The development of an acceptable culinary product using crocodile meat

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Introduction

In the past few years, most modern food producers have realised that the world will be faced with challenges of feeding the ever increasing global human population. One strategy that has been employed to increase meat protein output is to promote the harvesting of species that are indigenously abundant (Hoffman & Cawthorn, 2012b; Jori, Lopez-Béjar & Houben, 1998; Jori, Mensah & Adjanohoun, 1995). The trade of exotic meats is increasing in the global market and could make a big contribution to feeding the ever increasing world population. A large number of crocodile species serve as protein sources for human populations across the globe. (Klemens & Thorbjarnarson, 1995). The crocodile industry across the world mainly consists of crocodile leather/skin trade for the fashion industry and crocodile meat is considered a by-product in most countries. The meat produced usually ends up 'recycled' as unprocessed crocodile feed on the farms (Hoffman, Fisher & Sales, 2000). As the industry grew, farmers realised that production costs per unit of skin became very high and measures had to be taken to boost profitability. An opportunity therefore presents itself to take advantage of the existing market and developing it in South Africa. If an exotic product using crocodile can be developed into a form which is acceptable to consumers, it could deliver a new culinary product to the market of consumers that are increasingly hungry for new innovative products.

Materials and methods

Consumers' sensory perceptions of four innovative crocodile meat products were studied. Affective sensory evaluations were performed and consumers (n=87) assessed the food

products' sensory attributes. This was done to explore the food's profile and contribution to sensory perceptions and experience. CATA was conducted using 20 sensory characteristics. Insights into how the product characteristics influence sensory liking and acceptance for regular consumption were gained.

The study was structured into three phases, namely product development, consumer perception and consumer experience of the products. The focus was on the sensory evaluation of the developed products.

Four products were developed by students from the University of Pretoria, Suth Africa. These were red wine and rosemary marinated sous-vide crocodile, Cornflake crumbed crocodile strips, Cape-Malay crocodile curry filled dumplings, Rooibos smoked crocodile kebabs with red wine and sherry sauce.

The consumers' overall liking of the four sensory attributes (appearance, aroma, flavour, texture) were measured. These hedonic experiences were measured on a 9-point hedonic scale, ranging from '(1) Dislike extremely' to '(9) Like extremely'.

Using the Check-All-That-Apply method, consumers had to indicate which of the following characteristics were experienced in a specific product:

- Appearance: Light meat colour, dark meat colour, golden brown
- Aroma: Chicken-like
- Texture: Tough, flaky, chewy, juicy, tender, minced meat, crispy
- Flavour: Bitter, metallic, bland, sweet, hot, smoky, salty, liquor, deep fried

Consumer profiles were chosen according to gender, ethnicity, age groups, level of education, residential area and interest in novel foods.

Results

Results indicate that the product with the highest scores for each of the attributes were the strips, followed by the smoked product.

The results from the smoked product did not differ from the strips except for liking of appearance. The overall liking and flavour of this product was also favoured above that of the dumplings and the sous vide product. The dumplings' overall liking score was the lowest. It is clear that the crocodile strips were highly preferred over the other products.

Cochran's Q test was performed to test if there were significant differences ($p \leq 0.001$) between products with respect to its characteristics.

In general, females scored liking of attributes higher than males. As discussed previously, strips are liked best overall. However, considering mean scores per demographic group, Baby Boomers scored slightly higher for overall liking of smoked products. Population groups showed an effect on appearance scores ($p=0.0383$), Caucasians liking it more than non-Caucasians. Consumers that hold a degree or diploma scored all the attribute likings higher than the other two groups. Similar to Baby Boomers, consumers with post-graduate degrees, scored marginally higher for overall liking of the smoked product. Previous experience with crocodile meat did not show a significant effect on liking scores. These results are surprising, since many studies found that consumers that are familiar with a certain food product have an increased positive hedonic response toward it (Lee et al., 2010; Tuorila et al., 1994, 2008; Borgogno et al.,2015). There is, however, a slightly higher score for mean overall liking of consumers with previous experience.

Conclusion

Crocodile meat has the potential to contribute to many needs in South Africa, e.g. sustainable meat/protein source, demand for novel products, a healthy protein source and reduction of waste in crocodile leather production. It was clear that there is a considerable lack of information and knowledge on crocodile meat in South Africa. Extensive review of literature and brief sensory profiling of crocodile meat allowed four innovative products to be developed, prepared with a variety of methods and ingredients. Consumers had high expectations of the products and were very accepting thereof. Consumers favoured products with familiar characteristics. The viability and acceptance of crocodile meat products on the South African market was positively concluded. This research opened many possibilities for future studies and improvements, by scientific researchers as well as product developers of retail stores.