

Study on temperature and time effect in baking on the shelf life of soft dough biscuit

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Abstract

Baking is not usually thought of as chemical industry, but it relies on the interactions of various chemicals in flour and other substances used to make it and thus is chemically based. The aim of this study was to investigate the effects of temperature and time in baking on the shelf life of soft dough biscuits. In this procedure and formulation we kept temperature at 195°C, 220°C, 235°C, 240°C, 230°C, 234°C in the 1st, 2nd, 3rd, 4th, 5th, and 6th burner respectively, and passing time was 4 minutes in total, thus we obtained moisture below 5%, which has 06 months shelf life with indicated high quality. The biscuits baked at lower temperatures and for the longest time had the lowest moisture. Meanwhile, higher temperature takes less baking time, while lower temperature takes longer baking time. The increase or decrease in combination of time and temperature was adjusted with the speed of the conveyor belt of the oven. The study also explained the mode of heat transfer in the oven during the baking process.

Keywords: baking; temperature effect; time effect; oven setting; biscuit quality

Introduction

Biscuits, which are chemically leavened baked products, are one of the most delicious foods liked by most people. They are stable foods and have advantages such as long shelf life and the good eating quality. The physical properties of dough and recipes in biscuit making depend on the types of biscuit and the method used in the dough formation. Maintaining quality standards from the raw materials to the end product is essential in biscuit making to ensure food safety. The delicious smell of biscuits is produced as a result of the interaction of various chemical and physical processes that can be adjusted to create a great variety of products. Baking is obviously one of the most important stages of biscuit production. Biscuit quality and baking time also changes with oven design and operating parameters. These parameters must be well established and controlled for each type of baked products. In the production of biscuit dough, dough-mixing procedure, packaging of the product, storage period should be well established for a high-quality product. Baking time and oven temperature have the greatest effects on biscuit quality. This study aims to investigate the effects of baking time, temperature and humidity on biscuit quality and their shelf life. The study also aims to subsequently find the relationship between biscuit crust and crumb properties. This study has evaluated the effects of different temperature and time combinations on the quality of biscuits [1].

The design and control of an oven is principally a matter of heat transfer, but for the baker, it is a matter of temperatures and turbulences at specific stages. Heat and temperature are not the same and should not be confused. It is relatively easy to measure temperatures in an oven but much more difficult to measure heat, or heat flux, which is the rate at which heat is being transferred. Heat is transferred much more effectively if the air is moving near the dough piece at a given temperature. Nearly all biscuits are now baked in band or traveling ovens with several independently

controlled zones. This means that oven conditions such as temperature, movement, and humidity of the atmosphere may be altered during the baking period. Baking times for biscuits are quite short, ranging from 3-4 minutes. It is usually not possible to change the temperature of a static or reel oven quickly, so the results of baking in these ovens compared with that in traveling ovens are often very different. The conditions needed for different types of biscuits are not the same, as the structure development and the amount of moisture to be removed depends on the richness level of fat and sugar of the recipe [2].

Considering the above circumstance, the objectives of this study are as follows:

1. To know overall process of biscuit.
2. To Standardize baking time and temperature.
3. & Shelf-life study.

Materials and Methods

Materials

List of instruments

- a. Weight Scale
- b. Mixing machine
- c. Rotary Machine
- d. Forming belt and dies
- e. Trolley
- f. Six chamber ovens
- g. Cooling conveyer
- h. Staking belt
- i. Tray
- j. Packing Machine
- k. Moisture Meter

List of raw materials

- a. Flour
- b. Palm oil
- c. Sugar
- d. Skimmed milk powder

e. Salt

List of Chemicals

- a. Ammonium bi carbonate
- b. Sodium bi carbonate
- c. Invert syrup
- d. Malt extract
- e. Soya lichenin
- f. Artificial flavor (Food Grade)

Method

Preparation of biscuit

Pour milk into flour mixture while stirring with a fork. Mix in milk until dough is soft, moist and pulls away from the side of the bowl. Turn dough out onto a lightly floured surface and toss with flour until it is no longer sticky. Roll dough out into a 1/2-inch-thick sheet and cut with a floured biscuit cutter or cookie cutter.

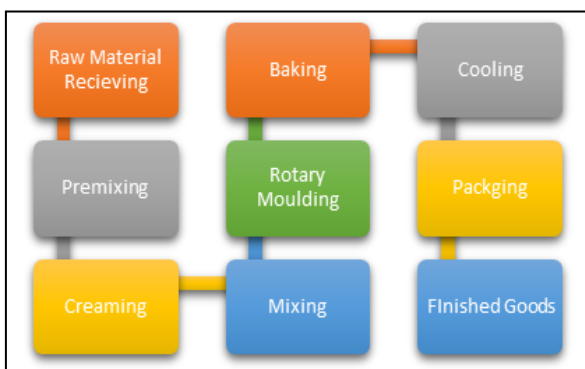


Fig 1: Process flow chart of soft dough biscuit

Baking

The zones are classified as

- There are 6 independent zones in all three plants. These are-
- a) Proofing zone: zone 1 (Structure is set here)
 - b) Puffing zone: zone 2 & 3 (Product gets oven spring)
 - c) Baking zone: zone 4 & 5 (Moisture removal of product)
 - d) Coloring zone: zone 6

a. Temperature control

Direct Gas-Fired Ovens

Direct gas-fired (DGF) ovens have the most complete system of temperature control. The system can provide separate top and bottom control of heat input from the burners and lateral control across the width of the oven with multilane distributor burners [3].

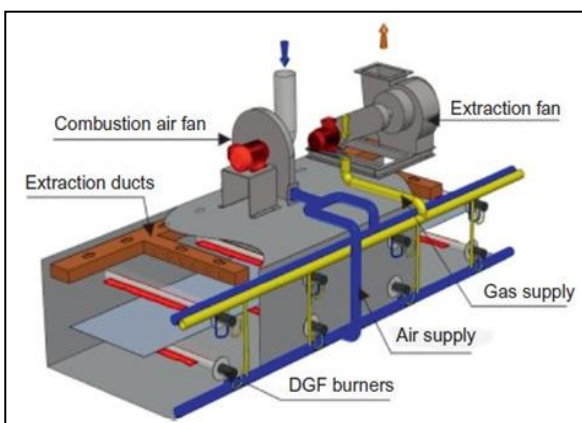


Fig 2: Direct gas-fired baking chamber.

Temperature monitoring and control

The temperature is controlled separately in each oven zone. The temperature is detected within the baking chamber by 'K' type thermocouples. The thermocouples are connected to the temperature controllers by special screened cable: Ni Cr / Ni type K.



Fig 3: 'K' type thermocouple with insulated head from TC Direct.

Normally, in a DGF oven, there will be four thermocouples in each zone, two above the band and two below. The thermocouples are connected to temperature controllers on the zone control panel. The controller will average the temperatures from the two thermocouples at the top of the baking chamber and the two thermocouples at the bottom of the oven. In a DGF oven there may be a separate controller and separate system for controlling the top burners and the bottom burners. Alternatively, a heat ratio system may be used to adjust top and bottom heat inputs. The position of the thermocouples is important, and the location should not be close to a burner flame, which might give a misleading temperature reading. The location should be adjacent to the back of the burner (opposite side to the flame) and as far from the burners as possible. Locations are often chosen close to an inspection door or at a zone end. For indirect radiant or convection ovens, the control is for a single burner and the oven may have a single or multiple thermocouples from which the temperatures are averaged by the controller. Thermocouples would normally be located in the baking chamber on each side of the heater module [4].

Temperature controllers

The thermocouples provide temperature data to automatic controllers. The required baking temperature is set at the controller using push button and the controller will display the set temperature and the actual temperature. In addition, a simple controller is used to detect an over temperature condition which could be unsafe. A thermocouple in the zone flue or heat exchanger will detect an excessive temperature (as set on the controller) and will automatically shut down the burner system by operating the gas solenoid valve if the temperature exceeds the maximum set point [5].



Fig 4: Zone control panel for two zones on a direct gas-fired oven with Omron temperature controllers. Each zone has a separate top and bottom controller and a safety override controller.

Top and bottom temperature control and heat ratio control

There are two systems of temperature control used on DGF ovens

1. Separate top and bottom control in this system,

The top burners and the bottom burners in each zone have independent temperature controllers and air supply via separate motorized valves.

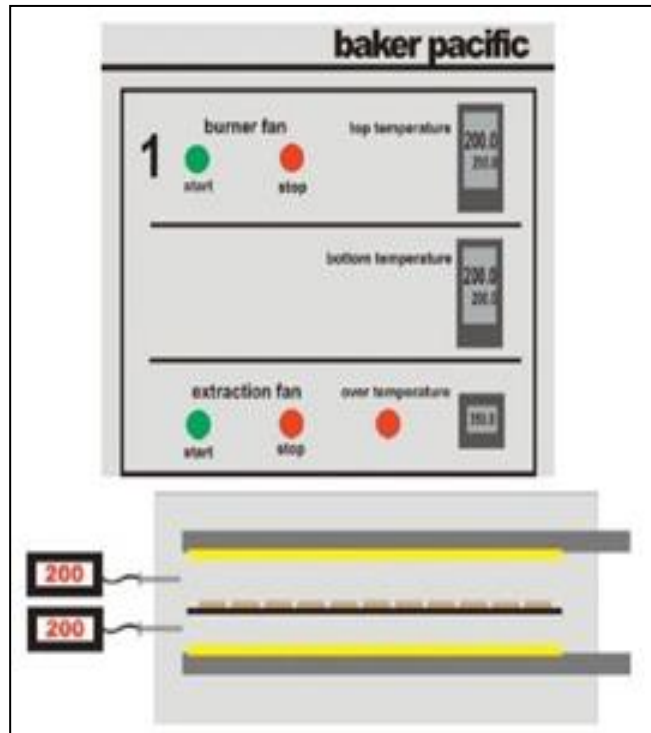


Fig 5: Separate top and bottom temperature control.

Heat ratio control

For heat ratio control, there is a single temperature controller and set temperature. The system then controls the top and bottom burners according to a ratio setting. The operator can set the ratio, for example, 60% heat input by bottom burners and 40% by top burners, or any other required ratio. Most new ovens do not use this system and has been superseded by the separate top and bottom control systems [6].

Baking Time

The baking time is simply altered by adjusting the conveyor speed. The motor is an AC motor with inverter control. The speed range will depend on the range of products to be made: for example, a cracker oven may have a baking time range of 2.5–7.5 minutes, a cookie oven from 4.0–12.0 minutes [7].

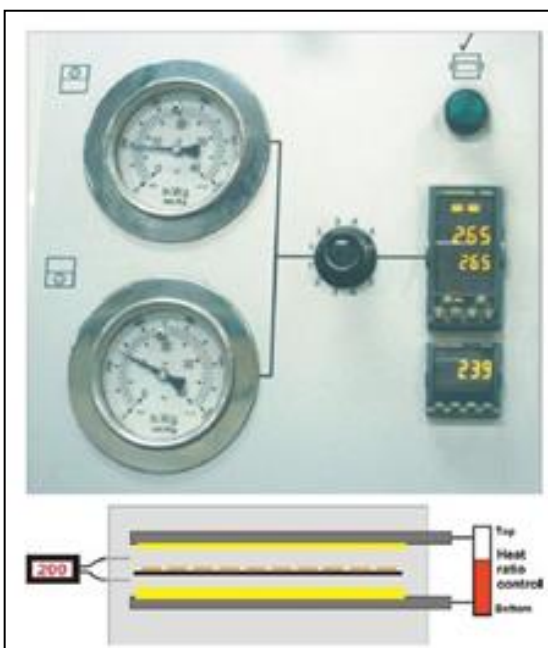


Fig 6: Heat ratio control panel.



Fig 7: The PAX Lite Process Time indicator from Red Lion Controls is located on the main control panel.

Temperature monitoring by oven thermometer

Table 1

Parameters	Level	Oven Zones					
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Temperature (°C)	Mean	195.65	220.39	235.34	302.60	324.34	169.5

Table 2: Oven setting and parameters

Baking time		Temperature					
4.00 (Minimum)		(125 - 350) °C					
Table 3.3							
Parameter		Zone 01	Zone -02	Zone -03	Zone -04	Zone -05	Zone -06
Set Temperature	Upper	194 °C	230 °C	241 °C	245 °C	235 °C	240 °C
	Lower	198 °C	210 °C	230 °C	240 °C	225 °C	210 °C
Zone Temperature	Top	195 °C	220 °C	235 °C	240 °C	230 °C	234 °C
	Bottom	190 °C	218 °C	225 °C	235 °C	220 °C	200 °C
Steam Temperature	Top	100%	60%	70%	100%	100%	100%
	Bottom	100%	100%	93%	90%	95%	85%
Steam Extraction	Open	50%	50%	75%	80%	82%	85%
	Close						
Heat Control	Top						
	Bottom	45%	80%	75%	45%	40%	30%
RPM: 24 - 59	Baking Time: 4:00 Min					Moisture: 1.68%	

Determination of moisture content

Weigh accurately about 5g of the prepared sample (see D-3.3.3) in the moisture dish, previously dried and weighed. Place the dish in the oven maintained at 105 + 10°C for 4 hours or till to constant weight. Cool in the desiccator and weigh. Repeat the process of drying, cooling and weighing at 30 minutes intervals until the difference between the two consecutive weighing is less than 1mg. Record the lowest weight [8].

Calculation

$$(\%) \text{ Moisture} = \frac{100(W_1 - W_2)}{W_1 - W}$$

Determination of fat content

First of all, rinse all the glass apparatus by petroleum ether and dry it in the oven at 102°C and after removing it keep in the desiccator. Weigh 5g of grounded and dried sample and place it in the thimble. Place the thimble in the soxhlet extractor. Take a 150ml round bottom flask and clean it and fill the flask with 90ml petroleum ether. Place the whole setting on a heating mantle and allow the petroleum ether to boil. Continue the extraction process for almost 6 hours. Remove the condensing unit from extraction unit and allow the sample to cool down. Finally, when all the lipids are removed, collect almost all the solvent after distillation. Place the sample in the oven and after removing it place in the desiccator. Take the weight of the sample. As a result, a defat sample is found [9].

Calculation

$$\% \text{ Fat} = (w_2 - w_1) / p \times 100$$

Determination of protein content

Protein is determined by Kjeldahl method. This method requires three steps: digestion, distillation, and titration. Digestion converts nitrogen in the food into ammonia, and

other organic matter to CO₂ and H₂O by heating (370°C to 400°C) in the presence of sulfuric acid, anhydrous sodium sulfate, and a catalyst. Ammonia is separated by raising the pH with sodium hydroxide, which turns ammonium ions into ammonia gas, which is then distilled into a trapping solution with hydrochloric acid. The nitrogen content is then evaluated by titration of the ammonium borate formed with standard hydrochloric acid [10].

Determination of carbohydrate content

Carbohydrate is determined by Anthrone Method. The anthrone reaction is the basis of a rapid and convenient method for the determination of carbohydrates, either free or present in polysaccharides. Carbohydrates are first hydrolyzed into simple sugars using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxymethyl furfural. This compound forms with anthrone a green colored product with an absorption maximum at 630 nm [11].

Calculations

Amount of carbohydrate present in 100mg of the sample = (mg of glucose ÷ Volume of test sample) X 100

Determination of ash content

Weigh accurately about 20 g of the biscuits sample (D-3.3.2) in the dish and ash in the muffle furnace at 600 0 C + 20 0 C until light grey ash is obtained. Remove the dish from the furnace and allow it to cool at room temperature. Add 25ml of hydrochloric acid to the dish, cover with a watch-glass and heat on the water-bath for 10 minutes. Mix the contents with the tip of a glass rod and filter through Whatman filter paper No.42 or its equivalent. Wash the filter paper with water until the washings are free from acid tested with a blue litmus paper. Return the washed filter paper to the dish for ashing in the muffle-furnace as above. Cool the dish in a desiccator's and weigh. Again, ignite the dish for half an hour in the furnace, cool and weigh. Repeat this operation until the dish has a constant weight, the

difference between successive weighing being less than 1mg. Filter 25ml of the hydrochloric acid through a blank filter paper, wash, ash and weigh it as in the case of acid insoluble ash. Subtract its weight from the weight of insoluble ash of the sample ^[12].

Calculations

$$\text{Acid insoluble ash, percent by weight (A)} = 100 \times \frac{100(W_1 - W)}{W_2}$$

Determination of acidity of extracted fat

Weight accurately about 10g of biscuit powder (D-3.3.2) and transfer it to the thimble and plug it from the top with extracted cotton and filter paper. Dry the thimble with the contents for 15 to 30 minutes at 100°C in an oven. Take the weight of empty dry soxhlet flask. Extract the fat in the soxhlet apparatus for 3 to 4 hours and evaporate the solvent in the flask on a water-bath. Remove the traces of the residual solvent by keeping the flask in the hot air oven for about half an hour and weigh. Cool the flask and add 50ml of mixed benzene-alcohol-phenolphthalein reagent (C-2.2) and titrate the contents to a distinct pink color with the potassium hydroxide solution taken in a 10ml micro burette. If the contents of the flask become cloudy during titration, add another 50ml of the reagent (C-2.2) and continue titration. Make a blank titration of the 50ml reagent. Subtract from the titrate of the fat, the blank titrates ^[13].

Calculations

$$\text{Acidity of extracted fat (as oleic acid), percent by weight} = \frac{1.41 \times V}{W_1 - W}$$

Sensory evaluation

Sensory evaluation was carried out on 14 days of storage. The sensory and quality attributes test of Milk Biscuits was carried out with some modifications ^[14]. 10 panel members were selected from the university community. Randomly, the samples were presented. The panelists (10) were requested to assign appropriate score of characteristics color, flavor, texture and overall acceptability of various banana Milk Biscuits. To note the score a hedonic scale having a highest score of 9 for 'like extremely' and lowest of 1 for 'dislike extremely' was used. The hedonic scale was arranged as: 9 = like extremely, 8 = like very much, 7 = like moderately, 6 = like slightly, 5 = neither like or dislike, 4 = dislike slightly, 3 = dislike moderately, 2 = dislike very much and 1 = dislike extremely ^[15].

Shelf Life

The shelf life of a biscuit depends mainly on its baking temperature. There are also other issues that affects a biscuit's shelf life, such as- relative humidity, water activity, moisture content, packaging area and properties of packaging materials, etc. If the biscuits are not baked at the right temperature and time, the shelf life of the biscuits will be decrease. Biscuits usually have a shelf life of 6 months. To preserve biscuits, baking should be done between 150°C and 350°C in the oven. Packing should be done at a temperature of 36°C. Room temperature of the packing area should be kept between 25-28°C and relative humidity between 45% - 55%. Biscuit has moisture content and water activity of 2-5% and 0-3% respectively. They should be

stored in a dry and ambient environment at a temperature of 29°C.

Data Analysis

All means of the values and standard deviations were calculated from obtained data and analyzed statistically by the help of MSTAST-C, while DMRT was applied to determine differences among different samples.

Results and Discussion

Place of Experiment

This experiment was conducted by the department of Food Engineering, North pacific International University of Bangladesh, at the Quality Control Laboratory, Dekko Foods Ltd. Dhaka, Bangladesh.

Effect of temperature and time on baking

In this study, there are 6 regions for oven temperature control. Different regions are named separately due to rise or fall in temperature:

- A. Proofing (Zone-1)
- B. Puffing (Zones 2 and 3)
- C. Baking Zone (Zones 4 and 5)
- D. d) Color Zone (Zone-6)

The average temperatures in Zone-1 and Zone-2 were warm— 99.65°C and 177.39°C respectively. The warmer the temperature, the more active the yeast will be. In these regions, the flour removed relatively all the moisture. Decreased humidity from biscuits is related to temperature, heat flux and surface water vapor. Moisture was lost from the surface of the dough due to the transfer of water to the surface by capillary action and expansion. Both of these phenomena were accelerated by the temperature gradient. The center of the dough was primarily heated by heat transfer, but as the crust dried, it acted as an insulator and made the center more difficult to heat. [16] Color changes occurred prematurely during this period. Zone-3 had an average temperature of 214.34°C. In this zone, gas bubbles and water vapor were formed which expanded and as a result the amount of flour concentration decreased. Possible causes of this process include gelatinization of the starch and adhesion of the adhesive as a result of heating the starch and adhesive, which swelled as the rise in temperature released gas bubbles which increased the water vapor. The average temperatures in Region-4 and Region-5 were 302.60°C and 324.34°C, respectively. During this period, the characteristic color and aroma of the biscuit developed. The color turned yellowish-brown, which not only darkened but also reduced the reflection on the biscuit surface A possible mechanism is that in the presence of a mylard reaction and non-enzymatic browning, chemical reactions were involved in reducing the sugar content of the flour with the protein and produce interesting color also developed from the caramelization of sugar. To prevent the edges of the dough pieces from becoming colored, it is important to ensure that they are held together with the spaces aligned with the oven band. The biscuit was not packaged or discarded if the edges became overheated or burned. Zone-6 has an average temperature of 169.56°C. The desired texture of biscuits is obtained during this period and the oven temperature was always controlled by its

control system. The speed of the conveyor belt was adjusted according to the temperature of the oven depending on it. At the top-adjusted temperature in different zones of the oven, the 5mm thick biscuit took about 4 minutes to complete. This shows that if the baking time is reduced from 4 minutes to 2-3 minutes, the next time the baking temperature is increased. The temperature in Zone 1 had risen from 180 degrees Celsius to 210°C. The same thing happened in other regions as well. If the speed of the conveyor belts is slow or accelerated, then the temperature of the furnace has to be adjusted depending on the speed, so it can be said that the speed of the conveyor belt plays a big role here. We have to keep the production in mind otherwise the biscuit will not be produced properly. Thus, baking is a matter of looking for the optimal conditions of heat and time to allow structural development, surface coloring, and center drying. To achieve this dryness thicker biscuits, need to be baked longer at lower temperatures. Thin and small biscuits can be baked quickly at high temperatures.

Heat transfer process during baking

Direct Gas Fired (DGF) oven was used with visibility of the burners. The heat was provided by burning gas and transferred by the three modes known as radiation, conduction and convection. Three modes were always involved though engineering techniques were used to enhance the effects of each separately. Dough pieces were supported on a baking surface which was usually a sheet of steel. On entering the oven, heat was applied to the dough piece by a combination of conduction (through the baking surface), convection (from the hot air moving in the oven) and radiation (from hot surfaces of the structure of the oven). Radiant heat, at the wave lengths involved, did not penetrate the dough piece significantly. The most effective form of heat transfer was by convection but moving hot air also swept away moisture and dried the dough surface very rapidly. The baking chamber may be heated directly with gas burners or electric heaters or by an indirect system using heat exchangers. Direct heating systems use gas or electric energy; indirect systems may also use diesel oil fuel, as the products of combustion do not enter the baking chamber. The temperature and humidity control were divided into zones along the length of the oven: usually each control zone was between 8 and 20m long. This enabled the temperature and humidity to be set and controlled throughout the baking process to optimize the conditions for the establishment of the biscuit structure, moisture content and color as the dough pieces traveled through the oven. The control of the humidity in the baking chamber and the removal of moisture from the dough pieces were accomplished by an extraction system in each zone. This was composed of ducts which drew air and moisture from the baking chamber through a fan and expelled the air through vertical flues (chimneys) to atmosphere. In some ovens, this wet air removed from the baking chamber were diverted either to the flue or back into the baking chamber. This provided moving air within the baking chamber which can aid heat transfer and contribute to even baking conditions across the width of the oven. These systems are called 'turbulence' systems and are mainly used on ovens which have relatively still air in the baking chamber, for

example, indirect radiant ovens and direct gas-fired ovens [17].

Moisture removal process

When the gluten and starch have been sufficiently hydrated and the structure of the biscuit is formed, the remaining free water must be evaporated. The water was evaporated from the surface of the dough pieces. This occurred principally at 100°C for pure water, but at higher temperatures (up to 130°C) when the water is held in solution, for example in a sugar solution. At temperatures over 100°C, the application of heat always resulted in moisture loss from the surface of the dough pieces, even in an oven atmosphere which was saturated with water vapor. This loss of moisture from the dough piece is dependent on the temperature, method of heat transfer and the humidity of the oven [18]. The moisture gradient across a dough piece increased during drying and as the biscuit structure dried the starch/protein structure shrank. While hot biscuits are flexible enough to withstand these shrinkage stresses, but a phenomenon known as 'checking' may occur if a large moisture gradient remains after the biscuit leaves the oven. As the biscuit cool's moisture equilibrates (moving from the wetter areas to drier) and the shrinkage stresses so developed may cause cracks to form. This is checking. The best way to prevent checking is to ensure that the total moisture content of the biscuit is low so that any gradients will be small. Products with more fat or sugar have a more plastic structure and the stresses are less pronounced as the biscuit cools. Therefore, it is more important to control the moisture levels in crackers, semi-sweet and other 'lean' products than other types [19].

Quality of the raw materials

Moisture is an important parameter in flour that significantly affects shelf life and growth of microbial contaminants (ICMSF 1998). In the BDS 382 as well as in the Codex Alimentarius Standard (1995), the maximum moisture in flour is defined as 13% and 15.5%, respectively in this study the moisture in Bangladeshi wheat flour samples used in biscuit manufacture were tested, which ranged from 12.20 ± 0.26% to 13.7- ± 0.59%. Gluten content of different flour brands ranges from about 22-26g in 100g. Wheat flour of these gluten ranges are appropriate for biscuit manufacture. And also, Vegetable fat melting point range is 31°C - 40°C. Milk powder had proper solubility property and desirable color and flavor. Brix of sugar was satisfactory and pH of water used in the operation was 7.2. And also, all leaving agents % of purity is 98 %.

Table 3: Observation

Sl. No	Parameters	Std	Actual
1	Length of Biscuits	55±2	55 mm
2	Width of Biscuits	35±1	35 mm
3	wt. /20 Pcs	82±2	82 gm
4	Thickness /20 Pcs	125±3	125 mm
5	Moisture %	Below 2.0 %	1.55 %
6	Fat %	Max 16 %	13.50%
7	Insoluble Ash	-	-
8	Acid Soluble Ash	-	-
9	Shelf Life	6 months	6 months
10	Taste	Verry Good	Verry Good

Table 4: Different Milk Biscuits Test Result

Product Name	Product Trial	Value Name	Govt. Standards %	Test Result	Variance	Remarks
Milk Biscuits	1 st trial	Moisture	5 (max)	2.5	-2.5	Average Result
		Fat	13 (max)	12.3	+0.7	
		Protein	5 (max)	5.6	+0.6	
		Carbohydrate	80 (max)	79	-1	
		Ash	0.05 (max)	.04	-0.01	
		Acidity	1.00 (max)	0.08	0.02	
	2 nd trial	Moisture	5 (max)	2.3	-2.7	2.47
		Fat	13 (max)	12.4	-0.6	12.3
		Protein	5 (max)	5.5	+0.5	5.6
		Carbohydrate	80 (max)	79.2	-0.8	79.2
		Ash	0.05 (max)	.06	+0.01	.04
		Acidity	1.00 (max)	0.07	0.03	.077
	3 rd trial	Moisture	5 (max)	2.6	2.4	
		Fat	13 (max)	12.2	-0.8	
		Protein	5 (max)	5.7	+0.7	
		Carbohydrate	80 (max)	79.4	-0.6	
		Ash	0.05 (max)	.04	-0.01	
		Acidity	1.00 (max)	0.08	0.02	

Table 5: Comparison between different Milk biscuits:

SL No	Product Name	Value Name	Govt. Standards%	Test Result %	Variance	Company Name	Reference
01	Milk Biscuit	Moisture	5 (max)	2.47	-2.53	Thesis Group	BDS 383:2001
		Fat	13 (max)	12.3	-0.7		
		Protein	5 (max)	5.6	+0.6		
		Carbohydrate	80 (max)	79.2	-0.8		
		Ash	0.05 (max)	.04	-0.01		
		Acidity	1.00 (max)	0.77	0.23		
02	Dekko Milk Rich	Moisture	5 (max)	2.8	-2.2	Dekko Food ltd.	
		Fat	13 (max)	12.88	-2.22		
		Protein	0.5 (max)	5.64	+3.36		
		Carbohydrate	80 (max)	79.9	-0.01		
		Ash	0.05 (max)	0.6	+0.01		
		Acidity	1.00 (max)	0.09	0.01		
03	Bengal Nutri Milk	Moisture	5 (max)	1.8	3.2	Bengal Biscuits Limited	
		Fat	13 (max)	12	+1		
		Protein	5 (max)	5.8	+8		
		Carbohydrate	80 (max)	80	-		
		Ash	0.05 (max)	.04	-0.01		
		Acidity	1.00 (max)	0.07	0.03		

Table 6: Sensory characteristics of Milk Biscuits under storage

Storage (days)	Product	Color	Texture	Flavor	Taste	Overall acceptability
0	1 st Trial	8.30±0.51b	8.60±1b	8.40±1a	6.70±1.1b	7.50±1.40b
	2 nd Trial	8.10±0c	7.50±0.90b	7.40±0.90a	7.10±0b	7.40±0.90b
	3 rd Trial	9.85±.05a	7.60±1a	7.70±1.03a	9.00±0a	7.30±0.80a
7	1 st Trial	8.30±0.51b	6.40±1.60ab	6.38±1.54b	6.55±0.64b	6.70±1.60b
	2 nd Trial	8.10±0c	7.70±1.20a	6.77±1.20ab	7.10±0.85b	7.53±1a
	3 rd Trial	9.00±0a	7.40±1.30b	7.50±1.30a	8.30±0.77a	7.43±0.40a
14	1 st Trial	8.30±0.51b	7.75±1.38a	5.75±1.58a	5.50±0.63b	5.93±1.43a
	2 nd Trial	8.10±0c	8.75±1.09a	5.75±1.39a	5.70±0.72ab	6.20±1.46a
	3 rd Trial	9.00±0a	6.50±1.40b	6.55±1.60a	6.15±1.13a	6.70±1.38a

a–c Means followed by different superscript alphabets in each column are significantly different within the product in same day ($p \leq 0.05$).

Conclusion

In our opinion, hard dough biscuits should be baked at as high a temperature as possible and soft flour biscuits should be baked at a low temperature. From this study, we learned that increasing the baking temperature in line with the speed of the conductive belt can effectively reduce the baking time. In this study, we also tested the quality of raw materials and the production process and the quality of milk biscuits. The flour had satisfactory moisture and Gluten content. The amount of moisture, taste, aroma, and color of

all the Milk biscuit brands seemed satisfactory. At the end of daily testing, fresh, and storage of all processed products, the comforts are recognized before they become so comfortable that they become objectionable to consumers. Most of the biscuits sold today can be made more delicious by initially picking high quality raw and concentrating on preserving its taste and aroma during processing and distribution. Maintaining consumer confidence in reliable high-quality biscuit products is essential for maximum use.

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