



# ENZYMATIC SYNTHESIS OF FATTY ACID METHYL ESTERS FROM JATROPHA OIL USING ACETONE-DRIED GERMINATED *Jatropha curcas* L. SEEDS

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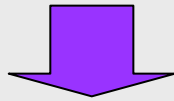
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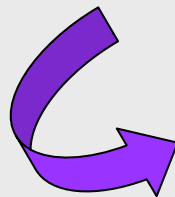


# BACKGROUND

Shortage of petroleum based fuel



Alternatif energy : Biodiesel



Vegetable oil  
TRANSESTERIFICATION

Chem.Catalyst

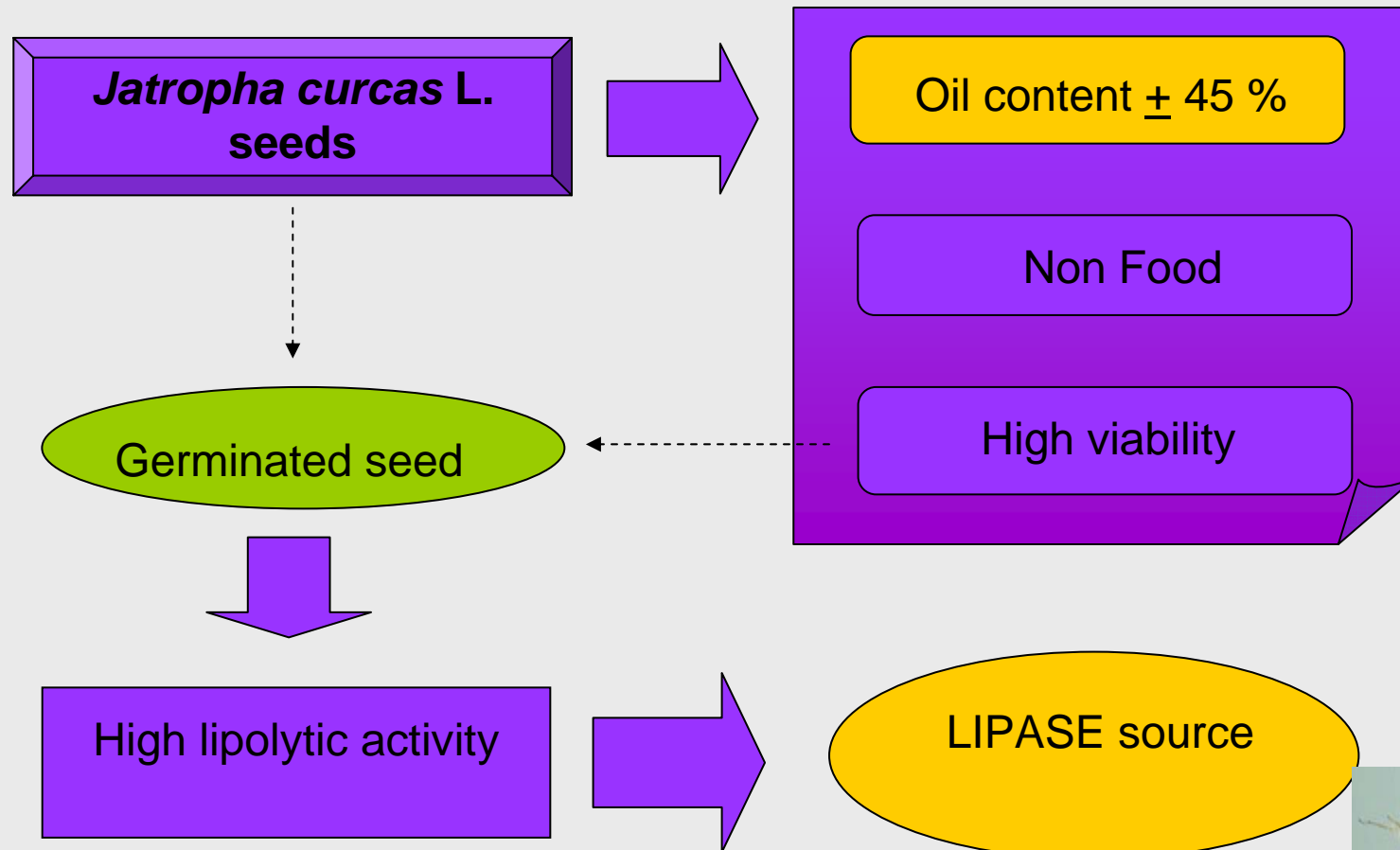
Biocatalyst  
(Lipase)

Microbes

Plant



# WHY JATROPA CURCAS ?



## WHY ACETONE DRIED ?

**ACETONE DRIED\***  
germinated seed

### **Acetone dried :**

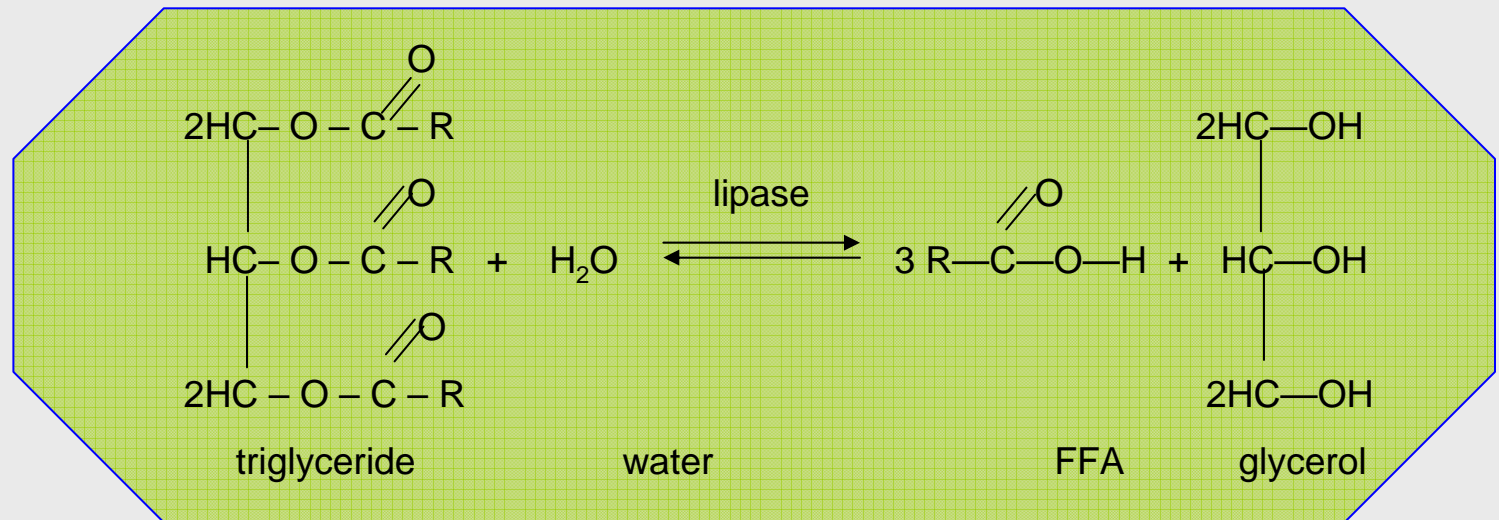
- *Defatting* using acetone
- Air dried

- ❖ drying process → low energy, simple, short time
- ❖ powder → not bulky, easy handling, storage, utilization
- ❖ Low moisture content → self life

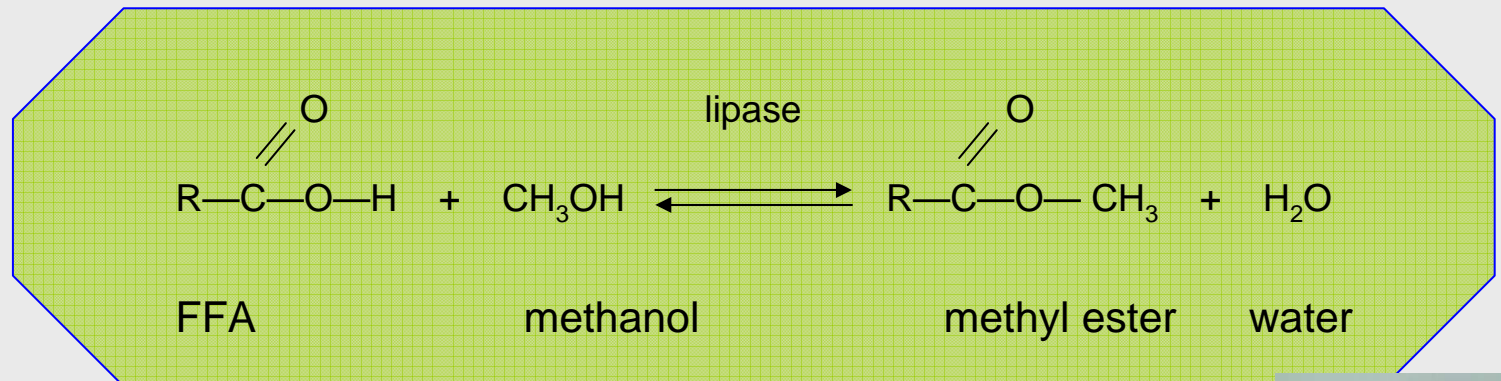


# Lipase-catalyzed transesterification

1



2



Factors :  
solvent, moisture content, ratio enzyme substrate

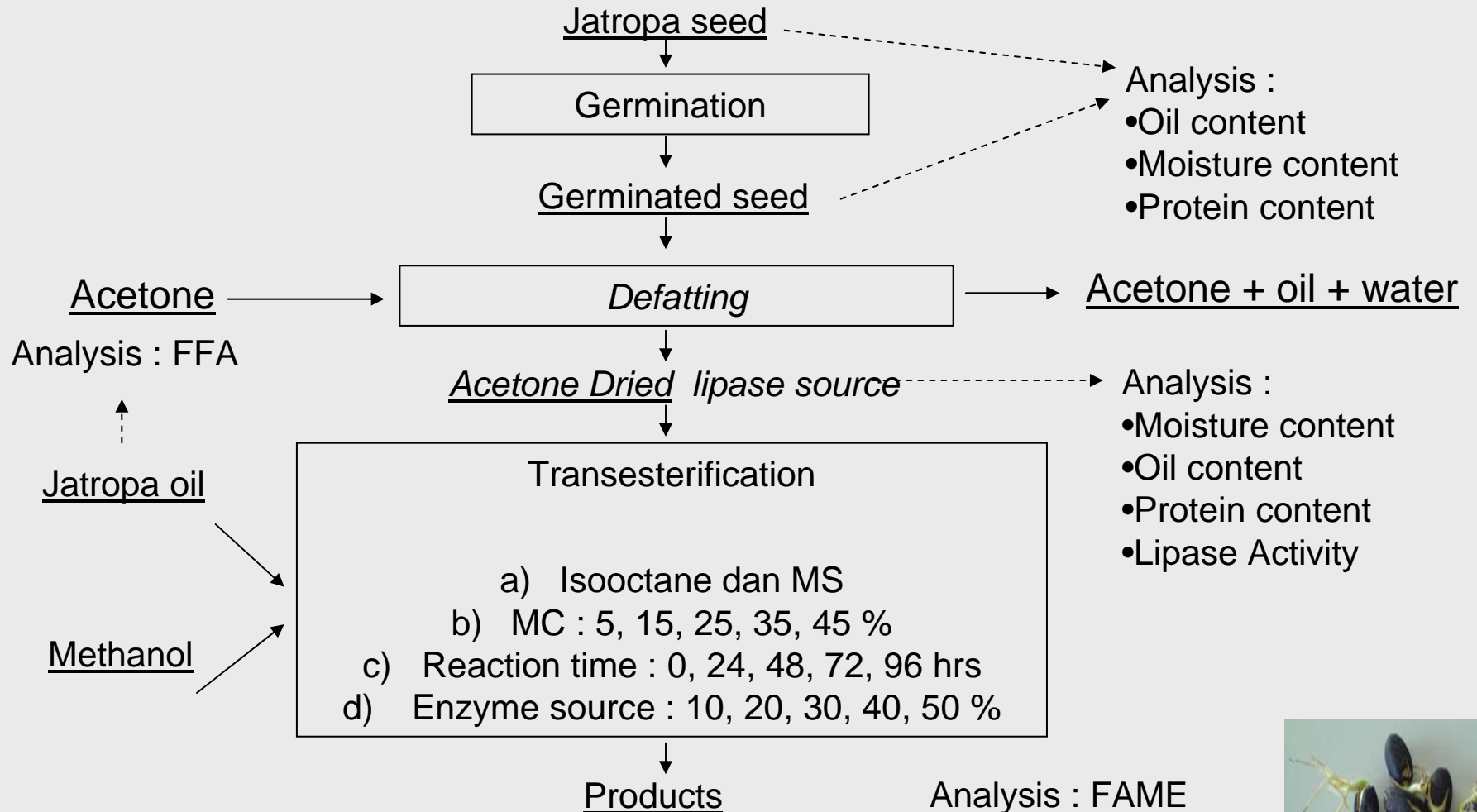


## OBJECTIVE

- To study the effect of isooctane addition, utilization of molecular sieves, moisture content, reaction time and ratio enzyme source to substrate on FAME formed during lipase-catalyzed methanolysis of jatropa oil



# METHODS



# RESULTS

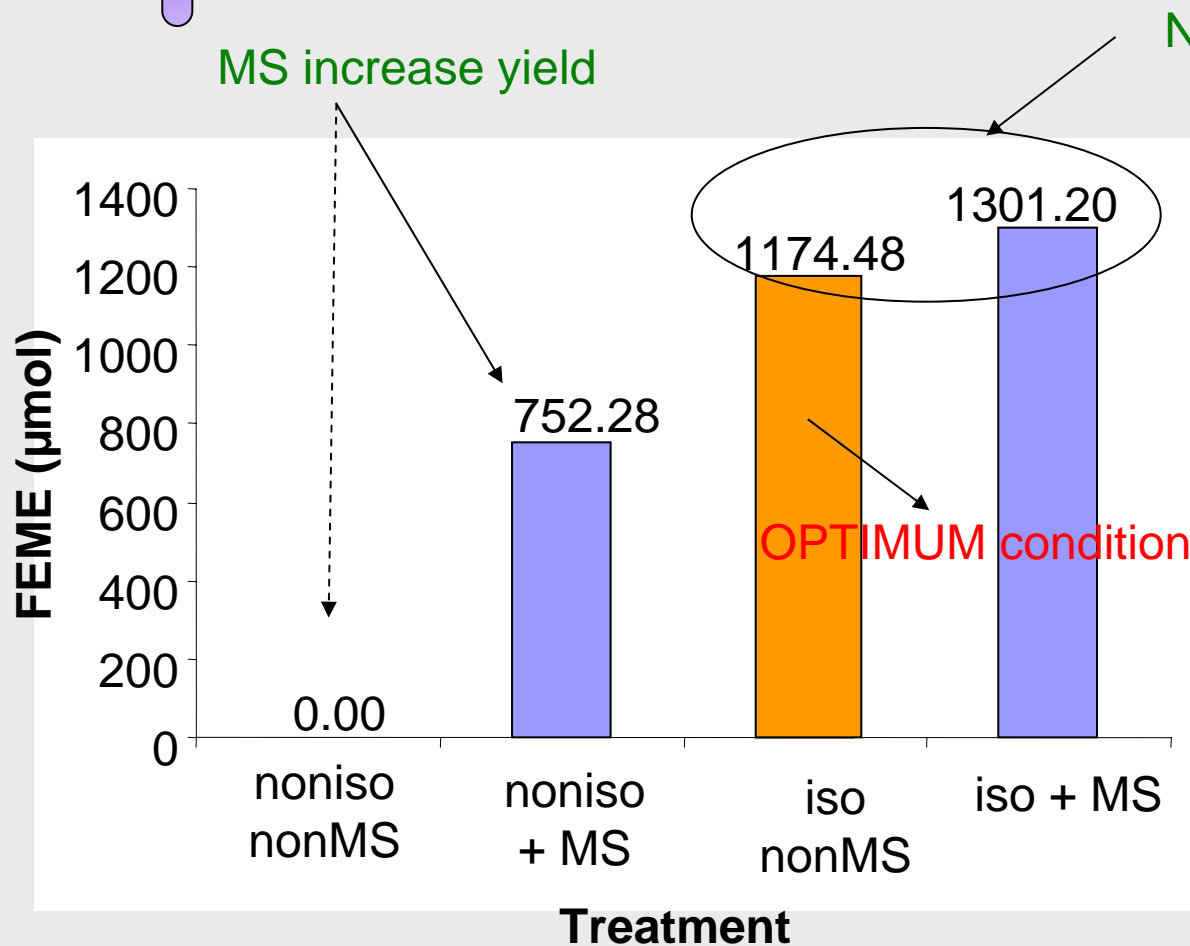
Table 1. Composition of jatropa seed and germinated seed

<b>Components</b>	<b>Seed</b>	<b>Fresh germinated seed</b>	<b><i>Acetone- dried germinated seed</i></b>
Moisture (% wb)	5,79	47,16	5,34
Oil (% db)	56,81	26,02	1,96
Protein (% db)	18,19	16,93	46,18





# The Effect of Isooctane dan Molekular Sieves



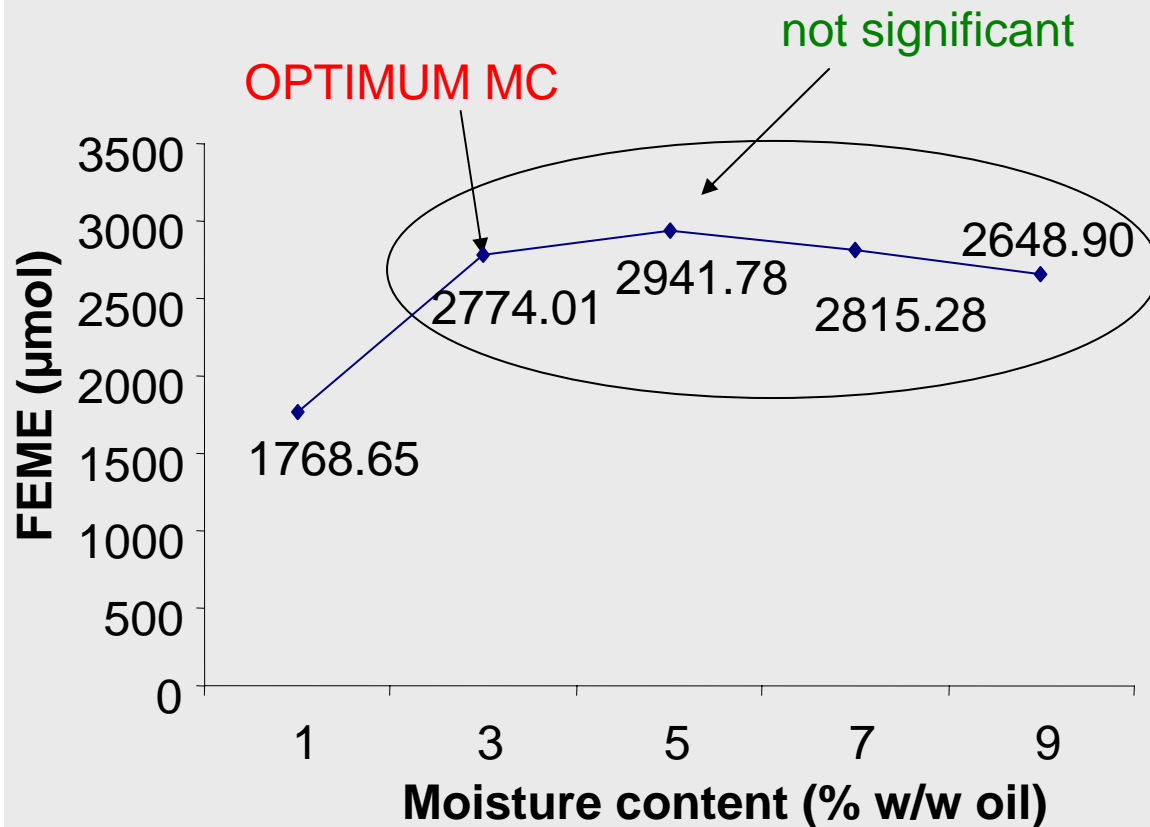
Condition :

- 30 °C; 24 hrs; 120 strokes/min
- Oil 0,5 M in isooctane
- Mol ratio Oil/methanol = 1/3 (stepwise at 0, 8, dan 16 hrs)
- MS 20 % oil
- enzyme source 10 % oil
- Hydrolisis actv. 1,87 U
- Esterification actv 44,08 U

Figure 1. The effect of MS and isooctane on FAME formed



## The effect of moisture content



Condition :

- 30 °C; 48 hrs; 120 strokes/min
- Oil/methanol = 2 mmol/6 mmol (stepwise at 0, 8, and 16 hrs)
- Oil 0,5 M isooctane
- Enzyme source 10% of oil
- Hydrolytic actv 1,87 U
- Esterification actv 44,08 U

Figure 2. The effect of moisture content on FAME formed



## The effect of reaction time

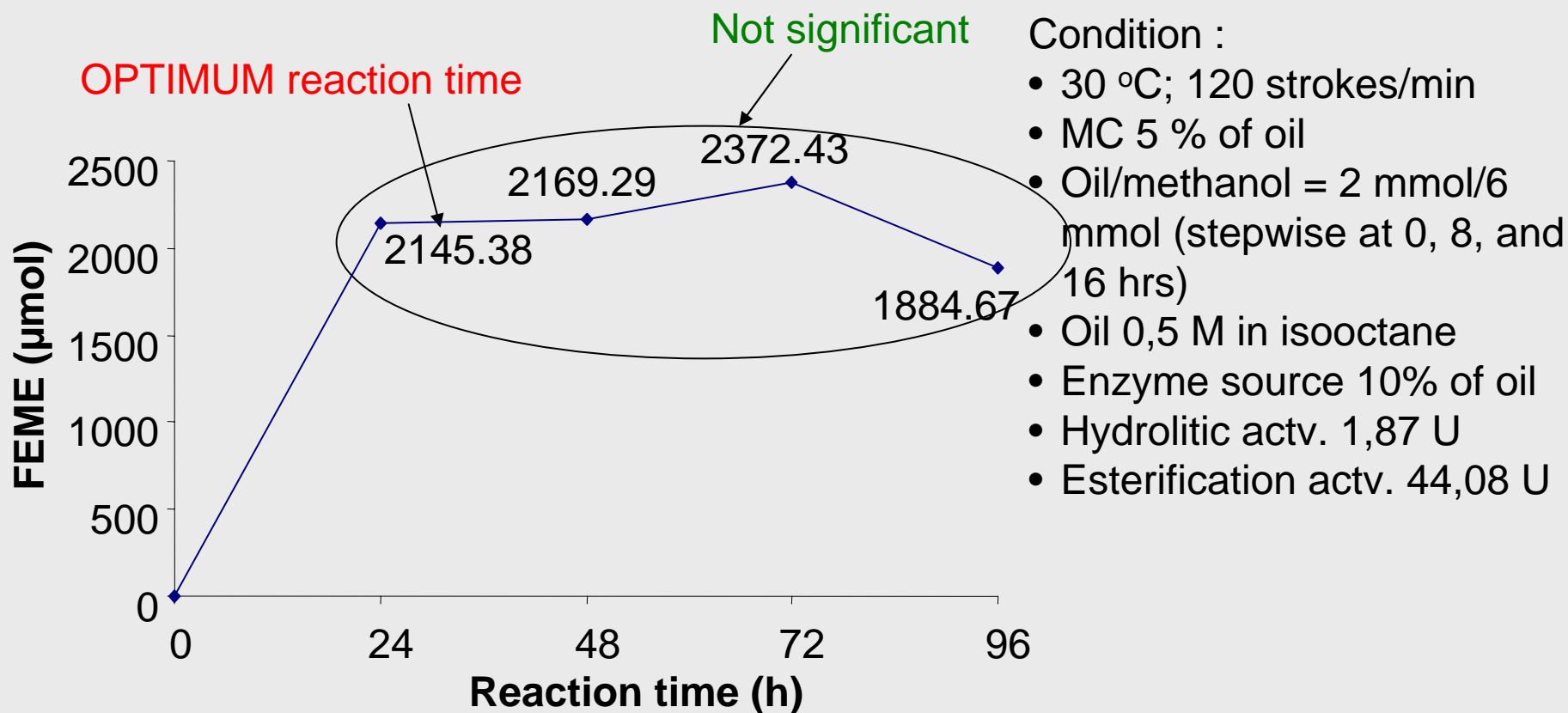
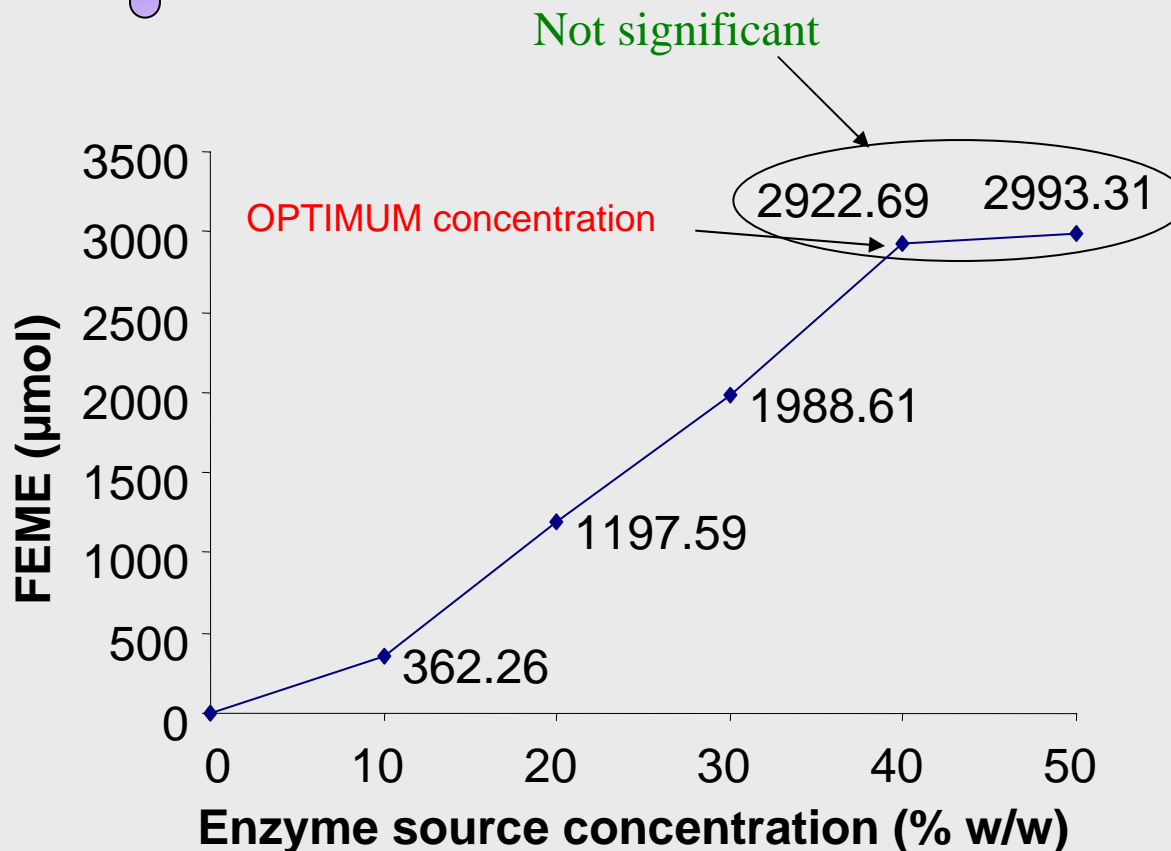


Figure 3. The effect of reaction time on FAME formed



## The effect of enzyme source concentration



Condition :

- 30 °C; 72 hrs; 120 strokes/min
- MC 5 % of oil
- Mol ratio oli/methanol 1/3 (stepwise at 0, 8, and 16 hrs)
- Oil 0,5 M in isooctane

Figure 4. The effect of enzyme source concentration on FAME formed



## CONCLUSION

- Isooctane and molecular sieves addition separately may promote FAME formed
- The moisture content of acetone-dried germinated seeds up to 15% (or 3% of the oil weight) found to promote the formation of methyl esters significantly. However, beyond 15% up to 45% not to affect the FAMES formed.
- The formation of FAMES found to increase during 24 hours of reaction time, beyond this value until 72 hours, the formation of FAMES no longer increase significantly.
- Up to 40%, the more the acetone-dried germinated seeds added into the reaction system, the more the methyl esters formed.
- It can be concluded that the acetone-dried germinated *Jatropha curcas* seeds is potentially used as source of lipase.





Thank you for your attention

