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Effect of extruder screw speed on colour and appearance of fresh Chhattisgarhi Churma

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Abstract

Now a day for more convenience to cook and also to maintain nutrition in food a new development was developed such as extrusion cooking for ready to eat/cook foods. Chhattisgarh *Churma* is a traditional product of Chhattisgarh and is prepared by using *khoa*, chickpea flour, ghee, sugar, flavor and color. It is a chickpea based product with pleasant sensory characteristics and having long shelf life. On survey very few literature is available on *Churma* prepared in Chhattisgarh. The present work was carried out to develop Chhattisgarhi *Churma* by using twin screw extruder.

In 1st phase of experiment, Chhattisgarhi *Churma* was prepared by extruder as well as from traditional method. The variation will occur in screw speed (42 rpm, 63 rpm and 98 rpm) were as the barrel temperature (90°C, 100°C, 110°C, 120°C) will remain constant in treatment T₁, T₂ and T₃ and T₀ (control sample) was prepared by traditional method. In all the treatments proportion of ingredients is constant Chickpea flour (24.8 g), ghee (15 g), *khoa* (30 g), sugar (30 g), cardamom (0.1 g) and color (0.1 g) per 100 g of product. The treatment T₁, T₂ and T₃ prepared by extruder in which first chickpea flour and ghee is passed for one time then in second pass chickpea flour, ghee and *khoa* is passed through extruder then sugar syrup of 72 brix were prepared and cooled down then flavor and color is added in the roasted mixture and mixed gently and pour in a tray for setting and cut into pieces after 6 hours. The treatment T₀ is prepared by traditional method by roasting chickpea flour in ghee followed by addition of *khoa*, sugar syrup of 72 brix were prepared and cooled. The roasted chickpea flour and *khoa* was mixed gently and pour in tray for setting and cut into pieces after 6 hours. Fresh samples were subjected to sensory analysis. Sample T₂ and T₃ was most preferred for its sensory attributes color and appearance 7.80 (T₂) and 7.82 (T₃), body and texture 7.76 (T₂) and 7.72 (T₃), sweetness 7.36 (T₂) and 7.38 (T₃), flavor 7.60 (T₂) and 7.56 (T₃) and overall acceptability 7.42 (T₂) and 7.40 (T₃) out of nine. However, the treatment T₁ scored third highest for these attribute. Therefore, treatment T₀, T₂ and T₃ were selected for the further study in the 2nd phase.

In the 2nd phase, fresh and stored samples T₀, T₂ and T₃ were packed in metalized polyester bags and stored at (37 ± 1°C). The fresh product were subjected to further study for chemical analysis (moisture, fat, protein, total carbohydrate, ash, acidity, dietary fiber and iron), sensory evaluation (color and appearance, flavor, body and texture, sweetness and overall acceptability) and textural analysis (hardness, adhesiveness, springiness, gumminess, chewiness and cohesiveness).

In sensory analysis of fresh sample, significant difference found in color and appearance, body and texture, flavor, and overall acceptability. The color and appearance, body and texture, flavor and overall acceptability were 7.32 (T₀), 7.80 (T₂) and 7.82 (T₃), 7.08 (T₀), 7.76 (T₂) and 7.72 (T₃), 7.16 (T₀), 7.76 (T₂) and 7.76 (T₃), 6.76 (T₀), 7.86 (T₂) and 7.82 (T₃) respectively. Water activity of sample (T₀), (T₂) and (T₃) were 7.6, 7.6 and 7.6, standard plate count of sample (T₀), (T₂) and (T₃) were 3.82 log₁₀ cfu/g, 3.61 log₁₀ cfu/g and 3.43 log₁₀ cfu/g, yeast and mould count of sample (T₀), (T₂) and (T₃) were 2.07 log₁₀ cfu/g, 1.24 log₁₀ cfu/g and 1.23 log₁₀ cfu/g.

Keywords: churma, cost of churma and nutrition

Introduction

In India only 5-6% of total milk is converted into western type of products in the organized sector. Nearly half of the milk produced in India (50-55%) is utilized for the manufacture of traditional milk products and approximately 45.7% is used as fluid milk. Recently, it is learnt that the entrepreneurs in developed western countries of Europe, North America and Australia are looking into the prospects of manufacturing traditional Indian sweets (Anon, 2002). With the growing demand, there is a need to manufacture traditional Indian dairy products in modern dairy plants, without any compromise on the quality of the product (Patel, 2006). Traditional dairy products have great commercial significance as they account for over 90% of all dairy products consumed in the country (Aneja *et al.*, 2002)^[1].

Material and Methods

Preparation of Chhattisgarhi Churma

Chhattisgarh *Churma* is a cereal based traditional dairy product which is prepared by using

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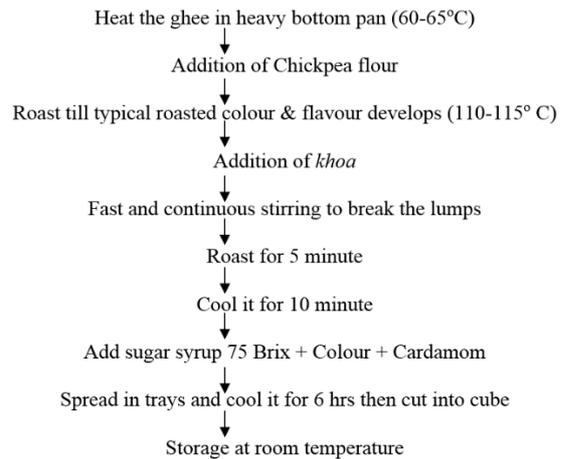
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chickpea flour, *khoa*, ghee and sugar as per the proportion given in table 1. The product is good source of protein, iron and fat etc.

Table 1: Composition of *Churma* / 100 gm

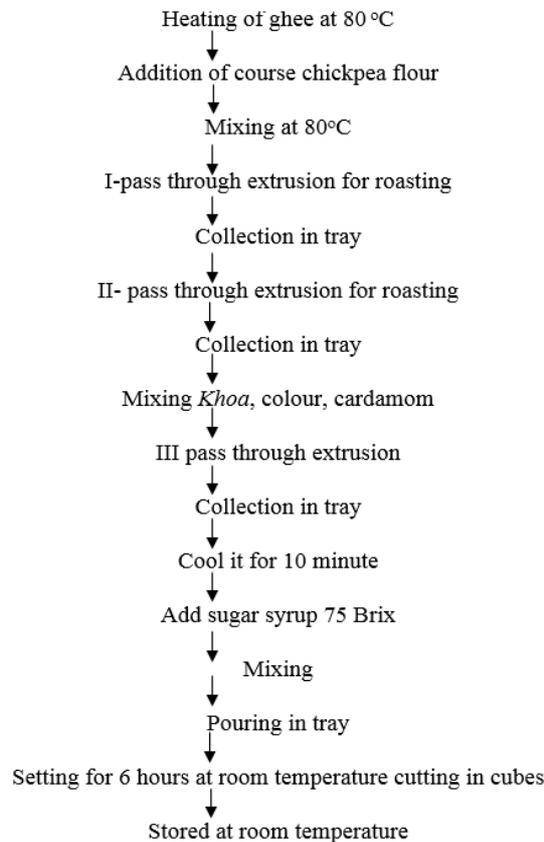
Ingredients	Quantity
Chickpea Flour	24.8
Ghee	15
<i>Khoa</i>	30
Sugar	30
Cardamom	0.1
Colour	0.1
Total	100

Preparation of Chhattisgarhi *Churma* by Traditional Method



Flow chart of Chhattisgarhi *Churma*

Preparation of Chhattisgarhi *Churma* by Extrusion process



Flow chart

Results and Discussion

Product development

In the primary phase of the experiment Chhattisgarhi *Churma* was prepared by using extruder and also from traditional method, where traditional method is taken as control sample and the other treatments were prepared by using extruder having same barrel temperature and different screw speed as given in the table 2 and 3. Chhattisgarhi *Churma* was prepared by taking Chickpea flour, *Khoa*, Ghee, Sugar, flavour and colour having same composition for all the treatments given in table below. The samples of *Churma* prepared was replicated Five times and samples were subjected to sensory analysis for attributes like colour &

appearance, body & texture, sweetness, flavour and overall acceptability by using 9 point Hedonic Scale. The average score assigned by the panel of five judges is presented. Then, on the basis of sensory analysis the highly acceptable sample is screened out for further study.

Table 2: Combination of treatments

Treatment	Screw speed	Barrel temperature constant in all section
T0	-	By Traditional Method
T1	42 rpm	90 °C, 100 °C, 110 °C, 120 °C
T2	63 rpm	90 °C, 100 °C, 110 °C, 120 °C
T3	98 rpm	90 °C, 100 °C, 110 °C, 120 °C

Table 3: Proportion of Ingredients

Ingredients	g/100g of products
Chickpea flour	24.8
<i>Khoa</i>	30
Ghee	15
Sugar	30
Cardamom	0.1
Colour	0.1
Total	100

Raw Materials

The chemical composition of *khoa* and chickpea flour is given in Table 4 and 5 respectively

Table 4: Average chemical composition of *Khoa*

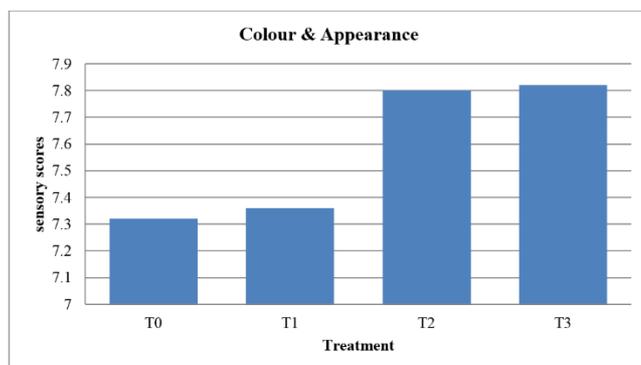
Constituent	Percent
Moisture	23.0
Fat	30.0
Protein	21.0
Iron	0.0
Acidity	0.4% LA

Table 5: Average chemical composition of chickpea flour

Constituent	Percent
Protein	25.0
Fat	4.0
Ash	3.0
Iron	45mg
Dietary fiber	10.2

Colour and appearance

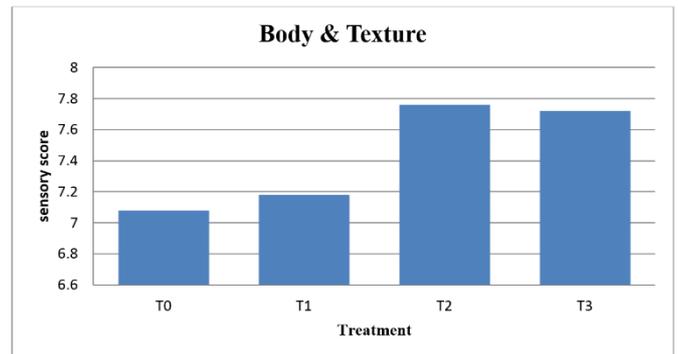
It is evident from fig 1 that only screw speed is varied (not the temperature) had definite effect on colour and appearance of Chhattisgarhi *Churma*. The Colour and appearance score of samples ranged from 7.32 (T₀) to 7.82(T₃) out of 9 as shown in fig 1 and the control sample T₀ had significantly lower colour and appearance score of 7.32 which is statically differed from experimental samples except T₁. While, the T₂ and T₃ sample had the higher colour and appearance score of 7.80 and 7.82 respectively and was at-part with each other. As the level of screw speed increased at and above 63 rpm, colour and appearance score of Chhattisgarhi *Churma* also increased. The higher colour and appearance score in T₂ and T₃ sample might be attributed to less residential time (63 rpm in the screw barrel) that would have caused less browning in the sample.

**Fig 1:** Effect of Extruder screw speed on colour and appearance of fresh Chhattisgarhi *Churma*

Body and Texture

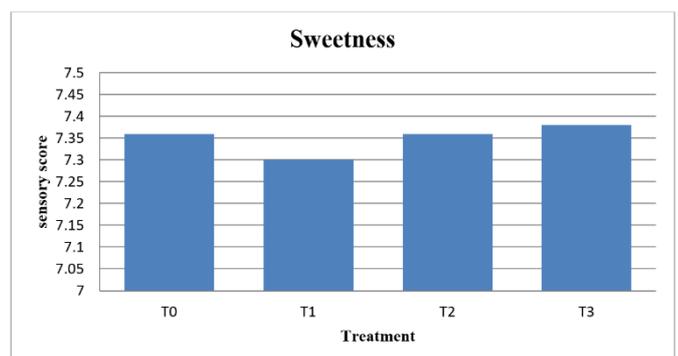
The term body and texture is used to describe the physical property that is examined on the basis of touch, appearance

and mouth feel. In general, body refers to makeup of the mass while texture to the arrangement of the particles that makeup the mass (Gupta, 1996). The body and texture for Chhattisgarhi *Churma* sample were found to be 7.08 (T₀), 7.18 (T₁), 7.76 (T₂), 7.72 (T₃). The highest score was found in the T₂ sample of Chhattisgarhi *Churma* and lowest was in control sample. It is evident from the fig 2 that sample T₂ and T₃ were significantly different from T₀ and T₁. The body and texture score was improved in the T₂ and T₃ due to the addition of milk solids in the form of *khoa* into chickpea flour, which would have significantly improved the body and texture score of the product. There are several reports which suggested that incorporation of milk solids improved the body and textural characteristics of the product (Ranganadham and Rajorhia, 1989) [6].

**Fig 2:** Effect of Extruder Screw Speed on body and texture of fresh Chhattisgarhi *Churma*

Sweetness

The fig 3 shows the sweetness score for Chhattisgarhi *Churma* samples. The Chhattisgarhi *Churma* had obtained 7.36, 7.30, 7.36 & 7.38 for T₀, T₁, T₂ & T₃ respectively. The sample T₃ had obtained highest score of 7.38 whereas lowest score was found a non-significant difference among all the experimental & control sample.

**Fig 3:** Effect Extruder screw speed on Sweetness of fresh Chhattisgarhi *Churma*

Flavour

Flavour has been defined as the sum of the sensory impression perceived when a food or beverage is placed into the mouth. It is composed of taste and odour. The flavour of any food product including *peda* is the most important sensory attributes, and determines its level of acceptance by consumers (Gupta, 1996). It is evident from fig.4 that T₂ had the highest score of (7.60) as compared to T₁ (7.45), where T₀, T₁, T₃ were at par and T₀, T₂, T₃ were at par with each other. The residential time of T₂ was little more under screw speed 63 rpm that might have resulted in caramalization of the

product as compared to T₃ which has more screw speed (98 rpm).

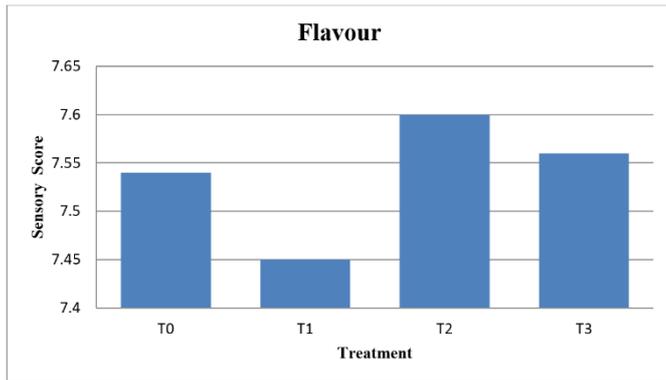


Fig 4: Effect of extruder screw speed on flavour of fresh Chhattisgarhi *Churma*

Overall acceptability

The level of screw speed had considerable effect on overall acceptability score of Chhattisgarhi *Churma* as indicated in the Fig 5. The sample T₂ had the highest score of 7.42 from rest of the samples. The T₁ had the lowest overall acceptability score of 7.35 than experimental samples. The higher score for overall acceptability of T₂ sample might be due to the fact that basically it had secured higher score for colour and appearance (7.80), body and texture (7.76), and flavour (7.60) than rest of the samples. Among all the samples, T₂ and T₃ were most liked by judges. Therefore, on the basis of sensory analysis, the sample T₂ and T₃ were selected from experimental sample and T₀ as (control sample) for final study.

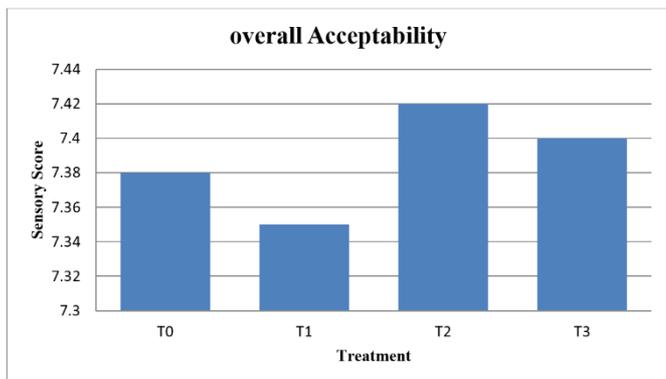


Fig 5: Effect of Extruder Screw Speed on overall acceptability of fresh Chhattisgarhi *Churma*

Conclusions

In sensory analysis of fresh sample, significant difference found in color and appearance, body and texture, flavor, and overall acceptability. The color and appearance, body and texture, flavor and overall acceptability were 7.32 (T₀), 7.80 (T₂) and 7.82 (T₃), 7.08 (T₀), 7.76 (T₂) and 7.72 (T₃), 7.16 (T₀), 7.76 (T₂) and 7.76 (T₃), 6.76 (T₀), 7.86 (T₂) and 7.82 (T₃) respectively

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