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Original Article

INCREASED SENSORY QUALITY AND CONSUMER ACCEPTABILITY BY FORTIFICATION OF CHOCOLATE FLAVORED MILK WITH OAT BETA GLUCAN

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ABSTRACT

Objective: This study is done in respect to develop a milk based product having both the properties of milk and oat beta glucan. The objective of the study is to analyze the stability, texture and overall acceptance of flavored milk with oat beta glucan and to assess the processing parameters in order to increase the stability. **Materials & Methods:** In this study two methods have been used. First method is one stage processing in which beta-glucan (3%) was added simultaneously with carrageenan and In Second method, oat beta-glucan is not added and chocolate milk is made by carrageenan and the other dry ingredients only. Result is tasted by sensory evaluation, texture properties and viscosity. **Results**: In both the studies, the mouthfeel and viscosity is better in chocolate FM fortified with oat beta glucan. **Conclusion**: In this study we use 3% oat beta-glucan for fortification of the chocolate milk. Sensory evaluation is carried out for consumer preference and the texture and viscosity is also measured. chocolate FM with oat beta-glucan has improved mouthfeel, viscosity and fortified with fiber milk. By adding oat beta-glucan we can claim points about Fiber as per FSSAI Guidelines also.

KEYWORDS

Oat beta glucan, flavored milk, sensory evaluation, chocolate milk.

INTRODUCTION

Now-a-days consumption of milk is declining at a fast rate whereas on the contrary there is a rise in consumption of carbonated beverage which in turn increases obesity%. It is also been seen that there is an increasing prevalence of cardiovascular disease (CVD), so there arises a need to identify functional foods that reduce CVD risk factors. Researches have shown that there is a strong association between oat beta-glucan consumption and a decrease in blood cholesterol level. Ideal carriers of bioactive compounds are milk based beverages. Among the many such compounds beta-glucan which is a viscous soluble dietary fiber, has been approved by FDA as an agent that can lower serum cholesterol. So milk and milk products with oat beta-glucan in the diet can help contribute to a reduction in coronary heart disease (CHD) and associated health issues. The sources of oat beta-glucan includes oat bran, oat meal and rolled oats which are generally consumed as breakfast cereals, biscuits, bread etc.

Mechanism of Beta glucan:

Mechanism shows that dietary oat beta-glucan forms a viscous layer in the small intestine. The viscous layer thrusts the intestinal uptake of dietary cholesterol as well the re-absorption of bile acids - which the body makes from cholesterol. Because of which the body draws the pool of circulating cholesterol to produce new bile acids.[1] The combination of lower uptake of cholesterol from the gut with bodily cholesterol used for bile acid production results in low cholesterol levels which circulates in the blood. As a result of all the researches done so far if a person consumes 3grams of oat beta-glucan has chances to reduce total plasma and LDL cholesterol levels by 5 -10% respectively. This can be achieved by consuming the oat based products or fortified oat products 2 – 4 portions daily.[2,3]

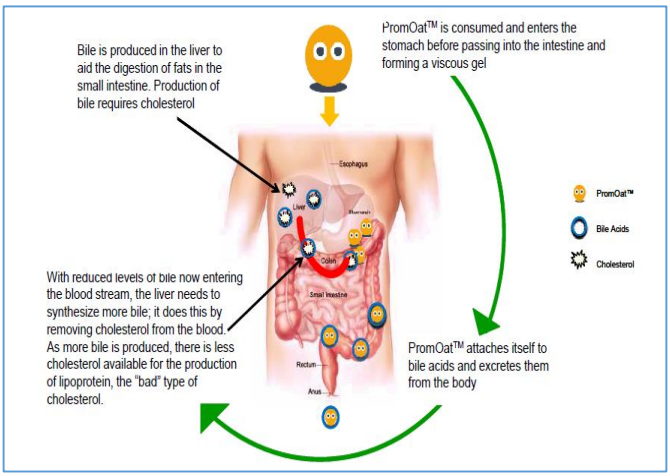

Figure 1. Mechanism for reducing blood cholesterol

OBJECTIVES

This study is done in respect to develop a milk based product having both the properties of milk and oat beta glucan. The objective of the study is to analyze the stability, texture and overall acceptance of flavored milk with oat beta glucan and to assess the processing parameters in order to increase the stability. Stability can be judged by the phase separation and viscosity of the fortified milk product.

Consumption of soluble dietary fiber is becoming popular as it results to improve health by reducing risk of CVD which can lead to decreased blood cholesterol, delay in carbohydrate digestion, regulation of insulin levels and resulting in healthy balance of gut micro-flora.[3] Since children do not always prefer drinking milk so if we can develop new innovative flavored milk so it can be a source of increasing milk consumption.

Oat beta glucan are sugars that are found in the cell wall of bacteria, Fungi, Yeasts, Algae Such as oats and barley. Beta glucan may lower the blood cholesterol by preventing the absorption of cholesterol from food in the stomach. In this study, we are going to add oat beta glucan in Chocolate Flavored milk and tasted the viscosity, sensory properties and consumer acceptance. In this study, Firstly we discuss the Mechanism of oat beta glucan reducing the blood cholesterol, Objectives and methodology, sensory properties and viscosity of the fortifies flavored milk.

BETA-GLUCAN

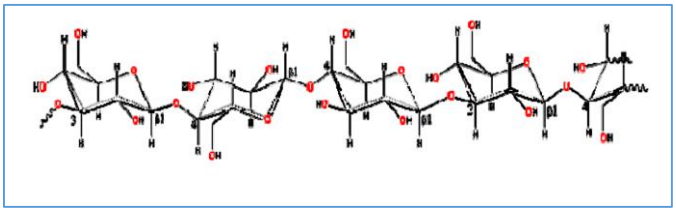

Figure 2. Structure of beta-glucan with linkages present in oats and barley

Oat beta-glucan with Beta 1 - 4 and Beta 1 – 3 linkages.70% Beta 1 - 4 linked with 30% Beta 1 – 3 linked beta D – glucopyranosyl residues, organised in blocks of Beta 1 -4 linkage sequences (cellotriosyl cellotetraosyl cellulose like segments) separated by single Beta 1 – 3 linkages.This is typically found in the endosperm cell walls of oats and barley.[7]

MATERIAL AND METHODS

In this study two methods have been used. First method is one stage processing in which beta-glucan was added simultaneously with carrageenan and In Second method, oat beta-glucan is not added and chocolate milk is made by carrageenan and the other dry ingredients only. Stability can be judged by the phase separation and viscosity of the fortified milk product. Organoleptic test can be done by sensory evaluation of the product. For this study the oat beta-glucan was obtained from SA Pharmachem and Carrageenan was obtained from Duke Thompsons. Cocoa powder from Campco and Flavor from Dohler and IFF.

INSTRUMENTS USED:

Planetary Mixer – with jacketed kettle was used for uniform mixing which helps in homogenization.

Homogenizer – For smooth and uniform texture of the product and to avoid cream plug formation.

Viscometer – to measure the viscosity of the final fortified product.

INGREDIENTS USED:

Milk, Sugar, Oat beta glucan, Cocoa powder, chocolate flavor, Eurovanillin, Cocoa extender and Carraganan etc.

Process Flow chart: (Method 1)

Standardized/ Pasteurized/ Homogenized Milk
|
Addition of Powdered Sugar
|
Mixing
|
Addition of required amount of cocoa powder, Cocoa Extender, Stabilizer, Euro vanillin and Oat Beta Glucan at 30°C and heating upto 72 °C and continues stirring the mix
|
Agitation for 4-5 min
|
Homogenization (necessary for chocolate milk)
|
Addition of Flavor
|
Filling in the Bottles
|
Capping
|
Sterilization (121 °C/ 15 min/15 psi)
|
Quality Check for deformed bottles if any
|
Storage

Figure 3. Process Flow for Chocolate Milk 1

Processing Steps:

- Standardized, Pasteurized, Homogenized Milk is taken and it is mixed with the sugar.
- Milk is heated upto 30° C and all the dry ingredients (Cocoa Powder, Cocoa Extender, stabilizer, Eurovanillin and oat beta glucan) are mixed and heated up to 70° C with continuous mixing for 4-5 min.
- Homogenization of the mix at fixed pressure.
- After homogenization, addition of flavor and fill into the glass bottles and put it into the sterilizer at 121° C for 15 min.

Process Flow (Method 2):

Standardized/ Pasteurized/ Homogenized Milk
|
Addition of Powdered Sugar
|
Mixing
|
Addition of required amount of cocoa powder, Cocoa Extender, Stabilizer, eurovanillin
at 30° C and heating upto 72° C and continues stirring the mix
|
Agitation for 4-5 min
|
Homogenization (necessary for chocolate milk)
|
Addition of Flavor
|
Filling in the Bottles
|
Capping
|
Sterilization (121° C/ 15 min/15 psi)
|
Quality Check for deformed bottles if any
|
Storage

Figure 4. Process Flow for Chocolate Milk 2

Processing Steps:

- Standardized, Pasteurized, Homogenized Milk is taken and it is mixed with sugar.
- Milk is heated upto 30° C and all the dry ingredients (Cocoa Powder, Cocoa Extender, stabilizer, Eurovanillin) are mixed and heated up to 70° C with continuous mixing for 4-5 min.
- Homogenization of the mix at fixed pressure.
- After homogenization, addition of flavor and fill into the glass bottles and put it into the sterilizer at 121° C for 15 min.

Sensory evaluation:

After processing of the Chocolate Milk with two methods. Both Flavored milk are analysed by the sensory evaluation panel. The Sensory Panel contains 20 people and sensory evaluation method is "hedonic scale" .The parameters of hedonic scale is defined in the Figure 3. The parameters that are covered in this sensory are: Color and Appearance, Smell/odor, Taste/Flavor, Mouthfeel, Sweetness, Viscosity and Overall. The sensory panel judge all the seven parameters as per the Hedonic scale. [8] There are two samples put in front of them. The sample 1 is chocolate flavored milk fortified with oat beta glucan and sample 2 is simple chocolate flavored milk.

Table 1. Hedonic scale Rating

Rating	Description
9	Liked Extremely
8	Liked Very Much
7	Liked Moderately
6	Liked slightly
5	Neither Liked Nor Disliked
4	Disliked Slightly
3	Disliked Moderately
2	Disliked very Much
1	Disliked Extremely

RESULTS

1) Sensory evaluation:

Average rating for all the parameters (Table 2)

Table 2. Average Rating for All the Parameters

Sample #	Color / Appearance	Smell / Odor	Taste / Flavor	Mouth-feel	Sweetness	Viscosity	Overall
CHOCOLATE FM 1	7.32	6.55	7.45	8.25	7.06	8.56	7.53
CHOCOLATE FM 2	7	6.84	7.23	7.55	7.09	7.23	7.15

Comparison of Chocolate FM viscosity:

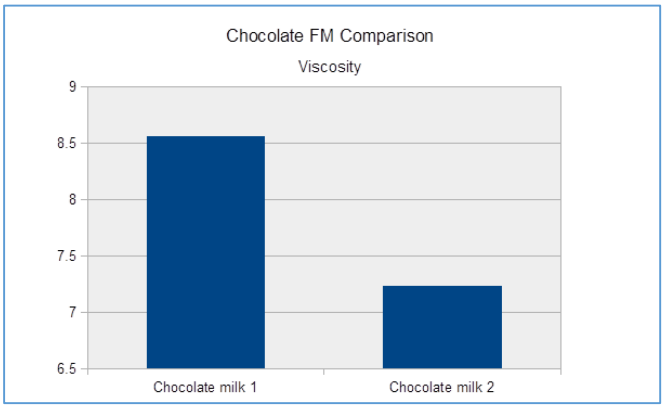

Figure 5. Viscosity of Chocolate FM1 and Chocolate FM 2

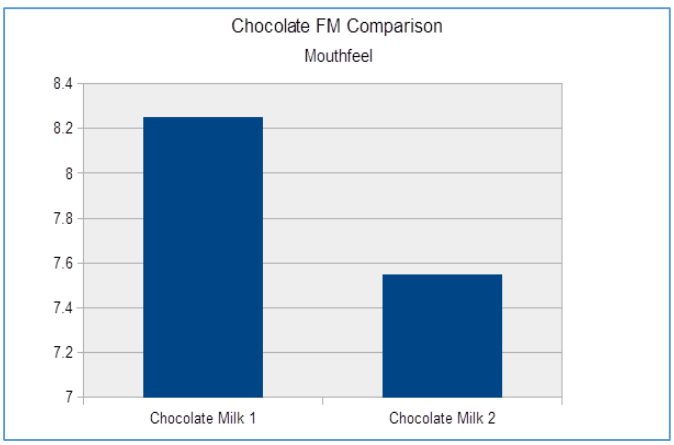

Figure 6. Mouthfeel of Chocolate FM1 and Chocolate FM 2

Conclusion of sensory evaluation:

Sensory evaluation result is shown in Table 2.where the sensory panel tasted both the samples and judged the color, smell, taste, mouthfeel, sweetness and viscosity. Both the samples are acceptable on the basis of sensory but the sensory panel says that they find the mouthfeel good in chocolate milk 1 due to the fiber content (Oat beta Glucan) as compared to Chocolate milk 2. The viscosity and Mouthfeel difference between chocolate milk 1(fortified with 3%oat beta-glucan and chocolate milk 2 is shown by chart in Figure 5 and Figure 6. [9]

Texture Analyser:

Texture Analysis Beta glucan fortified milk (Chocolate FM 1) can be successfully developed using carrageenan to stabilize milk proteins. In this study stability of beta glucan fortified chocolate flavored milk was improved by addition of carrageenan .The addition of beta glucan give good viscosity and mouthfeel as compared to the ordinary flavored milk due to the high fiber content. Eventually the milk began to coagulate as a result of destabilization caused by beta glucan. The viscosity of the control and beta glucan samples did not change overtime. Viscosity at day one was not different than viscosity on other days meaning that beta glucan did not effect the viscosity overtime. However, the reason might be that carrageenan interacts with casein to achieve a higher viscosity prior to the addition of beta glucan particles. Thus it can be concluded that the addition of carrageenan and beta glucan and interaction with casein has a significant effect on stability of the oat beta glucan fortified flavored milk and have more viscous than ordinary flavored milk.

Viscosity:

The Viscosity for the different fluid is given in the Table 3.

RPM	Viscosity
20	25.6
50	21.25
100	16.22
150	12.56
200	11.28

Table 3. Viscosity At different RPM Chocolate FM 1

The Viscosity for the different fluid is given in the Table 4.

RPM	Viscosity
20	23.56
50	20.69
100	15.26
150	11.63
200	10.8

Table 4. Viscosity At different RPM Chocolate FM 2

In this method a flavored milk with beta glucan was made using both protocols and viscosity was measured using a Brookfield viscometer. Stability was measured by means of physical appearance for every day for both the samples. The viscosity readings are tabulated in Table (3 & 4). The viscosity of chocolate FM 1 and Chocolate FM 2 (With and without beta gluacan) readings taken at different rpm and that is tabulated in table (3 & 4). The results showed that the viscosity of the chocolate FM 2 is low than the beta glucan FM sample .The Viscosity at different rpm is shown by graph in Figure 7. The results of graph clearly shows the viscosity difference between fortified flavored milk and normal flavored milk.

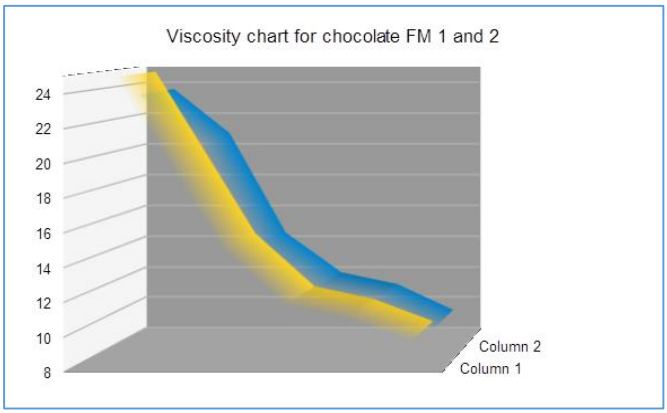

Figure 7: Graph for Viscosity at different rpm

CONCLUSION

In this study we use 3% oat beta-glucan for fortification of the chocolate milk. Sensory evaluation is carried out for consumer preference and the texture and viscosity is also measured. After few days, the product taste and viscosity has not changed and there is no Separation observed. The main purpose behind the making of chocolate FM with oat beta-glucan is improved mouthfeel, viscosity and fortified with fiber milk. By adding oat beta-glucan we can claim some points about Fiber as per FSSAI Guidelines also.

REFERENCES

1) A lia, G Hallmans, A S Sandberg, B Sundberg, P Aman and H Andersson, Oat beta Glucan increases bile acid excretion and fiber rich barley fraction increases cholesterol excretion in ileostomy subjects. The Amarican journal of clinical Nutritionm J Clin Nutr,1995, Dec:62(6):299-309.
2) Oathman RA, Moghadasian MH, Jones P. J, Cholesterol Lowering effects of oat beta glucan, Nutr rev 2011; Jun:69(6):299-309.
3) Brown, L., Rosner, B., Willet, W. W., & Sack, F. M. (1999). Cholesterol-lowering effects of dietary fiber: A meta analysis. American Journal of Clinical Nutrition, 69, 30-46.
4) Pick, M. E., Hawrish, Z. J., Gee, M. Toth, E., Garg, M. L., & Hardin, R. T. (1996). Oat bran concentrate bread products improve long term control of diabetes: A pilot study. Journal of American Dietetic Association, 96, 1254-1261.
5) Saris, W. H. Asp, N. G. Bjorck, Blaak E., Bornet F., Brouns, F., et al. Functional food science and substrate metabolism. British Journal of Nutrition, 80, S47-75.
6) Stacey Bell, valerie M. Goldman, Bruce R., Effect of beta flucan from oats and teast on serum lipids,Critical reviews in Food science and Nutrition, 1999;vol 39(2);189-202..
7) S kendi, A., Biliaderis, C. G., Lazaridou, A., & Izydorczyk, M. S. (2003). Structure and rheological properties of water soluble ~-glucans from oat cultivars of Avena sativa and Avena bysantina. Journal of Cereal Science, 38, 15-31.
8) Jyun Lim, Hedonic scaling: A review of methods and theory, Food quality and preference 22(2011)737-747.
9) Brennan, C. S., & Tudorica, C. M. (2008). Carbohydrate-based fat replacers in the modification of the rheological, textural and sensory quality of yoghurt: Comparative study of the utilization of barley beta-glucan, guar gum and inulin. International Journal of Food Science and Technology, 43, 824-833.