



## DEVELOPMENT OF SPICED PANEER USING HEMP (*Cannabis sativa L.*)

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**Abstract :** Lactose intolerance is one of the main health issue that prevented the use of dairy products among consumers. In all countries, dairy sector is a major contributor to the food production industry and paneer is one of the main dairy products produced. Milk is the basic constituent of dairy industry and it causes lactose intolerance. So to prevent lactose intolerance substitute dairy milk with any other milk is a solution. Our study focus on developing paneer from hemp milk which is free lactose intolerance and highly nutritional for human health. In this study wet milling is used for the extraction of hemp milk from hemp seeds. Different combinations of indian spices is blended and add to the inoculum to develop spiced hemp paneer. Our study leads to develop different combination of spices incorporate to develop paneer. In this study, seven formulations were formed with both Indian spices and Italian spices. Spiced hemp paneer was formulated using Hemp milk (400ml), Indian spices (2%) and Citric acid (0.25%) were mostly acceptable based on parameters – consistency, sensory and textural attributes.

**IndexTerms – Plant-based protein, Hemp Seed, Hemp Milk, Paneer, Spices.**

### 1 INTRODUCTION

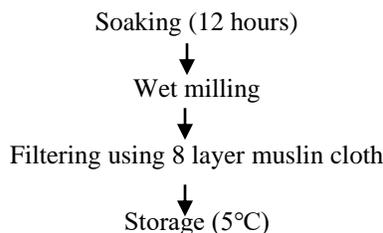
The worldwide vegan food market length turned into USD 23.31 billion in 2020. The marketplace is projected to develop from USD 26.16 billion in 2021 to USD 61.35 billion in 2028 at a CAGR of 12.95% during the 2021-2028 length. Plant based non-dairy milk merchandise have become famous among purchasers .This aspect has precipitated the corporations to innovate and release new products inside the market. Health and well-being have become the two important elements contributing purchasers to shift their purchase patterns, causing a rise in the income of vegan products inside the international market. Hemp seeds are a wealthy source of vitamins and wholesome fats, such as omega-3 and omega-6 fatty acids. Hemp seed's nutty flavor and versatility additionally make them a high-quality alternative for the ranges of protein, essential fatty acids, and different dietary blessings discovered in meat and dairy products. Adding hemp oil for your food plan may also reduce risk of heart problems. The minerals and vitamins in hemp seeds can provide a health advantages. As an instance, hemp oil is rich in vitamin E, which is beneficial for helping keep immune system functioning. It also acts as an antioxidant to reduce free radicals that cause cell damage.

Paneer represents a south asian sort of soft cheese organized with the aid of acid and warmth coagulation of milk. Paneer is a rich source of milk protein available at a comparatively decrease value and a vital supply of milk protein for vegetarians. Further, paneer is a valuable supply of fat, vitamins and minerals like calcium and phosphorus. It has fairly long shelf lifestyles of 7 days below refrigeration Because of availability of various forms of milk and variation in milk composition, various techniques were advanced for the manufacturing of paneer as in step with the requirements of the purchasers with considerable development in the yield and other nice characteristics. Due to the ever developing demand for paneer, researchers had been advocated to broaden new techniques for the manufacture of paneer. Researchers encouraged varied processing situations of paneer using different. A spice is a seed, fruit, root, bark or other plant substance on the whole used for flavoring or coloring foods. Normally spices are available in dried shape. Spices can be ground into a powder for comfort. A whole dried spice has the longest shelf life, so it could be purchased and saved in larger amounts, making it less expensive on a consistent with-serving basis. A fresh spice, such as ginger, is normally more flavorful than its dried shape, but fresh spices are greater cost and have a much shorter shelf existence. India contributes to 75% of worldwide spice manufacturing.

### 2 MATERIALS AND METHODS

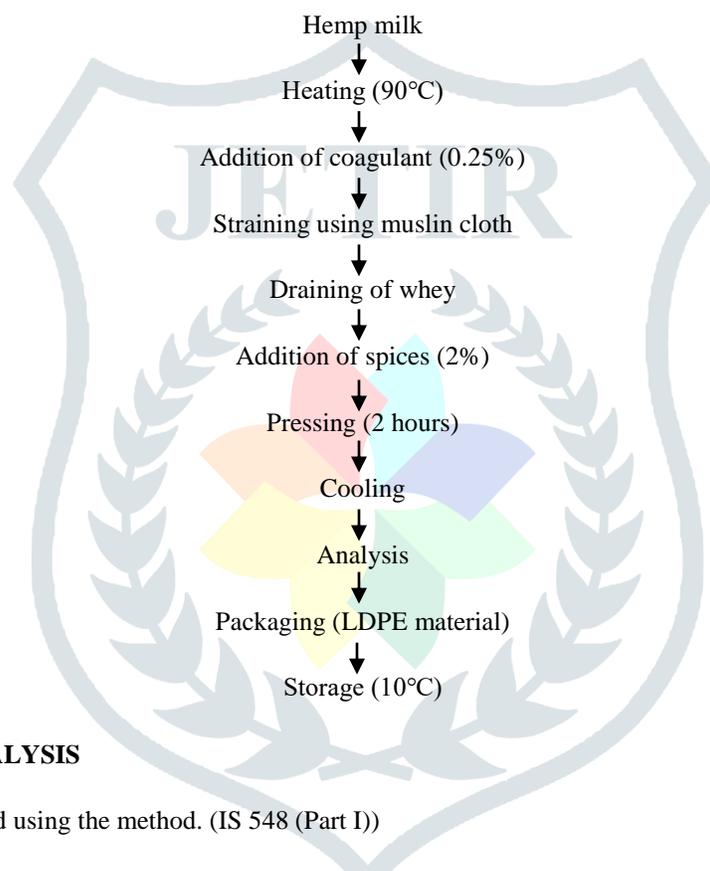
#### 2.1 EXTRACTION OF HEMP MILK

Hemp seeds (100g) were soaked for 12 hours. After soaking, by the process of wet milling hemp seeds were grinded and hemp milk was obtained. This hemp milk was filtered using muslin cloth having 8 layers. The hemp milk was packed in storage bottles and stored under refrigeration condition and utilized for the production of spiced hemp paneer.



## 2.2 PRODUCTION OF SPICED HEMP PANEER

Hemp milk (400ml) was taken in a vessel and heated at 90°C. Then coagulant (citric acid) was added to the hemp milk. After addition of coagulant straining and draining was done using muslin cloth to remove the whey. Spices were added to the coagulum and pressing was done for 2 hours. After pressing paneer was packed using vacuum packaging in LDPE material and stored under refrigeration condition. Final product is shown in Figure 1.



## 2.3 PHYSICO-CHEMICAL ANALYSIS

### 2.3.1. Moisture

Moisture content was found using the method. (IS 548 (Part I))

### 2.3.2. Ash

Ash content was determined by the method. (IS 4706 (Part II))

### 2.3.3. Total solids

Total solids was found using the method. (IS 3025 (Part 15))

### 2.3.4. Protein

Protein content of the paneer sample was estimated by the Kjeldahl method. (IS 1797: 1985)

### 2.3.5. Fat

Fat content of the paneer sample was estimated by the Soxhelt method. (IS 7874 (Part I))

### 2.3.6. Carbohydrate

Carbohydrate was calculated using differential method. To calculate carbohydrate content, after determining moisture, ash, fat and protein content the sum was subtracted from 100. (IS 1656: 2007)

$$\text{Carbohydrate Content (\%)} = 100 - (A+B+C+D)$$

where,

A – Moisture content

B – Ash content

C – Fat content

D – Protein content

**2.3.7.pH**

pH was measured using digital pH meter as described by (IS 4706 (Part II)).

**2.3.8.Titratable Acidity**

Titratable acidity was determined using the method suggested by (IS 548 (Part 1)).

$$\text{Titratable Acidity (\%)} = (0.9 * v * N) / V$$

where,

V – Weight of paneer, g

N – Normality of NaOH used for titration

v - Volume of NaOH used in titration

**2.3.9.Free fatty acids**

The percentage of free fatty acid was determined by titration method. The FFA content measured was expressed in % oleic acid.

$$\text{Free Fatty Acid (\%)} = \frac{28.2 * V * N}{W}$$

where,

V – Volume of standard potassium hydroxide solution used, ml

N – Normality of standard potassium hydroxide solution

W – Weight of the paneer taken, g

**2.3.10.Anti-oxidant Presence**

Antioxidant content was detected using ORAC Method. Antioxidant is detected using the splitting ability of the radical chain reaction by antioxidants through monitoring the inhibition of the oxidation of the peroxy radical.

**2.4 MICROBIAL ANALYSIS****2.4.1.Standard Plate Count**

Standard plate count was determined using ISI (IS: 5402) 1969 method by using tryptone dextrose agar medium mentioned by SA Dongare *et al.*, (2019).

**2.4.2.Yeast and Mold Count**

Yeast and Mold count was determined using method mentioned by SA Dongare *et al.*, (2019).

**2.4.3.Coliform Count**

Coliform count was determined using method mentioned in IS 5401 (Part 1).

**3 RESULTS AND DISCUSSIONS****3.1.PHYSICO-CHEMICAL ANALYSIS**

The results of physico-chemical analysis is shown in Table 1.

**3.1.1.Moisture**

Moisture content of spiced hemp paneer was 53.17% by using Hot air oven drying method. Similar study was conducted by Umer Asrat *et al.*, (2019) in paneer prepared from soy milk resulted the moisture content of 72.45% to 74.93%.

**3.1.2.Ash**

Ash content of spiced hemp paneer sample was 1.92%. Similar results were found by Umer Asrat *et al.*, (2019) in which ash content of soy paneer was found as 1.81%.

**3.1.3.Total Solids**

Total solids of spiced hemp paneer sample was 46.83% comparing to Umer Asrat *et al.*, (2019) whom prepared paneer from soy milk with the total solid content ranged from 25.07% to 27.55%.

**3.1.4.Protein**

Protein content of spiced hemp paneer sample was found to be 11.08% which was correlated with the study conducted by Sanjay Yadav *et al.*, (2019) whom prepared herbal paneer with protein content of 16.51%.

**3.1.5.Fat**

Fat content of spiced hemp paneer sample was found to be 12.63%. Similar study conducted by Sanjay Yadav *et al.*, (2019) whom prepared herbal paneer with fat content of 22.76%.

**3.1.6.Carbohydrate**

Carbohydrate content of spiced hemp paneer sample was found to be 2.20%.

**3.1.7.pH**

pH of the spiced hemp paneer was found to be 6.23 comparing to herbal paneer prepared by Sanjay Yadav *et al.*, (2019) with the pH of 5.8.

**3.1.8.Titratable Acidity**

Titratable acidity of spiced hemp paneer was found to be 2.47%. Similar study was conducted by Sanjay Yadav *et al.*, (2019) whom prepared herbal paneer with the titratable acidity of 4.01%.

**3.1.9.Free fatty acids**

Free fatty acid of spiced hemp paneer was found to be 1.24% comparing to herbal paneer prepared by Sanjay Yadav *et al.*, (2019) with the free fatty acid of 2.69%.

### 3.1.10. Anti-Oxidant Presence

Using in-house method the presence of antioxidant was identified.

### 3.2. Microbial Analysis

The results of microbial analysis is shown in Table 2.

#### 3.2.1. Standard Plate Count

Standard plate count value of paneer sample was found to be >10 CFU. Similar study conducted by SA Dongare *et al.*, (2019), in milk paneer got 31.5 CFU.

#### 3.2.2. Yeast and Mold Count

Yeast and mould was absent in the spiced hemp paneer sample, compared to study conducted by SA Dongare *et al.*, (2019), as he got 24.7 CFU in milk paneer.

#### 3.2.3. Coliform Count

Coliform was absent in the spiced hemp paneer sample. Similar study conducted by M Rani *et al.*, (2014), in the black pepper milk paneer the value was not detected.

**Table 1.** Results of Physico-Chemical Analysis

S.NO	Analysis	Value
1	Moisture (%)	53.17
2	Ash (%)	1.92
3	Total solids (%)	46.83
4	Protein (%)	11.08
5	Fat (%)	12.63
6	Carbohydrate (%)	21.20
7	pH	6.23
8	Titrateable acidity (%)	2.47
9	Free fatty acid (%)	1.24
10	Antioxidant Presence	Present

**Table 2.** Results of Microbial Analysis

S.NO	Analysis	Value(CFU/g)
1	Standard Plate Count	>10
2	Yeast and Mold Count	Absent
3	Coliform Count	Absent



**Figure 1.** Spiced Hemp Paneer

## 4 CONCLUSION

Formulation and analysis of spiced hemp paneer was studied. This spiced hemp paneer is recommended to those who is suffering from lactose intolerance. Hemp seeds are used as source of plant-based protein and 2% of Indian spices are used for the final formulation of the spiced hemp paneer. Human body cannot produce essential fatty acids, hemp seeds contains all 9 essential fatty acids which make diet balanced. Nowadays hemp products are suggested to patients undergoing post covid recovery. Spiced hemp paneer are successfully formulated with nutritional improvement when compared to conventional dairy based paneer. Final spiced paneer having composition 2% Indian spices and 0.25%. The fiber content in spiced hemp paneer is high when compared to normal milk based paneer. The sensory characteristics show similar results to milk based paneer. The physicochemical characteristics like moisture content 53.17%, protein content 11.08%, carbohydrate content 21.20%, fiber content 2.78% and presence of antioxidant content was detected.

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