International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 4 Issue 8, August 2017

ISSN: 2394-4404

# Studies On The Development Of Fermented Whey Beverage

**Nikhilesh Kulkarni**

**Prashant Pawar**

**Rachana Pachori**

**Prithviraj Sadar**

***Abstract:*** ***Whey is highly nutritious byproduct in cheese making process. Every year millions of tons of whey are discarded as waste. Whey has several uses like as cattle feed fertilizer and in food industry as protein source .The whole whey by itself carries an unpleasant taste and aroma and hence refuse for drinking purpose. The domestic and low scale milk processing produces whey that has a higher nutritional content and can be utilized locally to produce nutritional drinks that can serve a variety of purposes from refreshment to dietary supplements. Hence, taking Dairy waste into attention the whey produced from Butter, Curd & Cheese by native dairies were collected and handled for development of fermented beverage using bacteria and yeast. Post incubation the fermented whey was analyzed for Total acidity, Alcohol, Maltose, Riboflavin and Protein content .The data was compared with uninoculated & refrigerated control. The results revealed that in post fermented whey total acidity, alcohol, maltose, riboflavin and protein content was increased over control. The maximum enhancement was recorded in whey produced from cheese followed by curd and butter .The study indicates the possible development of energy drink from whey from cheese industry.***

***Keywords: Whey, Whey protein, nutritional beverage***



## I. INTRODUCTION

Whey is the watery part of milk that remains after the acid or proteolysis enzyme mediated coagulation of milk. It is major by-product of cheese, casein, curd, and butter making industry, approximately, of the whole raw material of dairy product, about80-90 per cent liquid portion is generated as whey. It is considered to be reliable source of number of high quality and biological active proteins, carbohydrates and minerals. Bhattacharjee (2006) reported that during cheese making, for every 10 lb of milk used; only 1 lb is converted to cheese, and 9 lb is sloughed off as whey. Darade et al., (2014) reported the current world production of whey is estimated at about 165 million tones out of which In India, nearly 5 million tones whey is produced of which channa, and *Paneer whey* contributes around 80 per cent of total whey (Gupta, 2008).Whey is not only a good source of protein, but is also significantly rich in minerals and lactose Huffman 1996. Yet, most of the whey produced every year is disposed of into rivers and lakes. Currently, the world produces well over 80 x 109 L of whey per year.Smitherset.al 1996.

Whey protein products are a growing segment of the nutritional supplement industry; most protein shakes are manufactured and sold in powder form, after ultra filtration and spray drying of the whole whey. However, all the current methods of whey dispensation necessities the complex technical infra-structure and are expensive which imitates in the higher cost of final product and Hence, are outside the focus of poor community. Therefore the novel method has to be developed whereby whole whey could be utilized as a beverage without being subject to any treatments, whey based beverages could be produced at a much lowered manufacturing cost price, which would benefit the manufacturer, as well as the consumer. The only constraint with using whole whey in a beverage as opposed to micro-filtered, ultra-centrifugation as the bad odor and taste can't be removed, however, some purification studies using the process of charcoal adsorption has found to reduce surface

contaminants of whey proteins (Cornec and Narsimhan 1998). In view of the high quantum of dairy by products with its successive recycling for other products. It has been tempted the focus of attention to ferment whey for the development of cheap, nutritionally valuable beverage.

## II. METHOD AND MATERIALS

### COLLECTION AND PROCESSING OF SAMPLE

Fresh butter, cheese and curd whey was obtained from the local Dairy, Risod the samples were collected in sterile container. The whey was heated at $60^{O}$C for 30 minutes, cooled at room temperature and further separated using sterilized muslin cloth and stored in refrigerator until further use.

### ISOLATION OF STARTER'S

#### *LACTOBACILLUS SPECIES*

1 gram Fresh Curd sample was inoculated in Lactobacillus broth and incubated at 37ºC for 48 hrs in aerobic condition. The enriched sample was isolated by spread plate method using Lactobacillus agar the isolates were characterized by conventional method and compared with slandered literatures.

#### *ACETOBACTER SPECIES*

1 gram Fresh apple sample was inoculated in Acetobacter broth and incubated at 37ºC for 48 hrs in aerobic condition. The enriched sample was isolated by spread plate method using *Acetobacter* agar the isolates were characterized by conventional method and compared with slandered literatures.

#### *SACCHAROMYCES CEREVISIAE*

1 gram crushed grape juice was inoculated in potato dextrose Broth and incubated at $28^{0}$C for 48 in aerobic condition. The enriched sample was isolated by spread plate method using potato dextrose agar the isolates were characterized by conventional method and compared with slandered literatures.

### WHEY FERMENTATION

For primary fermentation the isolated bacterial cultures were separately inoculated@ 15 %v/v in 100 ml of all the whey samples viz curd, chess and butter. All the inoculated sets were incubated for 48 hrs in aerobic conditions. After incubation the enriched samples were observed for development of turbidity and compared with uninoculated control. Followed by the fermentation in each fermented bottle 1.5 gm. glucose was added under the aseptic condition. To each fermented broth secondary inoculation was done using 15 % v/v s. cereviceae. The bottles were sealed and incubated initially aerobically followed by anaerobic condition, for seven days at room temperature. Subsequent to incubation the fermented broths were analyzed for acidity, alcohol, maltose, riboflavin and protein content as comparing with uninoculated control.

### POST FERMENTATION ANALYSIS

The acidity of the Whey was determined adopting method suggested by (Lansky and Newman 2007). The Reducing sugar was determined adopting DNSA method suggested by (G.L.Miller 1959). The alcohol was estimated using specific gravity method and percentage was calculated as per the standard AOAC table by (Crowell, E. A., et.al, 1979). Riboflavin content was estimating bioassay method by (Bartzatt et al., 2014). The protein concentration was estimated adopting standard biurate test by (Goa, J. "A 1953).

## III. RESULT AND DISCUSSION

Comparative chemical analysis of fermented beverage for Alcohol, Acidity, Protein, Riboflavin & Maltose

The results on alcohol content of the fermented whey samples are presented in table 5.1 & in fig 5.1 It was observed that, the alcohol produced in whey generated from cheese was (9.6) per cent where as it was (7.8) in case of whey generated from curd, followed by (5.8) in butter whey the results indicated that the percentage of Alcohol in the fermented Chees whey is more as compared to whey generated from butter, curd. The alcohol produced in control was minimum (0.5) per cent over all the fermented samples. Hence, if the fermented whey is developed by optimization protocol it can be taken into consideration as traditional alcohol beverage at industrial scale. Thereafter in case of an acidity generated after fermentation table 5.2 & fig 5.2 it was observed that, the acidity produced in whey generated from cheese was higher (16.8) per cent where as it was (9.6) in case of whey generated from curd, followed by (14) in butter whey the results indicated that the percentage of Acidity in the fermented Chees whey is more as compared to whey generated from butter, curd. The Acidity produced in control was minimum (2.4) per cent over all the fermented samples. The generated acidity may impart the acid hydrolysis potential of whey beverage which may be favorable for the digestion process. The results on protein content after fermentations are presented in table 5.3 & in fig 5.3 It was observed that, the protein produced in whey generated from cheese was (42) per cent where as it was (39) in case of whey generated from curd, followed by (28) in butter whey the results indicated that the percentage of protein in the fermented Chees whey is more as compared to whey generated from butter, curd. The protein produced in control was minimum (7.8) per cent over all the fermented samples. This may be due to the contribution of starters in secreting the protein molecules during the fermentation processes which will possible enhance the nutritive value of the whey fermented beverage. The results on the riboflavin content of fermented whey samples are presented in table 5.4 & in fig 5.4 From the result it was observed that, the riboflavin produced in whey generated from cheese was (11) per cent where as it was (9.9) in case of whey generated from curd, followed by (6.9) in butter whey the

ISSN: 2394-4404

results indicated that, the percentage of riboflavin in the fermented Chees whey is more as compared to whey generated from butter, curd. The riboflavin produced in control was minimum (3.2) per cent over all the fermented samples the study indicates the induction of an antioxidant property to fermented whey beverage .similarly the result on sugar content are presented in table 5.5 & in fig 5.5 It was observed that after fermentation sugar content was increased, the sugar produced in whey generated from cheese was (2.7) per cent where as it was (1.45) in case of whey generated from curd, followed by (0.7) in butter whey the results indicated that the percentage of sugar in the fermented Chees whey is more as compared to whey generated from butter, curd .The sugar produced in control was minimum (0.2) per cent over all the fermented samples. This indicates that if the whey is fermented it may become a good source of energy

| Whey | Alcohol % |
|---|---|
| Butter | 5.8 |
| Curd | 7.8 |
| Cheese | 9.6 |
| Control(non-fermented) | 0.5 |

*Table 5.1: Effect of fermentation on Alcohol percent*

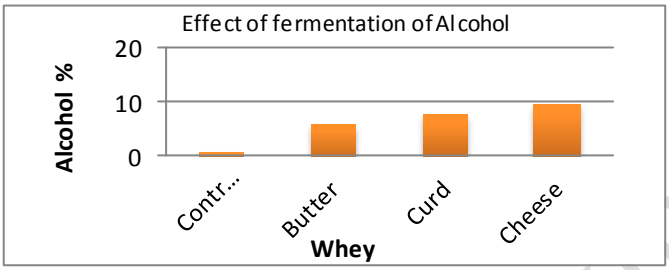


*Figure 5.1: Effect of fermentation on Alcohol percent*

| Whey | Acidity % |
|---|---|
| Butter | 14 |
| Curd | 9.6 |
| Cheese | 16.8 |
| Control(non-fermented) | 2.4 |

*Table 5.2: Effect of fermentation on Acidity percent*

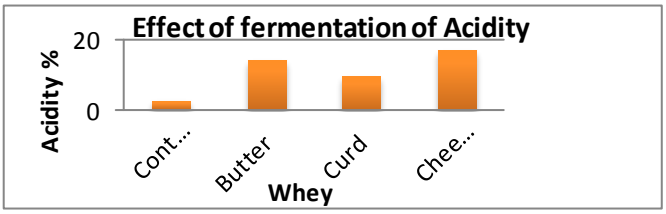


*Figure: 5.2: Effect of fermentation on Acidity percent*

| Whey | Protein % |
|---|---|
| Butter | 28 |
| Curd | 39 |
| Cheese | 42 |
| Control(non-fermented) | 7.8 |

*Table 5.3: Effect of fermentation on Protein percent*

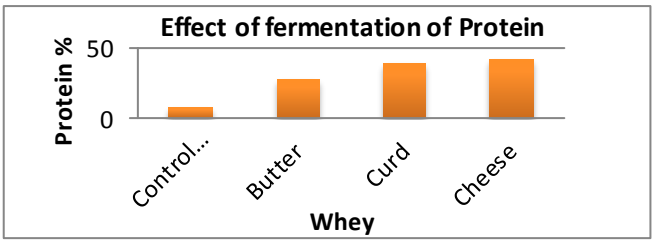


*Figure 5.3: Effect of fermentation on Protein percent*

| Whey | Riboflavin% |
|---|---|
| Butter | 6.9 |
| Curd | 9.9 |
| Cheese | 11 |
| Control(non-fermented) | 3.2 |

*Table 5.4: Effect of fermentation on Riboflavin percent*

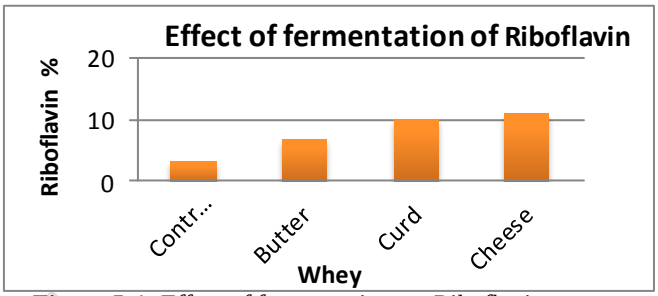


*Figure 5.4: Effect of fermentation on Riboflavin percent*

| Whey | Sugar % |
|---|---|
| Butter | 0.7 |
| Curd | 1.45 |
| Cheese | 2.7 |
| Control(non-fermented) | 0.2 |

*Table 5.5: Effect of fermentation on Sugar percent*

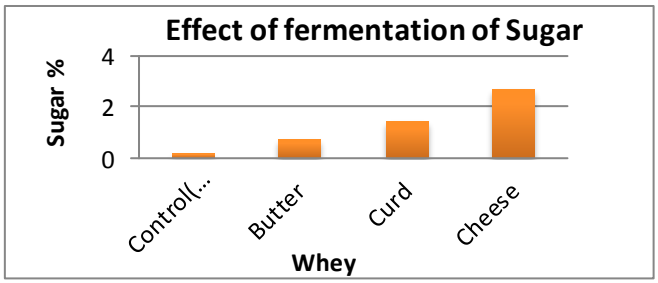


*Figure 5.5: Effect of fermentation on Sugar percent*

## IV. CONCLUSTION

Whey is rich in valuable proteins which can be used as main ingredient in value added and nutritious products. Utilization of whey instead of draining can reduce the environmental pollution. It also reduces the load of effluent treatment plant. Due to fermentation the whey can be improved for its nutritive value. The free amino acids can be generated due to whey fermentation the development of alcoholic whey beverage can be replaced by wine and may work as mendicant. The enhanced acidity may help for digestion of food as well as for reducing the risk of infection by neutrophilic and alkaophic gastrointestinal pathogens It can be used as the baby drinks instead of traditional ghuti. The

ISSN: 2394-4404

enhanced riboflavin may help in energy production and may enhance the value of essential anti oxidant nutrient in our diet. The enhanced protein may help to improve muscle protein and promote the growth of lean tissue mass this can be develop as liquid food supplement for body builders .The enhanced sugar may help as high calorie drink to enhance the stamina. Lack dietary fiber, are generally lacking in nutritious value.

## REFERENCES

[1] Bhattacharjee et.al; (2006). Studies on the fractionation of ß-lacto globulin from casein whey using ultra filtration and ion-exchange membrane chromatography. J. Mem. Sci., 275(1-2), 141-50.
[2] Cornec, M, Narsimhan, G. (1998). Effect of contaminant on adsorption of whey proteins at the air-water interface. J. Agric. Food Chem., 46(7), 2490-8.
[3] Crowell, E. A., and C. S. Ough. (1979) "A modified procedure for alcohol determination by dichromate oxidation." American Journal of enology and viticulture., 30(1), 61-63.
[4] Darade, R.V., and Ghodake, S. S. (2014). An overview of whey beverages. Research Journal of Animal Husbandry and Dairy Science, 3(1), 41-44.
[5] Goa, J. (1953)"A micro biuret method for protein determination Determination of total protein in cerebrospinal fluid." Scandinavian journal of clinical and laboratory investigation, 5(3), 218-222.
[6] Gupta, V.K. (2008). "Overview of production, processing and utilization of dairy by products. Course Compendium": Technological advances in the utilization of dairy Products.15-16, Dec. 2008, National Dairy Research Institute, Karnal, Haryana (India). pp.1-7.
[7] Huffman, LM. (1996). "Processing whey protein for use as a food ingredient". Food Tech. 50, 49-52
[8] Lansky, Ephraim P., and Robert A. Newman. (2007). "Punica granatum (pomegranate) and its potential for prevention and Treatment of inflammation and cancer." Journal of ethno pharmacology 109(2), 177-206.
[9] Miller, Gail Lorenz. (1959). "Use of dinitrosalicylic acid reagent for determination of reducing sugar." Analytical chemistry 31, 3426-428.
[10] Ronald Bartzatt and Tasloach Wol. (2014). Detection and Assay of Vitamin B-2 (Riboflavin) in Alkaline Borate Buffer with UV/Visible Spectrophotometry. International Scholarly Research Notices. Volume 2014 Article ID 453085. 7 pages
[11] Smithers, et.al; (1996). New opportunities from the isolation and utilization of whey proteins. J Dairy Sci. 79 (8), 1454-9.