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Research paper

A study of Phyisco-chemical properties of probiotic cow milk kiwi fruit (*Actinidia deliciosa*) enriched functional curd

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Abstract: Curd recognized as a healthy and multifunctional food. It is a coagulated milk product obtained from the lactic acid fermentation by the action of Mesophilic mixed strain dahi culture NCDC-167 (containing *Lactococcuslactis ssp. lactis, L. lactis ssp. cremoris, L. lactis ssp. diacetylactis and Leuconostoccitrovorum*). In this present studies, kiwi fruit extract was added in milk and their effects during curd fermentation were investigated. The changes in pH and Titratable Acidity (TA) were measured during fermentation and after 20 days of storage at 5°C. The curd extracts were subsequently analysed for their syneresis, proteolysis, peptide content, total phenolic content, and antioxidant activities, inhibitory activities on α- amylase and α-glucosidase, presence of exo polysaccharides (EPS) and organoleptic properties. pH values for both dragon fruits curd showed significant reduction while titrabel acidity showed higher percentages compared to plain-curd during fermentation and after days of storage. Syneresis in curd (27.93%) also has been increased (p>0.05) with the addition of kiwi fruit compared to the control (29.67%) The total phenolic content (TPC) in kiwi fruit curd (36.44-64.43 ug GAE/ml) showed a greater increase (p<0.05) than plain curd (20.25 ug GAE/ml). Kiwi showed the highest score for visual appearance (7.77), aroma (5.9) and sweetness (4.22) while plain curd showed highest scores for body texture (6.81), sourness (7.13) and overall taste (5.45). In conclusion, the addition of kiwi fruit in curd gave enhanced effects on physicochemical, therapeutic properties, production of EPS and organoleptic properties in curd.

Keywords: cow milk, kiwi pulp, probiotic, Curd, functional, syneresis.

Introduction:

Curd as a product obtained by lactic acid fermentation of cow or buffalo mixed milk caused by single or mixed strains of lactic acid bacteria or by alcoholic fermentation of yeasts. The preparation of Dahi includes pasteurization of raw milk, standardization followed by inoculating the standardized milk with starter cultures and incubation at about 37-42°C depending on the types of

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culture used (Tamime and Robinson, 1999). Curd is well known dairy product obtained by lactic acid fermentation of milk. It is generally consumed in its original forms as an accompanied to the meal or it may be turned into raita by mixing it with grated cucumber, diced failed potato, fried bits of gram flour batter, or pulse based vadas. Some of the beneficial effects of curd are attributed to the antibacterial component formed during the fermentation and the low pH that prevents the growth of putrefactive and other undesirable organisms including potential pathogens and possess an increased digestibility (Colony *et al.*, 2014). Further it balanced the fecal enzymes and intestinal microflora, prevention of cancer, treatment of traveling diarrhea, antibiotic therapy and control of ulcer and reduction of serum cholesterol (Gandhi, 2002). A good quality dahi made from whole milk has a creamy layer on top, the rest being made up of homogeneous body of curcl and the surface being smooth and glossy, while the cut surface should be firmed and free from cracks of gas bubbles and it should have a pleasant acid taste with sweetish aroma. However, the chemical composition of dahi has been reported as fat ranging from 5 to 8 per cent, protein 3.3 to 3.4 per cent, ash 0.75 to 0.79 per cent and lactic acid 0.5 to 1.1 per cent (Gandhi, 2006).

Probiotics are live microorganisms, which when administered in adequate amount confer a health benefit on the host (Aida *et al.*, 2011). These include bacteria, mould, yeast, but most probiotics are bacteria of which, LAB are the most common type (Martha, 2001). Probiotic organisms for human should have demonstrable health benefits and generally regarded as safe (GRRS) status, with a proven low risk of inducing or being associated with the etiology of disease. The probiotic organisms must be able to survive and grows in vivoconditions of the desired site of administration without thus must be able to low pH and bile salts. Fruits are an important part of a healthy diet in our daily routine. They are of course naturally low content of calories, sodium, fat, and cholesterol. Kiwi fruit (*Actinidiadeliciosa*) has become terribly popular during the past two decades due to its various medicinal properties. Kiwi fruit belongs to family *Actinidiaceae* and genus Actinidia. It contains very good levels of vitamin-A. Vitamin-E, vitamin-K and flavonoid anti-oxidants such as beta-carotene, lutein and xanthin (Tyagi *et al.*, 2015).

Kiwi fruit contains vital substances that are required to maintain good health. so it is also called as wonder fruit. The fruit is rich in vitamin C, E, sugars and several minerals such as phosphorus, potassium, magnesium, copper and calcium. It is low in calories and high in ascorbic acid content (Singh *et al*. 2008).

The kiwi fruit (*Actinidia deliciosa)* is unique because of its high nutritional content, different flavors, vitamins, minerals, antioxidants, photochemical and fiber content. In terms of nutrient content, the kiwi fruit is amongst the richest fruits. It is also very valuable in terms of health. It is usually consumed fresh but in recent years along with increased production, industrial use is increasing. It is used in the canned food industry, for marmalades, fruit sauces and candies and for fruit juice concentrates, either separately or mixed with strawberries or apples.

The kiwi fruit is highly acclaimed for its nutritive and medicinal value. It is rich source of Vitamin C and E (twice that of orange and more than Guava, Tomato, and Avocado) and low in calories. Kiwi fruits are either canned or frozen, whereasdifferent kinds of drying processes may also be used. Kiwi fruit juice are used extensively as fruit ingredients in many food such as dairy products, jam and jellies. syrups, confectionery, etc. (Popovic*et al*. 2013).

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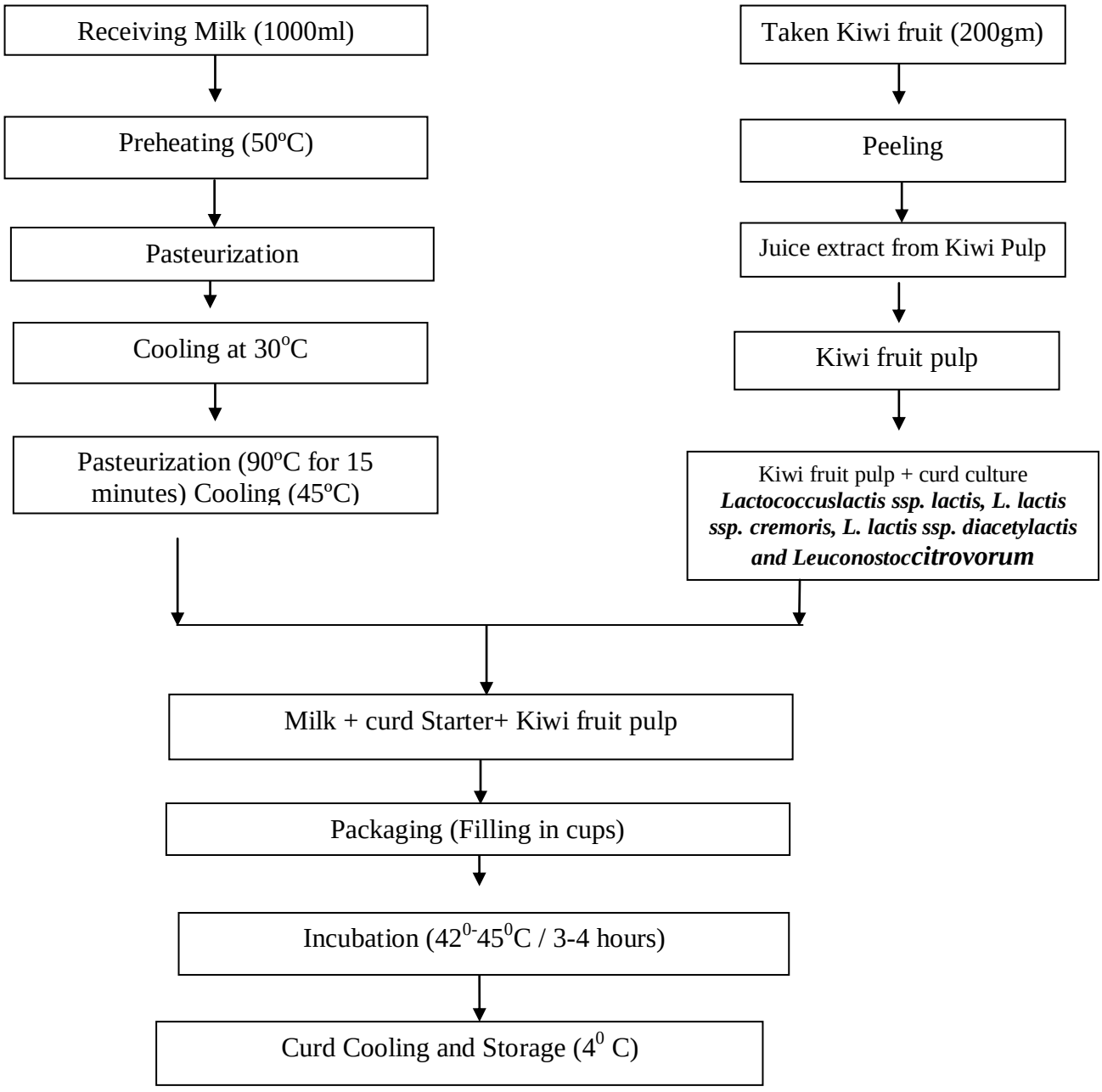
The purpose of our study was to investigate the Development of probiotic bacteria in cow milk curd incorporated with Kiwi fruit pulp .

Materials and Methods:

Cow milk (protein 3.32%, moisture 87.52%, fat 4.16% and ash 0.71%) were procured from the Department of Animal husbandry and Dairying Dairy technology Lab, T.D.P.G. College Jaunpur. and kiwi fruit were procured from local market line Bazar Jaunpur .Curd culture NCDC-167 (containing *Lactococcuslactis ssp. lactis, L. lactis ssp. cremoris, L. lactis ssp. diacetylactis and Leuconostoccitrovorum*) Other raw material including cup (Polyproplene). Dahi was prepared by using the procedure prescribed by Zubeir, E., Ibtisam, E. M., Voughon, G. and Johnson, Q. (2007). with some minor modifications.

Methodology: The research was done in three stages to create a useful cow milk curd that included kiwi pulp by using the methods described below



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Physicochemical analysis of kiwi fruit rich curd:

Only after 24-72 H of curd preparation were the proximate compositions, total phenolics content, and total carotenoids content of each yoghurt formulations identified. Additionally, the firmness of the yoghurt was examined after 7 days of preservation. During the storage times, variables including pH, syneresis, and Titratable Acidity (TA) were measured (on 0, 7th, 14th and 21st day after production). For all of the aforementioned parameters, the physicochemical study was performed three times in duplicate for each treatment sample. With the exception of yoghurt firmness, which was assessed seven days after the product was produced, the impact of kiwi pulp concentration and stabiliser addition on physicochemical properties was discussed based on analysis findings from the first five days after yoghurt production. Additionally, based on the analysis results from the storage study, impacts of storage time (and its interactions) on specific physicochemical parameters like pH, titratable acidity (TA), and syneresis were studied.

Determination of sensory qualities

Sensory quality attributes *viz*. colour and appearance; consistency, flavour, taste and overall acceptability of the samples were evaluated using a 9-point hedonic rating test by a panel of six judges by the method recommended by Ranganna (2001).

Statistical analysis:

The data obtained from the various experiments were recorded and subjected to statistical analysis as per the Analysis of Variance method of Factorial Complete Randomized Design (CRD). The significance and non significance of data obtained from various experiments were judged with the help of an F (variance ratio) Table. The significant difference between the means was tested against the critical difference at the 1% and 5% level of significance by using STPR software for data analysis.

Table 1: Physicochemical properties of raw cow milk

Properties	**Cow milk**
pH	6.65
Acidity	0.17
Moisture	87.52
Fat	4.16
Protein	3.56
Ash	0.67
Carbohydrate / lactose	4.26

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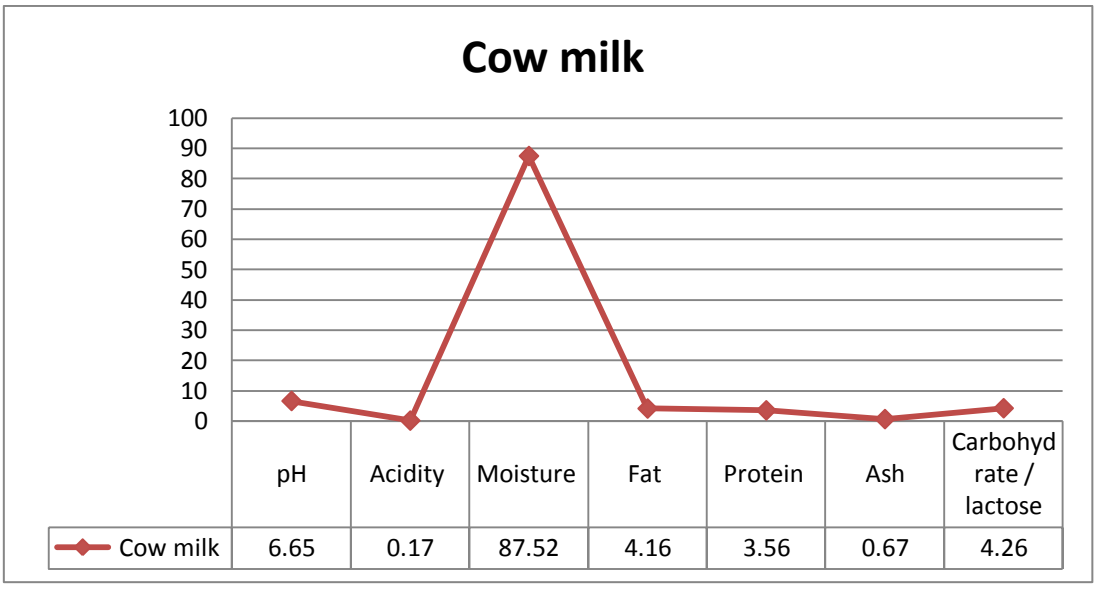

Fig: 1 physicochemical properties of raw cow milk

Result:

Table 2: Physicochemical properties of raw cow milk

Treatment	**Moisture**	**Protein**	**Fat**	**Acidity**	**TS**
T_0	77.58	3.33	4.13	0.65	14.17
T_1	81.35	3.50	4.18	0.78	14.71
T_2	76.03	3.14	3.64	0.72	14.43
T_3	78.64	3.98	4.04	0.82	12.61
T_4	82.14	3.99	4.21	0.66	13.67
T_5	74.33	3.71	3.34	0.83	12.21
T_6	76.42	3.95	4.13	0.78	13.48
T_7	78.39	4.07	3.90	0.69	13.28
T_8	75.38	4.03	3.22	0.77	12.97
T_9	79.37	3.60	4.06	0.66	12.54
SEm+	0.6049518	0.1108653	0.0712585	0.0258844	0.1245971
CD	1.7846064	0.3270523	0.2102125	0.0763588	0.3675613

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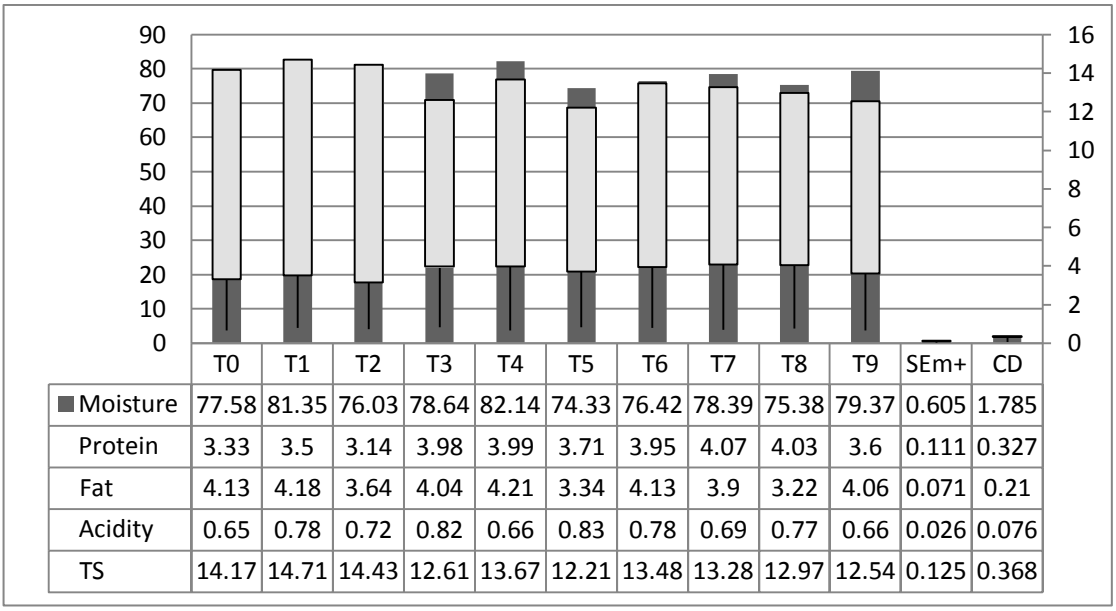

	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	SEm+	CD
Moisture	77.58	81.35	76.03	78.64	82.14	74.33	76.42	78.39	75.38	79.37	0.605	1.785
Protein	3.33	3.5	3.14	3.98	3.99	3.71	3.95	4.07	4.03	3.6	0.111	0.327
Fat	4.13	4.18	3.64	4.04	4.21	3.34	4.13	3.9	3.22	4.06	0.071	0.21
Acidity	0.65	0.78	0.72	0.82	0.66	0.83	0.78	0.69	0.77	0.66	0.026	0.076
TS	14.17	14.71	14.43	12.61	13.67	12.21	13.48	13.28	12.97	12.54	0.125	0.368

Fig 2 Physicochemical properties final product

Discussion: Moisture content of samples of kiwi curd were in the range of 74.33 to 82.14 per cent and coincided with the result of Sodini, I. Remeuf, F., Haddad, S. and Corrieu, G. (2004). Moisture content was maximum in control samples, i.e T_4 (82.14 %). The moisture content of dahi samples of T_5 (74.33%) was lower than other kiwi curd sample. The values of moisture content of all kiwi curd samples did not differ significantly from each other. The moisture content in kiwi curd samples were decreased as the kiwi fruit pulp increased.
The protein content in samples of kiwi curdwere ranged from 3.23 to 3.31 per cent. Maximum protein content was found in kiwi curd sample of T7 (4.07 %) while minimum in kiwi curd sample of T2 (3.14 %). The protein content of all samples of kiwi curdsignificantly from each other. Protein content of samples of kiwi curdwere more or less similar to protein content of samples of milk used for kiwi curd preparation. Protein content of samples of kiwi curd are coincided with the result. The Table 2 revealed that, mean fat content of samples of kiwi curd were in the range of 3.22 to 4.21 per cent and coincided with the result of Sodini, I. Remeuf, F., Haddad, S. and Corrieu, G. (2004). The relative effect of milk base, starter, and process on yogurt texture: A review. Critical Reviews in Food Science and Nutrition, 44: 113–137.
Average fat content was maximum in control samples, i.e T4 (4.21%). The fat content of kiwi curd samples of T8 (3.22%) was lower than other kiwi curd sample. The values of fat content of all kiwi curd samples are significantly from each other. The fat content in kiwi curd samples were decreased as the kiwi fruit pulp increased.
The acidity of samples of kiwi curd were ranged from 0.65 to 0.83% (LA). The maximum acidity was found in kiwi curd samples of T5 (0.83% LA). While minimum was in sample of kiwi curd of To (0.65% LA). The acidity of all samples of kiwi curd significantly from each other.the acidity of kiwi curd get increased with increase in levels of kiwi fruit pulp. Acidity of samples of kiwi curd coincided with the results of From the data given in the Table 2 it is revealed

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that, all treatments differ significantly from each other. The samples of kiwi curd T1 (14.71 %) shown higher total solids than other samples of kiwi curd. The samples of kiwi curd T5 lowest total solids (12.21%) than remaining samples of kiwi curd. The kiwi fruit pulp contained more percent of solids than milk therefore as kiwi fruit pulp level increased, the total solids content have proportionally increased in kiwi curd. The total solids content of kiwi curd samples are coincided with the results of Babu, K. S., Singh, R. S. and Chander, H. (1989).

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