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Research Article

EFFECT ON SENSORIAL QUALITY OF CHANNA BASED SWEETMEAT BY USING NATURAL COAGULANT

***Honkar A.S. and Hembade A.S.**
Department of Dairy Science, Yeshwant Mahavidyalaya, Nanded
**Author for Correspondence: amolhonkar@gmail.com*

ABSTRACT
Sweetmeats are extensively used chiefly along with other foods due to their good flavor and high food value. They are also easily digested. Channa well known traditional indigenous milk product is used extensively as a base material for large variety of Indian delicacies namely Sandesh, Rasogolla, Channa Murki, Rasmalai and many other such products. Among these Channa Murki is sugar coated dessert, close knit body and texture. Channa Murki generally prepared by coagulating milk by using Citric acid, Calcium lactate. The present study was carried out to standardize Channa Murki by using natural coagulant i.e. Kiwi fruit juice. Soybean is an excellent and cheap source of quality protein. The Channa Murki was prepared by using 70 percent cow milk and 30 percent Soymilk. Soymilk blended and Kiwi fruit juice used as a coagulant, prepared Channa Murki would offer several distinct nutritional advantages to the consumer. From this investigation it is also clear that kiwi fruit can be successfully used instead of traditional coagulants in making of coagulated Dairy products and also due to use of soy milk cost of final product decreases. Due to its properties as well as to the accessibility of the primary source for the preparation of the aqueous solution, it might represent a good Coagulant.

Keywords: *Channa Murki, Channa, Soymilk, Kiwi fruit, Sweetmeats*

INTRODUCTION
Milk is widely used in the preparation of sweetmeats. The sweetmeats made from milk are delicious, highly nutritious and very popular items. From birth to death in each part of life milk sweetmeats have occupied a significant place in our society. On occasions like birthday, marriages, funerals, religious festivals everywhere sweetmeats are unavoidable. Channa Murki has a longer shelf life owing to its preparation by heat desiccation of Channa in sugar syrup in an open pan, reducing its water activity and thus spoilage (Gurditta, *et al.,* 2020).

Soybean regarded as an ideal food because it contains high quantity and quality protein. So to fulfill our body protein requirement soybean is a very cheap and nutritious source. Soymilk is good alternative for people who cannot consume dairy products due to their lactose intolerance, milk protein allergy or galactosemia. (Xu and Chang, 2009). Soymilk is a water solution of soybean constituents, such as high quality proteins, essential fatty acids, carbohydrates, vitamins and minerals; however it does not contain cholesterol, gluten and lactose (Roque, *et al.,* 2013). Due to use of soymilk to replace some quantity of cow milk it reduces the cost of Channa Murki and also increases the protein content of it.

Kiwi fruit is very popular in the human diet due to its pleasant taste and high content of vitamin C and several investigations on possible health-promoting effects of kiwi fruit have been reported (Rush, *et al.,* 2002 , Jung *et al.,* 2005). Kiwi fruit content minerals (potassium, phosphorus, iron) and low calorific value. Kiwifruits are good sources of folate, potassium and contain large amounts of vitamin E in the seeds. Moreover, kiwi fruit juice is known to contain highly active proteolytic enzymes (Kaur, *et al.,* 2010). Protease enzymes are multifunctional class of enzymes (Marques, *et al.,* 2010). Hence Kiwi fruit enzyme as a protease enzyme can be used in food industry as milk clotting enzyme. Approximately 1

million metric tons of kiwi fruits are processed annually worldwide; this results in about 30% (wet weight) of byproducts, such as pulp and peel and there is a growing interest in utilizing these by-products in the food industry (Yang *et al.*, 2013).

Coagulation is a basic step in channa manufacturing and is most commonly achieved by addition of citric acid. Vegetable or plant extract have been used as coagulants since ancient times, although relatively few is known about their action. Cheeses made with plant coagulant can be found mainly in Mediterranean, West African and southern European countries (Piero, *et al.*, 2002, Roseiro, *et al.*, 2003). Proteolytic enzymes extracted from plants, such as Lactuca sativa (Piero and Petrone, 1999), Streblus asper (Tripathi, *et al.*, 2011), Solanum elaeagnifolium (Gutierrez-Mendez *et al.*, 2012), Kiwi juice (Puglisi, *et al.*, 2014), kiwi juice coagulated mozzarella cheese (Karki and Ojha, 2018), kiwifruit enzyme for preparation of cottage cheese (Sharma and Vaidya, 2018).

By considering the food and nutritive value of Kiwi fruit and its coagulating property Channa Murki was prepared with different level of Kiwi fruit juice as coagulant.

MATERIALS AND METHODS

Preparation of Kiwi fruit Coagulant

The Kiwi fruit coagulant made according to Piero, *et al.*, (2011) with slight modification in it. The kiwi fruit was obtained from local market. The skin of kiwi fruit was removed and cut in to small pieces with knife. A homogeneous mass of juice was obtained by grinding it in mixer. The juice obtained then filtered through muslin cloth to remove suspended particles and clear juice was used as a coagulant for further study.

Preparation of Channa Murki

Good quality of milk purchased from local market. Standardize it at prescribed rate of Fat and SNF. Blended it with fresh prepared soymilk and strained with the help of muslin cloth. Then milk was transferred to stainless steel vessel and boil it up to 90^0c temperature. After that vessel removed from fire and brought temperature of milk down to 75^0c to 80^0c. At this temperature the coagulant Kiwi fruit juice of required quantity added slowly in to the milk and stirred it to mix properly. After some time coagulation of milk takes place, then the coagulated milk strained through muslin cloth in another vessel to drain the whey. After draining of whey, remaining solid mass channa which was the base of Channa Murki. Channa was then cut into blocks or dicing into one cm cubes. These cubes cooked in to boiling sugar syrup for 5-10 minutes in a karahi. Take out karahi from fire and sieving of cubes and condensing of syrup. Cubes again added in condensed syrup and stirring for 10 to 15 minutes till coating of sugar on cubes takes place. Allowing it to cool and Channa Murki ready to serve (Arora, *et al.*, 2019).

RESULTS AND DISCUSSION

The sensory quality of Channa Murki prepared from different levels of Kiwi fruit juice were evaluated by a panel of 6 semi trained judges using 9 points Hedonic scale given by Amerin, *et al.*, (1965). On the basis of sensory parameters such as colour, flavor, body and texture, taste and overall acceptability of Channa Murki by using Kiwi fruit juice as coagulant. The data obtained were subjected to statistical analysis using method recommended by Snedecor and Cochran, (1994).

From the table it is observed that the mean score for colour and appearance of the kiwi fruit Channa Murki ranged between6.0 to 8.3. The lowest score was observed in T_1 (6.0) whereas highest score was observed in T_2 (8.3). Score for colour and appearance increased as the rate of coagulant increased up to T_2 sample. But again it is decreased; it might be due to high level of addition of coagulant. In T_1 7.1 % of coagulant was added whereas in T_3 8.3 % of coagulant was added. Same findings authenticate by Olorunnisomo and Adewumi (2016) they native that colour score range in between 6.4 to 7.6 in soft

cheese made from fresh or reconstituted milk by using Lime and Mango juice as coagulant. Our results coincide

Table 1: Effect of different level of Kiwi fruit juice on Sensory quality of Channa Murki

Treatments	Colour		Flavor		Body and Texture		Taste		Overall Acceptability	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
T_0	7.633	0.203	7.633	0.088	7.167	0.067	7.867	0.067	7.600	0.000
T_1	6.033	0.033	6.733	0.133	6.133	0.088	6.733	0.067	6.433	0.033
T_2	8.300	0.115	8.733	0.067	8.033	0.033	8.733	0.067	8.500	0.000
T_3	6.533	0.033	6.633	0.088	6.167	0.067	6.700	0.100	6.500	0.000
C.D.	0.394		0.322		0.221		0.253		0.055	
SE(m)	0.119		0.097		0.067		0.076		0.017	
SE(d)	0.168		0.137		0.094		0.108		0.024	
C.V.	2.893		2.264		1.680		1.762		0.398	

with Rana, *et al.,* (2017a) were unearthed that cottage cheese prepared from buffalo milk with different levels of papaya latex colour of cottage cheese was lying 8.33 to 8.67 as compared to rennet cheese it was 8.50 and Rana, *et al.,* (2017b) in cottage cheese preparation uses alternative coagulant, instead of rennet they uses papaya latex and found that colour of cottage cheese from 8.33 to 9.00 which were in rennet cheese 9.00. Kushwaha and Shukla (2019) reported the highest mean score for colour and appearance in kiwi fruit pulp shrikhand (8.20) in T_2 followed the treatment by T_3 (7.80), T_1 (7.00). The minimum score (5.80) was obtained in T_0. The colour score found in this experiment was in consistent with Ingale, *et al.,* (2020) they testify that in kiwi fruit whey beverage the mean colour and appearance score of beverage in treatments T_1, T_2, T_3 and T_4 were 8.00, 8.03, 7.5 and 7.00 respectively. The treatment T_2 was significantly superior over treatments T_1 (control) whereas T_1 and T_2 at par with each other. It may be concluded that proper quantity of kiwi extract blending to the whey beverage was preferred by the judges, as far as colour character was concerned. Jesmin, *et al.,* (2021) they also shore that cheese samples A and B recorded the highest score (9.00) than other three samples. The results indicate that the cheese samples prepared from latex of mature and immature Papaya had the perfect colour which was desired.

From the table it is observed that the mean score for flavor of the Kiwi fruit Channa Murki ranged between6.6 to 8.7. The lowest score was observed in T_3 (6.6) whereas highest score was observed in T_2 (8.7). The score for flavor in T_3 was very low it might be due to high level of addition of coagulant. The reported value was in consistent with the value revealed by Sarani, *et al.,* (2014) they were prepared tofu by using Withania coagulans as a coagulant, they detected that flavor score of tofu 2.53 as compared to 2.15 of calcium sulphate tofu. Olorunnisomo and Adewumi (2016) found that in soft cheese made from fresh milk or reconstituted milk by using Lime and Mango Juice as coagulants flavour of cheese was in range of 6.4 to 7.4 as compared to control it was 6.2. Our results also supported by Ibrahim, *et al.,* (2019) they were detected that quality of cheese produced from soymilk by using some selected natural coagulants, flavor of cheese in range of 7.30 to 8.20. This result was in agreement with Kushwaha and Shukla (2019) they prepared shrikhand using Kiwi fruit pulp and observed that the highest mean score for flavor in Kiwi fruit shrikhand (8.20) was obtained from the treatment T_2 followed by T_1 (6.20), T_0 (6.60). The score (6.20) was obtained in T_3. There were significant differences found among the treatments. In another study Soliman and Shehata (2019) prepared yogurt (fermented camel's milk) fortified with kiwi or Avocado fruits they found that colour score was in between 11.75 to 12.75 as compared to control 11.25. The results in relation to flavor was in agreement with Ingale, *et al.,* (2020) they share that the

mean scores for flavor of Kiwi fruit whey beverage for treatments T_1, T_2, T_3 and T_4 were 6.03, 7.25, 8.13 and 8.00 respectively. The treatment T_2 was significantly superior over treatment T_1 (control) whereas T_3 and T_4 were at par with each other. It clearly indicated that the blending of proper quantity of kiwi fruit extract in preparing Kiwi fruit whey beverage was preferred in respect of flavor by the panel of judges. Same findings by Jesmin, *et al.,* (2021) related to flavor that consumer acceptance is very much important in case of flavor of cheese. Flavor score of Cheese from immature papaya higher than cheese from mature papaya.

From the table it is observed that the mean score for body and texture of the Kiwi fruit Channa Murki ranged between6.1 to 8.0. The lowest score was observed in T_1 (6.1) and T_3 (6.1) whereas highest score was observed in T_2 (8.0). The score for body and texture in T_1 and T_3 is very low it might be due to less and high level of addition of coagulant respectively. The reported value concurs with Sarani, *et al.,* (2014) who reported score for body and texture of Tofu prepared by using Withnia coagulans as a coagulant was 2.81 on 5 point hedonic scale. In another study Olorunnisomo and Adewumi (2016) they were assert that Cheese made from Lime and Mango juice as coagulants in soft cheese having score of 6.2 and 7.6 respectively for texture. Same result validate by Rana, *et al.,* (2017a) they were unearthed that cottage cheese prepared from buffalo milk with different levels of papaya latex body and texture of cheese in range from 23.67 to 28.00 which was also near or equal to cottage cheese prepared by using rennet it was 28.00. Ibrahim, *et al.,* (2019) produced cheese from soymilk using some selected plant origin coagulants they declare texture score in between 7.35 to 7.55. The findings was in agreement with Kushwaha and Shukla (2019) they demonstrate that the highest score for body and texture in Kiwi fruit pulp Shrikhand (8.40) was obtained from the treatment T_2 followed by T_0 (6.40), T_1 (6.20). The minimum score (6.00) was obtained in T_3. There were significant differences among the treatments. Soliman and Shehata (2019) were prepared yogurt (fermented camel's milk) fortified with kiwi or Avocado fruits they found that body and texture score was in between 30.75 to 33.25 as compared to control 30.50. Jesmin, *et al.,* (2021) also in support of result obtained.

From the table it is observed that the mean score for taste of the Kiwi fruit Channa Murki ranged between6.7 to 8.7. The lowest score was observed in T_1 (6.7) and T_3 (6.7) whereas highest score was observed in T_2 (8.7). Score for taste increased as the rate of coagulant increased up to T_2 sample. But again it is decreased; it might be due to high level of addition of coagulant. Taste score found in this study was in agreement with the findings of Olorunnisomo and Adewumi (2016) that in soft cheese made from fresh milk or reconstituted milk by using Lime and Mango Juice as coagulants taste of cheese was between 5.8 to 7.6 as compared to control it was 7.4. The result revealed by Ibrahim, *et al.,* (2019) they discovered the taste of cheese produced from soymilk by using some selected natural coagulants from 7.35 to 7.60. Kushwaha and Shukla (2019) also reported same findings while studying Kiwi shrikhand prepared by using kiwi fruit pulp, highest score of flavor and taste obtained from T_2 (8.20) followed the treatment by T_1 (6.20), T_0 (6.60). The minimum score was obtained in T_3 (6.20). Present investigation corroborates with that of Ingale, *et al.,* (2020) in their investigation they reported that mean score of taste for the treatments T_1, T_2, T_3 and T_4 were 6.63, 8.00, 8.13 and 7.53 in Kiwi fruit whey beverage respectively. The treatment T_2, T_3 and T_4 was significantly superior over treatment T_1 (control). From these observations it was clearly indicated that the highest liking was towards the treatments T_3.

From the table it is observed that the overall acceptability for treatment T_0, T_1, T_2 and T_3 was 7.5, 6.4, 8.5 and 6.5 respectively. It was clear from mean value that treatment T_2 which scored the highest score but treatment T_1 and T_3 is very low it might be due to less and high level of addition of coagulant respectively. The overall acceptability score indicate collectively all the sensory scores. The mean of total sensory score indicate the overall acceptability of Kiwi fruit Channa Murki. Overall acceptability result found in this study was in agreement with Puglisi, *et al.,* (2014) observed that the preliminary evaluation of the mozzarella cheese's overall acceptability was very high especially in respect to the flavor considered by

all the tasters to be comprised between good and very good. Sarani, *et al.,* (2014) prepared tofu by using Withania coagulans as a coagulant; they detected that overall acceptability score of tofu 2.44 as compared to 2.28 of calcium sulphate tofu. Olorunnisomo and Adewumi (2016) spotted in soft cheese made from fresh and reconstituted milk prepared by using Lime and Mango as a coagulant overall acceptability score in between 6.6 to 7.1. In the study Rana, *et al.,* (2017a) native that cottage cheese prepared from buffalo milk with different levels of papaya latex overall acceptability of cottage cheese range from 77.67 to 91.67 which was more than rennet cheese i.e. 91.18.The results obtained were in consistent with Sharma and Vaidya (2018) they demonstrate that the cottage cheese prepared with partially purified kiwi fruit enzyme scored highest for overall acceptability compared to cottage cheese prepared with rennet because kiwi fruit cheese exhibited softer texture and higher creaminess scores as compared with calf rennet cheese. Sharma, *et al*.,(2018) were validate that evaluators had given higher scores for overall acceptability of cottage cheese produced with Kiwifruit enzyme compared to reference (animal rennet) cheese. There was decrease in acceptance of product by the evaluators with the advancement of storage period. Our results also coincide with Ibrahim, *et al.,* (2019) they were detected overall acceptability of cheese produced from soymilk by using some selected natural coagulants in range of 7.30 to 8.25. Soliman and Shehata (2019) prepared yogurt (fermented camel's milk) fortified with kiwi or Avocado fruits they also found that overall score was in between 87.25 to 89.25 as compared to control 85.50. Ingale, *et al.,* (2020) prepared fruit based channa whey beverage using Kiwi fruit extract observed that mean score for overall acceptability of whey beverage for treatment T_1, T_2 T_3 and T_4 were 7.03, 7.66, 7.94 and 7.60 respectively. The treatment T_3 had comparatively highest mean overall score than treatment T_2 and T_4. The treatment T_1 had least mean overall scores. Pathrikar, *et al.,* (2021) also hold up to above result, they found that increase in overall acceptability with increase in kiwi fruit pulp.

CONCLUSION

From the present investigation it is cleared that all samples were satisfactory in terms of organoleptic score, though Channa Murki sample T_2 obtained highest score in terms of colour and appearance, flavor, body and texture, taste and overall acceptability. Upon sensory evaluation of all the parameters it may be concluded that Kiwi fruit juice can be successfully used as a natural coagulant in preparation of Channa based sweetmeats on industrial scale.

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