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RESEARCH ARTICLE

CHEMICAL ANALYSIS OF HERBAL PANEER

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ABSTRACT

The Present study investigate the biochemical analysis of herbal paneer prepared from Ginger, Rosemary and Thyme herbs , all three herbs were procured rom local area of Dehradun. Moisture, ash, pH, Titrable acidity and free fatty acids were performed in lab. The results were moisture content of paneer was found to be 51.8%, the ash content of paneer was found to be 1.43% Free Fatty Acid was found in paneer is 2.69%.

Keywords:

Paneer, Ginger, Thyme,
Rosemary, Titrable acidity.

INTRODUCTION

During victory over the White Revolution, India has been evidence an extra ordinary expansion in milk production during a period of ten years. That is the world biggest and successfully non segregated dairy development programme started in 1970s. India is the largest producer of milk in the world. In the year 2008, It has been exceeded to the information level to 104.8 million metric tonnes that must be 15% accounting of total production of milk in the world (Bhasin, 2009; NDDDB, 2009). In India, an observation of 5% milk is produced that must be changing into the paneer (ICMR, 2000; Chandan, 2007); in the year 2002-03, production structure must be 3,959 metric tonnes therefore in the year 2003-04, which expand to 4,496 metric tonnes (Joshi, 2007; Shrivastava and Goyal, 2007) showing the growth of 13% per year. In South Asian countries, Paneer is made using the coagulating agents like acid and heat. It is a non-melting, non-fermenting, non-renneted and unripened kind of cheese. The most famous South Asian dairy product, paneer is utilized into different varieties of snacks and culinary dishes and is also consumed in raw form. In modern hectic world, the wide utilization of paneer is taking place. The largest acceptance is of deep fried paneer that has excellent utilization especially in making of paneer chunks and snacks like pakoras (Aneja, 2007). An excellence source of protein, paneer is accessible at very cheap price and is a major animal protein consumed by vegetarians. Due to presence of protein in higher amount and its higher digestibility, the protein in the paneer ranges in between 80-86% (Shrivastava and Goyal, 2007). Besides, it is the most precious source of vitamin, mineral, calcium, fat and phosphorous. The shelf life of paneer can be improved by refrigeration. Being a gorgeous source of protein paneer has been given more importance among all dairy products.

In most of the snacks and dishes paneer is used as a base material (Mathur *et al.*, 1991). It is only possible to sustain or conserve milk solid in form of paneer. Paneer consists of total milk casein, some amount of denatured whey protein and all fats present in the milk. Paneer has the property of sticking together and forming a closed structure spongy body with mild taste and smooth texture (Kanawjia *et al.*, 1990). Food processing industry has been growing rapidly and dairy is one and only of the major parts of processing industries. According to the survey performed in 2006-07, production of milk is growing at a rate of 4 to 5 per cent per year. India is part of the international market in production of dairy products (Baxi, 1994). From the overall milk production, 50 per cent of milk is exploited to make dairy products such as ghee, dahi and paneer. Considerable amount of milk has been utilized to produce authentic dairy products. It has been estimated that out of total milk production of India only 1 per cent is converted into paneer. The yearly production is said to be 150 thousand tones (Aneja *et al.*, 2002). Due to increase in number of micro-organisms, contamination in paneer can be observed. Due to these micro-organisms the formation of greenish yellow sledge takes place over the surface of paneer and results in unpleasant flavour which contributes to the product's unsuitability (Sachdeva, S., and Singh, (1990)). Paneer is a simple means of storing and protecting precious milk solids and it can be delivered to the areas where the production of milk is in inadequate amount or the landscape is mighty for comfortably dispatching of milk usually during the changing of seasons. Paneer is easily spoiled and faces restricted shelf life largely due to presence of high moisture content. Few research reports describe that increase in shelf life is a very big difficulty for industrial production of paneer at a wider scale. When some food additives like brine solution, H₂O₂ solution, sorbic acid and potassium sorbate (Thakral, 1986) are added to the paneer, shelf life gets extended. Along with this, some chemicals like Niacin and Delvocid were also added and were observed to enhance the usable time period of paneer. All of

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these preservatives and chemicals are not used as they do not pass as additives in paneer in accordance to PFA rules 1995. Today, the consumer demand has been increasing for the food product with high usable time period and less chemicals. Use of chemical preservatives in large amount develops chances of disease in the consumer and toxicity takes place in the food product. Natural ingredients and herbs are used in terms of food safety of the food product. Herbs are utilized in food products and act as flavoring agents. They also contribute to the flavor, color and taste of the product. Herbs also help in extending the product's shelf-life and are used like a preservative as they have antioxidant, medicinal and preservative properties. Besides, some spices and herbs enhance the usable time period of product owing to their bactericidal and bacteriostatic activity. They also prevent the rancidity occur in the food materials due to the presence of antioxidants in them. Shelef (1984).

An indigenous product, paneer is a very much perishable milk product because its moisture content is high (Arora and Gupta, 1980). High production cost and short shelf life have greatly influenced the position of paneer in Indian market. At refrigeration temperature of 10°C, the freshness of the product was lost only after three days and the usable time period was observed to be six days without any deterioration in quality (Bhattacharya *et al.*, 1971). When stored at -13 or -32°C, acceptable flavor was observed even after 120 days. But when stored at room temperature it will not sustain for more than a day and is greatly due to growth of microorganisms which leads to the formation of greenish yellow sludge on the surface of paneer which is accompanied by discoloration and off-flavor (Kanawjia *et al.*, 1990) (Thakral, 1986). Those plant in which medicinal and aromatic preservative properties are present and also occurrence of essential oils and since Biblical times, extract has been recognised, while attempts to describe these properties in laboratory date back nearly to the beginning of 1900s (Hoffman and Evans, 1911). Zaika, (1988) studied that some studies have revealed the result on preservative action of herbs and their essential oils. Therefore, substitution of chemical preservatives with herbs and spices in food is becoming highly desirable in the traditional and novel foods. Farag *et al.*, (1990) deals with extends the safety of the food. Herbs could be used for the food safety as good and healthy substitutes to harmful additives. Souza *et al.*, (2005) studied the herbs and their derivatives for inhibitory activity and observed that they prevented the growth of fungi, yeasts, bacteria and stopped the synthesis of microbial toxins. This also means that herbs could be beneficial in food preservation as adjuvant antimicrobial compounds. Almeida *et al.*, (2000) studied the herbs and spices for their properties like antioxidants, preservative and medicinal properties. Currently, Spices and herbs are mainly used for enhancing the shelf life and food flavor. Shelef *et al.*, (1980) observed that in addition to providing flavor, several spices and herbs enhanced the usable time period of product due to their bactericidal and bacteriostatic activity and the occurrence of antioxidants which helps to avoid rancidity in the food material. Herbs have essential oils that are active against the different types of food borne molds and bacteria. (Aureli *et al.*, (1992)).

Ginger (*Zingiber officinale* Roscoe) is a herb and it is used like preservative and flavouring agent in food. The word "Singabera" comes from Sanskrit word that means of horn-shaped. Ginger also has medicinal property, aromatic property and preservative property. Ginger also known in the world by

other name like Black ginger, Geigibre, African ginger, Race ginger and Cochin ginger. Ginger has also over 25 varieties grown in the worldwide. Zingiber, Suprabha, ISR-Varada2, Suruchi, IISR Mahima, Surani, IISR Rejatha, Himagiri, Rio-de-Janerio, China and Nadia are some important cultivars grown outside the world (Shasikumar *et al.*, 2008). Byers, 1999, Branney, 2005 reported by Globba, Siphonochilus, Cantleya, Kaempferia and Roscoea are grown for medicinal and ornamental purpose. Ginger has phenolic compound like Gingerole and also have small amt. of tannins, alkaloids, saponins, carotenoids, steroids, flavonoids and cardiolides (Shirin Adel, 2010). Ginger has approximately 50% carbohydrate, 9% free amino acid and protein, 3-6% ash, 6-8% fatty acid and 3-6% crude fibre which depending on geography, variety and climatic condition (Leung, 1984, Tang, 1992). Ginger is also used as a medicinal plant due to their medicinal property and it has many important functions which beneficial to human body like improving function of body and also helps in toxin eliminates from the body (Nadkarni, 1976).

Thyme (*Thymus vulgaris*) was used from ancient time for medicinal, cosmetic and culinary purposes etc. and also used in food for enhancing flavour, taste and shelf-life due to rich in antioxidants, essential oil (thymol oil) etc. Many constituent present in thymol oil like carvacrol and phenol thymol, tannin, saponins, terpenoids, linalool, p-cy-mene and rosmarinic acid (Spiewak, R *et al.*, 2001; Van Den Broucke *et al.*, 1983; Van Den Broucke *et al.*, 1983). Antioxidant activity of the thymol oil against periodontopathic and cariogenic bacteria like streptococcus sobrinus, Porphyromonas gingivalis etc. formation and rapid effluence of intracellular components (Shapiro S. *et al.*, 1995). Rosemary (*Rosmarinus officinalis*) is also rich in antioxidants and also contains antibacterial property, antifungal property and anticancer agents etc. Rosemary is widely used in the world due to their medicinal property and also occurring natural antioxidants (Peng *et al.*, 2005). Essential oil of rosemary effects on bacterial activity which is responsible for food spoilage organisms were observed by Ouattara *et al.*, (1997). Rosemary contains many compounds and these compounds are isolated from rosemary which is present in it. It also occurs triterpenes, flavones, steroids and diterpenes. In rosemary, α -pinene, camphor, 1-8 cineole and bornyl acetate are the main compounds which responsible for antimicrobial activity (Daferera; Ziogas; Polissou; 2000; 2003; Pintore *et al.*, 2002).

MATERIAL AND METHODS

Materials

Collection of samples: Full cream milk (6% Fat & 9% SNF) was preferred for manufactured of paneer. Paneer was prepared in the Food Technology laboratory from buffalo milk purchased from different shops of local market of Premnagar, Dehradun, Uttarakhand.

Herbs: Herbs like Ginger (*Zingiber officinale* Roscoe), Rosemary (*Rosmarinus officinalis*) and Thyme (*Thymus vulgaris*) were collected from local market Dehradun and mixed in different ratio in paneer.

Chemicals: All the chemicals which have been used in preparation of paneer were of Analytical Grade (AR) and have been preferred from standardize companies. The reagents required for analysis were freshly prepared according to standard procedures.

Methodology

Analytical Methods

Moisture Content: Determination of moisture content was proceeded by the method recommended by (AOAC, 2000) 5gm of paneer sample was taken accurately in a petridish. The petridish was kept in oven to remove moisture at 105°C for 3-4 hours. After that cool it in desiccator for 10-15 minutes and then weigh. The loss of weight was used to calculate moisture content of sample.

$$\text{Moisture content (\%)} = \frac{W_1 - W_2}{W_1 - W} \times 100$$

Where,

W = weight of empty petridish in gram

W₁ = weight of petridish with sample before drying in gram

W₂ = weight of petridish with sample after drying in grams

Ash Content: Determination of ash content was proceeded by the method recommended by BIS (1981).

Take crucible and clean it properly and weigh. Accurate 5gm of paneer sample was taken in a dried crucible and then crucible was placed on hot plate for charring. Then put it into a muffle furnace at temperature 550°-600°C for 4 hours. All the organic elements are burn and it turns into white. After that transfer it to desiccator to cool and take weight.

Calculation of ash content:

$$\text{Total ash content (\%)} = \frac{W_1 - W_2}{W_1 - W} \times 100$$

Where,

W = weight of empty crucible in gram

W₁ = weight of crucible with sample in gram

W₂ = weight of crucible with sample after drying in gram

Fat Content: Estimation of fat content was done by Soxhlet's method (AOAC, 1995) from paneer sample. Take the weight of empty flask. 2gm of dried paneer sample remaining after moisture was taken. Put the sample into a thimble and then thimble was dropped into fat extraction tube of the Soxhlet apparatus. Attach the bottom of the extraction tube to a Soxhlet flask and then pour approx. 60ml or more petroleum ether through sample in a tube into the flask. Fat was estimated with petroleum ether and then petroleum ether was evaporated by using hot air oven. Dry at 100°C for 1 hour. Cool it and weigh. Calculate the percentage of fat by using this formula:

$$\text{Fat \%} = \frac{W_2 - W_1}{W_3} \times 100$$

Where,

W₁ = Wt. of empty round bottom flask

W₂ = Wt. of flask with extracted fat

W₃ = Wt. of the sample

Protein content: Estimation of protein content from the paneer sample was accomplished by Kjeldahl method as reported by Horwitz (1980). It is a three step process that is Digestion, Distillation and Titration. In digestion, take 2gm of paneer sample in a digestion tube and add digestion mixture (copper sulphate and potassium sulphate) and then add conc.

H₂SO₄. After complete digestion it turns into transparent green and blue colour. Cool the digest add distilled water and volume made up to 100ml. In distillation, take 10ml of sample and then add 30ml of 30% NaOH. Put it into distillation unit and ammonia gas is liberated and gets trapped into boric acid then boric acid turns into transparent greenish colour. In titration, take a burette fill with 0.1 Normality of HCL. Take boric acid in which ammonia gas is trapped in a beaker and then add few drops of mix indicator and titrate against 0.1 Normality of HCL.

Calculation of protein content:

$$\text{Protein \%} = 6.25 \times \text{Nitrogen \%}$$

pH: pH of diluted sample was measured by using handy pH meter.

Titrateable Acidity: Titrateable acidity was calculated by titration method by titrating sample against 0.1N NaOH using phenolphthalein as an indicator (IS: 10484, BIS (1983)). 2gm of paneer sample was taken and add 3ml of boiling water. Make the slurry by using pestle & mortar and then add few drops of phenolphthalein indicator. Titrate it against 0.1N of NaOH until pink colour appear.

$$\text{Titrateable Acidity} = \frac{\text{titer value} \times \text{acid factor} \times 100}{\text{Weight of sample taken for estimation}}$$

Free Fatty Acid (FFA): Estimation of FFA % in paneer sample was accomplished by method for cheese reported by Thomas (1954).

$$\text{FFA\% (oleic acid \%)} = \frac{2.82 \times T}{5 \times W}$$

Where,

T = Vol. of 0.02N NaOH (ml) required for titration,

W = taken wt. of sample (gm).

RESULT AND DISCUSSION

Moisture content The moisture content of paneer sample was found to be 51.8% and show in (Table 1). According to Desale *et al.*, (2009) paneer prepared from full cream milk (buffalo milk) the range of moisture content between 42.62 to 60.39%. While 51.50% of moisture content was found in paneer made from buffalo milk (6% fat) by Karadbhaje and Bhoyarkar (2010).

ASH Content: The ash content of paneer sample was found to 1.43% respectively (Table 1). Acc. To Chawla *et al.* (1987) the ash content was found to be 2.20 in paneer prepared from buffalo milk (4%).

Fat Content: The % of fat in paneer sample was found to be 22.76% respectively (Table 1). Desale *et al.*, (2009) described that the range of fat content from 16-28% in paneer. Kumar *et al.*, (2008) observed that fat% of paneer was found to be 27.97% prepared from buffalo milk (6% fat). According to Karadbhaje and Bhoyarkar (2010) the fat% was found 25.88% in paneer.

Protein Content: The protein% of paneer sample was found to be 16.51% respectively (Table 1). According to Desale *et al.*, (2009) the range of protein content in paneer was found 15.06 to 20.33%. Karadbhaje and Bhoyarkar (2010) stated that

protein content was found 20.75% in paneer prepared from buffalo milk (6% Fat).

pH: The pH of paneer sample was found to be 5.8 respectively (Table 1). Sunil Radhakrishnan observed that the range of pH in paneer from 5.7-6.0 prepared from 6% fat buffalo milk.

Titrateable Acidity: The titrateable acidity of paneer sample was found to be 0.41% respectively (Table 1). According to BIS specification, the range of titrateable acidity between 0.34 to 0.50%.

FFA (Free Fatty Acid): Free Fatty Acid was found in paneer to be 2.69 % respectively (Table 1). According to Gohian (1996) observed that the % of free fatty acid in paneer range from 0.583 to 2.250 in different types of paneer.

Table 1. Qualitative analysis result of paneer

S.No	Qualitative Property	Value
01	Moisture content	51.8%
02	Ash content	1.43%
03	Fat content	22.76%
04	Protein content	16.51%
05	pH	5.8
06	Titrateable acidity	0.41%
07	FFA	2.69%

Conclusion

The good source like protein of animal is paneer that must be accessible at very differently cheap price and it must be made into major protein of animal source which must be consumed by vegetarians people. The consumer demand is increasing of the food product due to its high usable time period and lack of chances of disease in the food product and the feasible effect of toxicity takes place in the food material due to the using of herbs. Herbs are used in preparation of paneer and it has also preservative property. Herbs have preservative properties and are also rich in antioxidants which prevent the spoilage of paneer. Paneer is a milk product and it is made by the use of coagulant agents like acid and heat. It must be prepared by non-melting, non-fermenting, and unripened kind of cheese. Paneer is a perishable product which spoils quickly within two to three days so that the quality of paneer is enhanced by the using of herbs and it also prevents from spoilage due to the growth of unwanted micro-organisms. Herbs also impart the flavour, taste and aroma etc. Herbs are beneficial to increase the usable time period of paneer or shelf-life. Herbs are popular for their properties like antioxidant, preservative and medicinal. Currently, herbs and spices are mainly used for enhancing the shelf life and extending food flavour rather than in addition to providing flavour, several spices and herbs enhance the usable time period of product due to bactericidal and bacteriostatic activity and due to the occurrence of antioxidants which help to prevent the rancidity in the food material.

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