*IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)*
*e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 4, Issue 4 (May. - Jun. 2013), PP 86-92*
*www.Iosrjournals.Org*

# Sensory Evaluation of Fura Made From Malted and Unmalted Grains of Millet

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***Abstract**:Fura is a popular food that is traditionally consumed by the Hausas and Fulanis of Northern Nigeria and Niger republic. The aim of this study is to find out the effect of malting millet on the taste of the eventual fura produced. Some members of the public were picked to carry out sensory evaluation on fura made from unmalted millet which served as the control group, 1-day malted type and that of 2-day malted grains and graded them according to their taste. The data generated were analyzed for significance using one way and 2-way ANOVA. One-way ANOVA analized difference between samples of fura by each group of persons. The 2-way ANOVA compared the assessments given by the different group of persons to judge the overall sensory acceptability of the fura types. Sensory evaluation of fura produced from malted and unmalted grain show that there is a high preference to Fura produced by 2-day malting than the others.*

## I. Introduction

Fura is a popular food that is traditionally consumed by the Hausas and Fulanis of Northern Nigeria and Niger republic. People of other tribes in Northern Nigeria are also fast adopting Fura as a beverage. It can now be found in non-Hausa towns such as Zuru, Abuja and Minna. In fact Fura is available in some Southern towns such as Lagos though mainly among the Hausa residents.

The popular material for producing Fura is the millet. All varieties of millet are suitable for Fura production. In some parts of Hausa land rice is also used to produce Fura. Millet could be modified before being used to produce Fura by malting of grains, which is a process of soaking grains in water to induce seed germination and starch hydrolysis. Malting is of interest to plant biologist because of its importance in brewing beer and because it is a model system for studying membrane transport. During malting different solutes move by a variety of transport mechanism. The result is that glucose is provided to the rapidly growing embryo.

Structural and biochemical changes in barley during germination have been the subject of numerous investigations. Most were initiated to aleurone layers treated with gibberellic acid (Buttrose 197l: Clutterbuck and Briggs 1973. Chen and Jones, 2004. Locy and Kende 1978, Pliotis *et. ai.*, 2009).

Various methods primarily light and scanning electron microscopy have been used to allow changes in specific components of germinated or sprouted cereal grains. Dronzek *et.al.*, (2002) found enzymatically degraded starch granules malted barley contains three main heterogeneous groups of α-amylase. Basically small granules were hydrolyzed faster than larger granules. Starch degradation started at the endosperm edge adjacent to the embryo.

The pattern of endosperm modification of malted grain is critical to the science and technology of malt production (Pa1rner and Battgate, 2006) to understand its basic feature of malting grain is at the very root of inefficient processing.

The term modification describes the sum total of physical and chemical changes that take place during malting. According to Macleod (l967) optimum modification is "a rather nebleous but nonetheless real condition that has resulted from the transformation of endospermic constituents" to yield a maximum of extractable solids while minimizing malting losses and excessive degradation of high molecular weight components. According to Kneen and Dickson (1967) modification of cell wall material is primarily responsible during malting for the physical change which converts vitreous barley to friable and mellow malt. The aim of this study is to find out the effect of malting on the taste of the eventual fura produced. Some members of the public were picked to carry sensory evaluation on fura made from unmalted millet which served as the control group. 1-day malted type and that of 2-day malted grains and graded them according to their taste.

## II. Materials And Methods

**Procurement and Malting Of Millet**

Three litre-bowl-fills of *pennisetum typhoides* were obtained from Sokoto central market. The grains were cleaned of stones and all other foreign materials. Two bowls of the grains, after cleaning were thinly spread on moist jute sack. Water was frequently sprinkled to keep the sack and the grains moist. The condition was maintained, in a well-ventilated room, until the grains sprouted for one day and for two days. At the end of the sprouting the grains were dried in oven regulated at 7O $^{o}$C. for five days. The remaining bowl of the grains was not processed to sprout rather it served as the unmalted grains.

**Production of Fura with The Grains**

The grains, whether malted or unmalted, were used the same way for the production of Fura. Two kilograms of each grain was processed in the traditional way to produce the Fura.

The traditional preparation of Fura involves the removal of endosperm from the test, winnowing the cleaned grain obtained, it was dehusked by dry abrasion using mortar and pestle the endosperm was washed and rinsed, the grains grinded into flour and sieved. The fine flour was mashed in a mortar with little water added to make a paste. It was molded into dough and the dough boiled in hot water for 30-40 minutes. After which Fura was produced. It was crushed in a calabash with required quantity of water.

**SENSORY EVALUATION**

Fura types made from unmalted grains of millet and from grains malted for one day and those malted for two days were directly compared. The best of the three was scored 3, second best 2 and the least wanted 1. Assessment of the fura types was done by four different persons of the society, in Sokoto. The different group of persons included primary school pupils (16), secondary school students (18) University undergraduates (18) and the elders (18).

**STATISTICAL ANALYSIS**

The data generated were analyzed for significance using one way and 2- way ANOVA. One-wav ANOVA analyzed for difference between samples of Fura by each group of persons. The 2- way ANOVA, compared the assessment given by the different groups of persons to judge overall sensory acceptability of the Fura types.

## III. Results

The results of the assessment and the statistical analysis are presented here.

**Table I:** Comparative organoleptic assessment of fura made from unmalted and malted grains by primary school pupils (7-11 yrs) assessment of fura products

| | Malted for one day | Malted for two days | unmalted |
|---|---|---|---|
| **TOTAL** | 31 | 44 | 21 |
| **Average Score** | 1.93 | 2.75 | 1.31 |

**Table 2:** Comparative organoleptic assessment of fura made with malted grains by secondary school pupils (11-16 yrs) assessment of fura products

| | Malted for 1 day | Malted for 2 days | unmalted |
|---|---|---|---|
| **Total score** | 36 | 50 | 22 |
| **Average score** | 2.00 | 2.77 | 1.22 |

**Table 3:** Comparative organoleptic assessment of fura made with unmalted and malted grains by undergraduate students (16-25 yrs)

| | Malted for 1 day | Malted for 2 days | unmalted |
|---|---|---|---|
| **Total score** | 36 | 54 | 18 |
| **Average score** | 2.00 | 3.00 | 1.00 |

**Table 4:** Comparative organoleptic assessment of fura made with unmalted and malted grains by elders (25 yrs and above)

| | Malted for 1 day | Malted for 2 days | unmalted |
|---|---|---|---|
| **Total score** | 36 | 54 | 18 |
| **Average score** | 2.00 | 3.00 | 1.00 |

## IV. Statistical Analysis

**Analysis of Variance on Pupils Responses from Different Sample 1**

Analysis of Variance Procedure
Class Level Information

**Dependant variable: Pupils**

| Source | DF | sum of squares | mean Square | F-value | Pr >F |
|---|---|---|---|---|---|
| Treatment | 2 | 23.37037037 | 11.68518519 | 30.39 | 0.0001 |
| Error | 51 | 19.61111111 | 0.384553159 | | |
| Corrected Total | 53 | 42.98148148 | | | |

| R-Square | C.V | Root MSE | Pupils mean |
|---|---|---|---|
| 0.543731 | 31.295075 | 0.62010611 | 1.98148148 |

| Source | DF | Anova SS | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| SAMPLE | 2 | 23.37037037 | 11.68518519 | 30.39 | 0.0001 |

**Analysis of Variance on Pupils Responses from Different Samples 3**

Analysis of variance procedure
T tests (LSD) for variable: PUPILS
**NOTE:** This test controls the type I comparison-wise error rate not the experiment-wise error rate
Alpha = 0.05 df = 51 MSE = .3845316
Critical value of T = 2.01
Least significant difference = .41497
Means with the same letter are not significantly different

| T Grouping | Mean | N | SAMPLE |
|---|---|---|---|
| A | 2.778 | 18 | 2 |
| B | 2.000 | 18 | 1 |
| C | 1.167 | 18 | 3 |

**Analysis of Variance on Students Responses from Different Sample 2**

Analysis of variance Procedure
Class Level Information
Dependant Variable: STUDENTS

| Source | DF | sum of Squares | Mean Square | F-value | Pr > F |
|---|---|---|---|---|---|
| Treatment | 2 | 21.77777778 | 10. 88888889 | 39.05 | 0.0001 |
| Error | 51 | 14.22222222 | 0. 27886710 | | |
| Corrected Total | 53 | 36.00000000 | | | |

| R-Square | C.V | Root MSE | STUDENTS mean |
|---|---|---|---|
| 0.604938 | 26.403934 | 0.52807869 | 2.00000000 |

| Source | DF | Anova SS | mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| SAMPLE | 2 | 21.77777778 | 10.88888889 | 39.05 | 0.0001 |

**Analysis of Variance on Students Responses from Different Sample 3**

Analysis of variance procedure
T test (LSD) for variable: STUDENTS
NOTE: This test controls the type I comparison wise error rate not the experiment wise error rate
Alpha = 0.05 df = 51 MSE = 2788671
Critical value of T = 2.001
Means with the same letter are not significantly different

| T Grouping | Mean | N | SAMPLE |
|---|---|---|---|
| A | 2.778 | 18 | 2 |
| B | 2.000 | 18 | 1 |
| C | 1.222 | 18 | 3 |

**Analysis Variance on Undergraduates from Different Sample 4**

Analysis of variance procedure

Class Level Information

| Class | Levels | Values |
|---|---|---|
| SAMPLE | 3 | 123 |

Number of observations in data set = 54

**Analysis of Variance on Undergraduates from Different Samples 5**

Analysis of variance procedure

Dependant variable UNDERGRADUATE

| Source | DF | sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| Treatment | 2 | 28.44444444 | 14.22222222 | 96.00 | 0.0001 |
| Error | 51 | 7.55555556 | 0.14814815 | | |
| Corrected Total | 53 | 36.00000000 | | | |

| R-Square | C.V | Root MSE | STUDENT mean |
|---|---|---|---|
| 0.790123 | 19.245009 | 0.38490018 | 2.00000000 |

| Source | DF | Anova SS | mean square | F value | Pr > F |
|---|---|---|---|---|---|
| SAMPLE | 2 | 28.44444444 | 14.22222222 | 96.00 | 0.0001 |

**Analysis of Variance on Undergraduates Responses from Different Sample 6**

Analysis of variance procedure

T test (LSD) for variance: UNDERGRADUATE

NOTE: This test controls the type I comparison wise error rate not the experiment wise error rate

Alpha = 0.05 df = 51 MSE = 1481481

Critical value of T = 2.01

Least significant difference = 25757

Means with the same letter are not significantly different

| T Grouping | Mean | N | SAMPLE |
|---|---|---|---|
| A | 2.889 | 18 | 2 |
| B | 2.000 | 18 | 1 |
| C | 1.111 | 18 | 3 |

**Analysis of Variance on Leaders from Different Samples 7**

Analysis of variance procedure

Class level Information

| Class | Levels | Values |
|---|---|---|
| SAMPLE | 3 | 123 |

Number of observations in data set = 54

Analysis of variance procedure

Dependant variance: ELDERS

| Source | DF | sum of squares | Mean square | F value | Pr > F |
|---|---|---|---|---|---|
| Treatment | 2 | 36.00000000 | 18.00000000 | 99999.99 | 0.0000 |
| Error | 51 | 0.00000000 | 0.00000000 | | |
| Corrected Total | 53 | 36.00000000 | | | |

| R-Square | C.V | Root MSE | LOCAL mean |
|---|---|---|---|
| 1.000000 | 0 | 0 | 2.00000000 |

| Source | DF | Anova SS | mean square | F value | Pr > F |
|---|---|---|---|---|---|
| SAMPLE | 2 | 36.00000000 | 18.00000000 | 99999.99 | 0.0000 |

**Analysis of Variance on Elders from Different Samples 9**

Analysis of variance procedure

T test (LSD) for variable: ELDER

NOTE: This test controls the type I comparison wise error rate not the experiment wise error rate

Alpha = 0.05 df = 51 MSE = 0

Cretical value of T = 2.01

Least significant difference = 0

Means with the same latter are not significantly different

| T | Grouping | Mean | N | SAMPLE |
|---|---|---|---|---|
| | A | 3.000 | 18 | 2 |
| | B | 2.000 | 18 | 1 |
| | C | 1.000 | 18 | 3 |

**Analysis Variance on Scores from Different Sample and Subject 10**

Analysis of variance procedure

Class level Information

| Class | Level | Values |
|---|---|---|
| SAMPLE | 3 | 1 2 3 |
| SUBJECT | 4 | 1 2 3 4 |

Number of observations in data set = 216

**Analysis of Variance on Scores from Different Samples and Subject 11**

Analysis of variance procedure

Dependent variance: SCORES

| Source | DF | sum of squares | mean square | F value | Pr > F |
|---|---|---|---|---|---|
| Treatment | 5 | 108.52314815 | 21.70462963 | 107.32 | 0.0001 |
| Error | 210 | 42.47222222 | 0.20224868 | | |
| Corrected Total | 215 | 150.99537037 | | | |

| R-Square | C.V | Root MSE | SCORES | mean |
|---|---|---|---|---|
| 0.718718 | 22.538205 | | 0.4472067 | 1.99537037 |

| Source | DF | Anova SS | mean square | F value | Pr >F |
|---|---|---|---|---|---|
| SAMPLE | 2 | 108.50925926 | 54.25462963 | 268.26 | 0.0001 |
| SUBJECTS | 3 | 0.01388889 | 0.00462963 | 0.02 | 0.9953 |

**Analysis of Variance on Scores from Different Sample and Subject12**

Analysis of variance procedure

T test (LSD) for variance: SCORES

NOTE: This test controls the type I comparison wise error rate not the experiment wise error rate

Alpha = 0.05 df = 210 MSE = .2022487

Critical value of T = 1.97

Least significantly difference = .14776

Means with the same letter are not significantly different

| T | Grouping | Mean | N | SAMPLE |
|---|---|---|---|---|
| | A | 2.8611 | 72 | 2 |
| | B | 2.0000 | 72 | 1 |
| | C | 1.1250 | 72 | 3 |

**Analysis of Variance on Scores from Different Samples and Subject 13**

Analysis of variance procedure

T test (LSD) for variance: SCORES

NOTE: This test controls the type I comparison wise error rate not the experiment wise error rate

Alpha = 0.05 df = 210 MSE = 2022487

Critical value of T = 1.97

Least significant difference = .17062

Means with the same letter are not significantly different

| **T** | **Grouping** | **Mean** | **N** | **Sample** |
|---|---|---|---|---|
| | A | 2.0000 | 54 | 3 |
| | A | 2.0000 | 54 | 2 |
| | A | 2.0000 | 54 | 4 |
| | A | 1.9815 | 54 | 1 |

Table 5: Means of scores from malted and unmalted fura

| Assessors | Malted for 1 day | Malted for 2 day | unmalted |
|---|---|---|---|
| Primary pupils | $2.0^{b}$ | $2.78^{a}$ | $1.17^{c}$ |
| Sec. Sch. Student | $2.0^{b}$ | $2.78^{a}$ | $1.22^{c}$ |
| Undergraduate Students | $2.0^{b}$ | $2.89^{a}$ | $1.11^{c}$ |
| Elders | $2.0^{b}$ | $3.0^{a}$ | $1.07^{c}$ |

Means with same letter are not significantly different

Table 6: comparison of means of scores from malted and unmatled fura by different group of assessors.

| Assessors | Number of values | Mean Score |
|---|---|---|
| Primary pupils | 48 | $2.0^{c}$ |
| Sec. Sch. Student | 54 | $2.0^{c}$ |
| Undergraduate | 54 | $2.0^{c}$ |
| Elders | 54 | $1.98^{c}$ |

Scores are not significantly different

## V. Summary Of The Results

**Average scores of types of fura**

The Fura product that was most wanted by pupils was that produced from millet grains that were malted for 2 days (2.78) followed by that from grains malted for one day (2.0). Fura of malted grains were more wanted than from unmalted grains (1 .67) (Table I). The average scores by students were in the same pattern for the pupils two days malted (2.78). One-day malted (2.0) and unmalted (1.22) (Table 2). The undergraduates scored the Fura product as 2.89. 2*) and 1.11 for two day malted Fura, one-day malted and unmalted respectively Table 3). Similarly, the local elders scored them as 3.0. 2.0 and 1.0 respectively for two-day malted Fura, one-day malted and unmalted Fura products (Table 4)

**Significance Test for Fura Products**

The results of significance comparison of the Fura products are shown in table 5. The Fura products from two-day malted grains are generally significantly different from one-day malted grains and. both are significantly different from the unmalted grains of *Pcnnisetum typhoides.*

Assessment by Different Groups of Persons

The assessments of Fura types by the different groups of persons show no difference (table 6). The four groups of persons agree with themselves.

## VI. Discussion

Acceptability of a food may be due to taste, colour and appearance (lopez *et al*, 1990). According to Kneen and Dickson (1961) modification of cell wall materials is primarily responsible during making the hard millet is converted to friable malt. Early in malting, proteolytic enzymes are elaborated and render about 40% of the total protein soluble in dilute salt solution.

In later stage of making starch is being hydrolyzed to increase the sugar content and also improve vitamin C and the flavour (Lopez *et. al.*, 1990).

## VII. Conclusion

In conclusion sensory evaluation of Fura produced from malted and unmalted grain shows that there is a high preference to Fura produced by 2 day malting than the others.

The eventual decision to go for a particular brand of Fura would depend, apart from taste, on the mass of Fura derivable from a given quantity of grains and the nutritional value. Further work is therefore recommended to determine mass of Fura per quantity of grain type and their respective nutritional values.

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