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Development of Whey Enriched Protein Rusk

K Murali Naik, D Daniel Smith and M Sardar Baig
College of Food Science,Bapatla 522 101, Andhra Pradesh

ABSTRACT

The present study was undertaken on whey protein enriched rusk and prepared by the use of ingredients likewhey protein, skim milk powder, refined wheat flour, sugar, baker's yeast, vanaspati, ammonium sulphate, salt, almonds and cardamom with different ratios of skim milk powder and whey protein powder *i.e.* 100:0, 75:25, 50:50, 25:75 and 0:100. The formulations were evaluated for nutritional aspects mainly protein and calcium content and sensory attributes like texture, taste *etc* through 9 point hedonicscale method. The product has been formulated with sole objective to increase dietary protein intake which is ultimately beneficial for muscle building. The formulation of 50:50 has the highest overall acceptability and best in texture and the protein content was highest in this sample was found to be 14.83 per cent.

Key words : Baker's yeast, Protein content, Rusk, Sensory attributes, Whey protein.

Rusk is a raised bread, cracker, or cake that has been dried to a crisp and browned either toasted in an oven or baked a second time after slicing. It can be plain or sweet. It is one of the snack food consumed by all age group people andsometimes also used as a baby teething food.Rusk is a hard, dry, double baked biscuit and its protein content can be increased by incorporating whey protein which also contributes to the economy of operation of dairy plants by reducing the cost of effluent treatment (Jaritha *et al.*,2010).

Whey is a by-product of cheese, paneer and casein manufacturing. Whey protein represents nearly 20% of the total bovine milk proteins and commercially it is available in three major forms as concentrate, isolate and hydrolysate. The major fractions of whey proteins are á-lactoglobulin, á-lactoalbumin, immunoglobulin and bovine serum albumin. Whey protein prepared by using ultra filtration and micro particulation process converts the protein molecules into spherical particles which allow smooth flowing layer in foods where fat is replaced. Not only the biological values of whey protein superior to most other proteins but also have a high content of sulfur containing amino acids, which support antioxidant function. Newer whey ingredients include hydrolysed whey proteinsthat contain high levels of bioactive peptides (Foegeding*et al.*,2002). These hydrolysates can be added to special foods to increase protein value, as enzymatic hydrolysis can optimize their functional properties. Thus, there is considerable commercial interest in the preparation of whey proteins for food, nutraceutical and therapeutic applications.

In the unorganized dairy industry, the whey is disposed as effluent and results in loss of valuable milk solids which can be better utilized as a source of nutrient (Jaritha and Kulkarni, 2009).

Whey proteins impart an important functionality in bread formulations that helps to enhance crust browning, crumb structure and flavor, improve toasting qualities and retard staling. The modified whey proteins have been found to have excellent water absorption properties and its ability to absorb and bind water is useful in connection with frozen dough for bread and rolls that are mixed, formed and then held in frozen storage for some length of time before being thawed, proofed and baked. It may confer a protective effect on the gluten network in the frozen dough system. The whey proteins also contribute to browning process in bakery items through Maillard'sreaction by reacting with lactose and other reducing sugars present in a formulation. It can also improve the flavor and texture of reduced fat, low fat and fat free baked goods.

OBJECTIVES: Keeping in view of its high nutritional values and high protein content, whey

Table 1. Nutritional Value for Whey Protein Powder.

Serving size	100grams
Protein	81%
Total Carbohydrates	7.04%
Total Fat	7.04%
Energy	387kcal
Calcium	0.4%

Source: USDA Nutrient Database

protein enriched rusk was developed by incorporation of whey protein in a conventional rusks, which contain dietary protein beneficial for muscle building.Thus developed rusks were evaluatedfor their sensory attributes, microbial growth and nutritional aspects.

MATERIALS AND METHODS

2.1.Materials Required

- Refined wheat flour
- Whey Protein
- Skim milk powder
- Baker's Yeast
- Crystalline sugar
- Vanaspati
- Salt
- Cardamom
- Almonds
- Ammonium sulphate

2.2.Equipments used in product preparation and analysis

- Microwave oven
- Muffle furnace
- Hot air oven
- Digestion chamber
- Soxhlet Apparatus
- Distillation chamber
- Cooling centrifuge
- Colorimeter
- Weighing machine
- Baking trays

2.3.Procurement of raw materials

All the raw materials except Whey Protein were procured from local market of Bapatla. Whey Protein was procured from Chennai.

2.4.Preparation

The methodology of whey protein enriched rusk preparation is divided into various steps. These are described below:-

Ferment preparation
↓
Combining ingredients
↓
Dough preparation
↓
Moulding and Panning
↓
First proofing (6-8 hours)
↓
First baking (225ÚC/15-20 minutes)
↓
Final proofing (overnight)
↓
Slicing
↓
Final baking (150ÚC/15min)
↓
Brownish crisp rusk

Fig.1. Process flow chart for whey protein enrichedrusk

2.5. Experimental Details

2.5.1. Different proportions of whey protein incorporated

In the present study, we have blended different proportions of whey protein powder in rusk for the proper standardization of the product. Five different blends like 0%, 25%, 50%, 75% and 100% of whey protein incorporated into rusk with respect to the mix following the above mentioned procedure. The details of formulations are shown in table:

Evaluation of formulated product

Samples of different ratios were evaluated for following parameters:-

- Microbial Analysis (AOAC, 1990)
- Organoleptic evaluation(Peryac and Giradot 1952).
- Proximate analysis (AOAC, 1990)
- Physical analysis(AOAC, 1990)

RESULTS AND DISCUSSIONS

3.1. Microbial Analysis: The formulated product is evaluated for the presence of microbial count. Here, we analyzed two samples microbially i.e. sample A and sample E. The results obtained is given in table below which shows that the colony count for both bacterial and fungal is below the permissible count.

Table 2. Formulations used in whey protein (WP) enriched rusk.

Ingredients	Maida	Sugar	SMP	WP	Vanaspati	Badam	Yeast
100:0	100g	30g	20g	-	10g	2g	1g
75:25	100g	30g	15g	5g	10g	2g	1g
50:50	100g	30g	10g	10g	10g	2g	1g
25:75	100g	30g	5g	15g	10g	2g	1g
0:100	100g	30g	-	20g	10g	2g	1g

Table 3. Details of formulation.

Treatment	Skim milk powder,%	Whey protein, %
Sample A	100	0
Sample B	75	25
Sample C	50	50
Sample D	25	75
Sample E	0	100

Table 4. Microbial Analysis.

GROUP	SAMPLE A	SAMPLE E
Bacterial count (CFU/g)	100	125
Fungal count (CFU/g)	150	185

Table 5. Sensory analysis data.

ATTRIBUTES	S-A	S-B	S-C	S-D	S-E
Color	6.6	7.0	7.0	7.1	7.2
Texture	6.8	6.9	7.3	7.0	7.4
Crispiness	7.4	7.0	7.5	7.3	8.0
Taste	7.3	7.5	7.8	7.3	7.6
Overall Acceptability	7.0	7.4	7.5	7.2	6.9

Plate 1. Product after first baking.

Plate 2. Final product after second baking.

Plate 3. Bacterial limit test of sample A and sample E

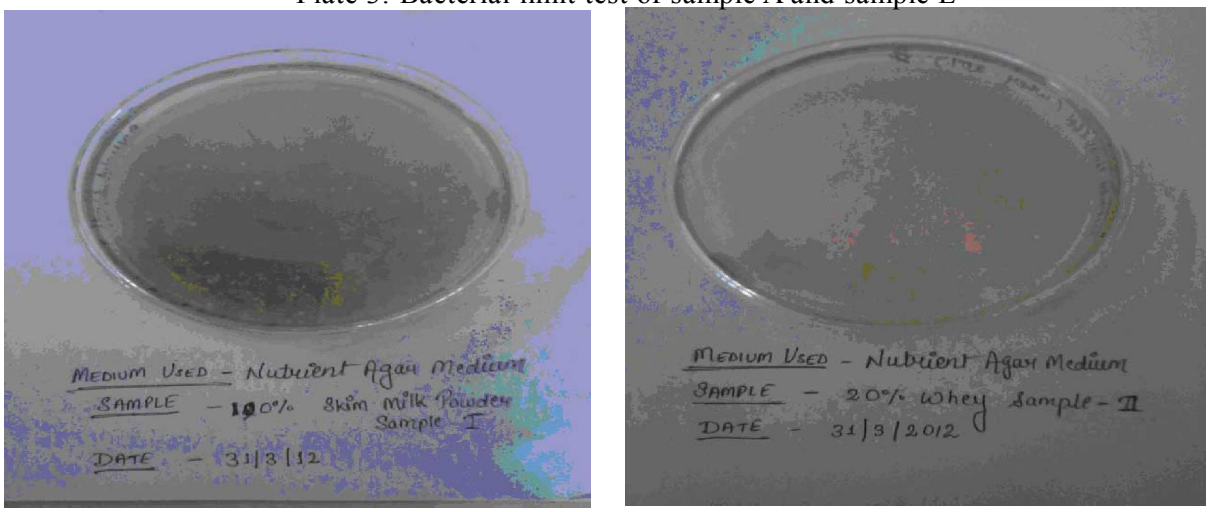
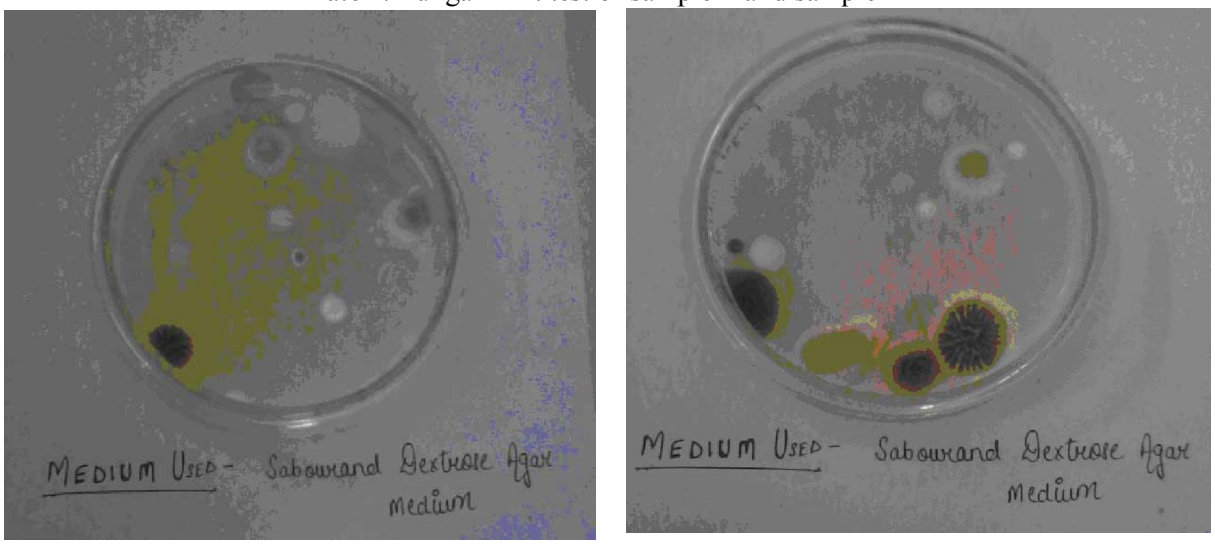


Plate 4. Fungal limit test of sample A and sample E



3.2. Organoleptic Evaluation

Sensory evaluation for the Whey Protein enriched Rusk was conducted using 5 test samples having different ratios of whey protein powderand skim milk powder. These samples were tested with the help of a 10 member panel.

3.2.1.Evaluation:

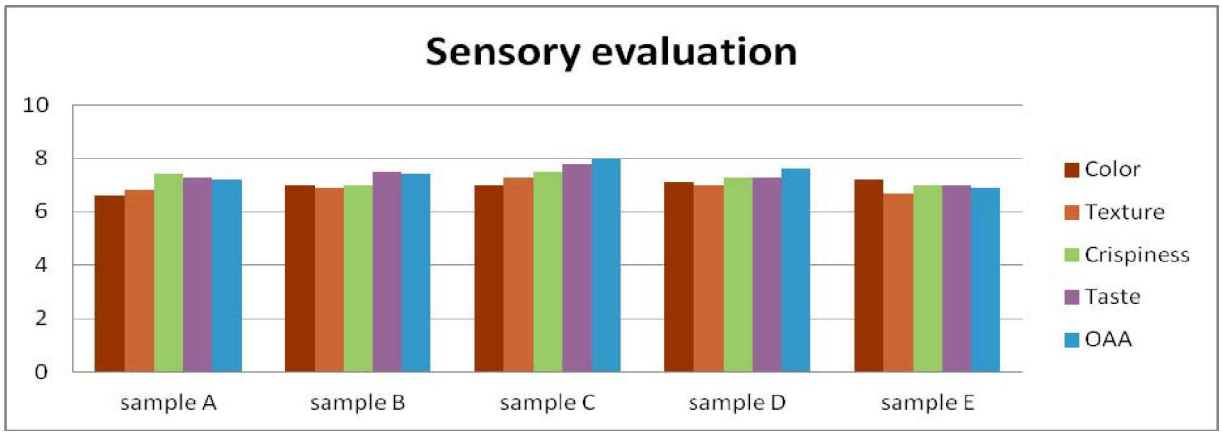
From the sensory evaluation analysis, it is clearly seen that in terms of color, sample E is best, in terms of texture is sample C is best, in terms of crispiness sample C is best and in terms of taste sample C is best and finally in terms of overall acceptability sample C is best. Hence at the end of sensory evaluation it is concluded that sample C is having better edge over the other samples.

3.3. Proximate Analysis: Results obtained after proximate analysis of different samples of product are following:

Conclusions:

According to proximate analysis sample E contained good amount of protein as well as energy content also. Sample A gave high amount of calcium which is an essential mineral.From sensory evaluation results it is concluded that sample C has good acceptability to that of other samples in terms of flavor, taste, color and texture. The cost of production is not very expensive and is affordable for almost all class of people and is mainly used as snacks.

Fig 2. Organoleptic Evaluation.



3.3.1 Estimation of moisture content:

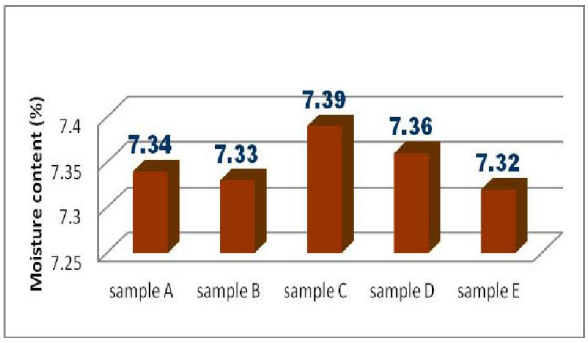


Fig .3 Analysis of moisture content

3.3.2 Estimation of titratable acidity:

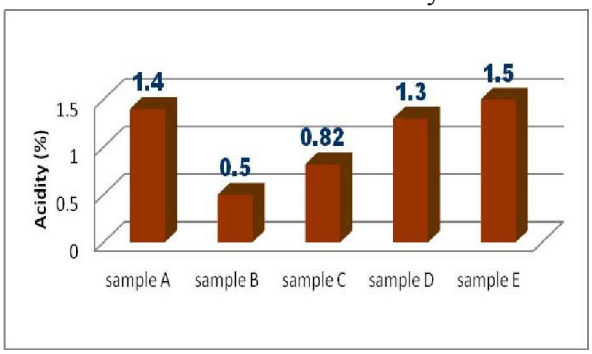


Fig .4 Analysis of Acidity

3.3.3. Estimation of energy:

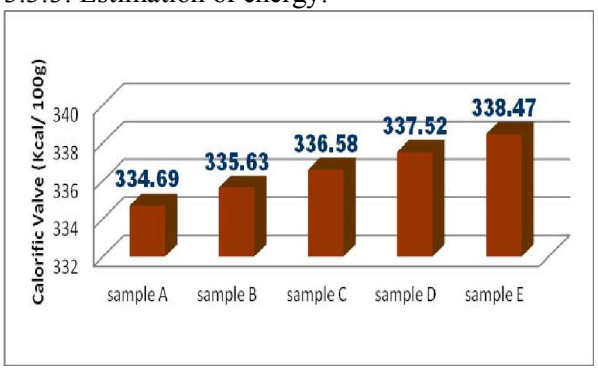


Fig .5 Analysis of Energy

3.3.4 Estimation of carbohydrate:

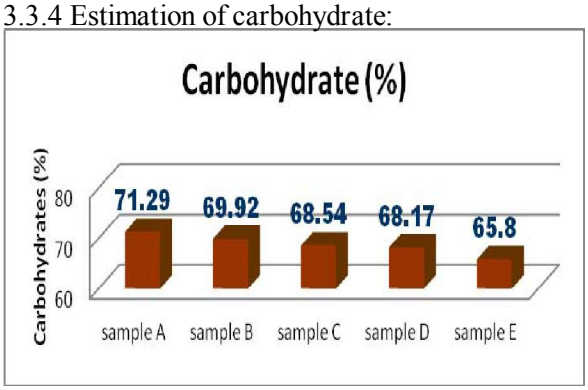


Fig .6 Analysis of Carbohydrate

3.3.5 Estimation of fat:

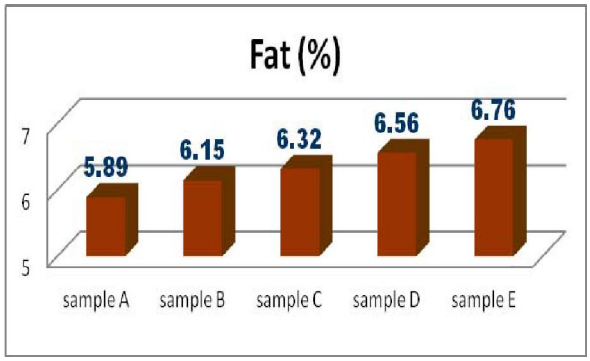


Fig.7 Analysis of Fat

3.3.6 Estimation of protein:

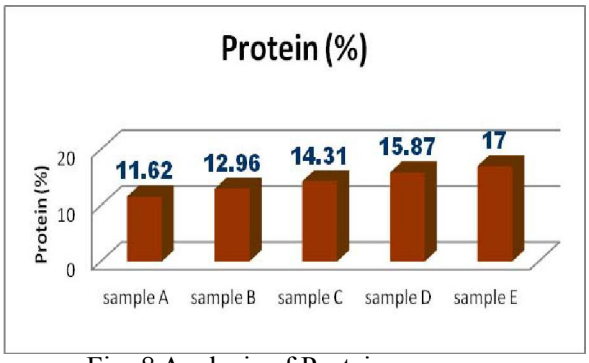


Fig .8 Analysis of Protein

3.3.7 Estimation of total ash:

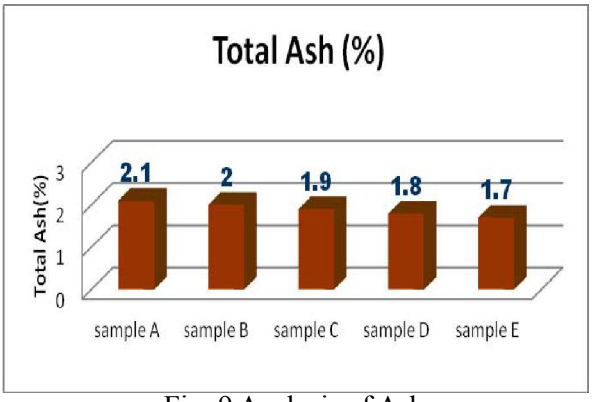


Fig .9 Analysis of Ash

3.3.8 Estimation of calcium:

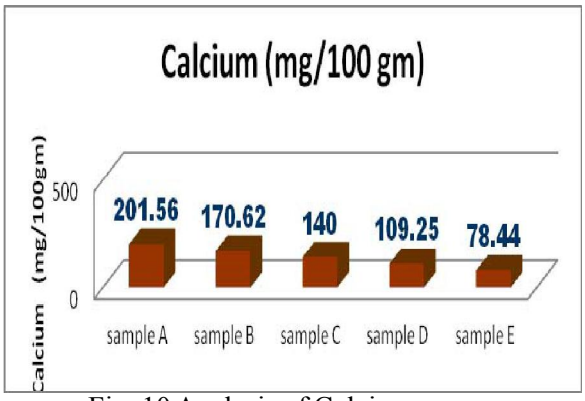


Fig .10 Analysis of Calcium

3.3.9 Estimation of iron:

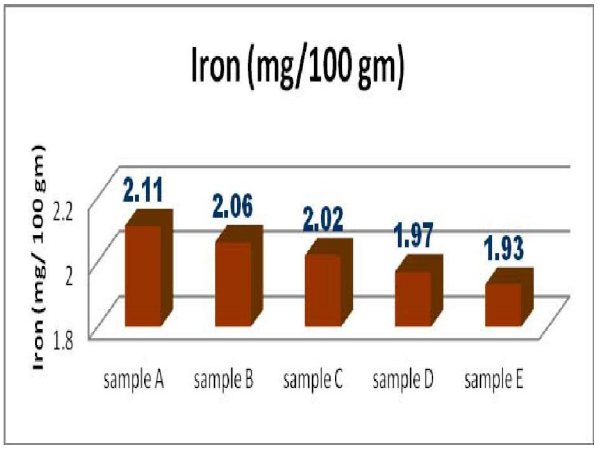


Fig .11 Analysis of Iron

3.4. PHYSICAL ANALYSIS:

3.4.1 Bulk density :The bulk density of different samples varied from 0.49gm/ml to 0.61gm/ml.

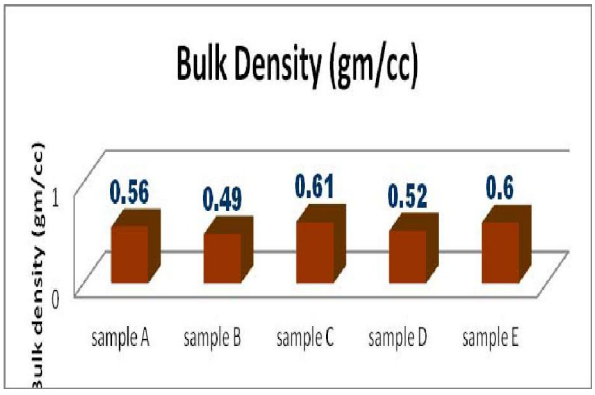


Fig .12 Analysis of bulk density

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