AOSIS

The willingness to pay for African wormwood and Cancer bush capsules among youths in Mbombela, South Africa

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Background: The demand for African wormwood and Cancer bush has surged as modern healthcare products have provided limited solutions for the ailments they treat. Moreover, there has been an increase in younger consumers of these medicinal plants, who expect lower-priced products which have a 'polished look' that is similar to over-the-counter medicinal products.

Aim: This study investigates the need to introduce lower-priced capsules to meet these changes in consumer product preferences.

Setting: The study was conducted in the city of Mbombela. This is a city that has a rich heritage in indigenous medicinal plant use but has the absence of a large informal market for their sale.

Methods: A willingness-to-pay analysis was conducted. It utilised survey data that was collected from 105 university students.

Results: The study found that there were two market segments split with a ratio of about 3:1 between those willing to pay a price similar to a conventional product in the lower price range and those not willing. However, the market potential for introducing a lower-priced product was only found in the Cancer bush market, where respondents were willing to procure the product at a discounted price, as opposed to the African wormwood market, where some respondents were not willing to part with any money at all.

Conclusion: The study concludes that there is potential for lucrative market diversification if the industry introduces lower-priced capsules for Cancer bush.

Contribution: The study provides insights into the possible areas of market development in the African indigenous medicines market.

Keywords: Complementary and supplementary medicine; healthcare products; African indigenous medicinal plants; traditional medicine; market diversification; market development; *Artemisia afra*; *Sutherlandia frutescens*.

Introduction

South Africa is likely to continue experiencing an increase in the demand for its indigenous medicinal plants because of an increase in the country's population and the increased need for alternative medical products from the global community (Asong et al. 2019; Noorhosseini et al. 2017). However, the industry for indigenous medicinal plants is facing challenges in achieving the forecasted growth (Nwafor, Nwafor & Manduna 2021). Several studies (Seifu & Teketay 2020; Speirs 2014; Van Wyk & Prinsloo 2018; Xego, Kambizi & Nchu 2016) have documented the challenges encountered in supplying the market with the requested products, and a few studies have focused on analysing the market's structural limitations. Some studies (Ndou et al. 2019; Sewani-Rusike & Mammen 2014; Spier 2014; Rasethe, Semenya & Maroyi 2019) have extended their supply-side analyses to include the investigation of some market aspects. However, these studies did not investigate possible ways of extending the industry's product extension and market expansion.

The African medicinal plants industry made a significant leap forward in the mid-nineties when popular indigenous medicinal plants were commercialised. This enabled the tackling of product quality, safety and efficacy concerns which formed some of the biggest bottlenecks to the industry's growth (Asong et al. 2019; Van Wyk 2011). Various industry experts (e.g. Makunga, Philander &

Smith 2008; Mander, Ntuli & Diederichs 2007) have recommended that the industry further provide a wider range of differentiated products to meet the different consumer demands and to identify potential expansion opportunities. This message has become relevant in the current age, as consumer preferences shift towards products that closely resemble over-the-counter medicines, which would have been shunned in the past (Semenya & Portggier 2014; Van Wyk 2011). At the fore of this wave of increasing product expectations is the youth (16 to 35-year olds) (Spiers 2014). This age group makes up a market segment that is not easy to ignore, as it is the biggest and fastest-growing demographic group in the nation's population. In addition to requesting products that have a 'polished look', youths require lower-priced products, as they often have limited financial resources. As the provision of quality often conflicts with price, it is important that research be conducted on how the current product mix can be augmented to meet these product characteristic requirements while catering for the distribution in demand at the different pricing points.

Market expansion would be useful for medicinal plants such as the African wormwood (*Artemisia afra*) and Cancer bush (*Sutherlandia frutescens*) from a healthcare delivery perspective. These two plants are used in the treatment of diseases such as coronavirus disease 2019 (COVID-19) (African wormwood), human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS), malaria, diabetes and cancer (Cancer bush) that have accounted for a significant proportion of South Africa's health bill (DAFF 2013; Kepe 2007; Ndhlovu et al. 2022). As a product launch into higher-priced medicinal products (as occurs in the current trends) presents a danger of excluding potentially lucrative market segments in society such as the youth from receiving quality healthcare (Gruca, Blach-Overgaard & Balslev 2015; Paudyal et al. 2022), this study investigates the feasibility of success of a lower-priced product. It does so by determining how the demand (willingness to pay) for a bottle of 30 capsules of 100 mg of these two medicinal plants changes as the price deviates from that of the average multivitamins on the lower or entry end of the health supplements market.

Developing the market for indigenous medicinal plants also has an economic importance, as it could be the key to unlocking potential for the rural economy(Mander et al. 2007; Paudyal et al. 2022). A report provided by Agribook Digital (2022) has indicated that the commercial production of indigenous medicinal plants is one of the most viable agribusinesses that can be undertaken in Southern Africa. Nwafor et al. (2021) also agree that commercial production of indigenous medicinal plants could be a feasible solution to ending rural poverty. The industry holds enormous unexplored potential, as the average South African consumer of traditional medicine uses 750 g of plant material a year (Moeng & Portgieter 2011), and less than a quarter of South Africa's medicinal plants have been commercialised in the formal ethnopharmacological industry (Agribook Digital 2022). In addition, other nonhealth motivations of purchase

(for example, those that are social in nature) motivate the products' purchase (Makunga et al. 2008; Ndhlovu et al. 2022; Semenya & Portggie 2014; Street & Prinslo 2013). Hence, vast and promising business opportunities could be explored. However, the growth opportunities can only be achieved if there is significant effort directed towards diversifying the industry's market offering (Daouda, Barth & Ingenbleek 2020).

The rest of the article is structured as follows. The 'Research methods and design' section presents the study's methodology, while the 'Results and discussion' section provides and discusses the study's results. The study is concluded in the 'Conclusion' section.

Research methods and design

The data for this study were collected using an online survey that was administered to university students studying in the city of Mbombela in South Africa. A convenience sampling method was utilised in which the questionnaire was circulated on students' online platforms. A sample of 105 students was acquired after the data cleaning and incomplete survey responses were dropped.

The dichotomous choice approach of the contingent valuation method (CVM) was used to estimate willingness to pay for Cancer bush (*Artemisia afra*) and African wormwood (*Sutherlandia frutescens*). This approach entailed presenting respondents with three possible prices and asking whether they were willing to accept the bid. The initial first bid (B_I) was a benchmark price of R85.00 and was equivalent to the average price of a bottle or packet of 30 capsules (100 mg each) of multivitamins or health supplements that were priced for the lower end of the market. Contingent on the response of the first bid on this conventional product, respondents were presented with a second bid (Loureiro, Mccluskey & Mittelhammer 2002). If the respondent was willing to pay the initial price (B_I), they were presented with a bid which was R10.00 higher (B_H). If the respondent was not willing to pay the initial price, they were presented with a bid which was R10.00 lower (B_L).

Completion of the bidding processing resulted in a classical double-bounded model in a log-likelihood formation. Possible responses were: (1) 'no' to both bids, (2) 'no' followed by 'yes', (3) 'yes' followed by 'no' and (4) 'yes' to both bids. These resulted in the following intervals: $(-\infty, B_L)$, (B_L, B_I), (B_I, B_H) or $(B_H, +\infty)$ (Loureiro et al. 2002). Thus, discrete outcomes of the bidding process are observed as follows:

$$\text{WTP} = \begin{cases} 1 & WTP < B_L \\ 2 & B_L \leq WTP < B_I \\ 3 & B_I \leq WTP < B_H \\ 4 & B_H \leq WTP \end{cases} \quad \text{[Eqn 1]}$$

where WTP denotes the individual's willingness to pay and 1–4 show the bid functions describing the four categories of

consumers emerging as determined by the demand for the capsules at the different pricing points or ranges. Category 1 represents consumers who perceive the good to be of low value and are not willing to pay for it or are willing to pay a price that is significantly lower than the conventional product. Category 2 represents consumers who deem the new product to have a value that is slightly below the conventional product and as a result are willing to pay a slightly lower price than the conventional product for its procurement. Category 3 represents a category of consumers who see more value in the new product as compared to the conventional product. Hence, they are willing to pay the market equivalent or slightly higher price. Category 4 represents a category of consumers who see more value in the new product as compared to the conventional product and are willing to pay a significantly higher premium for the good.

Ethical considerations

This study was approved by the University of Mpumalanga School of Agricultural Sciences Research Board.

Results and discussion
Descriptive statistics

About two thirds (66%) of the survey respondents were female, and just above three-quarters (76.5%) lived in rural areas. As shown in Table 1, most (67%) of the respondents were between the ages of 21 and 25 and came from poor backgrounds, who mostly received a monthly income that was below R7501.00. Most respondents came from four to six member households, which were similar to the typical households in South Africa. Various sources of African Traditional Medicines (ATMs) were utilised by the respondents. The largest proportion (38%) of respondents harvested their ATMs from the wild. This was probably because most of the respondents were from rural areas. The second largest proportion of acquisitions (31%) were sourced from pharmacies. This result shows the substitutability of the wild-sourced products with the commercialised products among the youths. It also tells of the successful integration of

ATMs in South Africa's formal market. The respondents did not spend much money on ATMs a year. The majority (44.8%) spent less than R150.00 on the various ATMs, while 27.9% spent between R151.00 and R300.00. The respondents reported that almost 90% of their family members used ATMs. This proportion is much higher than the 60% – 80% that has been reported in nationwide estimations (Mander et al. 2007; Nieman, Leslie & Wilkinson 2019).

Table 2 shows that the respondents had more knowledge of African wormwood than Cancer bush. The survey results show that 82.1% of the respondents had some knowledge of African wormwood, as compared to just 32.0% of the respondents who had some knowledge of Cancer bush. These differences in knowledge endowment were probably because of the types of ailments that the two plants treated. The former is probably well known because it was popularly used to treat COVID-19 virus symptoms during the COVID-19 pandemic. Cancer bush, on the other hand, was probably not as well known because the ailments that it is well known for treating (e.g. Cancer, malaria, diabetes) are not as prolific as COVID-19. This result was also because of the geographical distribution of the wild plants. According to DAFF (2013), African wormwood is widely available in eight out of the nine provinces of South Africa, while Cancer bush is only found in five.

Table 2 also shows that there was limited use of the two medicinal plants forming the focus of this study. While about half of the respondents reported that they used African wormwood, 14% reported that they used Cancer bush. Interestingly, the study's results on the use of the medicinal plants are similar to the results on the knowledge of the different medicinal plants and their healing properties.

Empirical results

Table 3 provides a summary of the outcomes derived from the bidding conducted for the prices of two medicinal plants' capsules. The results show that the distribution of consumers' bidding outcomes was fairly similar for both

TABLE 1: Summary of respondent demographic characteristics.

Consumers' characteristics	Frequency and distribution							
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Age	15–20	20.2	21–25	67.3	26–30	5.8	> 30	6.7
Monthly family income	R0–R7500	64.7	R7501–R15 000	16.7	R15 001–R22 500	10.8	> R22 500	7.8
Family size	1–3	15.8	4–6	54.4	7–9	21.8	> 10	8
Acquisition of ATMs	Wild	38	Local vendor	20	Pharmacy	31	Traditional healer	11
Annual spend on ATMs	R0–R150	44.8	R151–300	27.9	R301–450	10.4	> 451	16.9
Proportion of households using ATMs	None	11	Few	58	Most	13	All	18

ATMs, African traditional medicines.

TABLE 2: Knowledge and use of African wormwood and Cancer bush.

Medical plant	Knowledge			Use				
	No (%)	Limited knowledge (%)	Yes (%)	Do not use (%)	Seldom use it (%)	Use it sometimes (%)	Use it frequently (%)	Use it all the time (%)
African wormwood or *Umhlonyane*	17.9	33	49.1	50.5	18.8	16.8	10.9	3
Cancer bush or *Unwele*	68	15.5	16.5	86	9	2	1	2

TABLE 3: Distribution of bid outcomes.

Bid outcome	Interpretation	African wormwood (Umhlonyane)		Cancer bush (Unwele)	
		n	%	n	%
Yes, yes (Category 4)	Consumers who see more value in the new product as compared to the conventional product and are willing to pay a significantly high premium for the good.	58	55.2	59	56.2
Yes, no (Category 3)	Consumers who perceive more value in the new product than the conventional product. Hence, they are willing to pay the market equivalent or slightly higher.	15	14.3	13	14.3
No, yes (Category 2)	Consumers who deem the new product to have value that is slightly below the conventional product and as a result are willing to pay slightly less for its procurement.	1	1	29	27.6
No, no (Category 1)	Consumers who place a significantly lower value to the good in question and are willing to part with significant less or no money to acquire it.	31	29.5	4	3.8

medicinal plants. As shown, almost 75% of the respondents were willing to pay for a bottle of 30 capsules (100 mg) of Cancer bush and African wormwood. These were identified as lying in categories 3 and 4. These respondents were willing to pay a price that is equal or greater than the conventional product. For both medicinal plants, the largest proportion of survey respondents was willing to pay a price that was significantly higher than the benchmark price, indicating that the respondents attached very high value to the product. Such a finding of high willingness to pay is good for the industry, as it could ensure that the supply of the product remains economically viable for the suppliers. The study's results are similar to those acquired by Oyekale (2017) and Farinola et al. (2014), who found that Nigerian consumers were willing to pay a premium for processed ATMs.

The study's results displayed in Table 3 show distinct differences in the distribution of consumers in categories 1 and 2. In the case of African wormwood, there was a higher proportion of individuals who were willing to pay a price that was significantly lower than the price of the conventional product and those who were not willing to pay at all. These made up over a quarter of the sample. This result was probably because most of the consumers could have had experience in harvesting their own plants in the wild or would acquire it for free from friends and neighbours. This could have been possible because during the COVID-19 pandemic, self-medication and individual harvesting of this medicinal plant were common. Hence, some consumers would have found it irrational to pay for a product they have accessed (and can still access) for free. This result is similar to the findings of Du Toit and Van der Kooy (2019) that cast a shadow on the commercial expansion of African wormwood. On the other hand, there was a comparably larger number of consumers who were willing to purchase the capsuled product at a discount price for the Cancer bush. This acknowledgement of perceived value for Cancer bush as compared to African wormwood indicates that there may be a feasible market for the provision of a lower-priced product for the former product rather than the latter.

This study's findings on the demand across the different pricing points were quite different from those of a similar study of African medicinal plants that was conducted by Farinola et al. (2014). The study found that Nigerian consumers were willing to pay for the indigenous medicinal plant (Moringa oleifera) that was processed in powder, but the demand decreased with an increase in price. Just over a quarter (28.7%) of the respondents were willing to pay a premium for the product. The majority (38.6) were willing to pay a price equivalent to the conventional product, while about a third (32.7%) of the respondents were not willing to pay the equivalent of the market price. Differences in findings can be attributed to differences in the value attached to the different medicinal plants. A higher value is placed on the two plants investigated in this study as compared to Moringa oleifera. The latter is an antioxidant (Seifu & Teketay 2020), unlike the former two which are used in treating specific ailments, hence the differences in consumer response.

Conclusion

The study's results showed that there was a demand for the capsuled products that were suggested in the study. Almost 75% of the survey's respondents were willing to pay for the processed products of both medicinal plants under investigation. Consumers were more willing to pay for Cancer bush capsules. The scarcity of the plant, limited knowledge of the medicinal plant and the nature of the ailments treated by the medicinal plant may have had a positive influence on the consumers' willingness to pay. On the other hand, the lower willingness to pay for African wormwood was associated with the ease of access and widespread knowledge of how to harvest the wild plants. Although the study found that the markets for both products were split with a ratio of about 3:1 between those willing to pay and those not willing, there was potential in the introduction of a lower-priced Cancer bush product, as the respondents showed a willingness to procure the product at a discounted price, as compared to the African wormwood, where the respondents were either not willing to pay at all or were willing to pay a significantly lower price than lower entry level in the immunity-boosting product market.

Given these findings, the study recommends that efforts be made to explore the production of more diversity in the Cancer bush product offering, as the study has shown that there is a segment of consumers who would be willing to pay for the product if provided at a lower price. However, this should be done after careful consideration of the cost of production, as this was not investigated in this study. The

study was also limited in focusing on youths in Mbombela; hence, it would be prudent to conduct further research with a larger dataset. Additional research can be conducted to compare demand structure across different age groups, income groups and religious backgrounds. The study also recommends that additional research be carried out on the technological investment that can be made to allow the production of lower-priced products that can ensure broader access to better-quality medical products for the poor. Government assistance (e.g. financial, legislative) into such market developmental efforts is also recommended.

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Data availability

The data that support the findings will be made available by the authors upon request.

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