favorably by decreasing the associated formation of poly-β-hydroxybutyric acid, an alternate storage polymer, to 30% of the dry cell mass, suggesting a more specific role for nitrogenous nutrients [17].

2.2.5.2 Effect of Phosphate on Bacterial Alginate Production

The study of the effect of phosphate on alginate production by *A. vinelandii* has also given divergent results. When a phosphate-rich medium (7.5 g K_2HPO_4) was used in culture media, the phosphate was reported to merely function as a buffer agent in the medium [17]. It has also been observed that a medium with excess phosphate (200–400 g/L) leads to maximum growth rate and greater biomass production; alternately alginate yield from biomass is highest at low phosphate levels (100 mg/L). The calculated RQ value (respiratory quotient) was optimally ~0.8 at the low end of phosphate concentrations. The kinetics of alginate production are affected by culture conditions, in addition to growth rate.

2.2.5.3 Effect of Dissolved Oxygen on Bacterial Alginate Production

Dissolved oxygen has a key function in the alginate production by *Azotobacter*, in the presence of nitrogen- and phosphate-rich medium. The kinetics of biomass growth and alginate production by *A. vinelandii* from glucose in a nitrogen- and phosphate-rich medium were studied based on the use of a laboratory fermenter at pH 7 and 35°C. Batch fermentations in presence of uncontrolled DO and at controlled levels of 1%, 2%, 5%, and 10% DO were carried out. At higher DO, growth was speedy, but the maximum biomass concentration was reduced. At 10% DO, the highest controlled level, production of alginate was nil. Alginate production was rapid at 5% and 2% DO, but increased alginate concentrations and yields were obtained in the absence of DO control. The DO level of 3–5% is found to be ideal for significant alginate production by *Azotobacter*; at this DO level, reducing the activity of nitrogenase aids the microbe to increase alginate production. At a fixed growth rate, the pO_2 (partial pressure of oxygen) at 2–5% air saturation gave the peak algal production rate [14].

2.2.5.4 Effect of Agitation in the Medium for the Production of Alginate

The effect on alginate production by *Azotobacter* spp. by varying shaking rates (revolutions per minute [rpm]) was significant in the fermenter studies at controlled pH conditions. At a shaking rate of 500–600 rpm, the