University of Venda

NUTRITIONAL COMPOSITION OF TRADITIONAL MIXED – DISHES EATEN BY ELDERLY WOMEN IN VHEMBE DISTRICT

By

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The dissertation is submitted in partial fulfilment of the requirements for the degree of Master of Science in Public Nutrition in the School of Health Sciences, Department of Nutrition at the University of Venda.

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December, 2020

DECLARATION

I, **Sedzani Elsie Madala**, hereby declare that the dissertation titled**: Nutritional composition of traditional mixed-dishes eaten by elderly women in Limpopo Province,** for the Master of Science in Public Nutrition degree at the University of Venda, hereby submitted by me, has not been submitted previously for a degree at this or any other university, that it is my own work in design and all reference materials contained therein have been duly acknowledged.

…….

Signature

……28/12/2020…….

Date

DEDICATIONS

I dedicate this dissertation to:

- The God of Mount Zion for giving me strength, knowledge, wisdom and guidance throughout my life.
- My mother, Mashau Gladys Tshidzumba, for being my pillar of strength in times of hardship and for all the sacrifices she has made for me, throughout my life.
- My son, Mphahlela and niece Rialivhua, for their love, patience and motivation.
- My brothers, Tshifhiwa, Phuluso and Shaka, my sisters Maipfi, Mukondi and Vhutali and my sister in-law Mapula, for their love, support and encouragement during my studies.
- My late aunt, Eunice Tshidzumba.
- My partner, for the patience, love, support and for being a shoulder to cry on during my entire study.

ACKNOWLEDGMENTS

I would like to dedicate special thanks to:

- My supervisors, Dr LF Mushaphi and Ms HV Mbhatsani for their exceptional supervision and hard work they bestowed upon me. Thank you for always being there when I needed guidance with my research and encouraging me that nothing is impossible.

- All the elderly women who opened their homes with warmth and shared their traditional food knowledge, with love.

- The Department of Nutrition staff for the support and motivation.

- The Department of Food Science staff, lab technicians and postgraduate students for all their assistance during my study.

- The University of Venda research support grant, DST, NRF and HWSETA, also, for their financial support.

ABSTRACT

Globally, one in every eight people (868 million) are malnourished and nearly two billion people suffer from some type of micronutrient deficiencies. Most traditional dishes contain exceptional capabilities to improve nutrition, bring about nutritional variety, hence, they play a significant role in reducing malnutrition, including micronutrient deficiencies sub-Saharan Africa (SSA) and South Africa in particular, where these ills still persist. The conveyance and documentation of indigenous knowledge on traditional food, which this research is aimed at, will make sure that the obtainability and consumption of these foods will be sustained. The aim of this study was to determine the nutritional composition of traditional mixed-dishes eaten by elderly women in Vhembe District. The research design was ethnographic with an analytic component; a mixed methods approach was used for data collection. The qualitative data was analysed using thematic analysis and the quantitative data was analysed using statistical methods on IMB-SPSS (version 26). Frequencies, mean, and analysis of variance (ANOVA) were used to interpret data and means were separated using Duncan's multiple range test at $p < 0.05$. The study was conducted in accordance with the Declaration of Helsinki. From the results, one theme and eight sub-themes emerged from the respondents' narratives during the in-depth interviews. Sixteen types of stiff porridge, eight types of traditional mixed-dishes and twenty-three types of indigenous leafy vegetables were documented. Boiling was the most common traditional cooking method used in food preparation by the Vhavenda and Vatsonga. The Vhavenda and Vatsonga frequently used ground peanuts in the preparation of most traditional foods. The total dietary fibre values ranged from 7.70% to 28.40% and a significantly higher total dietary fibre content was observed in *tshidzimba/tihove* B at $p < 0.05$. The protein content of traditional mixed dishes varied from 11.70% to 31.50% and a relatively higher protein content was observed in *bovhola/xipaswi* at $p < 0.05$. The iron content varied from 51.4 mg/100 g to 195.6 mg/100 g significantly different at ($p<0.5$). *Thophi/tshopi* had higher vitamin A (288.0 µg/100 g) and β-carotene (576.0 µg/100 g) content, respectively. Sensory evaluation showed that *tshidzimba/tihove* A was rated significantly higher in mouthfeel, aroma, taste and appearance and overall acceptability than *tshidzimba/tihove B, thophi/tshopi and bovhola/xipaswi* at $p < 0.05$. The conclusion is that, there is a great reliance on traditional foods by rural communities. Mixing traditional foods into composite dishes is a common practice among the Vhavenda and Vatsonga. These foods are inexpensive sources of important nutrients and their consumption must be encouraged, especially in local communities where they are readily available to prevent and lessen the burden of micronutrient deficiencies, thereby, promoting healthy lifestyle.

Key Words: Traditional mixed-dishes, elderly women, nutrient composition, sensory acceptability, indigenous leafy vegetables, Vhembe district

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ABBREVIATIONS

ANOVA	Analysis of variance
ARC	Agricultural Research Council
EU	European Union
FAO	Food and Agricultural Organization
g	gramme
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
RDA	Recommended Daily Intake
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
Stats SA	Statistics South Africa
TLVs	Traditional leafy vegetables
µg	Micro-gramme
UNICEF	United Nations Children's Fund
USDA	United States Department of Agriculture
WFP	World Food Programme
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Elderly people – the term, elderly people, usually refers to individuals who are 60 years and older. In this study, however, 'elderly people' refers to individuals who are 50 years and older and who have the knowledge and expertise about cooking traditional mixed-dishes.

Indigenous leafy vegetables – Indigenous leafy vegetables are those comestible plants that are geographically indigenous to an area.

Nutritional value – Nutritional value refers to the quantity and quality of nutrients found in food, including information on the energy, macronutrients (carbohydrates, protein and fats), micronutrients (vitamins and minerals) and phytochemicals contained in food.

Traditional leafy vegetables – Traditional leafy vegetables are part of traditional-production systems and local knowledge; these plants have been consumed locally over years, although, they may not originally be from that specific area.

Traditional mixed-dishes – Traditional mixed-dishes, in this study, refer to dishes that are made by combining more than one type of traditional food, for example, combining indigenous leafy vegetables with ground peanuts or combining mealie-corn, whole and ground peanuts, as well as, Bambara grounduts.

Traditional foods – In this study, 'traditional foods' refer to all indigenous and traditional foods found in the study area, including traditional mixed-dishes, traditional and indigenous leafy vegetables that have been eaten over a long-term, for generations.

CHAPTER ONE: INTRODUCTION

1.1 Background and motivation of the study

Globally, one in every eight people (approximately 868 million people) are malnourished and nearly two billion people suffer from micronutrient deficiencies (United Nations Children's Fund (UNICEF); World Health Organization (WHO) & World Bank (WB), 2011). The Food and Agricultural Organization (FAO, 2008) reports that Sub-Saharan Africa (SSA) has the highest occurrence of under-nutrition in the world. Furthermore, Faber *et al.,* (2011) reveal that micronutrient deficiencies remain one of the largest contributors to the burden of morbidity and mortality in South Africa, where 64% of the children under nine years were found to be vitamin-A deficient; 13% had poor iron levels and 45% had low zinc levels. Many of these malnourished children have these problems owing to faulty feeding practices by their mothers or caregivers (WHO, 2009). Noteworthy developments have been initiated to alleviate undernourishment and micronutrient deficiencies. However, such improvements have not been consistent, rather, these efforts have been hampered by the rise in food prices, political and social issues and other distresses (UNICEF *et al.,* 2011).

Additionally, other forms of malnutrition, specifically, overweight and obesity are rapidly rising as more than 1.4 billion adults are overweight, worldwide (WHO, 2012). More than 40% of the adult inhabitants of South Africa are obese with poor eating habits being the principal contributor. Similar to trends in developled countries, many people in South Africa are leaning towards consuming processed foods that are high in saturated fats, sugars and salt. This has coincided with an erosion of agricultural biodiversity and a decrease in dietary diversity (Welch & Graham, 1999; Puoane *et al.,* 2002; Frison *et al.,* 2010; Faber *et al.,* 2011). According to Black (2003) and Uusiku *et al.* (2010), these predicaments can be avoided by the addition of traditional foods in the diet.

Traditional foods contain exceptional capabilities for better nutrition, provide nutritional variety and can enact a significant role in reducing micronutrient deficiencies and malnutrition in South Africa, where these challenges still persist (World Bank, 2010). According to van Rensburg *et al.* (2007) and van der Walt *et al.* (2009) traditional foods are locally available and are low-priced for the low-income segments of the economy.

Traditional leafy vegetables are rich sources of protein, carbohydrates, dietary fibre, minerals (including iron, calcium, potassium and magnesium), vitamins (including vitamins A, C, E, K and many vitamins from the B group) as well as a diversity of phytonutrients (including beta-carotene, lutein and zeaxanthin) (Luthria & Pastor-Corrales, 2006). Indigenous leafy vegetables also comprise of small quantities of omega-3 fatty acids, which protect people from cardiovascular diseases (Nordeide *et al.,* 1996; Sundriyal & Sundriyal, 2001; Orech *et al.,* 2007; Kalita, 2014). According to Yang & Keding (2012), when compared with cabbage, amaranth has been found to contain 57 times more vitamin A precursor, 13 times more iron, and 8 times more calcium.

Traditional foods are collected from both cultivated and uncultivated lands and the knowledge about these foods is handed down from generation to generation, as part of the indigenous knowledge system of communities (Lwoga *et al.,* 2010). Elderly people cook and eat traditional foods because they have the information, expertise and time to cook traditional foods (Puoane *et al.,* 2006). Unfortunately, this knowledge of traditional foods-value, habitant and processing is not been passed on to the current youth since they are unappreciative of these dishes and associate these foods with poverty and so called 'backward knowledge' (van Rensburg *et al.,* 2004; van der Walt, 2009). The need to collect, document and preserve this knowledge before it becomes extinct and, therefore, unavailable for future generations is vital; this, additionally, can help maintain local cultures and traditions (van Rensburg *et al.,* 2004; van der Walt, 2009; Uusiku *et al.,* 2010).

Traditional foods have been part of the culture in many societies worldwide for many years, however, many of these foods are currently unappreciated, since their nutritional value is unknown (Keatinge, 2012). There is a necessity for people to become aware of the nutrient content and other properties of traditional foods to motivate them to include these in their day-to-day meals; only minimum efforts, however, have been made to evaluate the nutritional value of these foods. Nutrient content analysis will enable evaluation and highlighting of nutritional significance of traditional foods, which can lead to an enhanced understanding and appreciation of the worth of these foods (Pandey *et al.,* 2006).

1.2 Problem statement

Ireland *et al.,* (2002) and Egan *et al.,* (2007) point out that data on the nutrition composition of traditional dishes are fundamental for health academics and health experts, such as, nutritionists and dieticians. These professionals determine nutrient intake and examine the association between food and disease in populations, hence, the need for them to have exact

details on nutrient intake. Data on traditional dishes' nutritional composition are the foundation for improvement in the dietary pattern of a population (Trichopoulou *et al.,* 2007; Herselman & Du Plessis, 2011).

In the deprived rural societies of South Africa, the consumption of traditional food is predominantly significant for women and children (Shackleton *et al.,* 2002a; Vorster & Jansen van Rensburg, 2005). Lack of data on the nutrient composition of traditional mixed-dishes within the South African food composition tables, makes it difficult for nutritionists and dietitians to determine the dietary intake of communities. At the same time, there is partial understanding of the nutritional worth of most indigenous foods and this makes it difficult to estimate the nutrient intake of populations that still rely on these food items (Flyman & Afolayan, 2006). These factors usually result in underestimation or overestimation of nutrient intake in these populations.

Elderly people remain the most valuable sources of information, but this knowledge is quickly vanishing as the older people pass on, hence, placing some urgency on the need for the documentation of knowledge on traditional food (Masarirambi *et al.,* 2010 & Vorster *et al.,* 2007). The United Nations Educational Scientific and Cultural Organization (UNESCO, 2007) & the European Union (EU, 2007) report that there is a rising loss of food heritage, owing to the scarcity of experienced experts on traditional food, including older generations, to pass the skills and knowledge onto the young generation. Knowledge on the preparation and use of traditional foods needs urgent scientific investigation and documentation before it is irreversibly lost to future generations (Uusiku *et al.,* 2010). There is, thus, a growing concern amongst countries regarding the possible loss of food knowledge of traditional foods, specifically, amongst the youth (Kamaruddin *et al.,* 2010; Almli *et al.,* 2011; Bonanno, 2011). The documentation of knowledge on traditional food, therefore, will make sure that the cultivation and consumption of these foods will be sustained (Dweba & Mearns, 2011).

In addition, several studies have been conducted, with the focus on nutrient analysis of individual traditional leafy vegetables but not as mixed-dishes (Nesamvuni *et al.,* 2001; Jansen van Rensburg *et al.,* 2007; Odhav *et al.,* 2007; Uusiku *et al.,* 2010; Schonfeldt & Pretorius, 2011; van Jaarsveld *et al.,* 2014). This study aims to determine the nutrient composition of traditional mixed-dishes, so that, secondly, the results can be included in the South Africa's food composition tables.

1.3 Aim of study

The aim of this study is to determine the nutritional composition of traditional mixed-dishes eaten by elderly women in the Vhembe District.

1.4 Objectives of study

The objectives of this study are:

- To identify traditional mixed-dishes eaten by elderly women.
- To determine traditional cooking methods of traditional mixed-dishes eaten by elderly women.
- To assess the consumer acceptability of traditional mixed-dishes.
- To determine the nutritional composition of traditional mixed-dishes.

1.5 Significance of study

Upon completion of the study, the results may assist nutrition professional with enhancing the current nutrition education programmes so as to help combat malnutrition in South Africa, by promoting the health benefits associated with the consumption of traditional mixed-dishes. The objectives of the study include determining traditional cooking methods, hence, this may assist the community at large with preparation methods of traditional mixed-dishes.

Additionally, the results may be incorporated into the South African food composition tables and this can aid nutrition professionals with the determination of dietary intake and intervention strategies for addressing micronutrient deficiencies and malnutrition in communities that still consume traditional foods. The results will also be available at the University of Venda's library to provide insights on the nutrient composition of traditional mixed-dishes for further academic research.

1.6 Organisation of the dissertation

This dissertation is written in article format. Chapter one outlines the Introduction, Problem statement, Aim, Objectives and Significance of the research study. Chapter two is a Literature review. Chapters three to five report the investigation conducted to achieve each specific objective of the study.

The following format was utilized in Chapters 3 and 4: Summary of the research design, Study population, Sampling design and procedure, Data collection, Data analysis, Quality assurance, Ethical considerations, Presentation of results, Discussion and Conclusion.

In Chapter 5, the following format was used: Selection of traditional mixed-dishes, Collection of samples, Preparation of samples, Methods of analysis, Sensory evaluation procedure,

Statistical analysis, Ethical considerations, Presentation of results, Discussions and Conclusion. The final chapter presents the General conclusion and Recommendations for policy designers and further research.

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CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

Van Wyk & Gericke (2000) report that South Africa is a nation with rich cultural variety and biodiversity, with numerous people still utilizing a variety of traditional food. Several studies have revealed the significance of traditional foods and various recipes of particular groups of people (Jansen van Rensburg *et al.,* 2007; Twine & Hunter, 2007; Faber *et al.,* 2010; Uusiki *et al.,* 2010). Traditional foods have been the main source of nutrition for several rural communities, over centuries (Frison *et al.,* 2005) and they represent foods and dishes consumed over the long-term by generations. Traditional foods are differentiatedfrom other dishes with regard to their utilization of ‘’traditional ingredients’’(Weichselbaum *et al.,* 2005; Saunders, 2010; Kristbergsson & Oliveira, 2016).

Luke (2013), explains ‘cooking’ as the knowledge and dexterity of preparing food for consumption, with the utilization of heat. The majority of foods are prepared before ingesting them to enhance lusciousness, feel and pleasure to the palate (Migliot *et al.,* 2008). According to Grivetti and Ogle (2000), African people’s food selections show the consumption of an inadequate number of domesticated plants staples, while the consumption of comestible desolate plant species that once sustained health and nutritional status is curtailed. Regardless of certain cultures indicating a reduction in the consumption of traditional, foods mainly owing to the non-availability of traditional foods in certain populations and regions, other communities are, nevertheless, continuing with the consumption of traditional foods (Grivetti and Ogle, 2000).

Studies conducted in different parts of South Africa reveal diversities in cultural lifestyles regarding various traditional foods and the habit of combining traditional foods into mixed-dishes is something that is usual (Nesamvuni, 2000). Traditional foods eaten by communities, over a long period of time are significant parts in creating native uniqueness, culture and transference of cultural heritage, from generation to generation (Inamdar *et al.,* 2005; Albayrak & Gunes, 2010). The perceived nutritional value of these traditional foods has motivated organisations, like the Agricultural Research Council (ARC) to encourage the cultivation of traditional vegetables by farmers, particularly women and other nutritionally at-risk groups (Chetty, 2013).

2.2 Consumption of traditional foods

Over centuries, traditional foods have been the key source of nutrition (Frison *et al.,* 2005) and are features of numerous traditions around the world, consequently adding to cultural identity

and the gratification of societies (Bessiere, 1998; Weichselbaum *et al.,* 2009; Licitra, 2010; Almli, 2012). Tontisirin (2010) writes that traditional Asian-Pacific diets are still characterized by an expansive variety of traditional food, such as, the well-known Som Tum, an indigenous dish from the Esan tribe in Thailand. In SSA and West Africa, in particular, there are diverse agricultural ecosystems for the production of a wide range of traditional foods, which rural people still include in their diet today (Tontisirin, 2010). Parsons (1993) and Bundy (1988) report that in South Africa, different cultures have a tradition of consuming comestible plants gathered from the wild, which constitute many traditional mixed-dishes. The majority of South Africa's rural inhabitants live on common lands of the former homelands, where destitution is common, thus resulting in traditional foods being the only guarantee of a nutritious diet (Cousins & Adams, 2001; Vurren, 2006).

Traditional foods represent the backbone of a variety of indigenous food systems of societies in developing countries; these foods also conserve the cultural heritage of local communities (FAO, 2014). In South Africa, consumption of traditional food, in both rural and urban regions, has ensured that the knowledge, expertise, skills and technologies for processing traditional foods have been preserved (Jansen van Rensburg *et al.,* 2007). Affordability of these foods in the rural regions (owing to local production) is deemed one of the most convincing motives why traditional foods are still eaten in these segments of South Africa (Faber *et al.,* 2010; Cloete & Idsardi, 2013,). Matenge *et al.* (2012) buttressed this notion by affirming that rural communities deem traditional foods as being more economical than "contemporary'' foods, as they are locally grown, therefore, obtainable in abundance.

Societies traditionally make use of a variety of locally-obtainable food resources in their diets. In SSA, indigenous leafy vegetables are essential dietary elements and have been identified as fundamental ingredients of soups or sauces that complement carbohydrate staple (Smith & Eyzaguirre, 2007). Shackleton (2005) attests to regular consumption of traditional leafy vegetables amid rural populations in SSA. According to Cloete and Idsardi (2013) almost 52% of South African households still incorporate traditional leafy vegetables (TLVs) in their diet, indicating the fundamental role that these plants play in maintaining food security, in such households. In underprivileged rural societies, the use of traditional food is very significant for women and children (Shackleton *et al.,* 2002a, Vorster & Jansen van Rensburg, 2005). Nesamvuni *et al.,* (2001) also confirm that the consumption of leafy vegetables was extensive in rural societies of South Africa, with over 90% of households consuming these vegetables.

With an increasing 'middle class' in places like Asia, transformations are evident in the make-up and pattern of traditional Asian-Pacific diets. This is also owing to the dietary transformation

globalization that has intensified the consumption of fats and refined carbohydrates (FAO, 2006-2008; Pingali, 2007). Uusitalo & Pushka (2003) note that these transformations have encompassed modifications in the direction of higher energy-dense diets that are categorized by augmented consumption of fat and added sugars, saturated fat intake (mostly from animal sources) and decreased consumptions of complex carbohydrates, dietary fiber, fruits and vegetables. Similar trends are also visible across emerging countries, where socio-economic transformations are adding to modifications in dietary patterns and traditional food behaviors. These modifications have an important impact on various health complexities encountered by deprived societies (Mendez *et al.,* 2005). Recent reports reveal that the Sub-Saharan population is under an increased threat of undernutrition, as an outcome of the transformations in the traditional food systems and dietary patterns (Sneyd, 2013; FAO, World Food Programme & International Fund for Agricultural Development, 2014); International Food Policy Research Institute, 2014). These modifications from varied traditional dishes to more simplified and monotonous diets, have led to an increased intake of rice, maize and wheat products, therefore, a decrease in the intake of traditional foods that are abundantly obtainable within the African region (Frison *et al.,* 2006; Keller *et al.,* 2006; Pingali, 2007; Penafiel *et al.,* 2011).

Additionally, the transformation in the everyday life has, to some extent, been allied with the loss of indigenous African knowledge on the utilization and preparation of many traditional food dishes (Maundu, 1996; Akpavi *et al.,* 2008). In places like South Africa and Togo, undesirable comments concerning traditional foods have been recorded as they are labelled as “food for the underprivileged by the sophisticated segment of the urban occupants in Africa, ensuing in their desertion and rejection” (Akpavi *et al.,* 2008; Dweba & Mearns, 2011). Termote *et al.* (2012) state that these comments have been validated by some recent case studies among the forest-reliant communities of Kisangani in the DR Congo, the Guizga tribe in Cameroon and residents of Lama Forest Reserve in Benin (Hamawa, 2013; Boedecker *et al.,* 2014).

Transformation of South African rural communities has resulted in a deterioration in the knowledge of the worthiness of traditional foods, hence, the decrease in consumption of these foods (UNICEF, 2008). According to Matenge *et al.,* (2012), a reduction in traditional food intake, in South Africa, is mainly motivated by concerns regarding health, nutrition and food safety, along with tradition and culture; with the latter giving particular beliefs and insights concerning the supposed unsavoury nature of such foods. This has created a reluctance to the intake of traditional food (van der Merwe *et al.,* 2016). Various studies in South Africa have reported a decline in the usage of leafy vegetables, which are some of the ingredients used in

the preparation of traditional mixed-dishes (Nesamvuni *et al.,* 2001; Modi, 2003; Mbhenyane *et al.,* 2005). Even in remote rural parts of South Africa, a decrease in the consumption of these leafy vegetables, particularly those that are collected from the wild or those seen as weeds, in favour of exotic vegetables, has been recognized. This was demonstrated from a case study conducted by Jansen van Rensburg and Vorster (2005) in three locations of the previous Transkei in the Eastern Cape Province, where a decrease in the consumption of these leafy vegetables, in all the three locations, was reported. This dietary modification, particularly, in deprived rural societies put the people at peril of malnutrition and nutrition related non-communicable diseases (UNICEF, 2008, Kwapata & Maliro, 1995).

2.3 Traditional cooking methods

According to van Averbeke & Juma (2006a), traditional cooking methods include exhaustive boiling, which may comprise of the throwing away of the first cooking water and replacing it with new water to continue the boiling; this is particular so in the case of bitter-tasting leafy vegetable, such as Solanum retroflexum. Steaming includes the use of very limited amounts of liquid water, which is convetered into steam. Steaming reduces preparation time when compared to boiling. Steaming can be applied when cooking for example pumpkin leaves and flowers. The ingredients of traditional foods are usually dependent on what are accessible in the vicinity (Keller, 2005). Furthermore, recipes used to cook different traditional foods tend to be similar within specific cultural groups, thus, restricting culinary variety.

Raschke *et al.,* (2007), state that food preparation practices have transformed over time. From the 1930s to 1960s, in East Africa, boiling and, infrequently roasting were the major food preparation methods compared to the present practices which favour shallow and deep-frying of foods. The change towards frying as an alternative to boiling vegetables and other foods in urban areas, however, has not produced any unique urban recipes calling for new methods. People have a tendency to stick to food practices, therefore, cooking methods learned in early childhood have been maintained even if people move from rural to urban areas (Sodjinou *et al.,* 2009). The dearth of research on the nutritional composition of traditional food has resulted in a shortage of information about the significance and preparation of these foods (Fox & Norwood Young, 1982).

2.4 Measurement of food acceptability

Stone *et al*., (2012) state that sensory examination is a significant tool - in food product expansion, in measuring food product variations, in determining characteristics of food products and in demonstrating product acceptability. Sensory analysis is a scientific discipline used to comprehensively measure, evaluate and construe responses to food qualities as such

examination is performed through the five senses: sight, smell, taste, touch and hearing (Oliveria, 2011; Stone *et al.,* 2012).

Sensory qualities comprise of everything from appearance to texture. Appearance traits take account of the colour, size, shape and opacity or clearness of the food product (Stone *et al.,* 2012). The aroma of the food product is significant with certain kinds of food products requiring a check to see if there are any tainted odours. Texture is a significant part of the consumption experience; sensory tasting is used to check if the food product is, for example, crunchier than what the consumer would anticipate. Flavour is also used to check if the food product's flavour is like the concept (Stone *et al.,* 2012).

Sensory analysis is a central aspect of research and development of a food product (Stone *et al.,* 2012). Sensory assessment can be used to compare resemblances/variations in dishes/products, assess a variety of current dishes/food products, evaluate food samples for enhancements, measure responses to a dish/product (for example, acceptable vs. unacceptable), determine particular features of an ingredient or dish/food product, check whether a final dish/food product lives up to its original description and offer impartial and individual response data to allow comprehensive choices to be made (Food- a fact of life, 2010 & Stone *et al.,* 2012). Affective tests measure individual response by potential consumers to a dish/product, a food product concept or product characteristics. Stone *et al.* (2012) suggest that consumers be used for these tests and that all the panel members must be selected for the dish/food product usage, and must be involved in the evaluation.

Affective tests of acceptability and preference gauge individuas' assertiveness about a dish/food product. Lawless & Heymann (2010) note that the hedonic scale tests are common examples of affective tests; these tests are methods for gauging the people's level of fondness for dishes/food products. Samples are offered in sequences and the panellists are requested to indicate how much they like or dislike each dish/product listed on the scale. The 9 point hedonic scale is, therefore, commonly used in sensory evaluation to gauge the satisfactoriness of developed recipes (Lawless & Heymann, 2010).

2.5 Nutrient composition of traditional food

Traditional foods are rich in macronutrients such as, fibre, starch, proteins, fats as well as vitamins and minerals (Odhav *et al.,* 2007; Makobo *et al.,* 2010; Kwenin *et al.,* 2011). Numerous studies that were conducted in South Africa have also recorded high nutrient content of traditional leafy vegetables, including *Corchorus olitorius* (jew's mallow), *Clemome gynandra* (cat whiskers), *Solanum nigrum* (nightshade) and *Vigna inguiculata* (cowpeas)

(Mnkeni *et al.,* 2007; Ndlovu and Afolayan, 2008; Akula and Odhav, 2008; van der Walt *et al.,* 2009). Furthermore, Ndlovu and Afolayan (2008) discovered that the magnesium content of *C. olitorius,* a leafy vegetable eaten by many societies around South Africa was greater than that of cabbage (Brassica oleraceae) and spinach (Spinacea oleracea).

In Europe, traditional diets of the people of the Mediterranean areas have remained the focus of a series of phytochemical and phytopharmacological studies in past years; these have proved their role in counteracting metabolic diseases and being remarkable anti-oxidants (Nomikos *et al.,* 2007; Conforti *et al.,* 2011; Vasilopoulou & Trichopoulou, 2011; Fragopoulou *et al.,* 2012; Marrelli *et al.,* 2014). These days, people are progressively considering traditional food products, as they comprehend them as food products of superior quality with positive health benefits, within the modern-day European cuisine (Willet, 2006; Gellynck & Kuhne, 2007; Banterle *et al.,* 2008; Guerrero *et al.,* 2009; Jordana, 2010; Adams & Salois, 2012).

Most traditional foods are rich sources of vitamin A that appears as provitamin A carotenoids, such as β-carotene (Uusiku *et al.,* 2010; van Jaarsveld *et al.,* 2014). Njume *et al.,* (2014) have identified substantial quantities of vitamin C, riboflavin and folate in various genera of *Amaranthus.* Mnkeni *et al.* (2007) assert that 100 g of these leafy vegetables, when prepared with no oil can donate 45% of daily vitamin A requirement. To avert developing many non-communicable diseases, nutrition professionals have advocated for people to consume food comprising of more than 400 g/day of fresh vegetables and fruits, particularly, in SSA where numerous people are at a risk of suffering from vitamin A deficiency (Venneria *et al.,* 2012).

Tontisirin (2010) reveals that *Som Tum*, a traditional dish from the Esan tribe in Thailand is high in fiber, endows protein, and is a good source of carotenoids, flavonoids and polyphenols. Kuhnlein *et al.* (2009), report on traditional foods and the FAO has revealed that diets of tribal communities in designated areas of India and Thailand, offer 59% and 85% of dietary energy respectively; these originate from foods made available from local production. Equally important, considerable quantities of vitamins D, E, K, thiamine, niacin, riboflavin, folate, pantothenic acid, pyridoxine and cyanocobalamin have been identified in many African traditional food (Akubugwo *et al.,* 2007a; Uusiku *et al.,* 2010; Erukainure *et al.,* 2011); these can be obtained in substantial quantities, in many types of *Amaranthus, Cucurbita, Solanum, Brassica* and *Cleome*. Folate amounts ranging between µg/100 g and 217 µg/100 g have been recorded in some Amaranthus genera including *Amaranthus hybridus* and *A. thunbergii* (van der Walt *et al.,* 2009). According to van der Walt *et al.* (2008; 2009), if traditional leafy vegetables are eaten daily, these may, possibly, be a significant source of dietary folate. Antioxidant and anti-inflammatory functions of folate and other elements of TLVs are very

essential to better the health of a lot of South Africans who are at peril of cardiovascular diseases and to sustain the increased folate requirements of pregnant mothers (van der Walt *et al.,* 2008; 2009).

Traditional foods are essential sources of dietary minerals, such as iron, zinc, calcium, magnesium, sodium, potassium and phosphorus (Odhav *et al.,* 2007; Aukbugwo *et al.,* 2007a; van der Walt *et al.,* 2009). Furthermore, Amaranthus, Solanum nigrum, Cleome gynandra and other dark African leafy vegetables have been recorded as exceptional sources of iron (Kumari *et al.,* 2004; Faber *et al.,* 2007; Maina and Mwangi, 2008; van der Walt *et al.,* 2009). Iron plays a key role in the formation of haemoglobin and the regular operations of the central nervous system (Odhav *et al.,* 2007). Its value in the regulation of anaemia, particularly in children and pregnant mothers residing in malaria-endemic regions of Africa have been identified (Akubugwo *et al.,* 2007a,b; Uusiku *et al.,* 2010). According to Akubugwo *et al.* (2007a,b), proportions of, particularly, sodium/potassium are important in the regulation of high blood pressure, while calcium and phosohorus play key roles in the growth and preservation of bones, teeth and muscles. Gropper *et al.* (2005) recommend the consuming of meals which have significant portions of green vegetables to guard against colon and stomach cancers. The high dietary fibre in traditional foods aids in regulating the digestive system, consequently assisting in maintaining bowel health and weight management (Panda, 2010). Numerous studies have revealed that high folate consumption from traditional foods, may, lower the possibility of colon polyps by 30 to 40 percent as against the low consumption of this vitamin, which might have the opposite effect (Yan, 2010).

Additionally, consuming traditional foods in abundance treats haemorrhoids, gallstones, obesity and constipation (Whitney *et al*, 2002). The antioxidants in traditional vegetables reduce the probability of heart disease and the vitamin K constituents of dark-green leafy vegetables provide several health advantages, including, protecting bones from osteoporosis and aiding with the fight against inflammatory diseases (Whitney *et al.,* 2002). Furthermore, traditional foods are acknowledged to be low in calorie, comprise of low carbohydrate constituents and contain a low glycaemic index. These physiognomies make traditional foods perfect for stimulating and upholding healthy body weight and when combined with the high fibre content, these foods also assist with decreasing type II diabetes (Whitney *et al*, 2002). Traditional foods are excellent sources of roughages, offering a stodgy matrix which arouses intestinal muscles and maintain them in functioning order, hence, averting constipation in people, through their laxative effect (Seidu *et al.,* 2012). Bioactive non-nutrient phytochemicals like flavonoids and hydrolysable have the possibility to decrease low-density lipoprotein, which is the cholesterol involved in placing fat in the arteries; consumption of these, thus, averts

blood clotting which can lessen the danger of a heart attack or a stroke (Onyeka and Nwambekwe, 2007).

2.6 Summary

Numerous studies have revealed the significance of traditional foods for societies. The prominence of traditional foods is embedded in their exceptional nutritional value and their capability to flourish under unfavourable environments (Nesamvuni, 2001; Jansen van Rensburg *et al.,* 2007; Smith, 2013). Traditional foods are economical; they are also essential sources of vitamin A, iron and calcium and can improve the nutritional status of both underprivileged rural and urban households who may, possibly, not be able to consume enough vegetables because of non-affordability in some urban locations (Chadha, 2003; Bichard *et al.,* 2005). Traditional foods can offer more than 20% of the Recommended Dietary Allowance (RDA) of protein and other nutrients (Kwapata & Maliro, 1995; Bhat & Rhubuluza, 2002).

The dearth of research on the nutritional composition of traditional food has resulted in a shortage of information about their significance as well as the preparation of traditional food (Fox & Norwood Young, 1982). Reports reveal that traditional foods are an essential constituent of the Sub-Saharan diet, particularly, traditional green vegetable species, however, insufficient documented scientific information on traditional foods and mixed-dishes is the main issue that motivates people's preference for exotic vegetables over the traditional leafy vegetables (Darkwa & Darkwa, 2013). There is, therefore, an increasing necessity for more research to be conducted on traditional food composition in South Africa. This will provide scientific information on the nutrient consumption of societies which still eat traditional food, thus, eliminate presumptions when judgements on the nutrient intake of such groups of people. In addition, this research will aid with the promotion of traditional food consumption to the population at large.

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CHAPTER THREE: IDENTIFICATION OF TRADITIONAL FOODS EATEN BY ELDERLY WOMEN IN VHEMBE DISTRICT

Abstract

Traditional foods are acknowledged by cultures as suitable and appropriate source of food. Indigenous leafy vegetables are still eaten in rural areas throughout South Africa, mainly, because they are regarded as an inexpensive source of nutrients with high accessibility. The aim of the study was to identify traditional mixed-dishes eaten by elderly women in Vhembe District. The study was ethnographic in nature and four elderly women from the Vhembe District were purposively sampled as the participants. Ethical approval was granted and data was collected through in-depth interviews. Data was analysed through thematic analysis and major themes and subthemes were determined. The results showed one main theme and eight sub-themes from the respondents' narratives during the in-depth interviews. Sixteen types of stiff porridge, eight types of traditional mixed-dishes, 23 types of indigenous leafy vegetables, eight kinds of traditional alcoholic beverages, indigenous fruit-based beverages, ground peanuts-based traditional dishes, various meats, edible insects and indigenous fruit-based products were documented. In conclusion, the current study revealed that elderly women possess vast knowledge about traditional mixed-dishes as well as other traditional foods. A large number (16) types of traditional stiff porridge found in this study, demonstrates the importance of stiff porridge as a staple food for the rural people in the studied population. The findings also provide evidence that there is great reliance on indigenous leafy vegetables as relish by rural communities.

Keywords: Traditional mixed-dishes, indigenous leafy vegetables, elderly women, traditional stiff porridge, indigenous non-alcoholic beverages, Vhembe district

3.1 Introduction

According to Food and Agricultural Organisation (FAO) reports, approximately 1 billion people, particularly in emerging countries, rely on edible plants in their diets (Unuofin *et al*., 2017). Shava (2000) explains that traditional foods, which include millet, wild green leafy vegetables, roots and tubers, fruits, legumes, palm oil, wild animal meat and maize. Traditional foods are defined as those with precise elements, which differentiate them distinctly from other analogous food products of similar groups with regard to either the use of traditional ingredients or traditional composition or traditional cooking methods (Weihselbaum *et al*., 2005). These foods are generally derived from traditional crops (sorghum, finger millet, legumes, cereals, cucurbits) and wild edible plants; they are more accessible to rural populations than contemporary foods (Modi, 2009; Shava, 2000).

Nesamvuni (2000) maintains that various rural communities through several generations have depended for their sustenance and nutritional requirements, on a comprehensive food base, which among others, comprises of traditional plants. In several traditional African cultures, the principal meal comprises of a starch staple such as "*vhuswa/vuswa*," complemented by a relish of either traditional leafy vegetable or meat or a combination of both, which offers other nutritional elements and flavour to meals (Heever, 1997). In Vhembe District, common traditional recipes consist of legumes, cereals, sorghum, cucurbits, indigenous leafy vegetables and insects.

Several traditional food plants, such as leafy vegetables, have been known for some time as having health-protecting properties and uses (Smith & Eyzaguirre, 2007). Traditional leafy vegetables are economical and readily available and they are increasingly being acknowledged as possible providers of both micronutrients and bioactive compounds such as vitamins and minerals, anti-oxidants and even anti-cancer factors to diets of communities in Africa (Omotoso, 2006). The International Centre for Research in Agroforestry in 2004, reported that minerals and vitamins found in traditional leafy vegetables (TLVs) surpass those found in exotic vegetables, like cabbage and that TLVs are also suitable to use with starchy staples as they contain ascorbic acid, which augments iron absorption. Furthermore, the high protein and vitamin composition in these vegetables can eradicate micronutrient deficiencies in children, pregnant women and the poor (Habwe *et al*., 2008). People diagnosed with diseases, such as HIV/AIDS, cancer and nutrition-related conditions, like high blood pressure and hypertension, have been counselled to consume TLVs because of their nutritional and medicinal values (Lyatuu *et al*., 2009).

Traditional food varieties are still surrounded by many negative perceptions, despite their many health and medicinal benefits. Traditional leafy vegetables are frequently deemed as underprivileged people's food, hence, reducing its potential widespread utilization (Voster *et al*., 2007a & 2007b). Despite this, diversifying diets with traditional food is a maintainable way to provide an assortment of nutrients to the human body, while fighting micronutrient malnutrition and related health problems, particularly for the poor rural and urban households of South Africa (FOA, 2011). The transmission of traditional food knowledge may contribute to personal skills that would correlate to food security, personal nutrition, therefore, improve community wellness (Norazmir *et al*., 2012). The current study aimed at identifying traditional foods eaten by elderly women in the Vhembe District.

3.2 Methodology

3.2.1 Study design

The study design was ethnographic. According to Creswell (2014), ethnography is a qualitative approach in which the researcher studies a cultural group in its natural setting y by gathering predominantly observational and interview data, over a length of time. The research was qualitative in nature.

3.2.2 Study population

The target population was elderly women residing in Limpopo Province; the accessible population was elderly women age 50+ years, and residing in Vhembe District. Elderly women are regarded as knowledge holders (key informants) and are predominately involved in food preparation.

3.2.3 Study area

The study was conducted in Vhembe District, which is one of five districts of the Limpopo province in South Africa. The district is in the northern part of Limpopo province, sharing boarders with Zimbabwe in the north, Mozambique through Kruger National Park in the east and Botswana in the north-west (Van Averbeke, 2013; Vhembe District Municipality, 2019). Vhembe District consists of all terrains that were part of the former Venda Bantustan. Two large densely-populated districts of the former Tsonga homeland of Gazankulu, in particular, Hlanganani and Malamulele were also amalgamated into Vhembe, hence, the ethnic diversity of the District (Vhembe District Municipality, 2016). The majority of the communities are rural (Statistics South Africa, 2007) and Tshivenda (67.2%) and Xitsonga (24.8%) are the most dominate languages spoken.

The District has an estimated total population of 1,393,949, of which 98.6% are Black Africans, 0.8% White, 0.4% Indian and 0.2% Coloured residing in 382,357 households (Stats SA, 2016). There are approximately 186,249 elderly persons in the District (Stats SA, 2016). According to Mpandeli (2014), the average annual rainfall is 820mm, with precipitation commencing in October and climaxing in January to February. Vhembe District is predominantly covered by three vegetation types, namely, the Soutpansberg Sandy Bushveld, Makuleke Sandy Bushveld and Musina Mopane Bushveld (Mucina & Rutherford, 2006). The extensive vegetation species and endemism add to the intricacy between traditional plant utilisation and plant-related cultural practices amongst the Vhavenda and Vatsonga (Mabogo, 1990).

3.2.4 Sampling

3.2.4.1 Sampling design

Vhembe District was sampled purposively, as this District comprises of two different ethnic groups, namely, Vhavenda and Vatsonga. For this study, Thulamela Municipality was purposively sampled as the researcher was able to easily access this Municipality since Thulamela Municipality serves the rural areas of Vhembe District. Purposive sampling was applied to select study respondents; this involved choosing information-rich individuals. These are individuals who are experts in the phenomenon being studied, to obtain in-depth understanding and information that would benefit the study (Brink & Wood, 1998; Patton, 2002; Green & Thorogood, 2004; Burns & Grove, 2011).

3.2.4.2 Sampling procedure

Four elderly women were purposively selected from four rural villages around Vhembe District - Dzimalwi, Lwamondo, Saselemani and Phaphazela. The purposive sampling method is frequently used when researchers want a sample of experts (Polit & Beck, 2008). The researcher selected and interviewed elderly women with the purpose of obtaining information about indigenous food, as this population is regarded as being knowledgeable about the foods being studied. To avoid the limitation of this sampling technique resulting in the interviewing of participants from a similar social network, the researcher interviewed respondents from two different ethnic groups – Vhavenda and Vatsonga elderly women. This assisted in widening the variety of information by tapping into numerous different social networks in the context of the respondents (Hennink & Simkhada, 2004).

3.2.5 Data collection

The researcher conducted in-depth interviews with elderly women using the following focus question:

- What type of traditional foods do you consume?

Interviews were conducted using the local languages, Luvenda and Xitsonga. The interviews were audio recorded on a digital voice recorder. At the beginning of the interview, each respondent was introduced to the researcher and the assistant researcher, who was responsible for operating the video recorder and assisting in taking notes for the Xitsonga interviews as the researcher is not fluent in Xitsonga. The study's aim and objectives were explained to the respondents; anonymity and confidentiality were also assured and voluntary participation was guaranteed. The participants orally consented for the audio recording of the sessions. The use of the local languages, Luvenda and Xitsonga, by the researcher widened the variety of information obtained as it made it possible to tap into the participants' different social networks (Hennink & Simkhada, 2004).

3.2.6 Data analysis

The in-depth interviews' transcripts were thematically analysed (Creswell, 2014). The tape-recorded information was transcribed verbatim to contribute to the trustworthiness of the data. The written transcripts were carefully translated from local languages (Luvenda and Xitsonga) to English and contrasted with the field notes to ensure accuracy and authenticity of the recorded information. The researcher reviewed the data to determine major themes and trends that emerged from the study; major themes and sub-themes were recorded, delineated and coded.

3.2.7 Quality assurance

Quality assurance was achieved through Creswell's principles of trustworthiness (Creswell, 2014). Credibility was attained by gaining participants' trust through lengthy interactions; this also allowed adequate time for in-depth interviews, conducting mock interviews with the fieldworker to gain experience in recording interviews and observing traditional cooking methods. Triangulation was achieved through verbatim transcription of the in-depth interview recordings, analogous data collection and handling as well as the de-briefing sessions with supervisors. Member-checks were ensured by follow-up interviews with respondents to validate their statements. Transferability was achieved by the purposive sampling, using the original statements as quotations when presenting the data and discussing the study results, supported by the existing literature from diverse sources. Dependability was attained by a rich thick description of methodology, training the fieldworker on data collection methods and procedures and corroborating the findings with the participants. Conformability was achieved by keeping a journal of field notes and transcripts, making available the complete details of the procedures and authenticating the raw data.

3.2.8 Ethical considerations

Ethical approval (Appendix A) was granted by the Higher Degrees and Ethics Committee of the University of Venda (SHS/17/NUT/04/2018). Before the commencement of the study, the selected respondents were asked to sign informed consent forms (Appendix B) by those respondents who could write and verbal consents were obtained from those who could not; this agreed that they were willing to participate, after the study aim and objectives were explained to them in their home languages. Respondents were guaranteed data confidentially and that the data obtained will only be used for the purpose of the study. Participation was voluntary and respondents had the right to withdraw from the study at any time without giving any explanations. The study was also conducted in accordance with the Declaration of Helsinki.

3.3 Results

3.3.1 Themes

One main theme emerged from the respondents' narratives - identification of traditional foods (Figure 3.1). Eight sub-themes also emerged from the interviews including - traditional mixed-dishes, traditional stiff porridge, indigenous leafy vegetables, ground peanut-based traditional dishes, meat and insects, indigenous fruit-based food products, indigenous fruit-based beverages and traditional alcoholic beverages.

3.3.1.1 Tabulated presentation of themes and sub-themes that transpired from the respondents' interviews.

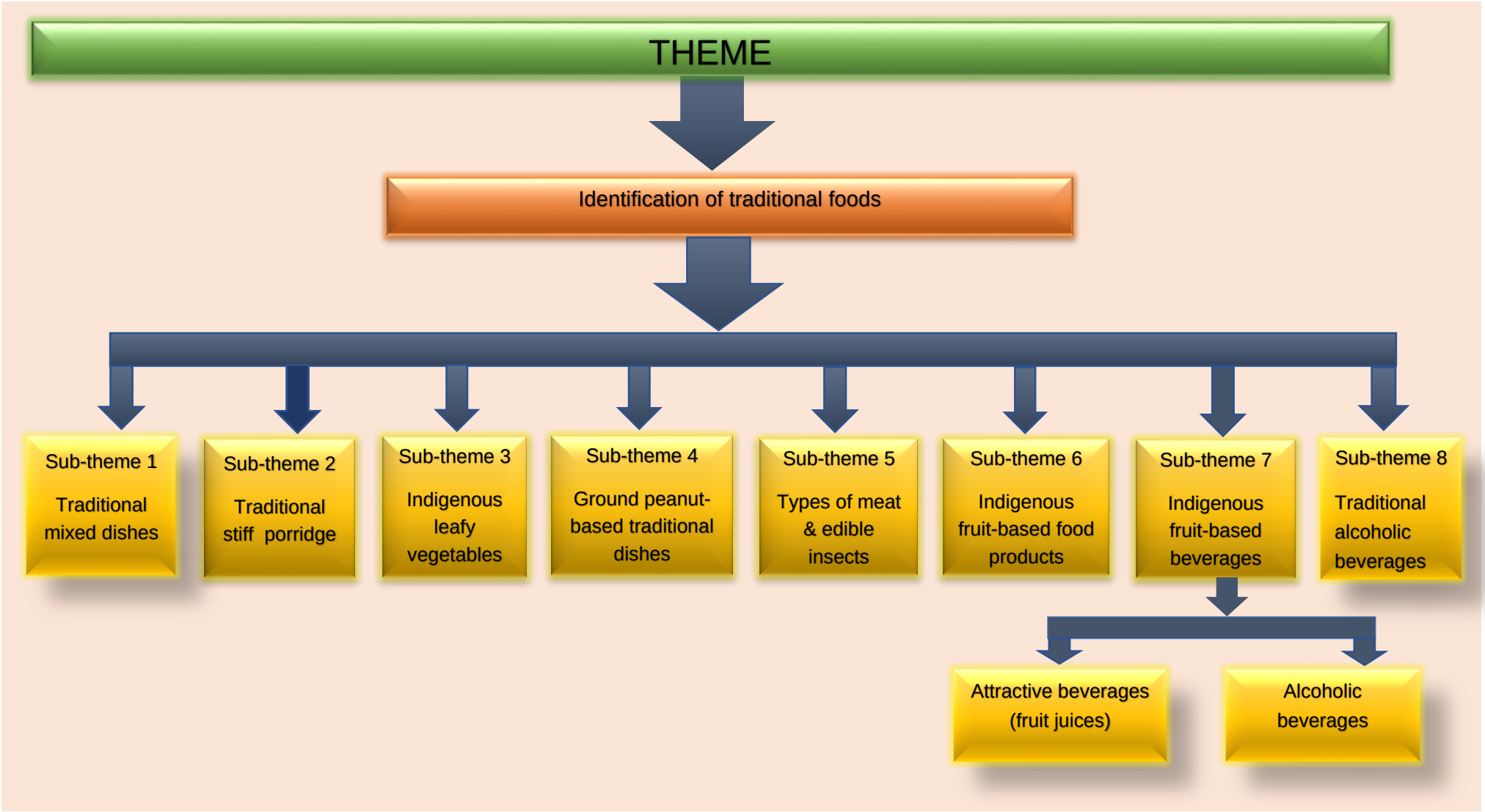

Figure 3.1: Schematic presentation of themes and subthemes.

3.3.1.2 Theme: Identification of traditional foods eaten by elderly women in Vhembe District

This section outlines the results and discussions of traditional mixed-dishes, traditional stiff porridge, traditional leafy vegetables, ground peanut-based traditional dishes, meat and insects, indigenous fruit-based food products and indigenous fruit-based beverages. All sub-themes analysed divulged extra information when respondents were asked about which other traditional foods they consume. Analysis of the findings discussed in this chapter addresses objective 1 of the study: to identify traditional mixed-dishes eaten by elderly women. Direct quotations from the respondents are also incorporated with the aim of giving an extensive description of the context.

When respondents were asked about which traditional mixed-dishes they consume, respondents said they eat - *tshidzimba/tihove, tshimbundwa/ximbundwa, thophi/tshopi, tshigume/xigugu, tshingwimbi/xingwimbi, xiendla hivomu, dovhi la mukusule/xiridza xa mukhusa and bovhola/xipaswi*. Table 3.1 presents traditional mixed-dishes consumed by the respondents.

Table 3.1 Types of traditional mixed-dishes

Tshivenda name	Xitsonga name	Description	Consumption
Tshidzimba	*Tihove*	Dish consisting of samp, red ground peanuts, bambara groundnuts, red speckled beans (optional), peanuts powder and salt; all ingredients are cooked together and mashed.	This is the most commonly consumed traditional mixed-dish amongst the Vhavenda and Vaxtsonga people and it is still being consumed but during special occasions, like weddings and cultural ceremonies.
Tshimbundwa	*Ximbhundwa*	Dish comprising of ground peanut powder, semi-dried mealie powder and salt combined into a dough, and cooked using the steaming method.	This dish was mostly consumed in the past when people were experiencing food shortage and while waiting for maize harvest. Nowadays, it is rarely prepared, and when prepared, it is eaten mainly with tea for breakfast or as a snack.
Thophi	*Tshopi*	Dish containing pumpkin, maize meal and sugar (optional) cooked together and mashed.	This dish was usually eaten in the past during pumpkin season; this was mostly during summer. It is still prepared nowadays but during selected occasions, such as cultural ceremonies and weddings
Tshigume	*Xigugu*	Dish made up of fried maize kernels, fried whole ground peanuts and salt, which are pounded together with wooden mortar and pestle into paste form.	*Tshigume/xigugu* was usually prepared in the olden days for people who were travelling long distances. It was both to satisfy hunger during the journey and because of its ability to last for a long periods without spoiling, but it is rarely prepared these days and when prepared, it is eaten as a snack.
Tshingwimbi	*Xingwimbi*	Dish consisting of pumpkin, peanut powder and salt; cooked together and mashed.	This dish was commonly prepared in the past during cultural rituals and other celebrations. Today, it is still prepared during special occasions like weddings and cultural ceremonies.

	Xiendla hivomu	Dish made from maize kernels, ground peanuts, ground peanut powder and salt, which are cooked together but are not mashed.	This is a dish eaten by Vatsonga. *Xiendla hivomu* was a common dish in the olden days but these days it is prepared during particular events, such as cultural events and celebrations.
Dovhi la mukusule	*Xiridza xa mukhusa*	Dish made from ground peanuts which are cooked to a gravy consistency together with sun-dried pumpkin leaves and flowers or sun-dried cowpea leaves and salt. (Sun-dried vegetables were cooked before drying).	This dish was mostly consumed during winter in the olden days because peanuts easily spoil in summer but nowadays this dish is prepared during special occasions only.
Bovhola	*Xipaswi*	Dish containing pumpkin leaves, pumpkin flowers and young pumpkin, ground peanut powder and salt; cooked together and mashed.	This dish was commonly consumed in the past, during ploughing season in summer. These days it is consumed throughout the year as pumpkin leaves, its flowers and young pumpkin are available throughout the year, through cultivation.

"Tshimbundwa (Figure 3.2) was usually consumed in the past when there was a shortage of food in the household because of its ability to satisfy hunger for quite some time. Scarcity of food was experienced while awaiting for harvest of the maize crops. Tshigume/xigugu was mostly prepared for people who were travelling long distances so as to satisfy hunger during their journey", said participants 1 and 2.

Figure 3.2: Tshimbundwa

3.3.1.3 Types of traditional stiff porridge

The respondents identified sixteen types of traditional stiff porridge which were *vhuswa ha luvhele/tshithumbuthumbu/vuswa bya n'wahuva, vhuswa ha makhaha/vuswa bya makhaha, vhuswa ha mavhele/Xibasa, vhuswa ha mutore, vhuswa ha mufhumbu, vhuswa ha munamba, vhuswa ha mutuku wa dini/dini ra mavele, vhuswa ha mutuku wa munzelu, vuswa bya xitatana, vuswa bya xipepenene, vuswa bya zakhomi, vhuswa ha tshisese, vhuswa vhutete, kwangwali ya mbuyu, kwangwali ya pfuka and kwangwali ya thombe*. Table 3.2 illustrates types of traditional stiff porridge consumed by the study respondents.

Types of stiff porridge are derived from different types of indigenous grain crops, such as pearl millet (*luvhele*; *Figure 3.3)* and sorghum (*makhaha*, *Figure 3.4*) and maize crops (*mavhele; Figure 3.5*). Furthermore, there are different maize grain varieties, such as *gororo* (dark grey maize grains*), mutonga, thomana, mavhele* (yellow maize grains) *and tshikundanwedzi* (white maize grains). Maize crops are mainly ploughed during summer and without any milling can be eaten as sweet corn - either boiled or grilled. When maize crops are dry, they are harvested and processed into maize meal.

Figure 3.3 Pearl millet plants

Figure 3.4 Sorghum grains

Figure 3.5 White and yellow maize ears

Table 3.2 Types of traditional stiff porridge

Tshivenda name	Xitsonga name	Description	Consumption
Vhuswa ha luvhele	*Vuswa bya n'wahuva*	Stiff porridge cooked with homemade pear-millet flour and water.	This type of stiff porridge was one of the main staple food before the introduction of maize crops. These days, this type of stiff porridge is rarely consumed as people favour maize grains over other grains used to prepare stiff porridge.
Vhuswa ha makhaha	*Vuswa bya makhaha*	Stiff porridge cooked with sorghum flour and water.	Sorghum stiff porridge was also one of the key staple foods in the past, and even though it is still consumed today, the rate has decreased due to the introduction of maize grains that gives more yield than sorghum.
Vhuswa ha mavhele	*Xibasa*	Stiff porridge cooked with sifted homemade yellow/white maize flour and water.	Since the introduction of maize crops, this type of stiff porridge has, today, become the main staple food against the other indigenous grain crops.
Vhuswa ha mutore	*	Stiff porridge cooked with liquid from whey (water substance from fermented milk) and homemade yellow/white maize meal and water.	This stiff porridge was cooked in the past only during special occasions, but it is rarely consumed today.
Vhuswa ha mufhumbu	*	Stiff porridge cooked with refined maize-bran of homemade yellow/white maize meal, mealie rice and water.	This stiff porridge was consumed in the olden days and the consumption still exists today.
Vhuswa ha munamba		Stiff porridge cooked with fresh milk, mealie rice and homemade yellow/white maize meal and water.	This stiff porridge was prepared during special events and cultural rituals in the past. This practice still exists today.
Vhuswa ha mutuku wa dini	*Dini ra mavele*	Stiff porridge cooked with fermented slurry of refined maize-bran of homemade yellow/white maize-meal and water.	This stiff porridge was consumed in the past and it is still being consumed today. Maize-bran was fermented in the past to avoid spoilage and to add a sour taste to the stiff porridge. This porridge is still being consumed, especially, for its sour taste.
Vhuswa ha mutuku wa munzelu		Stiff porridge cooked with water from fermented refined maize-bran of homemade yellow/white maize meal, mealie rice and water.	This stiff porridge was consumed in the past and it is still being consumed today. Maize-bran was fermented

			in the past to avoid spoilage of stiff porridge and to add a sour taste to stiff porridge. This porridge is still being consumed, especially, for its sour taste.
Vhuswa ha mbongo	*Vuswa bya xitatana*	Stiff porridge cooked with sifted homemade yellow/white maize meal made from semi-dried mealies and water.	This stiff porridge was consumed in the pas, in times of hunger, while waiting for harvest period of maize grains. This type is no longer made.
*	*Vuswa bya xipepenene*	Stiff porridge cooked with un-sifted homemade yellow/white maize meal made from semi-dried mealies and water.	This stiff porridge was consumed in the past, in times of hunger, while awaiting for harvest period of maize grains. This type is no longer made.
*	*Vuswa bya zakhomi*	Stiff porridge cooked with unfermented refined maize-bran, homemade yellow/white maize-meal and water.	This stiff porridge was prepared and eaten on the same day; it was prepared without fermentation of the maize-bran as result of food shortage. This type is no longer common.
Vhuswa ha tshisese	*	Stiff porridge cooked with mealie rice, homemade yellow/white maize meal and water.	This stiff porridge was consumed in the past and it is still eaten even today.
Vhuswa vhutete		Stiff porridge cooked with water and sifted homemade yellow/white maize meal	This stiff porridge was consumed in the past and it is still eaten today.
Kwangwali ya mbuyu	*	Stiff porridge cooked with water from boiled baobab fruit (*Adansonia digitate)* and homemade yellow/white maize meal.	Stiff porridge made from fruits was eaten in past but the practice no longer exists due to unavailability of indigenous fruits.
Kwangwali ya pfuka	*	Stiff porridge cooked with liquid from ground [1]*Grewia microthyrs (L.F.) kuntze* and homemade yellow/white maize meal.	Stiff porridge made from fruits was etean in past and the practice no longer exists due to unavailability of indigenous fruits.
Kwangwali ya [2]thombe	*	Stiff porridge cooked with liquid from mashed thombe and homemade yellow/white maize meal.	Stiff porridge made from fruits was eaten in past, but the practice no longer exists due to unavailability of indigenous fruits.

***** Stiff porridge not reported by either Vaxtsonga or Vhavenda.

[1] Common name was not found. **[2]** Scientific and common names were not found.

Before grain crops can be used to prepare stiff porridge, they undergo some processes; several stages of these traditional processing are described below.

i) Traditional cultivation of fields

In the olden days, ploughing of fields was undertaken by *davha* or *tshilembe. Davha* refers to a large group of people working together. In the past, community members would alternate and gather, mainly, at the chief's kraal to plough fields belonging to the chief and his relatives. The chief and his family would provide the village members with food and traditional beer. According to respondent 1 and 2, *"in the past women would prepare traditional beer that will be given to community members ploughing at the fields. While at the fields during the first break, people will sit down and drink tshikesa (first drink of the traditional beer). After then, people will continue ploughing, while others cook pap and meat.*

Tshilembe refers to different families jointly cultivating each other's fields. Families would help plough one another's field so that they could finish cultivating the fields before the rainy period which was usually between January and February. *Tshilembe* differs from *davha* in the sense that *tshilembe* is done among ordinary families while *davha* is done by village members for the chief and his close relatives.

ii) Harvest and storage

Maize ears are harvested either fresh or when completely dried. Fresh maize ears are eaten as sweetcorn and dried maize ears are processed into maize flour used for porridge and other products. Maize ears are hand-harvested in subsistence farming.

When maize ears are harvested, they can be stored in *tshisiku*, an open or close *tshitatari* or *dulu*. If the harvest is plentiful, men would dig a big hole in the ground called *tshisiku* which is well covered with leaves. People would store their harvested maize ears with leaves still attached and cover the storage with *mueneene (Anthocleista grandiflora Gilg)* leaves and bamboo sticks collected from the river. If the harvest is small, men would build an open or closed storage called *tshitatar*i (Figure 4.6) for storing dried maize ears without leaves. A small harvest can also be stored inside a *dulu*, which is a maize storage built from mud bricks and covered with hay. *Tshitatari* differs from *tshisiku* for the former is built from thick sticks and hay if it is closed and is elevated from the ground with wood, whereas the latter is made by digging a big hole in the ground and covering it with hay, sticks and leaves.

Figure 3.6: A closed tshitatari

iii) Traditional preparation of maize meal

In the past traditional maize meal processing was predominately performed by women and young girls. According to the participants, traditional maize-meal processing is still being practiced, such as pounding maize kernels with a wooden mortar and pestle known as *u thohola* and then separated (*u fhefhera)* from its bran using *luselo* (Figure 3.7).

Figure 3.7: Luselo with fried yellow maize kernels

Maize meal being traditionally prepared by using a wooden mortar and pestle (mutuli na muse), was confirmed by respondents *1, 2, 3 and 4.*
"*The pounded maize kernel pieces are washed in water to removes any impurities and removed from the water to dry. After drying, the maize corn pieces are further pounded using a wooden mortar and pestle until the maize corns change into powder form - maize meal",* said respondents *1*, 2, 3 and 4.

After the pounding, the maize meal is sifted with a sieve called *galatshane* and then sun-dried for 3-4 days, depending on the amount of sunshine needed to remove all the moisture to avoid spoilage and extend shelf-life. Once dried, the maize meal is sifted again using a different sieve known as *(shefo),* through a process called *u shefulula* to remove any impurities that might have been gathered during the sun-drying.

"However, luvhele flour is prepared slightly differently from the above-mentioned mavhele meal", said respondent 2.

When *luvhele* flour is being prepared, pearl millet seeds are pounded using a wooden mortar and pestle. The pounded seeds are separated from its bran and roasted in a pot over an open fire then washed in cold water and sun-dried. When the pieces of pearl millet seeds are dried, they are processed into flour at the mill.

iv) Preparation of stiff porridge

The different types of stiff porridge obtain their colours from the type of grain crop used in the production of the flour, such as the brown colour of sorghum and the yellow and white colours of maize meal.

"*Gororo (tshithumbuthumbu) maize grains are grey in colour, tshikundwanwedzi is white, mavhele is yellow, luvhele is dark grey in colour and sorghum is brown",* said respondent 2.
In the olden days, women used to also cook stiff porridge from indigenous fruits' pulp and flavoured water. The fruit pulp or water was mixed with homemade maize meal to cook stiff porridge called *kwangwali*. Fruits, such as *thombe*, *pfuka* (*Grewia microthyrs (L.F.) kuntze*) and *mbuyu* (baobab tree fruit) were usually used to make fruit-flavoured stiff porridge. These fruits were mainly found in the mountains, but unfortunately, they have become extinct except for baobab tree fruit, which is still available today.

3.3.1.4 Types of indigenous leafy vegetables

A total of 23 traditional leafy vegetables consumed by the respondents are listed below (Table 3.4). Traditional leafy vegetables are mainly eaten with stiff porridge and are determined by location and seasonal availability. The most commonly eaten traditional leafy vegetables, according to the respondents are - *Thanga/Tinwembe* (*Cucurbita pepo L.)*, *Delele/Guxe* (*Corchorus tridens L.*), *Vowa/Thyeke* (*Amaranthus dubius C. Mart.*), *Muxe/Khope* (*Solanum retroflexum Dunal*), *Murudi/Bangala* (*Cleome gynandra L.*), *Mushidhzi/Mixiji (Bidens pilosa L.), Munawa/Tinyawa* (*Vigna unguiculuta L.)*, *Nngu* (*Momordica foetida Schumach.*) and *Lubavhe/Nkaka* (*Momordica balsamina L.*).

Table 3.3 Indigenous leafy vegetables

Tshivenda name	Xitsonga name	Common name	Botanical name
		Bitter leafy vegetables	
Lubavhe/Tshibavhe	*Nkaka*	Balsam Pear	*Momordica balsamina L.*
Mbandatshilale		*	*Momordica boivinii Baill*
Muxe	*Kophe*	Nightshade	*Solanum retroflexum Dunal*
Shashe		Wild thistle	*Sonchus asper. (L.) Hill*
Tshitangwi		*	*
Nngu		Bushman karo,karu	*Momordica foetida Schumach.*
		Semi - bitter leafy vegetables	
Phulule		African heart vine	*Pentarrhinum insipidumE.May.*
Mufungwi		*	*Riocreuxia torulosa Decne.*
Munawa	*Tinyawa*	Cowpea	*vigna unguiculuta (L.) or Phaseolus sp.*
Murudi	*Bangala*	Cats whiskers	*Cleome gynandra L.*
Mushidhzi	*Mixiji*	Spanish needle	*Bidens pilosa L.*
Mutohotoho		Spindle flower	*Cleome monophylla L.*
Mutshatsha		Bitter melon	*Citrullus lanatus (Thunb.)*
Nyedanyedane		*	*Telasma africana*
Thanga/phuri	*Xipaswi/tinwembe*	Pumpkin leaves	*Cucurbita pepo L.*
Tshinyagu		African cucumber	*Cucumis africanus L.f.*
		Slippery leafy vegetables	
Delele	*Guxe*	Wild jute plant	*Corchorus tridens L.*
Delele mandande	*Guxe madande*	Ladys finger	*Abelmoschus esculentus (L.)*
Dzaluma		Stinging nettle	*Urtica dioica L.*
Lubikela		*	*Hypoestes forskaolii*
Muvhazwi		Mountain nettle	*Obetia tenax (N.E.Br.) Friis*
Thebe		Pigweed	*Amaranthus hybridus L.*
Vowa	*Thyeke*	Smooth pigweed	*Amaranthus dubius C. Mart.*

Key: * Common or botanical name was not found.

Indigenous leafy vegetables are readily found in residential areas during rainy seasons or accessed through cultivation. According to the respondents, traditional leafy vegetables can be grouped according to their taste and texture - bitter, semi-bitter and slippery.

"*Semi-bitter indigenous leafy vegetables can be picked, cooked and eaten or preserved through sun-drying to make mukusule/mukhusa (pieces of sun-dried traditional leafy vegetables)," said respondent 2.*

According to the respondents, bitter traditional leafy vegetables can be picked, cooked and eaten fresh or preserved just like semi-bitter leafy vegetables. Slippery traditional leafy vegetables can be picked, cooked; they must be eaten on the same day cooked. These leafy vegetables can only be preserved when raw not cooked, owing to their slippery texture.

Sun-dried Corchorus tridens *L. is called mutshovhotshovho*", *said respondent 2.*

Furthermore, *Cucurbita pepo L* can be used to cook *bovhola* and *tshitshatshatsha. Bovhola/xipaswi* is prepared with tender *Cucurbita pepo L.* leaves mixed with its flowers, tender pumpkin and ground peanuts. *Tshitshatshatsha* is only cooked with *Cucurbita pepo L.* leaves which are mashed and ground peanuts are optional.

Figure 3.8: *Cucurbita pepo L.* leaves

Figure 3.9: *Citrullus lanatus (Thunb.)* leaves

i) Indigenous leafy vegetables combinations

The study respondents identified fifteen (15) indigenous leafy vegetable combinations (Table 3.4). According to the respondents, these leafy vegetable combinations are prepared by cooking two or more different types together. These leafy vegetables are combined with regards to their seasonal availability, texture, subjective predilection and taste.

"Some of these combinations are called by names, such as muroho wa tshinange and muroho wa mafhera," said respondent 2.

Muroho wa tshinange consists of a combination of three or more different types of indigenous leafy vegetables; it is consumed both during drought when indigenous leafy vegetables are scares and during seasonal availability. M*uroho wa mafhera* is a combination of *Solanum retroflexum Dunal, Bidens pilosa L., Amaranthus dubius C. Mart. and Amaranthus hybridus L*.

Table 3.4 Indigenous leafy vegetable combinations

Vanecular name	**Bontanical name**
Delele + vowa + tshibavhe	*Corchorus tridens L. + Amaranthus dubius C. Mart. + Momordica balsamina L.*
Dzaluma + lubikela + ungu/tshibavhe	*Urtica dioica L. + Hypoestes forskaolii + Momordica foetida Schumach/ Momordica balsamina L.*
Delele + vowa + thanga	*Corchorus tridens L. + Amaranthus dubius C. Mart. + Cucurbita pepo L.*
Delele + tshinyagu	*Corchorus tridens L + Cucumis africanus L.f.*
Shashe + mushidzi	*Sonchus asper.(L) Hill + Bidens Pilosa L.*
Delele + muvhazwi	*Corchorus tridens L. + Obetia tenax (N.E.Br) Friis*
Thanga + delele + ungu/tshibavhe	*Cucurbita pepo L. + Corchorus tridens + Momordica foetida Schumach/ Momordica balsamina L.*
Delele + thanga	*Corchorus tridens L.+ Cucurbita pepo L.*
Mutohotoho + murudi	*Cleome monophylla L. + Cleome gynandra L.*
Mushidzi + shashe + murudi	*B. pilosa + Sonchus asper.(L) Hill + Cleome gynandra L.*
Mutohotoho + shashe + murudi + mushidzi	*Cleome monophylla L. + Sonchus asper.(L) Hill + Cleome gynandra L. + B. Pilosa*
Murudi + mushidzi	*Cleome gynandra L. + Bidens pilosa*
Mushidzi + mutohotoho	*B. pilosa + Cleome monophylla L.*
Mutshatsha + vowa	*Citrullus lanatus (Thunb.) + Amaranthus dubius C Mart.*

3.3.2.5 Ground peanut-based traditional dishes

Six ground, white peanut-based traditional dishes were identified by the elderly women. These dishes include, *dovhi la muksule wa phuri/xirhiza xa tinwebe, dovhi la masonzha/xirhiza xa matomani/masonja, dovhi la nama ya mukoki/xirhiza xa nyama ya mukoki, dovhi la mukusule wa munawa/xirhiza xa mukhusa tinyawa and dovhi la nama yo bikiwahoxirhiza xa nyama yo swekiwa*. Table 3.5 illustrates the types of ground, white peanut-based traditional dishes.

Table 3.5 Ground, white peanuts-based traditional dishes

Tshivenda name	Xitsonga name	Description
Dovhi la mukusule wa phuri	*Xiridzani xa mukhusa wa tinwebe*	Cooked ground peanut soup with sun-dried pumpkin leaves
Dovhi la mashonzha	*Xiridzani xa matomani/masonja*	Cooked, ground peanut soup with mopani worms
Dovhi la nama ya mukoki	*Xiridzani xa mitonga/swihwaba*	Cooked ground peanuts soup with sun-dried biltong
Dovhi la mukusule wa munawa	*Xiridzani xa mukhusa wa tinyawa*	Cooked ground peanut soup with sun-dried cowpea leaves
Dovhi la nama yo bikiwaho	*Xiridzani xa nyama yo swekiwa*	Cooked ground peanut soup with cooked red meat
	Xiridzani xa tinjhiya	Cooked ground peanut soup with fried grasshoppers

Dovhi/xiridzani is a gravy made from ground peanuts that can be mixed with a variety of ingredients, such as dried indigenous leafy vegetables, insects, biltong and cooked meat. This is mainly eaten with stiff porridge.

"Dovhi/xiridzani is one of the most favoured delicacy amongst the Vhavenda and Vatsonga cultures", said all respondents.

3.3.1.6 Types of meat and edible insects

The elderly women identified eight edible wild animals and five edible domestic animals (Table 3.6). Edible wild animals were - *nama ya muvhuda/nama ya mpfundla, nama ya phiti, nama ya nntsha, namaya nari/nyama ya nyari, nama ya phala/nyama ya mbhala, nyama ya ndhopfu, nyama ya giraffi and nama ya nguluvhe daka/nyama ya honci ndhova*. Edible domestic animals were - *nama ya kholomo/nyama ya homu, nama ya mbudzi/nyama ya mbhuti, nama ya nguluvhe/nyama ya nguluve, nama ya khuhu/nyama ya huku and nama ya ungu/nyama ya nyitfhu*.

Table 3.6 Types of meat

Tshivenda name	Xitsonga name	English name
	Wild Animals	
Nama ya muvhuda	*Nyama ya mpfundla*	Rabbit meat
Nama ya nnthsa	*	Springbok meat
Nama ya nari	*Nyama ya nyari*	Buffalo meat
Nama ya phala	*Nyama ya mbhala*	Impala meat
Nama ya phiti/ khongoni/madavhu	*	Wildebeest meat
*	*Nyama ya ndhopfu*	Elephant meat
*	*Nyama ya giraffi*	Giraff meat
Nama ya nguluvhe daka	*Nyama ya honci ndhova*	Wild pig meat
	Domestic Animals	
Nama ya nguluvhe	*Nyama ya nguluve*	Pork
Nama ya kholomo	*Nyama ya homu*	Beef
Nama ya khuhu	*Nyama ya huku*	Chicken
Nama ya mbudzi	*Nyama ya mbhuti*	Goat
Nama ya nngu	*Nyama ya nyifhu*	Mutton

Edible animals are distinguished by their environment, whether wild or domestic and according to their size.

"Big wild animals include wildebeest, buffalo and impala. Small wild animals include springbok and rabbit. These animals can be eaten within one day, while big animals can be eaten for a longer period", said respondents 1, 2, 3 and 4.

Both wild and domestic animals' meat can be used to make *mukoki* (biltong). Biltong made from wild animal meat is called *mavhilidomu* in Luvenda. According to the respondents, biltong must be made from meat with minimum fat or no fat at all to prolong its lifespan. Biltong can either be cooked, or eaten as it is, or made into *dovhi la mukoki/xirhidza xa mukoki (*peanut gravy with pieces of biltong).

Grilled biltong can be diced into small pieces and mixed with diced marula seed kernels. This is eaten as a snack called tshinyamadoli", said respondents 1 and 2.

i) Types of insects

Respondents identified seven edible insects - *Mashonzha/Matomani/masonja (Gonimbrasia belina*), Madzhulu a nemeneme/Timenemene *(Macrotermes natalensis), Madzhulu a nthwa/Tintshwa (Macrotermes falciger), Nthwa/thamakura/Tintshwa (Alates), Ndhzie/Nwabava/nwabuxu (Grasshopper Caelifera), Nemeneme/Tintshwa and*

Thongolifha/Xipembele (Encosternum delegorgueiSpinola). Table 3.7 presents types of edible insects.

Table 3.7 Types of insects

Tshivenda name	Xitsonga name	Common name	Scientific name
Mashonzha	*Matomani/masonja*	Mopani worms	*Gonimbrasia belina*
Madzhulu a nemeneme	*Majenje*	Termites	*Macrotermes natalensis*
Madzhulu a nthwa	*Tintshwamakhuru*	Termites	*Macrotermes falciger*
Nthwa	*Tintshwa*	Flying termites	*Alates*
Nzie	*Tinjiya*	Grasshopper	*Caelifera*
Nemeneme	*Tintshwa*	Flying termites	*
Thongolifha	*Xipembele*	Stinkbug	*Encosternum delegorgueiSpinola*

* Scientific name was not found.

Macrotermes natalensis and Macrotermes falciger are found in summer and they usually come out when it is dark. They are attracted to light hence, they are seen flying where there is light.

"Madzhulu a nthwa/tintshwamakhuru are found in tshiulu (termite hill) and are collected through a process called, u fhemba. They are gathered by inserting muthathe, a type of reed found by the riverbanks into the termite hill with macrotemes", as stated by respondent *1.*

Figure 3.10: Macrotermes natalensis

Alates are termite castes and are found in hills, just like *macrotermes,* however *alates* are harvested differently from *macrotermes.*

As said by respondent 1: *"when collecting alates, a hole is dug on the termite hill and a pot with vertically- inserted sticks inside, is placed inside the termite hill. The pot must be closed*

with leaves to hide sunlight to create an illusion that it is night. The alates will fly out of the hill thinking that it is dark and fly into the pot".

"*Nemeneme without wings are called tshiendangakhuni and can be seen on the ground crawling", said respondent 1.*

3.3.1.7 Indigenous fruit-based food products

Vhavenda elderly women identified three indigenous fruit–based food products - *Khombothole ya mavhungo (yoghurt made from Landophia kirkii)*, *Khombothole ya mazwilu (yoghurt made from Vanguira infausta*) *and Khombothole ya mbuyu (yoghurt made from Adansonia Digitata*). *Khombothole* is a Tshivenda term referring to indigenous yoghurt. Table 3.8 illustrates types of indigenous fruit – based food products.

Table 3.8 Indigenous fruit-based food products

Tshivenda name	English name	Scientific name
Khombothole ya mavhungo	Yoghurt made from sand-apricot vine	Yoghurt made from *Landphia kirkii*
Khombothole ya mazwilu	Yoghurt made from wild medlar	Yoghurt made from *Vanguira infausta*
Khombothole ya mbuyu	Yoghurt made from baobab fruit	Yoghurt made from *Adansonia Digitata*

*Indigenous fruits-based food product not reported by Vaxtsonga.

According to respondent 1 and 2, *"this was made usually in summer when the wild fruits were available in abundance".*

The respondents indicated that, during the olden days, *khombothole* was regarded as a very special food and was usually made during special occasions, such as Christmas. *Khombothole* was made from fresh cow milk, however, this food is no longer made since there is commercially-produced yoghurt that is always available.

3.3.1.8 Indigenous fruit-based beverages

Two types of indigenous fruit-based beverages were identified by the respondents, fruit-based attractive beverages and fruit-based alcoholic beverages. Attractive beverages identified were *Tshithakada tsha mbula (cooldrink made from Parinari curatellifolia), Tshithakada tsha mbululu/thaladzi (cooldrink made from Mimusops zeyheri) and Tshithakada tsha nie (cooldrink made from Berchemia discolour). Tshithakada* is a Vhavenda term referring to soft drinks. Table 3.9 presents types of indigenous fruit-based attractive beverages.

Table 3.9 Types of indigenous fruit-based attractive beverages (fruit juices)

Tshivenda name	English name	Botanical name
Tshithakada tsha mbula	Fruit juice made from mobola plum	Fruit juice from *Parinari curatellifolia*
Tshithakada tsha mbubulu/thaladzi	Fruit juice made from red milkwood	Fruit juice made from *Mimusops zeyheri*
Tshithakada tsha nie	Fruit juice made from brown ivory	Fruit juice made from *Berchemia discolor*

*Indigenous fruits-based attractive beverages not reported by Vatsonga.

According to respondents 1 and 2, *"tshithakada was made during the olden days from sweet indigenous fruits so to resemble cool drink which was very expensive during those days".*

Tshithakada was habitually prepared in summer when indigenous fruits were readily accessible. Some of these indigenous fruits, such as *Parinari curatellifolia* has become extremely threatened because of human infringement into its natural environment. This beverage is no longer prepared like in the olden days, owing to the availability of commercial soft drinks.

Figure 3.11: *Berchemia discolour*

i) Types of indigenous fruit-based alcoholic beverages

Three indigenous fruit - based alcoholic beverages were identified by the study participants. These beverages were *mukumbi wa mbula/vukanyi, mukumbi wa mafhula and mukumbi wa nombelo. Mukumbi* is a traditional term referring to traditional beer made from indigenous fruits found mostly in the mountains. Table 3.10 presents types of indigenous fruit-based alcoholic beverages.

Table 3.10. Indigenous fruits-based alcoholic beverages

Tshivenda name	Xitsonga name	English name	Botanical name
Mukumbi wa mbula	*Byala bya mbulwa*	Home-made distilled spirit made from mobola plum	Traditional beer made from *Parinari curatellifolia*
Mukumbi wa mafhula	V*ukanyi*	Home-made spirit prepared from marula fruit	Traditional beer made from *Sclerocarya birrea*
Mukumbi wa nombelo dza thava	*Byala bya nombela ta ntsava*	Home-made spirit made from stem fruit	Traditional beer made from *E.magalismontanum*

Indigenous fruit-based alcoholic beverages are very popular amongst the Vhavenda and Vatsonga people. Traditional beer made from *Sclerocarya birrea* is still being brewed in villages around Vhembe District.

Nonetheless, *"traditional beer brewing is no longer as prevalent as it used to be during the past, due to the availability and attractiveness of western alcoholic beverages,"* according to respondents 1, 2, 3 and 4.

3.3.2.9 Types of traditional alcoholic beverages

The respondents identified eight traditional alcoholic beverages, *mabundu/mandlheke, mabundu a mase/mandlheke ma handelo, halwa/muqomboti, tshifatufatu, xikoko, muvanya, thothotho and chayoni*. Table 3.11 presents types of traditional alcoholic beverages.

Table 3.11. Traditional alcoholic beverages

Tshivenda name	Xitsonga name	English name
Mabundu	Mandlheke	Traditional beer made from home-made maize flour and water.
Mabundu a mase	Mandlheke ma handelo	Traditional beer made from maize meal, water, home-made maize bran and sugar.
Halwa	Muqomboti	Traditional beer made from maize meal, home-made maize bran and water.
Tshifatufatu	*	Traditional beer made from home-made maize flour, maize bran and water.
Muvanya	Muvanya	Traditional beer made from sorghum bran, sugar and water.
Thothotho	Thothotho	Traditional beer made from sorghum bran, sugar and water.
*	Chayoni	Traditional beer made from sugar, yeast and water.
*	Xikoko	Traditional beer made from pearl millet kernels, pearl millet flour and water.

*Not reported by Vhavenda or Vatsonga.

Traditional alcoholic beverages are still being prepared and consumed in Vhembe District. They are prepared during ceremonies, such as weddings and traditional rituals, although, some people sell these beverages for income generation.

3.4 Discussion

The identification of traditional foods, carried out in rural areas of Vhembe District, revealed that several of these foods are still being consumed, especially, when available seasonally. These traditional foods can be used to distinguish Vhavenda and Vatsonga cultures from others in terms of food recipes. These findings are like to those of past studies, which reported that indigenous foods are still being consumed in communities across South Africa (Mbhenyane *et al*., 2005; Jansen van Rensburg *et al*., 2007; Faber *et al*., 2010). Mabogo (1990), also revealed that people in rural communities consume diverse types of traditional foods and edible plants and have substantial knowledge with reference to these foods. In the current study, eight traditional mixed-dishes were identified; seven were similar in their ingredients and preparations. This reveals that mixing of traditional ingredients into dishes is common practice amongst the Vhavenda and Vatsonga people. These findings are in accord with Nesamvuni (2000), who explains that studies in diverse areas of South Africa confirm variations in cultural practices, traditional foods and the custom of mixing traditional ingredients.

In the present study, sixteen types of traditional stiff porridge were documented. Study respondents pointed out that stiff porridge is an important food for the Vhavenda and Vatsonga people. These findings are attested to by the Department of Agriculture, Forestry and Fisheries (2018), which reported that maize (*Zea mays*) is the common staple food for the South African population. Similar findings were obtained by Enzama (2016), indicating that maize is the main grain crop for more than 1.2 billion people in the Sub-Saharan Africa (SSA) and Latin America. It makes available over 20% of the total calories in human diets in 21 countries and is Africa's most common staple cereal crop; giving food to more than 300 million people on the continent (Okweche *et al*., 2013; Shiferaw *et al*., 2011). Additionally, thick porridge is suggested as a functional food for the control of certain non-communicable diseases, such as type ll diabetes (Eli-Cophie *et al*., 2016; Mlotha *et al*., 2016).

The elderly women explained that types of stiff porridges are prepared from different cereal crops, such as sorghum, pearl millet and maize (Wanjala *et al*., 2016; Murty & Kumar, 1995). These studies indicate that thick porridge is cooked from individual or mixture of flours from tropical cereals such as finger millet (*Eleusine coracana),* pearl millet (*Pennisetum glaucum*),

sorghum (*Sorghum bicolor*) and maize (*Zea mays*). The above-mentioned is in line with the findings of Mabogo, (1990) amongst the Vhavenda.

The elderly women also reported that stiff porridge made from indigenous cereal, such as *Pennisetum glaucum* and *Sorghum bicolor* is rarely consumed now due to the introduction of maize crops and the commercial availability of maize flour. These findings corroborate those of Baichard *et al*. (2011), that sorghum is an indigenous African cereal, which has been substituted by maize which generates an improved yield. Similarly, Louw (2018) explains the dwindling of the cultivation of pearl millet in preference for maize because of several factors; among them are research endeavours which have made maize more prolific than pearl millet and with simpler processing, maize has become more convenient to use.

In the current study, it was reported that cereal grains are cultivated during the summer rainy period. A study conducted by Mabogo (1990) about the Vhavenda reported similar finding; that cultivated cereals such as *Sorghum spp*, *Zea mays*, *Pennisetum spp.* and *Andropogan spp* can be ploughed only during a rainy summer period, hence, when rainfall is inadequate, the crops yield nothing, forcing the people to rely on their insufficient reserves. This reinforces the present study's findings regarding the practice of traditional storage of harvested maize. Respondents explained that harvested maize was stored in three types of storage, namely, *tshitatari, dulu* and *tshisiku* depending on quantity of the harvest. The storage of maize for future use explains how Vhavenda and Vatsonga manage to still consume stiff porridge even in times of crisis.

The study respondents pointed out that stiff porridge acquire its colour from the type of cereal flour used in preparation. Similarly, Wanjala *et al*. (2016), elucidate that colour of stiff porridge ranges from white to yellow and dark brown since it is made from different mixtures of white-coloured cassava, maize, sorghum, coloured-maize and millets. According to the respondents, nowadays, white and yellow-coloured maize flour are the preferred maize flours used in preparation of stiff porridge. On the contrary, study conducted by Enzama (2016), reported that yellow maize is only occasionally eaten by humans, usually when white maize is scarce, although, some rural communities prefer cultivating yellow maize over the white one because of the former's resistance to drought and better yield, as indicated by the respondents.

In the present study, indigenous fruits were also used to prepare a type of stiff porridge called *khwangwali.* These findings are confirmed by Mabogo (1990), who revealed that powder from *Adansonia digitata* and *Strychnos pungens* was commonly blended with maize flour and

prepared into a sour porridge known as *khwangwali* or *phwambwali*. Porridge made from indigenous fruits is now rare, possibly owing to modernization which has led to enhanced production and storage of maize (Mabogo, 1990). The use of indigenous fruits' pulp or powder to add bulk when preparing thick porridge, reveals how the Vhavenda managed their maize reserves to last them until the next harvest.

A total of 23 indigenous leafy vegetables were documented in the current study. The results are in accord with Kwinana (2014) who recorded 25 indigenous wild leafy vegetables commonly consumed in Amathole District in the Eastern Cape and Mwanyambo (1994) who identified 27 wild leafy vegetables species in the Lower Shongwe Valley of Malawi. The current study results reveal that elderly women are knowledgeable about edible indigenous leafy vegetable species. FOA (1997:145) report echoes the same sentiment that elderly women normally have tremendous knowledge about indigenous species of indigenous leafy vegetables. These leafy vegetables are easily accessed from residential plots or through cultivation and are abundant during the rainy season. These finding are confirmed by Legwaila *et al*. (2013) who elucidated that indigenous vegetables are garnered from communal vicinities, around villages, housing plots, as well as cultivated and uncultivated lands. The same study further claimed that extensive consumption of indigenous vegetables was practiced during summer months.

Studies conducted by Liengme (1981) and Mabogo (1990) highlight that Vatsonga and Vhavenda plough indigenous leafy vegetable, such as *thanga* and *munawa*. The fact is reiterated by Jansen Van Rensburg *et al*. (2004); Husselman & Sizane (2006); Modi *et al*. (2006). According to Faber *et al*. (2010) traditional leafy vegetables have continuously remained part of Limpopo rural communities' diet and even in towns, such as Thohoyandou, Giyani, Polokwane and Tzaneen. *Cucurbita peop L, Cochorus tridens L and Amaranthus dubius C. Mart* were reported as the most commonly consumed indigenous leafy vegetables by the study respondents. These results corroborate those of Chetty (2013), who revealed that *Cucurbita peop L* and *Amaranthus dubius C* were amongst the frequently eaten food items in the Limpopo Province. Similar findings were reported by Voster (2007) on parts of Mpumalanga and KwaZulu Natal.

Respondents indicated that indigenous leafy vegetables are picked, cooked and served with stiff porridge. Furthermore, leafy vegetables can also be preserved, cooked or raw by sun-drying for later use. Similarly, Masekoameng (2007) reported that indigenous leafy vegetables are cooked whilst fresh and eaten with porridge as relish. Mabogo (1990) reiterates the sentiment, that when indigenous leafy vegetables are obtainable in abundance, the excess is

conserved for use during winter when these vegetables are scare. The same study elucidates that dried raw indigenous leafy vegetables are called *mushovhotshovho* e.g. *Cochorus tridens L* leaves. Cooked leafy vegetables are shaped into pellets, sun-dried and are known as *mukusule*. This practice demonstrates that elderly people have knowledge on ensuring household food security and dietary diversity during lean periods. In addition, indigenous leafy vegetables can be cooked alone or in combinations with regards to taste, texture or personal preference. The current study findings agree with those of Mabogo (1990), which revealed that mixtures of vegetables are determined by flavour, texture, availability and personal preference. A study conducted by Mathenge (1997:77) in Kenya, revealed that some 'unpleasant' indigenous leafy vegetables may be combined with other leaves, such as those that are slippery to minimize the bitterness. Studies done by Vorster & Jansen Van Rensburg (2005) and Vorster (2007) echo the same sentiment.

African diet comprises of diverse ingredients, including legumes such as peanuts, which contributes to dietary diversity of rural communities. In the present study, the elderly women stated that peanuts can be used to make a soup called *dovhi/ xirhiza.* This soup can be mixed with various traditional ingredients, such as *mukusule*, biltong, mopani worms or cooked meat. These findings are confirmed by Andrauwus *et al*. (2014), who reported that peanuts can be used to prepare a soup with leaves called "*hausa"* in Nigeria. Similarly, peanuts are consumed worldwide through diverse products, of which the majority are traditional foods (Guiman & Guiman, 2012). Similarly, the use of *Sclerocarya birrea* seed kernels (peanuts) is recorded in that current study. This is also asserted to by Mabogo (1990) who revealed that the seeds of *Sclerocarya birrea* are crushed and the embryo is ground into a powder which is cooked with vegetables or by itself to make a savoury. Similar, findings were documented by Liengme (1981) about the Tsonga people of Gazannkulu.

Africans hunt bucks (*phala*), duiker (*phiti*), buffalo (*nare*), zebras as well as birds of all kinds and flying ants (Bodenheimer, 1951:138). The same was noted in the present study, where respondents pointed out that big wild animals, such as buffalo and wildebeest and small animals like springbok and rabbits are hunted and consumed by Africans (Masekoameng, 2007); products like biltong is produced from wild animals such as '*phala* and' '*phiti'* for consumption.

DeFoliart (1999), explains that the practice of eating insects by humans is referred to as 'entomophagy'. Consumption of insects was reported in the present study. Documented edible insects include, termites, locusts, mopani worms and stinkbugs. A study conducted by Netshifhefhe *et al*. (2018) in Vhembe District produced the same points. Similarly, Quin (1959)

revealed that communities in Sekhukhune collect insects for consumption; this was reiterated by Masekoameng (2007). Edible insects are cooked and eaten as a relish served with stiff porridge. Consumption of edible insects is a form of dietary diversification and food security for rural inhabitants.

The use of indigenous fruits to make different food products and beverages has been documented, many decades ago (Platt, 1955; Liengme, 1981; Mabogo, 1990; Van Wyk & Gericke, 2003; Nwonwu, 2006). In the current study, it was reported that indigenous fruits were used to make products, such as indigenous yoghurt, alcoholic and non-alcoholic beverages; Masekoameng (2007) reported that *Vangueria infausta* can be pounded and combined with fresh milk to make indigenous yoghurt and the *marula* fruit is processed and fermented to make *marula* beer. Mabogo (1990) makes the same point about the Vhavenda and Liengme (1981) reported the same about the Vatsonga. In the present study, eight types of traditional alcoholic beverages were reported upon.

Traditional alcoholic beverages were reported to be prepared at various cultural ceremonies such as weddings, rituals and now, some people also prepare them as a source of income. Plat (1955), noted that the utilisation of traditional alcoholic beverages has been passed on from generation to generation, in Africa and South Africa. The same study continued that African traditional beers are prepared for various socio-cultural functions, including its use as a leisure drink in communal occasions, offering it as a form of homage to the chiefs and leadership, as a mode of remuneration for work performed, for income generation and as submissions to spirits during rituals. A decline in traditional beer brewing, because of the attractiveness and abundance of western beer was reported in the current study. Saul (1981) echoes the same sentiment that the selling of sorghum beer has decreased in many African countries, due to competition from European beers.

3.5 Conclusion

The current study revealed that elderly women possess profuse knowledge about traditional mixed-dishes as well as other traditional food. Sixteen types of traditional stiff porridge were documented in this study, thus, demonstrating the importance of stiff porridge as a staple food for rural people in Vhembe District. The findings also provide evidence that there is great reliance on indigenous leafy vegetables as relish by rural communities, as 23 types of indigenous leafy vegetables were reported in the present study. Nonetheless, knowledge about traditional foods is being threatened by the youths' perceptions that traditional foods are associated with poverty and backward/uncivilised behaviour. Elderly people remain custodians of traditional knowledge, therefore, this is fast becoming scarce as the older people

pass on. The current study documented knowledge about traditional foods and beverages to conserve it for generations to come and to assist in maintaining the consumption of traditional foods, as well as the conservation of Vhavenda and Vaxtsonga cultural identity.

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CHAPTER FOUR: TRADITIONAL COOKING METHODS OF INDIGENOUS FOODS EATEN BY ELDERLY WOMEN IN VHEMBE DISTRICT

Abstract

Traditional foods constitute an important element of Vhavenda and Vaxtsonga culture, identity and heritage. Rural communities are usually acquainted with the ingredients, how to prepare traditional foods and delight in consuming them. As knowledge of traditional foods, however, is slowly vanishing, it has resulted in a gap in its transmission. The aim of the study was to determine traditional cooking methods of traditional mixed-dishes eaten by elderly women in the Vhembe District. The study was ethnographic in nature and four elderly women were purposively sampled. Ethical approval was granted and data was collected through in-depth interviews and observations. Data was thematically analysis and major themes and sub-themes were determined. The results showed that boiling was the most common traditional cooking method used in the preparation of traditional food by the Vhavenda and Vaxtsonga. They frequently used ground peanuts in the preparation of most traditional food and the use of a wooden mortar and pestle in the pre-preparation of ingredients was similar among the two cultural groups, resulting in very similar traditional cooking methods with only a few distinctions. In conclusion, traditional cooking methods were similar amongst the Vavenda and Vatsonga cultures, owing mainly to the amalgamation of the former Venda Bantustan and the former Tsonga homeland of Gazankulu.

Keywords: Traditional cooking methods, traditional mixed-dishes, boiling, traditional food, ground peanuts, mortar and pestle

4.1 Introduction

According to Norazmir *et al*. (2012), food can be considered as a medium of cultural identify since some processes of food preparation and consumption are discernible dressings of identity. 'Traditional food product' is defined by Guerrero *et al*. (2010) as products commonly consumed or related with revelries, specific local areas, region, country and/or seasons; information on these foods are usually conveyed from generation to generation and cooked precisely according to the region's epicurean heritage. To be considered traditional, a food product not merely has to include traditional ingredients, but must be prepared in accordance with traditional recipes (Guerrerro *et al*., 2010). Traditional foods are mostly based on dietary diversity for ideal nutrition, which also show biodiversity (Wahlqvist & Specht, 1998; Janrs & Sthapit, 2004). Fajans (2006) argues that several ingredients and methods of food preparation epitomize a fundamental aspect of people's identify, types of available local foods and their connotation to the people who eat them. The Vhavenda and Vaxtsonga traditional food dishes consist mainly of cereals, legumes and indigenous leafy vegetables, as these ingredients are available in the Vhembe District.

Preparation and consumption are an amalgamation and association of different foods and culture (Camp, 2009; Powell, 2007). Bower (1997) explains that cooking is the whole process that an individual does with food to alter it; this includes each and every part of food preparation and cooking methods. Food preparation usually involves - selection, measurement and mixing of ingredients consecutively – in line with mandatory food recipes (Usummo, 2000). Preparation of traditional dishes entails not just knowing the ingredients, but also traditional knowledge regarding, exactly, how to choose, blend and serve; these habitually symbolize characteristics of one's culture (Kwik, 2008). Symons (2003), points out that the elementary social and cultural aim of cooking have, often, been portrayed as part of women's house chores, thus, Voster *et al*. (2007; 2008) acknowledge women as key owners of knowledge on traditional foods. Most traditional foods are prepared by boiling or steaming. For example, indigenous leafy vegetables are cooked by boiling and then prepared into a relish by the supplementation with several additives and seasoning (Mavengahama, 2013).

Details on traditional food is customarily passed down from generation to generation; the facts explain how food preparation is executed precisely according to the traditional way without 'mistreatment' in terms of taste and ingredients. Traditionally, seniors impart information on identification and cooking of traditional food to children. Some researchers point out that ways of transmitting traditional food knowledge includes verbally, hands-on activities, observations, and by consumption of the actual food (Guerrero *et al*., 2009; Kuhnlein *et al*., 2009; Milburn,

2004). The ingredients, preparation methods, cooking skills and equipment, therefore, are divulged during different knowledge transmission sessions (Sharif *et al*., 2013).

Despite of the above-mentioned, shortage of research on nutritional composition of traditional food has been related to the current lack of information about cooking of traditional food (Fox & Norwood Young, 1982). Absence of knowledge about cooking of traditional foods has contributed in their neglect (Altiert, 1987). Globally, there is a rising cognizance that intangible cultural heritage is delicate and problematic to restore when knowledgeable experts are not able to pass on their skills and knowledge (Goody, 1982). Ohiokpehai, (2003) draws attention to the fact that communities play a key role in the transmission of food knowledge to younger generation to make certain that culture identify does not vanish with time. The growth and utilization of food tradition rest on the passing of traditional food knowledge from older generation to the younger generation. It is, hence, vital to conserve and transfer the techniques and skills of traditional food preparation to future generations (Kwik, 2008 & Yohannes, 2009).

4.2 Methodology

4.2.1 Study design

The study design was ethnographic. A detailed description of the study design is presented in Chapter 3 under Section 3.2.1. Elderly women were observed cooking different types of traditional food; this process was dependent on the number of dishes prepared for the day and their preparation methods.

4.2.2 Study population

The study population was elderly women residing in Vhembe district. A detailed description of study population is provided in Chapter 3 under Section 3.2.2.

4.2.3 Study area

The study was carried out in the Vhembe District. The description of the study area is detailed in detail Chapter 3, Section 3.2.3.

4.2.4 Sampling

4.2.4.1 Sampling design

Purposive sampling was used to select the study area and respondents. A detailed explanation of the sampling design is offered in Chapter 3, Section 3.2.4.1.

4.2.4.2 Sampling procedure

Purposive sampling was used to choose study respondents. A detailed description of sampling procedure is presented in Chapter 3 under Section 3.2.4.2

4.2.4 Data collection

The researcher conducted in-depth interviews and structured observations of the traditional cooking methods with the elderly women using the initial question:

- How do you cook traditional mixed-dishes?

According to Silverman (2008), a structured observation can be carried out on a research question. It involves observing only data that refers specifically to the research question. Interviews were conducted using the local languages, Luvenda and Xitsonga. The interviews were audio recorded on a digital voice recorder and observations of traditional cooking methods were video recorded. A detailed explanation of data collecting procedure is narrated in Chapter 3, Section 3.2.5.

4.2.5 Data analysis

The in-depth interviews transcripts and video recordings were subjected to thematic analysis (Creswell, 2014). The audio-taped information was transcribed verbatim to contribute to the trustworthiness of the data. A detailed description of data analysis is presented in Chapter 3 under Section 3.2.6.

4.2.6 Quality assurance

Quality assurance was achieved through Creswell's principles of trustworthiness, credibility, transferability, dependability and conformability. These qualities are explained in detail in Chapter 3, Section 3.2.7.

4.2.7 Ethical considerations

Ethical approval was granted, either verbally or in a signed written informed consent form and confidentiality was maintained. A detailed explanation of ethical issues considered in the study is provided in detail in Chapter 3, Section 3.2.8.

4.3 Results

4.3.1 Themes

One theme emerged from the participants' narratives - traditional cooking methods of traditional foods. Eight sub-themes also transpired from the participants' interviews – traditional preparation of traditional mixed-dishes, traditional stiff porridge, indigenous leafy

vegetables, grounded white peanuts-based traditional dishes, meat and insects, indigenous fruit-based food products, indigenous fruit-based beverages and traditional alcoholic beverages.

4.3.1.1 Theme: Traditional cooking methods of traditional foods eaten by elderly women in Vhembe District

This section delineates results and discussion on the preparation methods of traditional mixed-dishes, traditional stiff porridge, traditional leafy vegetables, ground nuts - based traditional dishes, meat and insects, indigenous fruit-based food products, indigenous fruit-based beverages and traditional alcoholic beverages. All sub-themes analysed were from information acquired from the structured observations when respondents were asked about how they cook traditional foods that they consume. Analysis of the findings discussed in this chapter addresses objective 2 of the study: to determine traditional cooking methods of traditional mixed dishes. Direct quotations from the respondents are also incorporated with the purpose of giving a comprehensive description of the context and content.

a) Traditional mixed-dishes

i) Tshidzimba /Tihove

Pound peanuts into flour, using a mortar and pestle, then set aside. Combine samp, red ground peanuts, Bambara nuts and red-speckled beans (optional). Pour water into a pot and bring to boil over an open fire. Wash the dry ingredients with water and pour inside the pot of boiling water. Cook until water changes colour and then stir the mixture. If the mixture is well cooked, wait until the water has reduced to the same level as the mixture. Then add salt and the ground peanuts flour and cook until the peanut powder turns brownish. Mash the mixture until well combined and remove from the heat and cool.

"*Tshidzimba/tihove is a highly favoured traditional food delicacy among the Vhavenda and Vatsonga, said respondents".*

Figure 4.1 (a)

Figure 4.1 (b)

Figure 4.1 (a). Traditional preparation of tshidzimba/tihove when ground peanuts flour is added to the samp, Bambara nuts and whole red peanuts before combining. Figure 4.1 (b). Cooked tshidzimba/tihove.

ii) Tshimbundwa /Ximbundwa

Pound ground peanuts into flour and set aside. Pound semi-dried mealies into flour and set aside. Combine ground peanuts and maize flour with salt and knead into a dough. Then place a half-filled pot with water over an open fire. Place sticks vertically inside the pot (not touching the water level), covering almost the whole surface area. Lay washed maize plant leaves or banana leaves on top of the sticks. Shape dough into small pieces and place on the banana/maize leaves. Cover the dough pieces with more leaves and cover the pot with a lid. Let the dough steam-cook. Insert a knife into the dough to check if well cooked. When cooked, remove and let cool.

Figure 4.2 (a)

Figure 4.2 (b)

Figure 4.2. Tshimbundwa /ximbundwa covered with maize plant leaves before cooking**.** Figure 4.2 (b). Cooked Tshimbundwa /ximbundwa.

iii) Thophi /Tshopi

Peel the pumpkin, remove the inside seeds and cut into small pieces. Remove the pumpkin sap by squeezing it out of the seeds with your hands, into a bowl and set aside. Wash pumpkin pieces and pour them into a pot over an open fire. Cook until pumpkin is soft. Add pumpkin sap and mash until it has a smooth consistency with no pieces. Add mealie rice in small amounts and mix. Then let the mealie rice cook until well done. If the pumpkin consistency is too thin, you can add yellow traditional maize meal and cook until medium consistency is reached. Brown sugar (optional) may be added if the pumpkin mixture is not sweet. Remove from the fire, put the pumpkin on a plate and let it cool.

According to respondents 1, 2, 3 and 4, *"pumpkin sap is added to make thophi/tshopi retain its yellow colour and make it tastier".*

Figure 4.3 (a)

Figure 4.3 (b)

Figure 4.3 (a). Preparation of thophi/tshopi**.** Figure 4.3 (b). Cooked thophi/tshopi

iv) Tshigume /Xigugu

Roast maize kernels and peanuts separately until golden brown. Pound the roasted maize kernels with a mortar and pestle, adding a pinch of salt until powdery form; set aside. Pound roasted peanuts using a traditional wooden mortar and pestle until it has a powdery consistency. Then add the maize powder to the ground peanuts powder and further pound until a smooth peanut butte-like paste is formed. Remove the paste from the mortar and serve.

"*This mixed-dish can last even up to five years without spoilage",* said respondent 2.

Figure 4.4 (a)

Figure 4.4 (b)

Figure 4.4 (a). Roasted whole ground peanuts and maize kernels. Figure 4.4 (b). Roasted whole peanuts and maize kernels pounded into a peanut butter-like paste.

v) Tshingwimbi /Xinghwimbi

Pound peanuts using a mortar and pestle until it has a powder consistency; set aside. Peel of the pumpkin's skin and remove the seeds. Wash the pumpkin and cut into small pieces. Cook the pumpkin over open fire until soft. Then add the ground peanut powder and simmer until the peanuts are cooked. Dish up and serve.

"*Thophi/tshopi and tshingwimbi/xinghwimbi are cooked the same way but only differ with the use of ground peanuts when cooking tshingwimbi/xinghwimbi and the use of yellow traditional maize meal and mealie rice when cooking thophi/tshopi",* said respondents 1, 2, 3 and 4.

vi) Xiendla hivomu

Pound peanuts using a mortar and pestle into powder and set aside. Combine red ground peanuts and maize kernels. Boil the peanuts and maize kernels until they are well cooked. Then add salt and the ground peanut powder and simmer until the peanuts powder is well cooked. Combine the maize kernels with the peanut powder until well blended.

Figure 4.5 Traditional wooden mortar and pestle

vii) Dovhi la mukusule/Xiridzani xa mukhusa

Pound peanuts with a mortar and pestle into flour and set aside. In a pot over an open fire, bring water to warm and then add the ground peanuts flour and stir. Let the mixture simmer and add salt. Hand crush any dried leafy vegetable of your choice and add to the ground peanut mixture. Let the mixture further simmer until cooked.

Respondents 2 and 3 stated that *"ground peanuts are cook first to make sure that there is enough salt, to avoid lumps and also to evade dried leafy vegetable from turning brown whilst cooking"*.

Figure 4.6 Dovhi la mukusule/xiridzani xa mukhusa

viii) Bovhola /Xipaswi

Pound peanuts with a mortar and pestle into flour and set aside. Wash pumpkin leaves, flowers and tender green pumpkin. Cut the tender pumpkin and pour inside a pot with some water, over an open fire. Add the pumpkin flowers and cook until soft. Then add the pumpkin leaves and further cook until soft. Add the ground peanut flour and salt and combine. Simmer until peanuts are cooked.

"*For a bitter taste, you can add balsam pear or bushman karokaru leaves",* said respondents 1, 2, 3 and 4.

Figure 4.7 Tender green pumpkin boiling

b) Traditional stiff porridge

Traditional stiff porridge was prepared from different indigenous cereals such as sorghum and pearl millet and from yellow maize (Table 4.1). Porridge is commonly eaten with indigenous leafy vegetables and meat.

Table 4.1. Traditional cooking methods of types of traditional stiff porridge

Tshivenda name	Xitsonga name	Traditional cooking methods
Vhuswa ha luvhele (pearl millet flour)	*Vuswa bya n'wahuva*	Bring water to boil in a pot over an open fire. Add home-made pearl millet flour/sorghum flour in small portions taking turns, while stirring with a traditional cooking whisk until soft porridge consistency. Then using a traditional wooden cooking spoon, continue stirring small amounts of flour until desired consistency has been reached. *"This homemade pearl millet flour is very light in texture, as it has no starch at all",* said participant 2. According to participants 1 and 2, *"after the glumes are removed during harvesting, sorghum seeds are washed in warm water until no red colour is visible. Then you let it rest to remove all the water. After, you take the seeds to the miller".*
Vhuswa ha makhaha (sorghum flour)	*Vuswa bya makhaha*	
Vhuswa ha mavhele/vhutete	*Xibasa*	This stiff porridge is cooked with sifted homemade yellow/white maize flour. Bring water to boil in a pot over an open fire. Add home-made yellow/white maize flour in small portions taking turns, while stirring with a traditional cooking whisk until the mixture has a soft porridge consistency. Then using a traditional wooden cooking spoon, continue with the process until desired thickness is reached. "*This stiff porridge can be dished using different designs such as dzi phetwa, magaku, mikonde and maavhelakombwe*", said participant 1 and 2.
Vhuswa ha mutore	*	Bring to boil whey (water substance from fermented milk) in a pot over open fire. Add home-made yellow/white maize flour in small portions in turns while stirring with a traditional cooking wooden whisk and simmer. Continue adding maize flour but now stirring with a traditional wooden cooking spoon until desired thickness is achieved. According to participants 1 and 2, *"this is one of the types of traditional stiff porridge which were prepared during special occasions such as traditional ceremonies"*.

Vhuswa ha mufhumbu mutshena	*	Roast refined white maize-bran in a pan over an open fire and set aside. Bring water to boil in a pot and add mealie rice. While simmering the mealie rice, add the roasted white maize-bran and simmer. Then add home-made white maize flour in small portions in turns while stirring with a traditional wooden cooking spoon until desired thickness is attained.
Vhuswa ha munamba	*	In a pot over open fire, bring to boil fresh milk. Add mealie rice and stir. Then add homemade yellow/white maize flour in small portions in turns while stirring with a traditional cooking wooden whisk; let it simmer. Continue adding maize flour but now stirring with a traditional wooden cooking spoon until desired thickness is achieved. *"This porridge is so tasty that there is a Tshivenda saying that was derived which says: "a dog likes munamba but lacks who that will cook" simply saying that a person likes tasty food but lacks a person that will cook for him",* said participants 1 and 2.
Vhuswa ha mutuku wa dini	*Dini ra mavele*	Mix maize bran of home-made yellow/white maize flour with water and let it ferment for three to four days. Bring water to boil in a pot over open fire. Add the fermented mixture to the boiling water and stir with a traditional wooden cooking spoon until it has soft-porridge consistence; simmer. Then add home-made yellow/white maize flour in small portions in turns, while stirring with a traditional wooden cooking spoon until desired thickness is attained.
Vhuswa ha mutuku wa munzelu	*	According to participants 1, 2, 3 and 4, *"this type of stiff porridge has a sour taste owing to its method of preparation"*. Mix maize bran of home-made yellow/white maize flour with water and let it ferment for three to four days. In a pot over an open fire, bring to boil water from the fermented slurry of home-made yellow/white maize flour. Add mealie rice and stir with a traditional wooden cooking spoon and let it simmer. Then add home-made yellow/white maize flour in small portions in turns while stirring with a traditional wooden cooking spoon until the desired thickness is reached.
Vhuswa ha mbongo (semi-dried mealies) *	*Vuswa bya xitatana (sifted maize flour)* *Vuswa bya xipepenene (unshifted maize flour)*	Bring water to boil in a pot over an open fire. Add sifted/unsifted home-made yellow/white semi-dried maize flour in small portions taking turns, while stirring with a traditional cooking whisk until it has soft porridge consistency. Using a traditional wooden cooking spoon, continue with the process until desired consistency has been reached.
*	*Vuswa bya zakhomi*	Mix maize bran of home-made yellow/white maize flour with water but do not ferment the mixture. Bring water to boil in a pot over an open fire. Add the unfermented mixture to the boiling water and stir with a traditional wooden cooking spoon until soft

		porridge consistency; simmer. Then add home-made yellow/white maize flour in small portions in turns while stirring with a traditional wooden cooking spoon until desired thickness is attained.
Vhuswa ha tshisese	*	Boil water in a pot over an open fire. Add mealie rice and simmer until soft. Then add home-made yellow/white maize flour in small portions, in turns, while stirring with a traditional wooden porridge-cooking spoon until thick consistency.
Indigenous fruits flavoured stiff porridge:		Dissolve dry pulp of baobab fruit in boiling water. Sieve out the remaining seeds. Use the same water to cook stiff porridge. Pour the baobab- flavoured water in a pot over open fire and let it boil. Add home-made yellow/white maize flour in small portions, taking turns, while stirring with a traditional cooking whisk until soft porridge consistency. Then after, continue adding the maize flour in small amounts but now cooking with a traditional wooden spoon until desired consistency is reached. *"This type of stiff porridge is sour in taste, owing to the taste of baobab fruit"*, said participants 1 and 2.
Kwangwali ya mbuyu *(baobab fruit)*	*	
Kwangwali ya pfuka *([1]Grewia microthyrs (L.F) kuntze*	*	Pound *Grewia microthyrs (L.F) kuntze* with a mortar and pestle, adding small amounts of water to form liquid mixture. Sieve the mixture to remove the skin and seeds and set aside. Bring water to boil in a pot over open fire. Add the *Grewia microthyrs (L.F) kuntze* liquid mixture and stir. Then add home-made yellow/white maize flour in small portions taking turns, while stirring with a traditional cooking whisk until soft porridge consistency. Then using a traditional wooden cooking spoon, continue with the process until the desired thickness is reached. According to participant 1 and 2, *"Grewia microthyrs (L.F) kuntze flavoured stiff porridge is dark grey in colour and sweet, owing to the indigenous fruit's purple colour"*.
	*	

Kwangwali ya [2] *thombe*	Mash *thombe* with a wooden spoon. Sieve the mixture to eliminate seeds and the skin; set aside. Bring water to boil in a pot over an open fire. Add the *thombe* liquid mixture and stir. Then add home-made yellow/white maize flour in small portions, taking turns, while stirring with a traditional cooking whisk until soft porridge consistency. Then using a traditional wooden cooking spoon, continue with the process until desired consistency is reached.

***** Stiff porridge not reported by either Vaxtsonga or Vhavenda.
[1] Common name was not found.
[2] Scientific and common names were not found.

c). Indigenous leafy vegetables

Table 4.2 presents traditional cooking methods of indigenous leafy vegetables. Indigenous leafy vegetables can be cooked individually or in combination with other vegetables and condiments, such as ground peanut flour. Indigenous leafy vegetables cooking methods are presented according to their similarity in taste and texture.

Table 4.2 Indigenous leafy vegetables

Tshivenda/Xitsonga name	Common name	Traditional cooking method
		Bitter indigenous leafy vegetables
Lubavhe (Tshibavhe) / Nkaka	Balsam Pear	Bring water to boil, in a pot, over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time until soft. Add salt for taste. The addition of ground peanut powder is optional. These leafy vegetables can be cooked with wild jute plant, *lubikela*, stinging nettle and smooth pigweed leaves. *"You can add onions, tomatoes, green pepper, carrots and tender green balsam pear pods when cooking nkaka", said participant 3..*
Mbandatshilale	*	Bring water to boil in a pot over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time until soft. Add salt for taste. Adding ground peanuts powder is discretionary.
Muxe/ Kophe	Nightshade	
Shashe	Wild thistle	

Tshitangwi	*	• Nightshade leaves can be cooked with pumpkin leaves, smooth pigweed and African heart vine leaves.
Nngu	Bushman karo, karu	• Wild thistle leaves can be mixed with catswhiskers, spindle flower and spanish needle leaves. • Bushman karo, karu leaves can be combined with pumpkin leaves, wild jute plant and stinging nettle leaves.

Semi – bitter indigenous leafy vegetables

Phulule	Arican heart vine	Bring water to boil in a pot over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time, until soft. Add salt for taste. Adding ground peanut powder is discretionary.
Mufungwi	*	• African heart vine leaves can be cooked with pumpkin and smooth pigweed leaves.
Munawa / Tinyawa	Cowpea	• *Mufungwi* leaves can be mixed with smooth pigweed, nightshade and spanish needle
Murudi / Bangala	Cats whiskers	Bring water to boil in a pot, over an open fire. Wash the cats' whiskers leaves with warm water to remove the soil particles. Add the leaves and diced tomatoes to the boiling water. Cook until soft, add salt and ground peanut powder. Simmer until the nuts are cooked and then mix the nuts' powder and leaves together. Catswhiskers leaves can be combined with *mutohotoho*, spanish needle and wild thistle leaves.
Mushidhzi / Mixiji	Spanish needle	Bring water to boil in a pot, over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time, until they are soft. Add salt for taste. Adding ground peanut powder is discretionary.
Mutohotoho	Spindle flower	
Mutshatsha	Bitter melon	
Nyedanyendane	*	
Thanga / Xipaswi	Pumpkin leaves	• Spanish needle leaves can be combined with wild thistle, catswhiskers and spindle flower leaves.
Tshinyagu	African cucumber	• Spindle flower leaves can be mixed with spanish needle, cats whiskers and wild thistle leaves. • Bitter melon leaves can be cooked with smooth pigweed leaves • Pumpkin leaves can be combined with nightshade, wild jute plant, balsam pear, bushman karo, karu, stinging nettle and ladysfinger leaves. • African cucumber leaves can be cooked with smooth pigweed, nightshade and pumpkin leaves.

Slippery indigenous leafy vegetables

Delele / Guxe	Wild jute plant	Bring water to boil in a pot over an open fire. Add about two thirds of a handful of *mukango wa thothotho* to the boiling water. Wash the leaves and add to the boiling water together with diced tomatoes. Cook until soft and add salt for taste.

		• Wild jute plant leaves can be cooked with pumpkin leaves, smooth pigweed, balsam pear, mountain nettle and African cucumber leaves. *Mukango wa thothotho* refers to traditional bicarbonate of soda. *"Wild jute plant leaves can be cooked with onions, carrots and green peppers", said participant 3.*
Delele mandande/ Guxe madande	Ladys finger	Bring water to boil in a pot over an open fire. Add about two thirds of a handful of *mukango wa thothotho* to the boiling water. Wash and cut ladysfinger pods into small pieces and add to boiling water together with diced tomatoes. Cook until soft and add salt for taste. • Ladysfinger pods can be cooked with pumpkin leaves, smooth pigweed, balsam pear and African cucumber leaves.
Dzaluma *Lubikela* *Muvhazwi*	Stinging nettle * Mountain nettle	Bring water to boil in a pot over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time until soft. Add salt for taste. • Stinging nettle leaves can be combined with *lubikela,* bushman karo, karu, balsam pear and pumpkin leaves. • *Lubikela* leaves can be cooked with stinging nettle, balsam pear and bushman karo, karu leaves. • Mountain nettle leaves can be mixed with wild jute plant leaves.
Thebe *Vowa / Thyeke*	Pigweed Smoooth pigweed	Bring water to boil in a pot over an open fire. Wash the leaves and add to the boiling water. Add diced tomatoes. Cook, while turning the leaves from time to time until soft. Add salt for taste. Adding ground peanuts powder is optional. • Pigweed and smooth pigweed leaves can be cooked with wild jute plant, balsam pear, bitter melon and pumpkin leaves.

Key: * Common names were not found.

d) Ground peanut-based traditional dishes

Ground peanut-based traditional dishes are prepared from various ingredients ranging from sun-dried traditional leafy vegetables to cooked meat.

i) Dovhi la mukusule wa phuri / Xiridzani xa mukhusa wa tinwebe

Pound peanuts with a mortar and pestle, into flour and set aside. Warm water in a pot over an open fire and add the peanut flour. Stir the mixture until it has blended well. Add salt for taste. Break the sun-dried pumpkin leaves into small pieces and add to the ground peanut mixture. Cook until well done.

ii) Dovhi la mukusule ya munawa / Xiridzani xa mukhusa wa tinyawa

Pound peanuts with a mortar and pestle, into flour and set aside. Warm water in a pot over an open fire and add the peanut flour. Stir the mixture until it has blended well. Add salt for taste. Break the sun-dried cowpea leaves into small pieces and add to the ground peanut mixture. Cook until well done.

According to the respondents, dovhi must not be runny. It must be of a thick consistency.

iii) Dovhi la mashonzha / Xiridzani xa matomani

Wash mopani worms and bring them to boil in a pot over an open fire. Pound peanuts with a mortar and pestle, into flour and set aside. Add tomatoes and salt, cook until well done. Then add the peanut flour in small portion while stirring consistently. Simmer until peanuts are well cooked.

Another method is to first cook the mopani worms until they are well done and set aside. Then prepare the ground-peanut soup by mixing the ground-peanut flour with warm water and simmer. Then you combine the mopani worms with the peanut mixture.

iv) Dovhi la nama ya mukoki / Xiridzani xa swihwaba

Pound peanuts, with a mortar and pestle into flour; set aside. Also, pound biltong into small pieces and set aside. Warm water in a pot over an open fire and add the peanut flour. Stir the mixture until it has blended well. Add salt for taste. Then add biltong pieces to the peanut mixture and cook until well done.

Another method is to first cook the biltong until soft and set aside. Then prepare the ground peanuts soup by mixing the peanut flour with warm water and simmer. Then add the cooked biltong to the peanut mixture and simmer further until well done.

v) Dovhi la nama yo bikiwaho / Xiridzani xa nyama yo swekiwa

Pound peanuts with a mortar and pestle, into flour; set aside. Cook meat in a pot over open fire until well done. Add tomatoes, salt and peanut flour in small portion while stirring consistently. Simmer until peanuts are well cooked.

vi) Dovhi la nzie / Xiridzani xa tinjhiya

Roast grasshoppers until crispy and set aside. Pound peanuts with a mortar and pestle into flour and set aside. Warm water in a pot over an open fire and add the peanut flour. Stir the mixture until it has blended well. Add salt for taste. Add the grasshoppers and simmer until well cooked.

e) Indigenous edible insects

Table 4.3 Indigenous edible insects

Tshivenda / Xistonga name	Common name	Traditional cooking method
Mashonzha / matomani	Mopani worms	Wash mopani worms and boil them in a pot over an open fire. Add tomatoes and salt and cook until soft.
Madzhulu a nemeneme / majenje	Termites	Clean the termites with water and remove the feathers. In a pot, over an open fire, pour oil and fry the termites until crispy. Add salt for taste.
Madzhulu a nthwa / tintshwamakhuru	Termites	
Nemeneme / tintshwa	Flying termites	
Nthwa / tintshwa	Flying termites	Clean the flying termites with water. Bring water to boil in a pot over an open fire and add the termites. Cook the flying termites until soft. Add salt for taste. Sun-dry the flying termites over a day and then remove the feathers. Then further dry the flying termites until completely dried. Then the termites will be ready to be eaten.
Nzie / tinjiya	Grasshopper	Prepare the grasshoppers for consumption by removing the legs and wings. Also remove the faeces through the neck and wash the grasshoppers. In a pot over an open fire, pour oil and fry the grasshoppers until crispy. Add salt for taste. Participant 1 stated that, *"if grasshoppers are harvested in abundance, they can be sun-dried to persevere for later use. They are eaten with vhuswa vhutete."*
Thongolifha / xipembele	Stinkbug	Clean the stinkbug with water. Boil a small amount of water in a pot over an open fire and add the stinkbug. Cook the stinkbug until soft. Add salt for taste. When all the water has evaporated, add a bit of oil and fry until they are golden brown.

f) Indigenous fruit-based food products

i) Khombothole ya mbuyu

This indigenous yoghurt is made with baobab fruit, milk and honey. Break the baobab fruit in half and remove all the dried-up flesh and discard the seeds. Then add milk to the flesh leaves until they melt inside the milk. When all the flesh has melted, combine the mixture until smooth and to the desired consistency.

"If the yoghurt mixture is sour, you can add honey to sweeten it up", said respondent 2.

ii) Khombothole ya mavhungo

Khombothole ya mavhungo is made with sand apricot vine fruit and milk. Wash the fruits and remove the inside flesh with a spoon, as the fruit is soft in texture. Add milk to the flesh and mix until smooth and to the preferred thickness.

iii) Khombothole ya mazwilu

This indigenous yoghurt is prepared with ripe wild medlar fruit and milk. Wash the wild medlar fruits and remove the flesh. Add milk to the flesh and mix until smooth and to ideal consistency.

g) Indigenous fruit-based attractive beverages (fruit juices)

i) Tshithakada tsha mbula

This indigenous attractive drink is made from ripe *mobola* plum. Wash the *mobola* plums and pound with a mortar and pestle. While pounding, remove the skin and remain with the flesh only. Add small amounts of water and mix until desired consistency. Pour the mixture into an airtight container. Chill and serve.

ii) Tshithakada tsha nnei

Tshithakada tsh nnei is made from brown ivory fruit. Gather brown ivory fruit and sun-dry them. When dried, remove the small stalks and pound the fruit with a mortar and pestle. While pounding, add small amounts of water. Continue to pound until the flesh is separated from the seeds. Remove the mixture from the mortar and pour inside an open container. Add small amounts of water until it is at the preferred consistency. Chill and serve.

"*When pounding the brown ivory fruit, add a fruit called thafha to minimize the slipperiness of the brown ivory fruit",* said participants 1 and 2.

iii) Tshithakada tsha mmbubulu/thaladzi

This indigenous attractive drink is prepared from red milkwood fruit. Collect and wash the red milkwood fruits. Then open the mouths of the fruits with a knife and pour hot water to remove the seeds. Sun-dry the fruits and when dried, pound the fruit (flesh and skin) with a mortar and pestle. While pounding, add small amounts of water. Remove the mixture from the mortar and pour inside an open container. Add small amounts of water until it is at the desired texture. Chill and serve.

h) Indigenous fruit-based alcoholic beverages

i) Mukumbi wa mafhula/vukanyi

Collect ripe marula fruit and wash to remove dirt and dust. Remove the flesh from the skin with a fork, a process called *u fhonda/pyaxiwa.* Pour the marula fruit flesh inside a plastic bucket and mash with a traditional wooden whisk. Add water and remove the seeds. Cover the bucket with pumpkin leaves. Let the mixture ferment for 2 to 3 days. Then filter the liquid from the thickened solid-like mass with a clean cloth or sieve; after this, the traditional beer is ready for consumption.

According to participants 1 and 2, "in the olden days, mukumbi was preserved by storing a pot filled with mukumbi inside a hole dug in the ground. Furthermore, marula fruit seeds contain nuts inside that can be eaten raw, the seeds can be pounded and mixed with indigenous leafy vegetables or the pounded seeds can be mixed with ground biltong, and eaten as a snack called tshinyamaduli", said participants 1 and 2.

ii) Mukumbi wa nombelo

Collect and wash ripe stem fruit to remove dirt and dust. Mash the stem fruit with a wooden spoon and remove the seeds. Then pour the mixture inside a pot and add water. Place the pot over an open fire and bring the mixture to boil. Then remove the mixture from the heat and cool. Take out the stem fruit skin and let the mixture ferment for 1 to 2 days. Sieve the congealed solid-like mass and remain with a liquid blend. Once done, the traditional beer is ready to drink.

"This traditional beer is rarely prepared nowadays, as people no longer gather indigenous fruits from the mountains", stated participants 1 and 2.

iii) Mukumbi wa mbula

Collect and wash ripe mobola plum fruit to remove dirt and dust. Remove the skin and seeds. Then add water to the mobola fruit flesh and mash with a traditional wooden whisk. Add home-made pearl millet flour and mix. Let the mixture ferment until it reaches the preferred taste; then this traditional beer is ready for consumption.

i) Traditional alcoholic beverages (traditional beer)

i) Mabundu/Mandlheke

Bring water to boil in a pot over an open fire. Mix water and home-made maize flour to form a paste. Add the maize paste to the boiling water and stir until it reaches a soft porridge-like consistency. Remove the mixture from the fire and cool. Then add fine sorghum flour called '*mufhoho'* and mix, a process known as *'u sutshela'*. Let the mixture ferment until it reaches the desired sourness.

ii) Mabundu a mase/Mandlheke ma handelo

Bring water to boil in a pot over an open fire. Mix water and home-made maize flour to form a paste. Add the maize paste to the boiling water and stir until it reaches soft porridge-like consistency. Add sifted maize bran to the maize mixture and cook. Remove from the heat and cool. Once cooled, add sugar and cover the mixture with a lid. Let the mixture ferment until it is ready to drink.

iii) Halwa/Muqomboti

Bring cold water to boil in a pot over an open fire. Mix maize meal and water to form paste. Add the maize meal paste to the boiling water and stir constantly with a wooden spoon. Let the mixture simmer for a short while and cool. Pour about 20kg of maize bran into a drum. Add the cooled maize mixture into the drum and add equal amounts of hot and cold water until the drum is full. Cover the drum with a lid overnight. On day two, cook the mixture until well done and let it cool. Once cooled, return the mixture into the drum. On day three, add approximately 10kg of maize bran and let the mixture ferment for 1 and a half days. Then on day 5, agitate the mixture constantly, using a jug, a process called *u tuda/ku hluta*. After this process, the traditional beer is ready for consumption.

"*The maize meal, maize bran and water mixture cooked on day 2 is referred to as birima/phiriva", said respondents 1 and 3.*

iv) Tshifatufatu

Mix maize bran with water and let mixture ferment until bitter. Separate the water from maize bran paste. Then bring to boil the fermented water in a pot over an open fire. Mix home-made maize flour with water to form a paste. Add the paste to the boiling water and stir. Let the mixture simmer. Remove the mixture from the heat and pour mixture into a container. Let the mixture cool and add '*fhumela yo sindiwaho'* and mix. Cover the container with a lid and let the mixture ferment for 2 days. Then after two days, the traditional beer is ready for drinking.

v) Muvanya/muvanya

Mix brown sugar with water in a pot and add malt. Close the pot with a lid and let the mixture ferment. Once the mixture has risen, it is ready to for drinking.

"*Muvanya is a traditional alcoholic that does not require heat for preparation", stated respondents 1 and 3.*

vi) Thothotho/thothotho

First prepare *muvanya* as above; let it ferment for 2-3 days. Make a small insertion/hole in a bucket or pot and insert a small pipe. Pour the *muvanya* mixture into the bucket and let it further ferment. During the process, the fermented water will be dripping through the small pipe and into a bottle, until it is ready for consumption.

vii) Cayoni

Mix sugar, yeast and water in a pot. Cover the pot with a lid and let the mixture ferment until it reaches the desired taste.

viii) Xikoko

Bring water to boil in a pot over an open fire. Then add pearl millet kernels; cook them until well done. Remove the mixture from the heat and let it cool down. Once cooled, add pearl millet bran and cover the pot with a lid. Let the mixture ferment until it achieves the ideal taste.

4.4 Discussion

Traditional food recipes constitute an important cultural significance for Vavenda and Vatsonga communities in rural areas of the Vhembe District. The traditional food preparation methods documented in the present study represent the vast indigenous knowledge required to select traditional ingredients, cook and serve them as dishes. These findings are in accord with Guerrero *et al.* (2008), who revealed that knowledge about the recipes, their ingredients and the preparation procedure of diverse traditional foods show an essential element in the

perceptions on traditional food. In the current study, *tshidzumba/tihove,* a very popular dish amongst the Vavenda and Vatsonga people was prepared by adding samp, red ground peanuts, Bambara nuts and red-speckled beans (optional) to boiling water and cooking the mixture until soft. Then add salt and ground peanut powder and cook until the peanut powder turns brownish. Mash the mixture until well combined and serve. Similar results were documented by Basemzansi (2004: 67) in the preparation of *tihove*. This dish is prepared by soaking samp, jugo beans and cowpeas overnight. Boil the soaked ingredients until cooked, grind nuts into powder and add to mixture. Add salt and pepper to taste. *Isiphuphutho,* a similar traditional Zulu dish is made by cooking mealies until soft and then adding beans or cowpeas or jugo beans and cook until soft (Nyembezi, 1996).

Tshimbundwa/Ximbundwa is a traditional dumpling made from semi-dried mealies and peanuts which are pounded into powder and kneaded into a dough after the addition of salt. The dough is then shaped into small pieces and steamed on a bed of maize plant leaves or banana leaves. A study conducted by Nyembezi (1996) about IsiZulu traditional dishes reported analogous preparation method of *ujeqe*, bread that is made by green maize crushed into powder and mixed with water to make a dough. The dough raises after the addition of a small amount of traditional beer and then it is covered in fresh maize husks and steamed until cooked. This indicates that mixing traditional foods into dishes is shared cultural practice amongst the different ethnic groups of South Africa. *Thophi/tshopi* is prepared in a similar manner to *isijingi*, which is made from maize meal and pumpkin. Pumpkin is boiled and then mixed with maize meal. Then the mixture is cooked further for a few minutes and served warm (Lima Rural Development, 2011; Nyembezi, 1996).

The elderly women described *xiendla hi vomu* as being made by boiling peanuts and maize kernels until soft then adding salt and ground peanut flour. Combine the mixture and further cooked for few minutes. These results are corresponding with those of Basemzansi (2004: 67) and Malaza (2000), who published that *xiendla hi vomu* is prepared by boiling mealies and beans until tender; then grind nuts and add to the mixture. At the same time, add salt and pepper and simmer. The preparation of *xiendla hi vomu* is like *uqhafunyeko*, a traditional Xhosa dish made by simmering beans and mealies that have been soaked overnight. Cook until soft but not watery in consistency. Add salt for taste (Basemzansi, 2004: 81). *Xiendla hi vomu* is traditionally served only to exclusive guests such as in-laws, parents or elite people in the community. It was deemed an exclusive dish, commonly served during the evening meal with meat, vegetables or unaccompanied, as it is rich and satisfying (Malaza, 2012). The preparation method of *tshigume/xigugu* documented in the present study corroborates with Malaza (2000), who revealed that *xigugu* is a dish made from coarsely ground maize kernels

which are roasted and mixed with whole roasted peanuts. The mixture is traditionally ground using wooden mortar and pestle. Then salt and sugar are added for taste. In the current study, *bovhola/xipaswi* was cooked by boiling tender pumpkin and pumpkin flower until soft. Then add pumpkin leaves and further cook until soft. Add salt and ground peanut flour and combine. Simmer until peanuts are cooked. Basemzansi (2004:65) tabulates the same preparation method of *moroho wa bovhola/muroho wa xipaswi*. This dish is made by simmering fresh pumpkin, pumpkin leaves, flowers and salt until pumpkin is cooked. Then add ground peanuts and simmer until cooked.

Different types of traditional stiff porridge were prepared by the elderly women. Boiling was the most commonly used cooking method when preparing traditional stiff porridge. In the current study, different types of traditional stiff porridge were made from fermented and unfermented flour derived from various indigenous and traditional cereals. These findings are in accordance with studies conducted by Anyango *et al.* (2011); Murty & Kumar (1995). These studies elucidate that thick porridge is prepared from either fermented, unfermented, chemical or natural acidified slurries. Unfermented stiff porridge is cooked with ordinary tape water and are classified as *ugali* in Kenya, *sadza* in Zimbabwe, *bita* in Niger and *pap* in South Africa. Neutral stiff porridge types recorded in the current study were those made from pearl millet and sorghum flours, *vhuswa ha mavhele (vhutete)/xibasa, vhuswa ha mufhumbu mutshena, vhuswa ha munamba, vhuswa ha mbongo/xitatana, vuswa bya xipepenene, vuswa bya zakhomi* and *vhuswa ha tshisese*. Unfermented stiff porridge is cooked by boiling water and adding cereal flour while stirring until the desired thick consistency is reached. These results are confirmed by De Groote and Kimenju (2012), who revealed that stiff porridge is a dish prepared with milled flour from different cereals or sour dough stirred with water until thickened. Similar findings were reported by Claasen (2017:11) for the preparation of Tswana sorghum thick porridge.

Fermented stiff porridge is also made by cooking cereal flour in water containing lemon juice, tamarind pulp or sprouts of camel foot plant and is known as *kunun* in Nigeria (Wanjala *et al*., 2016; Taylor & Emmambux, 2008; Murty & Kumar, 1995). Furthermore, acidic thick porridge can also be prepared from naturally fermented slurry, a common preparation method of fermented stiff porridge in the present study. It is known as *ting or bogobe* in Botswana, *acede* in Sudan and *nsima* in Malawi (Mlotha *et al*., 2016; Marty & Kumar, 1995). In the current study, types of documented fermented thick porridge were *vhuswa ha mutore*, *vhuswa ha mutuku wa dini/dini ra mavele* and *vhuswa ha mutuku wa munzelu*. This type of stiff porridge is made from fermenting maize, sorghum or millet flour soaked in water for 2 to 4 days and then using the fermented slurry or whey (water substance from fermented milk) to cook sour porridge.

These findings are analogous to Basemzansi (2004:65), who documented the cooking method of *mutuku,* a type of Vavenda stiff sour porridge with bran. This is prepared by mixing yellow mealie meal with white mealie meal and water, which is left to ferment for 2 days. After fermentation, the mixture is boiled and cooked until it has a thick consistency. Likewise *ting ya mabele,* a traditional Setswana starchy dish is made by mixing sorghum flour with lukewarm water and fermenting the mixture for 1 to 3 days, depending on the desired sourness. Then bring water to boil and add fermented mixture, stirring well to avoid lumps. Add more fermented mixture to obtain a thick stiff porridge consistency.

Indigenous leafy vegetables can be cooked either individually, in combination with other leafy vegetables or with addition of ground peanut flour. Boiling was the most common traditional cooking methods used in the preparation of indigenous leafy vegetable dishes reported in the present study. These findings repeat those of Oelofe & van Averbeke (2012), which revealed that leafy vegetable dishes are made from either individual species or a mixture of various species. The same study also showed that preparation methods of traditional leafy vegetable dishes differ because some are prepared either through boiling, steaming or sautéing. In the present study, traditional cooking methods of indigenous leafy vegetable dishes were similar amongst the Vavenda and Vatsonga except for the preparation of balsam pear and wild jute plant. The Vavenda prepare these addition leafy vegetable dishes by boiling them alone or in combination with other leafy vegetables with the addition of salt, tomatoes and ground peanuts. The Vatsonga prepare these leafy vegetables dishes in two ways, one way like that of the Vavenda, while the other is with the addition of onions, carrots, tender green balsam pear pods and green pepper.

The Basotho and Batswana have comparable preparation methods of indigenous leafy vegetables dishes. Basemzansi (2004: 19), explains that a Sotho traditional indigenous green leafy vegetable dish called *morogo* is made by cooking a combination of indigenous leafy vegetables in milk with margarine and onion until tender; salt and pepper are added for taste. Variations are made by adding either potatoes, peanut butter instead of margarine or adding grilled and grinded pumpkin seeds flour. These finding are analogous to the preparation of *morogo wa lerotho*, a traditional Setswana indigenous leafy vegetable dish cooked by simmering traditional leafy vegetable of choice in water until half cooked. Then add onion and tomato and simmer until soft. Add margarine and season with salt for taste (Basemzansi, 2004: 53). This reveals that traditional cooking methods used to make indigenous leafy vegetable dishes tend to be similar among cultural groups belonging living in proximity.
Guimon and Guimon (2012), state that ground peanuts are consumed worldwide in an extensive miscellany of forms, the majority of which are in traditional cuisines. In the current

study, peanuts were pounded into flour with a traditional wooden mortar and pestle to make a gravy mixed with an assortment of traditional ingredients, such as mopani worms, sun-dried indigenous leafy vegetables, grasshoppers and cooked and dried meat. Basemzansi (2004: 67-69) documented the preparation of *dovhi la mashonzha and xiritsa xa tamati*. *Dovhi la mashonzha* is a traditional ground peanuts gravy mixed with mopani worms. It is made by cooking soaked mopani worms in salty water until the water has been absorbed. Then add peanuts and simmer until the ground peanut flour is well cooked. *Xiritsa xa tamati* is prepared by frying onions in oil. Then add tomatoes and fry until cooked. Add water and boil the mixture for few minutes and then add ground peanut flour and simmer until cooked. These findings contradict the present study, as *dovhi la mashonzha* was reported to be prepared by firstly cooking ground peanut flour with water and salt to avoid lumps. Then cooked mopani worms were then added. Andrauwus *et al.* (2014) documented the preparation of *hausa*, a traditional Nigerian ground peanut soup that is made by toasting onion, pepper, salt, maggi (condiment) and other spices, then add fresh *Balanite eagyptium, Tamarinda indica, senna obtusifolia L. or Hibiscus aspe*r leaves and boil. Ground peanuts flour is mixed with cold water into a dough-like form, is added to the leafy vegetables and simmered until cooked.

Likewise, the consumption of traditional alcoholic beverages has a long history in Africa and South Africa. Gadaga *et al*. (1999) revealed the consumption of several traditional fermented beverages in Zimbabwe. These include non-alcoholic cereal-based beverages, such as *maheu/mageu*, *tobwa* and *mangisi,* as well as alcoholic assortments originating from sorghum or millet malt (*uthwala and chikokivana*), distilled spirits called *kachasu* and those fermented from wild fruits-*makumbi* (Nyanga *et al.,* 2008). Platt (1995), noted five main categories of African alcoholic beverages, namely, fermented honey, fermented fruit juices, fermented sap from different species of palm, drinks from milk and traditional beers. These results are in accord with those of the current study. The present study noted preparation methods of indigenous fruit-based attractive beverages (fruit juices), indigenous fruit-based alcoholic beverages (homemade distilled spirits) and traditional alcoholic beverages.

Indigenous fruit-based attractive beverages (fruit juices) were made from indigenous fruits, such as red milkwood fruit, mobola plum and brown ivory fruit. In the current study, indigenous fruit juice made from red milkwood was prepared by cleaning ripe red milkwood fruits with water. Then the mouths of the fruits were opened with a knife and hot water was poured inside to remove the seeds. The fruits were then sun-dried, then crushed with a mortar and pestle, while adding small amounts of water. The mixture was chilled and then served. Rampedi (2010) outlines the same steps in the preparation of indigenous fruit juices in Limpopo Province. Ripe fruits are washed with water. Then the seeds and skin of fruits are detached

with a knife and the bare flesh is ground with a mortar and pestle. Water and sugar are added to loosen the fruit pulp. The mixture is chilled for up to three hours or more before being filtered through a sieve or kitchen napkin; indigenous fruit juices are served cold. The filtration of fruit juice mixture was not reported in the current study. This might be because the traditional preparation methods documented in the present study were used in the olden days, when kitchen utensils such as sieves and dishwashing cloths were not abundant and not affordable by people. Also, the difference concerning the addition of sugar might be attributed to the affordability of this in the past.

The consumption of indigenous fruit-based alcoholic beverages, especially marula beer is still a popular cultural practice in the Vhembe District. The preparation method of marula fruit beer reported in the present study is analogous to the finding of Rampedi (2010); this beer is prepared by removing seeds with a knife and slice the fruit pulp into pieces or marula fruits are soaked in water overnight to remove seeds and skin from the flesh. The seeds and skin are removed from mixture, which then is placed in a warm place to start the fermentation process. Fermentation takes places for 2 to 3 days resulting in a concentrated solid-like slurry. Then the mixture is filtered with a fine mesh sieve or cloth, before being served. The study by Rampedi (2010) further noted that alcoholic beverages made from fruit pulp, particularly, those considered as traditional beers are not boiled, as heat destroys the microorganisms accountable for spontaneous fermentation process.

Additionally, traditional alcoholic beverages reported in the present study were brewed from various cereals such as maize, sorghum, millet and malt. These results are confirmed by Platt (1995), who revealed that African beers are brewed from different carbohydrate-rich ingredients such as sorghum, maize and cereal-enriched cassava flour. In the current study, *mabundu/mandlheke*, a fermented mealie and sorghum flour was prepared by mixing maize meal with water to make a paste that was cooked to soft-porridge consistency. The mixture was left to cool and then mixed with fine sorghum flour and left to ferment until desire sourness is achieved. These findings are similar to those of Basemzansi (2004:67) in the preparation of *mabudu*. Water is boiled, mealie meal is added and cooked to a soft porridge. The mixture is left to cool and then is mixed with malt and let to ferment overnight. Claasen (2017:63) reported on the preparation method of *mageu*, a Setswana traditional drink where all the ingredients - maize meal, fine sorghum flour and water are mixed to a paste, then added to boiling water and cooked. Then the mixture is poured in a bucket that is tightly closed and left to ferment for two days. The preparation of *cayoni* in the current study resembles that of *mahleu/tshweukoto*, a Sesotho traditional beverage reported by Basemzansi (2004: 27).

4.5 Conclusion

Traditional cooking methods were similar amongst the Vavenda and Vatsonga cultures, owing to the amalgamation of the former Venda Bantustan and the former Tsonga homeland of Gazankulu. The traditional ingredients, traditional preparation methods and cooking skills documented in the current study epitomise the transmission of traditional food knowledge from the older to the younger generation without any compromise of the taste and ingredients used. Very few variations in cooking methods were observed, while the noted differences were, usually, the addition of onions, peppers and carrots in the preparation of indigenous leafy vegetables dishes. Some of the reported preparation methods in the current study were comparable to that of other cultures, such as the Zulu, Sotho, Xhosa and Tswana. This provides evidence that the custom of mixing traditional food into single dishes is common in South Africa. The difference lies, mainly, in the cultural naming of these similar dishes.

It must be pointed out that some findings were not discussed due to limitation of relevant literature on traditional cooking methods, hence, more research needs to be conducted to aid the documentation of traditional preparation methods of indigenous foods; this will maintain the utilisation and development of traditional food. The need for conserving indigenous food knowledge will uphold local food culture which is facing concerted pressure from western preparation methods.

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CHAPTER FIVE: NUTRITIONAL COMPOSITION AND SENSORY ACCEPTABILITY OF TRADITIONAL MIXED DISHES IN VHEMBE DISTRICT.

Abstract

Traditional foods are rich sources of protein, carbohydrates, dietary fibre, minerals (including iron, calcium, potassium and magnesium), vitamins (including vitamins A, C, E, K and many vitamins from the B group) as well as a diversity of phytochemicals (including beta-carotene, lutein and zeaxanthin). The aim of the study was to determine the nutritional composition and sensory acceptability of traditional mixed-dishes in Vhembe District. The proximate composition, vitamins, minerals and total amino acid profile of traditional mixed-dishes were assayed using standard techniques. The results indicated that the values of moisture for traditional mixed-dishes increased from 2.85% to 6.73% and a high moisture content was observed in *tshidzimba/tihove* A (sample A) at $p < 0.05$. The fat content of *thophi/tshopi* (sample C) (0.32%) was lower than of sample A (6.00%), *tshidzimba/tihove* B (sample B) (5.98%) and *bovhola/xipaswi* (sample D) (3.06%) at $p < 0.05$. The total dietary fibre values ranged from 7.70% to 28,40% and a high total dietary fibre content was observed in sample B at $p < 0.05$. The protein content of traditional mixed-dishes varied from 11.70% to 31.50% and a higher protein content was observed in sample D at $p < 0.05$. The carbohydrate content of sample C (73.21%) was observed to be higher than of sample A (55.61%), sample B (50.16%) and sample D (32.77%) at $p < 0.05$. The iron content varied from 51.4mg/100 g to 195.6 mg/100 g significantly different at ($p<0.5$). The zinc content of sample D (37.5 mg/100 g) was observed to be higher than sample B (33.7 mg/100 g), sample A (27.8 mg/100 g) and sample C (15.3 mg/100 g) at $p < 0.05$. Sample D had a higher potassium content (16513.2 mg/100 g) than sample C. Sample C had higher vitamin A (288.0 µg/100 g) and β-carotene (576.0 µg/100 g) content. Sample C recorded a higher vitamin B9 (47.0 µg/100 g) content than sample D. Histidine, lysine, phenylalanine, valine levels were significantly different at ($p<0.05$). Sensory evaluation results showed that sample A was rated higher in mouthfeel, aroma, taste and appearance and overall acceptability than samples (B, C and D) at $p < 0.05$. There was no significant difference in texture for all samples at $p < 0.05$. The the study demonsrates that, traditional mixed-dishes are economical and abundant sources of fundamental nutrients and their consumption must be encouraged, especially in local communities where they are readily available to prevent and lessen the burden of micronutrient and macronutrient deficiencies and promote healthy lifestyle.

Keywords: Nutritional composition, sensory acceptability, proximates composition, vitamins, amino acids

5.1 Introduction

The Britannica Encyclopaedia (2017) and Okaka and Okaka (2005), define 'food' as any substance consumed by an organism to provide energy, repair worn-out body tissue, synthesis of new tissue as well as maintain and stimulate growth. According to Okaka and Okaka (2005), food is a mixture of chemicals that are combined to give it colour, shape, texture, taste and flavour. Several studies note that chemicals found in food are known as 'nutrients' which are classified as either carbohydrates, proteins, lipids, vitamins, minerals, amino acids and etcetera (Amadi *et al*., 2011; Olusanya, 2008; Okaka & Okaka, 2005; Onwuka, 2005).

Traditional foods have been consumed by people over a long period of time. They also play an important role in establishing local identity, culture, custom and contributes to the transfer of cultural heritage from generation to generation (Albuyrak & Gunes, 2010; Inamdar *et al.,* 2005). The use of various species of plants, fungi and edible insects has been documented (Rathore, 2009; Boa, 2004; Bennet & Robinson, 2000; DeFoliart, 1992). Evidence has been provided by numerous studies, globally and in South Africa, regarding indigenous and traditional foods being consumed by many households, especially in arears where these foods are accessible (Bvenura & Afolayan, 2015; Mbhenyane *et al*., 2012; Mbhatsani *et al.,* 2011; Tshukudu, 2005; Voster *et al*., 2005; Nesamvuni *et al*., 2001).

According to Kuhnlein *et al*. (2009), traditional foods are chiefly obtained either through farming or wild harvesting and utilized based on traditional wisdom and knowledge. Several studies have shown the importance of traditional foods in household food security and dietary diversity (Chetty, 2013; Faber *et al*., 2010; Uusiki *et al*., 2010; Twine & Hunter, 2007; Jansen van Rensburg *et al*., 2007). Indigenous foods can play a major role in enhancing the quality of diets by contributing to the daily dietary recommendations, reduce micronutrients malnutrition, recuperate nutritional status and human health and improve food and nutrition security (Kruger *et al*., 2015; Van Jaarsveld *et al*., 2013). Furthermore, Jansen van Rensburg *et al*. (2007) noted that these plants are inexpensive, easily accessible and provide many communities with health-promoting compounds such as vitamins and minerals, anti-oxidants and anti-cancer factors needed to maintain health and fight infections.

Likewise, a study conducted in Nigeria revealed that four commonly-consumed indigenous leafy vegetables had relatively high protein values (Aletor *et al*., 2002). James *et al*. (2010) reported that Amaranthus is grown for its leaves which are rich in beta-carotene, calcium, iron and vitamin C. A review on the nutritional value of 22 indigenous leafy vegetables conducted by to Uusiki *et al*. (2010) showed that *Manihot esculenta* contained significant levels of provitamin A, vitamin C, iron, zinc, calcium and magnesium.

The nutritive value and health benefits of many of these traditional foods, however, have been largely unexplored and under-researched (Ghosh-Jerath *et al*., 2016). Recorded nutrient data on indigenous vegetables and traditional foods consumed in South Africa will improve the country-specific food composition database in southern Africa considerably. The database should eliminate assumptions which nutrition researchers make on dietary intake analysis of indigenous vegetables and traditional recipes and impact significantly on dietary analysis outcomes (Chetty, 2013). The numerous traditional foods that exist among the Vhavenda and Vaxtsonga communities reflect the rich biodiversity of the Vhembe District that can potentially be used to promote food security, nutrition and health.

5.2 Materials and methods

This section describes the selection of traditional mixed-dishes, collection of samples, preparation of samples, proximate analysis of traditional mixed-dishes, and sensory evaluation of these dishes.

5.2.1 Selection of traditional mixed dishes

Four traditional mixed-dishes, namely *tshidzimba/tihove* A*, tshidzimba/tihove* B*, thophi/tshopi* and *bovhola/xipaswi* were selected for nutrient analysis because of their absence from the South African Food Composition Database and their popularity amongst the communities, as outlined in chapter 4. Nutrient analysis was done only on a few samples due to the high cost of analysis.

5.2.2 Collection of samples

The ingredients for *tshidzimba/tihove* A (samp, bambara groundnuts, whole ground peanuts and ground peanuts powder); *tshidzimba/tihove* B (samp, bambara groundnuts, whole ground peanuts, speckled beans and ground peanuts powder); *thophi/tshopi* (pumpkin and maize meal); *bovhola/xipaswi* (pumpkin leaves, pumpkin flowers, tender squash and grounded peanuts powder) used for the preparation of these traditional mixed-dishes were purchased from the local market and street vendors in Thohoyandou CBD. The traditional mixed-dishes were prepared at the Department of Food Science pilot plant at the University of Venda.

5.2.3 Preparation of samples

The above-mentioned traditional dishes were prepared using the cooking methods as elucidated in chapter 5. Samples were cooked and cooled then dried at temperatures ranging from 55°C to 75°C overnight and 48 hours, respectively. The dried samples were hand-ground with a porcelain mortar and pestle to reduce particle sizes and then milled. Milled samples were sifted through a stainless-steel sieve to attain a powder sample homogenization. Each of the sample was stored in coded zip-lock plastic bags at (- 5°C) for chemical analysis. The moisture, ash, fat and carbohydrates content were determined at the Department of Food Science chemistry laboratory, at the University of Venda. Protein, total dietary fibre, beta-carotene, vitamins, minerals and total amino acid profile were analysed at NOSA Testing Food and Beverage Laboratory in Cape Town; the registration number is 2013/002068/07.

5.2.4 Proximate analysis of traditional mixed dishes

This section describes the standard methods of nutritional analysis used in the current study.

5.2.4.1 Determination of moisture content

Moisture (g water/100 g sample) of traditional mixed-dishes was determined using the method described by AOAC (2000:925.09). Crucibles were washed and dried in an air oven at 100°C to a steady weight (W_1). About 2g of each traditional mixed dish sample was measured into the weighted crucibles (W_2). The crucible containing the sample was held for 3 hours, in an oven at 105°C and measured. After drying, samples were cooled in a desiccator and weighted (W_3). The moisture content was calculated as:

$$\% \text{ Moisture} = \frac{(W2-W3)}{(W2-W1)} \text{ x } 100$$

5.2.4.2 Determination of ash content

The AOAC (2000) method 923.03 was used to determine the ash content of traditional mixed-dishes. A clean crucible was dried, cooled and weighed in an oven (W_l). Approximately 2g of each sample was placed in the crucible and the crucible was weighed again (W_2). The crucible was placed into a muffle furnace at 550˚C and left overnight to ensure proper ashing. The materialization of whitish-grey ash showed complete oxidation of all organic matter in the sample (Gul & Safdar, 2009). The crucible was cooled in a desiccator and weighed (W_3). Ash content was calculated as follows:

$$\% \text{ Ash} = \frac{W3 - W1}{W2 - W1} \text{ x } 100$$

5.2.4.3 Determination of fat content

Fat (g fat/100 g sample) of traditional mixe- dishes was analysed by the Soxhlet extraction method (AOAC, 2000:920.39). Four beakers were cleaned, dried at 100°C and cooled to a steady weight in an air oven. About 2 - 5 g of each sample was weighed onto a porous paper (Whiteman filter paper) which was placed inside an extraction thimble. The thimble was transferred into a Soxhlet reflux flask and mounted onto a previously heated and weighed extraction flask. About 300 ml of petroleum ether at boiling point of 40-60˚C was placed in the flask. The upper end of the reflux flask was connected to a water condenser. Petroleum ether was heated (boiled), vaporized and condensed to liquid form that dropped back into the reflux flask (Obiakor *et al.,* 2014). The ether soluble substances were dissolved, which contracted the oil (fat) and were carried into the solution through the siphon tube and back into the boiling flask. The extraction lasted for 4 hours. The thimble carrying the defatted sample was removed; much of the solvent recovered and the oil extract was in the flask. The flasks were disconnected and dried in the oven at 60°C to a constant weight. The flasks were cooled in a desiccator and weighed. Percentage of crude fat was determined as follows:

$$\%\text{Fat} = \frac{\text{Weight of fat extracted}}{\text{Weight of dried sample}} \text{ x } 100$$

5.2.4.4 Determination of crude protein

Protein (g protein/100 g sample) of traditional mixed-dishes was analysed using the Kjeldahl method (AOAC, 2000:979.09). About one gram of flour sample was measured into the 100 ml Kjeldahl bottle. To speed up the reaction, a gram of catalyst was added. The bottle was put on a Kjeldahl rack and heated until a transparent solution was formed. At the end of the digestion, the flask was refreshed, and the sample was transferred quantitatively into a volumetric flask of 100 ml and marked with distilled water. Approximately 10 ml of the digest was pipetted into Markham semi-micro nitrogen during cooling and 40 ml of sodium was applied to hydroxide. This sample was a 100ml conical bottle of vapor-distilled releasing ammonia containing 10 ml of 40% boric acid and 2 drops of methyl red indicator. About 10 ml of sodium hydroxide from the measuring cylinder was added so that ammonia was not lost; then it was distilled into 20 ml of 4% boric acid solution containing modified methyl red indicator. The alkaline ammonium borate formed was then titrated directly with standard 0.1N HCl solution until the appearance of a pink colour. The percentage (%) total nitrogen (N) per sample was calculated as:

$$\%\ \text{N} = \frac{\text{V1} - \text{V0 x M x 14 x 100 x 100}}{\text{1 x 1000 x 10 x 1}}$$

The crude protein was calculated as % crude protein (P) = 6.25 x N.

V0 = Volume of HCL required for blank, V1 = Volume of the HCL required for 10 ml sample solution, M = Molarities of acid (0.1M), 14 = atomic weight of N_2, 100 = total volume of digest, 100 = % conversion, 10 = Volume of distillate, 1 = amount of sample taken in gram, 1000 = to convert to liter, Protein contains 16% N. This makes the general conversion factor at 6.25.

5.2.4.5 Determination of total dietary fibre

Total dietary fibre (g total dietary fibre/100g sample) was analysed using enzymatic gravimetric method (AOAC, 2006: 985.29). About 1 g of each sample was weighed into 400 mL tall-form beakers which were incubated at 98-100°C for 15 min. Approximately 50 mL phosphate buffer (pH 6.0) was added to each beaker. Then 50 µL heat-stable α-amylase solution was added and the beakers were covered with aluminium foil and placed in a boiling water bath for 30 minutes. The beakers were also gently shacked at 5minutes intervals, cooled to room temperature and to adjust the pH of the solution to pH 7.5 ± 0.1 with10ml 0.275N NaOH.

About 100 µL of protease solution was added, the beaker was covered with aluminium foil and incubated at 60°C with continuous agitation for 30 min. The solution was cooled to room temperature (25°C) and pH was adjusted to 4.5 ± 0.2 with 0.325M HCl. About 200 µL amyloglucosidase was added, the beaker was covered with aluminium foil and incubated for 30 min at 60°C with continuous agitation. Upon completion of the 3-enzyme digestion sequence, 280 mL 95% ethanol pre-heated to 60°C (volume was measured before heating) was added. Solutions were left for 60 minutes at room temperature to form a precipitate. Then the solution was filtered by suction, using a water aspirator or vacuum pump, through 1.0 g Celite layered on a Pyrex glass crucible filter that previously had been dried to constant weight. The 500ml tall-form beaker and the residue were washed 3 times with 20mL78% ethanol, 2 times with 10ml 95% ethanol and 2 times with 10 mL acetone. The filtrate and washings were quantitatively transferred into a 1L round bottom flask. The residue was air-dried in an oven at 105°C overnight and the weight recorded. This residue weight, minus the protein, ash, and blank residue weights represents the weight of the dietary fibre calculated as:

$$\% \text{ Total Dietary Fibre} = [R \text{ sample} - P \text{ sample} - A \text{ sample} - B)/SW] \times 100$$

Where: B = R Blank - P Blank - A Blank

TDF = Total Dietary Fibre R = Average Residue Weight (mg) P = Average Protein Weight (mg) A = Average Ash Weight (mg) SW = Average Sample Weight (mg)

5.2.4.6 Determination of carbohydrates

Carbohydrate was determined by mathematical calculation. It was obtained by subtracting the sum of percentages of all the nutrients already determined from 100 (AOAC, 2000). This gave the amount of nitrogen-free extract, commonly, known as carbohydrate (Ijarotimi & Keshinro, 2013).

$$\%\, Carbohydrate = 100 - \ (\%moisture + \%\, Fibre + \%\, protein + \%Fat + \%\, Ash\ content)$$

5.2.5 Mineral analysis

(Standard methods of analysis are presented below as NOSA Testing laboratory did not provide their analysis method)**.**

The mineral content (iron, zinc and potassium) of the samples were analysed in accordance with the dry ash extraction method (AOAC 2005: 984.27). A measured weight of each of the samples were ashed at 500^{o}C removing all the organic materials, leaving the inorganic ash. The consequential ash was dissolved in 5ml of dilute (0.1 m) hydrochloric acid solution and then diluted to 100ml in a volume flask. The amount of each element was determined with an ICP spectrometer by comparing emission of the unknow sample against emission of each element from the standard solution.

5.2.6 Determination of beta carotene

Beta carotene was analysed using AOAC method (Williams, 1984) of high performance liquid chromatography (HPLC) of carotenoids. Hexane in the test solution was first evaporated on a water-bath with the aid of nitrogen gas. The residue was immediately re-dissolved in a suitable volume of the mobile phase. After passing through a 0.45 µm regenerated cellulose membrane filter, suitable volumes were injected into the chromatograph. Identification of the carotenoids for HPLC profiles was carried out by comparing the sample with a reference carotenoid mixture, similarly chromatographed. Column fractions were injected under the same conditions to ascertain the presence of cryptoxanthin and alpha- and gamma-carotene. Carotenes were quantified by comparison of the area with β-carotene and cryptoxanthin by comparison with a known amount of added internal standard. The amount of vitamin A present was determined using a conversion factor (I IU Vitamin A = 0.3 µg retinol = 0.6 µg β – Carotene).

5.2.6.1 Determination of vitamin B9

Vitamin B9 was assayed using AOAC method (2004.05). Samples were suspended in phosphate buffer and heated to enable extraction of folates. Protease and -amylase treatment was used to further digest the food matrix. Naturally occurring folypolyglutamates were hydrolysed with -glutamyl hydrolyase to folylmono- or folydi-glutamates. Extracted folates were diluted with a basal medium containing all the required growth nutrients except folate. The growth response of Lactobacillus casei, subsp. rhamnosus (ATCC 7469) to extract folates was followed turbidimetrically and compared to the growth response to standard solutions of folic acid with known concentration. Vitamin B9 was determined turbidimetrically by comparing growth response of sample against the growth response of a vitamin B9 standard.

5.2.7 Determination of total amino acid profile

Samples were analysed through HPLC according to the method described by (Henderson *et al*., 2000; Barkholt & Jenson, 1989; Schuster, 1988). Each sample containing 5.0 mg of protein was acid-hydrolyzed with 1 mL of 6 N HCl at 110°C for 24 h in vacuum-sealed glass tubes. Phenol was added to the 6N hydrochloric acid to prevent halogenation of tyrosine. Cystine and cysteine were converted to S-2-carboxyethylthiocysteine by the addition of dithodipropion acid. Tryptophan was hydrolysed from proteins by heating at approximately 110^{o}C in 4.2N sodium hydroxide. Samples were analysed by HPLC after pre-injection derivatisation. The primary amino acids were derivatised with o-phthalaldehyde (OPA) and secondary amino acids were derivatised with fluorenylmethyl chloroformate (FMOC) before injection. The amino acids composition was calculated from the areas of standards obtained from the integrator and expressed as percentages of the total protein.

5.2.8 Sensory evaluation

This section describes the sample preparation and the procedure used for sensory evaluation.

5.2.8.1 Sample preparation

Samples were prepared per the traditional cooking methods outlined in Chapter 5. The selected traditional mixed-dishes were prepared by the researcher at the University of Venda Department of Food Science and Teachnology pilot plant, following the traditional cooking methods provided by the elderly women in the study area.

5.2.8.2 Sensory evaluation procedure

Sensory evaluation followed the procedure described by Lawless and Heymann (2010). The sensory rating was conducted at the University of Venda, Department of Food Science and Teachnology sensory laboratory. A total of 209 untrained panellists, consisting of university students and staff members were conveniently sampled. Rated sensory attributes were - appearance, aroma, taste, texture, mouthfeel and overall acceptability of the traditional mixed-dishes. Sensory attributes were evaluated using a nine-point hedonic scale from *dislike extremely* (score 1) to *like extremely* (score 9) as described by Mbata *et al*. (2009). The samples were blindly labelled with 3-digit codes and were randomly served to the panellists. Between tasting the samples, panellists were asked to take a sip of lemon water and eat a small piece of carrot to cleanse the palate to avoid possible overlap of flavours (van der Hoeven *et al*., 2013)

5.2.9 Statistical analysis

All analysis were done in triplicates. Results were entered in Microsoft Excel spreadsheet and analysed using IBM Statistical Package of Social Sciences (SPSS latest version). Frequencies, mean, standard deviation and analysis of variance (ANOVA) were used to interpret data. Means were separated using Duncan's multiple range test at $p < 0.05$ (Duncan, 1955).

5.2.10 Ethical considerations

Ethical clearance was sought and obtained (Appendix A) from the University of Venda Research Ethics Committee due to the sensory evaluation which was conducted. Panellists were asked to read and sign the consent form (Appendix D) before participation in this study after the researcher explained the aim and objectives of the study; participation was voluntary. Panellist were also screened for allergenicity to peanuts through a mini survey questionnaire (Appendix E).

5.3 Results and discussion

5.3.1 Proximate composition of traditional mixed-dishes

The results of proximate analysis of traditional mixed dishes are presented in Table 5.1. The values of moisture for traditional mixed dishes ranged from 2.85% to 6.73%. It was observed that the moisture content of samples A, B and C were higher than sample D with a moisture content of 2.85%; sample A had the highest in moisture content at $p < 0.05$. This observation suggests that the three samples have a shorter shelf-life when compared to sample D. The high moisture content could have been because of the water used when cooking *tshidzimba/tihove*. This observation indicates that samples A, B and C have a shorter shelf-life when compared to sample D with a moisture content of 2.85%. Higher moisture content is

known to enhance the growth of microorganisms in food, which causes food to spoil, hence, in food being nutritionally poor (Udensi *et al*., 2012). This result implies that traditional mixed-dishes should not be stored for longer periods, as they are susceptible to spoilage because of a high moisture content which can make the dish unhealthy for human consumption. High moisture contents of these types of food also indicate high susceptibility to microbial spoilage at ambient storage. Such dishes should, therefore, be consumed immediately after preparation or stored under cold storage or reheated before consumption to avoid microbial food poisoning (Awogbenja & Ugwuona, 2012).

The ash content in the current study ranged from 0.36% to 0.42%. The high ash content in samples A, B, C and A was not significantly ($p < 0.05$) different. This indicates that traditional mixed-dishes could be good sources of mineral. An increase in ash content could be because vegetables are known to be rich in minerals. Luthria and Pastor-Corrales (2006) echo the same sentiment that traditional foods are rich sources of minerals, including iron, calcium, potassium and magnesium. Minerals are inorganic substances found in body tissue and fluids and are essential for normal life processes. They are crucial for controlling body fluids inside and outside the cells, building strong bones and teeth and converting food into energy (Sizer & Whitney, 2017). More on the point, studies conducted reveal that legumes are nutritionally valuable, providing minerals for the human diet (Annor *et al*., 2014; Rebello *et al*., 2014; Bouchenak & Lamri-Senhadji, 2013). Consequently, inadequate dietary intake of minerals may lead to the development of osteoporosis later in life, iron deficiency anaemia in infants, women of childbearing age and preschool children, short stature, alopecia and goitre (Mahan & Escott-Stump, 2008).

In the present study, the fat content of *thophi/tshopi* (0.32%) was lower than that of sample A (6.00%), sample B (5.98%) and sample D (3.06%) at $p < 0.05$. The high fat content of sample A and B can be ascribed to the fact that legumes contain considerable amounts of fat that constitutes significant amounts of mono- and polyunsaturated fatty acids (PUFA) but virtually no saturated fatty acids (Kouris-Blazos & Belski, 2016). The same study also revealed that the highest amount of PUFA (71.1%) and monounsaturated fatty acids (34%) were found in kidney beans and chickpeas, respectively. According to Sizer and Whitney (2017), fat is the human body's primary storage of energy required for muscular functioning. Fat also serves as a reserve fuel supply in times of illness and diminished food intake, protects the internal organs from shock, insulates against temperature extremes by forming a fat layer under the skin and fat forms a major material for cell membrane (Sizer & Whitney, 2017). In addition, dietary fat is fundamental for digestion, absorption and transportation of fat-soluble vitamins and phytochemicals, such as carotenoids and lycopenes (Mahan & Escott-Stump, 2008).

Insufficient dietary fat intake, on the other hand, leads to deprivation of energy, vitamins and essential fatty acids.

Table 5.1 Proximate composition of traditional mixed-dishes

Samples	Nutrient content per 100g of sample					
	Moisture (%)	**Ash (%)**	**Fat (%)**	**Total dietary fibre (%)**	**Protein (%)**	**CHO (%)**
Sample A	$6.73^{b} \pm 0.78$	$0.36^{a} \pm 0.80$	$6.00^{c} \pm 0.14$	$17.00^{b} \pm 0.50$	$13.30^{b} \pm 0.50$	$55.61^{c} \pm 1.28$
Sample B	$6.39^{b} \pm 0.58$	$0.36^{a} \pm 0.85$	$5.98^{c} \pm 0.18$	$19.50^{c} \pm 0.55$	$16.60^{c} \pm 0.50$	$50.16^{b} \pm 0.56$
Sample C	$6.67^{b} \pm 0.88$	$0.40^{b} \pm 0.20$	$0.32^{a} \pm 0.00$	$7.70^{a} \pm 0.50$	$11.70^{a} \pm 0.50$	$73.21^{d} \pm 1.03$
Sample D	$2.85^{a} \pm 0.36$	$0.42^{a} \pm 0.20$	$3.06^{b} \pm 0.19$	$28.40^{d} \pm 0.50$	$31.50^{d} \pm 0.26$	$32.77^{a} \pm 0.44$

Mean values ± Standard deviation values of triplicates. Values in the same column with different superscript letters are significant different at ($p<0.05$).

Sample A = tshidzimba/tihove A is a dish consisting of samp, red ground peanuts, bambara groundnuts, peanut powder and salt; all ingredients were cooked together and mashed.
Sample B = tshidzimba/tihove B is a dish consisting of samp, red ground peanuts, bambara groundnuts, red-speckled beans, peanut powder and salt; all ingredients were cooked together and mashed.
Sample C = thophi/tshopi is a dish containing pumpkin, maize meal and sugar (optional, cooked together and mashed.
Sample D = bovhola/xipaswi is a dish containing pumpkin leaves, pumpkin flowers and green tender pumpkin, ground peanut powder and salt, cooked together and mashed.

The total dietary fibre values in the present study ranged from 7.70% to 28,40%; a high total dietary fibre content was observed in sample B at p <0.05. *Bovhola/xipaswi* had the highest content of dietary fibre. This result may be ascribed to the combination of indigenous leafy vegetables and legumes (ground peanuts). This finding corroborates with those of Maphosa and Jideani (2017), who documented that legumes are rich in dietary fibre, low in saturated fat and have no cholesterol. According to literature, indigenous leafy vegetables are good sources of dietary fibre, protein, vitamin and minerals (Uusiku *et al*., 2010). Several studies conducted indicate that dietary intake of fibre is associated with a decrease in total and low-density lipoprotein (LDL) cholesterol along with lessening risk of acquiring coronary heart disease, metabolic syndrome, hypertension, stroke, diabetes, obesity and certain gastrointestinal diseases (Anderson *et al*., 2009; Boudon *et al*., 2001; Brown et al., 1999; Anderson & Bridges, 1988). Furthermore, dietary fibre contributes to a feeling of satiety and assists to maintain functioning of the digestive system (USDA, 2010; Anderson *et al*., 2009). Samples A, B and C had lower dietary fibre values, however, they are still commendable sources of dietary fibre and their consumption should be encouraged, especially in rural area where they are abundant.

The protein content of traditional mixed-dishes ranged from 11.70% to 31.50% and a high protein content was observed in sample D at p <0.05. Combining traditional food into dishes contributes to increased nutrient content as noted in sample D. Aletor *et al*. (2002) highlighted that green leafy vegetables are rich and economical sources of protein. This is because of their ability to synthesize and accumulate amino acids with the aid of sunlight, water, oxygen and nitrogen which is readily available in the atmosphere. Proteins are large and multifaceted molecules comprising of numerous of amino acids (Aletor *et al*., 2002). Proteins perform significant roles in cellular functions, structure and regulations of metabolic activities. Sizer and Whitney (2017) documented that proteins form immune system's molecules that fight diseases, offer netting on which blood cell are built, supply some fuel for the body's energy needs, assist to maintain water and mineral composition of various body fluids and aid in needed chemical reactions; when dietary protein becomes inadequate, protein-energy malnutrition is likely to occur. Furthermore, the most recognisable consequences of protein deficiency include, slow growth in children, impaired brain and kidney functions, weakened immune defences and impaired nutrient absorption from the digestive tract (Sizer & Whitney, 2017). Even though samples A, B and C had lower protein values when compared to sample D in the present study, these samples are still laudable sources of dietary protein. Studies conducted indicate that legumes have higher protein content that most plant foods and this is ascribed to their association with the activity of the nitrogen-fixing bacteria from their association with the activity of the nitrogen-fixing bacteria in their roots; this process converts

unusable nitrogen gas into ammonium which the plant then incorporates into protein synthesis (Food and Agricultural Organisation, 2016; Kouris-Blazos & Belski, 2016; Mlynekova *et al.,* 2014; Leonard, 2012).

The carbohydrate content of sample C (73.21%) was observed to be higher than that of sample A (55.61%), sample B (50.16%) and sample D (32.77%). at $p < 0.05$. The higher carbohydrate content in sample C may be attributed to the combination of pumpkin and maize meal. Cereals have been reported to contain more carbohydrate and fewer amounts of protein and essential minerals. Maize is considered an important source of carbohydrate (Hussan *et al*., 2003). Sizer and Whitney (2017) also note that carbohydrates play essential roles in the body, including providing energy as fuel for the brain and nerves, glucose storage, translating raw materials, such as sugar into amino acids, moderates blood glucose concentrations and promotes digestive tract health. Inadequate consumption of carbohydrates, however, may lead to ketosis, dehydration, and the intake of other nutrients, such as fibre, thiamine, folate, vitamins A, E, and B6, calcium, iron, potassium and magnesium may be reduced, which may result in micronutrient deficiencies (Denke, 2001; Freedom *et al*., 2001). Essentially, a diet low in carbohydrates also has potential of cardiac complications, osteoporosis, muscle loss and possible insulin resistance (Bilsborough & Crowe, 2003).

5.3.2 Micronutrient composition of traditional mixed-dishes

Micronutrient composition of traditional mixed dishes is presented in Table 5.2. The iron content varied from 51.4mg/100 g to 195.6 mg/100 g significantly different at ($p<0.05$). *Bovhola/xipaswi* had the highest iron content when compared to samples A, B and C. Schonfeldt & Pretoruis (2001) reported an iron content of 15.7mg/100 g in cooked pumpkin leaves. In another study conducted by Ngozi and Nkiru (2014), the iron content of cooked pumpkin pulp leaves was 4.62mg/100 g. The above-mentioned iron composition of cooked pumpkin leaves is lower than the iron content documented in the present study. The high iron content of *bovhola/xipaswi* might be ascribed to the combination of cooked pumpkin leaves and ground peanuts. According to Kouris-Blazos & Belski (2016) and Brigide *et al*. (2014), legumes are also a good source of essential mineral, such as iron. The human body requires iron for the synthesis of its oxygen-transporting proteins, mainly haemoglobin which transports oxygen from the lungs to the cells and myoglobin which carries oxygen from the lungs to the muscles (King & Burgess, 2007; Wood, 2005; Hurrell, 1997).

Table 5.2 Micronutrient composition of traditional mixed-dishes

Samples	Nutrient content per 100g of sample					
	Vitamin A (µg)	Beta-carotene(µg)	Vitamin B9 (µg)	Iron (mg)	Zinc (mg)	Potassium (mg)
Sample A	-	-	-	78.0^{b} ± 0.50	27.8^{b} ± 0.50	-
Sample B	-	-	-	91.3^{c} ± 0.50	33.7^{c} ± 0.50	-
Sample C	288.0 ± 0.50	576.0 ± 0.50	47.0 ± 0.50	51.4^{a} ± 0.50	15.3^{a} ± 0.50	10617.4 ± 0.50
Sample D	188.0 ± 0.50	376.0 ± 0.50	5.00 ± 0.50	195.6^{d} ± 0.50	35.7^{d} ± 0.50	16513.2 ± 0.50

Mean values ± Standard deviation values of triplicates. Values in the same column with different superscript letters are significantly different at ($p<0.05$). Sample A = tshidzimba A/tihove; Sample B = tshidzimba B/tihove; Sample C = thophi/tshopi and Sample D = bovhola/xipaswi.
-, not determined.

King and Burgess (2007), however, noted that iron can be depleted from its storage through inadequate dietary intake, increased iron demands such as during growth or pregnancy, blood loss during menstruation and childbirth, as well as from inadequate iron absorption because of parasitic worm infections. This is referred to as 'iron deficiency'. According to Zimmerman and Hurrell (2007), approximately two billion people globally are iron-deficient. Mild and moderate forms of iron-deficiency anaemia can be allied with functional impairments affecting cognitive development, immunity mechanisms and work capacity (Beard & Connor, 2003; Failla, 2003; Viteri & Torun, 1974). Furthermore, the Centres for Diseases Control (2010) revealed that iron deficiency during pregnancy is linked with a range of adverse outcomes for both the mother and infant, including augmented risk of sepsis, maternal mortality, perinatal mortality and low birth weight. Iron deficiency and anaemia also decrease learning ability and motor development, especially in children and is linked with exalted rates of morbidity. The Food and Agricultural Organisation/World Health Organisation (2004) & Hurrell (2002) state that iron deficiency can also be prevented and corrected through dietary diversification, by increasing consumption of iron-rich foods, such as dark green leafy vegetables. *Bovhola/xipaswi* is a good source for iron, therefore, its consumption must be increased through awareness of the nutritional benefits of traditional foods.

Table 5.2.1 Iron requirements of 97.5% of individuals in terms of absorbed iron[a], by age group and sex (WHO, 1989).

Age/sex	mg/day[b]
4 – 12 months	0.96
13 – 24 months	0.61
2 – 5 years	0.70
6 – 11 years	1.17
12 – 16 years (girls)	2.02
12 – 16 years (boys)	1.82
Adult males	-
Pregnant women[c]	1.14
First trimester	0.8
Second and third trimester	6.3
Lactating women	1.31
Menstruating women	2.38
Postmenopausal women	0.96

[a]Absorbed iron is the fraction that passes from gastrointestinal tract into the body for further use. [b]Calculated on the basis of median weight for age. [c]Requirements during pregnancy depend on the women's iron status prior to pregnancy.

Table 5.2.1 shows the Recommended Daily Allowance of iron for individuals by age group and sex. When comparing the reported iron content of traditional mixed-dishes in the current study and the RDAs for iron, all traditional mixed-dishes are within the recommended daily allowances for iron. The documented traditional mixed-dishes should be part of the daily diet for local communities to increase their dietary diversity with the intention of improving and preventing micronutrient deficiencie, such as iron deficiency in children and women of reproductive age which is still a public health concern in South Africa.

The zinc content of *bovhola/xipaswi* (37.5 mg/100 g) was observed to be higher than *tshidzimba/tihove* B (33.7 mg/100 g), *tshidzimbatihove* A (27.8 mg/100g) and *thophi/tshopi* (15.3 mg/100 g) at $p < 0.05$. The high zinc content found in *bovhola/xipaswi* in the present study could be ascribed to the combination of dark green leafy vegetable and ground peanuts which are also sources of zinc (Kouris-Blazos, 2016; Brigide *et al*., 2014). Modi (2009), documented that traditional IsiZulu dishes made predominantly from beans, had a higher zinc content. Zinc is vital for growth, cell division, proper functioning of the immune system, transportation of vitamin A, taste perception, wound healing and reproduction (Sizer & Whitney, 2017; WHO, 2004).

King *et al*. (2006), however, observed that insufficient dietary zinc intake, increased requirements, malabsorption, impaired utilisation and increased losses through excretion can lead to zinc deficiency. In the Limpopo Province, approximately 48% of children aged three

years were reported to be stunted (Mamabolo *et al*., 2005). Inadequate zinc intake is linked with growth failure in infancy and childhood, loss of appetite, skin lesions, delayed wound healing, impaired immune system, delayed sexual maturation, low birth weight and maternal and infant mortality (Gibson, 2012; Shrimpton & Shanker, 2008). Zinc deficiency can be prevented and alleviated through dietary diversification by consuming variety of foods, including traditional mixed-dishes.

Table 5.2.2 Estimated physiological requirements for absorbed zinc by age group and sex (WHO, 2002).

Variables Age/sex	Reference Wt. (kg)	Requirement (mg/day)
6 – 12 months	9	0.84
1 – 3 years	12	0.83
3 – 6 years	17	0.97
6 – 10 years	25	1.12
10 – 12 years	35	1.40
12 – 15 years	48	1.82
15 – 18 years M	64	1.97
15 – 18 years F	55	1.54
Pregnancy*	-	2.27
Lactation*	-	2.89

*Different stages of pregnancy/lactation. Wt. = weight in kilograms (kg). mg = micrograms per day.

Table 5.2.2 summarizes the estimated physiological requirements for absorbed zinc by age and sex. The recorded zinc content in the current study meets the recommended daily allowance for zinc, across the distinctive age groups.

The National Food Consumption Survey-Fortification Baseline (NFCS-FB) conducted in 2005 on children aged one to nine years, reported levels of iron deficiency (14%), anaemia (33%), zinc deficiency (45%) and stunting (10%) (Labodarios, 2007). Likewise, the Academy of Science of South Africa (ASSAF) (2013), revealed that stunting is a proxy measure outcome of zinc deficiency. The South African National Health and Nutrition Examination Survey (SANHANES-1), reported a recuperating situation in terms of the prevalence of iron deficiency (11%), anaemia (10.5%) in children under 5 years and a reduced stunting rate (15.4%) in children aged 0-14 years (Shisana *et al*., 2013).

Regardless of the above-mentioned improvements, the national prevalence of iron and zinc might be low but the situation may be exalted in distinct provinces. Mongwaketse (2014), argues that although the nutritional status of iron and zinc has recovered in contrasted to preceding years, it continues to be a public health concern in South Africa. The consumption

of traditional mixed-dishes, therefore, should be promoted to aid the rural populations to meet their RDAs for iron and zinc; this would contribute to the alleviation of micronutrients' public health concerns in South Africa.

In the present study, sample D had a higher potassium content (16513.2 mg/100 g) than sample C. This may be ascribed to *bovhola/xipaswi* containing pumpkin leaves, flowers, green tender pumpkin and ground peanuts. According to Angela *et al*. (2010), potassium, iron, calcium and sodium are some of the major minerals found in green leafy vegetables. Studies conducted by Kouris-Blazos & Belski (2016); Brigide *et al*. (2014) affirm that legumes are also sources of fundamental minerals such as potassium, iron, zinc, calcium and others. For that reason, a combination of *Cucurbita pepo* leaves and peanut yielded a high potassium content. In addition, minerals are more stable during cooking and processing using most the commonly used methods (van der Walt *et al*., 2009; Akubugwo *et al*., 2007a & b; Odhav *et al*., 2007).

Potassium aids the body to regulate electrolytes (water and mineral balance), send nerve signals and regulate muscle and heart contractions (Raman, 2017; Bellows & Moore, 2013). In addition, Fulgoniet *et al*. (2011) point out that adequate dietary potassium is essential for heart and bone health and reduces the risk of stroke and cardiovascular diseases; hypertension is a major risk factor for the development of stroke, coronary heart disease, heart failure and is the most common cause of death worldwide (Roger *et al*., 2012; Lopez *et al*., 2006). Consequently, increased intake of dietary potassium is linked with decreased blood pressure and has been associated with the reduced risk of death due to cardiovascular diseases (Bellows & Moore, 2013; Dietary Guidelines Advisory Committee, 2011).

Table 5.2.3 Recommended daily allowance for potassium by age group and sex

Age/sex	mg/day
0 – 6 months	400mg
7 – 12 months	860mg
1 – 3 years	2000mg
4 – 8 years	2300mg
9 – 13 years (boys)	2500mg
9 – 13 years (girls)	2300mg
14 – 18 years (boys)	3000mg
14 – 18 years (girls)	2300mg
19 + years (men)	3400mg
19 + years (women)	2600mg
Pregnant women	2900mg
Lactating women	2800mg

Adopted from National Institute of Health, United States of America, 2018.

Table 5.2.3 presents RDAs for potassium by age and sex. The documented potassium content (16513.2 mg/100 g) in the current study only meets the RDA for infants, between zero to twelve months. Samples C and D do not meet the RDAs for individuals one year and above, however, they still represent a high potassium content. Consumption of traditional mixed-dishes together with other potassium-rich foods, like meat, poultry, fish, kidney beans and bananas should still be recommended for rural communities as traditional foods are inexpensive and readily accessible in local areas, like the Vhembe District.

In the current study, sample C had higher vitamin A (288.0 µg/100 g) and β-carotene (576.0 µg/100 g) content. The high beta-carotene content in *thophi/tshopi* might be attributed to the increase in carotenoid content due to improved extractability of carotenoids from vegetable matrix (Khachik *et al.,* 1992; Dietz *et al.,* 1988). Parada & Aguilera (2007) state that softening of plant tissue can be because of the swelling of the cell wall because of thermal processing. The low β-carotene (376 µg/100 g) and vitamin A (188.0 µg/100 g) contents of sample D when compared to that of sample C in the present study may, perhaps, be as a result of a non-disrupted cell wall which makes the compound difficult to extract. Tumuhimbise *et al*. (2009) reiterates the same sentiment that a toughened cell-wall surface can limit disruption of vegetable matrix for the release of the compound.

According to the United States Department of Agriculture (2015a), pumpkin is an exceptional source of beta-carotene for human consumption. The orange or yellow colour of pumpkin pulp shows a high carotene content (Dhiman, 2009). Beta-carotene is a type of carotenoid that is found predominantly in orange-coloured fleshed fruits and vegetables. It has antioxidant properties which can lessen the incidences of some chronic diseases, such as cardiovascular disease and cancer (Chen, 2015; Fraser & Brandy, 2004; Edge *et al*., 1997). Studies by Chen (2015) documented that β-carotene is also one of the provitamin A carotenoids which assists in the acquirement of vitamin A that is fundamental for human vison, immune functioning and normal development.

Blindness as a result of Vitamin A Deficiency (VAD) affects 2.8 million children below the age of five years, worldwide (Ijarotimi, 2008). WHO report that VAD has affected about 190 million pre-school-aged children and 19 million pregnant women, mainly in Africa and South-East Asia (Mclaren, 2012). Details from developing countries prove that up to 80% of dietary intake of vitamin A comes from provitamin A-rich food sources. Increased dietary intake of vitamin A-rich foods, including traditional foods can lessen the burden of vitamin A deficiency especially in rural areas.

Sample C recorded a higher vitamin B9 (47.0 µg/100 g) content than sample D. The high folate content in sample C may be attributed to the use of pumpkin and fortified maize meal in the preparation of *thophi/tshopi*. Maize meal is a very common staple food for most rural communities in South Africa and is officially fortified with vitamin and minerals, including vitamin B9 (South African Government Notice, 2003). According to Scaglione & Panzavolta (2014), humans rely on dietary folate sources, such as vegetables, fruits and grains for adequate folate intake.

Folate is essential for vital metabolic processes, such as new cell synthesis, mental and emotional health, growth of the spine and brain of a foetus and for the prevention of neural tube defects (NTDs) (Sizer & Whitney, 2017; Scaglione & Panzavolta, 2014). These folate requirements increase during pregnancy, infancy and adolescence. Sizer and Whitney (2017) note that folate deficiency may result from insufficient dietary intake, malabsorption due to illnesses, increased excretion, nutrient-drug-interaction and increased body requirements. Folate deficiency may also lead to birth defects such as NTDs which may result in death after birth (Sizer & Whitney, 2017), poor performance in schoolchildren due to weak cognitive development and dementia in adults (Food and Nutrition Bulletin, 2008). Increased dietary consumption of folate before and during pregnancy, hence, can reduce the risk of NTDs for women of child-bearing age. Similarly, consumption of a diversified diet, including food that are fortified with vitamin B9 can prevent and reduce folate deficiencies in our local communities.

5.3.3 Total amino acids composition for tshidzimba/tihove A and B

Table 5.3 summarises the total amino acid profile analysis for traditional dishes, *tshidzimba/tihove* A and B. In the present study, the following essential amino acids - histidine, lysine, phenylalanine and valine - were significantly different at ($p<0.05$). According to Sizer & Whitney (2017), essential amino acids cannot be synthesized by the human body to meet physiological needs and must be provided in the diet. Non-essential amino acids - arginine, aspartic acid, glutamic acid, glycine and serine - were also observed to be significantly different at ($p<0.05$).

Non-essential amino acids are those that the human body can produce for itself. In the current study, leucine was the highest-occurring essential amino acid, while glutamic acid was the highest observed non-essential amino acid in the samples. *Tshidzimba/tihove* B had the highest concentration of leucine (1.32 g/100 g) and glutamic acid (3.38 g/100 g). These results are in correlatation with Ponka *et al*. (2015), who noted high concentrations of leucine and glutamic acid in "*koki"*, a Cameroonian traditional dish. Similarly, Majesty *et al*. (2015) also

recorded the same results in a traditional Nigerian dish known as "*nduduagworagwo"*. The increase in the concentration of leucine and glutamic acid in *tshidzimba* B (containing kidney beans) may be attributed to the high concentration of leucine and glutamic acid in kidney beans (Margier *et al*., 2018; Kouris-Blazos & Belski, 2016).

Methionine had the lowest essential amino acid concentration, while the lowest non-essential amino acid in the current study was Ho-proline. The low methionine content observed in the present study corroborates with findings by Majesty *et al.* (2015) and Ponka *et al*. (2015) who documented the amino acid profile of traditional dishes in Cameroon and Nigeria. The low concentration of methionine in both samples is attributed to the fact that legumes are low in sulphur-containing amino acids, such as methionine (Okaka & Okaka, 2005). Studies conducted on cell culture have shown increasing evidence that some of the traditionally categorised NEAA (for example, glutamine, glutamate, and arginine) play significant roles in various signalling pathways, thereby regulating gene expression, intracellular protein turnover, nutrient metabolism, and oxidative defence (Brasse-Langnel *et al*., 2009; Bruhat *et al*., 2009; Yao *et al*., 2008). EAA can increase growth potential and precludes diseases such as obesity, diabetes, necrotizing enterocolitis, and intrauterine growth retardation in humans (Wu *et al*., 2009). Consequently, *tshidzimba/tihove* is a commended source of amino acids and can contribute to dietary protein intake of local communities.

Table 5.3 Total amino acids profile (g/100 g) for tshidzimba/tihove A and B

Amino acids	Tshidzimba/tihove A	Tshidzimba/tihove B
Essential amino acids		
Histidine	0.57^{a} ± 0.50	0.65^{b} ± 0.50
Isoleucine	0.62^{a} ± 0.50	0.68^{a} ± 0.50
Leucine	1.30^{a} ± 0.50	1.32^{a} ± 0.50
Lysine	0.82^{a} ± 0.50	0.90^{b} ± 0.50
Methionine	0.16^{a} ± 0.50	0.13^{a} ± 0.50
Phenylalanine	0.87^{a} ± 0.50	0.99^{b} ± 0.50
Threonine	0.55^{a} ± 0.50	0.60^{a} ± 0.50
Tryptophan	0.40^{a} ± 0.27	0.41^{a} ± 0.27
Valine	0.69^{a} ± 0.50	0.75^{b} ± 0.50
TEAA	**5.58 ± 0.67**	**5.4 ± 0.67**
Non-essential amino acids		
Alanine	0.83^{a} ± 0.50	0.87^{a} ± 0.50
Arginine	1.82^{a} ±0.50	2.00^{b} ± 0.50
Aspartic acid	1.81^{a} ± 0.50	2.02^{b} ± 0.50
Cysteine	0.44^{a} ± 0.35	0.47^{a} ± 0.41
Glutamic acid	3.20^{a} ± 0.50	3.38^{b} ± 0.50
Glycine	0.84^{a} ± 0.50	0.93^{b} ± 0.50
Proline	0.85^{a} ± 0.50	0.86^{a} ± 0.50
Serine	0.87^{a} ± 0.50	0.96^{b} ± 0.50
Tyrosine	0.73^{a} ± 0.50	0.78^{a} ± 0.50
Ho-Proline	0.07^{a} ± 0.50	0.08^{a} ± 0.50
TNEAA	**11.46 ± 0,80**	**12.35 ± 0.86**

Mean values ± Standard deviation values. Values in the same column with different superscript letters are significantly different at ($p<0.05$). TEAA = Total Essential Amino Acids; TNEAA = Total Non-essential Amino Acids.

5.3.4 Results of sensory evaluation of traditional mixed-dishes

This section presents the sensory evaluation results and discussion.

5.3.4.1 Socio-demographic information of panellists

Table 5.4 shows that the majority of panellists (87.7%) were aged between 18 to 25 years and 1.1% were aged between 35 to 45 years. More than half (53.1%) of panellists were females. Nearly half (40.1%) of the panellists were Venda-speaking, 25.3% were Pedi, 1.4% were Tswana while 22.0% were Tsonga speaking (Table 5.4).

Table 5.4 Socio-demographic characteristics of panellists

Socio demographic characteristics	Categories	Number of participants (N)=277	Percentage (%)
Age (years)	18 – 25	243	87.7
	25 35	31	11.2
	35 – 45	03	1.1
	45 and above	0	0.0
Gender			
	Female	147	53.1
	Male	130	46.9
Ethnicity	Venda	111	40.1
	Tsonga	61	22.0
	Pedi	70	25.3
	Swati	22	7.9
	Sotho	2	0.7
	Tswana	4	1.4
	Ndebele	2	0.7
	Shona	5	1.8

The sensory attributes (appearance, texture, taste, aroma, mouthfeel and overall acceptability) are presented in Table 5.5. The sensory analysis indicates a significant difference in appearance, taste and mouthfeel. The results show that sample A was rated higher in mouthfeel, aroma, taste and appearance and overall acceptability than samples (B, C and D) at $p < 0.05$. There was no significant difference in texture for all samples at $p < 0.05$. Sample D was the least accepted for appearance, taste and mouthfeel. The low rating of sample D in appearance may be associated to the dark green colour of the pumpkin leaves caused by chlorophyll and carotenoids, which is different from the common white colour of maize, light brown colour of ground peanuts, mixture of red and black colour of Bambara groundnuts and red-speckled beans. Similarly, Aduke (2017) reported that porridge made from 70% maize, 15% plantain and 15% soybean was the highest rated complementary food formulation in appearance, taste and overall acceptability in Nigeria. Moreover, the least rating in taste and mouthfeel of *bovhola/xipaswi* could be related to the fact that the youth, who were the majority of the panellists in the current study, is unappreciative of indigenous leafy vegetables and associated them with poverty and so called 'backwards knowledge' (van

Rensburg *et al.,* 2004; van der Walt, 2009). According to the South African National Youth Commission Act of 1996; cited in Cramm *et al*. (2013), 'a youth' is an individual from the age of 14 to 35 years.

Table 5.5 Sensory evaluation of traditional mixed-dishes

Samples	Sensory attributes					
	Appearance	**Aroma**	**Taste**	**Texture**	**Mouthfeel**	**Overall acceptability**
Sample A	$7.58^{a} \pm 1.27$	$7.76^{b} \pm 1.27$	$8.11^{b} \pm 1.33$	$7.67^{a} \pm 1.35$	$7.82^{b} \pm 1.41$	$8.11^{b} \pm 1.27$
Sample B	$7.30^{bc} \pm 1.52$	$7.26^{a} \pm 1.67$	$7.75^{b} \pm 1.59$	$7.60^{a} \pm 1.52$	$7.69^{b} \pm 1.58$	$7.77^{ab} \pm 1.80$
Sample C	$6.73^{ab} \pm 1.33$	$7.02^{a} \pm 1.45$	$7.23^{a} \pm 1.40$	$7.16^{a} \pm 1.33$	$7.00^{a} \pm 1.53$	$7.38^{a} \pm 1.24$
Sample D	$6.95^{ab} \pm 1.74$	$7.21^{a} \pm 1.52$	$7.06^{c} \pm 1.21$	$7.28^{a} \pm 1.58$	$6.63^{c} \pm 1.35$	$7.06^{b} \pm 1.00$

Mean values ± Standard deviation values. Values in the same column with different superscript letters are significantly different at ($p<0.05$). Sample A=tshidzimba A/tihove; Sample B=tshidzimba B/tihove; Sample= thophi/tshopi; Sample D=bovhola/xipaswi.

Nevertheless, these traditional mixed-dishes were overall highly accepted by the panellists according to the ratings. This indicates that traditional mixed-dishes can form part of the daily diet of rural communities in the Vhembe District as rural communities deem traditional foods as being more economical than "contemporary'' foods, as they are locally grown and are obtainable in abundance (Matenge *et al.*, 2012). This will also ensure dietary diversification of local people by increasing the intake in of a variety of foods from different food groups. Dietary diversity is a maintainable long-term strategy to promote the intake of various nutrients concurrently, whereas supplementation is short-term and fortification is a medium-term measure (Gibson & Anderson, 2009; Frison *et al*., 2006). Swindale & Bilinsky (2006) buttressed this notion by affirming that a diet with a better variety of foods consumed from distinctive food groups, offers the needed nutrition for households and individuals.

On the other hand, lack of dietary diversity may result in micronutrient deficiencies, such as in iron and zinc (Chakravarty 2000; Grivetti & Ogle 2000). A cross-sectional study investigating the dietary diversity of South Africans conducted by Labadarios *et al*. (2011), revealed that the Limpopo Province had one of the highest prevalence of poor dietary diversity (61.8%). A diverse diet can be encouraged by utilising local traditional dishes and other traditional foods, especially, dishes that are vegetable and legume-based as a strategy to surmount obstructions to a diversified diet (Nutrition fact sheet, 2012).

5.4 Conclusion

Nutritional properties and sensory acceptability of traditional mixed-dishes were determined. The finding revealed that *bovhola/xipaswi* had the highest content of protein, total dietary fibre, zinc, iron and potassium. These results add to the documented information showing that

indigenous leafy vegetables are inexpensive sources of essential macronutrients and micronutrients. They complement cereal-base South African staple ‘porridge’ which is low in vitamins and minerals, by providing daily micronutrients requirements to the diet of rural communities. Furthermore, the total amino acid profile revealed that *tshidzimba/tihove* is a laudable source of essential amino acids, meaning that this dish also contains exceptional amounts of protein. It was observed that *thophi/tshopi* recorded high values of vitamin A, beta-carotene and vitamin B9. This traditional mixed-dish, therefore, has the potential to help prevent and alleviate vitamin A deficiency, which is still of public health concern in South Africa. Traditional mixed dishes are economical and abundant sources of fundamental nutrients, consequently, their consumption must be advocated, especially in local communities where they are readily available. Traditional mixed dishes have the potential to diversify diet, while improving the simultaneous intake of nutrients; this can assist in preventing and lessening the burden of micronutrient deficiencies, chronic diseases of lifestyle and contribute to household food security, in the long-run.

5.5 References

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CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 General conclusion

The study aimed to determine the nutritional composition of traditional mixed-dishes eaten by elderly women in the Vhembe District. This was accomplished through the identification of traditional mixed-dishes, determination of traditional cooking methods, nutrient composition and consumer acceptability of traditional mixed-dishes.

Eight types of traditional mixed dishes were identified amongst the Vhavenda and Vatsonga, thus demonstrating that mixing of indigenous ingredients into dishes is a shared cultural practice. Sixteen types of traditional stiff porridge were identified in the present study, thus buttressing the notion that porridge is a staple food in South Africa. The present study revealed that Vhembe District is richly endowed with indigenous leafy vegetables as over 20 kinds of these vegetables were reported upon. These findings reinforce that traditional leafy vegetables are part of local communities' daily diet and they are commonly eaten as relish with porridge. Where ingredients are copious, such as in the Vhembe District, indigenous leafy vegetables are gathered and cooked while fresh or sun-dried for later use when they are scarce. Preservation of indigenous leafy vegetables contributes to household food security by enhancing micronutrients intake which promotes healthy lifestyle.

The consumption of insects and wild animals contributes to protein intake for the rural inhabitants of the Vhembe District. In the current study, indigenous fruits were reported to have many uses such as in the preparation of indigenous yoghurt, alcoholic and non-alcoholic beverages. The consumption of indigenous fruit-based food products made from sand apricot vine, wild medlar and indigenous fruit juices made from red milkwood and mobola plum, however, has declined due to the extinction of these wild fruits as a result of human infringement into their natural environment; c onsequently, it is important to preserve our traditional food knowledge for generations to come through documentation.

With regards to traditional cooking methods, boiling was the most common cooking method used by Vhavenda and Vatsonga. This cooking method requires less use of fats which is one of the main components of African diet. A diet high in plant-based foods promotes healthier and longer life. Ground peanuts were used frequently by Vhavenda and Vatsonga in the preparation of many traditional foods, such as in the preparation of indigenous leafy vegetable dishes, traditional mixed dishes and *dovhi/xirhidzani*. The cultural practice of consuming indigenous leafy vegetables with the addition of condiments such as legumes provides vital nutritional elements to the African diet by enhancing a concurrent intake of nutrients; also, the

use of traditional mortar and pestle in the pre-preparation of traditional food, symbolises shared cultural practices of the Vhavenda and Vatsonga.

The nutritional composition and sensory acceptability of traditional mixed-dishes was studied. The results revealed that traditional mixed-dishes can be recommended as sources of nutrients, such as protein, total dietary fibre, iron, zinc, potassium, vitamin A, folate, beta-carotene and amino acids. In the context of dietary requirements, it was observed that these dishes have the potential to meet the recommended daily allowance of iron and zinc which are still micronutrients of public health concern in our country. Traditional mixed-dishes are mostly plant-based food sources that are rich in protein, are high in essential amino acids, as reported in the current study. The sensory evaluation showed that traditional mixed dishes highly accepted, mostly by the young people, bringing to light that awareness of traditional foods can improve their consumption by the youth, who according to literature, associates these foods with 'backward knowledge' and they perceive them as 'food for the poor'. Consequently, the consumption of traditional-mixed dishes must be promoted, particularly, in rural areas. They are economical, copious, very good sources of fundamental nutrients required for growth and development, as well as the maintenance of various metabolic activities. They have the ability to diversify diets, thereby, enhancing simultaneous nutrient intake.

6.2 Recommendations

6.2.1 Recommendations for implementation

a) Nutrition professional should promote the health benefits associated with the consumption of traditional foods when planning nutrition-related intervention strategies to lessen the burden of micronutrient deficiencies and chronic diseases of lifestyle.

b) Nutritionists and dieticians can make reference to the documented nutrient content of traditional mixed dishes when determining dietary intake of communities. This documented information will reduce assumptions made when ascertaining nutrient consumption of traditional foods due to the lack of nutrient composition data of traditional mixed-dishes recorded in food composition database of South Africa.

c) Partnership between institutions of higher education and training and various stakeholders, including community leaders, in the context of indigenous knowledge systems should be strengthened to expand the documentation and preservation of our traditional food knowledge.

d) Inclusion of traditional food knowledge by the Department of Basic Education in the curriculum of primary and secondary school learners as another strategy to conserve our cultural-food knowledge.

e) The Department of Arts and Culture can attract involvement of the youth in preserving our traditional-food knowledge, for example, by creating cultural cooking competitions at school level across South Africa to modify the negative perceptions surrounding traditional foods.

6.2.2 Recommendations for further research

a) Further research must be conducted to determine nutritional composition of other traditional foods.

b) Documentation of traditional foods in other areas of South Africa, must be undertaken to preserve our traditional food knowledge and cultural identity for generations to come.

c) Product development using traditional mixed dishes must be explored in view of the fact that these dishes are inexpensive source of fundamental nutrients, beneficial to health.

APPENDIX A: Ethical approval certificate

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms SE Madala

Student No:
11606307

PROJECT TITLE: Nutritional composition of traditional mixed-dishes eaten by elderly women in Vhembe District.

PROJECT NO: SHS/17/NUT/04/2108

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr LF Mushaphi	University of Venda	Supervisor
Ms HV Mbhatsani	University of Venda	Co- Supervisor
Ms SE Madala	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: August 2017
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
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APPENDIX B: Consent form

RESEARCH PROJECT: NUTRITIONAL COMPOSITION OF TRADITIONAL MIXED-DISHES EATEN BY ELDERLY WOMEN IN VHEMBE DISTRICT

Researchers
Ms Madala SE, MSCPNT student, University of Venda
Dr LF Mushaphi Department of Nutrition, University of Venda
Ms HV Mbhatsani, Department of Nutrition, University of Venda

Dear Madam

You are invited to participate in our study. This study aims to determine the nutritional composition of selected traditional mixed-dishes used by elderly women in Limpopo. This study will assist nutritionists and dieticians to determine nutrient intake of communities that still consume traditional mixed-dishes and in turn also preserve traditional food knowledge for generations to come.

If you participate in the study, you will be expected to do the following:

- You will be asked questions about yourself – name and age;
- You will be asked what types of mixed traditional dishes you consumed and your explanation of the preparation methods of these dishes will be tape recorded;
- You will be asked to cook the mixed traditional dishes while being videotaped by the researcher.

You will not benefit directly from the research study, however, the information that we will receive from you and the results of the study will assist with the exact approximation of nutrient intake of communities who still consume traditional mixed-dishes and also preserve traditional cooking methods of these dishes for generations to come.

The following are aspects that you need to take into consideration:

- This research study was approved by the Higher Degrees Ethics Committee of the University of Venda; this committee makes certain that it is safe for you to participate in the study;
- Codes will be used in place of your name so that the information that you will provide remains confidential;

- You are entitled to withdraw your participation at any stage of the study, without stating any reasons;
- You are welcomed to contact Ms SE Madala on 0725516880 if you may have any questions related to the research study or contact the supervisor of the study, Dr LF Mushaphi on 0159628334.

Please fill in the space provided below if you agree to participate in the study:

I……..… (Surname & name),

acknowledge that the information in this document has been explained to me and I fully understand it, hence, I agree to participate in the study. This decision was made from my free will and I was not compelled to take this decision.

Signature…….. Date……..

Place…….

I acknowledge that I did not force the respondent to participate in the research study. I have fully informed the above-mentioned person of the aim, procedures and outcome of the study.

Signature of the researcher/fieldworker……

Name of researcher/fieldworker…….. ……..

Date… ……. Place……..

APPENDIX C: Sensory evaluation questionnaire

SENSORY EVALUATION OF TRADITIONAL MIXED DISHES

Name & Gender…… Date……

Age (circle) 18-25 25-35 35-45 45-60+

Please taste the sample from left to right and indicate by marking with an X in a relevant box how much you like or dislike the attributes stated below. Take a sip of water/carrot in between tasting

Code

Appearance (Colour)

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)

Aroma

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely

Taste

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)

Texture

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)

Mouthfeel

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)

Overall acceptability

Dislike extremely (1)	Dislike very much (2)	Dislike moderately (3)	Dislike slightly (4)	Neither like or dislike (5)	Like slightly (6)	Like moderately (7)	Like very much (8)	Like extremely (9)

APPENDIX D: Sensory consent form

LETTER OF INFORMATION

Title of the Research Study: Nutritional composition of traditional mixed-dishes eaten by elderly women in Vhembe District

Principal Investigator/s/ researcher: Ms SE Madala (BSc Nutrition)

Co-Investigator/s/supervisor/s: Dr LF Mushaphi (PHD Nutrition)

: Ms HV Mbhatsani (MSc Nutrition)

Brief Introduction and Purpose of the Study: Sensory evaluation is a systematic discipline that examines and measures human response to the composition of food and drink, for example, appearance, touch, odour, texture, temperature and taste. It is used to suggest, measure, analyse and interpret responses of sight, smell, touch, taste and hearing.

The purpose of this evaluation was to determine the consumer acceptability of traditional mixed-dishes.

Outline of the Procedures: Sensory test took place at the University of Venda, Food Science Sensory Lab. Potential panellists were screened before participation to determine their level of interest, availability and health (including allergies, dentures and the use of any medication) for the researcher to be able to select individuals who have the highest potential to be efficient panellists. The panellists evaluated acceptability of traditional mixed-dishes using a 9-point hedonic scale questionnaire (scoring sheet) for approximately 30 minutes. Panellists were presented concurrently with 4 samples that were randomly code with 3-digit numbers. The samples consisted of *tshidzimba/tihove, thophi/tshopi and bovhola/xipaswi* served at 60g sized pieces. Samples can be swallowed or expectorated in provided containers following the evaluation. Panellists were provided with warm lemon water and carrot pieces for palate cleansing in between samples.

Risks or Discomforts to the Participant: There were no risks or discomforts to the participants, as participants were screened in terms of their health (including allergies, dentures and the use of any medication) before they can participate in the sensory test.

Benefits: There were no direct benefits to the participants, but upon completion of the study, participants will be able to know the type and amount of micronutrients found in traditional mixed-dishes. The researcher will benefit from the study through disseminating the study results at workshops planned within the framework of the research, national and international conferences and also through publications.

Reason/s why a Participant May Be Withdrawn from the Study: Participation in the sensory test is voluntary. The participants' decision whether or not to participate will not affect the individual's present or future relations with the investigators or the university. If participants decide to participate in the sensory test, they are are free to withdraw their consent or to cease participation at any time without penalty.

Remuneration: No remuneration or monetary was received by the panellists.

Costs of the Study: Panellists did not cover any costs towards the study.

Confidentiality: To ensure anonymity of information, the researcher used codes instead of participants' actual names so that the research data cannot be linked to the participants. To ensure confidentiality, the researcher explained to the participants that only the researchers will have access to the sensory test data and this data will safely be stored by the researcher.

Research-related Injury: Potential candidates were screened before participation to determine their level of interest, availability and health (including allergies, dentures and the use of any medication) for the researcher to be able to select individuals who have the highest potential to be efficient panellists. No remuneration was given to the participants.

Persons to Contact in the Event of Any Problems or Queries:

(Dr LF Mushaphi, Office no 4, Biokinetics Building) Please contact the researcher (0725516880), my supervisor (0159628334) or the University Research Ethics Committee Secretariat on 015 962 9058. Complaints can be reported to the Director: Research and Innovation, Prof GE Ekosse on 015 962 8313 or Georges Ivo.Ekosse@univen.ac.za

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, (*name of researcher*), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _,
- I have also received, read and understood the above written information (*Participant Letter of Information*) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	Date	Time	Signature
I, …….	**……**	**……**	**……..**

(*Name of researcher*) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher		
…….	Date**…….**	Signature**……**

Full Name of Witness (If applicable)		
…….	Date **……..**	Signature**……..**

APPENDIX E: Sensory screening questionnaire

Sensory Evaluation Screening Questionnaire

Traditional mixed-dishes to be evaluated: *tshidzimba/tihove* A, *tshidzimba/tihove* B, *thophi/tshopi* and *bovhola/xipaswi.*

NB! Ingredients of the above-mentioned traditional mixed-dishes are - mealies, peanuts, beans, indigenous leafy vegetables and pumpkin.

Name…… Date…….

Age (circle) 18-25: 25-35: 35-45: 45-60+ Gender…….

Contact no…… Email……...

AVAILABILITY (If the person will not be available, end the interview)

Tuesday	Wednesday	Thursday	Friday
11H00 - 11H30	11H00 - 11H30	11H00 - 11H30	11H00 - 11H30
12H00 - 12H30	12H00 - 12H30	12H00 - 12H30	12H00 - 12H30
13H00 – 13H30	13H00 – 13H30	13H00 – 13H30	13H00 – 13H30

HEALTH

Are you allergic to any of the listed above ingredients? **Yes / No**

If yes (the person should be excluded and the interview ends)

Do you take any medication which affects your senses (sight, smell, taste)? **Yes / No**

If yes, specify……
……

Do you have dentures or oral/gum disease? **Yes / No**

FOOD HABITS

Are you currently on a restricted diet (diabetic, low salt, etc)? **Yes / No**

If yes, specify……
……

Do you consume any traditional food? **Yes / No**

If yes, specify……
……

THANK YOU.