



Using biological enzymes as catalysts to catalyze the transesterification of triglycerides to produce biodiesel



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The main components of biodiesel are monoalkyl esters. Fatty acid esters have similar physical and chemical properties to diesel and can be used as diesel substitutes. In this experiment, the lipase produced by the school of Life Sciences of Taiwan Normal University was used as a catalyst for the preparation of biodiesel by transesterification of waste soybean oil.

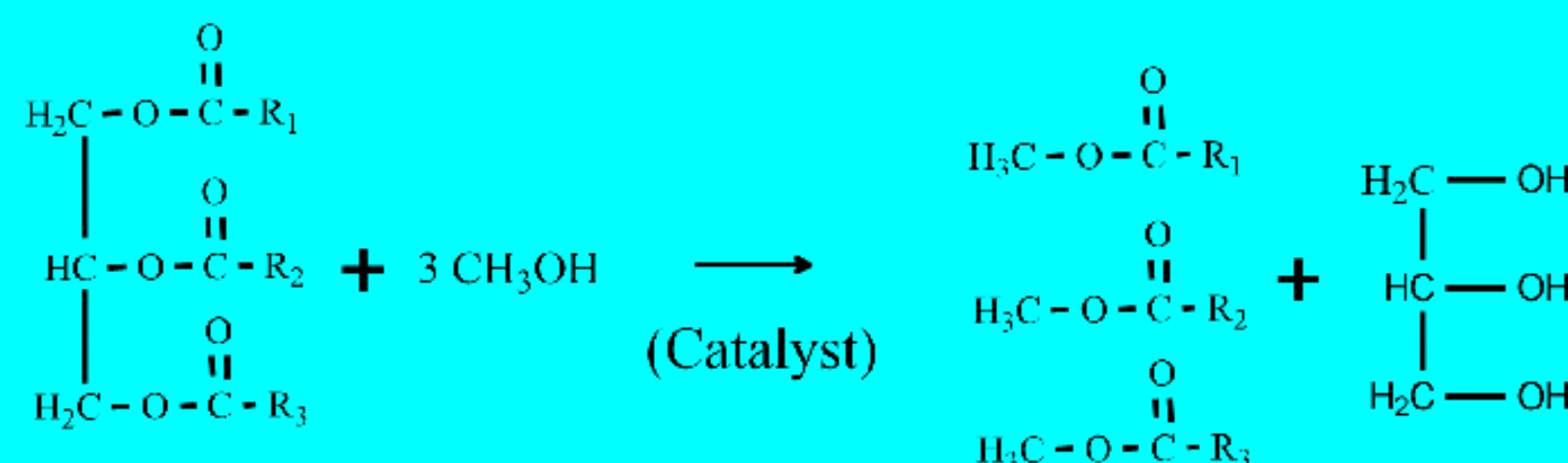
Experiment & Method

The main component of edible oil is triglyceride. The biocatalyst is used in the transesterification reaction of triglyceride and methanol, after the reaction, fatty acid methyl ester can be generated, which is the so-called biodiesel, and the by-product glycerol. The biocatalyst can be recycled, which is not only environmentally friendly but also in line with economic benefits. In this experiment, gas chromatograph (GC) was used to detect the transesterification rate, and a standard purchased from Sigma was used. 1g methyl heptadecanoate plus 100 ml isopropanol was used as a comparison standard. One focus of this experiment is to compare temperature, enzyme quantity, and the ratio of oil to methanol to determine the optimal conditions.

Transesterification equation



Transesterification equation of triglyceride



Result

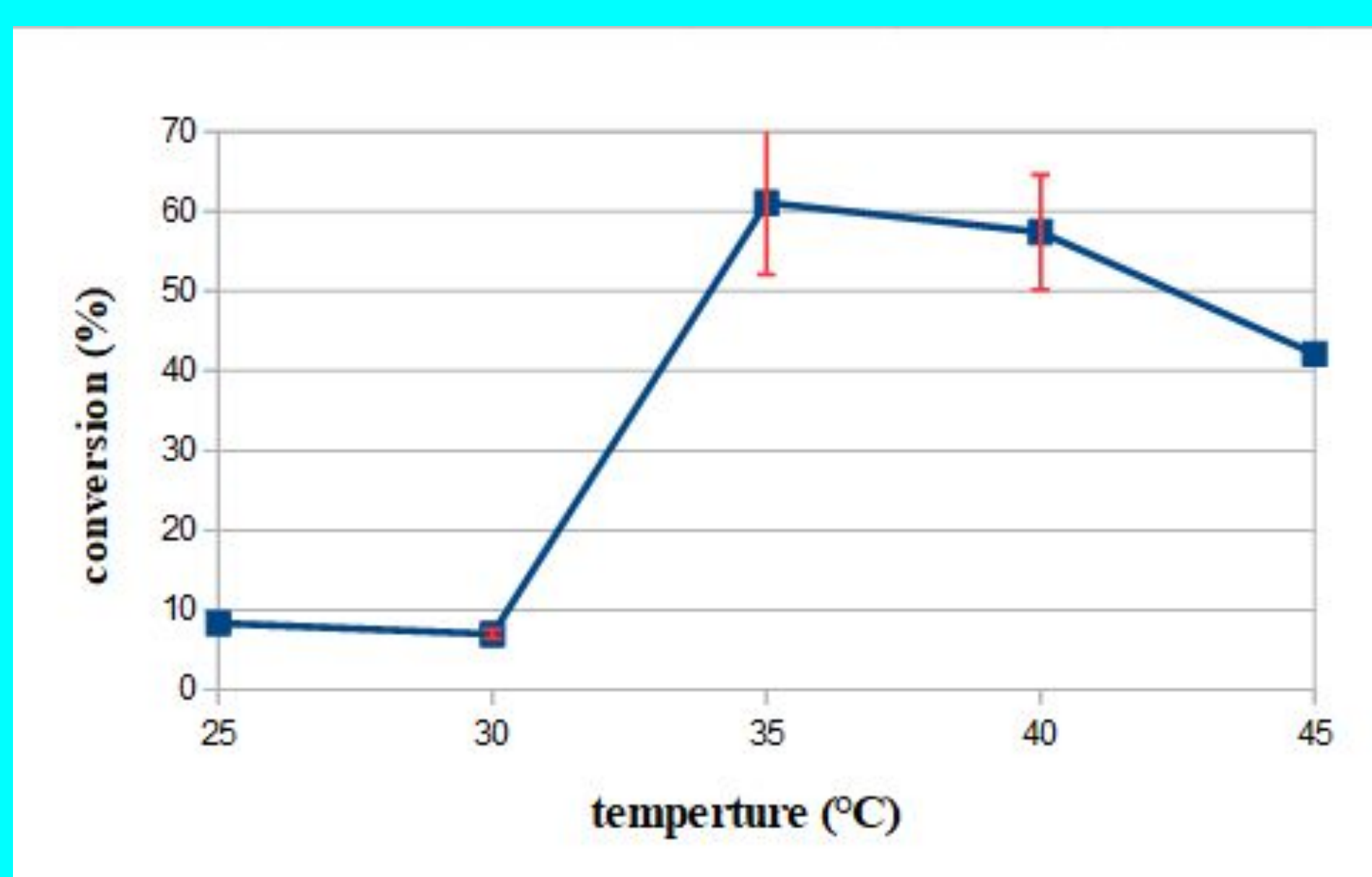


Figure 1. The GC analysis of use different temperature to catalyze the reaction of soybean oil.

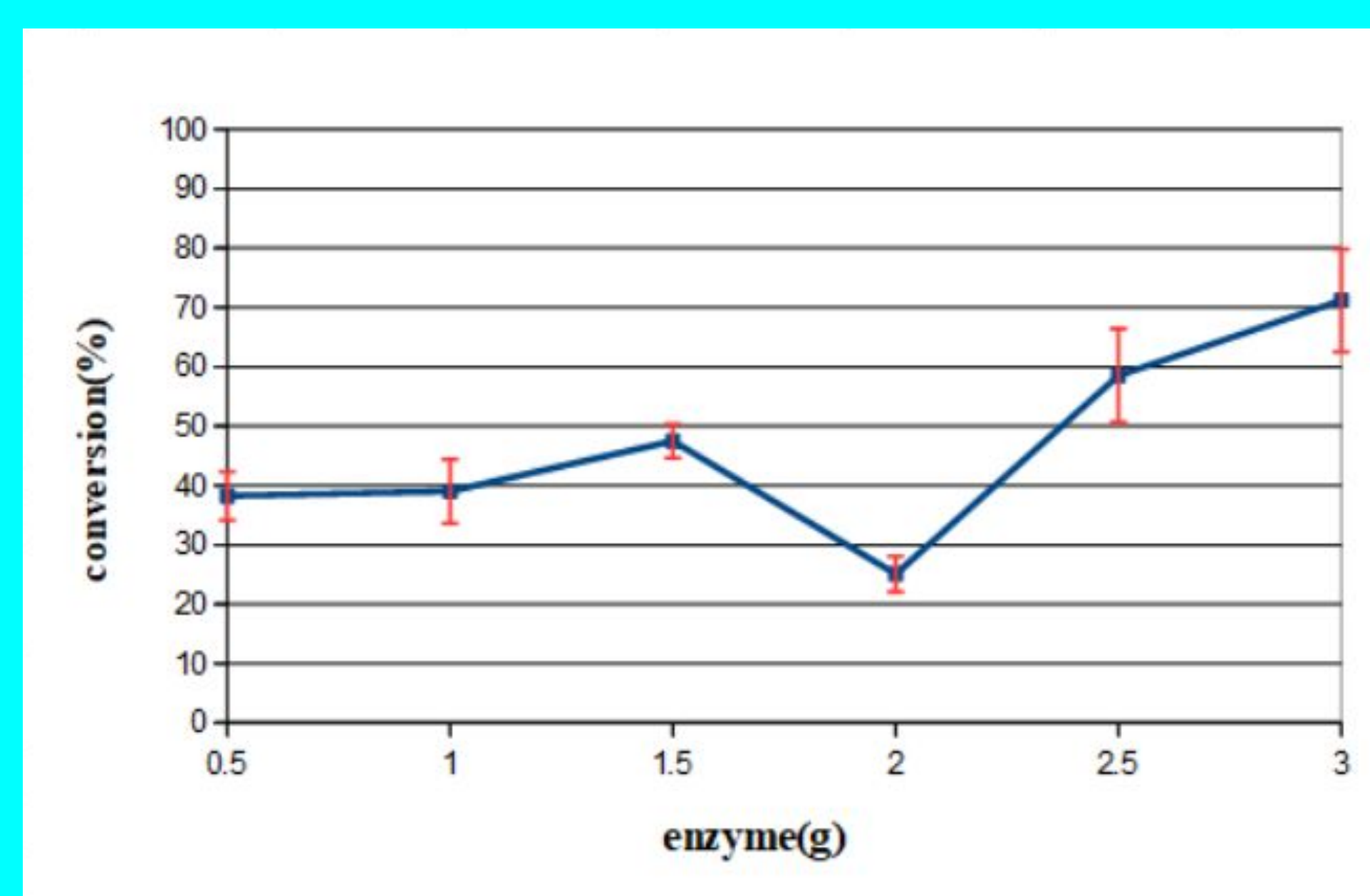


Figure 2. The GC analysis of use different amount of enzyme to catalyze the reaction of soybean oil.

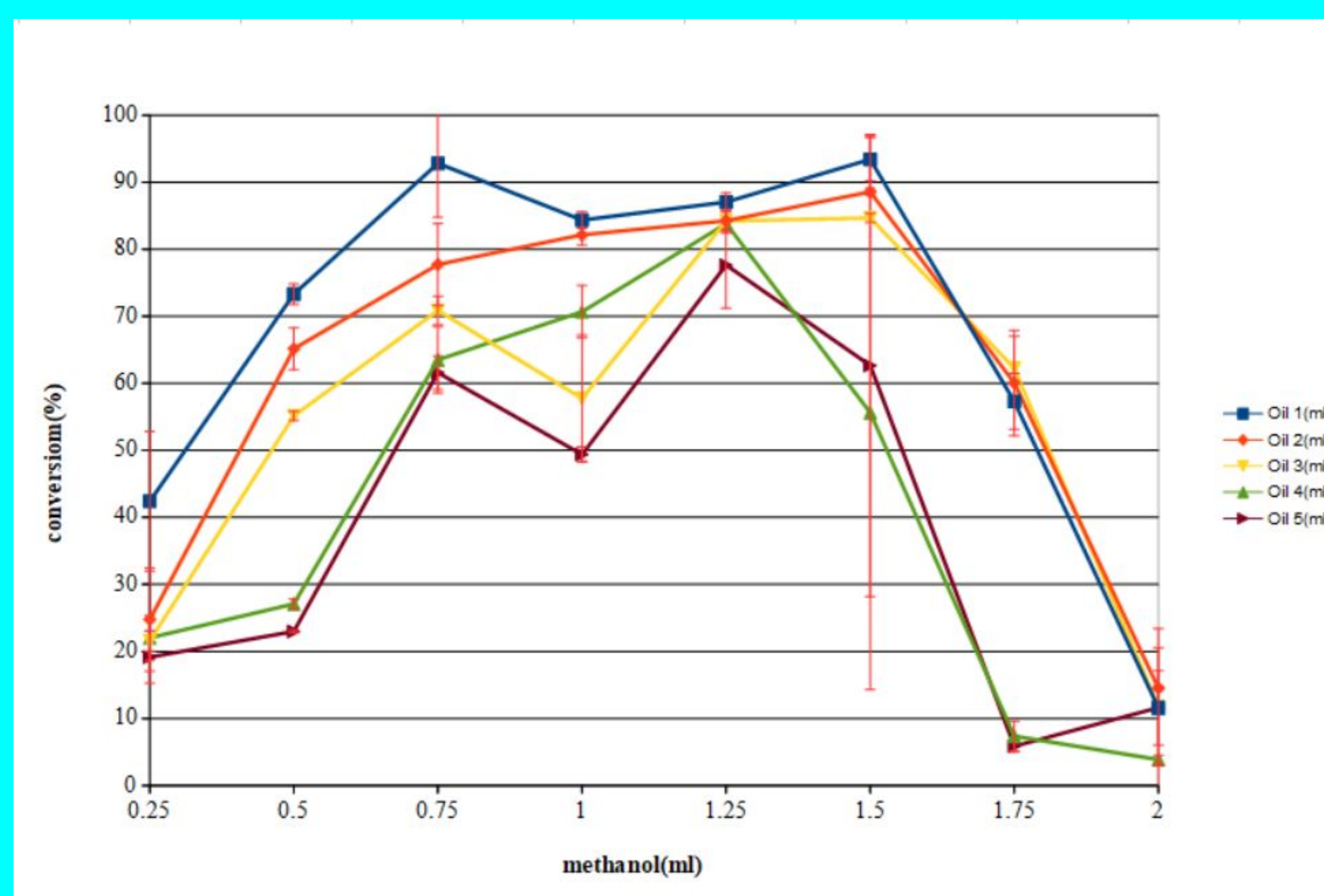


Figure 3. The GC analysis of use different oil methanol ratio to catalyze the reaction of soybean oil.

Conclusion

It was found that the enzyme had best reaction in 1ml soybean oil and 3g enzyme. The optimal reaction temperature was 35°C, and the optimal molar ratio of oil to methanol was 1:1.5.