ENHANCEMENT OF NUTRITIVE VALUE AND COLOUR OF PANEER (INDIAN COTTAGE CHEESE) USING *Clitoria ternatea* FLOWER

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ABSTRACT

The present study involves the enhancement of nutritive value and colour of *Paneer* (Indian cottage cheese) using *Clitoria ternatea* flower. *C.ternatea* flower is also commonly known as Butterfly Pea flower. It is a well-known food colorant especially in Thailand region .It possess antioxidant activity and have the essential nutrients such as protein, carbohydrates, vitamin A, etc. The flower extract contain protein and carbohydrates was determined by biochemical methods. The anti-oxidant property of *C.ternatea* flower was confirmed by DPPH (2, 2-diphenyl-1-picryl-hydrazyl-hydrate) assay. The coloured paneer was prepared and its physical properties was evaluated by sensory analysis and its nutritive value was determined by biochemical method. The prepared coloured paneer contain 22.67% of Fat, 3.45% of Vitamin A, 17.3% of protein and 2.45% of carbohydrates was evaluated. Normal paneer and coloured paneer was compared. Here 0.3% of protein, 0.25% of carbohydrates and 3.24% of vitamin A was enhanced using *Clitoria ternatea* flower.

Keywords: *Paneer* (Indian cottage cheese), *Clitoria ternatea*, anti-oxidant property, DPPH assay, protein, vitamins and carbohydrates.

1. INTRODUCTION

In India, about 5% of the milk production is converted into Paneer. Paneer is known as Indian cottage cheese, is an important product which is obtained by heat treating the cow or buffalo milk followed coagulation using suitable food acid such as lemon juice (citric acid), vinegar(glacial acetic acid), viz., Paneer has fairly high level of fat, protein, carbohydrates, vitamins and minerals . But the consumption of Paneer is quite low. Paneer have a white appearance. Modified the colour for attract to the infants and also enhance the nutritive value of Paneer using *Clitoria ternatea* flower to increase the consumption of Paneer. *Clitoria ternatea* L., flower (blue variety) is also known as 'Butterfly pea flower' is one of the source of natural food colorants and antioxidants. The flower contains several nutrients such as protein, carbohydrates and vitamins. *Clitoria ternatea* flower showed wide range of pharmacological activities including antimicrobial, antioxidant, anticancer, anti-inflammatory and many other pharmacological effects.

2. MATERIALS AND METHODS

2.1 Collection of flower sample:

The fresh flowers of *Clitoria ternatea* (Butterfly pea) were collected during the early morning from Kolathur (13.1440° N, 80.2112° E) Chennai. The collected flowers were washed twice with distilled water to remove the dust particles.

Fig 1 : Collection of *C.ternatea* flower

2.2 Preparation of flower extract:

The collected flowers were washed twice with distilled water to remove the dust particles. Washed flowers were shade dried for a period

of three days. After three days, the flowers were completely dried and attained a crisp stage. The plant extract was prepared by using a method called Soxhlet extraction. The dried *C.ternatea* flowers were placed inside the thimble, which was placed in the Soxhlet extractor. 150ml round bottom flask was taken and filled with 100ml of water allowed to boiled at 100^{o} C. Extraction takes place over a period of 4-5 hours (until the extract was obtained). Then the extract was stored under cold conditions.

Fig 2. Extraction process using Soxhlet apparatus

2.3 Antioxidant activity:

The anti-oxidant activity of the aqueous extract of *C.ternatea* flower was evaluated using the method of DPPH assay. In DPPH assay, 1ml DPPH (2, 2-diphenyl -1- picrylhydrazyl) solution was added to 2ml of *C.ternatea* flower extract at different concentration (100-500 µg/ml). After 30 minutes, the absorbance was measured at 517nm. Ascorbic acid was used as the positive control.

Inhibition (%) = [1-(Abs sample /Abs control)] x100

2.4 Coloured Paneer preparation:

The coloured Paneer prepared by using dry powder of flower added to the heated milk and coagulation of milk by adding food acid such as vinegar. The Paneer was shaped into a block and kept the heavy object over it for 30 minutes to remove the excess moisture. After 30 minutes, the blue coloured Paneer was prepared and stored in an airtight container under cold condition. [8]

2.5 Vitamin A estimation in coloured Paneer:

Vitamin A content in the coloured Paneer sample was estimated by TCA (Trichloroacetic acid). The coloured Paneer sample was prepared by crushed the 1g of coloured Paneer in Motor and Pestle and the filter it, the filtrate as a sample. A Standard solution was prepared as vitamin A capsules (7.5 mg in 0.5ml) and the experimental procedure was performed as a different concentration of the standard solution was taken in different five test tubes. Blank was taken in a test tube, unknown (coloured Paneer sample) was taken in another test tube. The chloroform was added as required to bring the volume to 1 ml. From a fast-delivery pipette, 2ml Trichloroacetic acid reagent was added rapidly, mixing with the vitamin solution. The optical density of the solution read at 620 nm in a spectrophotometer or colorimeter at maximum deflection of the galvanometer spot. The graph was plotted as the standard curve by taking the concentration of vitamin A along the X-axis and absorbance at 620 nm along the Y-axis. Then from this standard curve, the concentration of vitamin A was calculated in the sample.

2.6 Protein estimation in coloured Paneer:

Protein content in the coloured Paneer sample was estimated by Kjeldahl method.

2.7 Carbohydrates estimation in coloured Paneer:

Carbohydrates content in the coloured Paneer sample was estimated by Benedict method. A Standard solution was prepared by 1 mg of glucose was added to 100 ml of water. Different concentration of the standard solution was taken in different test tubes including blank, the coloured Paneer sample was taken in another test tube. Made up with 1 ml of water in all the test tubes.3 ml of Benedict reagent was added to all the test tubes. Incubated the all test tubes at 37ºC for 10 minutes. The optical density of the solution read at 540nm in a spectrophotometer or colorimeter. The graph was plotted by taking the concentration of carbohydrates along the X-axis and absorbance along the Y-axis. Then from this standard curve, the concentration of Carbohydrates was estimated in coloured Paneer sample.

2.8 Fat estimation in coloured Paneer:

Fat in coloured Paneer was determined by using the Gerber method. 2g of coloured paneer sample taken into a beaker, 1ml of distilled hot water, and 5ml of sulphuric acid were added. The content was mixed well-using glass rod and poured into a butyrometer. The remaining 4ml of hot water and 5ml of sulphuric acid were added to the beaker washed it and added to the butyrometer. 1ml of amyl alcohol was added to the butyrometer and closed with a lock stopper. The butyrometer was transferred to a water bath at 65 ^{o}C for 5 minutes. Then, the butyrometer was centrifuged for 5mins and the reading of the fat column in the stem of the butyrometer was recorded. [8]

3. RESULTS:

3.1 *C.ternatea* Flower extract:

80ml of aqueous extract of *C.ternatea* flower was obtained by Soxhlet extraction. The colour of the flower extract was blue.

Fig.3: *C.ternatea* Flower extract

3.2 Antioxidant activity:

The anti-oxidant activity of the aqueous extract of *C.ternatea* flower was evaluated using the method of DPPH assay

TABLE1: DPPH scavenging activity of *C.ternatea* flower extract

S.NO	VOLUME OF *C.ternatea* FLOWER EXTRACT(µl)	CONCENTRATION OF *C.ternatea* FLOWER EXTRACT (mg/ml)	OD AT 517 nm	INHIBITION
1.	control	0	1.213	_
2.	200	1	0.681	44
3.	400	2	0.571	52
4.	600	3	0.424	65
5.	800	4	0.375	69
6.	1000	5	0.258	79

The highest inhibition % of the *C.ternatea* flower extract was found to be 79% against DPPH at 1000µl.

3.3 Coloured paneer:

The blue coloured Paneer was prepared using dry powder of *C.ternatea* flower

Fig.4: Blue coloured paneer

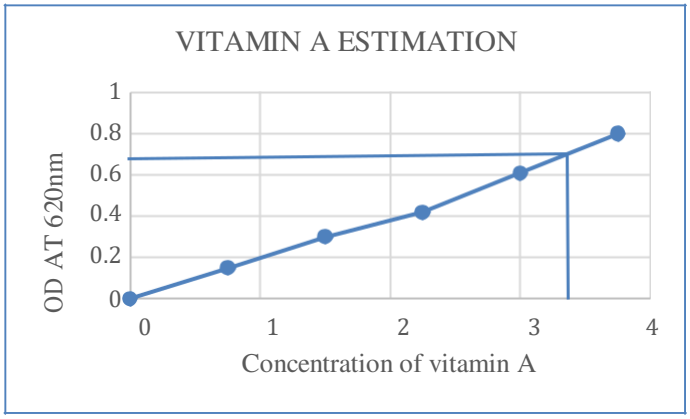
3.3.1 Physical properties of coloured Paneer:

Coloured Paneer is blue in appearance having a spongy body and odour of fresh Paneer was has butter like smell, stale ones smell little sour and texture of fresh one was soft to touch, it hardens over time and becomes brittle. The physical properties of coloured Paneer were determined by sensory evaluation.

TABLE 2: Physical properties of coloured Paneer

PHYSICAL PROPERTIES OF FRESH PANEER	
ODOUR	Butter like smell
APPERANCE	Soft
COLOUR	Blue
TASTE	Mild milky flavour
pH	5.8

3.4 Vitamin A estimated in coloured Paneer:



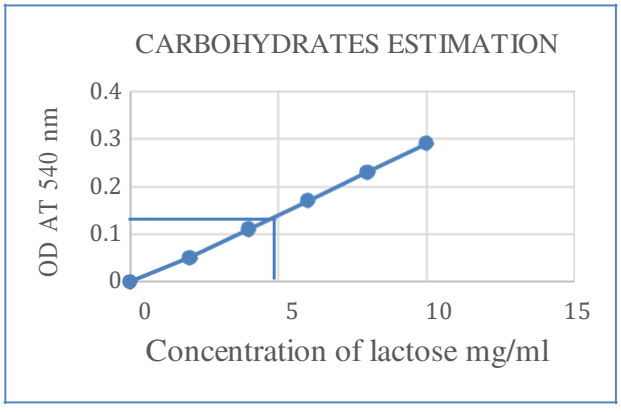
Graph 1:Standard curve for vitamin A estimation.

From the standard graph, the coloured paneer extract contain 3.45 mg/ml of vitamin A was determined.

3.5 Protein estimated in coloured Paneer:

Crude protein of prepared coloured paneer was determined by Kjeldahl method .17.3 g of protein was determined in 100g of coloured paneer.

3.6 Carbohydrates estimated in coloured Paneer:



Graph 2:Standard curve for carbohydrates estimation.

Coloured paneer sample contain 24.5 mg/ml of carbohydrates was determined using the standard curve.

3.7 Fat estimated in coloured Paneer:

Fat percentage of prepared coloured paneer was determined by Gerber method. 22.67 g of fat was determined in 100g of coloured paneer.

3.8 Comparative study:

The prepared coloured paneer was compared with normal paneer.

TABLE 3: Comparison of normal paneer and coloured paneer

Nutrients	Normal paneer	Coloured paneer
Image		
Colour	white	blue
pH	5.6	5.8
Fat %	22.8	22.67
Protein %	17	17.3
Carbohydrates %	2.2	2.45
Vitamin A %	0.21	3.45

4. DISCUSSION:

Clitoria ternatea is commonly known as Butterfly Pea flower is chosen for the purpose of making coloured *Paneer* (Indian cottage cheese) because of its various beneficial properties and also contains vitamins, minerals, protein and carbohydrates and also a food colourant. The highest inhibition % of the *C.ternatea* flower extract was found to be 79% against DPPH at 1000µl, this anti-oxidant property helps to increase the shelf-life of the product. Because of *Clitoria ternatea* flower is proved to have many advantages is used to enhance the nutritive value and colour of the paneer.

5. CONCLUSION:

C.ternatea flower is a well-known food colourant, and have antioxidant activity and also it contains many essential nutrients. So it is used to enhance the colour and nutritive value of paneer. The above results showed that the flower extract has potent antioxidant activity, this is also useful to increase the shelf life of the product (paneer). The prepared paneer *is* blue in colour it is attractive to infants and consumers and it contains 22.67% of fat, 17.3% of protein, 2.45% of carbohydrates, and 3.45% of vitamin A. Here 0.3% of protein, 0.25% of carbohydrates, and 3.24% of vitamin A were enhanced using *Clitoria ternatea* flower when compared to normal paneer.

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