

**ABSTRACT:** Unlike most other vegetable oils, coconut oil is about 92% saturated fatty acids and contains many medium-chain fatty acids (MCFAs); it is a prevalent ingredient in the chemical industry of fatty oil worldwide. The value of fatty acids has spurred the development of methods for producing fatty acids in coconut oil. The enzymatic hydrolysis method is an excellent way to protect the hydrolyzed product and keep some product properties as desired. The process can obtain a cleaner product, which is a primary concern in food, cosmetic, and biomedical applications. This study aimed to perform the hydrolysis of coconut oil using lipase enzyme catalysis to recover free fatty acids. Various factors affecting the degree of hydrolysis, including the ratio of coconut oil to buffer, lipase enzyme concentration, pH, temperature, and reaction time, were considered. It was found that the optimal parameters for coconut oil hydrolysis are as follows: the ratio of coconut oil to buffer of 1:4, lipase enzyme content of 3%, pH of 7.5, reaction temperature of 50 °C, and a hydrolysis time of 6 hours to achieve the highest degree of hydrolysis at 53%. This finding may contribute to enhancing the economic value of coconut oil.

## INTRODUCTION

**Table 1.** Content of fatty acid in coconut oil

Acid Fatty	Carbon Chain	Acid content (%)
Caproic acid	C 6:0	0.10 – 0.95
Caprylic acid	C 8:0	4 – 10
Capric acid	C 10:0	4 – 8
Lauric acid	C 12:0	45 – 56
Myristic acid	C 14:0	16 – 21
Palmitic acid	C 16:0	7.5 – 10.2
Stearic acid	C 18:0	2 – 4
Oleic acid	C 18:1	4.5 – 10
Linoleic acid	C 18:2	0.7 – 25

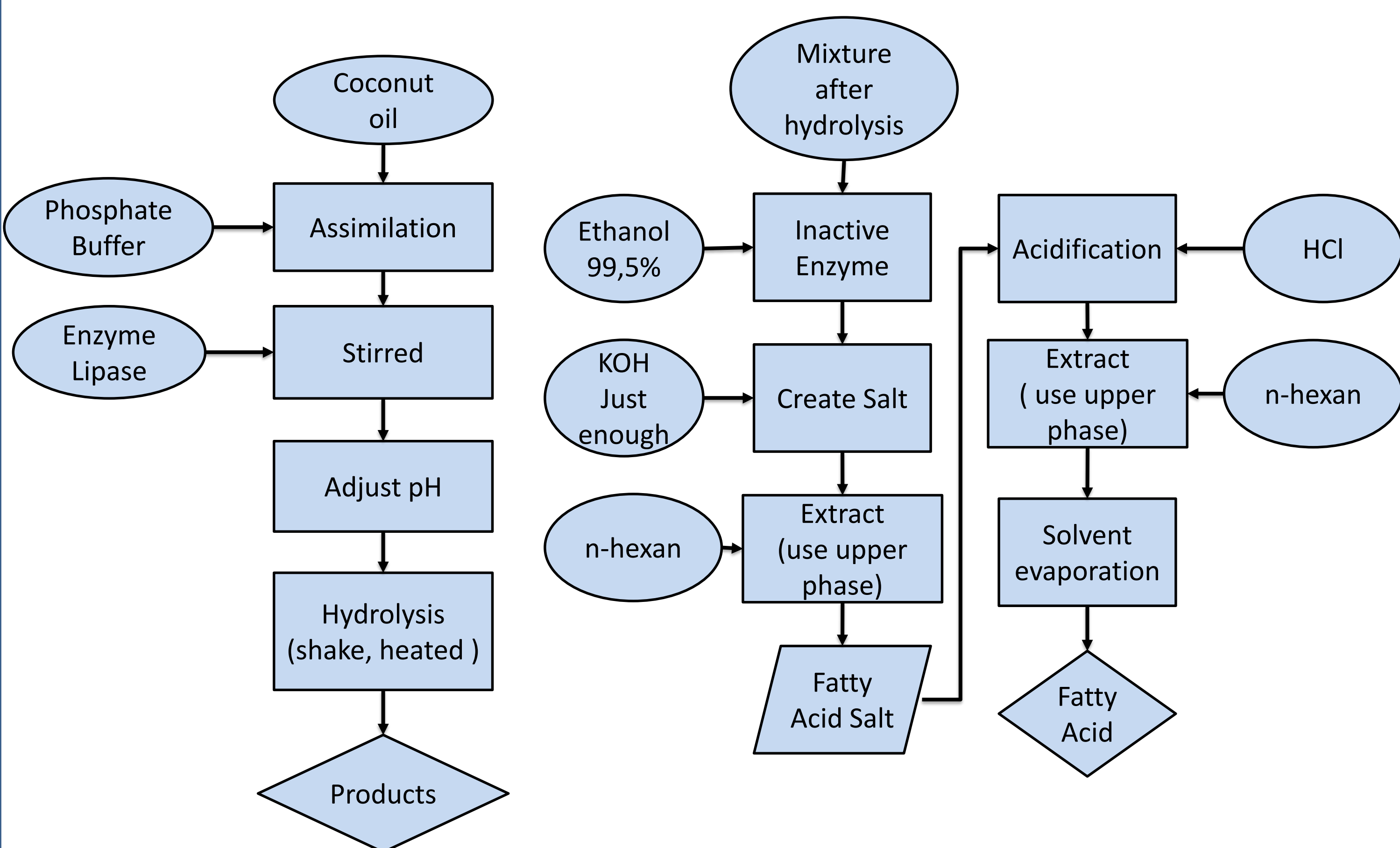


Crude coconut oil



Virgin coconut oil

## MATERIALS AND METHODS

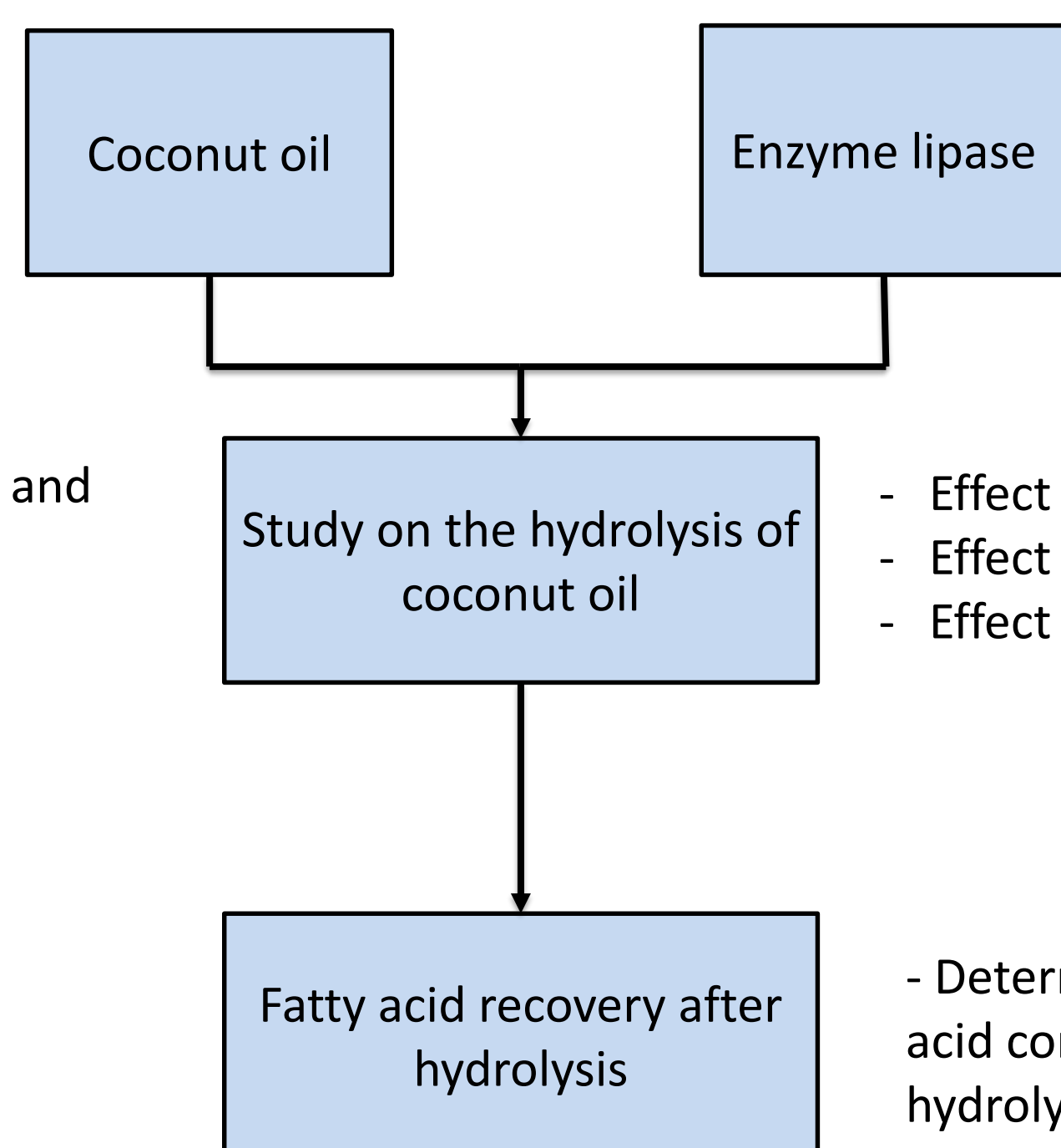


Coconut oil hydrolysis process

Fatty acid recovery process

- Determine index: Acid, Peroxide, Iod, Saponification.
- Determine the composition coconut oil

- Effect of ratio of coconut oil and buffer solution
- Effect of enzyme content



Research process flowchart

- Effect of pH
- Effect of temperature
- Effect of time

- Determination of fatty acid composition after hydrolysis

## RESULTS

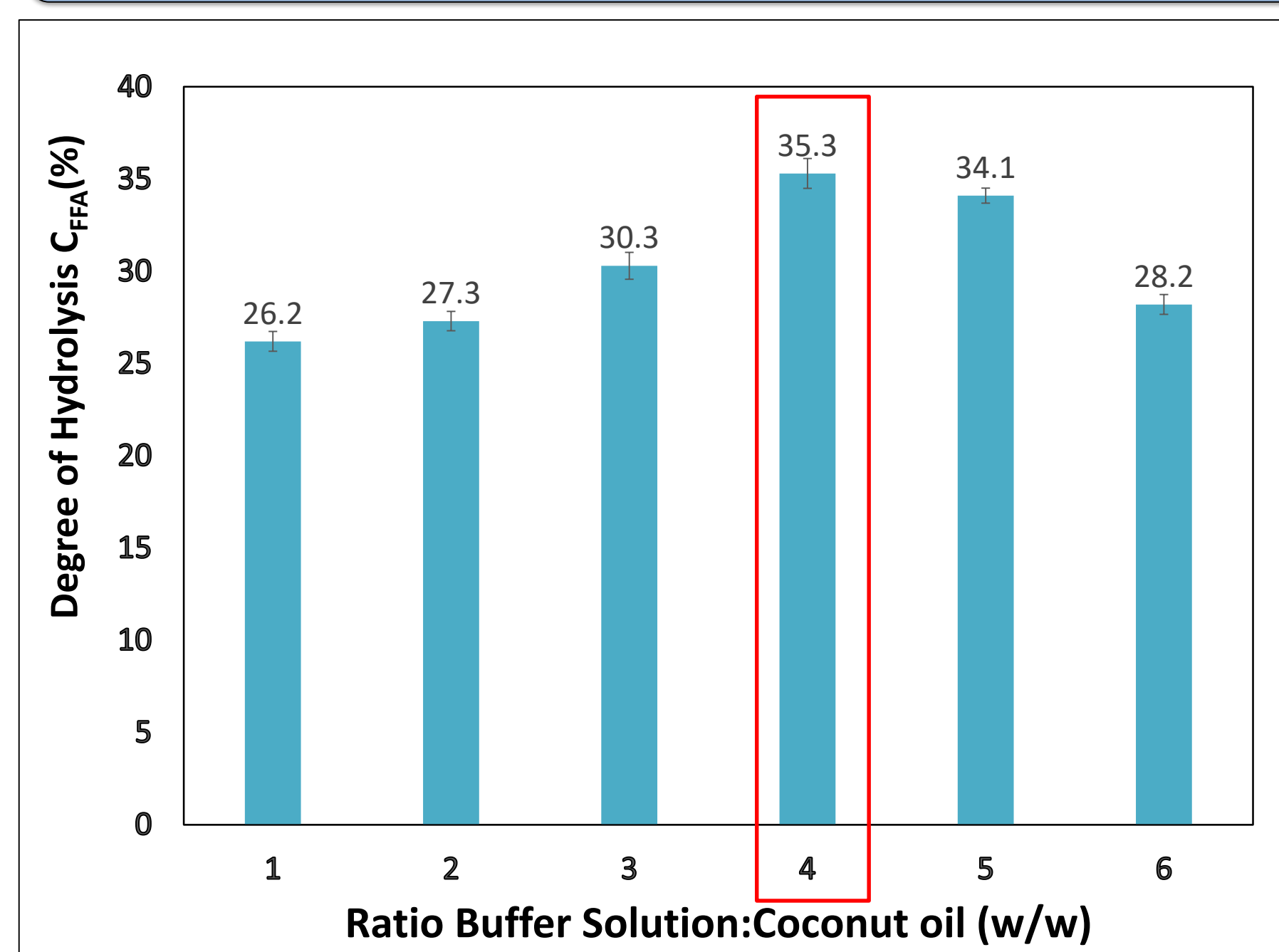


Figure 1. Effect of Coconut oil to Buffer Ratio on the hydrolysis degree

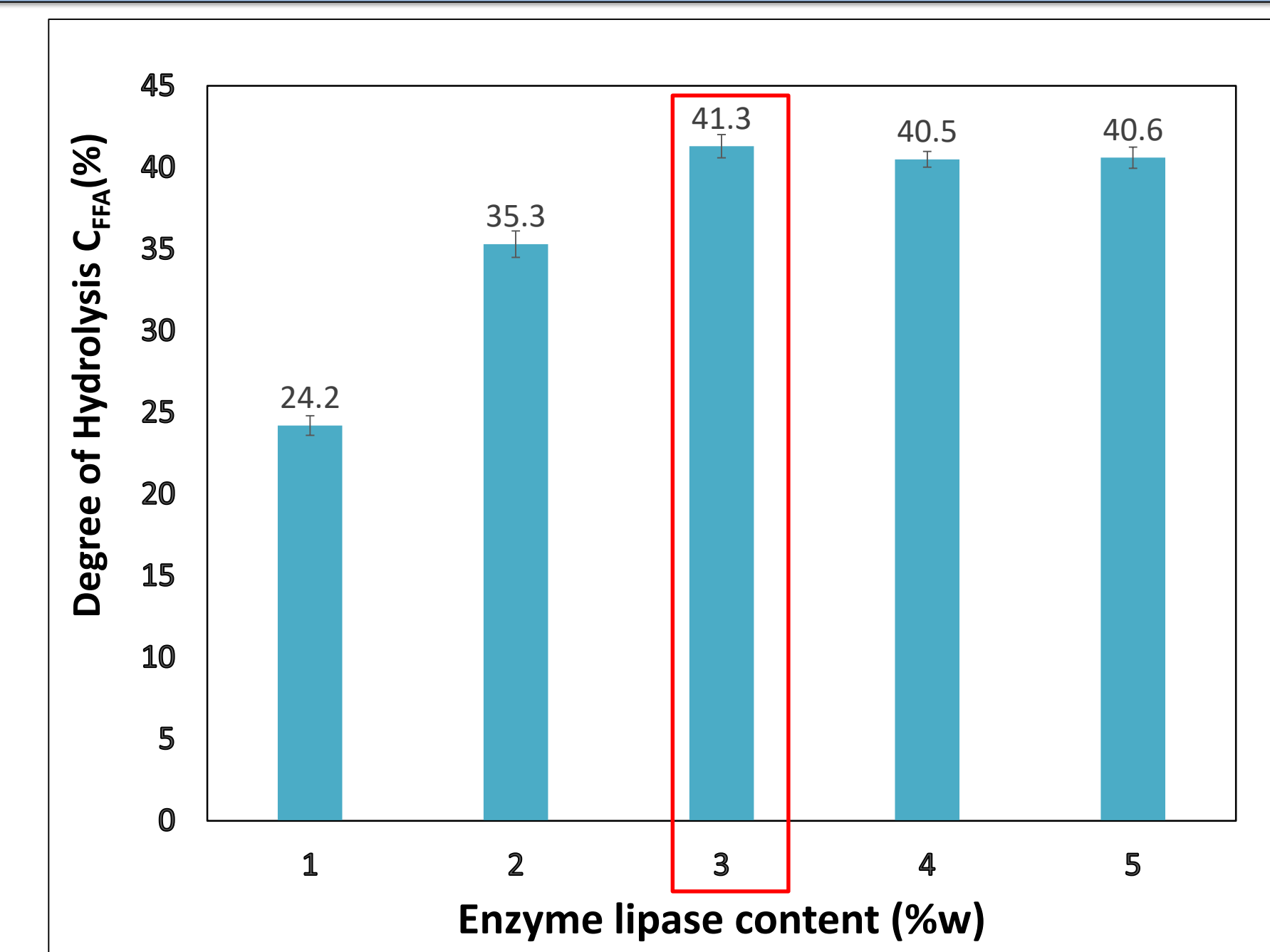


Figure 2. Effect of lipase enzyme concentration on the hydrolysis degree

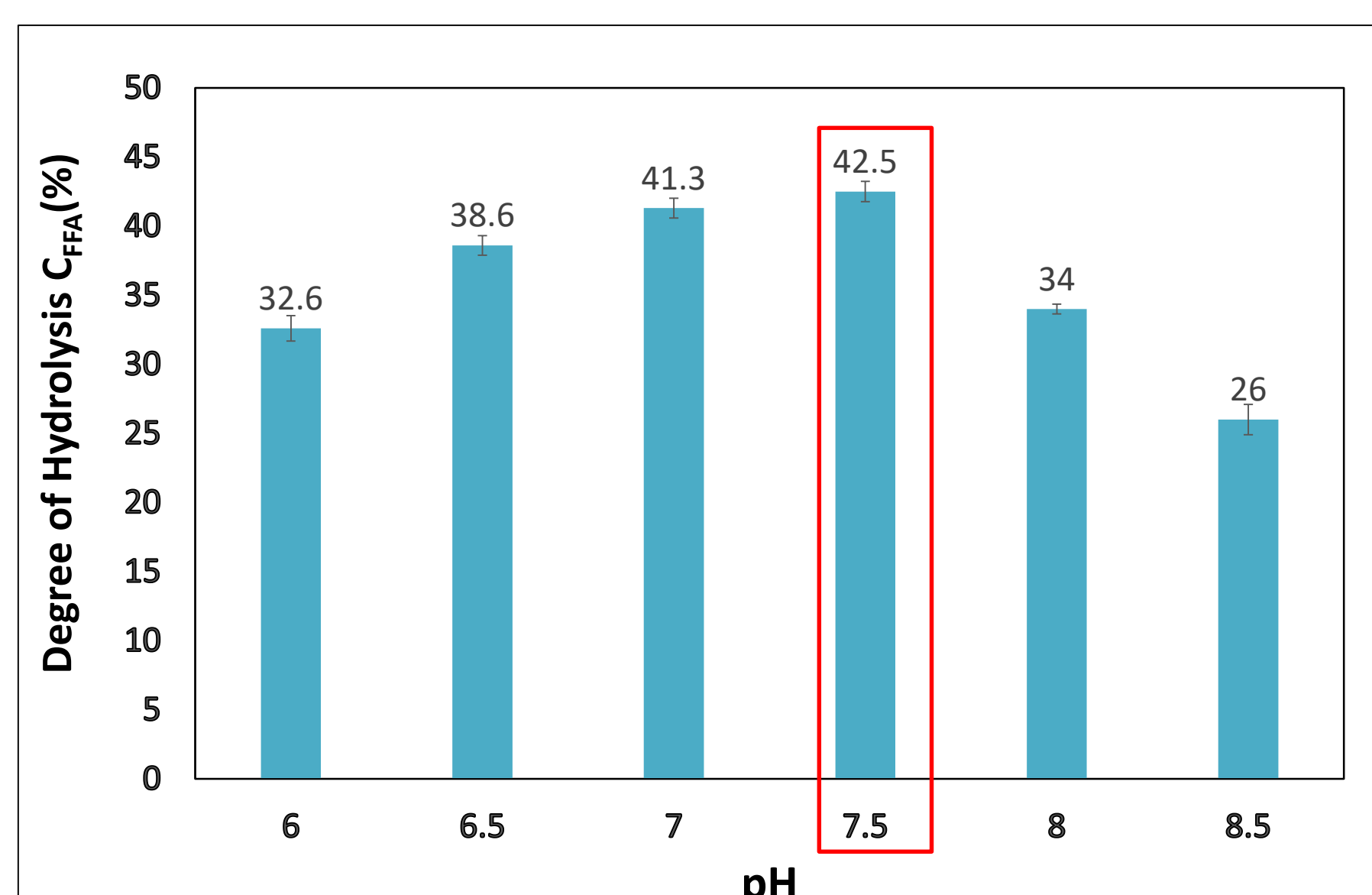


Figure 3. Effect of pH on the hydrolysis degree.

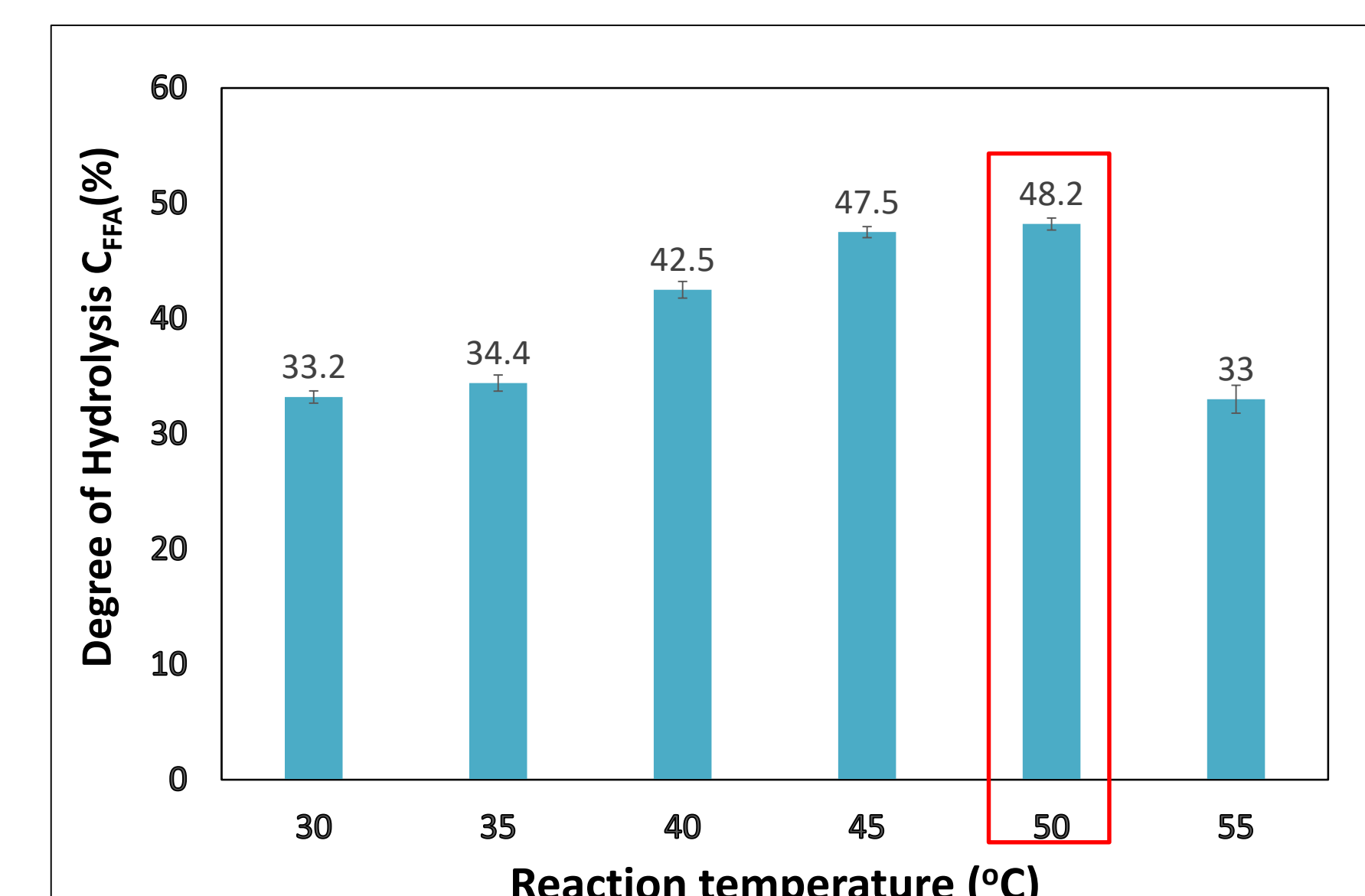


Figure 4. Effect of temperature on the hydrolysis degree.

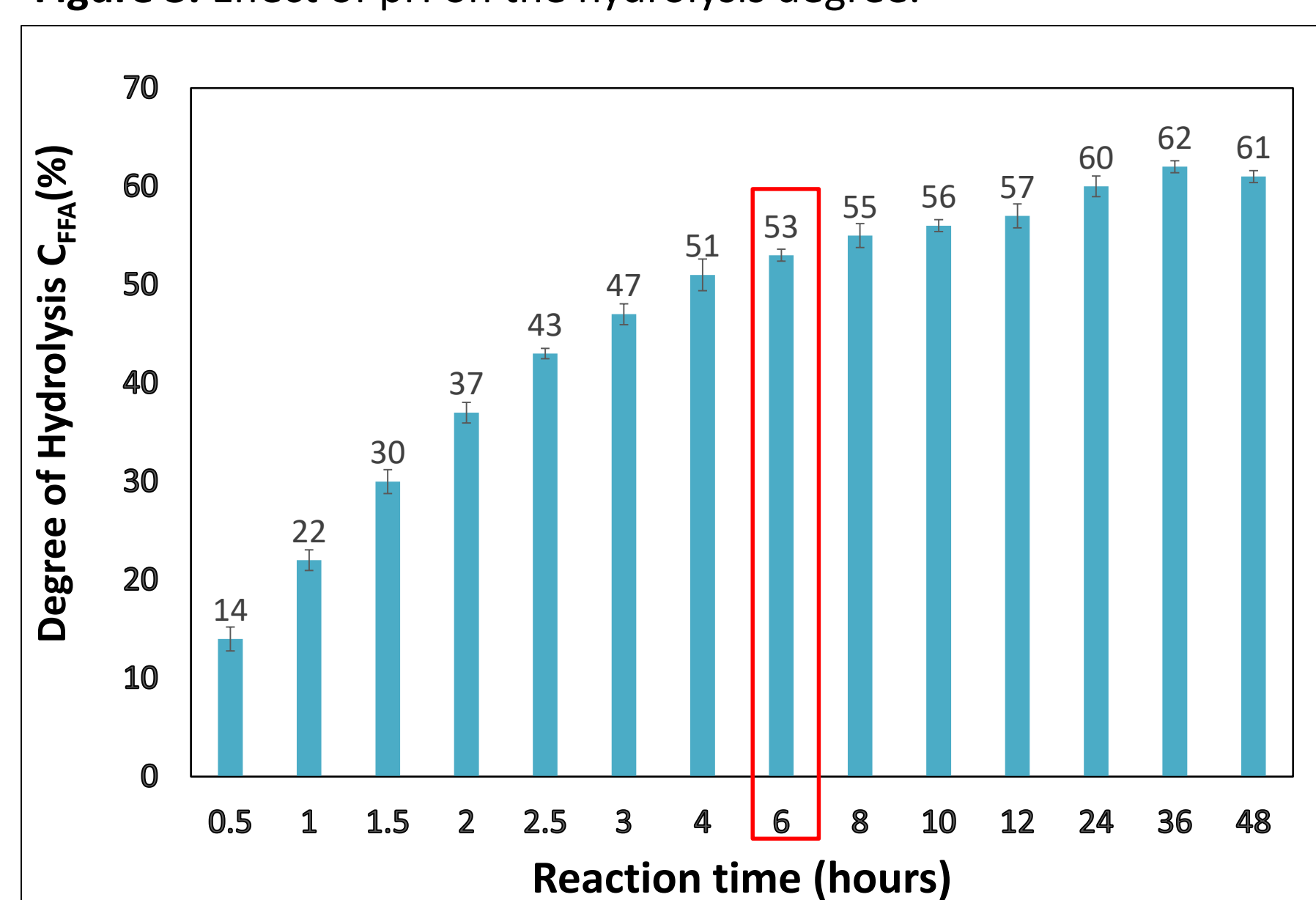


Figure 5. Effect of temperature on the hydrolysis degree.

Table 2. Physicochemical properties of coconut oil

Properties	Result	Standard
Acid value (mgKOH/g)	0.29 ± 0.04	TCVN 6127-2010
Peroxide value (meq/kg)	0.22 ± 0.03	TCVN 6121-2010
Saponification value (mg KOH/g oil)	249.1 ± 7.3	TCVN 6126-2007
Iod value (Wijs)	6.23 ± 0.34	TCVN 6122-2010

Table 3. Fatty acid content after hydrolysis

Acid Fatty	Carbon Chain	Acid content (%)
Caproic acid	C 6:0	0.27
Caprylic acid	C 8:0	6.25
Capric acid	C 10:0	5.69
Lauric acid	C 12:0	38.05
Myristic acid	C 14:0	21.13
Palmitic acid	C 16:0	11.47
Stearic acid	C 18:0	4.92
Oleic acid	C 18:1	11.67
Linoleic acid	C 18:2	0.38
Arachidic acid	C 20:0	0.17

## CONCLUSIONS

In this study, the hydrolysis of coconut oil using industrial lipase enzyme catalysis to recover free fatty acids was performed. The influence of various essential factors on hydrolysis efficiency was considered. The optimal parameters for coconut oil hydrolysis have been determined as follows: the ratio of coconut oil to buffer is 1:4, lipase enzyme content is 3%, pH is 7.5, reaction temperature is 50 °C, and hydrolysis time is 6 hours, resulting in a degree of hydrolysis of 53%. The results show that using the lipase enzyme to hydrolyze coconut oil to recover free fatty acids is a feasible method with potential applications to improve the economic value of coconut oil.

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## References

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