

# Physical and Sensory Evaluation of Cookies Incorporated with Oats and Honey

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**Abstract** - Cookies were developed by incorporating wheat flour with rolled oats at the level of 0, 25, 50 and 75 percent and in the standardized wheat and rolled oats blend, sugar was replaced with honey at the level of 0, 25, 50, 75 and 100 percent. The study was conducted to determine the acceptability limit of rolled oats and honey in cookies through sensory and physical evaluation. In the physical evaluation it was found that rolled oats increases the spread ratio from 28.37 to 40.34 and hardness from 18.88N to 29.26 N, while in case of honey incorporated cookies it was found that honey decreases the spread ratio from 35.70 to 25.13 and hardness from 27.13N to 13.59N. The sensory results revealed that increasing level of rolled oats lowered the overall acceptability of cookies from 4.54 to 2.94 and increasing level of honey lowered the overall acceptability from 4.42 to 2.67. The sensory results showed that the maximum of 50 percent rolled oats and 50 percent honey can be incorporated to prepare acceptable quality cookies.

**Key words:** Cookies, Rolled oats, Honey, Physical, Sensory

## I. INTRODUCTION

Baking Industry is considered as one of the major segments of food processing in India. Baked products are gaining popularity because of their availability, ready to eat convenience and reasonably good shelf life. Cookies are ideal for nutrient availability, palatability, compactness and convenience [1].

New developments are taking place, given the benefits of new knowledge in nutrition science, new process technologies and the modern consumers demand for foods with multiple health benefits. Also, the focus is on disease prevention and optimizing health by the use of functional food ingredients. Functional foods have been defined as foods and food components that provide a health benefit beyond basic nutrition (for the intended population). Examples may include conventional foods; fortified, enriched or enhanced foods; and dietary supplements [2].

Oats are rich source of dietary fiber but more importantly, oats are high in fiber, specifically,  $\beta$ -glucan. Oatmeal is a tonic for general debility, treats anorexia, is good for convalescence and fatigue, lowers blood cholesterol levels and helps to control

hormonal activity. Oatmeal cuts the risk of strokes and heart attacks from blocked arteries, stabilizes blood sugar and increases the body's ability to fight off infectious disease [3].

Honey is known for its effectiveness in instantly boosting the performance, endurance and reduces fatigue in muscle [4]. Beyond many health claims and ability to mask any taste deficiency that may have resulted from ingredient interactions, inclusion of honey into bread formulation is reported to offer functional benefits, improve water-binding capacity of dough, provide increased volumes and improves shelf life of bake products. [5]

The objective of the study was to prepare the cookies from the composite flour and their sensory evaluation to assess the suitable level of rolled oats and honey incorporation and to determine the physical properties of the cookies, so as to check the effect of incorporation.

## II. MATERIALS AND METHODS

### A. Procurement of raw materials

Rolled oats and honey and the other ingredients used in cookies preparation viz. fat, baking powder, sugar etc were procured from local market of Aurangabad.

### B. Treatment combination

The Rolled oats were mixed with wheat flour at the substitution levels of 0, 25, 50, and 75 % (w/w). In the standardized wheat: Rolled oats blends the refined sugar was replaced with liquid honey at the substitution levels of 0, 25, 50, 75% and 100%.

Table 1: Different combination of oat meal and wheat flour for cookies

Treatment	Rolled oats (%)	Wheat flour (%)
A <sub>0</sub>	00	100
A <sub>1</sub>	25	75
A <sub>2</sub>	50	50
A <sub>3</sub>	75	25

Table 2: Different combination honey and refined sugar for the developed oat cookies

Treatment	Honey (%)	Sugar (%)
B <sub>0</sub>	00	100
B <sub>1</sub>	25	75
B <sub>2</sub>	50	50
B <sub>3</sub>	75	25
B <sub>4</sub>	00	100

### C. Preparation of cookies

The cookies were prepared according to the method described by [6]. Two types of cookies were developed namely oat cookies and honey cookies. For development of oat cookies, rolled oats at the levels of 25, 50 and 75 per cent was taken and one basic cookie with 100 per cent wheat flour was prepared. In the oat cookies sugar (25g), fat (25g), egg (10g) and baking powder (1g) were kept constant. For development of honey cookies, honey at the levels of 0, 25, 50, 75 and 100 per cent was taken. In the honey cookies 25g wheat flour, 25g rolled oats, sugar (25g), fat (25g), egg (10g) and baking powder (1g) were kept constant.

The ingredients were weighed accurately. Then creaming of shortening and sugar was done, followed by the addition of eggs. The flour and baking powder were added to the creamy mass and mixed to a homogenous mass by mixer for 3 min. The batter was then rolled out with rolling pin to a thickness of 3 inches having 1 inch diameter cut with the help of a biscuit cutter. Cookies were placed on a baking tray inch distance and were baked at 175°C in a baking oven for 10-15 min. After cooling at ambient temperature, cookies were packed in a LDPE bags and stored for 90 days at ambient temperature.

### D. Sensory evaluation

The sensory evaluation of cookies was carried out by a 10 member semi-trained panel comprised of postgraduate students and academic staff members of the faculty. The panel members were requested in measuring the terms identifying sensory characteristics and in use of the score. The assessment procedure of scoring was based on assessment of representative quality attributes chosen by [7]. A score list with 5 points was applied. The sensory score was given as per Table 3.

### E. Physical analysis

Physical characteristics of cookies like weight width, thickness and spread factor were measured according to the methods described in [6].

Weight (W): Weight was determined using electronic weighing balance

Diameter (D): Diameter of cookies was measured by placing six cookies horizontally (edge to edge) and rotated at 90° angle for duplicate reading.

Thickness (T): The thickness of cookies was measured by placing six cookies on one another and the duplicate reading was recorded.

Spread Ratio (SR): The spread ratio is defined as a ratio of diameter and thickness and was calculated according to the formula

$$SR = (\text{Diameter/Thickness} \times CF) \times 10$$

Where,

CF=Correction factor at constant atmospheric pressure (1.0 in this case).

### F. Texture analysis of cookies

Texture of cookies was measured according to [8] by using texture analyzer CT3 settings for comparison of hardness, of different cookies within 24 hours after baking by three point bend rig probe with a 10 kg load cell. The parameter used was indicated below,

Parameters	Value
Pre-test speed	2.0 mm/s
Test speed	1.0 mm/s
Post-test speed	10.0 mm/s
Distance	5.0 mm
Trigger type	Auto

Table 3: Sensory attribute scored in sensory assessment of cookies

Sr. No	SENSORY TRAIT	DEFINITION
A	COLOR	Light brown to very dark brown. ( 4.9 to 1 )
	1)Light Brown	Give uniform light brown color.
	2)Medium Brown	Give patches of light and dark brown.
	3)Brown	Brown Uniform brown color.
	4)Dark Brown	Very dark brown color.
B	APPEAREANCE	Even surface to serious damage (4.9 to 1)
	1)Even Surface	No breakages, regular shape, without damage.
	2)Slightly Un Even Surface	Hardly visible breakages, shape irregularities, without damage.
	3)Uneven	Visible breakages, irregular shape, serious damage
C	TEXTURE	Crisp to hard. (4.9 to 1)
	1)Crisp	Cookie suddenly breaks when a small amount of force is applied
	2)Crumbly	The cookie breaks easily, forming loose fragment in the mouth.
	3)Tender	The cookie is easily broken down upon chewing.
	4)Hard Cookie	Withstands substantial force on initial bite
D	MOUTH FEEL	Crunchy to teeth clogging ( 4.9 to 1 )
	1)Crunchy	Require repeated chewing to break cookie down, Crunchy sound is heard.
	2)Granular	Small particles are detectable when the cookie is chewed.
	3)Flaky	On chewing a rough paste is formed, containing large irregular pieces.
	4)Teeth clogging	Particles stick in the mouth after the paste is swallowed.
E	TASTE	Very pleasant to off taste (4.9 to 1)
	1)Very pleasant	Very pleasant taste characteristic of cookies
	2)Pleasant	pleasant taste characteristic of cookies
	3) un pleasant	Taste uncharacteristic to cookies
	4) Off taste	Giving off taste after eaten
F	OVERALL ACCEPTABILITY	Outstanding to Unacceptable ( 4.9 to 1 )
	1)Outstanding	4.0-4.9
	2)Acceptable	3.0-3.9
	3) Marginal	2.0-2.9
	4)Unacceptable	1.0-1.9

### III. RESULT AND DISCUSSION

Table 4: Sensory evaluation of oat and honey supplemented cookies

Treatment	Color	Appearance	Texture	Mouth feel	Taste	Overall Acceptability
A <sub>0</sub>	4.68	4.45	4.41	4.47	4.69	4.54
A <sub>1</sub>	4.44	4.25	4.37	4.44	4.6	4.42
A <sub>2</sub>	4.38	4.25	4.23	4.26	4.43	4.31
A <sub>3</sub>	2.73	3.27	3.15	3.06	2.53	2.94
B <sub>0</sub>	4.7	4.27	4.42	4.03	4.68	4.42
B <sub>1</sub>	4.32	4.48	4.26	4.32	4.52	4.38
B <sub>2</sub>	4.1	4.6	4.12	4.43	4.33	4.31
B <sub>3</sub>	3.62	3.62	3.41	3.61	3.49	3.55
B <sub>4</sub>	2.73	2.98	2.92	2.42	2.3	2.67

A<sub>0</sub>- 0% Rolled oats, A<sub>1</sub>-25% Rolled oats, A<sub>2</sub>-50% Rolled oats, A<sub>3</sub>- 75% Rolled oats.

B<sub>0</sub>- 0% Honey, B<sub>1</sub>- 25% Honey, B<sub>2</sub>- 50% Honey, B<sub>3</sub>- 75% Honey, B<sub>4</sub>- 100% Honey.

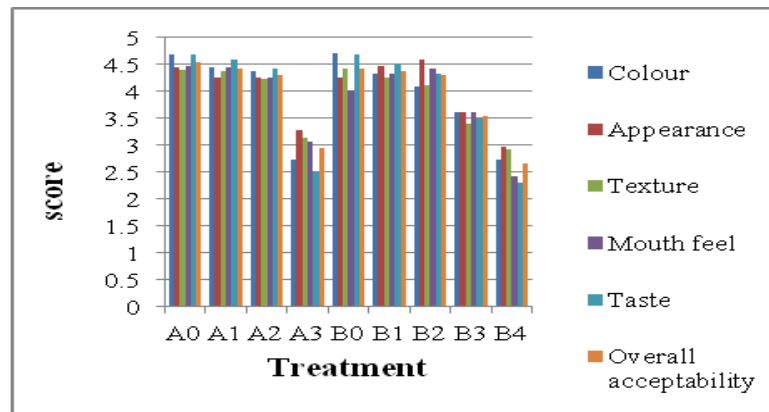


Fig 1. Sensory evaluation of oat and honey supplemented cookies.

A<sub>0</sub>- 0% Rolled oats, A<sub>1</sub>-25% Rolled oats, A<sub>2</sub>-50% Rolled oats, A<sub>3</sub>- 75% Rolled oats.

B<sub>0</sub>- 0% Honey, B<sub>1</sub>- 25% Honey, B<sub>2</sub>- 50% Honey, B<sub>3</sub>- 75% Honey, B<sub>4</sub>- 100% Honey

#### A. Sensory evaluation of oats and honey supplemented cookies

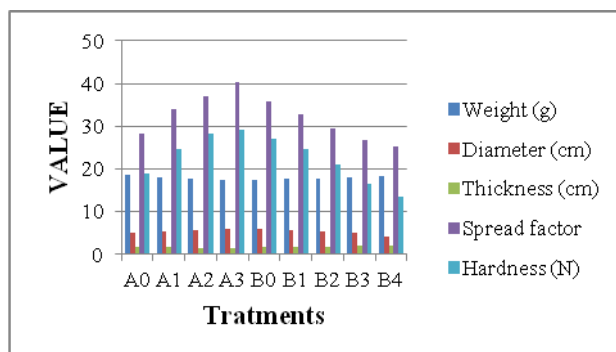
The effect of oats and honey incorporation on the sensory properties of cookies, such as color, appearance, texture, mouth feel, taste and overall acceptability are given in the table 4. The cookies formed with addition of 50% rolled oats got overall acceptability score of 4.3, which is very much acceptable to consumer Table 4. Sensory evaluation shows that the cookies made from 75% rolled oats was marginal acceptable with an overall score of 2.9. The score of taste reduced significantly to 2.53. However the color and taste of cookies made from 50% rolled oats was good and acceptable. The sensory score shows that rolled oats at the rate of 50% are acceptable with reference to taste mouth feel, color and texture. So A<sub>2</sub> was selected for the further substitution of sugar with honey at different levels 0%, 25%, 50%, 75% and 100%. However in case of honey supplemented cookies the cookies formed by the addition of 50% of honey got the overall acceptability score of 4.3 which is very much acceptable to consumer. More darkness of color of the cookies was observed in cookies and decrease in the crispiness and hardness of the cookies as the level of the supplementation of the honey was increased in cookies. So the score for the texture of cookies decreases from 4.6 to 2.3 as the level of honey

increases. The results of the sensory evaluation of the cookies prepared from the different treatments of the composite flour are according to the findings of [9] who reported increasing the level of flaxseed flour, in the cookies resulted in the significant decrease in the sensory attributes of the cookies.

Table 5: Physical evaluation of cookies incorporated with oats and honey

Treatment	Weight (g)	Diameter (cm)	Thickness (cm)	Spread ratio	Hardness (N)
A <sub>0</sub>	18.62	5.08	1.79	28.37	18.88
A <sub>1</sub>	17.89	5.35	1.58	33.86	24.51
A <sub>2</sub>	17.65	5.64	1.52	37.10	28.17
A <sub>3</sub>	17.38	5.93	1.47	40.34	29.26
B <sub>0</sub>	17.28	5.82	1.63	35.70	27.13
B <sub>1</sub>	17.69	5.58	1.7	32.82	24.62
B <sub>2</sub>	17.83	5.36	1.82	29.45	20.88
B <sub>3</sub>	18.12	5.14	1.93	26.63	16.5
B <sub>4</sub>	18.43	4.17	1.98	25.13	13.59

A<sub>0</sub>- 0% Rolled oats, A<sub>1</sub>-25% Rolled oats, A<sub>2</sub>-50% Rolled oats, A<sub>3</sub>- 75% Rolled oats. B<sub>0</sub>- 0% Honey, B<sub>1</sub>- 25% Honey, B<sub>2</sub>- 50% Honey, B<sub>3</sub>- 75% Honey, B<sub>4</sub>- 100% Honey

Fig. 2. Physical evaluation of cookies incorporated with oats and honey A<sub>0</sub>- 0% Rolled oats, A<sub>1</sub>-25% Rolled oats, A<sub>2</sub>-50% Rolled oats, A<sub>3</sub>- 75% Rolled oats.

B<sub>0</sub>- 0% Honey, B<sub>1</sub>- 25% Honey, B<sub>2</sub>- 50% Honey, B<sub>3</sub>- 75% Honey, B<sub>4</sub>- 100% Honey

#### B. Physical evaluation of cookies

Physical evaluation such as thickness, width and spread ratio was affected with the increase in the level of rolled oats Table 4. The average weight of control (wheat flour) cookies A<sub>0</sub> was 18.62 g whereas that of the supplemented cookies varied from 17.89 to 17.28 g. the average diameter of control cookies A<sub>0</sub> was 5.08 cm whereas that of rolled oats incorporated cookies varies from 5.7 cm to 5.93 cm. The average thickness of A<sub>0</sub> was 1.79 cm, and for the other supplemented level cookies, varied from 1.79 to 2.47 cm. The changes in the diameter and thickness are reflected in spread ratio which was calculated by dividing diameter by thickness of the cookies. Spread ratio of the A<sub>0</sub> cookies was 28.37 and increased as the level of supplementation increases, the range varied from 23.86 to 40.34. Thus the result indicated that as the level of rolled oats increases in the cookies there

was gradual decrease in the weight and thickness, while increase in the diameter of cookies and thus, spread ratio of the cookies. Cookies having higher spread ratio are consider as more desirable cookies [10]. Results regarding the physical evaluation of the oat incorporated cookies are in line with [2] who reported that fortified wheat flour with fructoligosaccharide flour isolate up to the level of 60% increased spread ratio and decrease cookie thickness.

However in case of honey incorporated cookies, physical properties such as thickness, width and spread ratio were also affected with the increase in the level of honey Table 4. The average weight of control cookies B<sub>0</sub> was 17.48 g whereas that of the supplemented cookies varied from 17.69 to 18.43 g. the average diameter of control cookies B<sub>0</sub> was 5.82 cm whereas that of honey incorporated cookies varies from 5.68 cm to 5.17 cm. The average thickness of A<sub>0</sub> was 1.63 cm, and for the honey supplemented cookies, varied from 1.70 to 1.98 cm. Spread ratio of the B<sub>0</sub> cookies was 22.14 and decreased as the level of supplementation increases, the range varied from 24.74 to 20.70. Thus the result indicated that as the level of honey increases in the cookies there was gradual increase in the weight and thickness, while decrease in the diameter of cookies and thus, spread ratio of the cookies. Results regarding the physical evaluation of the honey incorporated cookies are in line with [11] who reported addition of defatted sesame flour to unripe plantain flour slightly increased the thickness and weight of the composite cookies while the diameter and spread factor decreased.

#### C. Texture analysis

The hardness of the cookies made from varying proportion of rolled oats, are given in Table 4. Varying the amount of rolled oats changed the textural characteristics of cookies significantly. The hardness increased significantly from 18.88 N to 29.26 N in cookies prepared from control sample to 75% rolled oats. A similar trend was observed for the cookies by [7]. While in case of honey supplemented cookies the hardness decreases as the level of honey increases. The hardness of honey supplemented cookies ranged from 27.12 N to 13.59 N. A similar trend was observed in [6] the hardness of the cookies decreases as the level of xylitol is increased in the cookies.

#### IV. CONCLUSION

Results indicated that rolled oats can be incorporated in cookies as a partial replacement up to 50% of wheat flour and honey can be incorporated in cookies as a partial replacement up to 50% of refined sugar without negatively affecting the physical and sensory quality. This present study shows that there exists potential for rolled oats and honey incorporation of baked products. New formulations could therefore be tested aiming at the development and consumption of food fortified with higher proportions of functional and nutritious ingredients.

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