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AWARENESS OF POTENTIAL OF APICULTURAL PRODUCTS AMONG BEEKEEPERS AND ARABLE FARMERS FAMILIAR WITH BEEKEEPING IN OGBOMOSO AGRICULTURAL AREA, SOUTHWESTERN NIGERIA

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ABSTRACT

Honey bee products have been utilized by humans for thousands of years because of their nutritional, medicinal, and cosmetic values. These products include honey, beeswax, propolis, royal jelly, bee pollen, and bee venom, each possessing unique properties and diverse applications. This study investigated the level of awareness and knowledge of bee products among residents of Ogbomoso Agricultural Zone, Oyo State, Nigeria. The study was conducted in five Local Government Areas: Ogbomoso North, Ogbomoso South, Orire, Ogo-Oluwa, and Surulere. A structured questionnaire was administered to 110 randomly selected respondents to obtain information on socio-economic characteristics, awareness of bee products and production methods, consumption patterns, and knowledge of the economic and health benefits of bee products. Data were analyzed using descriptive statistics using SPSS version 25. The results showed that 43.5% of the respondents were between 41 and 50 years of age, while 51.9% were male. Most respondents (79.1%) were married, and 50.9% had tertiary education. A high proportion (92.7%) was aware of bee products and their production. Honey was the most recognized bee product (99.1%), followed by beeswax (65.5%), bee venom (60.9%), pollination services (58.2%), and propolis (20.9%). The majority (90.0%) was aware of conventional beekeeping methods, with 66.0% using fixed hives. Honey was the most commonly consumed bee product (97.3%), while 98.2% recognized the economic importance and 99.1% acknowledged the medicinal benefits of bee products. In conclusion, awareness of honey and its economic and medicinal importance was high; however, knowledge of other bee products, particularly propolis, royal jelly, bee pollen, and bee venom, remained limited. Increased public awareness and extension programs are therefore recommended to promote the utilization and benefits of these underutilized bee products for improved livelihoods, nutrition, and healthcare.

Keywords: Awareness, honeybee product, Honey, Propolis, Royal jelly, Bee pollen

INTRODUCTION

Honey bee, *Apis mellifera* Linnaeus, 1758 (Hymenoptera: Apidae), have attracted increasing attention across Africa because of its importance in pollination, biodiversity conservation, food security, and the production of valuable bee products. They are not only remarkable for their complex social organization and behavior but also for their significant contributions to agriculture, the environment, and the economy. Bees play a vital role in pollination, agriculture, and biodiversity. Klein *et al.* (2007) reported that honey bees, native bees, and flies pollinate 48 of the world's most valuable crops, contributing substantially to the global economy. In the USA, honey bee pollination alone contributes about USD 16 billion annually, with approximately USD 12 billion attributed to crop pollination (Calderone *et al.*, 2012; Rader *et al.*, 2016).

Bees are among the most important pollinators, contributing to the reproduction of approximately 75% of flowering plants, including many food crops essential for human survival (Sáez *et al.*, 2020). They also enhance agricultural productivity and food security (Khalifa *et al.*, 2021). Gallai *et al.* (2009) and Orges *et al.* (2020) estimated that animal pollinators contribute to about 35% of global food productions. Without bees, the production of many fruits and seeds would decline, threatening food availability and biodiversity. Bees also maintain ecosystem stability by

supporting plant reproduction and sustaining ecological interactions (Potts *et al.*, 2010) Besides, beekeeping markedly support the rural livelihoods in the tropics (Babarinde *et al.*, 2010, 2024). Honey bee products and services are classified into honey, propolis, royal jelly, bee bread, bee pollen, bee venom, and beeswax (Münstedt *et al.* 2022; El-Didamony *et al.*, 2024). Slum gum, a waste product from wax rendering, has been reported to have multipurpose functionality which include baiting of hives and use as animal feed ingredients (Babarinde *et al.*, 2011, 2015; Ojebiyi *et al.,* 2013). Honey bees have been utilized for thousands of years because of the nutritional, medicinal, and cosmetic benefits of these products (Kieliszek *et al.*, 2023). The products possess unique biological properties and diverse applications (Bogdanov, 2017). They are rich in bioactive compounds, vitamins, minerals, and antioxidants and are widely used in traditional and complementary medicine, public awareness of their benefits and utilization remains limited.

Honey is a natural sweet substance produced by honey bees and is widely recognized for its nutritional value and health benefits. Historically, it has been used by Egyptians, Greeks, Romans, and Chinese to treat wounds, gastric ulcers, coughs, sore throats, ear infections, and eye diseases (Rao, 2016). It is also consumed as a functional food that provides energy and nourishment (Ajibola, 2015; Sedik, 2022). Its major constituents, including glucose, fructose, flavonoids, polyphenols, and organic acids, contribute to its biological, physiological, and pharmacological activities (Alvarez-Suarez *et al.*, 2014).

Beeswax is a natural substance secreted by honey bees for comb construction. It is widely used in cosmetics, pharmaceuticals, candles, and the food industry because of its unique composition of lipids, hydrocarbons, and esters (Bogdanov *et al.*, 2008; Noang *et al.*, 2023). It possesses moisturizing, protective, antimicrobial, and anti-inflammatory properties, making it useful for wound healing and skin care (Eid *et al.*, 2026; Mekky *et al.*, 2025). Propolis, commonly known as "bee glue," is used by honey bees to seal cracks, maintain hive temperature, and protect the colony from pathogens and predators. It exhibits antiseptic, antioxidant, antibacterial, antifungal, anti-inflammatory, anti-ulcer, anticancer, and immunomodulatory properties, making it valuable for treating diverse diseases (Tlak, 2025).

Royal jelly is a creamy secretion produced by worker bees and serves as the exclusive diet of the queen bee. It contains royalactin, which induces the development of queen characteristics and contributes to the queen's longevity (Kamakura, 2011; Buttstedt, 2013). It is widely consumed as a nutritional supplement for managing several chronic health conditions (Pasupuleti *et al.*, 2017). Bee venom (apitoxin) is produced by honey bees as a defense mechanism. Although it causes pain and inflammation after a sting, its bioactive compounds, including peptides, enzymes, and amines, possess anti-inflammatory, analgesic, and antimicrobial properties (Son, 2007; Khalil *et al.*, 2021). Bee venom has shown therapeutic potential in treating inflammatory diseases such as arthritis and is increasingly used in skincare for its anti-aging and skin-rejuvenating effects (Ali *et al.*, 2016; El-Wahed *et al.*, 2021).

The knowledge generated from this study will promote informed decision-making, sustainable beekeeping, economic opportunities, improved nutrition and health, and the preservation of indigenous knowledge. Although, some arable farmers are aware of the modern practice of beekeeping, and some of them have adopted bee keeping as a complementary enterprise, not many of them are aware of the diverse products that are obtained from beekeeping besides honey. Therefore, this study aimed to assess the level of awareness and knowledge of the production, uses, and potential benefits of honey bee products among farmers who are familiar with beekeeping.

MATERIALS AND METHODS

Study Area

A survey was carried out in Ogbomoso Agricultural Zone which has five (5) Local Government Areas (LGAs): Ogbomoso North, Ogbomoso South, Orire, Surulere and Ogo-Oluwa areas of Oyo State, Nigeria. The area is a derived Savannah Agroecological Zone. The economic activities undertaken by the people including trading, public servants and agriculture. Farming is the dominant economic activity in rural area of Ogbomoso.



Figure 1. Map of Oyo State, showing Ogbomoso Area, Southwestern Nigeria

Sampling procedures and sample size

Multi-stage random sampling techniques was employed to select the respondents. The first stage involved purposeful selection of the five Local Government Areas in Ogbomoso Agricultural Zone. The second stage was the random selection of an average of twenty respondents per wards per LGAs where farming is dominant. Lastly, a total of one hundred and ten (110) respondents were selected from the 5 Local Governments Areas, bearing in mind those who either keep bees or are familiar with bee keeping. Data were collected from the respondents through a well-structured questionnaire administered through an interview schedule (Onifade *et al.*, 2022) which was used to identify professional with specific roles. The questionnaire was validated by a specialist in the Department of Agricultural Extension and Rural Development, Ladoke Akintola University of Technology, Ogbomoso, Nigeria. Pertinent information was elicited from the respondents based on the stated objectives of this research work.

Data analysis

Descriptive statistics were used including frequency, percentage and weighted mean score (WMS) to analyze the data. Respondents' perceptions were measured using a five-point Likert scale consisting of Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1). The weighted mean score (WMS) was calculated and subsequently used to rank the respondents' perceptions.

RESULTS

Socio-economic characteristics of the respondent

Most respondents (51.8%) are male, while 48.2% are female (Table 1). About 16% of the respondents are above 50 years of age. In comparison, 43.5% and 33.5% are between the ages of 11 and 50 and less than or equal to 40 years, respectively. The larger portion of the respondent are younger indicating that they are still active and in their economically productive years, which could influence their level of knowledge about their profession (Table 1). Furthermore, 79.7% of the respondents were married, 9.1% and 11.8% were single and unmarried, respectively. As their primary occupation, above 40% of the respondents were traders, followed by 41.8% civil servants and 11.8% were involved in farming. The dominance of the traders among the sampled respondents is due to the location of the study area, which is in the southwestern region of Nigeria. It was revealed that 67% and 43% of the respondents were Christians and Muslims, respectively.

More than 50.0% of the respondents obtained a tertiary school qualification; 21.8%, and 9.1% indicated a secondary school certificate and primary school of educational qualification, respectively, while 8.2% did not have formal education. Also, 42.7% of the respondents indicated that their primary occupation was trading and this accounted for the highest value, 41.8% of the respondents are civil servants, 11.8% of the respondents were into farming, while the least value 1.8% accounted for those who are artisan. Majority of the respondents (69.1%) of the respondents were not primarily into agriculture, 11.8% of the respondents were into crop production, 18.2% of the respondents were into livestock production, while 9% accounted for other enterprises. It was revealed that 77.3% had professional association membership while 22.7% accounted for those with no association membership.

Table 1: Distribution of respondents according to their socio-economic characteristics

Socio-economic Variables	Frequency	Percentage
Age		
≤40	37	33.5
41-50	48	43.5
51-60	18	16.2
61-70	5	4.5
71 and above	2	1.8
Sex		
Male	57	51.8
Female	53	48.2
Marital Status		
Single	13	11.8
Unmarried	10	9.1
Married	87	79.1
Religion		
Christianity	67	60.9
Muslim	43	39.1
Educational Status		
No Formal Education	9	8.2
Primary Education	21	19.1
Secondary Education	24	21.8
Tertiary Education	56	50.9
Primary Occupation		
Farming	13	11.8
Trading	47	42.7
Civil Service	46	41.8
Artisan	2	1.8
Agricultural Enterprise		
No Response	76	69.1
Crop Production	13	11.8
Livestock Production	20	18.2
Others	1	9
Years of Experiences in Primary Occupation		
≤3	12	10.8
4-7	17	15.4
8-11	22	20.0

12 and above	59	53.5
Association Membership		
No	85	77.3
Yes	25	22.7
Association Status		
No Response	86	78.2
Members	20	18.2
Executives	4	3.6

Source: Field Survey, 2024

Table 2: Distribution of respondents according to awareness of bee products and production method

Parameters	Frequency	Percentage
No	9	7.3
Yes	**102**	**92.7**
Bee Products Awareness		
Honey	**109**	**99.1**
Beeswax	72	65.5
Propolis	23	20.9
Pollen	26	23.0
Royal Jelly	35	31.8
Bee Venom	67	60.9
Pollination	64	58.2
Production Method		
No Response	7	6.4
Conventional Method	90	81.8
Scientific Method	7	6.4
Others	6	5.5
Conventional Method		
No Response	7	6.4
Fixed Hive	66	60.0
Movable	27	24.5
Both Fixed Hive & Movable	10	9.1
Scientific Method		
No Response	75	68.2
Thermo-solar Hive	8	7.3
Bee-smart Hive	13	11.8
Buzz-box Hive	14	12.7

Source: Field Survey, 2024

Distribution of the respondents on awareness of bee products and production

The majority (95.5%) of the respondents are aware of diverse bee products while 4.5 % of the respondents are unaware. This result indicates that the sampled respondents are familiar with bee products. Majority (99.1%) of the respondents are aware of honey, 65.5%, 60.9%, 58.2% indicated bee wax, bee venum and pollination, respectively. The level of the awareness of the apicultural products by others are royal jelly (31.8%), pollen (23.0%) and propolis (20.9%). Moreover, 81.8% of the respondents are aware of fixed hive conventional method and this accounted for the highest value, 6.4% of the respondents are aware of scientific methods of bee keeping, 6.4% had no response and 5.5% had the lowest value on scientific beekeeping. In addition, 60.0% of the respondents show awareness of conventional method, 24.5% are aware of moveable hive conventional method, 9.1% of the respondents are aware of both fixed and moveable hive, while 6.4 % has no response, which accounted for the lowest value. The distribution of respondent on awareness of scientific method shows that 68.2% of the respondents had no response, 12.7% of the respondents are aware of buzz-hive scientific method, 11.8% indicated bee-smart scientific method while 7.3% are aware of thermo-solar scientific method (Table 2).

Table 3: Distribution of respondents according to level of awareness of bee products and production method

Level of awareness	High	Moderate	Low	Not at All
Honey	92(83.6)	17(1)	0(0.0)_	1(0.9)
Beeswax	18(16.4)	43(39.1)	12(10.9)	37(33.6)
Propolis	6(5.5)	15(13.6)	7(6.4)	82(74.5)
Pollen	9(8.2)	8(7.3)	10(9.1)	83(75.5)
Royal Jelly	9(8.2)	15(13.6)	12(10.9)	74(67.3)
Bee Venom	19(17.3)	29(26.4)	19(17.3)	43(39.1)
Pollination	28(25.5)	27(24.5)	13(11.8)	42(38.2
Production Method				
Fixed Method	65(59.1)	19(17.3)	10(9.1)	16(14.5)
Movable Method	37(33.6)	38(34.5)	7(6.4)	28(25.5)
Thermo-solar Method	2(1.8)	17(15.7)	11(10.0)	80(72.7)
Bee-smart Method	5(4.5)	14(12.7)	11(10.0)	80(72.7)
Buzz-box Method	9(8.2)	13(11.8)	14(12.7)	74(67.3)

Source: Field Survey, 2024

Table 4: Significant differences between bee production methods across the seleted local government area

Method	Frequency	Significant differences
Fixed comb Method	1.542	0.116
Movable comb Method	1.914	0.038
Thermo-solar Method	1.626	0.091
Bee Smart Method	1.915	0.038
Buzz-box Method	0.972	0.484

Source: Field Survey, 2024

Significant figure between bee production methods across the selected local government area.

Results in all the local governments shows that there is no significant difference between the Movable Comb Method and Bee Smart Method, indicating significant differences in frequency across the selected local governments. The Fixed Method, Thermo-solar Method, and Buzz-box Method were not (0.116, 0.091, and 0.484, respectively), significantly different from one another. In summary, the analysis suggests that the frequency of the Movable Method and Bee Smart Method were not significantly varies across the selected local governments, while others were significantly different from one another (Table 4).

Table 5: Distribution of respondents on bee product usage

Bee production	Frequency	Percentage
Honey	107	97.3
Beeswax	41	37.3
Propolis	17	15.5
Pollen	18	16.4
Royal Jerry	32	29.1
Bee Venom	38	34.5
Pollination	33	30.0

Source: Field Survey, 2024 Multiple responses allowed

Multiple responses allowed

Distribution of respondents based on usage of different bee product consumption

The results show that 97.3% respondents make use of honey. The usage level of other apicultural products are beeswax (37.3%). Bee Venom (34.5%) Pollination (30.0%), Royal Jelly (29.1%), Pollen (16.4%), and Propolis (15.5%). These results illustrate the varying degrees of consumption for different bee products among the respondents. Understanding consumption patterns can provide insights into the preferences and utilization of bee products among consumers (Table 5).

Table 6: Distribution of respondents on economic and health awareness of bee products

Economic and health benefit awareness	Frequency	Percentage
Not Aware	1	9
Aware	109	99.1

Source: Field Survey, 2024

Distribution of respondents on economic and health awareness of bee product

Respondents (99.1%) were aware of the economic and health benefits of honey bee products. Only 1 respondent, which accounts for 9% of the total, is not aware of the economic and health benefits of bee products. These findings suggest a high level of awareness among the respondents regarding the economic and health benefits of bee products. It implies that the majority of the respondents recognize the value and potential advantages associated with bee-related products in both economic and health contexts (Table 6).

Table 7: Distribution of respondents on awareness of honey bee products as a source of income

Income source	Frequency	Percentage
Not Aware	2	1.8
Aware	108	98.2

Source: Field Survey, 2024

Table 8: Distribution of respondents on level of beneficial uses of bee products

Benefits of bee products	Always	Most Time	Occasionally	Never
Nutritional and medicinal purposes	105(95.5)	4(3.6)	1(0.9)	____
Royal jelly is a good source of vitamin B	49(44.5)	38(34.5)	15(13.6)	8(7.3)
Honey boosts immune system	65(59.1)	35(31.8)	9(8.2)	1(0.9)
Beeswax is used to produce candles	53(47.3)	34(30.9)	11(10.8)	13(11.8)
Royal Jelly supports heart health	32(29.1)	32(29.1)	25(22.7)	21(19.1)
Propolis is used in treatment of skin diseases	35(31.8)	28(25.5)	26(23.6)	21(19.1)
Bee serves as form of pollination for plants	62(56.4)	23(20.9)	13(11.8)	12(10.9)
Honey is used in healing wounds	82(74.5)	20(18.2)	6(5.5)	2(1.8)
Bee pollen improves digestion	38(34.5)	34(30.9)	21(19.1)	17(15.5)
Bee venom is used for allergy relief	49(44.5)	29(26.4)	22(20.0)	10(9.1)

Source: Field Survey, 2024

Distribution of respondents on income source

In the study area, it was revealed that sampled respondents (98.2%) were aware of the potential income accruable from honey bee products. These results indicate a high level of awareness among the respondents regarding their income sources. It suggests that the vast majority of respondents have knowledge of where their income is derived from, which is crucial for financial planning and decision-making (Table 7).

Distribution of respondents on awareness of the benefit of bee product

The majority of the respondents (95.5%) believe that bee products serve nutritional and medicinal purposes, with only a small percentage indicating otherwise. Royal Jelly as a source of Vitamin B was indicated by 44.5% of the respondents while a significant portion also believe this occurs most times (34.5%). A high proportion (59.1%) believes that honey boosts immune system with 31.8% believing this occurs most times. Nearly half of the respondents (47.3%) believe that beeswax is used to produce candles, with a similar percentage believing beeswax is used most times for candle production. Also, about 29.1% of respondents believe that royal jelly supports heart health, with the same percentage believing this occurs most times. Medically the respondents showed that propolis treats skin diseases (31.8%), with 25.5% believing this occurs most times. The involvement of bees in the pollination of plants have (56.4%) of respondents with 20.9% believing this occurs most times. In addition, the majority of respondents (74.5%) believe that honey is used in healing wounds, with 18.2% believing this occurs most times. Moreover, 34.5% of respondents believe that bee pollen improves digestion, with 30.9% believing this occurs most times. The use of bee venom for allergy relief is known by 44.5% of the respondents, with 26.4% believing this occurs most times (Table 8).

Table 9: Distribution of respondents on perception on usage of bee and its products

Perception on usage of bee	SA	A	U	D	SD
(a) Bee products combined both nutritional and health benefits	101(91.8)	9(8.2)	0(0.0)	0(0.0)	0(0.0)
(b) Bee products usage does not have any side-effect compared to product from other sources	26(23.6)	64(58.2)	10(9.1)	8(7.3)	2(1.5)
(c) Bee products that are locally sourced should be preferred to imported products	25(22.7)	52(47.3)	23(20.9)	4(3.6)	6(5.5)
(d) Bee products should be given preference in the treatment of any form of ailment compared to alternative medicine	33(30.0)	44(40.0)	25(22.7)	3(2.7)	5(4.5)
(e) Some individuals have allergy to some bee products	38(34.5)	53(48.2)	11(10.0)	6(5.5)	2(1.8)
(f) Usage of bee products (especially honey) does not have dosage	30(27.3)	24(21.8)	18(16.4)	34(30.9)	4(3.6)

Source: Field Survey, 2024

SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly disagree

Table 9 reveals the respondents' perceptions on the usage of apicultural products. Majority (91.8%) of the respondent strongly agree that bee products combined both nutritional and health benefits. About 52.8% believed that bee products usage does not have any side-effect compared to product from other sources, this is because the products are natural and not synthetic. A high proportion of the respondents (47.3%) also agree that bee products that are locally sourced should be preferred to imported products, while 22.7% strongly agree to this opinion. Also, 40% of the respondents agree that bee products should be given preference in the treatment of any form of ailment compared to the use of western medicine. In addition, 34.5% strongly agree and 48.2% agree that some individuals have allergy to some bee products., this implies that not all respondents can use bee products as natural it may be. The respondents in the study area (27.3%) strongly agree and 21.8% agree that medicinal usage of bee products (especially honey) does not have dosage (Table 9).

DISCUSION

The study revealed that males dominated the sampled population, where bee products are produced and processed. This corroborates Jeil *et al*. (2020), who reported that males usually dominate beekeeping as found in their study in Ghana. The respondents sampled, who were mainly traders and civil servants, also showed that both males and females are aware of diverse bee products, which is in line with Abro *et al.* (2022). The sampled respondents were mature, young, and still in their productive years. This has been reported by Prodanović *et al.* (2024), who stated that young people use bee products as an alternative source of livelihood to reduce migration and unemployment. Also, most of the respondents were married, which influenced their awareness of honey bee products, as they have people to care for in their respective households.

Almost all the respondents were literate, which was against the findings of Dingtoumda *et al.* (2024) in Burkina Faso where half of the respondents were not literate. Although the majority has higher educational status, this result implies that most of the respondents had a good educational background, which is expected to influence their awareness of bee products and their use in health, biodiversity, and food security. Their occupations varied, which could generate different levels of awareness about bee products. Moreover, the years of experience recorded among the sampled respondents were above 12 years. This result indicates that the sampled respondents were likely to have adequate awareness of bee products.

The findings from the respondents showed a high overall awareness (92.7%) of bee products, with honey being the most recognized (99.1%), while awareness of propolis, bee pollen, and royal jelly was low. This corroborates the findings of Šedík *et al*. (2022), who reported that Slovak consumers mainly consumed honey. Honey was also used for cosmetic and medicinal purposes, whereas other bee products, such as propolis, royal jelly, bee pollen, and bee bread were consumed only occasionally or not at all (Kowalczuk *et al.*, 2023).

In this study, the respondents practiced or are aware of conventional beekeeping, with the fixed hive being the dominant production method, whereas awareness and adoption of improved beekeeping methods were limited. These results suggest that traditional apiculture predominates, highlighting the need to promote awareness and adoption of improved beekeeping technologies for enhanced productivity. This finding is in line with Prodanović *et al*. (2024), who reported that traditional beekeeping fosters a sense of pride and belonging among indigenous communities on traditional knowledge and practices. On the other hand, modern methods such as thermo-solar and bee-smart were poorly known. These results suggest limited dissemination of information about modern beekeeping practices underscoring the need for targeted extension and awareness programmes.

The results of the sampled respondents showed

that the movable comb and bee smart methods differed significantly, suggesting variations in accessibility, technical knowledge, or resource availability among beekeepers. In contrast, the fixed comb, thermo-solar, and Buzz-box methods did not differ significantly, indicating similar levels of adoption across the study area. This corroborates the findings of Vishnu *et al*. (2025), who reported a transition from traditional to modern beekeeping technologies.

The exceptionally high awareness (99.1%) of the economic and health benefits of bee products suggests strong public knowledge and acceptance due to their proven nutritional, antioxidant, antimicrobial, and therapeutic properties. This finding agrees with Tlak *et al.* (2025) and Ogwu and Izah (2025), who reported the health benefits of honey and other bee products. Such awareness may promote increased utilization and market demand for bees products because of their nutritional, medicinal, and economic value. The findings also indicate a generally positive perception of bee products among the respondents, with most agreeing that they possess both nutritional and health benefits, highlighting widespread awareness of their functional and therapeutic properties (Stefanis *et al*., 2023).

Most respondents (81.8%) perceived bee products as safer than products from other sources, although 82.7% acknowledged that allergic reactions may occur in susceptible individuals. This corroborates the findings of Matuszewska-Mach *et al*. (2025), who reported that bee products are generally safe but may trigger hypersensitivity in sensitive consumers. Furthermore, 70.0% preferred locally sourced bee products over imported products, reflecting confidence in their freshness, authenticity, quality, and therapeutic value. However, respondents were uncertain about dosage, with 49.1% believing that bee products, particularly honey, do not require dosage, while 34.5% disagreed. This misconception highlights the need for public education, as the therapeutic use of bee products should be guided by scientific evidence and recommended dosages where applicable (Alvarez-Suarez *et al*., 2014).

CONCLUSIONS

The findings revealed a high level of awareness of various bee products among the respondents, with honey being the most recognized and widely known product compared to beeswax, propolis, royal jelly, and other bee products. The predominance of fixed hives in the study area suggests that traditional beekeeping practices remain the most common production system, likely due to their affordability and ease of management. Furthermore, respondents demonstrated good knowledge of the health benefits of honey, recognizing its nutritional, medicinal, and therapeutic value. This highlights the need for targeted awareness campaigns and extension services to educate beekeepers and the public on the economic, nutritional, medicinal, and industrial importance of these underutilized bee products. Increasing awareness and promoting improved beekeeping practices could enhance product diversification, income generation, and the overall development of the apiculture sector. Arable farmers who are familiar with beekeeping but are yet to practically engage in it can also be encouraged by their beekeeper counterparts, since they live in the same environment. This would likely increase the livelihood of such farmers via income realizable from beekeeping.

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