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Original Research Article

A study on physic-chemical properties of goat milk yoghurt incorporated with kiwi fruit (*Actinidia deliciosa*) pulp

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ABSTRACT

The major objective of this research was to study the effect of different levels of kiwi (*Actinidia deliciosa*) fruit pulp on physio-chemical properties of yogurt. During the study goat (capra hircus) milk yogurt incorporated with kiwi fruit pulp was analyzed for physico- chemical properties like fat, protein, moisture, total solids, ash, pH, synersis, acidity and colour properties etc. Yogurt was prepared by using different levels of kiwi fruit pulp. The data were statistically analysed by using Central composite rotatable design. The yogurt incorporated by kiwi fruit pulp different levels (0.20 to 2.50) showed overall acceptability sensory score. The chemical composition of yogurt prepared by addition of (0.20 to 2.50) kiwi fruit pulp having fat 0.20%, protein 0.17%, moisture 83.07%, total solids 16.70%, ash 0.15%, pH 3.26, Titrable acidity 1.43% and carbohydrate 14.67 percent.

1. Introduction

Yogurt is a significant fermented food that is frequently eaten community members and becomes functional when probiotics live microorganisms are added because of a wide range of health benefits. “Yogurt is a fermented product made from fresh milk and or reconstituted milk by using bacteria, such as lactobacillus bulgaricus and streptococcus thermophilus with or without any additional food ingredients and permitted food additives.”[1] As a result of lactic acid produced at the time of fermentation, simple yoghurt has an active acidic flavor. Flavoring of fruits and sweeteners has been incorporated to the yoghurt to improve the balancing of flavor or some masked acetaldehyde flavour quality for the increase customer product acceptability.[2]

Skim milk powder is incorporated to development low energy yoghurt to promote the overall solids content. Yogurt with low total solids and no protein fortification may weaken over time and lose whey, have poor texture, and have uneven quality. Yogurts are typically fortified with various kinds of stabilisers to enhance stability, thickness, and gelling properties in order to address these issues. However, in many nations where yoghurt is produced, adding stabilisers is not a usual practice.[3,4] Yogurt is frequently enriched with approximately 3 to 5 percentage skim milk powder (SMP) enhance the overall solids (Tamime and Robinson, 1985). High quantity of skim milk powder that can be used to achieve a firmer body because high amounts can cause a powdery mouth feel and excessive lactose from the skim milk powder can cause severe acidity when the finished product is stored.[4] The markets of many nations around the globe currently offer a wide variety of fruit or flavor-flavored yoghurts, and they are often similar in terms of the flavours or fruits added.

Special types of yogurt manufactured for dietetic and/or therapeutic purposes are known as bio-yogurt.[5] Yogurt should contain at least 3.25% of milk fat and 8.25% of Milk Solid Not Fat (MSNF) with a titratable acidity of

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not less than 0.9%. Yogurt has smooth texture and a mildy sour and pleasant flavor. It is obtained from pasteurized or boiled milk soured by naturally occurring or lactic acid fermenting bacteria i.e. Lactobacillus bulgaricus and Streptococcus thermophillus. The sensory characteristics of yogurt are due to its content of carbonyl, mainly acetaldehyde, acetone, diacetyl and ethanol produced by yoghurt bacteria. The highest consumption of yogurt is in Mediterranean, Asian countries and central Europe. Yogurt has been known for its nutraceutical, therapeutic, and probiotic effects such as digestion enhancement, immune system boosting, anticarcinogenic activity and reduction of serum cholesterol.[6]

2. Materials and Methods

The yogurt was prepared from composite sample of crossbreed cow milk, Aloe vera juice and 3% constant sugar level for all the treatments. The plain yogurt prepared without addition of kiwi fruit pulp used as a control (T1 to T20), yogurt with 1.35 percent kiwi fruit pulp (T1, T2, T4, T5, T7, T13,T14, T16,T19, and T20), Lowest kiwi pulp level Yoghurt with 0.20 (T8,T9,T18) and highest kiwi pulp level Yoghurt with 2.50 (T3, T6, T15, and T17). The samples of yogurt incorporated with kiwi fruit pulp were analyzed for their physico- chemical properties like fat, protein, moisture, total solids, ash, pH, acidity and overall acceptability. The production of yogurt was as per the method given by with slight modifications.[7]

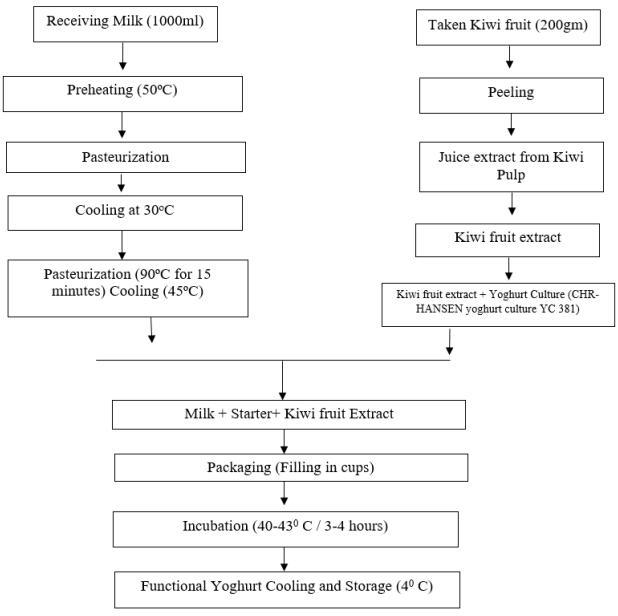

Chart 1: Flow chart of Kiwi Fruit Pulp

3. Result and Discussion

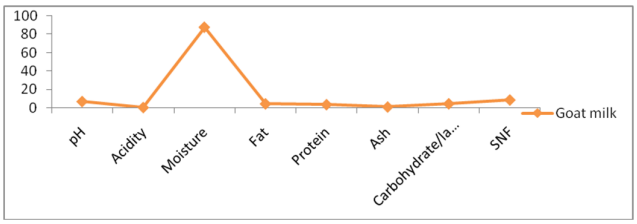

Fig. 1: Physicochemical properties of raw goat milk

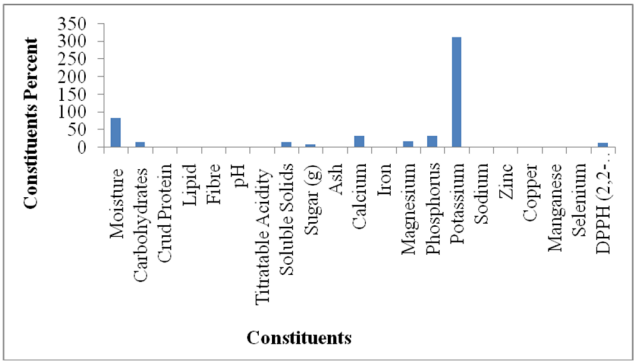

Fig. 2: The physicochemical and antioxidant properties of kiwi fruit pulp

3.1. Flavour

According to data functional yoghurt is increased after mixing with kiwi fruit extract in comparison to milk content.(Figure 3) The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, and 1.35gm baking powder rest of all 20 sample T1, T2, T3, etc. According to organoleptic test of flavour is highest value of T7, T12, T16, 9.0 and gradually decreased value of treatment of T1, T3 & T5 is 8.0. The lowest value of flavour T4 and T8 is 6.0.(Table 1) The statistical significant value (P>0.005) and standard deviation (=0.021), R^2 is 0.89. The similar data are found[5,8] in which own research in functional Yoghurt of flavour 8.9 during organoleptic test. Found in papaya flavoured yoghurt in flavour content is 8.5 by found by organoleptic test.[9]

3.2. Texture

According to data textural properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content.(Figure 4) According to organoleptic test of flavour is highest value of T4, T12, T13, is 9.0. The lowest value of flavour T1, T2, T6 & T9 is 7.0. (Table 1) The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder

Table 1: Central composite rotatable design for the optimization of the of kiwi extract yoghurt

Treatment	Milk	Kiwi extract	Flavor	Texture	Color	Overall acceptability	Fat	Protein	Total Solid
T1	99	1.35	8	7	8	7	3.6	4.3	16.55
T2	99	1.35	7	7	7	8	3.8	4.5	17.66
T3	98	2.5	8	8	8	8	3.3	4.7	17.55
T4	100	1.35	6	9	7	9	3.5	4.8	15.5
T5	99	1.35	8	8	9	8	3.4	4.6	14.5
T6	100	2.5	7	7	7	7	3.6	4.3	15.9
T7	99	1.35	9	8	8	7	3.4	4.5	18
T8	98	0.2	6	8	7	8	3.5	4.9	16.65
T9	100	0.2	8	7	7	9	3.6	4.8	17.5
T10	98	0.2	8	7	8	9	3.7	4.7	16.45
T11	99	3.28	7	8	9	7	3.7	4.4	14.87
T12	99	0.23	9	9	8	7	3.8	4.35	14.58
T13	99	1.35	8	9	8	8	3.9	4.78	15.88
T14	99	1.35	7	8	9	9	4.2	4.88	16.65
T15	100	2.5	7	7	8	8	3.8	4.65	18
T16	99	1.35	9	7	9	7	3.7	4.45	16.5
T17	98	2.5	8	8	8	8	3.8	4.9	15.5
T18	100	0.2	7	7	8	8	3.9	4.32	16.65
T19	97.31	1.35	8	8	7	9	3.7	4.23	17.88
T20	99	1.35	8	7	8	7	3.8	4.38	15.9

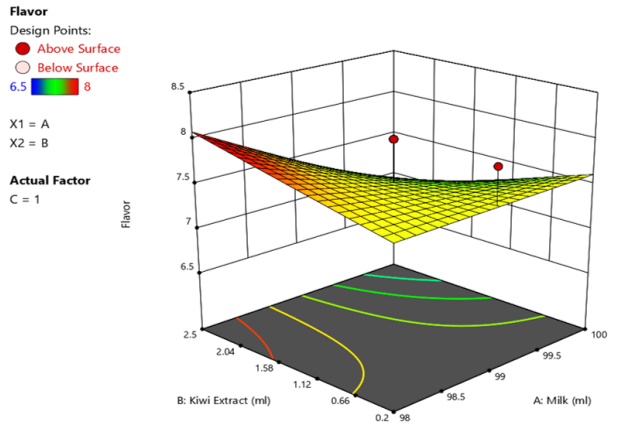

Fig. 3: Flavour

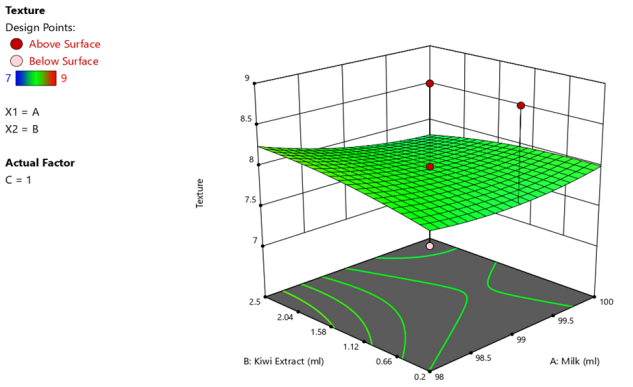

Fig. 4: Effect of Kiwi extract and milk on texture of functional yoghurt

rest of all 20sample. According to the statistical analysis significant value (P>0.002) and standard deviation (=0.020), R^2 is 0.90. The similar data are found in this research of Tea-Infused Set Yoghurt in textural properties in similar affect as a kiwi fruit extract.[9,10]

3.3. Colour

According to data color properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content Fig. 4 According to organoleptic test of flavour is highest value of T5, T11, T16, is 9.0. The lowest value of flavour T2, T4 T8, T9 & T16, is 7.0. (Table 1). The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20sample. According to the statistical analysis significant value (P>0.004) and standard deviation (=0.022), R^2 is 0.79. The white colour is generated by casein with the absence of carotene, while the slight yellowness in colour is generated by the fat granules in milk[11] the similar data are found[9] in which own research in functional Yoghurt of color 9.0 during organoleptic test. Similar data are found in papaya flavoured yoghurt in color content is 8.0 by found by organoleptic test.[9] Found in black carrot anthocyanins in yoghurt in color properties stability is similar.[11]

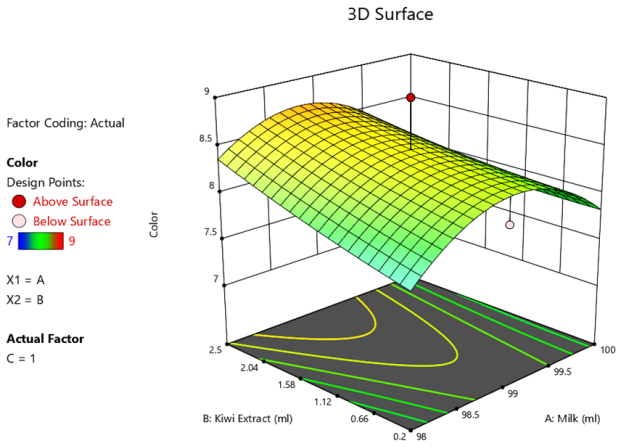

Fig. 5: Effect of kiwi extract and milk on colour of functional yoghurt

3.4. *Overall acceptability*

According to data overall acceptability properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content.(Figure 6) According to organoleptic test of flavour is highest value of T4, T9, T10 & T14, is 9.0. The lowest value of flavour T1, T6, T7 & T16, T20 is 7.0. The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20sample. According to the statistical analysis significant value (P>0.005) and standard deviation (=0.022), R^2 is 0.88. The overall acceptability rate is found as a similar result found [12]The found nutritional information did not affect the acceptability of 30 these products although analysis of individual consumer behavior showed that only for 31 around 50% of consumers surveyed, also similar results own research are also find similar results. [12]

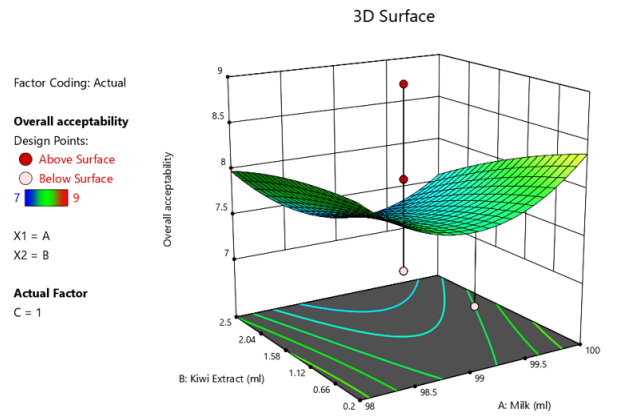

Fig. 6: Effect of kiwi extract and milk on colour of functional yoghurt

3.5. *Titratable acidity*

According to data Titratable acidity properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content.(Figure 7) The titratable acidity measure by titration method we found the highest value of T10 is 0.9. The lowest value of flavour T14 & T15 is 0.86. (Table 1) The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20 sample. According to the statistical analysis significant value (P>0.004) and standard deviation (=0.023), R^2 is 0.87. The evaluation of titrable acidity (0.69-1.81) in Yoghurt similar.[14] Find out titratable acidity an increase with decreasing pH value. [13] this is the similar results are found also. Titratable acidity of yoghurt was 0.51 to 0.61. [14]

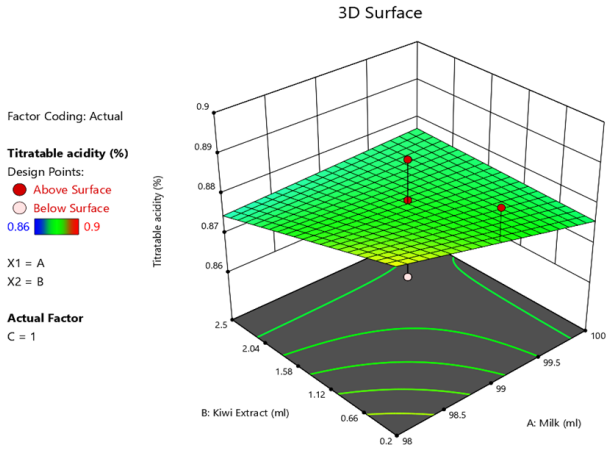

Fig. 7: Effect of kiwi extract and milk on overall acceptability of functional yoghurt

3.6. *Syneresis*

According to data syneresis properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content.(Figure 8) The value of sysnersis determined by centrifugal method that is highest value of T15, T11 is 40.5. The lowest value of flavour T1, T2, T4, T7, T19 &T20 is 25.5.(Table 1) The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20sample. According to the statistical analysis significant value (P>0.005) and standard deviation (=0.023), R^2 is 0.87. The similar results found The highest mean value (46.06mL/100 g) of syneresis was recorded in sample of Yogurt enriched with 4 percent kiwi flavor was more acceptable than the other samples, and high scored with respect to overall acceptability by panelists. [9] According to are found syneresis is 23.35 percent in Low-calorie Functional Yoghurt. [15,16]

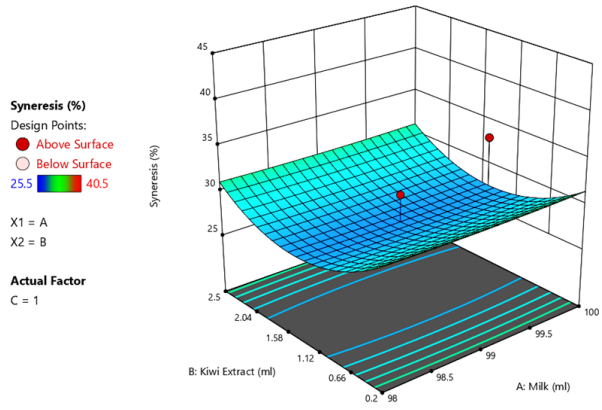

Fig. 8: Effect of kiwi extract and milk on syneresis offunctional yoghurt

3.7. Moisture

According to data moisture properties of functional yoghurt is highly affected by after mixing with kiwi fruit extract in comparison to milk content Figure 9. The moisture content measure by muffle furnace we have to find out the highest moisture value of T16 is 84.20 The lowest value of moisture T13 is 82.0. (Table 1) The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20sample. According to the statistical analysis significant value (P>0.004) and standard deviation (=0.022), R^2 is 0.92. Find out moistrue an increase with addition of kiwi fruit extract.[13] This is the similar results are found also miosture of yoghurt was 81.0 to 85.0.[17]

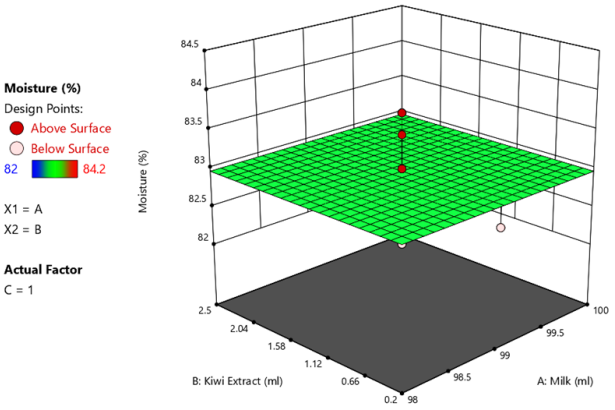

Fig. 9: Effect of kiwi extract and milk on moisture of functional yoghurt

3.8. Fat

According to data fat properties of functional yoghurt is slightly affected by after mixing with kiwi fruit extract in comparison to milk content Figure 10. The fat estimation by Butyrometer we have found of fat is highest value of T14 is 4.20% The lowest value of fat T3 is 3.30% Table 1 The best optimized sample of functional yoghurt in 99% milk, 0.497ml kiwi extract, 1.35gm baking powder rest of all 20 sample. According to the statistical analysis significant value (P>0.005) and standard deviation (=0.032), R^2 is 0.92. The similar results are found similar results in which own research study.[18,19]

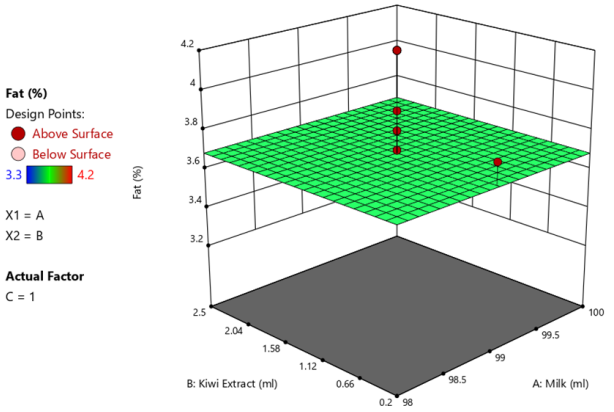

Fig. 10: Effect of kiwi extract and milk on fat of functional yoghurt

4. Conclusion

Use of kiwi fruit (Actinidia deliciosa) as pulp in the probiotic foods can be a promising trend towards functional ingredients in the dairy food. Kiwi fruit incorporated yogurt was prepared by using mix culture to study the physico-chemical properties of kiwi fruit yogurt; which is beneficial for the health and nutrition point of view.

5. Source of funding

None.

6. Conflict of interest

The author declares that there is no conflict of interest.

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