Several studies on the thickening and gelling ability of alginates have also been studied. Radiation of alginates as powder with different doses showed that at decreasing temperature, the viscosity of alginates increases [22]. A similar study on irradiating sodium alginate powder by gamma radiation shows that with irradiation dose of 0.5% to 1.0% and more than 30%, the viscosity and gel strength of alginate decreased, respectively. However, gels were formed at all doses of irradiation [29]. Gelling properties of sodium alginate studied with various concentrations of calcium showed that the highest rupture force was obtained at concentration of 60 g/kg sodium alginate with 100 g/kg calcium chloride. Similarly, the highest deformation in rupture point was found at 60 g/kg sodium alginate with 10 g/kg calcium chloride. In contrast, the smallest deformation of rupture was observed at 30 g/kg sodium alginate with 70 g/kg $C_6H_{10}O_6$ Ca and 650 g/kg sucrose. It has also been found from the study that the increase in calcium chloride concentration at particular alginate concentration and gelation time leads to rupture formation [30]. The effect of collagen fiber and gelatin on gelling properties of alginates showed that there was lower shrinkage level on alginates and mechanical properties were similar to those of pure alginates [31]. The effect of sodium alginate on drying and rehydration of konjac noodles showed that sodium alginate of 1% to 1.5% showed better springiness; however, the cohesiveness varied between 0.66 and 0.71, whereas sodium alginate of 0.25% and 0.5% showed no effect on springiness and cohesiveness on konjac noodles [32]. Similarly, covalent and noncovalent interactions of konjac glucomannan, xanthum gum, and alginate were studied. It has been found from the study that primary covalent structures were not affected, whereas the noncovalent structures of ternary mixtures caused sedimentation in the presence of sodium alginate. However, on heating the solution and at concentrations greater than 8% sodium alginate, the ternary mixtures had a shift to higher sedimentation coefficients [33]. As thickeners and gelling agents, alginates have been used in ice creams, soups, sauces, dressings, ketchup, mayonnaise, margarine, milkshakes, fruit juices, liquors, desserts, jams, puddings, whipped cream, pie fillings, mashed potatoes, and restricted foods [3].

### 13.3.2 Stabilizers and Emulsifiers

Stabilizer is a single component or mixture of components offering long-term stability to the food by involving adsorptive mechanism or any other covalent interactions, whereas emulsifier is a single chemical or mixture of components that gives temporary stabilization and also aids in promoting emulsification [34]. Stabilizers protect food substance by minimizing water