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MULTIDISCIPLINARY RESEARCH CENTRE (MRC)

Science, Technology and Innovation Division

Indigenous Knowledge system Technology (IKST) Food & Beverage Program

**Physiochemical, Nutritional and Microbiological analysis of *Oshikundu*: Namibian
Fermented Beverage Project**

Field Trip Report (Unpublished)

**Survey on Indigenous Knowledge and Household processing methods of *Oshikundu*; a
cereal-based fermented beverage from Oshana, Oshikoto, Ohangwena and Omusati
Regions in Namibia**

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Ministry of Education
DRST

DECLARATION

The authors of this technical report declare that this report contains raw data which have not yet been published and the main purpose of producing this report is to add a piece of art to the knowledge body of Namibian Indigenous Knowledge System. This report may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

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EXECUTIVE SUMMARY

The aim of this study is to survey the indigenous knowledge and Household processing methods of Oshikundu; a cereal-based fermented beverage from Oshana, Oshikoto, Ohangwena and Omusati Regions in Namibia. A field trip to the above mentioned regions was carried out from 16-21 April, 2012. A total of 22 Oshikundu samples were collected and 12 questioner on the traditional household processing method. Oshikundu was found to be acidic, with an average pH 3.56. Oshikundu has social values and serves as an important daily beverage in many households. Variations were not observed in household processing methods among the four regions and women over the age of 60 years old have shown interest and knowledge when it comes to Oshikundu. Interestingly, they were quick to point out that the Oshikundu brewed in the 21st century is not the genuine Oshikundu as they grew up drinking it. Furthermore, they attributed this to modernization, loss of interest in traditional knowledge and its practices, and lack of documentations. In addition, young people claimed they put sugar in Oshikundu to enhance the taste. It was interesting to learn that some people feared that researchers have (might) exploit their resources and knowledge, the art of processing, brewing *Oshikundu*. This can be linked to secrecy of Indigenous knowledge, where secrecy may be used to stop the unauthorized flow of information from the traditional knowledge holders to outsiders. Findings for similar research that involves communities' participants should look at communication strategy to disseminate information back to the community.

INTRODUCTION

Great emphasis has been recently laid on the role of traditional foods in the health and nutritional status of the people. Most of these foods have a good proportion of some nutrients and can make a significant contribution to daily nutrient intake, especially for those of low social classes. Additionally, traditional foods constitute an essential aspect of cultural heritage and they are highly regarded by the community (Musaiger *et al*, 2000). Despite lack of scientific knowledge, many local peoples understand the benefits of indigenous food in maintaining their culture and in health promotion. Indigenous food and beverages are being studied for scientific identification, nutritional composition and cultural food use; however, there is still much to be done and be learned (Mbhenyane, 2005). One of the oldest, most economical methods of producing and preserving food (Blandino *et al*, 2003; Chelule *et al*, 2010; Rhee *et al*, 2011) is fermentation, a process dependent on the biological activity of microorganisms for production of a range of metabolites which can suppress the growth and survival of undesirable micro flora in foodstuffs (Kohajdova & Karovicova, 2007). The art of production of many indigenous fermented foods and beverages is based on empirical knowledge transferred from generations to generations (Schwan *et al*, 2010).

Cereal based food and beverages significantly contribute to dietary fibre, protein, energy, minerals and vitamins required for human health (Kohajdova & Karovicova, 2007). In addition, Lactic Acid Bacteria (LAB), and presumably yeast produce a number of vitamins and increase in nutritional value of the food or beverage and many LAB produce antimicrobial compounds, including bacteriocins, increasing the shelf life of the product and possibly containing health benefits (Todorov, 2010).

Oshikundu is a fermented traditional drink brewed from Pearl millet (mahangu) and malted sorghum among Owambo, Kavango and Caprivi region in Namibia (Kanyangela, 2003). It is an everyday drink, given to guest since its known for its nutritious energy-giving and refreshing attributes (Indigenous knowledge). The focus of this field trip is to collect representative samples from Oshana, Oshikoto, Ohangwena and Omusati region within the different sub-Oshiwambo speaker and document the art involved in the household processing methods of *Oshikundu*. The samples collected will be analyzed for physiochemical, nutritional and microbial, and furthermore to document the traditional processing methods as Indigenous knowledge (IK) and add value to Oshikundu.

2. Data and Methods

2.1 Study area

The field trip took place in the four northern regions, Oshana, Oshikoto, Ohangwena and Omusati (fig.1). Oshana region has an area of 8682 km² with 161977 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 km² with 160135 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 10694 km² with 227728 inhabitants, 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 26558 km² with 228364 inhabitants, bordering Kunene to the west and south, Oshana to the east and Ohangwena region to the east-north (www. namibiansafari.com, 2012)

2.2 Data collection

The research team consisted of four members, Dr. Eroid Naomeb (team leader), Dr. Gladdys Kahaka (research supervisor) from the department of chemistry and biochemistry, Ms. Lusia Heita (Master student) and Mr. Werner Embashu (Master student). The team covered Ondehaluka village (three households) in Ohangwena region. In Omusati region, seven villages (Etunda, Okahao, Otsandi, Omutundungu, Epalela, Oshifo (Aadhemba) and Omugulugombashe) were covered with nine households. In Oshana region, one town (Oshakati) and three villages (Onkuni, Onamungundo and Olukonda) were covered with a total of eight households. In Oshikoto region, one town (Tsumeb) and one village (Oshivelo) were covered. Sampling was done on voluntary, availability of sample and willingness to be interviewed for processing method of *Oshikundu* and an incentive was given in the form of goods. *Oshikundu* samples (fig. 3) were collected using 250 and 500 ml sterile plastic bottle, potential hydrogen (pH) was taken at point of sampling, kept below 5° C in a portable fridge and interview (fig. 2) were also conducted. Questionnaire were prepared and written in local language and so do the interviews.



Fig. 2: Dr. Gladys Kahaka and Mr. Werner Embashu discussing results after interview in one of the household in Omusati region.



Fig. 3: *Oshikundu* sample from Onamungundo village, Oshana region in sterile sampling bottles. These were kept in 5° C as soon as they were collected from households.

Official letters informing the respective governors of the four regions were sent in advance. These letter addressed issues of the research objectives and the team assistance needed during the visit. In addition, radio announcement by respective councilors to the specific village to be visited requesting residents for corporation with the team. Before interviews and sampling, the team was introduced and detailed objectives were explained to the informants in the local language by Ms. Lusía Heita and Mr. Werner Embashu since they are from the region, can speak and understand the language, Oshiwambo.

2.3 Data Analysis

The data collected from pH measurements were recorded; average was calculated with standard error and standard deviation (table 1). The data collected through interview were compiled, computed and interpreted. The data were interpreted on the basis of the variation in traditional processing methods: ingredients used additives and social values.

3. Findings

A total of 22 *Oshikundu* samples (fig. 3) were collected from Ohangwena (3 samples), Omusati (9 samples), Oshana (8 samples) and Oshikoto region (2 samples) samples, which makes it 56% of proposed 39 samples considering no sample was collected on the April 16, 2012 as initially planned for Oshikoto. A total of 12 interviews were conducted. The youngest person interviewed was about 13 years old and oldest was 69 years old. Out of the 12 interviews, 33% indicated that they add brans in addition to Mahangu and sorghum flour as an additive of which the majority are above 60 years of age. Interviewee above the age of 60 were more willing to share information on how to brew *Oshikundu* and seemed to have the knowledge and interest

compared to interviewee below 60 years old. This was evident as they knew the significant of adding brans as an additive. Adding bran increases the *Oshikundu* volume (as not always Mahangu flour is available), give it *Oshikundu* a rich brown color, taste and keeps it cool. Interestingly, they were quick to point out that the *Oshikundu* brewed in the 21st century was not the genuine *Oshikundu* as they grew up drinking. Furthermore, they attributed this to modernization, loss of interest in traditional knowledge and its practices, and lack of documentations. Meanwhile 66% indicated that *Oshikundu* has social value, 25% indicated it does not and 8% could not tell whether it has or not. In addition, 16% have indicated to add sugar to enhance the *Oshikundu* flavor and 83% did not, of which the 16% are below the age of 60 years old. The shelf life was found to be less than 24 hours, with temperature having impact. Interviewee further pointed out that in summer, it takes few hours for *Oshikundu* to ferment and goes sour in less than 6 hours, meanwhile in winter it takes a bit longer to ferment and ready to drink and does not go sour fast compared to summer. In addition, the starter culture (previously fermented *Oshikundu*) plays a major role on the shelf life and fermentation period. The *Oshikundu* household processing methodology (Fig. 4) is not different among the sub-Oshiwambo cultures. It was interesting to learn that some people feared that researchers have (might) exploit their resources and knowledge, the art of processing, brewing *Oshikundu*. This can be linked to secrecy of Indigenous knowledge, where secrecy may be used to stop the unauthorized flow of information from the traditional knowledge holders to outsiders either because the traditional knowledge holders wish to retain a measure of control over the way in which the secret information is used or commercialized, perhaps in anticipation of being able to negotiate with third parties, or simply to prevent others accessing it (Tong, 2010).

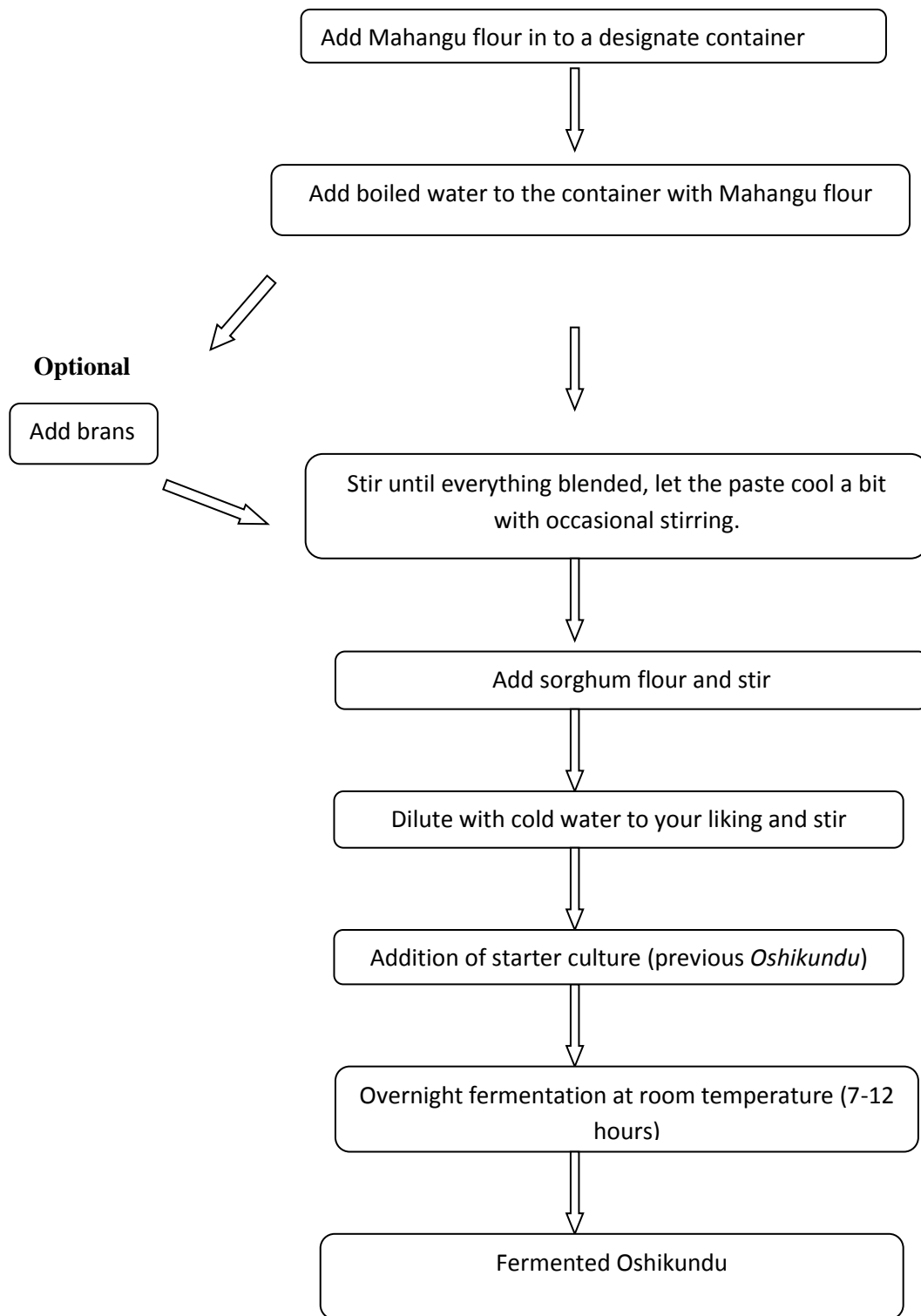


Figure. 4: A flow chart outlining the traditional processing method of *Oshikundu* after interviews.

On average, the entire 22 *Oshikundu* samples have pH of 3.56 (Table. 1), which is very acidic in accordance with the pH scale. With reference to *Bouza* (a fermented alcoholic wheat beverage, consumed mainly in Egypt, Turkey and in some Eastern Europe Countries); which has a low pH (3.9-4.0) and the high acidity indicates fermentation by lactic acid bacteria, meanwhile the alcohol is due to yeast fermentation. In addition, Boza (a colloid suspension from light to dark beige sweet, nonalcoholic beverage consumed daily in Bulgaria, Albania, Turkey and Romania), is consumed until pH drops to about 3.5 (Blandino *et al*, 2003) and this is the same pH in comparison with *Oshikundu*. Statistical analysis was done on standard deviations (table. 1) for the pH measurement. A low standard deviation is an indication that the data point tend to be very close to the mean.

Table 1: Oshikundu samples with collection sites, date, pH, standard error and deviation.

Sample Names	Sample Code	Date sampled	pH			Average
			Trial 1	Trial 2	Trial 3	
Ondehaluka-1	S1-A	17.04.2012	3.72	3.70	3.70	3.70 ±0.01
Ondehaluka-2	S1-B	17.04.2012	3.58	3.56	3.57	3.56 ±0.01
Ondehaluka-3	S1-C	17.04.2012	3.45	3.47	3.49	3.47 ±0.02
Etunda	S2-D	18.04.2012	3.21	3.23	3.25	3.23 ±0.02
Okahao	S2-E	19.04.2012	3.48	3.47	3.49	3.48 ±0.01
Otsandi	S2-F	19.04.2012	3.13	3.18	3.19	3.16 ±0.03
Omutundungu	S2-G	17.04.2012	3.35	3.33	3.31	3.33 ±0.02
Epalela	S2-H	18.04.2012	4.19	4.20	4.22	4.20 ±0.01
Aazemba	S2-I	18.04.2012	3.42	3.39	3.42	3.41 ±0.01
Ongulumbashe-1	S2-J	19.04.2012	4.31	4.37	4.39	4.35 ±0.04
Ongulumbashe-2	S2-K	19.04.2012	3.77	3.82	3.88	3.82 ±0.05
Ongulumbashe-3	S2-L	19.04.2012	3.47	3.45	3.49	3.47 ±0.02
Oshakati	S3-M	20.04.2012	3.52	3.55	3.59	3.55 ±0.03
Onkuni-1	S3-N	20.04.2012	4.09	4.13	4.17	4.13 ±0.04
Onkuni-2	S3-O	20.04.2012	3.31	3.35	3.38	3.34 ±0.03
Onkuni-3	S3-P	20.04.2012	3.33	3.37	3.39	3.36 ±0.03
Onamungundo-1	S3-Q	20.04.2012	3.07	3.08	3.09	3.08 ±0.01
Onamungundo-2	S3-R	20.04.2012	3.18	3.19	3.20	3.19 ±0.01
Onamungundo-3	S3-S	20.04.2012	3.37	3.39	3.39	3.38 ±0.01
Olukonda	S3-T	20.04.2012	3.39	3.41	3.42	3.40 ±0.01
Oshivelo	S4-U	21.04.2012	3.90	3.97	3.98	3.95 ±0.04
Tsumeb	S4-V	21.04.2012	3.80	3.81	3.89	3.83 ±0.04

± standard deviation and Mean pH 3.56

3.1. Challenges encountered

It was difficult to access some of the villages especially in Omusati region due to a lot of flood water that occupied the open space (fig.5). Though objectives were explained in local languages, people were reluctant to provide samples let alone to be interviewed and expected compensation in forms of money rather than goods. One of the influencing factor is strong cultural believes and myths of witchcraft. Most households do not brew *Oshikundu* as there is plenty of fruits and vegetables available in their fields and in the wild (rainy season). Most people in the morning are

working in their field and very difficult to get hold of, and mostly *Oshikundu* is readily available in the afternoon. In some households we only found children as young as 5 years old, adults have gone to nearby cuca shops or they have no idea of their parents' whereabouts. It was difficult to get *Oshikundu* and Traditional fermented milk in one household, and often had to drive around looking for either one. Some of the people were reluctant to be interviewed, since a lot of research has been conducted in their communities and findings are not communicated to them nor made public information and they claimed they do not benefit from such research or studies.



Figure. 5: Flood water near Ogongo in Omusati region.

4. Discussion and Conclusion

A total of 22 *Oshikundu* samples were collected, with 8 sample from Oshana, 9 from Omusati, 2 from Oshikoto and 3 from Ohangwena region. On average, 22 *Oshikundu* sample have the pH of 3.56 on the pH scale. This indicates that *Oshikundu* is very acidic. An explanation to the cause of

the very low pH will be investigated during the physiochemical analysis in the laboratory. Out of the 12 interview, 33% indicated that they add brans as an additive of which the majorities are in their middle 60's. Meanwhile 66% indicated that *Oshikundu* has social value, 25% indicated it does not and 8% could not tell whether it has or not. In addition, 16% have indicated to add sugar to enhance the *Oshikundu* flavor and 83% do not. Findings for similar research that involves communities' participants should look at communication strategy to disseminate information and findings back to the community.

5. Recommendations

The following recommendations to be considered:

- More time is needed to collect samples but this comes with its own challenges as well.
- More than one visits in needed to this four regions as per one region visit per trip (solution to previous point) especially when there no flood to access all areas.
- Early arrangement with the respective councilors to provide assistance and bust up the willingness of people to participate in the research.
- Incentives strategy geared to the needs and development of their respective participating community.
- Communication strategy on findings of research conducted in the communities and potential benefits of such findings, should be looked into.

6. Reference

- Blandino, A., Al-Aseeri, M.F., Pandiella, S.S., Cantero, D & Webb, C. (2003). Cereal-based fermented foods and beverages. *Food Research International*. 36, p.527-543.
- Chelule, P.K., Mokoena, M.P & Gqaleni, N. (2010). Advantages of traditional Lactic acid bacteria fermentation of food in Africa. *Current Research, Technology and Education Topics in Applied Microbiology and Microbial Biotechnology* A.Mèndeez-Vilas (Ed).
- Kohajdová, Z & Karovičová, J. (2007). Fermentation of cereals for specific purpose. *Journal of Food and Nutrition Research*. 46 (2), p.51-57.
- Mbhenyane, (2005). Nutrient intake and consumption of indigenous foods among college students in Limpopo Province. *SAJCN*, 18(1) 32-28.
- Musaiger, A.O., Ahmed, A & Rao, M.V. (2000). Nutritional value of traditional sweets consumed in the Arab Gulf Countries. *Int. J. Food Sci. Nut.*, 51, p.403-408.
- Rhee, S.J., Lee, J.E & Lee, C.H. (2011). Important of Lactic acid bacteria in Asia fermented foods. *Microbial Cell Factories*, 10 (suppl1): S5.
- Schwan, R.F., Ramos C.L., Almeida G.A., Pereira D.M, Cardoso P.G & Dias E.S. (2010). Determination of dynamic characteristics of microbiota in a fermented beverage product by Brazilian Amerindians using culture-dependent and culture-Independent methods. *International Journal of Food Microbiology*, 140, 225-231.
- <http://www.namibiansafari.com/namtravelMAP1.htm>. 27.06.2012. 3:26 pm
- Todorov, S.D. (2010). Diversity of Bacteriocinogenic lactic acid bacteria isolated from Boza, a cereal-based fermented beverage from Bulgaria. *Food Control*, 21, 1011-1021.

Tong, L.A. (2010). Protecting Traditional knowledge- Does secrecy offers a solution?. P.E.R.13
(4).pp 158-180.

Annexes List

Annex 5 Questioner used during the field trip on Traditional household processing of *Oshikundu*



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Oshikundu Biochemistry and Microbiological analysis

A pilot study on Oshikundu Traditional history, use among Different sub-tribes within Aawambo
in Oshana, Oshikoto, Ohangwena and Omusati Regions

Name/ Edhina

Age/ Eemvula

Gender/ Uukwashike kookantu

Ethnicity/ Uukwamuhoko

Region/ Oshikandjo hogololo

Beverage/ Oshikunwa

Processing method

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Ingredients

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Shelf life

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Additives

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Social value

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