few consumers are reluctant to use certain platforms for reasons of safety and authenticity of goods | (Hendarsyah, 2019) |
| 2007 - now | Online Forums and Social Media | Online trading in various media such as forums, social media, private online shops, etc. | Forums and social media have several advantages that make people tend to choose online forums and social media as a place for buying and selling, which include ease of access, and ease of use. buying and selling process. | Sometimes in buying and selling forums there are problems related to the quality of information which is often lacking and sometimes missleading. This causes a decrease in trust in the forum. | The intention to repurchase is strongly influenced by the overall level of satisfaction and trust | (Turban et al., 2015; Laudon & Traver, 2013) |
| | online | Mobile apps | Several e-commerce platforms provide special discount offers for mobile application users, ease of use is an important factor in user retention for m-commerce | | Mobile commerce provides convenience in accessibility, connectivity, personalization, and time efficiency for its users. | (Sidharta & Suzanto, 2015; Ahuja, V., & Khazanchi, 2016; Li, Zhao & Pu, 2020; Niranjanamurthy et al., 2013) |

from the bottom up by looking at consumers who are more enthusiastic about existing trends (Liu, Zhu & Li, 2011).

The marketing and promotion approach was changed from what was originally door-to-door promotion to spreading information about products through online forums, to using e-commerce platforms. Various e-commerce platforms are playing an important role in the new era of marketing campaigns. E-commerce with a review feature that can be seen by all users facilitates the dissemination of information about a product to be purchased. This can increase the trust of prospective buyers to buy certain products (Putri, 2022).

Companies are already using much more robust data repositories and using marketing analytics tools so that marketing is coordinated based on social networks, search engines, web, mobile and email platforms. The various e-commerce platform also plays important role on new era of marketing campaign (Brem & Wolfram, 2014). This way the company has more budget efficiency and better product exposure to the customer i.e company now can promote their product international wide with little cost and can reach different target of audience. The development of marketing approaches is summarised in Table 2.

## IV. CONCLUSION

The existence of integrated technology from the production process, packaging, certification, supported by the internet and digital promotion is expected to provide benefits to business players of bee products as traditional medicines in the world. The bee product business currently affects e-Commerce. Entrepreneurs of bee products who are able to compete in the competition are able to implement technology into their companies. Implementation of technology to increase business competition and sales of bee products by using e-commerce as a means to market various products, both in the form of digital and non-digital products. With the integration of technology, customers can access orders from various places and perform thoroughness before buying.

## V. ACKNOWLEDGEMENT

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## VI. REFERENCES

Ahmed, HR, Elshafiey, EH, Omar, EM & El-Seedi, HR 2022, 'Bee Pollen: Clinical Trials and Patent Applications', Nutrients, vol. 14, no. 14, pp. 2858.

Ahuja, V & Khazanchi, D 2016, 'Creation of a conceptual model for adoption of mobile apps for shopping from e-commerce sites–An Indian context', Procedia Computer Science, vol. 91, pp. 609–616.

Alam, SI 2022, 'The Customer Interaction Cycle: The Moments of Truth in CRM', Journal of Micro & Small Business Management. pp. 1-5.

Alamgir, ANM 2018, 'Biotechnology, in vitro production of natural bioactive compounds, herbal preparation, and disease management (treatment and prevention)', in: Therapeutic Use of Medicinal Plants and their Extracts: Volume 2, Springer, pp. 585–664.

Alzoubi, H, Alshurideh, M, Kurdi, B, Akour, I & Aziz, R 2022 'Does BLE technology contribute towards improving marketing strategies, customers' satisfaction and loyalty? The role of open innovation', International Journal of Data and Network Science, vol. 6, no. 2, pp. 449–460.

Bankova, V, Trusheva, B & Popova, M 2021, 'Propolis extraction methods: A review', Journal of Apicultural Research, pp. 1–10.

Basa, B, Belay, W, Tilahun, A & Teshale, A 2016, 'Review on medicinal value of honeybee products: Apitherapy', Advances in Biological Research, vol. 10, no. 4, pp. 236–247.

Boyacioglu, D, Samanci, AET & Samanci, T 2022, 'Future prospects of propolis, bee pollen, royal jelly, and bee venom', in: Bee Products and Their Applications in the Food and Pharmaceutical Industries, Academic Press, pp. 411–440.

Brem, A & Wolfram, P 2014, 'Research and development from the bottom up-introduction of terminologies for new product development in emerging markets', Journal of Innovation and Entrepreneurship, vol. 3, no. 1, pp. 1–22.

Chen, Y 2022, 'Health technology assessment and economic evaluation: Is it applicable for the traditional medicine?',

Integrative Medicine Research, vol. 11, no. 1, pp. 100756.

Chirilli, C, Molino, M & Torri, L 2022, 'Consumers' Awareness, Behavior and Expectations for Food Packaging Environmental Sustainability: Influence of Socio-Demographic Characteristics', Foods, vol. 11, no. 16, pp. 2388.

Dvykaliuk, R, Adamchuk, L & Pylypko, K 2022, 'Propolis Drops as Evidence for Dilution of Propolis by Honey Bees?', Bee World, pp. 1–7.

Ejigu, K, Gebey, T & Preston, TR 2009, 'Constraints and prospects for apiculture research and development in Amhara region, Ethiopia', Livestock Research for Rural Development, vol. 21, no. 10, pp. 172.

Elumalai, P, Muninathan, N, Megalatha, ST, Suresh, A, Kumar, KS, Jhansi, N, ... & Krishnamoorthy, G 2022, 'An Insight into Anticancer Effect of Propolis and Its Constituents: A Review of Molecular Mechanisms', Evidence-Based Complementary and Alternative Medicine.

Escriche, I, Juan-Borrás, M, Visquert, M & Valiente, JM 2022, 'An overview of the challenges when analysing pollen for monofloral honey classification', Food Control, pp. 109305.

Evans, JD & Chen, Y 2021, 'Colony collapse disorder and honey bee health', in: Honey Bee Medicine for the Veterinary Practitioner, pp. 229–234.

Faleiros-Quevedo, M & Francoy, TM 2022, 'Stingless bees honeys': physical-chemical characterization, difficulties and challenges', Research, Society and Development, vol. 11, no. 6, p. e25411628996.

Faqihi, RA & Taha, EAH 2022, 'Apitherapy as an Alternative medicine: Article review', African Journal of Biological Sciences, vol. 18, no. 2, pp. 43–57.

Gemeda, TK 2014, 'Integrating improved beekeeping as economic incentive to community watershed management: the case of Sasiga and Sagure Districts in Oromiya Region, Ethiopia', Agriculture, Forestry and Fisheries, vol. 3, no. 1, pp. 52–57.

Giampieri, F, Quiles, JL, Cianciosi, D, Forbes-Hernández, TY, Orantes-Bermejo, FJ, Alvarez-Suarez, JM & Battino, M 2022, 'Bee products: an emblematic example of underutilized sources of bioactive compounds', Journal of agricultural and food chemistry, vol. 70, no. 32, pp. 6833–6848.

Handayani, SB & Martini, I 2014, 'Model Pemasaran di Era New Wave Marketing', Jurnal Ekonomi Manajemen dan Akuntansi STIE Dharma Putra, vol. 36.

Handur, VS & Deshpande, SL 2023, 'Artificial Bee Colony Optimization-Based Load Balancing in Distributed Computing Systems—A Survey', in: Smart Trends in Computing and Communications, Springer Singapore, pp. 733–740.

Hassoun, A, Harastani, R, Jagtap, S, Trollman, H, Garcia-Garcia, G, Awad, NM, ... & Maqsood, S 2022, 'Truths and myths about superfoods in the era of the COVID-19 pandemic', Critical Reviews in Food Science and Nutrition, pp. 1–18.

Hendarsyah, D 2019, 'E-commerce di era industri 4.0 dan society 5.0', IQTISHADUNA: Jurnal Ilmiah Ekonomi Kita, vol. 8, no. 2, pp. 171–184.

Hristov, P, Neov, B, Shumkova, R & Palova, N 2020 'Significance of apoidea as main pollinators, ecological and economic impact and implications for human nutrition', Diversity, vol. 12, no. 7, pp. 280.

Jacobs, FJ, Simoens, C, Graaf, D & Deckers, J 2006, 'Scope for non-wood forest products income generation from rehabilitation areas: focus on beekeeping', Journal of the Drylands, vol. 1, no. 2, pp. 171–185.

Kasote, D, Bankova, V & Viljoen, AM 2022, 'Propolis: chemical diversity and challenges in quality control', Phytochemistry Reviews, pp. 1–25.

Kekeçoğlu, M, Çaprazlı, T, Samancı, AET, Samancı, T & Önder, EY 2022, 'Factors Affecting Quality of Honey Bee Venom', Journal of Apicultural Science, vol. 66, no. 1, pp. 5–14.

Kiprono, SJ, Mengich, G, Kosgei, J, Mutai, C & Kimoloi, S 2022, 'Ethnomedicinal uses of stingless bee honey among native communities of Baringo County, Kenya', Scientific African, p. e01297.

Kurrey, R, Saha, A, Sinha, S, Sahu, Y, Khute, M, Sahu, B & Deb, MK 2022, 'Recent advances on analytical methodologies for screening and detection of biophenols and their challenges: A brief review', Results in Chemistry, p. 100456.

Kustiawan, PM, Aziz, A & Yuliawan, VN 2022, 'Antioxidant and Antibacterial Activity of Various Fractions of Heterotrigona itama Propolis Found in Kutai Kartanegara', Open Access Macedonian Journal of Medical Sciences, vol. 10 A, pp. 531–534.

Kustiawan, PM, Syaifie, PH, Al Khairy Siregar, KA, Ibadillah, D & Mardliyati, E 2024, 'New insights of propolis nanoformulation and its therapeutic potential in human diseases', ADMET and DMPK, vol. 12, no. 1, pp. 1–26. doi: https://doi.org/10.5599/admet.2128.

Kustiawan, PM, Yanti, EN, Nisa, K, Zulfa, AF & Batistuta,

MA 2023, 'Bioactivity of Heterotrigona itama propolis as anti-inflammatory: A review', Biointerface Research in Applied Chemistry, vol. 13, no. 4, p. 326.

Laudon, KC & Traver, CG 2013, E-commerce, Boston, MA: Pearson.

Li, X, Zhao, X & Pu, W 2020, 'Measuring ease of use of mobile applications in e-commerce retailing from the perspective of consumer online shopping behaviour patterns', Journal of Retailing and Consumer Services, p. 55.

Liu, S, Zhu, Y & Li, S 2011, 'Research on agent-based bee product traceability platform and barcode system', in: International Conference on Computer and Computing Technologies in Agriculture, Springer, Berlin, Heidelberg, pp. 445–454.

Lu, W, Yao, J, Zhu, X & Qi, Y 2021, 'Nanomedicines: Redefining traditional medicine', Biomedicine & Pharmacotherapy, vol. 134, p. 111103.

Mărgăoan, R, Stranț, M, Varadi, A, Topal, E, Yücel, B, Cornea-Cipcigan, M, ... & Vodnar, DC 2019, 'Bee collected pollen and bee bread: Bioactive constituents and health benefits', Antioxidants, vol. 8, no. 12, p. 568.

Mohammad, MA & Jawhar, MM 2022, 'Compare between PSO and artificial bee colony optimization algorithm in detecting DoS attacks from network traffic', TELKOMNIKA (Telecommunication Computing Electronics and Control), vol. 20, no. 4, pp. 780–787.

Nikam, PH, Kareparamban, J, Jadhav, A & Kadam, V 2012, 'Future trends in standardization of herbal drugs', Journal of Applied Pharmaceutical Science, pp. 38–44.

Niranjanamurthy, M, Kavyashree, N, Jagannath, S & Chahar, D 2013, 'Analysis of e-commerce and m-commerce: advantages, limitations and security issues', Journal of Advanced Research in Computer and Communication Engineering, vol. 2, no. 6, pp. 2360–2370.

Oluwaseyi, FO, Mustapha, MA & Oluwaseyi, IG 2022, 'Effects of temperature and relative humidity on colonization of bees hives within Futa community', Journal of Research in Forestry, Wildlife and Environment, vol. 14, no. 2, pp. 18–25.

Pai, S, Shivappa, CB & Surendra, A 2018, 'Anti-obesity and Antihyperlipidemic activity of Processed Honey-A Randomised, Open labeled, Controlled Clinical Study', J Res Tradit Med, vol. 4, no. 2, pp. 40–48.

Papa, G, Maier, R, Durazzo, A, Lucarini, M, Karabagias, IK, Plutino, M, ... & Negri, I 2022, 'The honey bee Apis mellifera: An insect at the interface between human and ecosystem health', Biology, vol. 11, no. 2, p. 233.

Putri, DRL 2022, 'Pengaruh Social Media Marketing, Celebrity Endorse, dan Online Consumer Review Terhadap Purchase Intention (Survei Pada Calon Konsumen Avoskin Beauty di Daerah Istimewa Yogyakarta)', Universitas Pembangunan Nasional" Veteran" Yogyakarta.

Qu, Y, Wang, S, Wang, K & Wang, Z 2022, 'The newly rising meliponiculture and research on stingless bees in China-a mini review', Journal of Apicultural Research, pp. 1–8.

Salvati, A & Poelstra, K 2022, 'Drug Targeting and Nanomedicine: Lessons Learned from Liver Targeting and Opportunities for Drug Innovation', Pharmaceutics, vol. 14, no. 1, p. 217.

Sidharta, I & Suzanto, B 2015, 'Pengaruh kepuasan transaksi online shopping dan kepercayaan konsumen terhadap sikap serta perilaku konsumen pada e-commerce', Jurnal Computech & Bisnis, vol. 9, no. 1, pp. 23–36.

Turban, E, King, D, Lee, JK, Liang, TP & Turban, DC 2015, 'Social commerce: Foundations, social marketing, and advertising', in: Electronic commerce, Springer, Cham., pp. 309–364.

Vaishampayan, P & Rane, M 2022, 'Herbal nanocosmeceuticals: A review on cosmeceutical innovations', Journal of Cosmetic Dermatology.

Vimolmangkang, S, Rani, D, Prestwong, N, Sutcharitchan, C & Pakdeesattayapong, D 2022, 'Revisiting some overlooked registered Thai traditional medicine preparations: an alert to a regulatory affair', Bulletin of the National Research Centre, vol. 46, pp. 1–9.

Witte, H 2022, 'The Interplay of Biomimetics and Biomechatronics', Biomimetics, vol. 7, no. 3, p. 96.

Yang, J, Pi, A, Yan, L, , Li, J, Nan, S, Zhang, J & Hao, Y 2022, 'Research Progress on Therapeutic Effect and Mechanism of Propolis on Wound Healing', Evidence-Based Complementary and Alternative Medicine.

Yang, M 2022, 'Research on Network Marketing Innovation of Agricultural Special Products under the Background of Media Convergence', Forest Chemicals Review, pp. 2733–2739.

Zarei, A, Ramazani, A, Rezaei, A & Moradi, S 2022, 'Screening of honey bee pollen constituents against COVID-19: an emerging hot spot in targeting SARS-CoV-2-ACE-2 interaction', Natural Product Research, pp. 1–7.