Processing methods of *Oshikundu*, a traditional beverage from sub-tribes within *Aawambo* culture in the Northern Namibia

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Abstract

Fermented beverages have a long history in Africa and fermentation is the cheapest, oldest form of food preservation. Indigenous Knowledge (IK) has been at the for-front of the traditional food and beverage processing technology. *Oshikundu* is a Namibian cereal based fermented beverage brewed with water, brans, pearl millet (*Pennisetum glaucum* (L.) R. Br.) flour locally known as mahangu and malted sorghum (*Sorghum bicolor*) flour. *Oshikundu* is brewed in many households among *Aawambo* and part of Kavango region. It is a perishable beverage with a shelf life under six hours. *Oshikundu* is brewed for many generations among *Aawambo*, which the brewing process have adopt and evolved over time. The traditional art of brewing *Oshikundu* has been passed orally from generation to generation. The knowledge of brewing and interest is declining over time especially among young people. Rural women have taken advantage of the locally available raw materials with their IK for their livelihood by selling *Oshikundu*. The traditional methods have potential to incorporate the modern biotechnology to control, optimise and standardise the organoleptic quality of *Oshikundu*.

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Introduction

Africa is blessed with a rich culture that is made up of food and beverages. Great emphasis has been recently laid on the role of traditional foods in the health and nutritional status of the people (Abdulrahman, Musaiger, & Ahmed, 2000). Despite lack of scientific knowledge, indigenous peoples understand the benefits of indigenous food as part of their culture, hence there is still much to be done and to be learned (Mbhenyane, 2005). The traditional technology of food preservation dated back thousands of years. The production of fermented beverages is based on oral and empirical knowledge transferred from generation to generation (Schwan, Ramos, Almeida, Pereira, Cardoso, & Dias, 2010).

Traditional Foods and beverages constitute a vital body of indigenous knowledge (IK) (Aworh, 2008). Although the IK meaning differ depending on a specific case. However, the broad definition of IK, is the information based for a society that facilitate local-level decisions making in agriculture, health care, food preparation, education and natural resources management (Boven & Morohashi, 2002). Indigenous knowledge since it is not documented; it is therefore on the risk of being lost to future generations (Dweba & Mearns, 2011). In Namibia, this is also a problem when it comes to IK preservation, specifically to traditional food and beverage processing technology. The preservation of traditional technology can serve as a template for transformation of the development of new products and consequently improved nutrition. For this reason, the art of traditional processing method need to be documented into order to be transformed into a technology that incorporate objective methods of process control, optimization and standardise quality of the end product without losing the desired attributes (Gaden, Bokanga, Harlander, Hesseltine, & Steinkraus, 1992). This promotes food security at the household level. Food security at household level refer to the ability of food providers to secure adequate food at all time to meet the dietary requirements and cultural preferences of the household members (Ibnouf, 2012). The role that women play in the food security at the household level can not be overlooked.

The availability and acceptability of fermented beverages has a long history in Africa, and thus the traditional manufacturing process of fermented beverages varies on different characteristics including the kinds of ingredients used and cultural diversity (Hui, Evranus, Lopez, Fan, Hansen, Flores, Rakin, Schwan, & Zhou, 2012). Cultural diversity and habitat plays a fundamental role on the choice and acceptability of beverages especially in a traditional setting. Namibia is no exception, the geographical location savannah and desert or coastal coupled with a rich diverse culture manifest in different consumer choice of traditional food and beverages.

Fermentation is one of the oldest and economical forms of food preservation in the world (Blandino, Al-Aseeri, Pandiella, Cantero, & Webb, 2003; Chelule, Mokoena, & Gqaleni, 2010; Rhee, Lee, & Lee, 2011). Fermentation is the conversion of sugar to acid, gas or alcohol, without involving exogenous oxidising agent (Bourdichon, Casaregola, Farrokh, Frisvad, Gerds, Hammes et al, 2012). Fermented food and beverages makes up an imperative contribution to human diets in many developing countries including Namibia. Given that, fermentation is an inexpensive technology which preserves food and improves its nutritional value, it is also enhance taste, aroma, shelf life, texture, and attractive properties. In addition to detoxification of secondary metabolites such as; cyanide, phytates, polyphenols (Tannins) and enhances its sensory properties (Nzigamasabo & Nimpagaritse, 2009).

Fermented beverages are defined as those products that have been subjected to the

effects of microorganisms or enzymes; to cause desirable biochemical changes (Blandino, Al-Aseeri, Pandiella, Cantero & Webb, 2003). The main responsible microorganisms for this process belong to yeast and lactic acid bacteria (LAB). Generally; LAB considered as the main source of the starter culture of many fermented beverages. LAB is a group of gram positive bacteria, catalase-negative, non-sporing rods or cocci utilise carbohydrate and have similar properties of lactic acid production, which is an end product of fermentation (Blandino et al, 2003).

Oshikundu (also known as *Ontaku* in other dialects of Oshiwambo) is a cereal based fermented beverage, made with water, pearl millet bran, Pearl millet (*Pennisetum glaucum* (L.) R. Br.) locally know as *mahangu* and malted sorghum (*Sorghum bicolor*) flour. *Oshikundu* has a strong cereal taste and it is brewed in many households among *Oshiwambo* speaking communities, part of Kavango region and sold in open markets. Oshikundu is not only brewed for household consumption but also for commercial purposes. In most cases, it is sold at open markets and construction sites. It is a perishable beverage with a shelf life under six hours. Oshikundu is not only brewed for household consumption but also for commercial purposes. In most cases, it is sold at open markets and construction sites. It is a perishable beverage with a shelf life under six hours. Benchmarking *Oshikundu* traditional production methods to United Nation Educational, Scientific and Cultural Organization (UNESCO) and Netherlands organization for international cooperation protocol (Nuffic) shown applicable potential to incorporate *Oshikund*u brewing in sub-Aawambo tribes development process (Mu Ashekele, Embashu, & Cheikhyoussef, 2012). Therefore, the aim of this study was to look into the traditional processing methods of *Oshikundu* within the sub-*Aawambo* tribes, variations and social aspects as well as perceptions.

Materials and Methods

Study Area

The study took place in the four northern regions in Namibia; Oshana, Oshikoto, Ohangwena and Omusati (fig.1). Oshana region has an area of 8682 $km^{2,}$ with 161,977 inhabitants, bordering Omusati to the west, Oshikoto to the east, Kunene to the south and Ohangwena to the north-east. Oshikoto region has an area of 38669 km^2 with 160,135 inhabitants, bordering Otjozondjupa to the south, Kavango to the east, Ohangwena to the north, Oshana to the west and Kunene region to the south-west. Ohangwena Region (10694 km^2) has a population of 245,446 of which 99% live in rural areas. Ohangwena Region has the highest population density at 23.20 persons per square kilometer (National Statistics Agency, 2011). Ohangwena region bordering Angola to the north, Kavango to the east, Oshikoto to the south, Oshana to the south-west and Omusati region to the west. Omusati region has an area of 26558 km^2 with 228,364 inhabitants, bordering Kunene to the west and south, Oshana to the east and Ohangwena region to the east-north (Namibian Safari, 2012).

The annual temperature range between 23-34°C and the annual rainfall varies between 480 mm and 600 mm. This survey was conducted in Eenhana and Okongo constituencies based on their geographical location and their known flora. Oshikoto has a subtropical climate, with very hot summers and mild winters. The average maximum temperature lies at 29.7°C, while the average minimum temperature is 14.4°C. The average rainfall is 555 mm per annum

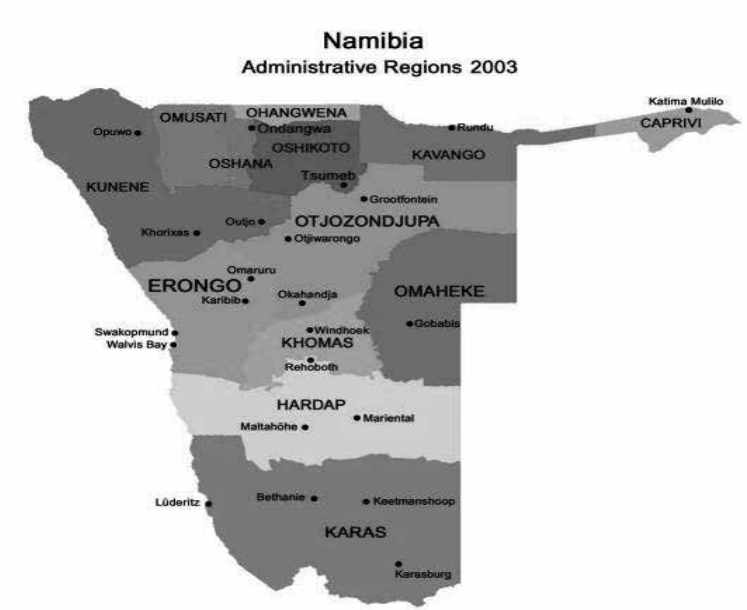

Figure 1: **Thirteen Administrative regions Namibia, Study areas are circulated (www. namibiansafari.com, 2012)**

All the four regions were selected based on the sub-*Aawambo* inhabitant distribution. Oshikoto region is dominated by *Aandong*a and partly *Aakwanyama*, Oshana region dominated by *Aakwambi*, *Aandonga* and *Aakwanyam*a. Meanwhile, Ohangwena region dominated by *Aakwanyam*a and *Aandonga.* Omusati region is the melting pot with *Aakwanyama, Aakwambi, Aangandjela, Aakwaaludhi, Aakolonkadhi, Aandongona, Aambalantu and Aambandja*. Omusati region has all the sub-*Aawambo* tribes except *Aandonga* nevertheless; some of the sub-*Aawambo* tribes are populated in other regions. A good representative in all the four regions was based on the sub-tribes geographical distribution to study if there is any variation in the traditional household processing methods of *Oshikundu* with in the sub-tribe of *Aawambo* and geographical influence. Oshana region consist of the three largest towns of the northern Namibia, resulting in its large population living in urban settings as compared to the other regions.

The four regions are located in the semi-arid zone with rainfall ranging between 300mm (west) – 500mm (east). Traditionally, the Aawambo people are predominantly crop farmers combined with livestock farming. Pearl Millet (Mahangu) and Sorghum are the common crops which are farmed in combination with peas, nuts and melons (Nangula & Oba, 2004).

Data collection

The study documents the indigenous knowledge (IK) of *Oshikundu* processing method. The study was conducted using semi-structured questionnaires which were administered to households from the four regions. The main questions on this questionnaire included processing method, ingredients, shelf life, additives and social values of *Oshikundu*. The questionnaire was prepared in English and *Oshiwambo*, and interviews were conducted in *Oshiwambo.*

A total of 12 of households were randomly selected for interviews in the four regions. These households were selected from the following villages: Omugulugombashe, Onkuni, Etunda, Uupito, Ondeihaluka and Onayena. Households were selected randomly depending on the participant willingness to participate, were householder are available during the time of the study. Permission to conduct the study to the regions was granted through the office of the Regional Governor to the Constituency Councilor and Headman of the respective villages in all the four regions.

Results and discussion

Social Aspects of *Oshikundu*

Oshikundu was regarded by most respondents as an important diet supplement at household level. It is brewed on a daily basis and consumed throughout the day by both adults and children. It is also brewed in consideration of visitors, as respondents indicated to offer Oshikundu to their visitors both from the neighborhood or elsewhere. There was not difference in consumption levels between males and females as well as age.

- Oshikundu is also regarded very important at household level for the following reasons:
- Children carry Oshikundu along to school;
- When household members work in the field they also take along Oshikundu;
- Boys and young men also take along Oshikundu when they go to look after livestock;
- Nursing mothers are advised to consumed more Oshikundu;
- Oshikundu is also prepared for elderly and sick people as it is a strong drink for the weak;
- Oshikundu is said to keep at household strong daily work or activity;
- It is also prepared during important traditional festivals.

One of the most important in this study was to understand the perception of local people on the social value of Oshikundu. Social value in this context refers to the value local people attach to Oshikundu for traditional ceremonial functions. The results show that a total of 66% of the informants indicated that *Oshikundu* has social value, 25% indicated it does not, meanwhile 9% where not sure. They reflected that it is the main drink during social visits, gatherings, weddings and other traditional ceremonies. There were very little variations among the views of respondents from the sub-tribes in terms of the social value of the Oshikundu drink.

Furthermore, the social value is evidently decreasing in some sub-tribes due to geographical influence compare to others. The *Aambandja* people from the Omusati region value most the social aspects of *Oshikundu*. Most of their villages are located close to the Namibia-Angola with limited urban influence and this has contributed to the high value for Oshikundu. They are followed by some part of the *Aakwanyama* people from Ohangwena region. The rest of the respondents from Oshana, Omusati and Oshikoto regions did not attach high social value to *Oshikundu* and this is due to modern influence of emerging modern drinks. However, these people have reported that *Oshikundu* has social value aspect more than those who live in and close to towns. Therefore, the fewer the urban and modernity influence the higher the social value attached to the *Oshikundu* drink.

Respondents also indicated that Oshikundu drink is also associated with the economic status of households. In areas with modernity or urban influence, a households that offers Oshikundu to its visits is considered poor. In addition, during social visits or ceremonies, Oshikundu is regarded as drink for the poor as compared to exotic beverages that are more associated with modernity. This was, however, on the contrary among the Aambandja people were Oshikundu was expected during social visits. Nevertheless, it a general trend

among all the sub-groups of Aawambo that if you pay a social visit and they do not offer you Oshikundu, people may interpret that as a sign of poverty or not welcomed in their home. There was also lack of knowledge and interest in the social value of Oshikundu among young people below the age of 30 years across all regions.

Most of the women whom participated in study had no background of formal education. Some women indicated that they sell *Oshikundu* for their livelihood which their households survive on. The money that they earn goes to paying school development fund for their children and day to day household needs. They adapted and incorporate IK (*Oshikundu*) to rural livelihood system and this contributes to efficient utilization of local resources. In addition, this initiative plays a key role in enhancing rural people capability to adapt different climate and social-economic stressful conditions. This is in agreement with Ibnouf (2012) that women are more likely that men to use available resources and skills to sustain a living and well being of their households. It is evident that education plays a major role on the livelihood of rural women within these regions. For this reason, many unemployed people demand employment from the Namibian government. Many young adults can emulate the example of rural women taking advantage of local available raw materials fused with IK on food processing technology for their livelihood.

Traditional Household Processing Methods

Perceptions of the Oshikundu processing methods

Oshikundu is regarded by respondents as an old drink among the Aawambo people that has been carried orally and through practical experiences from generations to generations. In most cases, Oshikundu is brewed by girls under the guidance of an adult or young female adults. Occasionally, males are also involved in the production of this drink especially in situations where females are absent. Oshikundu is mostly at night or early morning in quantities that will carry the household members throughout the day and it is kept in cool places.

The perceptions and knowledge on the processing methods of *Oshikundu* were greatly affected by age and slightly by gender. Woman above the age of 60 years seemed to have more knowledge on the processing methods and their perceptions on the significance of *Oshikundu* was higher as compared to their male counterparts. On the contrary, young males and females below 30 years of age displayed little interest and knowledge on the importance and processing methods of *Oshikundu*. In addition, some households (40 %) add brans as an additive; meanwhile maize (10 %) is used instead of *mahangu* flour (Table 1).

The role that women play in traditional food processing technology cannot be disregarded. Women in the traditional African setting are the custodian of the art in food and beverage perfection as well as training. Using of IK in solving food shortage remains a powerful mean of sustaining household food security (Ibnouf, 2001). Women have indicated to be the custodian of the IK on *Oshikundu* brewing and responsible for oral knowledge transfer to young generation. This ensures food security at household level since, *Oshikundu* is daily beverage brewed in many households within the studied area. Aworth (2008) suggested that the involvement of women in the traditional processing technology can be used to our advantage in reducing drudgery associated with processing operation rough introduction of simple machine would make life a lot easier for women for attending benefits for the well-being of the family and society at large.

Traditional processing methods of Oshikundu among the Oshiwambo sub-tribes tend to

show minor differences geographically and culturally and those little differences depended on the practice adopted at community or household level. Mahangu flour, malted sorghum flour and water emerged as the main ingredients in *Oshikundu* brewing for most households. However, some households (40 %) indicated that they sometimes add brans as an additive while as few (10 %) indicated to use maize instead of *mahangu* flour (Table 1). Most of the dry ingredients are produced at household level except for the maize meal which is bought from shops.

Table 1 **Raw materials usage percentage for Oshikundu brewing**

Ingredients	percentage of households using the ingredients
Water	100%
Mahangu (Pearl millet) flour	100%
Sorghum flour	100%
Bran	40%
Maize	10%

The processing methods

Two main procedures that direct the flow of the brewing process resulted from the interviews (fig. 2). These procedures were not associated with the sub-tribes, geographical location, gender or age of the respondents but rather at household level. The proportion of the dry ingredients and water do not change in the procedures. The first procedure, involved the production of the initial mixture by adding boiled water to the mahangu flour which is left to cool to room temperature. Malted sorghum flour is then added to this cooled mixture. This is regarded as a crucial step by respondents as it has an effect on the taste and texture of the final product. The purpose of the addition of malted sorghum flour to the cooled mixture is to prevent the inactivation of enzymes that are involved in the fermentation (Dewar & Taylor, 2000).

In the second procedure, warm water is added to the mixture of the *mahangu* and malted sorghum flour. In both procedures, bran can be added optionally at this stage. The addition of the malted sorghum flour in the Oshikundu brewing process softens up the mixture through regular and thorough stirring of the mixture to ensure ideal combination of all ingredients. The final brewing process of Oshikundu leads to the final solution which is done by diluting the mixture with proportionate cold water and a starter culture. The process of adding a starter culture (previously fermented *Oshikundu*) is called back-sloping. This is normally an overnight process or accelerated by exposing the solution to sunlight when prepared in the morning. The ambient temperature is the conducive for the growth of many microorganisms that are implicated in *Oshikundu* fermentation.

The purpose of the addition of malted sorghum flour to the cooled mahangu flour mixture is to prevent the inactivation of enzymes that are involved in the fermentation. When malting the sorghum, enzyme amylase is activated to breakdown starch in the grains into simple sugar, this is to contribute to the flavour of *Oshikundu*. The sugar then is utilised by the Lactic Acid Bacteria (LAB) and produce lactic acid. Yeast fermentation is likely to be involved where sugar is utilised and produce alcohol (ethanol) and carbon dioxide (Dewar

& Taylor, 2000).

The nutritional quality of traditional food during storage period can be considered as an initiating step affecting product quality (Ioannou, Hafsa, Hamdi, Charbonnel and Ghoul, 2012). In *Oshikundu*, this can be concern on the short shelf life and nutritional value. The low pH of *Oshikundu* inhibit the growth of pathogens and this contributes to *Oshikundu* safety, as well as access to safe and clean water used in brewing remains a challenge in rural area (Embashu, Cheikhyoussef, & Kahaka, 2013).

The traditional technology of *Oshikundu* brewing is laborious, time consuming and does not guarantee consistency of the final product. The processing technology has shown consistency among the sub-tribes of *Aawambo*. Nevertheless, the final product is always varying on organoleptic characteristics. The organoleptic properties are the manifestation of sensory characteristic of *Oshikundu* such as taste, aroma and appearance. Sensory characteristics are the major contributors when it comes to consumes choice and acceptability. This remains a challenge in cereal based beverages to come up with a generic approach, with a comprehensive view of the combined effect of the matrix, processing, application of biotechnology to microbiota on the technology, organoleptic and nutritional value of the final product (Guyot, 2012). Losses of food in post-harvest are an area that needs to be looked at in the case of *Oshikundu*. The reduction in post-harvest food losses increases food availability (Aworth, 2008).

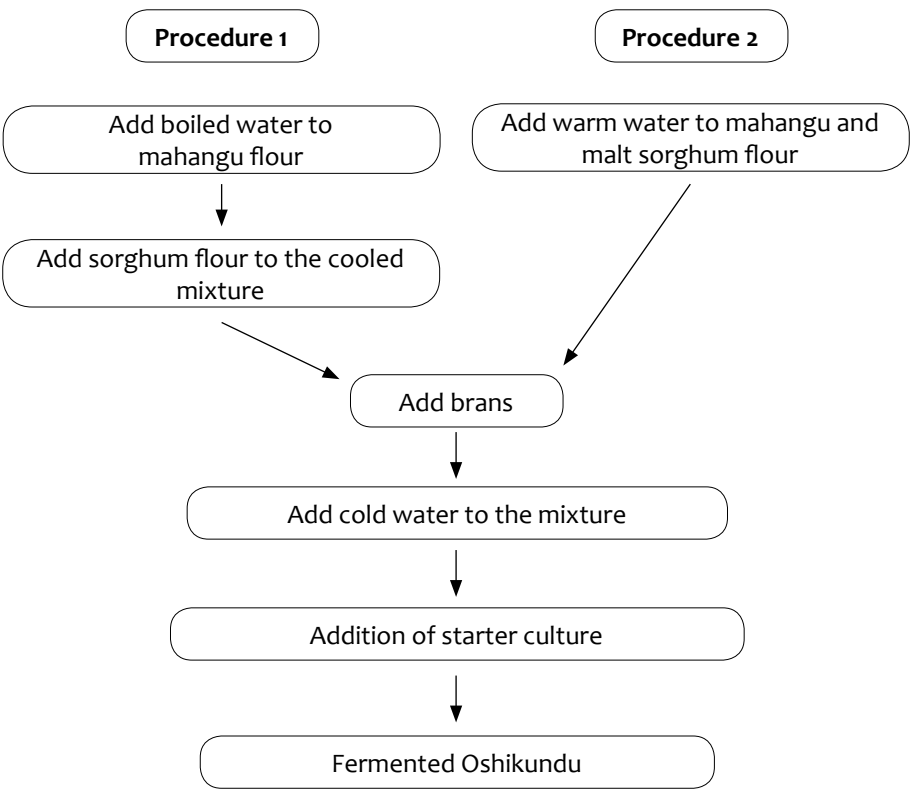

Figure 2: **A flow chart outlining the traditional processing methods of Oshikundu in Oshana, Oshikoto, Ohangwena and Omusati regions.**

Oshikundu processing methods have shown potential for commercialization. In addition, the incorporation in into school feeding program to address malnutrition. It is given to school children as their daily beverage and the social implications. This is in agreement with Mu Ashekele et al. (2012), that commercialization of the production of *Oshikundu* would guarantee the utilization of local traditional resources, preservation of culture, job creation for subsistence farmers and the reduction of poverty. Unemployment in Namibia is at an arming rate. Hence, employment opportunities in rural area on small-scale production of *Oshikundu* can contribute to reduction of rural-urban migration and associated social problems. Comparing to the United Nation Educational, Scientific and Cultural Organization (UNESCO) and The Netherlands Organization for International Cooperation in Higher Education (Nuffic) protocol, *Oshikundu* was considered as an IKS best practice (BP) from Northern regions of Namibia (Mu Ashekele et al., 2012). The aim and purpose of developing BP criteria is to encourage the researchers and policy-makers to incorporate IKS in their development processes (Boven & Morohashi, 2002). Scaling-up and specialization call for better control of fermentation and quality, including choice of raw material, fermentation condition and use of starter culture (Nout & Sarkar, 1999).

Conclusion

Oshikundu is a very important daily beverage among *Aawambo* tribe in northern Namibia. Generally, it is brewed in many households in *Oshiwambo* speaking culture. The social value of *Oshikundu* however is decreasing among the sub-tribes of *Aawambo,* the major attributes being age and geographical location. The sub-tribes *Aambandja* (Omusati region) and *Aakwanyama* (Ohangwena region) valued the importance of the social values of *Oshikundu* and they mostly live in the regarded remote areas. *Aakwambi*, *Aandonga* and *Aakwanyam*a (Oshana region), *Aakwanyama, Aakwambi, Aangandjela, Aakwaaludhi, Aakolonkadhi, Aandongona* and *Aambalantu* (Omusati region) and *Aandong*a (Oshikoto region) have less value of *Oshikundu* comparatively. Despite the cultural differences within the *Aawambo*, there are no significant differences in the processing methods of *Oshikundu*. Moreover, there is a need to improve toward a more economic processing method, reduced fermentation time of *Oshikundu* without altering the desirable organoleptic attributes.

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