

# CONTRIBUTION TO THE IMPROVEMENT OF PRODUCTS QUALITY IN BAKING PRODUCT

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## ABSTRACT

The present study deals with the quality for production of cookies. Cookies flour with 13-14 % moisture content, 7.5-10 % gluten, 18-25 ml sedimentation volume, 1 % ash and 0.1 % acid insoluble ash are considered suitable for cookies production. Under process control several physico-chemical and functional tests were performed daily. Flour is a dominant raw material upon which the quality of the cookies is dependent. Cookies flour with 13-14 % moisture content, 7.5-10 % gluten, 18-25 ml sedimentation volume, 1 % ash and 0.1 % acid insoluble ash are considered suitable for cookies making. Review of checks conducted over seven weeks revealed that these parameters were within specified limit

**Keyword:** Quality management system, moisture content, physico-chemical and functional tests

## 1. INTRODUCTION

The main principles of baking: wheat flour fined their production of bakery foods chemically leavened goods include layer cake, doughnuts and biscuits raised by carbon dioxide from baking powder and chemical agents. Air leavened goods include Angel cakes and Sponge cakes made without baking powder partially leavened goods include certain crackers, and other items where no intentional leavening agents are used a slight leavening occurs from expanding steam and other gases during the oven baking operation. The composite flour can be described as a mixture of several flours obtained from roots and tubers, cereal, legumes etc with or without the addition of wheat flour [1]. It can also be a mixture of different flours from cereal, legumes or root crops that is created to satisfy specific functional characteristics and nutrient composition. HACCP is based around seven established principles. The successful implementation of HACCP demands each of these principles be well understood. It should cover all the processes from the point of receiving raw material through manufacturing, packaging and all post manufacturing steps, storage, distribution and consumer handling. The following principles are taken consider for maintain the quality of food products:

- Conduct hazard analysis-Prepare a flow diagram of the steps in the process.
- Identify the critical control points (ccps) in the process using a decision tree or other methods.
- Establish target level(s) and tolerances which must be met to ensure each CCP under control.

- Establish monitoring system of control of the CCP by scheduled testing or observations.
- Establish the corrective action to be taken when monitoring indicates that particular CCP is moving out of control.
- Establish documentation concerning all procedures and records appropriate to these principles and their application.

Establish verification procedures which include appropriate supplementary tests together with a review which confirms that HACCP is working [2].

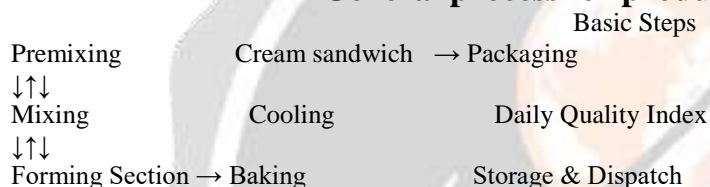
### 1.1 Bakery Products

Cookies appear to have their origins in 7th century AD Persia, shortly after the use of sugar became relatively common in the region. They spread to Europe through the Muslim conquest of Spain. By the 14th century, they were common in all levels of society throughout Europe, from royal cuisine to street vendors [3].

### 1.2 Cookies

The raw materials used for cookies production example, maida. salt, sugar, yeast, ammonium bicarbonate, condensed milk, sodium metabisulphite, starch ,oil, butter, cream was procured from certified vendors [4].

#### General process for production of cookies.



#### LINE-1

→ Short dough feed hopper → Rotary → Dough cutter → Metal detector → Forming section → Oven → Cooling conveyer → stacker → Packaging

#### LINE-2

→ Short dough feed Hopper → Rotary → Dough cutter → Metal detector → Forming section → Oven → Cooling conveyer → Stacker → Sandwiching → Packaging

#### LINE-3

→ Hard dough feed Hopper → Rotary → Metal detector → Presheeter → pressing → Relaxation → Forming section → Milk spray → Oven → Cooling conveyer → Stacker → packaging

## 2. MATERIALS AND METHODS

### 2.1. Raw Materials

The raw materials used for cookies production example, maida. salt, sugar, yeast, ammonium bicarbonate, condensed milk, sodium metabisulphite, starch ,oil, butter, cream was procured from certified vendors

### 2.2. Premixing

Premixing involves several steps like, sieving (flour and sugar), sugar grinding, syrup preparation, lecithin preparation, SMBS preparation, solbake preparation and milk spray preparation.

### 2.3. SMBS preparation

10% of SMBS was prepared by using suitable of sugar can be added with constant stirring until it dissolved followed by the filtering of the solution through 100 mesh, the solution is then stored in plastic cans with tightly closed lid to avoid loss of sulfur dioxide.

#### 2.4. Sugar Syrup (Invert syrup)

Suitable amount of water was heated to attain temperature of 60-65°C then sugar is added with continuous stirring until the sugar gets dissolved. Raise the temperature up to 105°C & add suitable amount of diluted citric acid was added, later the temperature should be maintained at 105°C for about an hour. Then allow the content to settle for 20-30 min and transfer the syrup to storage tank.

#### 2.5. Sugar solution

The suitable amount of water and sugar is charge into reconstitution vessel with stirring facility run for 15-20 min. After complete dissolution of sugar solution is drained into an intermediate tank after passing through a sieve of 16 mesh & again passed through filter press having finer mesh size 40 mesh. The filtered sugar solution from the filter is then pumped into storage tank and then cooled at room temperature before use.

#### 2.6. Physico-chemical analysis

**Sieve Test Sieve Test:** Samples of all dry raw materials were sieved for examination of foreign bodies like metal contents, stones, insects and rodent infestation, lump formation due to high moisture content.

**Moisture test:** Moisture in the sample was estimated by employing the standard method of analysis (AOAC, 1990).

**Ash Content:** Ash in the sample was estimated by employing standard method of analysis (AOAC).

**Acid insoluble Ash:** Acid insoluble ash in the sample was estimated by employing standard method of analysis.

**Peroxide value analysis:** Oil is assessed for peroxide value were estimated using standard technique.

#### 2.7. Process quality control check during cookies preparation

Following checks were carried out during processing of cookies to ensure that determining factors are under the control and did not affect the quality of cookies.

**Table 1: Process quality control methods**

Sl. No.	Name of test/check	Frequency	Method	Done by
1.	Sedimentation Value Of Maida (ml)	Daily	Chemical test	Quality personnel
2.	Gluten content of Maida (%)	Daily	Hot air oven	Quality personnel
3.	Ammonia bicarbonate (kg)	Hourly	Weighing machine	Quality incharge as well as production incharge
4.	Sodium meta bi sulphate(kg)	Hourly	Weighing machine	Quality incharge as well as production incharge
5.	Dust quantity (kg)	Hourly	Weighing machine	Production personnel
6.	Dough temperature (°c)	Hourly	Thermometer	Line inspector
7.	Weight of 20 unbaked cookies(g)	Hourly	Weighing machine	Line inspector
8.	Oven temperature (°c)	Every batch	Online temperature recorder	Line inspector
9.	Baking time ( min)	Every batch	Online time recorder	Line inspector

10.	Weight of 20 baked cookies t (g)	Hourly	Weighing machine	Line inspector
11.	Diameter of cookies (cm)	Hourly	Caliper	Line inspector
12.	Stack length of cookies t (cm)	Hourly	Stack length meter	Line inspector
13.	Organoleptic check	Hourly	Sensory evaluation	Quality personnel
14.	Moisture content of cookies(%)	Hourly	Infrared machine	Quality personnel

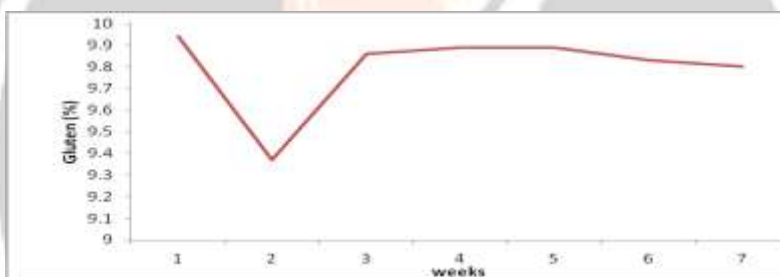
### 3. Results and Discussion

#### 3.1 Physico-chemical studies of cookies

In physicochemical analysis of cookies mainly gluten, sedimentation volume, sugar retention (cream), moisture test, peroxide value was obtained.

#### 3.2. Gluten analysis of cookies

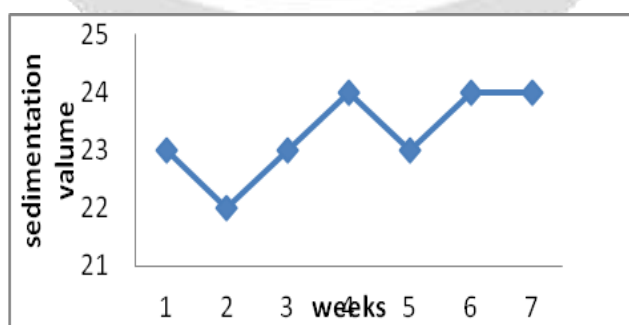
Gluten content of the flour ranged from 9.3 to 9.94 %, the highest being at first week while lowest was observed at second week.



**Chart -1:** Change in gluten content during storage of cookies

#### 3.4. Sedimentation Volume

Sedimentation volume of flour observed over 7 weeks varied from 22 ml to 24 ml. As mentioned in the Chart-2.



**Chart -2:** Change in sedimentation volume during storage of cookies

#### 3.5 Sugar Retention

Sugar retention varied from 7.7-8 % Sugar retention (shell). As mentioned in the Chart no 3.

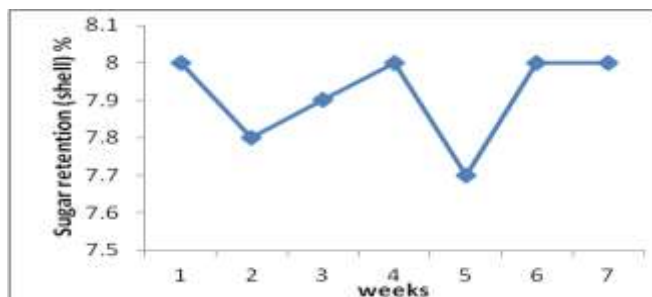


Chart-3: Change in Sugar retention during storage of cookies

### 3.6 Moisture test

Moisture of the raw material (cookies) is decreased in first week after that while it is increased in second week, then no result was found after fifth week.

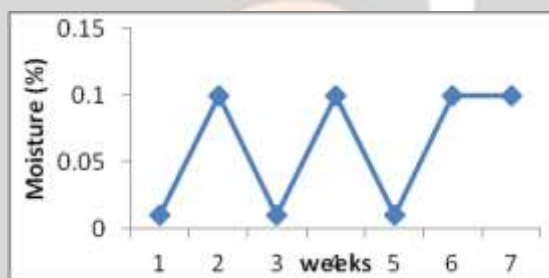


Chart-4: Change in moisture test during storage of cookies.

### 3.7 Peroxide value

Peroxide value of oil over 7 week ranged from 1.3 to 1.7 meq/kg and slight deviation from reference value was observed at second and third week.

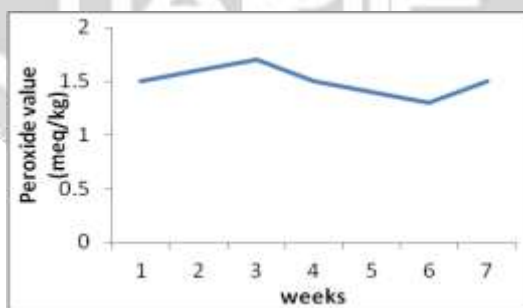


Chart-5: Change in Peroxide value of oil during storage of cookies

### 3.8 HACCP Programmes

Using HACCP method food processing like safety, quality, hygiene, specification, etc can be monitored.

**Table 2: The hazards identified in cookies ingredients and their control measures**

Sl. No.	Ingredient	Hazard	Control Measure
1.	Flour	MP	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
2.	Hydrogenated oil	MCP	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
3.	Sugar	MP	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
4.	Milk powder	MCP	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
5.	Water	MCP	Filtering and supply of quality water
6.	Salt	MP	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
7.	Flavour	NO HAZARD	ensuring supply of quality product Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling
8.	Leavening agent	MCP	Store at clean and dry place at room temperature away from direct sunlight Proper personal hygiene and handling.

M-Microbiological, P- Physical, C- Chemical

**Table 3: The hazards identified in cookies steps and their control**

Sl. No.	Process step	Description	Hazard	Control measure
1.	Raw material receiving and storage	Raw material were received and stored for a certain period of time before processing	MCP	Proper checking proper storage condition Pest control
2.	Mixing	The ingredients were mixed to formulate the combination according to recipe	MCP	Proper supply of quality water Sanitization of all the equipment & tools
3.	Cookies piece formation	Formation of the cookies	MP	Proper equipment setting sanitization of all the equipment
4.	Baking	Cooking of moulded cookies	NO HAZARD	Proper equipment setting sanitization of the equipment
5.	Aeration	Aeration of cookies before packaging	P	Proper equipment setting sanitization of the equipment, personal hygiene



6.	Packaging	The cookies were packed by machine	MP	Proper personal hygiene and handling Proper equipment setting
7.	Storage	The product is stored	MCP	Proper personal hygiene and handling proper storage condition & Pest control
8.	Distribution	The product is distributed in clean trucks	MP	Proper procedure of loading of trucks for minimization of damage

M-Microbiological, P-Physical, C- Chemical

The use of good and sound raw material is of primary importance for the achievement of required end product of consistent quality. The firm had prescribed set of specification in respect of all raw ingredients which are followed strictly during process of procurement. The firm had vendor approval process where it was made sure that it supplied raw materials as per the specification of the firm. Physical and chemical tests were carried out for examination of incoming materials. Under chemical analysis, sample of flour was tested for moisture, ash and acid insoluble ash, sugar was tested for moisture whereas fat sample was tested for rancidity. Flour with 13-14 % moisture content, 7.5-10 % gluten, 18-25 ml sedimentation volume, 1% ash and 0.1 % acid insoluble ash were considered suitable for cookies making. With respect to sugar, two parameters namely, moisture content (maximum 1 %) and solubility (minimum 99.9 %) were considered. Peroxide value and free fatty acid of procured fat should not be more than 1.5 mill equivalent/Kg and 0.1 % respectively. Under process control several physico-chemicals and functional tests namely gluten content and SDS-sedimentation volume of flour, moisture content and retention value of sugar, peroxide value of oil were carried out daily during processing to judge the quality of raw material in relation to end product quality. Observation of checks over seven weeks revealed that gluten content and sedimentation volume of flour varied from 9.3-9.94 % and 22-24 mL, respectively and these values were found within the prescribed limits. Sugar retention (shell) varied from 7.7 -8 %, whereas sugar retention (cream) varied from 3.7-4 %. Peroxide value of fat ranged from 1.3 to 1.7 meq/Kg and slight deviation from critical limit was observed at second and third week. The process steps in cookies production consisted of creaming of fat and sugar, addition of other ingredients and mixing to a pliable mass, sheeting, molding, baking, cooling and packaging. Observation of check results over 7 week revealed that there was wide deviation in the temperature of different zones of oven from prescribed limit. However other parameters were within the specified limit [5]. Oven exit is most important control point in the bakery industry as this is the first time that a baked product can be assessed. The critical parameters of the product assessed at this point in cookies plant at cookies were diameter of cookies, stack length, moisture content and weight of 20 baked cookies. The cookies weight is paramount as changes in this will have an effect on all the other parameters. Besides this organoleptic check on biscuit color, texture, flavor and shelf life test were done regularly by quality control personnel. Breakage in cookies and return of stocks due to broken cookies is a major problem of biscuit industry and therefore regular check was performed by the management team to check on procedure of loading truck and incidence of broken cookies within packs [6-8]. the ingredient wise hazard had been identified and among all identified. [9-10].

#### 4. CONCLUSIONS

The present investigation focused on various physico-chemical and functional test to validate the quality of the cookies, 7.5-10% and 13-14% of gluten and moisture content respectively with a sedimentation volume of 18-25 ml with 1% ash and acid insoluble ash of 0.1% were considered to be standard measurements and the present study proved that the seven days review check on all the specified parameter were in favor of specified limits.

## 5. ACKNOWLEDGEMENTS

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## 6. REFERENCES

- [1]. Ajila, CM; Leelavathi, K and Rao, UTS (2008). Mango peel powder in cookies. *J. Cereal Sci.*48: 319-326.
- Aiyar (2001). Food safety consideration in the context of globalization. *Indian Food Industry*, 20(1):16-18.
- [2]. ACI Global (2008). Overview of ISO 22000:2005 International food safety training [http://www.aciglobal.com.au/FSMS\\_overview.html](http://www.aciglobal.com.au/FSMS_overview.html)
- [3.] Akingbala, JO; Falade, KO and Ogunjobi, MA (2009). The Effect of root maturity, preprocesses holding and flour storage on the quality of cassava biscuit. *Food Bioprocess Tech.* DOI: 10.1007/s11947-009-0185-Z.
- [4]. Sulieman AHE; Siddeg HM and Salih, ZA (2013). The design of Hazard analysis critical control point (HACCP) plan for cookies plant. *Food and Public Health*, 3(5), 240-246
- [5] Artz WE; Warren, CC, Mohring, AE and Villota, R. (1990). Incorporation of corn fiber into sugar cookies. *Cereal Chem.*, 67 (3): 303-305
- [6] Bajaj, P; Mathur, P and Sharma, S (2002), Safety of street foods: case study of a food plaza in Delhi. *Indian Food Industry* 21(3): 39-42.
- [7] Chaudhary, A and Awasthi, P (2009). Quality evaluation of biscuits containing parboiled rice bran. *J. Food Sci. Technol.*46 (1): 83-85.
- [8] Devi, R; Nerlekar, J P; Zanvar, VS; Pagare, MP; Deshmukh, SV; and Kalabande, VH (2000). Development of nutritious supplementary biscuits from green gram dhal. *J. Food Sci. Technol.*, 37 (5): 506-508.
- [9] Wadikar, D.D. and K.S. Premavalli (2010). ISO-22000: Food safety management system. 29 (1).
- [10] Gupta, HO and Singh NN (2005). Preparation of wheat and quality protein maize based biscuits and their storage, protein quality and sensory evaluation. *J. Food Sci. Technol.* 42(1):43-46.