The objective of this study has to find out some halophiles and thermophiles which have direct or indirect application in the process of either biodiesel production or methanogenesis. For biodiesel, halophilic yeast was used as feedstock material as a possible replacement for existing plant based or animal based sources. In this study metabolic stress conditions led yeast to accumulate lipids in significantly higher concentrations. Higher growth rate of yeast enabled production of higher quantity of biomass in comparatively shorter periods of time. This can solve the problem of feedstock scarcity. A comparative study between jatropha and yeast has shown that at least seven times higher production is possible with yeast as feedstock per year. Composition of biodiesel obtained from yeast was very nearly similar to the biodiesel produced by either animal or plant based feedstock. The production method is very fast and efficient as certain steps like extraction and purification of lipids are omitted and transesterification of biomass was carried out directly in a single step reaction. For the single step purification of product by nonpolar solvent has made the purification faster and easier. A significant higher conversion ratio of yeast lipids to biodiesel (>90.0%) is also an indication of a good source of biodiesel.

In case of enzymatic processes, enzymes isolated and purified from thermophiles were used. Free enzymes were able to give reactions with higher rate but could not be recovered for the next reaction cycles. So immobilization of enzymes was done and later used for biodiesel production. This proved to be another efficient method for transesterification. Uses of methanol and ethanol as acyl acceptors have shown certain limitations which were overcame by using ethyl acetate as acyl acceptor. Immobilized enzymes were able to give more than 85.0% of product yield which was reduced gradually upon repetitive use for another reaction cycles. However, the reaction time was long for this kind of reaction compared to the chemical methods. Thermophilic enzymes were also enabled to carry out reactions at higher temperature where the reaction rates are faster as compared to mesophilic enzymes.

From all the studies done for biodiesel production, it was found that halophilic yeast could be a better, economic and long lasting feedstock for biodiesel. Use of thermophilic enzymes enabled carrying out the transesterification at higher temperatures with higher conversion rate.
In methanogenesis, an attempt was made to increase the rate of production by accelerating the hydrolysis steps by using thermophilic enzymes obtained from various thermophiles. It was believed that only addition of acidophiles and methanogens can increase the rate of reaction under anaerobic condition. But here we have shown that digestion of polymers with thermophilic enzymes in aerobic conditions also has direct effect on the rate of methanogenesis. Aerobic digestion of polymers before feeding for methanogenesis and addition of cellulose digesting microbes to the fermentor chamber has proven to be an efficient technique for methanogenesis. This led to production of more than double the quantity of biogas in a desired time period with double production rate. Production also starts earlier under such conditions. Composition of biogas produced under such condition has shown ideal composition of methane and carbon dioxide gas. Thermophilic microbes and thermophilic enzymes also enabled carrying out of the reaction at higher temperatures.