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Review Article

POTENTIAL APPLICATION OF MILK AND MILK PRODUCTS AS CARRIER FOR HERBS AND SPICES: A REVIEW

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Herbs and spices generally cotain a variety of active phytochemicals including the flavonoids, terpenoids, lignans, sulfides, polyphenols, carotenoids, coumarins, saponins, plants sterols, curcumins and phthalides have been identified. These phytochemicals have been shown to have several medicinal benefits. There are several ways in which the medicinal benefits of herbs could be conveyed via certain foods as carriers. Milk is one such carrier that has been effectively used to deliver phytochemicals for targeted health benefits in the traditional Indian system of medical science. Addition of herbs or its extracts to milk and subsequent processing treatments, however, poses a definite challenge as possibilities exist for varying degree of interactions among the major and minor biomolecules of milk and bioactive compounds in herbs. Such interactions could have beneficial effect but at times it may also lead to certain practical difficulties if they modify properties of the foods. There are evidences to suggest that addition of polyphenols (mainly phenol) from certain herbs into milk increased antioxidative (free radical scavenging) stability, heat stability, alcohol stability but reduced non-enzymatic browning, RCT (Rennet coagulation time), astringency, etc. These modifications in properties of the milk system are of great commercial significance as it may alter processing parameters for the manufacture of products significantly. In present review we have discussed the potential of milk and milk products to act as carrier for nutraceuticals.

Keywords: Herbs, Milk, Phytochemicals, Polyphenols

INTRODUCTION

Food safety is a fundamental concern for both consumers and food producers alike. Despite the high degree of awareness of food preservation methods there is increasing occurrence of disease outbreaks caused by pathogenic and spoilage microorganisms in foods (Meng and Doyle, 1998). Currently some ready meal

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manufacturers add synthetic antimicrobial agents such nitrates, nitrites, benzoates to inhibit the growth of food spoilage and food pathogenic microorganisms. However, the uncontrolled use of chemical preservatives over the years has led to emergence of microbial resistance to classic antimicrobial agents which has become a major health concern (Kiessling *et al*., 2002). Consumer awareness and concern that synthetic chemical additives may have some toxic or even carcinogenic effects, has increased the demand for high-quality, minimally processed foods with extended shelf-life, preferably free from or with a reduced level of added chemical antimicrobial agents. Recently there has also been an observed trend towards reducing salt levels in ready meals as a result of the proven association between excessive sodium intake, the development of hypertension and increased risk of cardiovascular disease. Therefore, there is growing interest in using natural antimicrobial compounds, including extracts of herbs and spices, as salt replacers or alternatives to synthetic compounds for food preservation (Smid and Gorris, 1999). Plants, including herbs and spices, contain products of secondary metabolism such as phenolics, phenolic acids, quinones, flavonoids, tannins (Lai and Roy, 2004). Many of these phytochemicals are rich sources of antioxidants and provide defense mechanisms to plants against predation by infectious organisms and insects. A number of studies have reported a high correlation between antimicrobial efficacy and the level of phenolic components present in certain herb and spice preparations. Indeed, compounds such as eugenol, carvacrol and carnosic acid present in clove, oregano and rosemary respectively, have been identified as being responsible for antimicrobial activity. In general, crude extracts of herbs and spices are mixtures of several or even dozens of phytochemicals, with the major bioactive compounds constituting up to 85%, while other components are found at trace levels (Burt, 2004; and Lai and Roy, 2004). These bioactive compounds may involve multiple modes of antimicrobial action (Lambert *et al.*, 2001) including degradation of the cell wall, disruption of the cytoplasmic membrane, leakage of cellular components, alteration of fatty acid and phospholipid constituents, changes in the synthesis of DNA and RNA and destruction of protein translocation (Shan *et al.*, 2007). Hence it is possible that combining spice and herb extracts could lead to synergistic antimicrobial effects against both food spoilage and pathogenic microorganisms. Information on the occurrence of synergy in herb and spice extracts is slowly emerging, and some combinations of herbal extracts have been reported to display stronger inhibitory effects on food-borne bacteria than when used alone. Recently, there has been considerable emphasis on studies involving essential oils of spices as a means of inhibiting the growth of microbes. However, in the manufacture of ready meals there is limited research on the inhibitory effect of different commercial spice extracts including oleoresins and aqueous resins of herbs and spices. Many studies have concentrated exclusively on antimicrobial effects of one or few herb or spice extracts only. While these data are useful, this information is difficult to compare directly due to a number of factors, such as variability in composition or content of active agents between plants due to origin from various geographical regions, harvesting seasons, growth and drying conditions, or using plant material of different maturity (McGimpsey, Douglas *et al.*, 1994; and Cosentino *et al.,* 1999). Other factors which

influence the outcome of antimicrobial testing involve differences in experimental design including inoculum size, growth phase, strain susceptibility, culture medium used, etc. Hence there is a need to undertake a comprehensive study of antimicrobial activity of commercial herbs and spice preparations used in ready meal manufacture. Such a study should allow a direct comparison of data arising from the use of standardized microbiological methodologies together with new insights gained from emerging techniques such as flow cytometry (FCM). We have previously reported on microbiological status of commercial herbs and spices used in the manufacture of ready meal and subsequently we undertook this study in order to evaluate antimicrobial properties of concentrated extracts against selected food-borne bacteria for future potential application in reduced sodium ready meals. The main objectives of this study were to: (i) undertake an evaluation and comparison of antimicrobial activity of various extracts of a range of commercial herb and spice preparations, (ii) to determine total phenolic content of the most potent herb and spice extracts, and (iii) to determine whether any synergistic effects existed for various combinations of extracts used against selected food spoilage and pathogenic bacteria.

HERBS AND SPICES

There is no particular definition of spices, mostly because they are derived from different parts of the plants, such as cardamom from seed, bay leaf from leafs, clove from flower bud, pepper from fruit, cinnamon from bark or ginger from rhyzome. Furthermore, there is no a common method to classify spices. They can be clasiffied by their flavour and colour, i.e., hot (pepper), pungent (garlic), aromatic (cinnamon, clove), colouring (turmeric) and herbaceous (rosemary, sage), or according to their taste, such as sweet, spicy, sour, bitter and astringent.

In India, a significant amount of milk produced is utilized for traditional dairy products which have a huge domestic demand. However, in order to sustain and compete with the ever increasing functional food markt, Indian dairy industry should find ways to induce or improve functionality in traditional dairy products. Ayurved, the Indian traditional medicinal literature, has prescribed several ways in which the medicinal benefits of herbs could be conveyed via certain foods as carriers. More than 50 medicated ghee formulations prepared by incorporating different herbal preparations are reported in Ayurveda. Recently, Sawale *et al*. (20I2 and 2013) and Moharkar (2013) reported that addition of herbs namely Withania somnifera (Ashwagandha) and Pueraria tuberosa (Vidarikand) improved the therapeutic value of milk. Very little or no literature has been found regarding supplementation of herbs into other Indian dairy products, irz. traditional Indian dairy products to improve, their functionality. In the recent past, traditional dairy products have received special attention from R&D institutions. Research has been carried out to induce and/or to improve the functionality of many tradition al dairy products. The present manuscript depicts, the studies carried out to improve the functionality of traditional Indian dairy products by supplementing herbal bioactives.

APPLICATION OF HERBS IN TRADITIONAL MILK AND MILK PRODUCTS

Ghee

Herbs contain high amounts of phenolic compounds which posses antioxidant properties'.The natural antioxidant properties of

Table 1: The Scientific Name, Common Name, Uses and Antimicrobial Component of Herbs and Spices

Herbs and Spices	*Scientific Name*	Common Name	Parts Used	Uses	Antimicrobial Component
Basil	*Ocimum sanctum, Ocimum tenuiflorum*	Sri Tulsi, Krishna Tulsi	Whole plant	Cures fever, Heals respiratory conditions, Beats cancer, Dissolves kidney stone	Eugenol, Methyl eugenol and Caryophyllene
Aloe Vera	*Aloe Barbadensis Miller*	Aloe	Gel of lower leaf	Protecting skin, Effevtive on sun burn, Curing skin diseases (Eczema, Pruritus)	Anthraquinones
Mint	*Mentha arvensis*	Wild mint, Corn mint	Whole plant,Oil	Treating headaches, Alleviating mouth ulcers, Acts as blood cleanser	volatile oil, carvone, limonene, 1,8-cineole, trans-carveol, linarin, pulegone, menthol, menthene, menthenone
Rosemary	***Rosmarinus officinalis***	Rosemary	Leaves, Flowers, Essential oil	Acts as rubefacient to soothe painful ailments in gout, rheumatism and neuralgic conditions. Stimulate the hair-bulbs and help prevent premature baldness. Natural remedy for nervous headache, colds, and depression	phenolic anti-oxidant rosmarinic acid, volatile essential oils such as *cineol, camphene, borneol, bornyl acetate, a-pinene*
Clove	*Eugenia caryophyllata*	*Eugenia caryophyllata*	Buds, Stems, and Leaves	The symptomatic treatment of toothaches, Healing stomach ulcers. Treats topical fungal, ringworm infections. Clove oil inhibits gram-positive and gram-negative bacteria	eugenol (4-allyl-2-methoxyphenol). Gallic acid, sesquiterpenes, furfural, vanillin, and methyl-n-amyl ketone
Cinnamon	*Cinnamomum verum*	Cinnamon,cinnamomon, ceylon cinnamon, Chinese cinnamon,	Part of bark	Used to combat microorganisms, diarrhea and other GI disorders, and dysmenorrhea	65% to 80% cinnamaldehyde, other phenols and terpenes, including eugenol, trans-cinnamic acid, hydroxycinnamaldehyde, o-methoxycinnamaldehyde, cinnamyl alcohol and its acetate, limonene, α-terpineol, tannins, mucilage, oligomeric procyanidins, and trace amounts of coumarin
Nutmeg	*Myristica fragrans*	Nutmeg, mace	Fruit	Widely accepted as flavoring agents, are used in higher doses for their aphrodisiac and psychoactive properties	Myristicin, Elemicin, Eugenol, and Safrole
Oregano	*Origanum vulgare*	Mediterranean oregano, mountain mint, wild marjoram, winter marjoram, wintersweet	Leves	Treating an upset stomach and indigestion, headache, colic, and nervous complaints, as well as for coughs and other respiratory ailments. An infusion of the flowers has been used to prevent seasickness. The oil has been used externally in liniments and lotions and to ease toothache. It has also been used as an ant repellent	Oleanolic and ursolic acids, flavonoids and hydroquinones, caffeic, rosemarinic, and lithospermic acid, tannins, and phenolic glycosides. Phenolic compounds represent 71% of the total oil. The polar phenols thymol and carvacrol are responsible for many of the properties of the essential oil, as well as p-cymene and terpinene

herbs have made their use in the formulation of functional foods specifically targeted for people suffering from cardiovascular diseases. The antioxidant properties of herbs also led their use into fat rich dairy products for retarding auto-oxidation thereby prolonging the shelf-life.

Table 2: The Inhibitory Effects of Spices and Herbs

Spice/Herb	Microorganisms
Garlic	*Salmonella typhymurium, Escherichia coli, Staphylococcus aureus, Bacillus cereus, Bacillus subtilis,* mycotoxigenic *Aspergillus, Candida albicans*
Onion	*Aspergillus flavis, Aspergillus parasiticus*
Cinnamon	Mycotoxigenic *Aspergillus, Aspergillus parasiticus*
Cloves	Mycotoxigenic *Aspergillus*
Mustard	Mycotoxigenic *Aspergillus*
Allspice	Mycotoxigenic *Aspergillus*
Oregano	Mycotoxigenic *Aspergillus, Salmonella* spp.,
Rosemary	*Bacillus cereus, Staphylococcus aureus, Vibrio parahaemolyticus*
Bay leaf	*Clostridium botulinum*
Sage	*Bacillus cereus, Staphylococcus aureus, Vibrio parahaemolyticus*
Thyme	*Vibrio parahaemolyticus*

Table 3: Phenoloic Content of Different Herbs

Herbs Name	DPPH (mg AAE/gm)	Phenols (mg GAE/gm)
Oregano	209.1	91.4
Peppermint	203.8	89.6
Sage	60.6	24.3
Basil	55.5	20.3
Rosemary	44.7	-
Hyssop	43.5	20.1

Moreover, it was found that the artificial antioxidants, like BHT (butylated hydroxytoluene) or BHA (butylated hydroxyanislie) are not safe for human consumption (suspected to have carcinogenic activity). On the other hand, increasing sensitivity of consumers to synthetic ingredients as well as their increasing awareness about the effect of diet on their health contributed to the increasing trend of using natural additives like herbal extracts for the stabilization of fat rich dairy foods like ghee, butter oil, butter, etc. Sage (Salvia offficinalis) and Rosemary (Rosmarinus officinalis) extracts are the most widely used for this purpose (Ozcan, 2003). These extracts have antioxidant activity many times stronger than synthetic antioxidants like BHA or BHT (Estevez *et al*., 2007). Milk fat, particularly ghee has the characteristic to absorb all the medicinal999 properties of the herbs with which it is fortified without losing its own attributes. About 60 medicated ghee preparations used for the treatment of various diseases 'were reported in Ayurvedic literature. Recently, Arjuna ghee was developed at NDRI, Karnal by incorporating functional attributes of Terminalia arjuna for providing beneficial effects against cardiovascular diseases. This product was more stable to oxidative deterioration as compared to control ghee . Unlike medicated ghee preparations, Arjuna ghee can be replaced with normal ghee in the daily diet. Pawar *et al.* (2012) had successfully increased the oxidative stability of ghee by incorporating the alcoholic and aqueous extracts of Satavari herb.

Research evidence supporting the health benefits of herbal ghee preparations is scanty. In a clinical study, reported that oral ingestion of vasa ghee was beneficial in reducing the risk of asthma. There was marked improvement rn 92.59% cases within 21 days of study period. HPTLC studies have shown that vasicinone, an anti-asthamine agent present in Adhatoda vasica was responsible for anti-asthamine effects of vasa ghee. The

Table 4: Studies Related to Antioxidant Effect of Herbal Supplemented Ghee

Type of Ghee	Herbs Used	Synthetic Antioxidant Compared with Herb	References
Sheep Ghee	Rosemary *(Rosmarinus officinalis)*	Mixture BHA and BHT(1:1)	Amr, 1990
Cow ghee	*Shatavari (Asparagus racemosus)*	BHT	Pawar *et al.* (2012)
Cow ghee	*Vidarikand (Pueraria tuberosa), Shatavari (Asparagus racemosus) and Ashwagandha (Withania somnifera)*	BHA	Pawar *et al.* (2014)

authors have also reported that vsasa ghee consumption also had an additional benefit in reducing serum cholesterol level by 30.16%. Pharmaco clinical studies showed that Panchtikta ghee (ghrit) prepared with different methods was beneficial in reducing the cardiovascular diseases. A thorough study on the bioactive components of herbs and effect of different processing conditions on them during ghee preparation could lead us to diversify the usage of ghee in a well-organized in commercial way.

Dahi and Lassi

Aloe vera., a herb of the Liliaceae family has a long and illustrious history dating from biblical times and is highly ranked as an all-purpose herbal plant. Scientific investigations on Aloe vera have gained more attention over the last several decades due to its reputable medicinal properties (Hussian *et al.,* In Press).

Lassi, a ready-to-serve traditional fermented milk beverage has got wide popularity in India as well as in overseas markets. Sweet 'lassi with its characteristic sweet and slightly sour taste can be used as a food carrier for herbal bioactives like Aloe vera juice. Hussain *et al*.(2011) has developed functional lassi using the herb Aloe vera (Aloe barbadensis Miller). A culture combination containing NCDC 60 and Lactobacillus paracasei ssp paracasei L. at an inoculum rate of 2 percent was used for functional lassi preparation. Animal study of functional lassi revealed that it has better immunoprotective effects compared to control lassi. Recently, Pal *et al.* (2012) also supplemented Aloe vera juice into lassl to enhance its health benefits. The authors have reported that supplementation of Aloe vera juice at the level of 15% into lassi has obtained optimum sensory scores. Herbal supplemented probiotic dahi using the herb Aloe barbadensis Miller was also prepared by Hussain *et al*. (2012). The authors have reported that Aloe verA supplementation has supported the growth of probiotic strain Lactobacillas paracasei ssp paracasei L in dahi. The probiotic viability was more than 7 log cf/lml during 12 days storage period.

Sandesh

Sandesh is a very popular haet desiccated product of coagulated milk protein mass called chhana.A large proportion of chhana produced in Kolkata is converted into sandesb. Incorporation of herbs into these kinds of highly sought dairy products will improve the health status of the consumers. Bandyopadhyay *et al.* (2007), incorporated herbs such as turmeric (Curcuma longa L.), coriander (Coriandrum sativum L.), curry leaf (Murraya koenigi; L.), spinach (Spinacia

oleracea) and aonla (Emblica officinalis) separately as a paste, at the 10% level into Sandesh to induce the antioxidant properties into the product. The antioxidative levels of these herbs were compared with the synthetic antioxidants TBHQ and BHA: BHT (1:1) at 100 and 200 mg/kg levels. The authors have reported that the total antioxidative status oi herbal sandesh was lower than samples with TBHQ but similar to those with 200 mg/kg BHA: BHT (1:1). The authors have also reported that the use of coriander herb with its antimicrobial and antioxidant properties increased the shef life of herbal sandesh up to t days and 30 days when stored at (30±1) ^{0}C and (7±1 ^{0}C), respectively when compared with the remaining sample.

Shrikhand

Shrikhand is a semi-soft, sweetish-sour, whole milk product prepared from lactic fermented curd .Being a sweetish-sour and semi soft product it can easily harbor herbs/herbal extracts without undergoing significant quality changes. Landge *et al.* (2011) successfully prepared shrikhand using ashwagandha herb powder as an additive. The authors have found that addition of 0.5% ashwagandha powder to shrikhand has improved the orginoleptic quality and the product remained acceptable up to 52 days at refrigerated temperatures.

Aloe Vera Herbal Ice Creams

Aloe vera ice cream prepared with various ingredients to have the final ice cream should contain 10% fat, 0.5% stabilizer and emulsifiers, 36% total solids and 15% sugar. Various ingredients Viz. milk (buffalo milk), skim milk powder, butter and aloe vera added in such a way to obtain the final ice cream should contains minimum of 10% milk fat and 36% total solids. The inclusion of Aloe vera pulp at 20% level had maximum score of 92.89. The bitter taste of the Aloe vera pulp had masked by the addition of the vanilla flavour and sugar. The production of this dairy herbal ice cream product is beneficial for diabetic patients with natural ingredients.

Low-Fat Set Aloe Vera Fortified Probiotic Yoghurt

The reconstituted skim milk for low-fat Aloe vera fortified set yoghurt was prepared by using 16.57 g skim milk powder in Aloe vera juice and water blend, 25 and 75 ml respectively. The prepared reconstituted skim milk was heated or pasteurized properly at 82-85 ºC for 12-15 min. The reconstituted skim milk was cooled to 45 ºC. Inoculation was done using 3.46% (v/v) of Streptococcus salivarius subsp. thermophilus and Lactobacillus delbrueckii subsp. Bulgaricus, Lactobacillus acidophilus and Bifidobacterium bifidum cultures, then kept for incubation at 37 ºC for 8 h. After incubation the samples were kept under refrigerated condition at 4 ºC. (Panesar *et al.,* 2011).

Aloe Vera Enriched Flavour Milk

Flavoured milk is a beverage in which sugar, flavouring and colouring agents are added and it contains all the constituents of milk. It is a good source of protein, carbohydrate and minerals. It provides energy and water to digest the food, regulate body temperature and prevent dehydration. A studay reveales preparation of the herbal aloe vera enriched flavour milk by incorporating aloe vera pulp extract at 5% levels to flavoured milk. Further, dietetic herbal (Aloe vera enriched) flavoured milk up to 75% replacement of sugar with aspartame and 100% replacement of sugar with sucralose are concluded as the best based on the sensory evaluation.

Aloe Gel Enriched Dahi

The milk (fat 3.6%, protein 3.2% and carbohydrate 4.6%) used for preparation of aloe vera enriched dahi. The homogenized milk was heated at 85-90 ºC for 5 minutes and cooled to 45 ºC. Spray dried Aloe vera gel powder was added at 0.15% level and then inoculated with 10% standard dahi starter (Hatsun brand, fat 3.1%, protein 3.3% and carbohydrate 4.4%). The inoculated milk was incubated at 45 ºC till the dahi was set (Ramachandran and Srividya, 2014). Aloe gel supplementation in the form of curd to be helpful in lowering the glycemic response to wheat based meal. It further indicates the potential of using Aloe gel as a hypoglycaemic ingredient in dairy products. Low glycemic foods incorporated Aloe gel nutraceuticals could also result in additional functional benefits.

Papaya-Aloe Vera Ready to Serve (RTS) Beverage

The freshly ripe papaya fruits are collected and washed thoroughly in running water. Fruits are peeled with the help of stainless steel knife, cut into two half and seeds were removed manually. The pulp is grind in mixer grinder and filtered through double muslin cloth and enzymatically treated with the 0.65% pectinase enzyme concentration for 230 minute to obtain papaya juice which is stored in refrigerated temperature until further use. Blended RTS beverages are prepared using 12% TSS, 0.3% acidity and 10% blended juices of blending ratio of 90% papaya juice + 10% Aloe vera juice (Boghani *et al*., 2012) described in Figure 4. The RTS beverage with above blending ratio (on the basis of sensorial evaluation) are packed in glass bottles and kept at refrigerated storage temperature. The storage studies revealed that blended papaya aloe vera gel could be successfully stored for the period of 3 months without significant in chemical and organoleptic qualities (Boghani *et al*., 2012).

Aloe Vera Chocolate

The cocoa powder is mixed with skim milk powder. Sugar is dissolved in water till complete saturation in a boiling pan and the mixture is heated with occasional stirring. Aloe vera juice is then added to the mixture. Once the mixture attains 110 ºC, the cocoa powder and skimmed milk powder are added after then, butter and flavour are added. After 20 minutes the whole mass is oared into a frame on an oiled slab, and then it is cut into appropriate size and wrapped in waxed paper. Maximum sensory analysis of colour, taste, aroma and texture in the aloe vera chocolate production is obtained from ingredients at the optimized process conditions. The optimum condition for taste is sugar 1000 g, skim milk powder 1019 g, cocoa powder 252.5 g and aloe vera juice 82.5 ml.

Therapeutic ready to serve (RTS) beverage made from blend of aloe vera, aonla and ginger juice:

Blended therapeutic RTS beverages were prepared using 15% of blended juice extracts of aloe vera, aonla fruit and ginger, 15% of Total Soluble Solid (TSS) and 0.3% of acidity at the time of preparation in all the formulated blends. The blended juice ratio of aloe vera, aonla fruit and ginger juices 70:15:15 respectively with 15% of sugar, 0.3% of acidity as % of anhydrous citric acid 50 ppm of KMS and 50 ppm of sodium sorbet in one litre of distilled water.

Whey Based Mango Beverage

Whey based Mango Beverage (WMB), whey powder based mango beverage dry mix (WPMB), and whey protein concentrate based mango beverage dry mix (WPCMB) were prepared with

different combinations. Based upon the sensory analysis, one formulation for each beverage was replicated thrice. The storability of the beverage was studied at 4 ± 1 ºC for 30 days. The storage study showed that there is an increasing trend in the acidity and a decreasing trend in the pH and but fat, protein and total sugar had a non significant effect during storage for all the three samples.

Total viable count, yeast and mold count, coliform count was analysed using standard methods. The Total Viable Counts (TVC) was ranging from 2.38×10^4 to 2.60×10^4 cfu/mL in WMB, while it ranged from 2.40×10^4 to 2.30×10^4 and 2.55×10^4 to 2.45×10^4 in WPMB and WPCMB respectively. Yeast and mould count was found to be maximum in WPCMB samples. Faecal coliform count was found to be minimum in WMB and WPCMB, while non-faecal coliform was found to be higher in WPCMB. Overall acceptability of the product showed a decrease in case of WMB, while it showed a non significant effect on the other two samples.

Other Possible Uses of Herbs to Improve the Functionality of Indian Dairy Products

Most of the Indian traditional dairy products' contain high amount of moisture content besides harbouring valuable nutrients. The high moisture content of these dairy products favour the growth of microorganisms leading to their spoilage. Phenolic compounds of herbs are a good alternative for the synthetic antimicrobial agents used in the food industry. Phenolic compounds namely, ferulic acid, tea catechins, oleuropein, ellagic acid and p-coumaric acid have been reported to inhibit the growth of pathogenic bacteria (Salmonella enteritidis, Stapbylococcus aureus, Listeria monocytogene) and fungi (Schaller *et al.*, 2000). These herbs with antimicrobial properties can be effectively utilized to control the growrh of unwanted/spoilage and pathogenic microbes in Indian dairy products. Oleuropein derived from olive tree has been reported to markedly inhibit the production of Aflatoxins (Bullerman and Gourma, 1987). This property of oleuropein could be advantageous in products like chhana and paneer where the growth of moulds leading to mycotoxins production may present health risk.

CONCLUSION

Herbs are considered as nature's gift to human beings as they can prevent and cure many illnesses. Herbs harbor a wide variety of functional components which can perform a wide range of biological functionalities. In recent past, research regarding functionality of herbal components, toxicology and their use in food products has attracted interest. Traditional Indian dairy products are popular throughout the country and are well liked by all age groups. Hence, they can be used as carriers for herbs to satisfy the needs of ever increasing health conscious consumers. However, depending upon the concentration and type, the incorporation of herbs into food products may have certain undesirable effects on their sensory, physico-chemical and textural properties which in turn could affect their overall acceptability. Presently, the herbal ghee being marketed in the global market is mostly sold as medicine (medicinal ghee), which is associated with typical flavour, bitter or pungent tasre and a dark colour. Such therapeutic preparations are therefore not acceptable for routine use. Incorporation of these nutraceuticals into food systems may therefore call for technological modifications/alterations so that the sensory quality of the final product remains unaltered. Further, very limited information is available for ascertaining the residual levels of these functional components in

herbal food preparations. Interactions of herbal and food constituents on human health have to be studied thoroughly. More research should be directed towards the effect of processing conditions on the bioavailability of functional components in the herbs so that the processes will be designed in such a way that little or no damage will occur to the functional components during their incorporation into food matrix.

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