



Entomophagy as a Potential Tourism Product: The Case of the Mopani District, Limpopo Province, South Africa

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ABSTRACT: Entomophagy and entomophagy tourism are emerging trends worldwide. While new to some areas, entomophagy has long existed, benefiting farmers, local communities, and tourists. Entomophagy tourism involves visiting regions to explore insect-based foods through tasting or participating in insect harvesting and preparation. It can boost farmer income, create jobs, utilise farm resources, and preserve natural and cultural heritage when sustainably managed. This study explored the potential of entomophagy tourism in Mopani District, Limpopo Province, South Africa, examining insect consumption's cultural, ecological, and economic aspects. Quantitative research was conducted, and 360 questionnaires were received, after which exploratory statistics and factorial analysis were conducted. The contributions of this work are threefold: First, it breaks new ground in research on entomophagy tourism in South Africa, identifies a significant market interest in edible insect consumption among tourists, and enriches the academic dialogue on entomophagy by providing empirical evidence from the South African context. The goal was to offer insights and recommendations for sustainable entomophagy tourism development in Mopani District, promoting cultural preservation and economic growth.

Keywords: Entomophagy; Tourism; Exploratory Factorial Analysis.

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INTRODUCTION

In the contemporary world, traditional practices and cultural knowledge often risk being overlooked or dismissed as outdated, particularly by the younger generation (FAO, 2011; Eaude, 2019; Obioma, Mohammadzadeh, & Alabi, 2022). However, the fusion of traditional wisdom with modern scientific understanding has proven beneficial across various fields (FAO, 2011). This synergy is evident in the practice of humans' consumption of insects, also known as entomophagy, which holds significant cultural and tourism importance in societies where it is customary (Shine, 2020).

Entomophagy, a practice with a history dating back over a millennium and documented globally (Bequaert, 1922; Capinera, Scott, & Walker, 2004; Paoletti & Dufour, 2005; Chung, 2010; Ramos-Elorduy, 2009), has taken on a new dimension as a form of tourism. Today, individuals participate in insect-based culinary experiences and activities, such as insect harvesting (Yen et al., 2013), as part of their recreational pursuits. This global trend is reflected in countries such as Japan, China, New Zealand, France, Belgium, Laos, Mexico, and the United States, where insect-based foods are becoming popular, and insect-related products are exported (Nonaka, 2010; Johnson, 2010; Boulidam, 2010; Gracer, 2010; Shockley, et. al., 2018).

Notably, in Northern Thailand's Phitsanulok province, edible insects have become a significant tourist attraction, with the "Ruammaland Edible Insect" cart being a well-known stop for tourists. This emerging

industry is also seen as an economic empowerment sector in Thailand (Yhoungraree, 2010). In contrast, Japan has imported wasp foods from Korea, China, and New Zealand, while France and Belgium have imported dried caterpillars in substantial quantities from the Democratic Republic of Congo (Johnson, 2010). Insect businesses globally are capitalising on the export potential of their products, as exemplified by the Torti Mundo Company in Mexico and the Atlanta Bread Company International, Inc. in the United States (Shockley, et. al., 2018).

Western countries are gradually embracing entomophagy through insect clubs and innovative insect-based products, offering economic opportunities and new sources of income (Cerdeira et al., 2001). In Africa, the consumption of edible insects is becoming a critical aspect of recreation and a source of tourism income. However, more research is needed in this area, especially concerning the potential economic and environmental benefits of entomophagy tourism (Kirkby et al., 2010).

In South Africa's northern part, particularly in the Limpopo Province, eating insects is a prominent aspect of local culture and heritage. Insects such as mopani worms and stink bugs are sold along the roads by people living in rural areas. Although some local people in the area or visitors to the region often purchase these edible insects, either raw or cooked (Hlongwane, Slotow & Munyai, 2020; Mkhize, 2023), entomophagy as a tourism product in South Africa needs to be more valued and developed in comparison to the rest of the world as it holds an enormous tourism potential



(Vantomme et al., 2004; Hlongwane et al., 2020). Despite the importance and benefits of entomophagy, relatively little work has been undertaken to market the commercial and sustainable management potential of edible insects in Africa and, in this case, South Africa's Limpopo province or to include entomophagy in South Africa's nature-based, heritage or cultural tourism products. Internationally, there are already tours in some regions that incorporate edible insects into trips, for example, in the headwaters of the Amazon in Ecuador, Manaus (Brazil), Borneo, and Tado in West Flores (Indonesia), Phitsanulok in Thailand (Yen, Hanboonsong & van Huis, 2013, p. 173). One of the popular places tourist groups visit is the Ruammal edible insects' cart in Phitsanulok province in northern Thailand. Given the existing research gap and the need to explore the potential of entomophagy and tourism products in Africa, this research aims to investigate and evaluate the potential of entomophagy as a tourism product in South Africa, particularly Limpopo province.

The article is structured as follows: The introduction outlines the study's justification and objectives, followed by a brief background. It then discusses the study area and provides a theoretical background on entomophagy in South Africa and globally, including its history and benefits, such as sustainable agriculture, poverty reduction, and improved sanitation. The role of entomophagy tourism in enhancing perceptions of insects as food is also explored, with a focus on mopane worms in South Africa. The methodology is presented next, followed by the research findings. The

article concludes with insights and recommendations for future research or initiatives to promote entomophagy acceptance in South Africa and beyond.

STUDY AREA

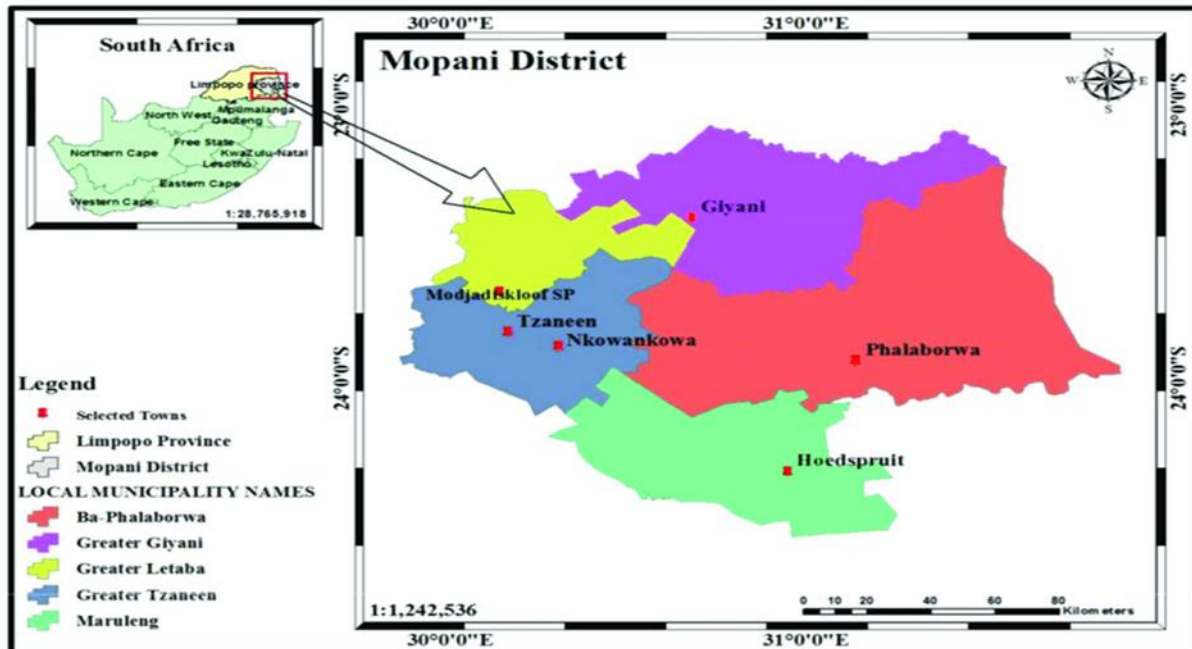
The study was conducted in 2021 in the Mopani district in the northeastern part of South Africa's Limpopo Province, known to be the second poorest province in the country (MDM, 2018). The name "Mopani" in the district's title stems from the plentiful Mopani worms that are highly nutritious and have many health benefits (Mopani District Municipality, 2016). This province is already a tourism hotspot, with the northern part of Kruger National Park, one of the world's most renowned national parks, located in the province. According to the Limpopo Tourism Agency (2017), 1.5 million people visited the Limpopo area in 2015/2016, of whom almost 50,000 (47 569) visited the Mopani District (Limpopo Tourism Agency, 2017; Mkhize, 2023).

LITERATURE BACKGROUND

Defining entomophagy

The practice of entomophagy, or the consumption of insects, is deeply rooted in the traditions of various cultures, spanning thousands of years, as documented in numerous studies (Bequaert, 1922; Capinera et al., 2004; Paoletti & Dreon, 2005; Ramos-Elorduy, 2009; Chung, 2010). The term "entomophagy" itself is derived from two Greek words, "entomon" and "phagem," meaning "insect" and "to eat" respectively (DeFoliart, 1999). This term encapsulates the

Figure 1 – Map showing the location of Mopani District Municipality, Limpopo Province, in the northeast of South Africa.



practice of insect-eating by both human and non-human species.

History of entomophagy

Historical records suggest that entomophagy dates back to ancient times. Herodotus of Halicarnassus, for instance, recorded the Asmoneans hunting wingless locusts, drying them in the sun, and incorporating them into a milk-based drink (Evans et al., 2015: p.294). Latin-American food culture, notably in the Aztec empire, has a rich history of insect consumption. Bernardino de Sahugan's work in 1557 illustrates the cultural significance of insect-eating; for example, water bug eggs were considered to be delicacies during ritual ceremonies in the court of ancient Aztec kings (Diaz & Rodríguez, 1977; Earle, 2010). Despite the high population density in central Mexico, the Aztec Empire were able to sustain itself without relying on large, domesticated animals, emphasizing the

importance of insects as a source of protein (Parsons, 2010; Melgar-Lalanne, 2019).

In prehistoric times, before the development of agriculture and advanced hunting tools, insects were a significant source of food for humans (Kohl, 2016). This is supported by the discovery of human coprolites in caves in the United States of America and Mexico that contained trace evidence of insect consumption during excavations in Arkansas and Missouri (Mitsuhashi, 2004). Additionally, cave paintings in Northern Spain dating from 30,000 to 9,000 BC depict images of insects, including wild bee nests, suggesting that entomophagy may have been practised in the region during that time (Capinera, 2004; Kohl, 2016). In the Shanxi Province in China, excavations uncovered wild silkworm cocoons dating



back to 2000-2500 BC, with a strong indication that people consumed the pupae of the silkworms (Capinera, 2004). Ramos-Elorduy (1998) contends that such archaeological evidence and records confirm the significance of insects in the diet of our ancestors.

Throughout human history, insects have been used for their nutritional value, medicinal purposes, and religious practices. For instance, the Mayans referred to certain locusts as "the divine flowers of God," the Huicholes believed that certain wasps carried the souls of the dead to heaven, and the Teotihuacans considered a butterfly to be the soul itself. These examples suggest that religious beliefs have historically influenced the dietary habits of cultures and heritage. van Huis et al. (2013:40) also note references to the consumption of insects in religious texts of Christianity, Judaism, and Islam.

Western accounts include Aristotle's description in the 4th century BCE of cicadas (the nymphs in particular) as a delicacy in Ancient Greece (History of Animals V: 30), a sentiment echoed by Athenaeus of Alexandria in the early 3rd century CE (Deipnosophist IV: 133b), as well as Pliny the Elder's account in the 1st century CE of Romans fattening 'cossus' larvae on flour and wine (Bodenheimer, 1951: p. 42-3; Bergier, 1941: pp. 19-23; Roos, 2012). According to Bodenheimer (1951), cossus was a meal prepared from a *Cerambyx cerdo* beetle and only the larvae were eaten. In a document written by Diodorus in 200 BC, the Ethiopians were referred to as the "Acridophagi" back in the day; the name stemmed from their diet consisting of the

Acrididae family (grasshoppers and locusts). According to Chinese literature, insects were eaten and used in their traditional medicine. This was documented and supported in the Compendium of Materia Medica (Li Shizhen, Ming Dynasty 1368–1644), which contained several insect-based recipes and their medicinal attributes.

The decline of entomophagy culture and heritage is believed to be associated with the development of agriculture and livestock (van Huis et al., 2013; Deroy, Reade & Spence, 2015). The historical region containing western territories of Asia, the Nile Valley, and the Nile Delta, commonly known as the Fertile Crescent, is considered the birthplace of agriculture and livestock. As agriculture started to spread to Europe, it replaced hunting and gathering food sources (van Huis et al., 2013). Although this section proves that eating insects has been part of the human race since thousands of years ago, as a tourism product, it still lacks development and marketing (Mkhize, 2023: p. 24). The following section delves deeper into entomophagy as a tourism product as well as the benefits of combining tourism with entomophagy and finding avenues by which entomophagy can be promoted to attract tourists.

Entomophagy as a tourism product in South Africa

In recent years, there has been a notable shift in global perceptions towards consuming edible insects, marking a departure from conventional dietary practices. This paradigmatic change is not only witnessed in local cuisines but has also emerged as a captivating trend in tourism.



Edible insects, once overlooked, have now taken centre stage as a major draw at various tourist destinations worldwide (the headwaters of the Amazon, Ariau in Manaus, Borneo, and Tado in West Flores).

According to Dobermann et al. (2017), negative stereotypes about insects are still a significant obstacle to the growth of the global market for insect-based food products and the wider adoption of entomophagy by consumers and as tourism products. This is particularly evident in Africa, where Western tastes and preferences dominate the dining habits of many patrons, even in traditional restaurants and nature-based attractions in South Africa. Nonetheless, efforts are underway in some parts of the world to shift Western tastes and promote entomophagy as a viable alternative. Hwang et al. (2020) suggest that such efforts could potentially help to improve perceptions of insect-based food and attract more food tourists, making it an important area for further exploration and development.

While the negative perception of edible insects has hindered its potential as a tourist attraction in Europe, efforts to increase exposure and improve the taste and appearance of insect-based food products have yielded some success in other Western countries, as noted by van Huis et al. (2013) and Looy et al. (2014).

According to Muller (2019) and Köhler et al. (2019), three primary groups of insect eaters exist in Thailand and Laos. The first group comprises indigenous consumers who traditionally incorporate insects into their diets. The second group includes urban consumers who may have learned about

and developed a taste for insect foods, possibly through exposure to indigenous consumers or other sources. The third group are foreign tourists, who are attracted to the exotic and ethnic nature of insect-based dishes and seek them out as a part of their cultural experience.

Edible insects have the potential to boost the tourism industry by enhancing their preparation, processing, and presentation to cater to the preferences and tastes of customers (Sun-Waterhouse et al., 2016). Marketers should highlight the practical benefits of increasing the demand for edible insects. Organizing tasting events or educational workshops can help raise awareness about edible insects and attract potential customers. To promote their consumption in the food service industry, it is crucial to create high-end cuisine incorporating edible insects into popular dishes. This can help overcome the resistance to eating insects in cultures where it is not common. Developing appealing business models and sustainable value chains for edible insect food can contribute to the growth of the food tourism sector (Ayieko et al., 2021).

Entomophagy has been identified as a potential tourism product in gastronomy and, further, can be a major source of income for many impoverished villagers in African countries (Meyer-Rochow, Kenichi & Somkhith, 2008; Vane-Wright, 1991). Since the products possess the potential for a longer shelf life, depending on the formulations and processing techniques, this may enable them to be available in supermarkets for a wider type of clientele. Before COVID-19, South Africa welcomed



Table 1 – Previous research conducted on the benefits of edible insects.

Where	What	Source
South Africa	Edible insects contribute over US\$ 85 million per year. Employs over 30,000 per season.	Styles (1994) Ghazoul (2006)
Botswana	Income from selling Imbrasia Belina in Botswana was estimated to represent 13% of the total household annual income.	Zitzmann (1999)
Globally	The edible insect market is expected to exceed USD 522 million by 2023.	Han <i>et al.</i> (2017)
Zimbabwe, Zambia, and Nigeria	Edible insects are commonly available in school cafeterias and open markets, forming a profitable business.	Mutungu <i>et al.</i> (2019).
US, Belgium, France, UK, Netherlands, China, Thailand, Vietnam, Brazil, and Mexico	Totalled USD 33 million (flour, bars, snacks, and animal feed markets combined) in 2015 and it is expected to exceed USD 522 million by 2023.	(Global Market Insights Inc 2016).
Republic of Korea	The edible insect market, encompassing food, medicinal, and animal feed segments, is valued at USD 143 million. This number is expected to double, resulting in a USD 259 million market.	Kim <i>et al.</i> (2015).
South Korea	The amount spent by both local and international tourists on edible insects in 2020 was estimated to be over USD 457 million.	Kim <i>et al.</i> (2015).
Malaysia	A study indicated that 52.2% of the interviewed tourists are interested in travelling to a location that serves edible insects.	Teng <i>et al.</i> (2022)
Japan	Edible insect festivals held annually attract more than 10,000 domestic and international tourists.	Nonaka (2019)

over fifteen million tourists from around the world (Stats SA, 2022). Excluding neighbouring countries such as Zimbabwe, Mozambique, and Lesotho, the top five foreign nations with the most tourists visiting South Africa were the USA, the UK, the Netherlands, Germany, and France (Stats SA, 2022). If negative feelings towards edible insect food products, especially those regional dishes with edible insects, could be overcome, foreign tourists may increase and exert a greater impact on local communities such as the community in the Mopani district of the Limpopo provinces. Popular restaurants in South Africa, including those on the culturally rich Vilakazi

Street like Sakhumzi Restaurant, as well as notable destinations such as Lesedi Cultural Village and Chef Pozi, are renowned for their emphasis on African-inspired culinary experiences (Cheifitz, 2009). Despite their focus on cultural foods and heritage, few of these establishments feature edible insects on their menus, highlighting a traditional yet selective approach to their culinary offerings. This observation underscores the intriguing blend of traditional and modern influences on South African cuisine, where even venues celebrated for their cultural authenticity opt not to incorporate insects, a dietary staple in various parts of the world, into their menus.



To better cater and market to tourists, African eateries, lodges, and other tourism products may consider incorporating locally available edible insects into their traditional dishes, thereby expanding their market reach within the hospitality sector. Furthermore, as consumer awareness of edible insects grows, so does their willingness to pay for insect-based food products, according to Piha et al. (2018). Therefore, the potential for the insect-based food industry to thrive and become a more mainstream option must be addressed. Table 1 highlights some of the studies conducted worldwide that highlight the potential and economic benefits of edible insects.

Even though entomophagy hosts enormous economic potential (Table 1), it will take time to change cultural attitudes about the consumption of insects as food (DeFoliart, 1999, Batat & Peter, 2020), especially in Western societies, which have witnessed a slow spread of entomophagy despite the many advantages and benefits of insects as protein (Sogari, 2015; van Huis, 2016).

METHOD OF RESEARCH

This study adopted a quantitative research approach. The reason for adopting a qualitative approach was because this method enables the objective measurement of variables, including the number of tourists interested in entomophagy, their demographics, and attitudes towards edible insects. This approach facilitates the employment of statistical techniques to analyze data, identify trends, and establish correlations, such as determining the

relationship between tourist demographics and their acceptance of entomophagy. The results can be compared with existing data from other regions or studies, providing a benchmark for assessing the potential of entomophagy as a tourism product in the Mopani District. However, the limitations that come with this methodology, such as not capturing the nuanced reasons behind tourists' attitudes towards entomophagy and missing the rich, detailed insights that qualitative methods can provide, cannot be ignored.

The sampling technique followed in this research was non-probability sampling using convenience sampling (Figure 2). The quantitative data for this study was obtained through a questionnaire. The sample population for the study consisted of tourists staying at one of the African Ivory route camps, the Fundudzi camp. The reason for selecting this camp was that it was one of the only places in the area with tourists visiting them during COVID-19. Lake Fundudzi camp was further chosen due to its cultural significance to the Venda people and is surrounded by beautiful landscapes, including the Soutpansberg mountains and the Thathe Vondo forest, making it a place of interest for tourists seeking natural beauty and cultural experiences, which was thought to be a suitable place to research entomophagy.

The questionnaire used for this study was designed based on previous studies conducted by Yen et al. (2013) on the role of edible insects in human recreation and tourism and by Iakovoglou & Zaimis (2018) on enhancing rural areas while safeguarding ecosystems through the sustainable practice



of ecosystem-based approaches (EBA), with an emphasis on ecotourism. Wearing & Neil (2009) focused on ecotourism concerning impacts, potentials, and possibilities; and Van Huis (2003) considered insects as food in Sub-Saharan Africa. The questionnaires were then altered to meet the objectives of this study.

The questionnaire was divided into two sections. The first section (SECTION A) focused on the socio-demographic profile of the respondents, whereas the second section (SECTION B) focused on entomophagy tourism. The questions asked were based on the perceptions and knowledge of visitors regarding entomophagy. Respondents were asked to rate 15 statements on entomophagy (see Table 3).

The process of questionnaire administration was completed between November 2021 and May 2022. For easy accessibility and identification of tourists in the area, the questionnaires were given to tourists at the accommodation facilities where they were staying. Verbal permission was obtained from each respondent (tourist). A total of 360 usable questionnaires were obtained.

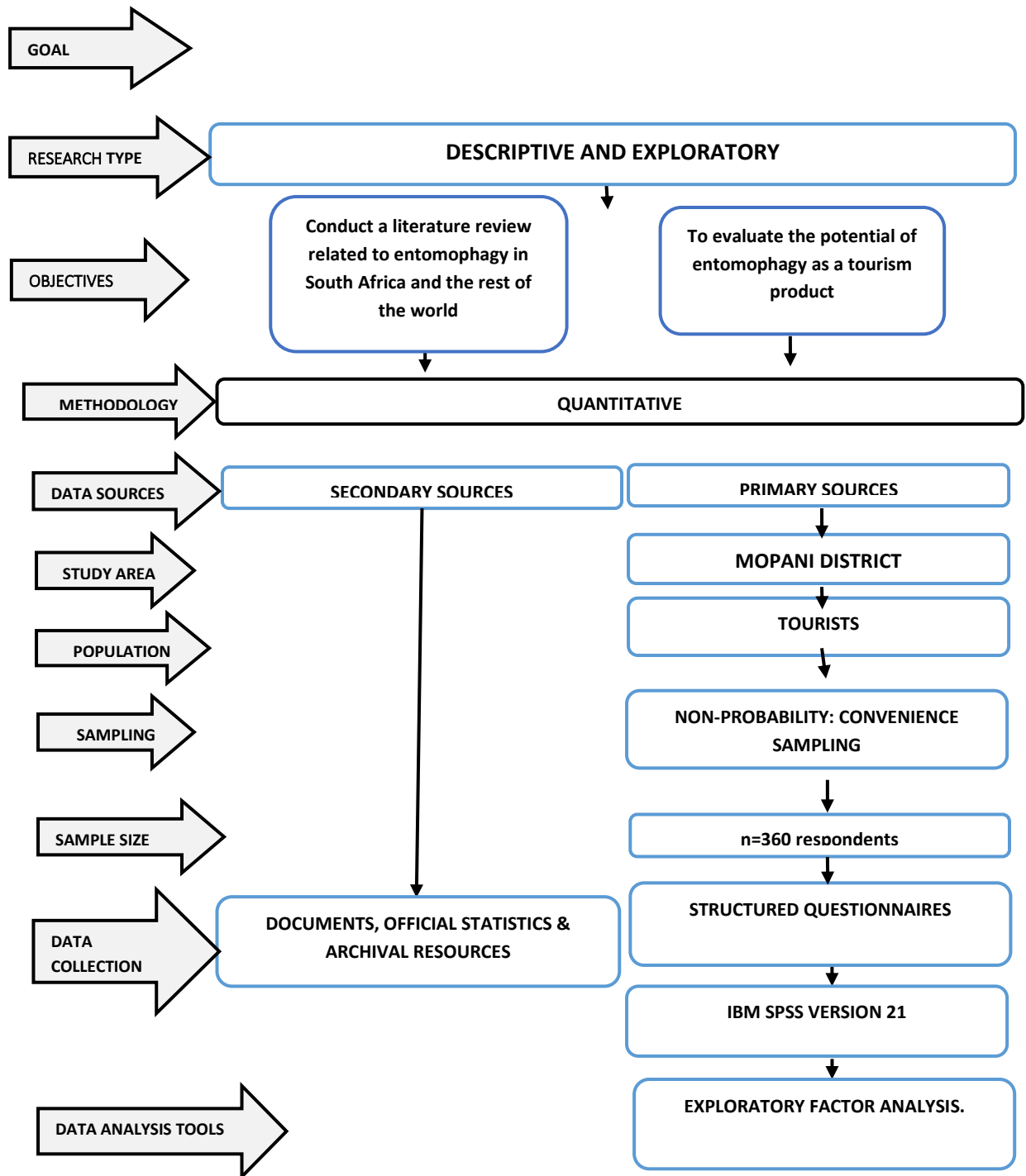
Data analysis occurred in two stages. The first stage involved descriptive analysis of the demographic profiles of the respondents using frequency analysis and percentages, presented in tables, graphs, and charts. The second stage involved factor analysis using the IBM SPSS version 21 software program, which included exploratory factor analysis, principal component analysis, and a pattern matrix.

For this study, the extraction method used was a Principal Component Analysis with

Orthogonal Rotation using Varimax. This approach was chosen because it focuses on identifying components with high eigenvalues and then arranges them in order of significance. Essentially, this method prioritises the most important components, which renders it a useful tool for analysing complex data. To confirm the validity of the construct in the questionnaire for entomophagy, the principal component exploratory factor analysis resulted in two factors that explain 75.52% of the variables from which the test was calculated. The levels of agreement with the importance of the identified potential entomophagy statement were accessed using a 5-point Likert scale.

The study analysed the mean value of each factor, Cronbach's Alpha, and inter-item correlation. The mean value represents the average integral of a continuous function over a specified range. Cronbach's Alpha helps to assess the consistency of items within a scale, indicating whether items measure related aspects effectively without redundancy. Inter-item correlation explores how scores on one item relate to scores on all other items in a scale, reflecting the extent of their mutual relationship. This comprehensive approach was guided by methodologies outlined in works by Piedmont (2014) and Tavakol & Dennick (2014).

Besides identifying the factors, the individual implications of the variables were further discussed. The study received ethical clearance from the North-West University in South Africa.



RESULTS

The results of this study are divided into three sections: the first considered the demographic profile of the respondents, the second looked at the visitor perceptions of entomophagy, and the third concluded with a factor analysis regarding entomophagy

tourism.

Demographic profile

The results indicated that 49% of the respondents were female. The average age of the respondents was 46 years.



Concerning the level of education of the participants, 31% of respondents held a postgraduate degree, Seventy-seven per cent of the tourists who participated in the study were repeat visitors. Table 2 gives a detailed report of the responses obtained from the respondents.

Table 2 – Demographic profile of respondents to the Mopani district

Category	Profile	
Gender	Male	48%
	Female	49%
	Other (LGBTQI+)	3%
Average Age	46	
Education	No schooling	8%
	High school/matric	13%
	Certificate	18%
	Diploma	30%
	Postgraduate degree	31%
Dietary requirements	Yes	32%
	No	68%
Type of neighbourhood	Rural	7%
	Suburban	23%
	Urban	70%
Place of permanent residence	Polokwane	20%
	Other locations in Limpopo	23%
	Another province	29%
	Another country	28%
First-time visit	Yes	23%
	No	77%

The largest percentage was from the Limpopo province, with a total of 43%. Respondents from outside South Africa comprised 28% of the sample, with countries such as China, India, Japan, the United Kingdom, and Zimbabwe making up the most inbound tourists (See Figure 2). However, it is important to note that these

figures have since changed, as the data was collected during the COVID-19 pandemic.

Dietary requirements were also asked in this study and the results indicated that 68% of the respondents indicated that they did not have any dietary requirements. The results showed that of the participants with dietary requirements, the highest were 9.7% who required Halaal, followed by 9.2% who did not want pork. The lowest of those with dietary requirements were those who were allergic to nuts and peanuts, constituting 0.3% of the respondents with dietary requirements. It was deemed necessary to ask about such as the study was looking at edible insects. The researcher wanted to investigate whether religion and diet requirements affect food choices. According to the results, almost half (48.1%) of the respondents were Christian. Furthermore, 13.3% of the respondents were Muslims, and 13.1%, were Jewish. It was important for religious affiliation to be tested as some religions, such as Hanafi scholars (part of the Islamic faith), forbid eating bugs. In contrast, others, like Maliki scholars, accept them. On the other hand, the Shafi'i and Hanbali academics forbid the consumption of some insects but not others (Rahim, 2018; Tajudeen, 2020).

Respondents' perceptions of insects as food

One must understand tourists' perception of insects as food to determine the potential of entomophagy tourism. This question was asked to determine how tourists relate to edible insects.

Regarding perceptions of entomophagy (Table 3), most of the respondents indicated

Figure 2 – Place of permanent residency by country

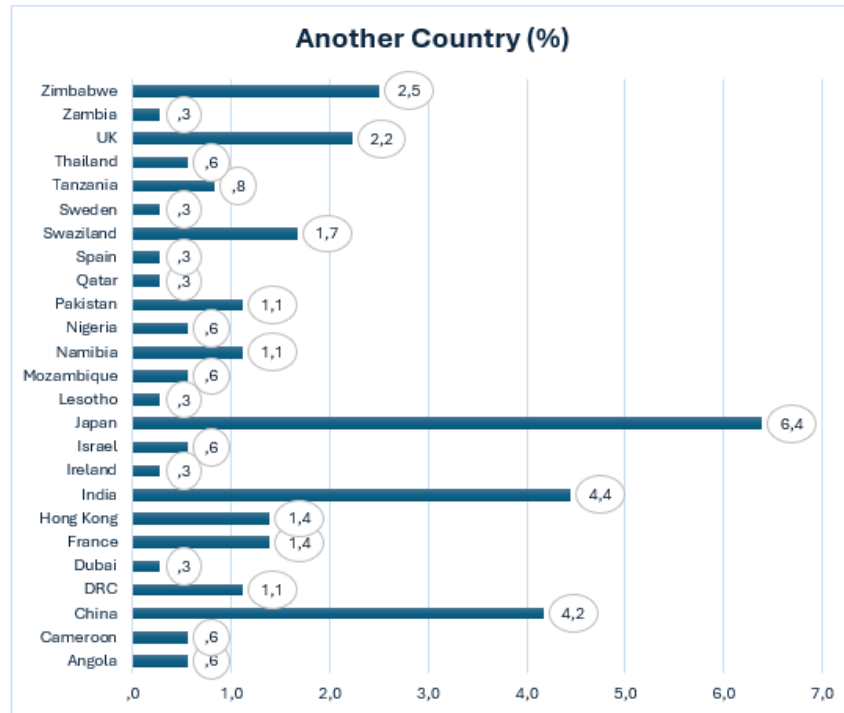


Table 3 – Entomophagy perceptions

Entomophagy statements	Strongly disagree	Disagree	Moderately agree	Agree	Strongly agree	Mean	Standard deviation
I am interested in sampling local traditional foods.	0.6	4.7	4.2	37.2	53.2	4.38	0.82
I do not trust new food.	15.5	49.3	8.5	24.5	2.3	2.49	1.09
I like to experience foods from different places.	0.3	19.2	14.5	50.4	15.6	3.62	0.98
At dinner parties, I will try new food.	0.6	15.1	17	46.9	20.4	3.72	0.97
I am afraid to eat things I have never had before.	11.8	40.4	20.2	23.3	4.2	2.68	1.08
I am very particular about the food I will eat.	9.8	38.8	19.6	20.7	11.2	2.85	1.19
I will eat almost anything.	7.0	25.2	23.8	33.3	10.6	3.15	1.13
Insects are highly nutritious.	4.0	18.2	36.6	25.3	15.9	3.31	1.07
We should support programmes designed to expose people to the eating of insects.	1.7	7.5	25.1	46.5	19.2	3.47	0.91
Humans should not eat insects except under conditions of starvation.	30.4	37.5	14.8	11.4	6	2.25	1.18
The eating of insects is disgusting.	17.4	26.4	18.8	30.9	6.5	2.83	1.23
Eating insects is good for the environment.	0.8	13.4	42.9	33.1	9.8	3.38	0.87
It is difficult to grow insects.	1.1	3.3	16.7	24.5	54.3	4.28	0.93
Insects carry harmful bacteria.	6.5	38.9	25.6	24.7	4.3	2.81	1.02
If recognised health organisations endorsed eating insects, I would trust them.	3.70	8.4	27.9	35.9	24.5	3.70	1.04



that they loved trying out food from other places and that programmes designed to expose people to edible insects should be supported. Overall, the respondents in the area responded positively to entomophagy, as most of the statements relating to supporting edible insects had a rating of slightly agree to strongly agree. This shows the possibility of establishing the eating of insects as a tourism product.

Of the respondents, 50.4% agreed that they liked to experience foods from different places. They considered the following five constructs (together with mean values) to be statements they strongly agreed with.

- I like to experience foods from different places. (3.62)
- If recognised health organisations endorsed the eating of insects, I would trust them. (3.70)
- At dinner parties, I will try new food. (3.72)
- I am interested in sampling local traditional foods. (4.38)

Table 4 – Factor analysis results

Variable	Factor loading	Mean value	The reliability coefficient (α)	Average item correlation
Factor 1: Cultural food Interest		4.77	0.871	0.759
I am interested in sampling local traditional foods.	0.785			
I am very particular about the food I will eat.	0.866			
I will eat almost anything.	0.927			
I am interested in sampling local traditional foods.	0.874			
Insects are highly nutritious.	0.826			
Factor 2: New experience		4.95	0.778	0.665
I like to experience foods from different places.	0.876			
At dinner parties, I will try new food.	0.836			
I am afraid to eat things I have never had before.	0.860			

Factor analysis

A factor analysis was conducted to further assist in reaching the research aim. The factor analysis aimed to determine the respondents' perception of edible insects, which will guide the tourism stakeholders in developing entomophagy as part of an ecotourism product in the Mopani District. The factors identified are shown in Table 4. These factors were labelled as cultural food interest (Factor 1) and new experience (Factor 2). Table 4 presents the results of the analysis. According to Pallant (2010:194), when interpreting factors, two important factors to consider are the number of factors per component and the number of items. A factor loading of above 0.3 is generally considered good, and a component with more than 3 items is desirable. In this analysis, both of these elements were supported by the results obtained from the factor loadings and number of items, indicating that the interpretation of the factors is reliable.



All the constructs with a factor loading of less than 0.3 were excluded; from a total of 14, only 8 were retained. The factors identified above delivered the following KMO statistics:

- F1: Interest (KMO= 0.854)
- F2: New experience (KMO=0.713)

It is worth noting that a principal component factor analysis was conducted on the 14 constructs related to entomophagy. The KMO measure verified the sampling adequacy for the analysis as all being above 0.7, which, according to Field (2009: p. 671), is considered acceptable as it is above the minimum level of 0.6. Bartlett's test of specificity indicated that the factors yielded p-values of < 0.000 , rendering the correlation structure valid for factor analysis of the data collected. The inter-item correlations within the factors were all greater than 3, ranging from 0.64 to 0.856, which indicates a satisfactory correlation of items with the overall scale (Field, 2009: p. 678).

Factor 1: Cultural Food Interest

This factor had a mean value of 4.77, making it the factor with the lowest mean value of the two factors identified, but still with a very high mean value, measured on a 5-point Likert scale. It had a Cronbach alpha of 0.871 and an inter-item correlation of 0.759. The factor showed the level of interest of the participants in trying out edible insects. The following five items were loaded into this factor: I am interested in sampling local traditional foods; I am very particular about the food I will eat; I will eat almost anything; I am interested in sampling local traditional foods; and Insects are highly nutritious. This

factor concurs with the study conducted by Dzerefos, Witkowski, and Toms. (2013), who observed that entomophagy is an ancient tradition that predates living memory in the north and north-eastern regions of South Africa.

Factor 2: New experience

This factor captured elements significant to trying edible insects as a new experience: I like to experience foods from different places; At dinner parties, I will try new food; and I am afraid to eat things I have never had before. It had a 0.778 measure of reliability, a mean value of 4.95, and an inter-item correlation of 0.665. This factor showed the participant's level of interest in new experiences. It supports the view of De Foliart (1999) that several ecotourists participate in entomophagy tours as part of a new experience. Because the experience is new, some tourists are afraid to try it (Yen, Hanboonsong & van Huis, 2013:169). Munthali and Mughogho (1992) and Meyer-Rochow (2008) explain that some people find eating insects bizarre.

The willingness of respondents to participate in entomophagy tourism

Once the results of how people relate to edible insects have been determined, the subsequent focus fell on investigating tourists' willingness to participate in entomophagy tourism and their preferred methods of experiencing it (see questionnaire in the appendix). Based on the structured questionnaire, data on participants' openness to tasting edible insects, their previous experiences with insect consumption, and their preferred



methods of insect preparation were collected. The study results indicate a surprisingly positive inclination towards entomophagy tourism among tourists.

Roughly 60% of the respondents showed curiosity or openness towards the idea of participating in edible insect tastings. This suggests a substantial base level of acceptance and interest in entomophagy that could be pivotal for tourism initiatives. Among those who were hesitant or opposed to trying edible insects, the reasons were primarily rooted in cultural norms, unfamiliarity, psychological barriers, and religion rather than a fundamental aversion. The willingness to try insects as food spans from outright refusal to eager acceptance. About 20% of participants indicated outright refusal under any condition, while 15% would consider insects only if survival necessitated it. Interestingly, 25% admitted that they could be persuaded to consume insects, highlighting the potential for changing perceptions through education and positive exposure.

Regarding the preferred preparation methods for consuming insects, there was a clear inclination towards less recognisable forms. Methods such as incorporating insects in tiny pieces, blending into a puree, or using insect flour were more acceptable, with each method preferred by roughly 20-30% of participants, compared to whole insects, which were less favoured. This preference underscores the significance of presentation and preparation in making insect-based dishes more palatable to tourists.

Responses showed a readiness to experiment with the acceptable level of

insect flour in a favourite dish, with about 10% of participants willing to try up to 25% or more. This reflects a significant openness to integrating insects into diets to a considerable extent, assuming the taste and presentation meet their standards.

The study suggests that education, gradual exposure, and integration of insects into well-known dishes could significantly enhance the attractiveness of entomophagy tourism. Highlighting the environmental advantages of entomophagy and providing diverse preparation methods to suit various preferences were identified as key strategies to boost the acceptance and enthusiasm for insect-based cuisine in tourism contexts.

DISCUSSION AND CONTRIBUTIONS

First, the research identified entomophagy as a potential tourism product for the Mopani District. As most respondents were from South Africa, it is safe to confirm that there is an untapped market potential in entomophagy tourism in South Africa. There is a need to develop products in entomophagy tourism as little is currently available in this province except for some informal stalls along the roads in the area (De Foliart 1995; Makhado et al. 2009). Therefore, there is a gap in developing tourism products in entomophagy tourism. Overcoming the negativities of edible insect food items in the Western world, particularly those local dishes containing edible insects, would see increased consumer demand from Western nations and the promotion of African heritage. As such, even supermarkets would realize improved sales of insect-



based flours in the retail markets. The same approach can be used in typical African food outlets, customizing locally available dishes to fit into the hospitality industry markets. To increase palatability, insects have been processed into powder or meal and mixed with other ingredients to camouflage visual associations and the dislike factor, a factor yet to be fully explored in designing foods for the lucrative tourism industry. The literature identified Chinese and Japanese tourists as significant international consumers of edible insects (Ramos-Elorduy, 1998; Nonaka, 2010; Van Huis et al., 2013; Jongema, 2017). Therefore, it is recommended that the tourism sector explore the possibility of attracting these markets to entomophagy tourism, as the province already attracts these markets when visiting Kruger National Park.

The second finding is that entomophagy tourism can be developed as a community project. Most visitors want to try out new food, eat local cuisines, and experience different cultural heritage (Mkhize, 2023). The Local Tourism Authority (LTA) needs to start working together with the local people to provide visitors with more of their local foods. An example is hosting festivals where local community members can showcase and sell different types of entomophagy meals and their heritage. In doing so, the local community benefits financially from catering food made up of the local cuisine. Respondents also preferred healthy food, and although they found it challenging to grow insects, they did not believe insects should be consumed only during starvation. This opens an opportunity for the local tourism management to educate locals and

visitors on how to grow edible insects.

The third and most important finding of this research was the need to collaborate with various stakeholders. Visitors indicated they would trust and eat more edible insects if major health organizations such as the UNWHO endorsed entomophagy. The collaboration of local people, the LTA, and health organizations could also promote the acceptance of entomophagy. This, in turn, would help the economy of many poor communities where entomophagy is very common.

This research's fourth and last finding was that marketing such products needs attention. The consumption of insects by tourists is not new, especially in Thailand and Laos (Muller, 2019; Köhler, Kariuki, Lambert, & Biesalski, 2019). However, there is no established type of tourism known as entomophagy tourism, with the focus on edible insects. In the case of this research, the type of tourists who participated in the study were ecotourists, indicating an unresearched tourism niche. Therefore, this would be key in product development in the area to start discussing the development of entomophagy tourism.

Contribution to the Research Field of Entomophagy Tourism

This study significantly contributes to the research field of entomophagy tourism in two key areas: it enriches the academic literature on entomophagy tourism and offers practical insight for the development of entomophagy tourism products. Providing empirical data from South Africa, a context that has been underexplored compared to other destinations such as Asia



and Mexico, enriches the academic literature, specifically that from Africa. The research instruments used in this study were adapted from previous studies conducted in regions where entomophagy tourism is more established, such as those by Yen et al. (2013) and Iakovoglou and Zaimis (2018). Additionally, this instrument was modified to suit the specific conditions of Africa and South Africa, thereby contributing to the academic literature by providing a tailored approach to studying entomophagy tourism in this unique context.

In regions like Asia and Mexico, entomophagy has been integrated into tourism through well-established entomophagy tourism product development through cultural festivals that attract international tourists. For example, the Ruammal Edible Insects cart in Thailand and the traditional markets in Mexico highlight entomophagy's economic and cultural importance. In contrast, South Africa, particularly the Limpopo Province, is still in the nascent stages of developing entomophagy as a tourism product. This study's findings underscore the potential for similar development in South Africa and Africa, leveraging its rich biodiversity and cultural heritage. By comparing the South African context with other regions, this research highlights the universal appeal of entomophagy and its potential to diversify tourism offerings. The study's insights into tourists' openness to insect-based foods and the importance of stakeholder collaboration provide a roadmap for developing entomophagy tourism products in South Africa and Africa. This research further enriches practical recommendations

for product development, marketing strategies, and community involvement, which are crucial for sustainable tourism development in South Africa.

Besides the practical and literature contribution, this research contributes to a deeper understanding of the opportunities and challenges in promoting entomophagy tourism in South Africa. It bridges the gap between traditional practices and modern tourism trends, emphasizing the importance of cultural heritage and economic empowerment, especially for black women in Africa, through innovative tourism products. By addressing the unique aspects of the South African context, this study adds valuable knowledge to the global discourse on entomophagy tourism and sets the stage for future research and development in this promising field.

CONCLUSION

This research represents a pioneering effort to explore the potential of entomophagy as a tourism product in South Africa, specifically in the Mopani district of the Limpopo province. It is the first of its kind to delve into this unique aspect of gastronomy within the South African context, making a significant contribution to the broader field of tourism studies and African heritage. The findings illuminate a clear market interest in entomophagy tourism, suggesting that there is a substantial base of tourists who are open to, and even curious about, the experience of consuming edible insects. This insight is particularly valuable in light of the global trend towards sustainable and experiential travel, positioning



entomophagy as both a culturally rich and environmentally responsible tourist attraction.

Moreover, this study significantly adds to the limited literature on entomophagy tourism, particularly in the context of African heritage, where such research is sparse. Identifying tourists' perceptions, preferences, and willingness to engage in edible insect consumption provides a foundation for future research and development in this niche tourism area. The findings highlight the importance of presentation and preparation in enhancing the palatability of insect-based dishes for tourists, suggesting that innovative culinary techniques could play a crucial role in mainstreaming entomophagy in the tourism sector.

The contribution of this work is threefold: it pioneers research on entomophagy tourism in South Africa, identifies a viable market interest in edible insect consumption among tourists, and enriches the academic dialogue on entomophagy by adding empirical evidence drawn from the South African context. These contributions are crucial for stakeholders in the tourism and hospitality industries looking to diversify and innovate their offerings and for policy-makers seeking to promote sustainable tourism practices. Ultimately, this study paves the way for further exploration into the intersection of culture, gastronomy, and sustainability, offering insights that could lead to developing new tourism products that celebrate local traditions and heritage while addressing global challenges.

Limitations and recommendations for

future studies

Future research should aim to conduct studies in a post-COVID-19 context to determine whether the pandemic has had a lasting impact on culinary openness among tourists, particularly regarding entomophagy. Expanding the geographical scope to include various cultural, environmental, and socio-economic contexts within South Africa and beyond will enrich the understanding of entomophagy's appeal. Larger, more diverse samples in future studies will enhance the generalizability of findings and provide a nuanced view of global perceptions towards edible insect consumption. Additionally, longitudinal research could offer insights into the evolving perceptions of entomophagy over time, informing the development of sustainable tourism products and marketing strategies that cater to changing tourist interests and global sustainability goals.

To contribute to the sustainable development of entomophagy tourism, several insights and recommendations should be considered:

Stakeholder Engagement: Engaging local communities, tourism operators, culinary experts, and environmental organisations is crucial. These stakeholders can provide valuable insights into local culinary traditions, help promote the benefits of entomophagy, and ensure that tourism practices are culturally sensitive and environmentally sustainable.

Educational Campaigns: Developing educational campaigns to raise awareness about entomophagy's nutritional, environmental, and cultural benefits can



help shift public perceptions. Collaborating with media outlets, influencers, and educational institutions can amplify these messages and reach a broader audience.

Cultural Integration: Integrating entomophagy into existing cultural and culinary tourism experiences can enhance its appeal. Showcasing traditional insect-based dishes and involving tourists in the preparation process can create immersive and memorable experiences.

Sustainability Practices: Emphasizing sustainable insect farming and culinary preparation practices is essential. Ensuring that insects are sourced responsibly and that farming practices do not harm local ecosystems will support the overall sustainability of entomophagy tourism.

Policy Support: Advocating for supportive policies and regulations that promote sustainable insect farming and the inclusion of edible insects in the culinary industry can create a conducive environment for the growth of entomophagy tourism.

Market Development: Developing niche markets for edible insects, such as gourmet restaurants, food festivals, and speciality food shops, can help build a market base. Encouraging local entrepreneurs to explore business opportunities in this sector can stimulate economic growth and job creation.

Feedback Mechanisms: Implementing feedback mechanisms to gather tourists' opinions and experiences with entomophagy can provide valuable data for improving tourism products and marketing strategies. Regularly assessing tourist satisfaction and adapting offerings based on feedback will enhance the overall

experience.

By addressing these areas, future research can advance the understanding of the potential of entomophagy as a tourism product. These efforts are crucial for leveraging edible insects to enrich tourist experiences, celebrate cultural heritage, and support sustainable tourism practices. Through collaborative efforts and comprehensive research, entomophagy tourism can contribute to global sustainability goals while offering unique and engaging experiences for tourists

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Appendix 1: Section of the questionnaire that was used

SECTION D: ENTOMOPHAGY WILLINGNESS

10. Would you be interested in participating in tasting edible insects?

• → Yes → No

If NO please give a reason

11. Have you ever voluntarily consumed whole insects?

• → Yes → No

If NO please give a reason

12. Have you ever voluntarily consumed food that contained ground insects or small pieces of insects?

• → Yes → No

If NO please give a reason

13. Which of the following statements best describes your willingness to try insects as food?

I would never eat insects under any conditions.	☐	☐
I would eat insects only if my survival depended on them.	☐	☐
I am unsure if I would ever consume insects.	☐	☐
I could be persuaded to consume insects.	☐	☐
I would be happy to consume insects.	☐	☐

¶

14. If you were to consume insects, rank the following in the order of the most suitable preparation method where 1 is the most suitable and 5 is the least suitable

Whole insects prepared alone	☐	☐
Whole insects cooked with other ingredients	☐	☐
Insects chopped into tiny pieces	☐	☐
Insects blended in a puree	☐	☐
Insects as insect flour	☐	☐

¶

15. What is the highest level of insect flour that you would be willing to consume when incorporated into a favourite dish of yours?

0%	☐	☐
1%	☐	☐
5%	☐	☐
10%	☐	☐
25% or more	☐	☐

¶

16. Do you have any suggestions about how entomophagy tourism can be improved?

☐
☐

Thank you very much for your participation. For more information or queries, please contact Ms Bianca Mkhize-Simelane at tslwandle@yahoo.com or 0733301511