

Hydrocolloids For Value Addition in Dairy Products

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Introduction

India has emerged highest milk producing country in the world. The milk production of India in year 2023 is 207MT which is 24 percent of the global production (944MT). Out of the total milk production 46 % of milk consumed in liquid form and 54 % milk is converted into milk products. This milk products occupy prominent place in food sector and Indian economy. During the preparation of various dairy products hydrocolloids is used as stabilizer, thickener, gelling agent etc. In dairy products it most often are used to stabilize, thicken and gel the system. Hydrocolloids are typically hydrophilic high molecular weight compound usually with colloidal properties.

What are Hydrocolloids?

Term hydrocolloids derived from greek word hydro means “water” and colloids means “gelatinous substance” i.e Hydrocolloids are colloidal substance with an affinity for water. Hydrocolloids are the substances which form a gel in presence of water, example which are used in surgical dressing and in various industrial applications (food and dairy industry). Primary function of hydrocolloids is thickening or gelling while secondary function is emulsification, aeration, suspension, encapsulation. These additives are used to modify the viscosity and texture of food products like ice-cream, Flavoured milk, Milkshake, salad dressing, beverages etc.

Types in food and dairy industry it act as

- **Thickener:** Eg. CMC (Carboxy Methyl Cellulose), Guar and Xanthan gum
- **Gelling agent:** Eg. Carrageenan, Agar, Cellulose
- **Emulsifier:** Eg. Methyl cellulose, Hydroxy-propyl cellulose

Percentage of hydrocolloids used in different Industries:

Industries	Hydrocolloids %
Bakery	28

Dairy	27
Savoury	27
Petfoods	10
Beverage	8

Functional properties of hydrocolloids:

1. Viscosity enhancing and thickening property: - The process of thickening involves non-specific entanglement of conformation ally disordered polymer chain; it is essentially polymer solvent interaction. Thickening and Viscosity effect of hydrocolloids depends on its concentration, type and pH of food system and temperature.

2. Gelling properties: - Hydrocolloids form gel network through entwining and cross linking of polymer chain to form three dimensional structure of gel. Gelling occurs when water and other molecules or other particles are prevented from moving around at all. Eg. Pectins or another large molecule bond or tightly entangle.

3. Surface activity and emulsifying property: - The functionality of hydrocolloids as emulsifier correlate to phenomenon such as retardation of precipitation of dispersed solid particles, decrease creaming rate of oil droplets and foam, prevent aggregation of dispersed particles, prevent syneresis of gelled system containing oil and retardation of coalescence of oil droplets.

4. Hydrocolloids as a fat replacer: - Novelty food and the development of high fiber and low-fat food products. Caloriedense material such as fats and oils may be replaced with 'structured water' to give healthy, reduced calorie foods with excellent eating quality For Eg. Light mayonnaise cheese contains guar and xanthan gum as a fat replacer. Inulin particles dispersed in water phase of any food system will contribute to creaminess of finished food Eg. Frozen dessert.

5. Hydrocolloids as edible film and coating: - Edible film means thin layer which can be consumed, coated on food, which act as a barrier between food and surrounding environment. Such films serve as inhibitor of moisture, gas, aroma, lipid migration.

Function and use of different Hydrocolloids in dairy products:

- 1. Yoghurt:** Addition of 0.25 %CMC (Carboxy methyl cellulose), 0.10-0.30 Xanthan gum & Carrageenan and 2.0% inulin in Yoghurt preparation resulted that it gives a

better gel structure, low syneresis and high-water holding capacity, viscosity and firmness as compared to control (without addition of hydrocolloids).

2. Ice-cream: Why hydrocolloids used in ice-cream

- To increase mix viscosity.
- To prevent ice crystal formation during storage and transportation, especially due to temperature fluctuation.
- To help prevent shrinkage.
- To provide resistance to melting.
- Gel formation-To create thicker more creamy texture. The researcher found that the ice cream mix containing 0.2% of sodium alginate had the greatest viscosity, whereas the ice cream mix containing guar gum at 0.1% had the lowest viscosity. Usually 0.2 – 0.5% stabilizer seldom perform all the desired function on body, texture, meltdown and stability in storage.

3. Cheese: The use of stabilizer like Xanthan gum, Carrageenan shows better storage stability with regard to their functional properties such as shred, stretch, fat leakage etc. to give consistent product throughout its storage life. Also hydrocolloids particularly guar gum can effectively be used up to 0.45% to improve the functionality and acceptability of low fat Cheddar cheese, improved the sensory acceptability of cheese and the hardness decreased gradually on increasing the concentration of gums, the samples having guar gum were less hard as compared to control sample (sample without hydrocolloids).

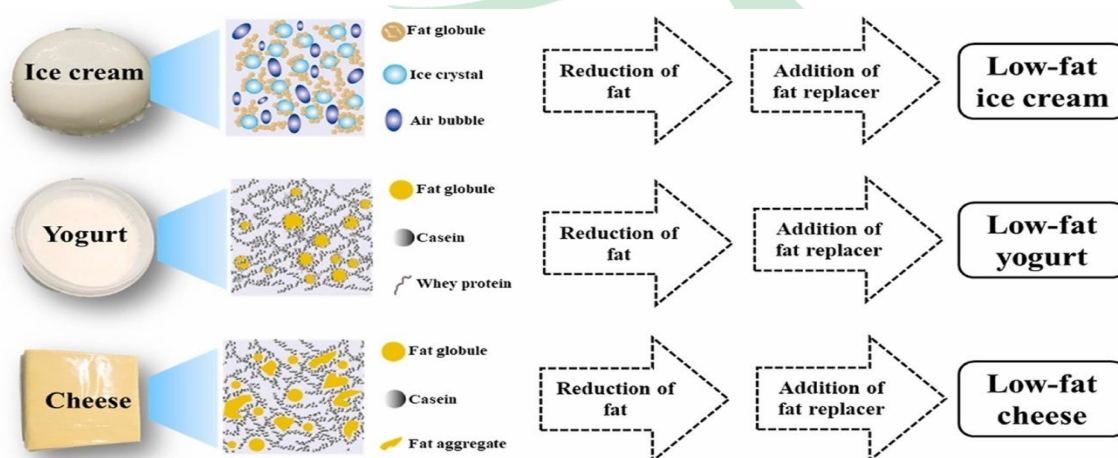


Fig.1 Hydrocolloids act as fat replacer

4. **Chocolate milk:** Chocolate milk was prepared by using Ultra high temperature method with adding carrageenans as a hydrocolloid shows increased viscosity and reduce the sedimentation of chocolate powder on the bottom of glass bottles it also providing stability against fouling during UHT processing.

Hydrocolloids for dairy products:

Product	Hydrocolloids
Yoghurt	Starch, Locust bean, Pectin, Agar, Alginate and Gellan
Cottage cheese	Starch, Locust bean, guar, carrageenan, xanthan
Sour cream	Starch, Locust bean, guar, carrageenan, xanthan
Cream cheese	Locust bean, guar, Xanthan
Buttermilk and kefir	Starch, Locust bean, guar, carrageenan, xanthan
Flavoured milk	Starch, guar, carrageenan
Ice-cream	Locust bean, guar, carrageenan, xanthan

Conclusion

Hydrocolloids are hydrophilic molecules that have a high molecular weight. They are used as functional ingredients in food formulation for increasing food consistency, improving gelling effect, and controlling the microstructure, texture, flavor, and shelf life. Also, Hydrocolloids are a valuable group of additives that provide functions such as thickening, emulsifying, stabilizing, fat replacing, flavour encapsulating, edible coating agents in a wide array of food systems. So, there is need to increase the use of hydrocolloids in dairy sector for we can improving the quality stability and shelf life of dairy products. Also need to work on suitability of different hydrocolloids for various dairy products.