



An overview of whey beverages

ROHINI V. DARADE AND SHITAL S. GHODAKE

KEY WORDS : Beverage, Whey beverage

HOW TO CITE THIS PAPER : Darade, Rohini V. and Ghodake, Shital S. (2012). An overview of whey beverages. *Res. J. Animal Hus. & Dairy Sci.*, 3(1) : 41-44.

Whey is the watery part of milk that remains after separation of curd / coagulated products that result from acid or proteolytic enzyme mediated coagulation of milk. It is major by-product of dairy industry, during manufacture of products like *paneer*, *channa*, *chakka*, cheese, casein, etc. In the manufacturing of these products, about 10- 20 per cent portion of milk is recovered as the desired end product and remaining 80-90 per cent liquid portion is the whey. It is considered to be reliable source of number of high quality and biological active proteins, carbohydrates and minerals. The current world production of whey is estimated at about 165 million tones. (Anonymous, 2010) in which about 68 per cent is produced in European countries and 24 per cent in north America. In India, nearly 5 million tones whey is produced of which *channa* and *paneer* whey contribute around 80 per cent of total whey (Gupta, 2008) and majority of it is disposed off as a waste.

These are two types of whey available, acid whey that is generated as a result of *paneer*, *channa*, *chakka* and acid casein manufacture and rennet whey, which is produced during cheese manufacture. The average composition of acid and rennet whey is presented in Table 1.

Whey – functional and nutritional ingredients:

Whey proteins are good tasting, versatile and highly

Table 1: Average composition of acid and rennet whey

Parameters	Acid whey	Rennet whey
Total solids(%)	6.06	6.87
pH	5.60	6.40
Lactose (%)	5.03	5.01
Protein (%)	0.30	0.98
Fat(%)	0.13	0.34
Ash(%)	0.60	0.54
Lactic acid (%)	0.21	0.14
Calcium (ppm)	710.65	501.50
Phosphorus (ppm)	560.50	441.50

functional ingredients and therefore provides essential benefits to food and beverage manufacture as they create nutritious and delicious products that consumers are demanding (Page, 2005). Whey proteins provide highest quality absorption characteristics as well as sulphur containing essentially branched chain amino acids like leucine, isoleucine and valine which are important in growth and repair of tissue, improved muscle strength and body composition (Khare *et al.*, 2007). Whey proteins referred to as “fast protein” for its ability to quickly provide nourishment to muscles. Additionally whey contains variable amount of lactic acid and nonsoluble nitrogen (Kosikowski, 1979). Whey has protective and curative facet to treat against different diseases such as jaundice, infected lesion of skin, gonorrhoea, arthritis, anemia, liver complaints, antioxidative action, anticarcinogenic activity and act against HIV infection (Gandhi and Dixit, 2008). Despite significant gains, more than 50 per cent of whey is being thrown away as waste in gutter, through which more than 50 per cent of milk solid losses as waste.

Now-a-days whey could be processed and used in various

MEMBERS OF RESEARCH FORUM

Address for correspondence :

Rohini V. Darade, Department of Animal Science and Dairy Science, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

Email: darade.rohini@gmail.com

Associated Authors' :

Shital S. Ghodake, Department of Animal Science and Dairy Science, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR (M.S.) INDIA

types of beverages *i.e.* fermented or non-fermented with or without addition of fruit juice/pulp/flavours. Plain whey carbonation and soups by using vegetables has been successfully developed and marketed all over the world. Also whey can be utilized in production of ethanol, acetic acid, wine and in the production of crackers, filled dairy gels, lactose, beer, chewing gum and caramel (Mann, 1986).

Whey beverages:

Beverages based on whey or partially based on whey are numerous from the technological point of view, whey drinks can be made from natural whey or whey permeate or refined whey or ultra filtered whey or whey concentrate. These may be classified as under the following heading :

Fruit flavoured beverages:

Simple technologies to incorporate fruit juices or flavour has been attempted by many researchers. Singh (1991) prepared good quality whey based chocolate drink with deprotenized whey and milk in 50:50 proportion, sugar 6 per cent cmc 0.05 per cent and cocoa powder 1.5 per cent. A technology for production of whey banana beverages containing acid whey and over ripe steamed bananas at a ratio 3:2 to get banana shake (Shekeilengo *et al.*, 1997). Excellent quality of whey based flavoured dairy drink from mixture of cheese whey and buffalo milk in 80:20 proportion as well as *panner* whey and buffalo milk 70:30 with addition of 0.075 per cent stabilizer, 6 per cent sugar and addition of different flavour and colour (Kumar, 2001).

Sikder and Ghatak (2003) developed the *channa* whey beverage with mango pulp. Four different varieties of mango *viz.*, Nimsagar, Amrapali, Langra and Fajil at 8, 12, 16 and 20 per cent, respectively were tried with different levels of sugar at 6, 8, 10 and 12 per cent. On the basis of sensory quality, Amrapali variety of mango pulp at 12 per cent with 8 per cent sugar level, score was highest. Suresha and Jayaprakasha (2003) prepared good quality whey beverage by addition of 0.1 per cent citric acid, 0.40 ml/lit and 0.30 ml/lit pineapple flavour and colour, respectively with 10 per cent sugar.

Sahu *et al.* (2005) prepared whey based mango herbal beverage. According to them, whey beverage (water 48% and *panner* whey 32%) with 12 per cent mango pulp, 8 per cent sugar and lemon grass 1.5 per cent obtained highest sensory score.

Sakhale *et al.* (2007) prepared whey based mango RTS beverage. The RTS prepared with 70 per cent whey and 30 per cent mango juice, scored at maximum for all sensory attributes *viz.*, colour, flavour, taste and overall acceptability.

Wadhwa and Sharma (2007) prepared egg whey beverage. The egg was incorporated at the level of 3, 5, 7 and 10 per cent in cheese whey to which 10 per cent sugar and 0.2 per cent essence and sodium alginate were added. The overall acceptability score was highest for beverage containing 5 per

cent egg and Kewra essence. Ingale *et al.* (2009) prepared custard apple whey beverage with combination of whey: pulp 90:10, 85:15, and 80:20. Out of these combinations, 85:15 (whey: pulp) with 10 per cent sugar was the best combination and obtained maximum scored. (7.2) Naik *et al.* (2009) prepared *paneer* whey blended with watermelon juice (15%) and betel leaves distillate (0-3%). The overall acceptability increased up to 2 per cent betel leaves distillate after that it decreased. Related to storage study, TSS, acidity, reducing sugar increased with decrease in pH and ascorbic acid. Bhavsagar *et al.* (2010) prepared pineapple flavoured beverage from *channa* whey. Good quality pineapple flavoured beverage can be prepared by addition of 5 per cent of pineapple juice and 95 per cent of *channa* whey with addition of 8 per cent sugar.

Carbonated beverages:

Method for preparation of carbonated whey beverages has been described by Russian scientists (Kudryavtseva *et al.*, 1981) carbon dioxide supports the taste of drinks and when applied in low concentration (1000-1500 ppm) it emphasises refreshing character of the drink.

Kudryavtseva *et al.* (1981) developed carbonated whey beverages technology. Filtration of whey (<1.5% protein, 0.2% fat), holding for a day at 6-8°C, heating (90 to 95 °C/15 min), cooling (60°C) centrifuging, addition of ingredients, cooling to 4-6°C and injection of carbon dioxide. The product was then bottled in narrow-neck bottles and closed with crown cork closure and stored at <8°C. Shaikh *et al.* (2001) prepared fermented carbonated whey beverages. The most acceptable preparation had sugar (12%), pineapple flavour (0.1%) and carbonated to extent of 72.48 kg/cm².

Alcoholic whey beverages:

Thiessen (1982) produced brilliant, clear light golden wine of 11 per cent alcohol from deprotenized whey concentrates, without sugar. Whey based alcoholic drink named "Mjoed". Zalashka *et al.* (1997) described method of producing an alcoholic beverage using whey. After removal of whey protein and pasteurization, lactose was fermented using *Kluveromyces spp.* Sucrose was then added until total sugar used was equal to 22 per cent. *Saccharomyces* was used for fermentation. The product was blended with syrups and citric acid and flavouring then took place to improve organoleptic traits of finished product which resembled table wine.

Dragone *et al.* (2009) produced an alcoholic beverage distillation of the fermented growth obtained by continuous whey fermentation with lactose fermenting yeast *Kluveromyces marxianus*. Choudhari (2010) prepared good quality alcoholic beverage with highest score (*i.e.* 7.95) from *channa* whey and mixed culture of yeast (*Kluveromyces fragilis* + *Saccharomyces cerevisiae*). The alcoholic beverage contained TS, ash, acidity as 12.03, 0.32, 0.73 per cent,

respectively and pH was 4.57. The alcohol in *channa* whey alcoholic beverage was 10.2 per cent.

Fermented whey beverages:

Besserzhnov (1968) patented for manufacture of whey beverage by inoculating 10 per cent culture of *Lactobacillus bulgaricus*, *L.acidophilus*, *L.helveticus*, *L.casei* and *Streptococcus thermophilus*, incubated at 42°C for 18-24 hr. Acidity of product should exceed 0.70 per cent. Peer (1970) prepared cultured whey product with 0.4 per cent acidity, 5-7 per cent sugar and pH 6.0-6.6. The whey was treated with calcium carbonate and diammonium phosphate followed by inoculated with *L. acidophilus* and incubated for 30°C until pH was 4.0. Grinence and Kyavichyas (1977) patented a method for manufacture of fermented whey beverage containing whey, sugar and flavouring substance. This mixture was inoculated with mixed culture of *Streptococcus cremoris* and *S. diacetylactis* (1-1.2%). Gandhi (1984) reported the procedure for preparation of "Acidowhey". *Paneer* whey was incubated with *Lactobacillus acidophilus* at 30 ± 1°C for 20 to 24 hr. and then sugar and pineapple flavour were added to acidophilus whey pasteurized in bottles and stored at low temperature

Bawke (1995) prepared cultured soft drink from *paneer* whey utilizing *L. acidophilus* with fixed levels of spices (1.5%) sugar (10%) and salt (0.5%).

Rahman and Hassan (1998) prepared fermented whey drinks by adding 8 per cent sugar and 0.5 per cent culture in *channa* whey and pH was adjusted to 3.8 by incubation for 24 hr at 40°C. The drink was heated at and 85°C for five minutes before filling in the bottles. The quality of the drink was satisfactory.

Kar and Misra (1999) manufactured "wheyghurt" drink with 4 per cent yoghurt culture inoculated in deprotenized whey. The shelf-life of product was 5 days under refrigeration condition and contained 10⁸ cfu/ml of lactobacilli count.

Fermented whey milk beverages:

Khrulkevich (1959) prepared beverage from whey and butter milk in 50:50 proportion and inoculated with kumis culture. The beverage resembled like Kumis and posses refreshing sour alcoholic taste.

Kapse (1998) prepared *chakka* whey *lassi* from mixed culture of *Lactobacillus acidophilus*+ *Streptococcus lactis* sub sp . *diacetylactis* with addition of 20 per cent whey, 80 per cent milk, 16 per cent sugar and 0.1 per cent salt was more acceptable.

Tiwari and Kumar *et al.* (2005) prepared whey based fermented beverage with 80:20 of whey and buffalo milk mixture. Fermentation by acidification with GEL and stabilizer pectin and CMC in range of 0.7 to 0.9 and 0.1 to 0.2 per cent, respectively.

Sharma and Sabhikhi (2005) prepared whey based *lassi* with four types of blends of cheddar cheese whey and buffalo milk in the ratio 50:50, 60:40, 70:30 and 80:20. Then suitable level of stabilizer was selected from 0.1 per cent, 0.15 per cent, 0.2 per cent, 0.25 per cent each of CMC and pectin individually and in combination. Good quality *lassi* was prepared with 60:40 blends of cheddar cheese whey and buffalo milk, 0.15 per cent CMC, 10ml/lit flavour and 15 per cent sugar.

Lean and Plaza (2007) prepared good quality fermented whey beverage. The acid whey was neutralized to milk pH i.e. 6.5. The milk and whey blended in 75:25, 50:50, 25:75, 100 per cent milk and 100 per cent whey. Kefir added @ 0.5 per cent at 25°C for 24 hr.

Mittal *et al.* (2009) prepared whey milk beverage with 50:50, 60:40, 70:30, 80:20 proportion of whey: milk. Addition of stabilizer 0.6 per cent then inoculated for 14-16 hr. addition of 12 per cent sugar in beverage. The good quality fermented whey beverage prepared with 70:30 proportion of whey: milk, 0.6 per cent stabilizer (1:1 proportion of CMC: Pectin) with 12 per cent sugar.

Legarova and Kourimska (2010) prepared whey based beverage with 100 per cent whey, 75:25, 50:50, whey: milk proportion fermented for 0, 3, 4 hr with yoghurt culture. The maximum score obtained for non-fermented drink which contained 50 per cent milk and 50 per cent whey.

Conclusion:

The whey with fruit juice combinations seems to be hold good promise in the manufacture of value added nutritious beverages. Such beverages have been highly acceptable as refreshing flavoured drinks. Whey fruit juice beverages need to undergo substantial improvement particularly in respect of their shelf-life and flavour.

LITERATURE CITED

- Anonymous (2010^a). Utilization of whey.
- Bawke, U.B. (1995). Studies on soft drink prepared from *paneer* whey utilizing *Lactobaccillus acidophilus*. M.Sc. (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR, M.S. (India).
- Besserzhnov, A.S. (1968). Method for preparation of whey beverage USSR pat. 210645 Cited: *Dairy Sci. Abstr.*, **33**:2867.
- Bhavsagar, M.S, Hassan Bin Awaz and Patange, U.L. (2010). Manufacture of pineapple flavoured beverage from *channa* whey. *J. Dairying Food & Home Sci.*, **29**(2):92-96.
- Choudhari, D.M. (2010). Whey utilization in preparation of alcoholic beverage. Ph.D. Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR, M.S. (India).
- Dragone, G, Solange, I, Mussato, K.L. and Teixeira, T.A. (2009). Characterization of volatile compounds in an alcoholic beverage produced by whey fermentation. *Food Chem.*, **112**: 929 - 935.

- Gandhi, D.N. (1984). Development of a soft whey drink– “Acidowhey”. *Dairy Guide*, **6**(8): 41-43.
- Gandhi, J. and Dixit, K. (2008). Preparation of fermented whey beverage from whey. Course Compendium: Technological advances in the utilization of dairy Products. 15-16 Dec., 2008, National Dairy Research Institute, KARNAL, HARYANA (India). pp.101-104.
- Grinence, E.K. and Kyavichyas, A.V. (1977). Method of obtaining a soured milk beverage from whey USSR. Pat. 581923. Cited: *Food Sci. Technol. Abstr.*, **10** pp. 808.
- Gupta, V.K. (2008). Over view 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.
- Ingale, M.P., Ranveer, R.C. and Nagargoje, K.D. (2009). Development of whey based custard apple beverage. *Beverage & Food World*, **36**(5):143-144.
- Kapse, B.A. (1998). Studies on preparation of *lassi* utilizing *chakka* whey. M.Sc. (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, AHMEDNAGAR, M.S. (India).
- Kar, T.A. and Misra, A.K. (1999). Therapeutic properties of whey used as fermented drink. *Revista de microbiologia*, **30**(2):12.
- Khare, A., Singh, A.P., Patil, R.S., Singh, K. and Singh, A.P. (2007). Utilization of whey into beverages-A Review. *Beverage & Food World*, **34**(5):127-132.
- Khrulkevich, A. (1959). Beverages from whey and buttermilk. Cited: *Dairy Sci. Abstr.*, 216-248.
- Kosikowski, F.V. (1979). Whey utilization and whey products. *J. Dairy Sci.*, **62**(7):1149-1165.
- Krishnaiah, N., Reddy, C.R., Sastry, P.M. and Rao, M.R. (1998). Studies on keeping quality of whey beverage. *Asian J. Dairy Sci. Res.*, **8**(1): 8-14.
- Kudryavtseva, T.A., Ivanova, T.Y. and Tishin, V.B. (1981). Carbonated whey beverages. *Molochnaya Prom.*, **5**: 45-46 .
- Kumar, A. (2001). Development of whey milk beverage. M. Tech. Thesis, National Dairy Research Institute, KARNAL, HARYANA (India).
- Kumar, A. (2001). Development of whey milk beverage. M. Tech. Thesis, National Dairy Research Institute, KARNAL, HARYANA (India).
- Kumar, A. and Tiwari, B.D. (2005). Preparation of whey based milk drink. *Indian J. Dairy Sci.*, **58**(5):321-325.
- Lean, P.D. and Plaza, L.M. (2007). Development of a fermented milk acid whey beverage. University of Puerto Rico at Mayaguez. Thesis, C.R.I.S.
- Legarova, V. and Kourimska, L. (2010). Sensory quality evaluation of whey based beverages. 13th Egyptain Conference of Dairy Science and Technology Carico, 19-21. Jan., 2010. Abstr. pp. 56-57.
- Mann, E.J. (1986). Whey utilization. *Dairy Indus. Inter.*, **51**(4): 7-8.
- Mittal, V., Thompkinson, D.K. and Sabhikhi, L. (2009). Sensory attribute of whey milk beverage. *Proc. Food Indus.*, **10**(4):22-26.
- Naik, Y.K., Khake, A. M., Choudhary, P.L., Goei, R.K. and Shrivastava, K. (2009). Studies on physico-chemical and sensory characteristics of whey based water melon beverage. *Asian J. Res. Chem.*, **2**(1): 57-59.
- Page, J.J. (2005). 4th International whey conference, CHICAGO.
- Peer, H.R. (1970). Cultured whey product and process for producing the same US Patent 3497359. Cited: *Dairy Sci. Abstr.*, **33**:36.
- Rahman, M.M. and Hassan, M.N. (1998). Utilization of *channa* whey in the form of fermented and non fermented drinks. *Bangladesh J. Anim. Sci.*, **122**(9): 57-63.
- Sahu, C.P., Choudhari, L. and Patel, S. (2005). Technoeconomic feasibility of rts whey based mango herbal beverage. *Indian J. Dairy Sci.*, **58**(4):258-263.
- Sakhale, B.N., Pawar, V.N., Kapse, B.M. and Ranveer, R.C. (2007). Studies on preparation of whey based mango RTS beverage. International Conference on Traditional Dairy Foods. 14-17 Dec, 2007. National Dairy Research Institute, KARNAL, HARYANA (India). pp. 80.
- Shaikh, S.Y., Rathi, S.D., Pawar, V.D. and Agarkar, B.S. (2001). Studies on development of process for preparation of fermented carbonated whey beverage. *J. Food Sci. & Technol.*, **38**(5): 519-521.
- Sharma, P. and Sabhikhi, L. (2005). Utilization of cheddar cheese whey for the manufacture of *lassi*. 2nd International Conference on Fermented foods, health status and social well being. 17-18 Dec., 2005. Anand Agricultural University, ANAND, GUJARAT (India). 94 pp.
- Shekeilengo, S.A., Jelen, P. and Beghdan, G.C. (1997). Production of whey banana beverage from acid whey and over ripe bananas. *Milchwissenschaft*, **52**(4): 209.
- Sikder, B. A. and Ghatak, P.K. (2003). Formulation of mango whey beverage. *Beverage & Food World*, **30**(1):11-12.
- Singh, S. (1991). Utilization of cheese for the preparation of chocolate drink. *Beverage & Food World*, **18**(2):25.
- Suresha, K.B. and Jayaprakasha, H.M. (2003). Utilization of ultra filtration whey permeates for preparation of beverage. *Indian J. Dairy Sci.*, **56**(5): 278-284.
- Wadhwa, M. and Sharma, A. (2007). Development of egg whey beverage. International Conference on Traditional Dairy Foods. 14-17 Dec., 2007. National Dairy Research Institute, KARNAL, HARYANA (India). pp. 82.
- Zalashka, M.V., Kapich, A.N. and Mishin, L.J. (1997). An alcoholic beverage made from whey. *Dairy Guide*, **13**(8): 48-49.

WEBLIOGRAPHY

<http://www.google.com>

Cited <http://www.Iwc.2005.org/index.htm>

Received : 01.10.2011; Accepted : 06.04.2012