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RESEARCH ARTICLE

PRELIMINARY ANALYSIS OF PEANUT CURD VIA NATURAL FERMENTATION USING GREEN CHILIES (CAPSICUM ANNUM)

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Abstract

Plant-based fermented milk alternatives, derived from seeds, nuts, or milk analogs, are gaining popularity due to sustainability, health consciousness, and dietary preferences. Increasing allergies and lactose intolerance associated with animal-based milk contribute to the shift towards non-dairy alternatives, fueling innovation in new products from nuts, seeds, or beans. Fermented options, such as peanut curd, are particularly favored by those managing lactose intolerance. Peanut milk and its fermented derivative, peanut curd, were prepared using methods including curdling with green chilies, cow curd, and buffalo curd. Titratable acidity analysis revealed variations, with the cow curd-inoculated sample exhibiting higher acidity at 4.52 g/L. pH dynamics during fermentation illustrated a gradual decrease, with the chili-fermented peanut curd showing a pH drop from 6 to 3.5. Colony Forming Unit values increased over fermentation, with cow curd inoculum rising from 7.36×10^6 to 11.52×10^6 CFU/ml. Antibacterial activity varied, with cow curd-inoculated peanut curd displaying superior efficacy, particularly against Shigella, showing a 13mm inhibition zone. Antioxidant activity was notable, with chili-fermented peanut curd showing the highest RSA at 80.7%. Sensory analysis highlighted differences in taste, flavor, and texture, with chili-fermented curd scoring highest in overall acceptance. These findings contribute to understanding the chemical and microbial transformations in peanut curd, showcasing its potential as a functional and diverse plant-based product.

Introduction:-

In recent years, there has been a growing interest in exploring alternative sources of dairy products due to concerns related to health, environmental sustainability, and animal welfare. One such promising avenue is the utilization of plant-based ingredients to develop dairy alternatives that mimic the nutritional profile and sensory attributes of traditional dairy products. Among these alternatives, plant-based curd has gained prominence as an important component of various cuisines and diets around the world. Plant-based milk alternatives are created from water extracts of legumes, oil seeds, cereals, or pseudocereals that share a visual similarity with cow's milk. (Singh et al.,

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2020). Common sources for plant-based curd include soy milk, almond milk, coconut milk, cashew milk, oat milk, rice milk, hemp milk, flax milk, pea milk, and blends of these plant-based milk.

This study aims to investigate the feasibility of producing high-quality plant-based curd using peanuts as the primary raw material. Peanuts (Arachis hypogea), hold importance as an oilseed crop within the legume family Fabaceae. They are alternatively recognized as groundnuts, and wonder nuts (Madhusudhana, 2013). As a readily available and economically viable source, they possess inherent attributes that can contribute to the formation of a desirable curd texture and flavor profile.Peanuts and peanut products provide a wealth of essential nutrients, including vitamins A and E, folate, dietary fiber, iron, zinc, calcium, magnesium, protein, and important fatty acids, making them valuable for meeting daily nutritional requirements for people of all ages.(Yadav et al., n.d.), (Griel et al., 2006)

The demand for plant-based dairy alternatives has surged due to concerns regarding lactose intolerance, milk allergies, and the environmental impact of conventional dairy farming.Lactose intolerance refers to the inability to properly absorb lactose following the consumption of dairy items. Due to insufficient lactase activity, lactose is not broken down into glucose and galactose. Instead, it moves directly into the colon, where bacteria ferment it, resulting in saturated fatty acids, H_2, and CO_2 gas. As per a 2015 survey, three out of every four Indians experience a lack of tolerance to milk. The gastrointestinal symptoms, such as diarrhea, bloating, abdominal distension, flatulence, and abdominal discomfort, are predominantly caused by the presence of undigested lactose molecules and the outcomes of bacterial digestion.(Rai, Pachisia, & Singh, 2018).In adults, lactose maldigestion is typically diagnosed by administering a 50-gram dose of lactose in water on an empty stomach, equivalent to the amount in 1 liter of milk, and then measuring either the subsequent increase in blood glucose levels or the presence of additional hydrogen in the breath. Alternatively, it can be identified by directly measuring lactase activity in a biopsy sample from the jejunum. For children, the test dose is adjusted according to their weight, and the severity of lactase deficiency and other factors can lead to symptoms like abdominal distention, pain, and diarrhea after the test. (Scrimshaw & Murray, 1988)

Materials and Methods:-

Raw materials collection

To prepare peanut-based curd, 100 grams of locally sourced, shelled, mature, and mold-free peanuts were obtained from a retail store in Panvel, Maharashtra. These peanuts were then stored at 4°C until needed for further processing. Additionally, 100 milliliters of fresh cow and buffalo milk were acquired from a local dairy in Panvel market, Maharashtra. Green chilies (Capsicum annum)for curdling were also purchased from the same market.

Extraction and preparation of peanut milk

The selected peanuts were thoroughly rinsed to remove surface impurities using clean, potable water. Subsequently, they were treated with a 1% sodium bicarbonate solution for 10 minutes to mitigate the strong peanut flavor in the curd (Beuchat & Nail, 1978). After rinsing again with tap water for further cleaning, the peanuts were blended with distilled water to achieve a uniform mixture. This blend was strained through a fine mesh strainer, such as cheesecloth or muslin cloth, to remove any remaining solid particles and produce a white, frothy liquid with a concentrated peanut taste (Rai, Pachisia, & Singh, 2018). This process was repeated twice to enhance the richness of the peanut milk, which was then stored in a clean, airtight container and refrigerated at 4°C for future use in making peanut-based curd.

Preparation of peanut curd

The extracted peanut milk was subjected to a controlled boiling process at 80°C for a duration of 5 to 6 minutes. Subsequently, the heated milk was allowed to cool down to room temperature.Peanut curd was prepared through three distinct methods, each contributing its unique flavor and texture to the final product.

Green Chilies for Curdling

Initially, one cleaned and washed green chili, specifically Capsicum frutescenswas added to lukewarm milk (Kirtana, 2021) and set aside for curdling. After 24 hours, no curdling was observed. Subsequently, one and a half pieces of green chili were added to lukewarm milk and again set aside for curdling. After another 24 hours, curdling was still not observed. Finally, two pieces of green chili were added to lukewarm milk, and curdling was observed after 14-15 hours. The process was repeated with two and a half chilies, but it was noted that the curd developed a chili flavor. The enzymes present in green chilies likely facilitated the curdling process, contributing to the distinctive flavor and texture of the resulting peanut curd.

Cow and buffalo curd as inoculum

In a separate experiment, cow and buffalo curd from Amul milk were used as inoculum for peanut milk to produce peanut curd as a control. The cow and buffalo curd inoculum was optimized from 1% to 5% for curdling peanut milk. Peanut milk with a chili starter curdled completely in 15 hours, while peanut milk with 5% cow and buffalo curd inoculum curdled in 6-7 hours.

Raw cow milk was gently warmed over medium heat and then cooled to a lukewarm temperature. To this lukewarm milk, 2 green chilies were added, and the mixture was left at room temperature toform curd (Kirtana, 2021). This curd was then used as the inoculum to initiate the fermentation of peanut milk, taking approximately 6-7 hours for curdling. Similarly, buffalo milk was gently warmed and cooled to lukewarm temperature, with green chilies added and left to ferment to form curd, which was used as an inoculum in peanut milk, also resulting in curdling in about 6-7 hours (Kirtana, 2021).

Physicochemical analysis of peanut curd samples

Determination of pH

The pH value of curd samples was determined by using a digital pH meter. Before use, the pH meter was standardized with a standard buffer solution of pH 4, pH 10, and pH 7.pH for peanut curd samples fermented using cow and buffalo curd was analyzed at three different fermentation time intervals (0hr, 3hr, and 6hr) respectively. Similarly, the pH for the peanut curd sample fermented with chili was analyzed at four different time intervals (0hr, 5hr, 10hr, 15hr). Two replications of the pH measurement were performed to obtain an average value.

Determination of Total Titratable Acidity

The lactic acid levels in all peanut curd samples were determined in accordance with the guidelines provided by the Association of Official Analytical Chemists (AOAC). (AOAC, 1990). To perform this analysis, 10 milliliters of well-mixed samples were placed in a beaker and titrated using 0.1 N NaOH, with phenolphthalein employed as the indicator. The resulting titratable acidity is expressed as a percentage of lactic acid. (Ponka et al., 2022). Each trial was replicated three times, and the resulting average value was recorded. The acidity was determined using the equation provided below. (Avhad et al., 2017)

Titratable acidity as Lactic acid = $\frac{9AN}{W}$

Where,

A =Volume of NaOH required for titration

N = Normality of NaOH solution

W =Weight of the sample taken for test

Determination of microbial count

Microbial analysis was conducted for each sample of peanut curd, following the method outlined by(Ijah, Auta, Aduloju, &Aranisolam, 2014). Nutrient Agar, Sabouraud Agar, and MRS Agar (deManRogosa Sharpe Agar) were used as the culture media, prepared following the manufacturer's instructions, and employed to determine the total viable bacterial count (TVBC). The media were sterilized at 121°C for 15 minutes, allowed to cool, and then dispensed.

Aseptically, 2 milliliters of each peanut curd sample were measured and homogenized in a centrifuge tube.(Otolowo et al., 2022). The resulting mixture was serially diluted to a 10^-3 dilution, which involved mixing 2 microliters of peanut curd sample with 1.8 milliliters of sterile saline solution. 0.1 ml of peanut curd sample was inoculated at the center of the surface of each agar plate. The sample was evenly spread over the surface of the agar using a sterile glass spreader, with the Petri dish being carefully rotated at a 45-degree angle. The plate was incubated at room temperature for 24 hours.After 24 hours, the colonies were counted, and the appropriate dilution factor was multiplied to determine the number of CFU/mL in the original sample.(Devika et al., 2019).Microbiological analyses for peanut curd, using cow and buffalo curd as inoculum, were performed in triplicate at three different time points: 0 hours, 3 hours, and 6 hours. Similarly, microbiological analyses for peanut curd, utilizing green chili for fermentation, were carried out in triplicate at four different time points: 0 hours, 5 hours, 10 hours, and 15 hours.(Adeyanju et al., 2022).

Antibacterial activity of peanut curd samples

The peanut curd samples were assessed for antibacterial activity using agar disc diffusion technique against three harmful bacteria that significantly affect health using the agar well diffusion method. (Rashid et al., 2014).These bacteria included Staphylococcus aureus (a gram-positive type) and the two Gram-negative pathogens, Salmonella typhi and Shigellasonnei. As a positive control, a 1:10 dilution of Chloramphenicol, a broad-spectrum antibiotic, was employed. Nutrient agar plates were prepared and solidified. The test bacteria were cultivated in nutrient broth and incubated for 24 hours at 37°C.Then the inoculated nutrient broth was centrifuged at 10000 rpm for 20 mins at 4°C, and the supernatant was collected to measure the optical density at 520 nm. After that, 100µl of the culture was spread onto the solidified nutrient agar plate using a swab, and sterile cork-borer was utilized to create 6 mm diameter wells in the agar plates.

On each plate, 40µL peanut curd samples were distributed with one well containing cow-curd-inoculated peanut curd, another with buffalo-curd-inoculated peanut curd and a third with chili-fermented peanut curd. In addition, 40µL of the respective antibiotic was used as the positive control, while 40µL of sterile distilled water was the negative control. After incubating the samples for 24 hours at 37°C, the diameter of the inhibition zone was measured.(Haripriya&Soundhari, 2022). The antibacterial activity was determined in millimeters based on the size of the growth inhibition zone around the wells. This experimental procedure was repeated in triplicates for each pathogenic bacterium, and the results were reported as the mean standard deviation.(Rashid et al., 2014)

Antioxidant activity of peanut curd samples

The antioxidant activity of the water extract from each peanut curd sample was evaluated using the DPPH radical scavenging method. (Adeyanju et al., 2022). This method assesses the sample's ability to counteract the stable free radical DPPH (2,2-diphenyl-1-picrylhydrazyl) through electron transfer. The procedure involved mixing the peanut curd water extract with a DPPH solution and then using a spectrophotometer to measure the change in DPPH absorbance at 517 nm. The level of DPPH decolorization was inversely related to the antioxidant activity of the sample. (Singh, Marimuthu, Murli, & Bawa, 2005)

To test the sample's antioxidant activity against DPPH radicals, 0.5 mL of the peanut curd water extract was combined with DPPH methanol solution at concentrations of 200, 160, 120, 80, and 40 mg/ml. Standard concentrations of ascorbic acid (200, 160, 120, 80, and 40 mg/ml) were also prepared. This mixture was then left at room temperature in a dark place for 24 hours. Methanol was used as a blank, and DPPH-methanol solution served as a control. The ability of the peanut curd water extract and ascorbic acid to scavenge DPPH radicals was calculated using the following formula: DPPH Radical Scavenging Activity (%) = [1 - (Absorbance of Sample / Absorbance of Control)] x 100. (Karnila et al., 2020). This equation determines the efficiency of DPPH radical scavenging as a percentage by comparing the sample's absorbance to the control's absorbance. A higher DPPH radical scavenging efficiency indicates a stronger ability of the sample to neutralize DPPH radicals. The antioxidant activity of specific samples was compared to an ascorbic acid standard graph created within the range of 40–200 mg/ml. (Karnila et al., 2020).

Sensory analysis

Sensory Evaluation is defined as "A scientific discipline used to evoke, measure, analyze, and interpret those responses to products that are perceived by the senses of sight, smell, touch, taste, and hearing (Stone & Sidel, 1993)." The curd samples were evaluated for their sensory characteristics six hours after being produced and stored at 4 °C. Both the samples and control groups were allowed to cool to room temperature before assessment.

Each portion of curd was placed in a 25 mL plastic container and identified with unique three-digit numbers assigned randomly (He and Chung, 2019b).Thirty evaluators, were provided with portable water and instructions to rinse their mouths before and after each assessment. The evaluators were selected based on their familiarity with yogurt products; 18 females and 12 males between 20 and 35 years of age were chosen to avoid bias in the evaluation. A 5-point hedonic scale for parameters attributes like Taste, Flavour, Odour, Thickness, Consistency and Appearance was used to evaluate the acceptability of soy curd containing chili, cow, and buffalo inoculum, with 5 indicating extremely satisfactory and 1 indicating extremely unsatisfactory (Otolowo et al., 2022).

Statistical analysis

Statistical analysis for sensory parameters was carried out using IBM SPSS Statistics 25.0 (IBM Corporation, Armonk, NY, USA). To assess variations in mean hedonic scale ratings for taste, flavor, aroma, thickness,

consistency, and appearance across all participants and treatments, a One-Way Analysis Of Variance (ANOVA) was applied. (Fatima & Hekmat, 2020)

Result and Discussion:-

In recent years, there's been a growing interest in alternative dairy sources, driven by concerns about health, the environment, and animal welfare. Significant investments in plant-based alternatives, like peanut milk, aim to offer consumers healthier, eco-friendly, and animal-friendly options.(Boaitey& Minegishi, 2020)

One promising avenue explores the use of peanut milk in creating plant-based curd. The study compared the nutritional composition, sensory attributes, and textural properties of three peanut curd samples (peanut curd fermented from chili, peanut curd fermented with cow and buffalo curd inoculum). Peanut milk, derived from soaked and ground raw peanuts, boasts nutritional benefits such as high protein, essential fatty acids, and minerals.(Yadav et al., n.d.).

Peanut milk was prepared by soaking and cleaning peanuts, removing husks, blending with water, and straining. The resulting peanut milk was stored and refrigerated. For peanut curd, the milk underwent controlled boiling and cooling. Three methods were used for curdling: green chilies were added to lukewarm milk for 12-14 hours, cow curd and buffalo curd functioned as controls. Each method contributed to the distinct flavor and texture of the final peanut curd.

Physicochemical analysis

pH

Time intervals	Using cow curd inoculum	Using buffalo curd inoculum
0 hr	5.5±0.2	5±0.2
3 hr	5±0.2	5±0.2
6 hr	4.5±0.2	4.5±0.2

Table 1.1:- pH of Peanut curd with Cow and Buffalo curd inoculum in different timepoints.

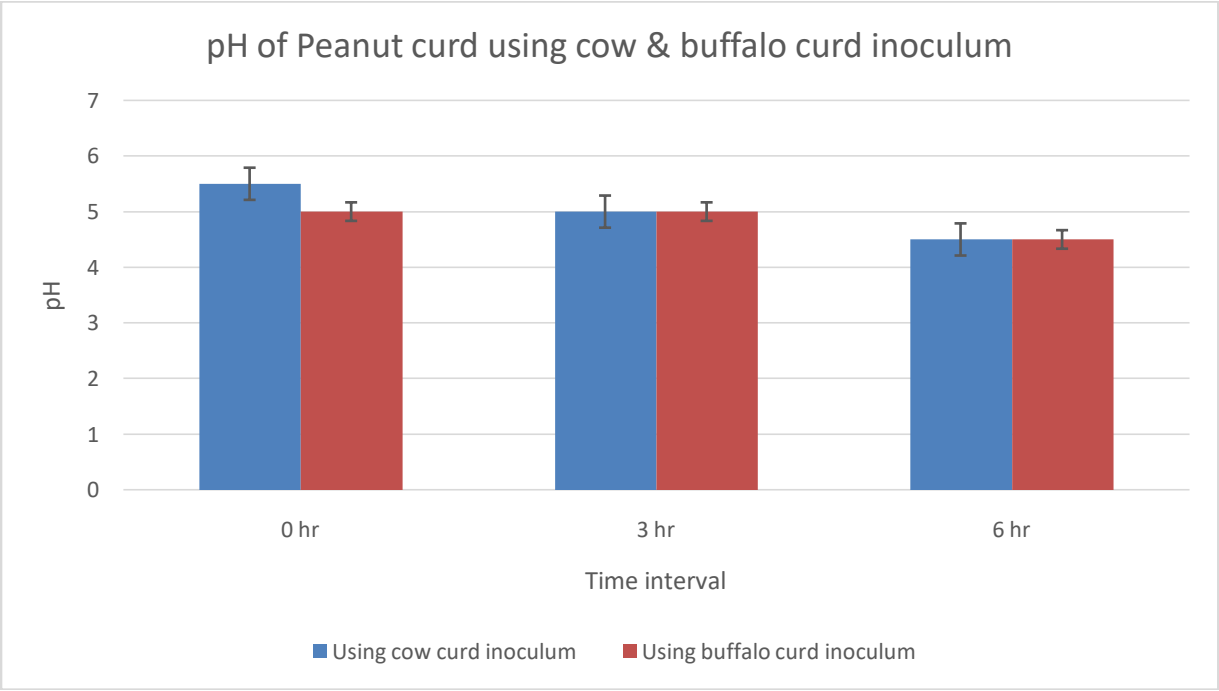

Figure 1.1:-pH of Peanut curd with Cow and Buffalo curd inoculum in different timepoints.

Time intervals	Peanut curd using chilli
0 hr	6±0.2
5 hr	4.5±0.2

10 hr	4±0.2
15 hr	3.5±0.2

Table 1.2:- pH of Peanut curd fermented withchilli in different timepoints.

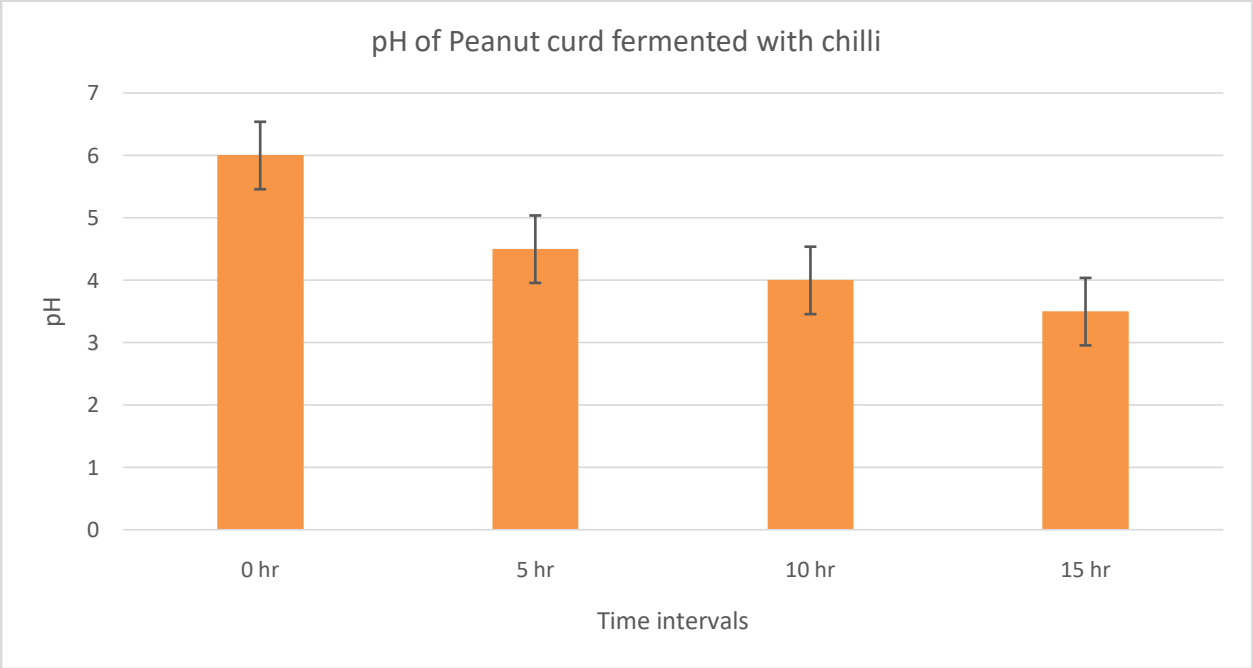

Figure1.2:- pH of Peanut curd fermented withchilli in different timepoints.

Figure 1.1 illustrates the pH dynamics of peanut curd sample fermented using cow and buffalo curd inoculum, while figure 1.2 represents Peanut curd fermented with chilliacross distinct fermentation time intervals. The observed trend indicates a gradual decrease in pH as the peanut milk undergoes curdling, suggesting a progressive acidification process during fermentation. Matsuyama et al. demonstrated that a combination of lactic acid bacterial cultures could achieve reduced pH and increased acidity (MATSUYAMA et al., 1992).This pH variation serves as a crucial indicator of the changing chemical composition throughout the fermentation period and contributes to the overall understanding of the dynamic transformations occurring in the peanut curd samples.

Titratable acidity

The acidity level of Peanut curd was determined using phenolphthalein as an indicator, titrating a 10 mL sample against a 0.1 N standard sodium hydroxide solution. The acidity was quantified as the concentration of lactic acid in grams per liter (g/L), with the CBR reading used for calculation. Peanut curd using cow curd inoculum exhibited the highest acidity at 4.52 g/L among the samples tested. Conversely, peanut curd using buffalo curdinoculum showed slightly lower acidity at 4.47 g/L, indicating a reduced level. The peanut curd fermented with chili had the lowest acidity of the three, measured at 3.68 g/L. Acidity plays a critical role in fermented dairy products, potentially affecting the perception of sweetness and overall product acceptability (Barnes et al., 1991; de Souza et al., 2021).

Microbial Analysis

Fermentations timepoints (hours)	CFU/ml on NA	CFU/mlon SA	CFU/mlon MRSA
0	7.36×10^6	5.12×10^6	1.28×10^6
3	7.52×10^6	8.32×10^6	0.72×10^6
6	11.52×10^6	9.32×10^6	1.44×10^6

Table 2.1:-Peanut curd using cow curd inoculums.

Fermentations timepoints (hours)	CFU/ml on NA	CFU/mlon SA	CFU/mlon MRSA
0	5.76×10^6	4.32×10^6	0.81×10^6
3	7.02×10^6	8.28×10^6	0.48×10^6

6	8.12×10^6	10.32×10^6	1.36×10^6

Table 2.2:-Peanut curd using buffalo curd inoculums.

Fermentations timepoints (hours)	CFU/ml on NA	CFU/mlon SA	CFU/mlon MRSA
0	3.76×10^6	3.56×10^6	0.72×10^6
5	6.62×10^6	5.72×10^6	0.92×10^6
10	7.12×10^6	6.08×10^6	1.00×10^6
15	8.48×10^6	7.84×10^6	1.34×10^6

Table 2.3:-Peanut curdfermented with chilli.

The data provided in Tables 2.1, 2.2, and 2.3 show the colony-forming units per milliliter (CFU/ml) for three different types of peanut curd fermentations measured at various time points on three different agar media: Nutrient Agar (NA), Soybean Agar (SA), and Mannitol Salt Agar (MRSA). For peanut curd using cow curd inoculum (Table 2.1), CFU/ml on NA increased from 7.36×10^6 at 0 hours to 11.52×10^6 at 6 hours, on SA from 5.12×10^6 to 9.32×10^6, and on MRSA from 1.28×10^6 to 1.44×10^6. For peanut curd using buffalo curd inoculum (Table 2.2), CFU/ml on NA increased from 5.76×10^6 at 0 hours to 8.12×10^6 at 6 hours, on SA from 4.32×10^6 to 10.32×10^6, and on MRSA from 0.81×10^6 to 1.36×10^6. For peanut curd fermented with chili (Table 2.3), CFU/ml on NA increased from 3.76×10^6 at 0 hours to 8.48×10^6 at 15 hours, on SA from 3.56×10^6 to 7.84×10^6, and on MRSA from 0.72×10^6 to 1.34×10^6. Generally, CFU/ml values increased over time for all three types of fermentation on all three media, with peanut curd using buffalo curd inoculum showing a significant increase in microbial growth on SA.

Antibacterial activity

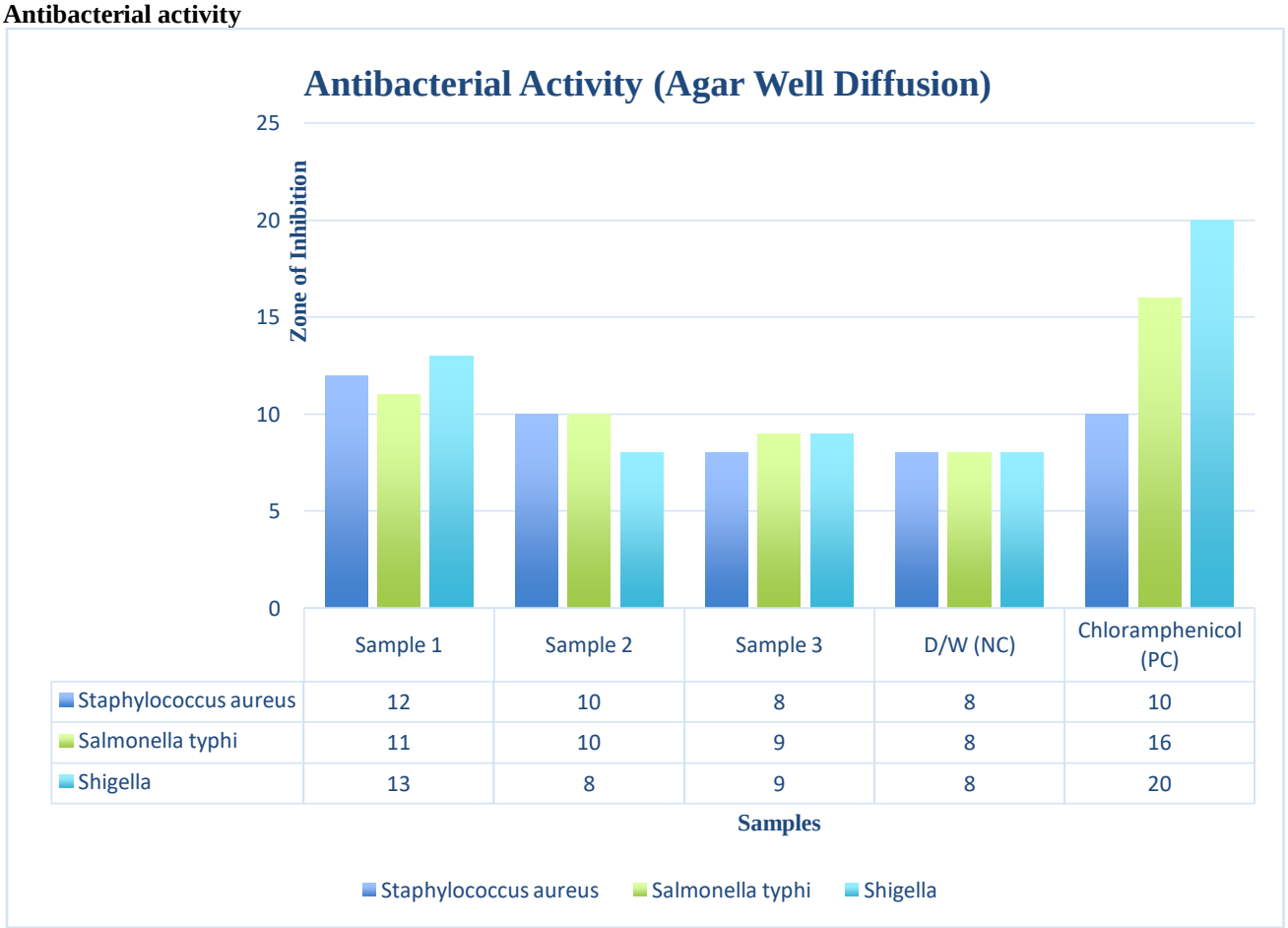

Figure 2:- Antibacterial activity of peanut curd samples against different bacteria. (NC=Negative Control and PC = Positive Control).

Gram-positive bacteria produce bacteriocins, which are protein-based substances that can be used as food preservatives and potential antibiotic substitutes. Lactic acid bacteria were isolated from curd using MRS broth and their antibacterial activity due to bacteriocins in crude form was assessed using the agar well diffusion method.

The bar graph in Figure 2. elucidates the variability in antibacterial activity among different peanut curd samples, specifically, Sample 1 fermented with cow curd inoculum, Sample 2 with buffalo curd inoculum, and Sample 3 with chili. The antibacterial efficacy was found to differ based on the bacterial strains tested. Notably, Sample 1 exhibited superior antibacterial activity compared to Samples 2 and 3, with the highest activity observed against Shigella, resulting in a zone of inhibition measuring 13mm. Conversely, Sample 3 displayed the least antibacterial activity, demonstrating no inhibitory effect against Staphylococcus aureus when compared to the negative control, which was distilled water.

Antioxidant activity

Concentration (mg/ml)	**200**	**160**	**120**	**80**	**40**
Peanut curd with Cow curd inoculum	35.8	46.8	58.7	72.8	70.6
Peanut curd with buffalo curd inoculum	25.3	36.9	51.1	64.7	74.9
Peanut curd fermented withchilli	36.9	48.5	56.2	70.6	80.7
Ascorbic acid	78.7	82.7	85.3	87.2	93.9

Table 3:-Antioxidant activity of Peanut curd with different starters in %RSA.

The antioxidant activity of peanut curd samples was assessed using their DPPH decolorization at 517 nm, compared against a standard graph of ascorbic acid. The Radical Scavenging Activity (RSA) was calculated by comparing the samples' absorbance to a standard at specific concentrations. The table 3. shows that at 40 mg/ml, peanut curd fermented with chili exhibited the highest RSA (80.7%), followed by peanut curd with buffalo curd inoculum (74.9%), and peanut curd with cow curd inoculum (70.6%). At higher concentrations (200 mg/ml), the RSA for peanut curd with cow curd inoculum started at 35.8%, increasing to a peak of 72.8% at 80 mg/ml before slightly decreasing. Peanut curd with buffalo curd inoculum displayed a similar trend, starting at 25.3% and rising steadily. In comparison, ascorbic acid showed superior RSA across all concentrations, ranging from 78.7% at 200 mg/ml to 93.9% at 40 mg/ml, highlighting its robust antioxidant activity.

Previous studies on polysaccharides and proteins in fermented products indicate that the antioxidant effect in peanut curd is likely due to bioactive compounds released during fermentation, such as polysaccharides, phenols, and proteins, which enhance its hydrogen-donating capacity and reactive oxygen species scavenging ability (Li et al., 2019; Colletti et al., 2020; Azi et al., 2020). This suggests that fermented peanut curd, particularly with chili, has significant potential as a health-promoting antioxidant, akin to other fermented soy products (Fatima and Hekmat, 2020).

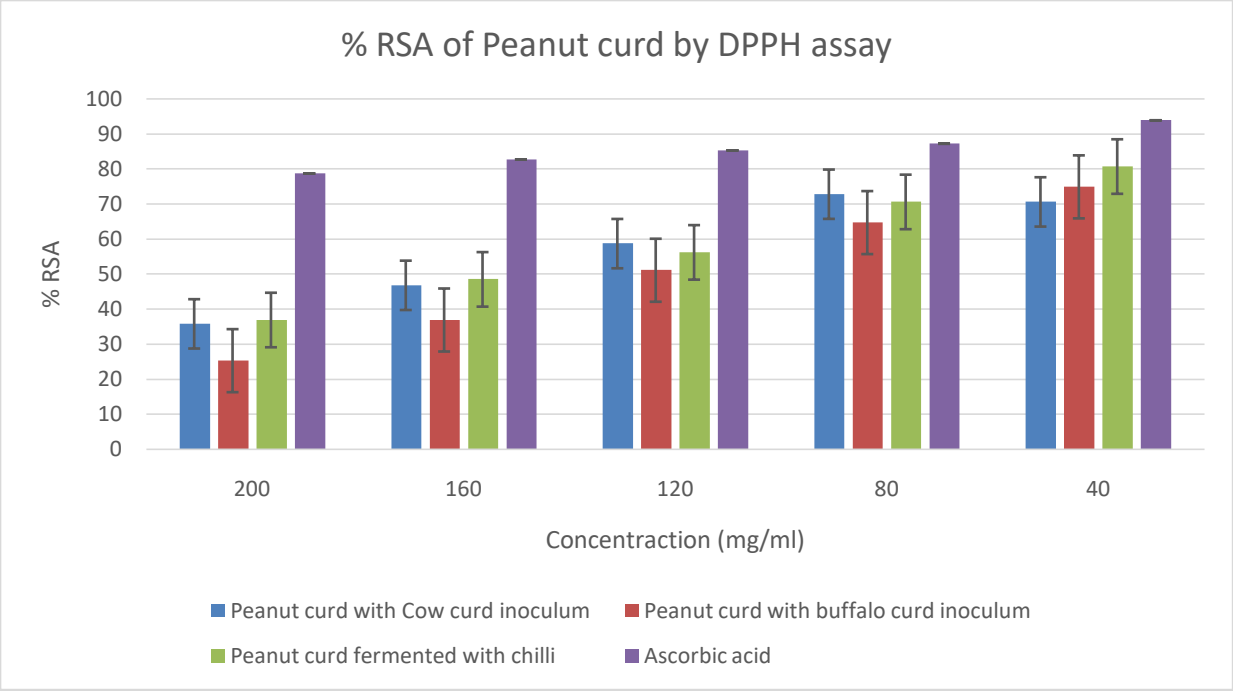

Figure 3:- % RSA of Peanut curd with cow inoculums.

Sensory evaluation

The control and test curd samples were assessed based on their taste, flavor, odor, thickness, consistency, and appearance. Findings revealed that soybean curd made with a chili starter scored highest in flavor, taste, and overall acceptance. The taste, flavor, and thickness of this curd were comparable to those of soybean curd prepared with cow and buffalo curd starters. Notably, the test curd's thickness was significantly greater than that of the other samples. The cohesiveness of a food, indicating its internal structural resistance, may be indirectly associated with curd thickness and volume (Zinia et al., 2022). The study showed that there were no significant differences ($P<0.05$) in the taste, flavor, and general acceptability between the control and test curd samples. The primary determinants for the acceptance or rejection of curd are its flavor and taste, with the soy flavor and odor being major factors influencing acceptance (Zinia et al., 2022).

Statistical analysis

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Chilli	Between Groups	35.711	5	7.142	6.987	<.001
	Within Groups	177.867	174	1.022		
	Total	213.578	179			
Cow	Between Groups	34.600	5	6.920	10.084	<.001
	Within Groups	119.400	174	.686		
	Total	154.000	179			
Buffalo	Between Groups	22.200	5	4.440	6.250	0.018
	Within Groups	123.600	174	.710		
	Total	145.800	179			

Table 4:- Analysis of Variance (ANOVA) for Peanut curd.

Table 1 depicts the results from the one-way ANOVA.A one-way ANOVA revealed statistically significant differences in sensory parameters, including taste, flavor, odor, thickness, consistency, and appearance, among the three curd samples, with p-values < 0.001 for all categories. The Tukey HSD test showed that odor distinguishes soy curd with a chili starter from other samples. The ANOVA results for each starter indicated significant differences: for the chili starter, $F(5, 174) = 6.987$, $p < 0.001$; for the cow starter, $F(5, 174) = 10.084$, $p < 0.001$; and for the buffalo starter, $F(5, 174) = 6.250$, $p = 0.018$. These findings highlight the importance of odor in distinguishing between the samples and provide valuable insights for product development. The sensory analysis showed that

different starters for curdling significantly affected the consistency and odor of soybean curd, with the chili starter yielding the highest thickness, consistency, and appearance values, and being moderately preferred by the panelists.

Conclusion:-

In conclusion, this study provides a preliminary analysis of three peanut curd samples: peanut milk with a chili starter, and peanut milk with cow and buffalo curd inoculum. The bacterial counts in all samples were within acceptable levels, indicating that the products are safe for consumption. The curd samples exhibited varying levels of titratable acidity, with the buffalo starter having the highest acidity and the chili starter the lowest. Lower acidity levels can reduce the risk of microbial growth and contamination, thereby enhancing food safety. The antioxidant activity analysis revealed that peanut curd made with chilies had the highest Radical Scavenging Activity, as determined by the DPPH assay. The curd sample with a buffalo starter exhibited the most significant antibacterial activity against Salmonella sp. and Shigella sp., suggesting therapeutic potential warranting further investigation.

This study illuminates the promising landscape of high-quality plant-based curd production using peanuts as a primary raw material. Peanuts, renowned for their nutritional richness, serve as a viable alternative to address the escalating demand for plant-based dairy options amid concerns like lactose intolerance and environmental sustainability. The investigation encompasses sensory evaluations, physicochemical analyses, antioxidant and antibacterial assessments, highlighting the multifaceted aspects of peanut-based curd. The revelation of microorganisms in chili stalks responsible for curd production offers a potential source for lactose-fermenting probiotic-like microbes. This study positions peanut-based milk and curd as safe, viable, and health-promoting alternatives, contributing essential insights into their composition, sensory appeal, and functional attributes. Future research could focus on developing processed peanut products like cheese, yogurt, and ice cream, enhancing the nutritional profile of peanut curd, and exploring its potential benefits for conditions like lactose intolerance.

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