

Exploring The  
Product Development  
In Beetroot For  
Production Purposes

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## ABSTRACT

Beetroot (*Beta vulgaris*) is usually consumed for its medical properties, mainly as antioxidant and immune boosting. Fifty (50) conveniently randomly selected students and staff of Accra Technical University were chosen on the bases that they are potential consumers of the various products that was developed. A semi-structured questionnaires were prepared for both qualitative and quantitative data collection. Shredded beetroots were subjected to oven and solar drying. The chips were converted into powder, which was then used to produce jam, juice, jelly, drink, tea and marmalade. Sensory analysis of the various products was carried out to evaluate the appearance, taste, texture/ consistency, aroma, general acceptance on a rating scale excellent, very good, fair, satisfactory and good. The overall acceptability of the jam was excellent (60%) and very good (40%). The overall acceptability of beetroot marmalade was 70% was excellent and 30% very good. General acceptability of the beetroot jelly was 57% excellent and 43% very good. Overall acceptability for beetroot juice was satisfactory. Overall acceptability was very good (66.7%) and 33.7% excellent. Beetroot tea was also found be generally accepted (56.7% excellent and 43.3% very good. The study reveals that beetroots are multipurpose

**Keyword:** Beetroot, Development, Exploring, Products, Purpose

## 1. BACKGROUND OF THE STUDY

Beetroot (*Beta vulgaris*) grows primarily in the ground with a leafy top that grows above ground. It can be found in both temperate and tropical areas of the world. It takes approximately 60 days from sowing to harvesting. Beets have been cultivated for thousands of years for their dietary values. Recent studies have indicated that consuming beetroot juice can improve certain health conditions and can also improve oxygenation during athletics activities. Though the full health effects of beetroot are not yet known, many health experts recommend consuming beetroots or beetroot herbal extract for nutritional boost (Gledhill, 2008).

Beetroot sometimes called table beet, garden beet, red or golden beet or just beet is believed to have evolved or originated from sea beet (*beta maritima*) according to Campbell (1979) and it is a tap root plant. It is indigenous to south Europe and was also cultivated by the ancient Greeks around 300BC.

For every 100 gram serving providing 43 Calories, beetroot is a rich source (27% of the Daily Value) of folate and a moderate source (16% of the Daily Value) of manganese, with other nutrients having insignificant content (Ware, 2017; Hobbs *et al.*, 2012). Daily dose of beetroot contains 320-340 mg of nitrate which significantly decrease blood pressure to about 7 mmHg in healthy people (Ware, 2017).

Beets are a unique source of phytonutrients called betalains. Betanin and vulgaxanthin are the two best-studied betalains from beets, and both have been shown to provide antioxidant, anti-inflammatory, and detoxification support provided in phase 2 detoxification steps involving glutathione conjugation (De Preter *et al.*, 2008).

Betalain pigments are found in other plants however, the concentration of betalains in the peel and flesh of beets gives you an unexpectedly great opportunity for these health benefits (Nemzer *et al.*, 2011).

## **2. RESEARCH METHODOLOGY**

### **2.1 SAMPLING TECHNIQUES**

The convenience and random sampling techniques were employed due to time restrictions, accessibility and proximity of information to the study. About fifty (50) conveniently and randomly selected students and staff of Accra Technical University were recruited on the bases that they are potential users of the various products that was developed.

### **2.2 DATA COLLECTION INSTRUMENT**

A semi-structured questionnaires were prepared for both qualitative and quantitative data collection. Questionnaires were administered to respondents and was ensured that at least 85% response rate was obtained.

### **2.3 PRODUCTS INGREDIENTS AND PROCEDURES**

The production ingredients for beetroot production includes, beetroot, sugar ginger, strawberry flavour, cloves.

### **2.4 BEET ROOT JUICE AND DRINK PRODUCTION**

The beets were cut into smaller pieces and par boiled for few minutes. It was then blended together with ginger, lemon, cloves, pineapple and carrot. The mixture was strain with a cheese cloth. Sugar and flavour were added to the resultant juice and chilled for consumption.

### **2.5 BEETROOT TEA (OVEN DRYING)**

Beetroots were washed thoroughly with clean water, peeled and shred. The pieces were spread on a baking sheet and dried in a hot air oven together with lemon grass at 70 °C for 22-24 hours. The resulting chips were blended together with lemon grass into a semi fine texture. 1 teaspoon of the powder was bagged in a teabag and sealed.

### **2.6 BEETROOT POWDER**

#### *Oven drying*

After washing, peeling and shredding the beetroot, the pieces were spread on a baking sheet and dried in a hot air oven 180 °F or 60 °C for 72 hours. The chips were blended to powder.

#### *Sun Drying*

The beetroots were washed thoroughly, peeled with the aid of knife and sliced beetroot with a mandolin. The sliced pieces were transferred into a basket and cover with a food cover net to prevent dust and insect settling on it. The basket was then exposed to sun for 72 hours.

### **2.7 BEETROOT JAM MAKING**

Beetroots were washed, peeled and shredded. The pieces were smash with blended into smooth puree, which was put in a saucepan and mixed with lemon juice and pectin. The mixture was boiled over medium heat and stir frequently. As it boils, sugar is added and stirred until consistency is attained. The sugar content was determined with the aid of refractometer and the rheological properties determined with a viscometer. The sweet and smooth jam was then ladled into sterile jars and capped.

### **3. RESULTS AND DISCUSSION**

This project was conducted to encourage the use of beetroot in our everyday food by producing easy to and convenient food products from the beetroot plant. The possibility of creating beetroot jam, marmalade, assorted juices and drinks, powder and tea was explored.

It came up with the recipes to ascertain these products by researching into possible methods and suitable ways to make these productions. However, after the production was done we had various challenges with the production of the beetroot powder due to colour deficiencies that occur when the shredded beetroots are dried in heat which turns from the reddish color to a blackish color. After various attempts to gain the color the powder was abandoned and rather another challenge which was encountered during the making of the jam which we eventually added to the product line to replace the powder. The production of the jam encountered a challenge where we added a packet more than was stated in the recipe due to consistency issues during cooking of the jam but after cooling of the jam it was much more firm than a regular jam thus we had a jelly instead.

#### **3.1 SENSORY EVALUATION**

The evaluation was conducted on the campus of the Accra Technical University with the participants being all tertiary students from various departments in the university. 30 students participated and tested samples of all the products that was developed from the beetroot. The products were evaluated for their appearance, taste, texture/ consistency, aroma / smell, general acceptance on a rating scale excellent, very good, fair, satisfactory and good (Figure 1).

90% of the respondents affirmed that the appearance of the jam was excellent. With regards to taste/ flavor, 60% of respondents graded it as having very good taste/ flavor. In the case of its consistency or texture 50% graded it as excellent and 40% graded it as very good. For the aroma/ smell 30% graded it excellent, 40% graded it as very good, 20% graded it as good and 10% graded it as fair (Figure 2).

70 % of the respondent graded the appearance of beetroot marmalade as excellent and 30 % graded it as very good, 57% graded the taste/ flavor to be excellent, 30% graded it as very good and 4 or 13 % graded it as fair. In terms of texture/ consistency, 57% graded it as excellent and 43 % graded it as very good. For the aroma/ smell, 57% graded it as excellent, 30% graded it as very good and 13% satisfactory. For the overall acceptability, 70 % was excellent and 30% was very good (Figure 3).

For beetroot jelly, 70% graded it as excellent and 30% graded it as very good. In terms of taste/flavor, 30% graded it as excellent, 57% graded it as very good and 4 or 13% graded it as fair. In terms of texture/consistency, 57% graded it to be excellent, 30% graded it as very good and 4 or 13% graded it as good. In terms of aroma/smell, 30% graded it as excellent, 57% graded it very good and 4 or 13% graded it as good. For general acceptability, 57% was excellent and 43% was very good (figure 4).

Beetroot juice scored 83.3% appearance as excellent, 6.67% as very good and 10% as fair. Taste /flavor graded 50% excellent, 33.3% as very good, 6.67% as good and 10% as fair. For the texture or consistency, 36.7% of the respondents graded it as excellent, 30% graded it as very good, 13.3% graded it as good, 10% graded it as fair and 10% graded it as satisfactory. For the aroma, 60% of the respondents graded it as excellent, 10% graded it as very good, 10% graded it as fair. 60% was graded for excellent for overall acceptability, 33.3% graded very good and 6.7% graded satisfactory.

50% scored excellent for appearance and 50% also graded it as very good for beetroot drink. 50% graded the taste/flavour as excellent, 35% graded it as very good and other 15% graded it as fair. For the texture/consistency, 85% graded it as very good and 15% graded it as good. In terms of smell/aroma, 15 or 65% of the respondent graded it as excellent, 15% graded it as good, 15% graded it as fair and the other 15% graded it as satisfactory. For the overall acceptability, 33.3% respondents graded it as excellent and 66.7% respondents graded it as very good.

Beetroot tea also scored 86.7% excellent for appearance as and the other 13.3% graded it as very good. In terms of taste/flavour 26.7% of the respondents graded as excellent while 73.3% graded it as very good. For the texture/consistency, 73.3% graded excellent and 26.7% graded very good. For the aroma/smell, 13.3% respondents graded excellent, 43.3% graded very good, 16.7% graded good and 26.7% graded fair. For overall acceptability, 56.7% of the respondents graded excellent and 43.3% graded very good (figure 6).

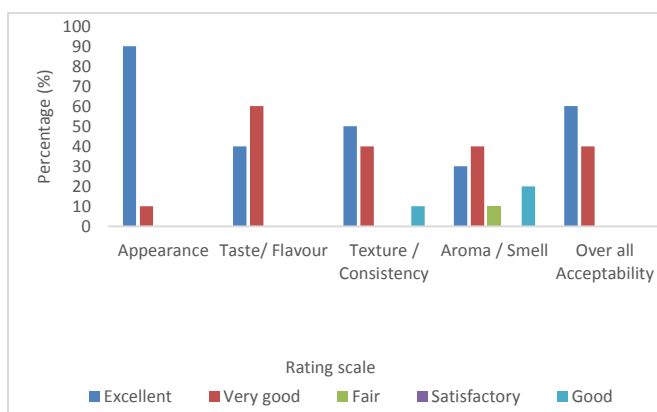


Figure 1: Evaluation of beetroot jam

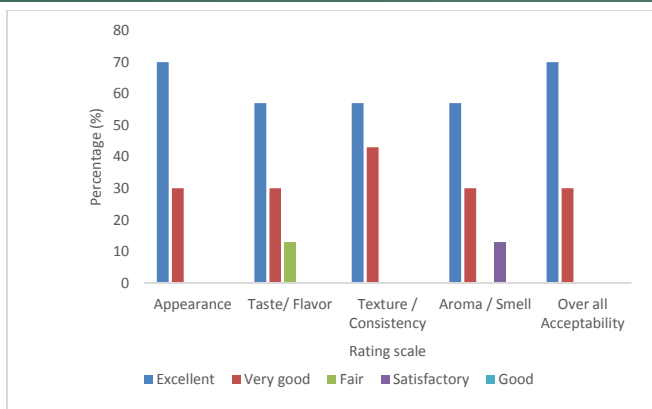


Figure 2: Beetroot marmalade.

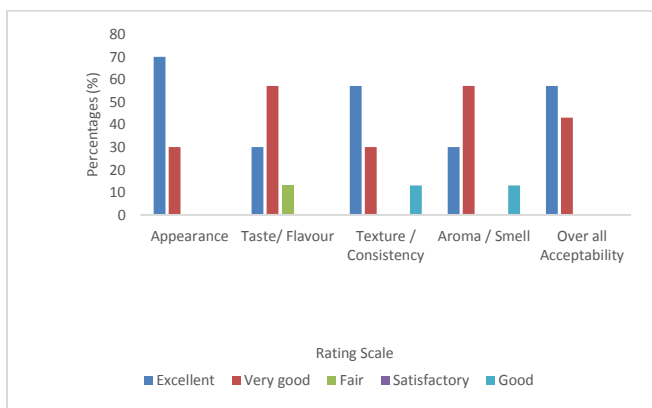


Figure 3: Evaluation of beetroot jelly

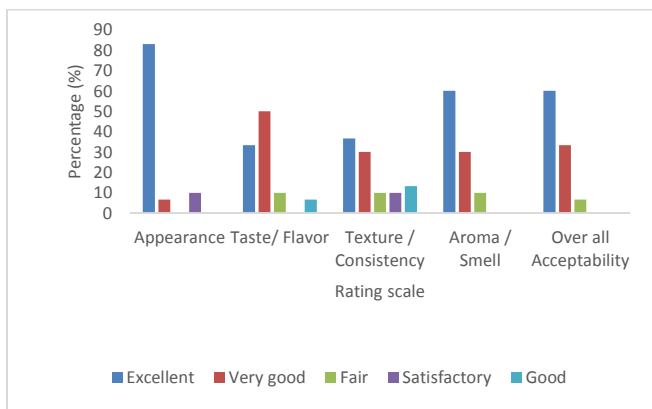


Figure 5: Evaluation findings for beetroot drink.



Figure 4: Evaluation findings for beetroot juice.



Figure 6: Evaluation findings for beetroot tea

#### 4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This project was initiated as basically because we sort to find the possible products that could be developed using beet root as a base ingredient. This was necessary because we realized that in Ghana this vegetable is among the least used in food preparation in spite of its abundance in supply and nutritional values too.

Our task at the beginning of this study was to explore the possibility of using the beetroot to produce some products that will make the vegetable easy to use and much more appealing to the general consumers in everyday life.

Thus we choose to create five products using this vegetable namely: beetroot jam, beetroot marmalade, beetroot tea, beetroot juice and drinks, and beetroot powder. At the end of the production phase however we had challenges with the powder and thus dropped it and we also had another challenge that gave us another product which is beetroot jelly.

Products developed were much more appealing to the general consumers in everyday life. Beetroots are known to play an essential role in preventing cardiovascular diseases and some cancers. Products developed from

beetroot includes beetroot Jam, marmalade, jelly, drink and tea. The consumption of beetroot products is thus, recommended to the general public.

## 5. REFERENCES

- Asian Vegetable Research and Development Center (AVRDC) (1990). Vegetable Production Training Manual. Asian Vegetable Research and Training Center, Shanhua. Accessed on 15 October, 2018.
- De Preter, V., Raemen, H. Cloetens, L. Houben, E. Rutgeerts, P. and Verbeke, K. (2008). Effect of dietary intervention with different pre- and probiotics on intestinal bacterial enzyme activities. *Eur J Clin Nutr*;62 (2):225-231.
- Dhaliwal, M. S. (2017). Classification of vegetable crops: 1-17.
- Ernest, D. (2020). Common Garden Beets. <https://www.diynetwork.com/how-to/outdoors/gardening/are-there-different-types-of-beets>. Retrieved on the 9<sup>th</sup> March, 2020.
- Gledhill, David (2008). "The Names of Plants". Cambridge University Press. P. 70
- Gregory, E. W. (2015). Vegetable History, Nomenclature, and Classification. Retrieved on the 23<sup>rd</sup> 2018.
- Hobbs, D. A.; Kaffa, N.; George, T. W.; Methven, L.; Lovegrove, J. A. (2012). "Blood pressure-lowering effects of beetroot juice and novel beetroot-enriched bread products in normotensive male subjects". *British Journal of Nutrition*; 108 (11): 2066–2074.
- Nemzer, B., Pietrkowski, Z., Sporna, A., Stalica, P., Thresher, W., Michalowski, T. (2011). Betalainic and nutritional profiles of pigment-enriched red beetroot (*Beta vulgaris* L.) dried extracts. *Food Chemistry*, 127(1), 42–53.
- Ware, M. (2017). What are benefits of beetroot. Retrieved on 14 December 2018.
- Department of Agriculture, Forestry and Fisheries (DAFF) (2005). Production guidelines for Beetroot in South Africa.