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STUDIES ON FORMULATION OF WHEY PROTEIN ENRICHED - PINTO BEAN CHIKKI

Deepika. N [1], Dr. A. Swaroopa Rani [*2], Sravani G [3] , Chakradhar. M [4], Dr. Kiran Kumar.A[5]

1. Student, Department of Food Technology, Oil Technology & Pharmaceutical Research Institute, J N T University, Ananthapuramu-515001, Andhra Pradesh- India.
*2. Head &Professor, Department of Food Technology, Oil Technology & Pharmaceutical Research Institute, J N T University, Ananthapuramu-515001, Andhra Pradesh- India.
3. Student, Department of Food Technology, Oil Technology & Pharmaceutical Research Institute, J N T University, Ananthapuramu-515001, Andhra Pradesh- India.
4. Production manager, of Vijaya dairy Kurnool district, Andhra Pradesh- 518002, India.
5. Assistant professor, Department of Chemistry, University College of Technology, Osmania University, Hyderabad-500007, Telangana State, India.
Corresponding author (*): bioswar2@gmail.com

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ABSTRACT

Chikki is traditional Indian sweet, known for its rich taste and energy-boosting properties, is made by combining the protein-rich Pinto beans and almonds with the natural sweetness of jaggery. The addition of whey water not only enhances the flavour but also contributes to the overall nutritional value by providing essential amino acids and minerals. Pinto beans are a powerhouse of nutrients, offering a substantial amount of protein, fibre, and essential minerals such as iron and magnesium. Almonds complement this by adding healthy fats, vitamin E, and additional protein. Jaggery, a natural unrefined sugar, is packed with minerals like calcium, iron, potassium, and magnesium. It also contains antioxidants that may help in reducing inflammation and oxidative stress. Whey water, a by-product of cheese production, is rich in lactose and whey proteins. It is often used in food products to improve texture and nutritional content. In the context of chikki, whey water can act as a binding agent that helps in creating a chewy texture while also contributing to the protein content. The combination of these ingredients results in a chikki that is not only delicious but also offers a balanced mix of macronutrients and micronutrients. It serves as an excellent snack option for those looking to maintain a healthy diet without compromising on taste. The study further explores the potential health impacts of regular consumption of this chikki, suggesting it could be beneficial for weight management and blood sugar control due to its low glycemic index. In conclusion, the Pinto beans, almonds, whey water, and jaggery based chikki stands out as a nutritious snack that aligns with the principles of healthy eating. Its unique blend of ingredients makes it an ideal choice for individuals seeking to incorporate more plant-based proteins and natural sweeteners into their diet.

Key words : Whey water ,Pinto bean , Almonds, Palm jaggery, Chikki

INTRODUCTION

Pintobean, almond, and whey water jaggery-based chikki offers a delightful blend of flavours and textures. Pintobean, known for its nutty richness, combines harmoniously with the delicate crunch of almonds, while the whey water jaggery infusion adds a subtle sweetness that enhances the overall taste experience. This chikki not only satisfies the palate with its unique combination but also provides a nutritious treat, packed with protein from both almonds and pintobeans, complemented by the natural sweetness of jaggery. Together, these ingredients create a chikki that is both wholesome and indulgent, perfect for those seeking a flavourful and health-conscious snack option.(Chetana R 2011) Dry beans (Phaseolus vulgaris L.) contain high levels of `that have shown to protect against such conditions as oxidative stress, cardiovascular disease, diabetes, metabolic syndrome, and many types of cancer, thereby positioning this legume as an excellent functional food. Pinto beans, belonging to the kidney bean family, are popular in the Southwest and Northern Mexico. (Aremu, M. O et al , 2006)

Almonds (Prunus dulcis Miller D. A. Webb), from the Rosaceae family, are highly regarded for their nutritional richness and have gained popularity as a healthful food choice among consumers and producers alike. Extensive studies on almond composition and characterization reveal a wealth of essential nutrients. These include a balanced profile of fatty acids, beneficial lipids, essential amino acids, proteins, and carbohydrates. Almonds are particularly noted for their high content of monounsaturated fats, which contribute to heart health, as well as their abundance of dietary fibre, vitamins (such as vitamin E), and minerals (like magnesium and potassium). This nutrient density positions almonds as a versatile and valuable addition to a balanced diet, supporting overall well-being and promoting various health benefits.

Whey water, often regarded as a byproduct of cheese or yogurt production, holds hidden nutritional benefits that make it a valuable ingredient in various culinary applications. This translucent liquid is rich in protein, vitamins, and minerals, offering a boost to immune health and muscle recovery. As awareness grows about reducing food waste, whey water emerges not just as a practical solution but as a nutritious addition that enhances the overall culinary experience. Incorporating whey water into chikki introduces a unique twist to this traditional Indian sweet. (Coskun Aydiner et al .. 2013)The whey water adds a hint of tanginess that balances the sweetness of jaggery, creating a complex flavour profile. This innovative approach not only reduces food waste but also transforms the chikki into a healthier snack option without compromising on taste. The result is a delightful treat that combines the richness of almonds, the earthiness of pintobean, and the nutritional benefits of whey water-infused jaggery, appealing to both taste and health-conscious consumers. (Amrane, A. 1993)

Among all jaggery, palm jaggery having its own importance. It usually contains 65-85% sucrose and 5-15% reducing sugars, and is consumed directly or used for preparation of sweet confectionery items and ayurvedic\traditional medicines, and it may have a role to reduce the chance of lung cancer. Incorporation of palm jaggery into the pintobean chikki enhances nutritional quality compared to that of marketed chikki. It is a good source of vitamins and minerals. (Dr P C Vengaiah et al , 2013)

MATERIALS AND METHODS :

Materials:

Whey water, Pintobeans, Almonds, Palm jaggery, Food processor, Moulds, Packing materials

Methods:

Select and Clean: Start with dried pintobeans. Ensure they are clean and free from debris. Sort through them to remove any stones or damaged beans.

Rinse and Soak: Rinse the pintobeans thoroughly under cold water. Transfer them to a bowl and cover with water. Allow them to soak overnight or for at least 8 hours. This soaking process softens the beans, making them easier to grind into a fine powder.

Drain and Dry: After soaking, drain the pintobeans using a colander or sieve. Spread them out on a clean kitchen towel or paper towels to remove excess moisture. Pat them dry gently.

Roast (Optional): Preheat your oven to a low temperature (around 250°F or 120°C). Spread the drained pintobeans evenly on a baking sheet. Roast them in the oven for about 30-40 minutes, stirring occasionally, until they are completely dry. This step helps remove any remaining moisture and enhances the flavour of the beans.

Grind: Once the pintobeans are dry, transfer them to a blender or food processor. Grind them in batches until they form a powder. A high-powered blender or spice grinder works best for achieving a smooth texture. (S. S. Audu1,2014)

Whey water extraction:

Cheese Cutting and Heating: Cut the cheese into small pieces or crumble it. Heat the cheese in a pot or saucepan over low to medium heat, stirring gently to prevent sticking. Heating helps to release more whey from the curds.

Draining: As the cheese heats, you'll notice whey separating from the curds. Allow the mixture to cook until the curds and whey are visibly separated. This can take several minutes, depending on the cheese type and amount.

Straining: Once the separation is clear, remove the pot from the heat. Set up a fine mesh strainer or cheesecloth-lined colander over a large bowl or pot. Carefully pour the mixture into the strainer, allowing the whey to drain through while capturing the curds.

Pressing (optional): If you want to extract more whey, you can gently press the curds with a spoon or spatula to encourage further drainage. Be careful not to press too hard, as you don't want to force the curds through the strainer or cheesecloth.

Collecting Whey Water: The liquid collected in the bowl or pot beneath the strainer is your whey water. It will be slightly cloudy and may have a faint yellowish tint depending on the cheese type.

Cooling and Storing: Allow the whey water to cool to room temperature before transferring it to a clean container with a tight-fitting lid. Store it in the refrigerator for up to a week. (Unal Sen et al .,2013)

Procedure:

1.Pinto beans were taken and roasted and grinded in food processer similarly almonds were taken roasted and grinded.
2.Cheese is taken heated and whey water is extracted from the cheese.
3.100 ml of whey water is boiled and palm jaggery is added to the mixture and boiled until the caramel is formed and cooled
4.Then mix the pinto beans and almonds powder into the mixture.
5.The mixture is spreaded on tray and shapes were cutted.

Table 1 Different formulations tested for pinto bean chikki

S.NO	SAMPLE	TREATMENT-1	TREATMENT-2	TREATMENT-3
1.	Whey water	50ml	45ml	40ml
2.	Pinto beans	20gm	15gm	17gm
3.	Almonds	15gm	10gm	12gm
4.	Palm jaggery	15gm	25gm	30gm

Fig: 1 PINTO BEAN

Fig :2 PINTO BEAN & ALMOND MIXTURE

PHYSICO CHEMICAL ANALYSIS

PROTEIN

Dissolve 3 g of copper sulphate (CuSO4.5H2O) and 9 g of sodium potassium titrate in 500ml of 0.2 mol/litre sodium hydroxide; add 5 g of potassium iodide and make up to 1 litre with 0.2mol/litre sodium hydroxide. Protein Standard: 5 mg BSA/ml. Apparatus and Glass wares required: Test tubes, Pipettes, Colorimeter, etc.,(Nawsheen Boodhun,2018)

Procedure:

Pipette out 0.0, 0.2, 0.4, 0.6, 0. 8 and 1 ml of working standard into the series of labelled test tubes. Pipette out 1 ml of the given sample in another test tube. Makeup the volume to 1 ml in all the test tubes. A tube with 1 ml of distilled water serves as the blank. Now add 3 ml of Biuret reagent to all the test tubes including the test tubes labelled 'blank' and 'unknown'. Mix the contents of the tubes by vortexing / shaking the tubes and warm at 37 ºC for 10 min. Now cool the contents to room temperature and record the absorbance at 540 nm against blank. Then plot the standard curve by taking concentration of protein along X-axis and absorbance at 540nm along Y-axis. Then from this standard curve calculate the concentration of protein in the given sample.

Calculations: OD of test (optical density) Total protein (go) =X Concentration of standard OD of standard

MOISTURE

The moisture content of the samples was determined by using the method of AOAC (2007)

Procedure:

The petri-dish with lid was weighed. 2. 5g of sample was weighed into the petri-dish and spread evenly for uniform drying. Oven was set at 100 to 1050C and the petri-dish with sample was placed inside the oven with lid open for 15-17 hrs. The petri-dish was cooled in a

desicator with lid open for 1-2 hrs. The petri-dish with sample was weighed. This was repeated for all samples till constant weight was achieved.

ACIDITY

Titratable acidity content, determined by titrimetry (Instituto Adolfo Lutz; 2008), considering 10 g of each of the formulations, which were diluted in distilled water to 100 ml. For reading, after addition of the phenolphthalein indicator, the solution was titrated with NaOH solution (0.1M), and results expressed in grams of citric acid 100 g-1 sample

RESULT AND DISCUSSION:

A chikki can be made by combining pinto beans, almonds, whey, water, and palm jaggery. First, roast the almonds until they're lightly golden. In a separate pan, melt the palm jaggery over low heat until it reaches the hard ball stage. Add the roasted almonds, pinto beans, and a splash of whey to the jaggery, mixing well. Transfer the warm mixture onto a greased surface, flatten it, and let it cool. Compared to that of marketed chikki the pinto bean chikki is highly nutritious and suitalble for different age groups

Table 2 sensory analysis of different formulation tested for pinto bean chikki

S.NO	Treatment	Colour	Flavour	Texture	Appreance	Taste	Overall acceptance
1.	T1	7	8	6	7.5	7	7.0
2.	T2	8.5	8	8	8.5	8	8.0
3.	T3	7	7	6.5	7	6.5	7.0

Table 2 shows the effects of treatment on sensory characteristics of the chikki. the value of appearance, taste, flavour, texture, and overall acceptability increased with the increasing level of pintobean and almonds in chikki. Chikki having 30% pintobean and almonds got highest score and minimum was given to chikki with low pintobean and almond quantity. Slight changes in texture and aroma were observed. According to (Byrappa Vasu Pallav 2011) with time passes the texture and aroma is changed by the time The mean score of the sensory evaluation is obtained for the variation (T2) by overall acceptability. Therefore, from the results it is concluded that the chikki formulated with pinto bean and almond chikki scored maximum score. Nutritional analysis of the chikki (T2) such as energy, fat and protein

Table 3 Nutritional analysis of chikki for 5 gm of sample

S.NO	Nutrient	Values
1.	Moisture	1.02%
2.	Fat	0.5%
3.	Protein	2.2gm
4.	Acidity	0.25%
5.	SNF	3%

Pinto bean and almond chikki are rich in protein and minerals, less in carbohydrates which can be taken by all age groups. High number of phyto nutrients and rich in fibre are a nutrient-dense snack option, which could be consumed by different age groups providing a good amount of vitamins, minerals, and antioxidants. They are also low in calories, fat, and

water content, making them a convenient and healthy choice for consumers. The protein content of pintobean chikki was found to be 2.2 gm as per 100 gm and the previous work on peanut based chikki was found to be 9.2 gm Saratu Stephen Audu et al..(2011). The variation in the protein content could be attributed to the difference in the ingredients utilized to formulate the chikki.

CONCLUSION

A new variety of chikki particularly rich in protein, fibre and minerals. Appearance,taste and mouth feel characteristics of chikki improved upon the addition of the pinto bean .Based on overall statistical analysis of all attributes T2 was mostly preferred by sensory panel which has good flavour, smell ,taste and offer nutrition element like vitamin B. Result of the study has revealed that addition of pintobean and almonds, to chikki is convenient snack option that retains natural nutrients and antioxidant and had longer shelf life. The developed formulation is healthy and nutritive treat than commercial chikki. Further research is recommended to establish the condition for processing of pintobeans in different forms and levels of addition in chikki without compromising the quality of the product.

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