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Effect of selected herbal preservatives and their combinations on physico-chemical properties of herbal paneer

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Abstract
The present investigation entitled "effect of herbal preservatives on quality of paneer prepared from cow milk" was carried out in the Department of Animal Husbandry and Dairy Science, Dr. PDKV, Akola. The study was planned to prepared herbal paneer the herbal preservatives *viz*; ginger, cardamom and turmeric powder were used in paneer. The herbal preservatives was incorporated in the product at the rate of 0.0 (control), 0.8%, 1%,1.5%, 2% ginger powder, 0.2%,0.4%,0.6%,0.8% cardamom powder and 0.2%, 0.4%, 0.6%, 0.8% turmeric powder by weight of yield of paneer. The chemical analysis was done to pre-storage on the day of preparation that the average moisture 53.27 to 54.03 and pH content 5.46 to 5.57 values of T_1 to T_8. The highest values of total solids (46.73), fat (24.00), protein (16.28), acidity (0.49), were found in T_1 with control. While the lowest values of total solids (45.97), fat (23.60), protein (16.12), ash (0.64), and acidity (0.45) were found in T_8 which indicated a decreasing trend with increase in the level of ginger, cardamom turmeric powder and their combinations.

Keywords: Herbal paneer, ginger, cardamom, turmeric, physic-chemical properties

Introduction
Milk has long been recognized as almost complete ideal food in nature. It supplies fat and lactose for energy, proteins and vitamins for body building and health and minerals for bone formation. Milk contains all above nutrient in an easily digestible and assumable from, so it is regarded as most ideal complete food (Bhadekar *et al*. 2008) [5]. India is the largest milk producer in the world. This status has maintained since nineties. India is world's largest producer of milk, producing 198.4 million tons per annum, per capita availability 407g per day (http://economictimes.indiatimes.com, 2020-2021). India's export of dairy products was 39,397.62 metric tons (MT) worth of Rs. 910.44 crores/136.06 united states dollar (USD) millions during the year 2016-17 (Anonymous, 2017) [3].
Paneer represents a South Asian variety of soft cheese prepared by acid and heat coagulated of milk. It is popular throughout South Asia and used in the preparations of several culinary preparations and snacks. It is a rich source of high quality animal protein, fat, minerals and vitamins. Due to availability of different types of milk and variation in milk composition, various techniques have been developed for the production of paneer as per the requirements of the consumers with appreciable improvement in the yield and other quality characteristics (Khan and Pal 2011) [11] According to the PFA (2010), paneer means product obtained from cow or buffalo milk or combination there of, by precipitation with sour milk, lactic acid or citric acid. It shall contain not more than 70 percent moisture and the fat content should not less than 50 percent express on dry matter. Paneer is of great value in diet, especially in the Indian vegetarian context, because it contains a fairly high level of fat and proteins as well as some minerals, especially calcium and phosphorous. It is also good source of fat soluble vitamins A and D.
Ginger (*zingiber officinale* Roscoe) is a well-known and widely use spice and condiment, epically in Asia. The potential health benefits on ginger with special reference to photochemical composition and physiological benefits such as anticancer, antimicrobial, antioxidant, hypoglycemic, anti-inflammatory, blood pressure lowering, antiplatelet. Cardamom belong to the family of Zingiberaceae, is obtained from the seed of Elettaria cardamomum maton and it is mostly cultivated in southern India. It is rich in vitamin, thiamine, riboflavin, nicin, vitamin B6, zinc, copper; iron, sodium, manganese, potassium, calcium, magnesium, phosphorus, respectively.

Turmeric is a medicinal plant that botanically belongs to Zingiberacea family. The curcumin contain vitamins or vitamin precursor which produce vitamin C, beta – carotene as well as polyphenol coupled with fatty acid and essential oil. Turmeric has been used traditionally as household remedy in curing various diseases such as anorexia, cough, rheumatism and intestine disorder. (Ikpeama *et al*., 2014) [6].

Materials and Methods

The material used and methods adopted during the course of this investigation are given in this chapter under the appropriate heads.

Experimental materials

The following ingredient was used for the research work.

Cow milk

In this investigation cow milk was used for conducting the experimental trials. The fresh, clean cow milk was procured from livestock instructional farm, Department of Animal Husbandry and Dairy Science, Dr. P.D.K.V., Akola.

Citric acid

Citric acid was procured from local market of Akola city, used as per requirement.

Ginger, Cardamom and Turmeric

Good quality Ginger, Cardamom and Turmeric was purchased from the local market of Akola city.

Methodology

Technique for preparation of Herbal paneer

The Herbal paneer was prepared from cow milk as per the method described Vishweshwaraiah and Anantakrishnan, (1986) [4] with slight modification for addition of different herbs.

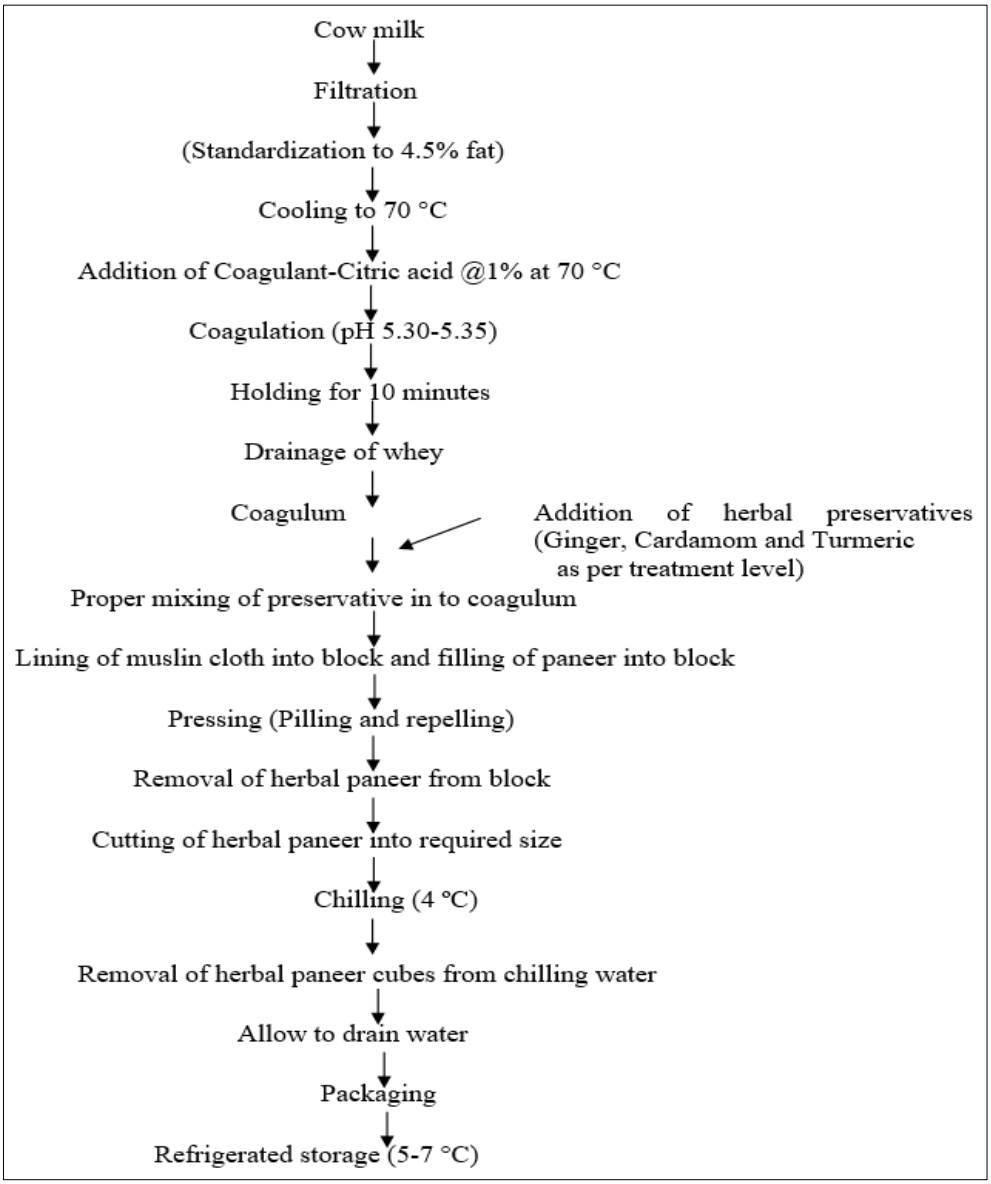

Fig 1: Technique for preparation of Herbal paneer

Evaluation of physico-chemical properties of herbal paneer

The herbal paneer was analyzed for moisture, pH, titratable acidity, fat, total solids and protein contents. The moisture content of paneer was determined by gravimetric method described in IS: 10484 (1983). The fat content was determined by using standard Gerber method as described in IS: 1224 (Part I), 1977. The total solids content was

determined by gravimetric method as per IS: 1479 (part- II), 1961.The protein content was determined by estimating the per cent nitrogen by micro kjeldhal method as recommended in IS: 1479 (Part II), 1961. The acidity of paneer was determined by using method given in IS: 10484 (1983). The pH was determined using the EC digital pH meter (single electrode) as per IS: 1479 (part II), 1961.

Result and Discussion

Physico-chemical analysis of herbal paneer

The requisite samples of herbal paneer with different treatments were subjected for proximate analysis *viz*., Moisture, titratable acidity, pH, fat, total solids, protein, SNF and ash.

Moisture (%)

The average moisture was 53.27 percent in cow milk paneer T_1 while moisture content of paneer blended with ginger, cardamom and turmeric powder and their combinations were 53.65, 53.28, 53.42, 53.43, 53.65, 53.84 and 54.03 per cent in treatments T_2, T_3, T_4, T_5, T_6, T_7 and T_8 respectively. The highest moisture content was noticed in T_8 (54.03%) i.e. paneer prepared with 1% ginger +0.6% cardamom + 0.4% turmeric powder, while the lowest moisture content was noticed in T_1 (53.27%) i.e. paneer prepared without preservatives. It indicated that the results obtained in present investigation were more or less in agreement with Kakad (2021) [10] stated that the increasing trend in moisture content was recorded as the rate of addition of the cinnamon and ginger powder is increased. These might may be due to more water holding capacity of both the powder.

Titratable acidity of paneer

The average acidity was 0.493 percent in cow milk paneer (T_1) while acidity content of paneer blended with ginger, cardamom and turmeric powder and their combinations were 0.490, 0.486, 0.483, 0.470, 0.473, 0.0.470 and 0.0.450 per cent in treatments (T_2), (T_3), (T_4), (T_5), (T_6), (T_7) and (T_8), respectively. Treatment T8 (0.450%) showed lowest acidity. than T_5, T_7, T_6, T_4, T_3, T_2 and T_1 treatments. The result observed in present investigation on titratable acidity was in close agreement with reported by Shweta Buch *et al*. (2014) [17] that decrease in titratable acidity of paneer with increase in level of turmeric.

Table 1: Effect of selected herbal preservatives and their combinations on physic-chemical properties of herbal paneer

Treatments	Chemical composition (%)							
	Moisture	Titratable Acidity	pH	Fat	Total solids	Protein	SNF	Ash
T1	53.27	0.493	5.460	24.00	46.73	16.28	22.73	1.71
T2	53.65	0.490	5.477	23.81	46.35	16.21	22.54	1.73
T3	53.28	0.486	5.483	23.86	46.72	16.24	22.86	1.72
T4	53.42	0.483	5.497	23.92	46.58	16.23	22.66	1.71
T5	53.43	0.470	5.510	23.71	46.57	16.17	22.86	1.75
T6	53.65	0.473	5.527	23.78	46.35	16.20	22.57	1.73
T7	53.84	0.470	5.563	23.97	46.16	16.16	22.19	1.75
T8	54.03	0.450	5.577	23.60	45.97	16.12	22.37	1.75
F test	Sig.	NS	NS	Sig.	Sig.	Sig.	Sig.	Sig.
SE (M)±	0.025	0.009	0.032	0.026	0.019	0.014	0.019	0.005
CD at 5%	0.077	--	--	0.080	0.058	0.042	0.057	0.015

pH content of paneer

The average pH was 5.460 for cow milk paneer T_1 while blends of cow milk with different spices and their combinations pH was 5.477, 5.483, 5.497, 5.510, 5.527, 5.563 and 5.577 in T_2, T_3, T_4, T_5, T_6, T_7, T_8 treatments respectively. The effect of proportion of different spices and their combinations with cow milk for making paneer was observed non-significant. It was observed that the pH content showed gradual increase with the increase in level of ginger, cardamom and turmeric powder and their combinations. The highest pH content was noticed in T_8 (5.577) i.e. paneer prepared with1% ginger +0.6% cardamom+0.4% turmeric powder. While lowest pH content was observed in T_1 (5.460) i.e. in control paneer. It indicated that the results obtained in present investigation were more or less in agreement with Kakad (2021) [10] that the pH content showed gradual decrease with the increase in level of cinnamon, ginger powder and their combinations.

Fat content in paneer

The addition of spices and their combinations decreased the fat content of paneer. The result indicated that fat content was highest in paneer prepared without addition of spices (T_1). The decreasing trend of fat content in paneer might be due to the fact that the fat content of turmeric (5.10%) is higher than ginger 5.03%) and cardamom (2.40%), both values are much lower than plain paneer (24.00%). Similarly finding of Priya Mishra (2013) [15], there was proportionately decreased in the fat content of paneer due to addition of different spices.

Total solids content of paneer

The total solids content showed gradual decreased with the increase in level of ginger, cardamom and turmeric powder and their combinations. The lowest total solids content was noticed in T_8 (45.97%) i.e. paneer prepared with 1 per cent ginger + 0.6% cardamom and 0.4% turmeric powder, while highest total solids content was observed in T_1 (46.73%) i.e. paneer prepared without preservatives. The results of present investigation are in close agreement with Kakad (2021) [10] concluded that the total solids content showed gradual decrease with increase in level of cinnamon powder, ginger powder and their combinations.

Protein content in paneer

It is indicated that, addition of ginger, cardamom and turmeric powder had significantly affected the protein content of paneer. It was observed that addition of ginger, cardamom and turmeric powder decreased the protein content of paneer. The gradually decreasing trend of protein content of paneer can be attributed to the fact that the protein content of ginger, cardamom and turmeric is lower 7.88,10.60 and 6.30 per cent) than that of plain paneer (16.28 per cent). The above result was in agreement with Richa Badola *et al*. (2018) [16] observed that the protein content of paneer is slightly decreased with

the addition of black pepper and cardamom. These findings are agreeable with the findings of present study.

Solid not fat content of paneer

The addition of ginger, cardamom and turmeric powder and their combinations in the preparation of paneer significantly changes the solid not fat content. The average solid not fat content was 22.73 percent in cow milk paneer (T_1) while solid not fat content of paneer blended with ginger, cardamom and turmeric powder and their combinations were 22.54, 22.86, 22.66, 22.86, 22.57, 22.19 and 22.37 per cent in treatments (T_2), (T_3), (T_4), (T_5), (T_6), (T_7) and (T_8) respectively. Treatment T_3 and T_5 (22.86%) showed highest solid not fat content.

Ash content of paneer

The proportion of ginger powder, cardamom powder and turmeric powder increased; the ash per cent shows gradual increase in paneer. The increasing trend of ash per cent in paneer was more in cardamom (5.30.0%) and ginger (4.00%) than the turmeric powder (2.80%), while the ash content in paneer is (1.71%). The results of present study was in agreement with Mrunali Mhatre (2018) [18] concluded that ash content of paneer increased gradually with addition of ginger juice.

Conclusion

Herbs in dairy products not only serve a functional food, but also as a natural preservatives that can replace synthetic preservatives that have been linked to negative human health effects. Herbal paneer was developed using herbal preservatives such as ginger, cardamom and turmeric. The incorporation of herbal preservatives was during coagulation temperature of milk sample. The herbal preservative enhanced has enhanced mouth feel and taste of the paneer sample. Paneer prepared with incorporation of 0.4% turmeric powder and 0.6% cardamom powder (T_6) found superior over the rest of the treatments. Effect of different spices levels and their combinations effects on chemical composition of paneer the effects related that fat, protein, acidity and total solids content in paneer was numerically decreased whereas moisture, ash and pH content was increased with increase in level of ginger, turmeric and cardamom powder and their combinations.

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