Germinated Jatropha curcas as Biocatalyst in Synthesis Biodisel

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Introduction

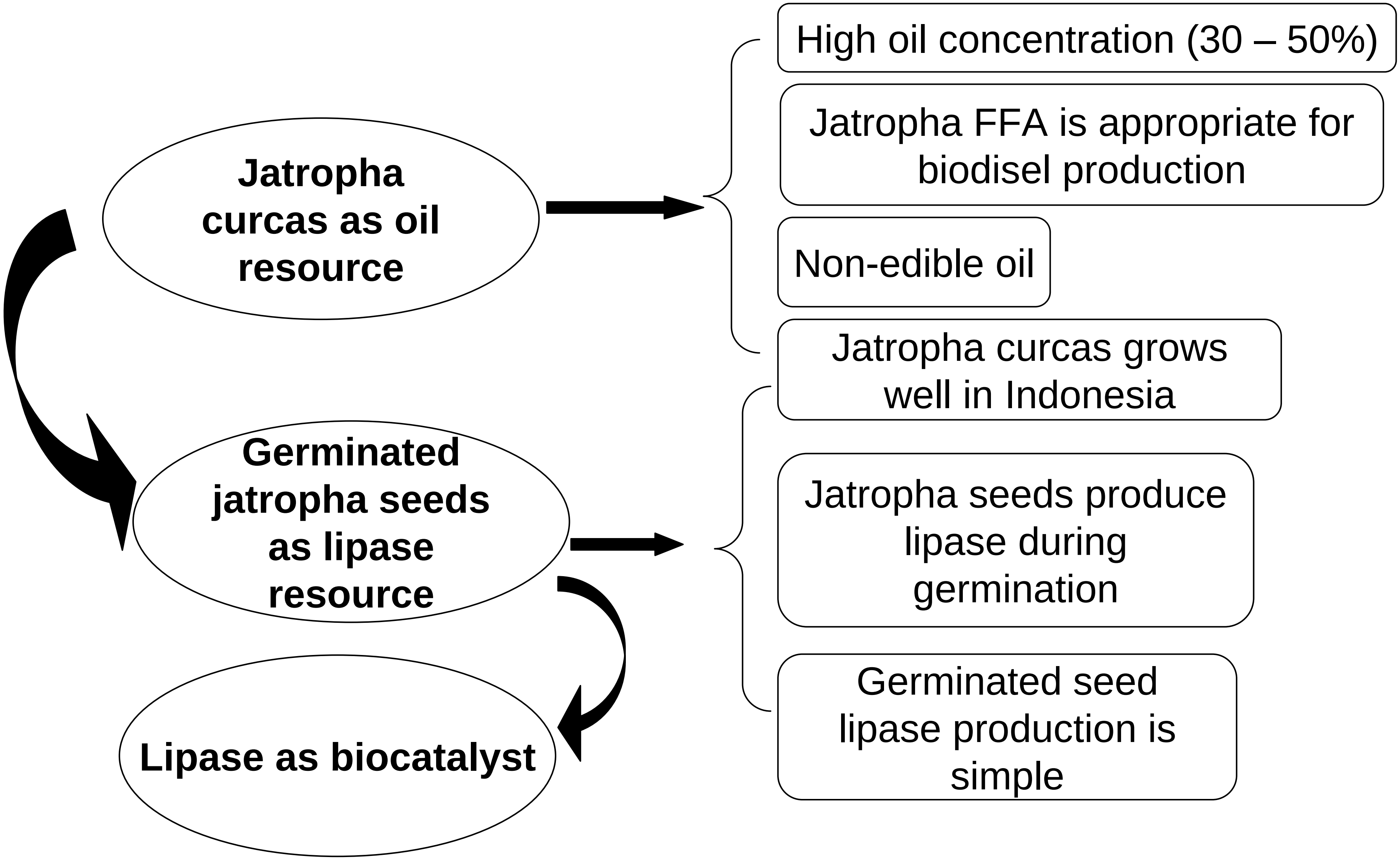
Some reasons of the research on Renewable Energy:

- An increase in world demand on fossil oil results in an increase in world crude oil price
- Fossil oil is non-renewable energy
- Resource of fossil oil becomes exhausted since it is not renewable
- Indonesia is no longer as oil exporter
- Government subsidy on fossil oil is very costly
- Environmental concerns: Fossil oil produces CO_2 that will increase gas emission

Drawback of jatropha oil as source of renewable energy:

- Free fatty acids (FFA) increase due to the hydrolysis of Jatropha oil during storage
- FFA and other compounds interfere with transesterification, reacting with the base to form soaps.
- High concentration of FFA need to be purified
- Water is formed during the hydroxyalcohol and free fatty acid reaction, which will interfere with transesterification.
- Two steps process using acid and base catalyst is not efficient

Jatropha curcas seeds as source of biodiesel



Objective

- To evaluate the capability of indigenous germinated jatropha curcas seeds as biocatalyst for synthesis of methyl ester
- To evaluate the effect of molar ratio of methanol and oil on the synthesis of methyl ester.
- To evaluate the effect of *molecular sieves* on the synthesis of methyl ester.
- To evaluate the effect of germinated jatropha curcas lipase concentration on the synthesis of methyl ester.

Results

Fig. 1. Germination of Jatropha seeds

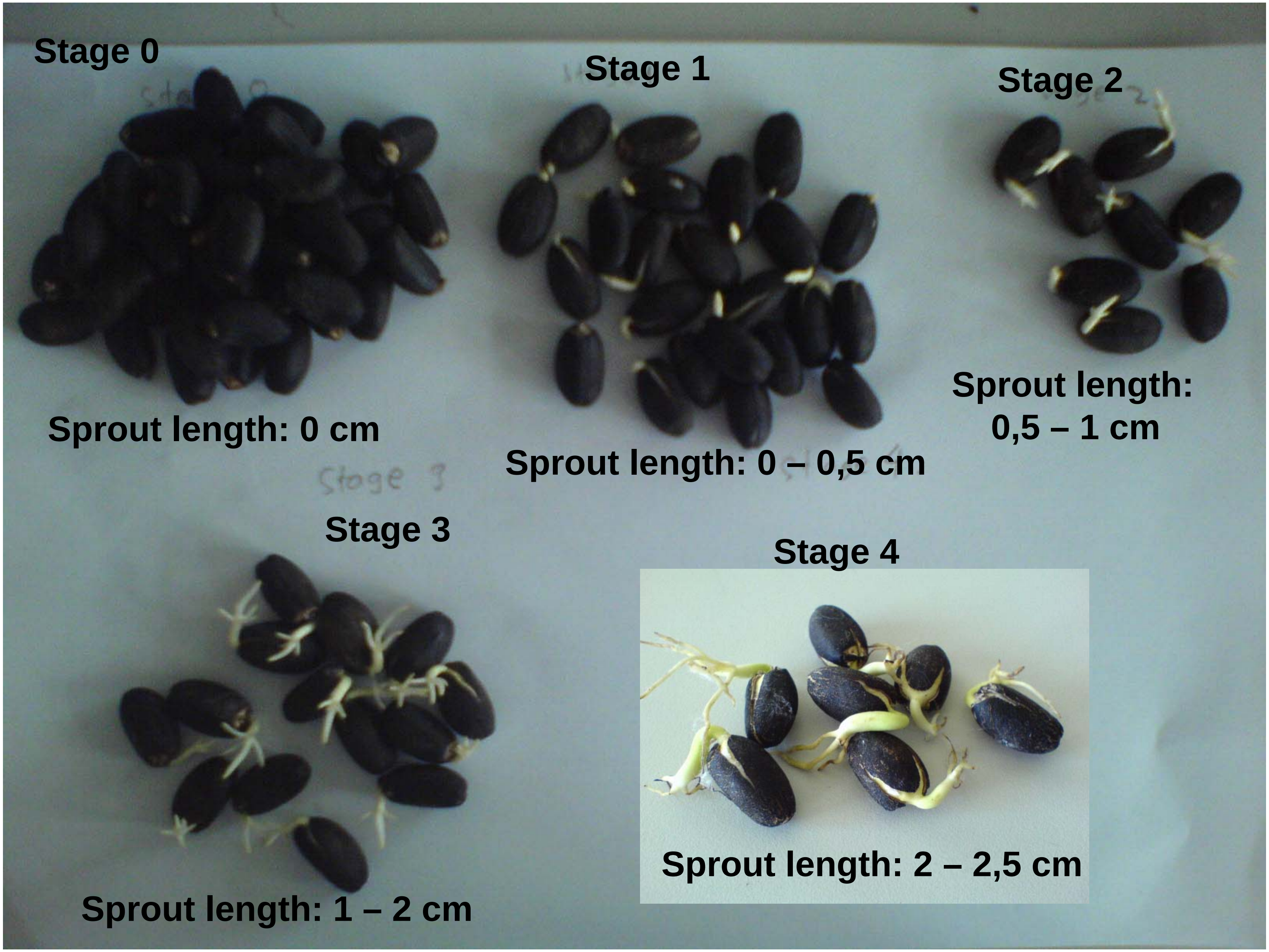


Fig. 2. Germinated *Jatropha curcas* at various stages

Table 1. Condition of Jatropha seeds and Germinated Jatropha curcas

Parameters	Jatropha seeds	Germinated Jatropha seeds
Water content (% wb)	5.79	55.5
Oil concentration (% db)	56.81	45.62
Protein concentration (% db)	18.19	26.74
FFA concentration (% v/v)	3.26	49.4
Esterification activity (U/g)	-	78.24
Hydrolytic activity (U/g)	-	4.18

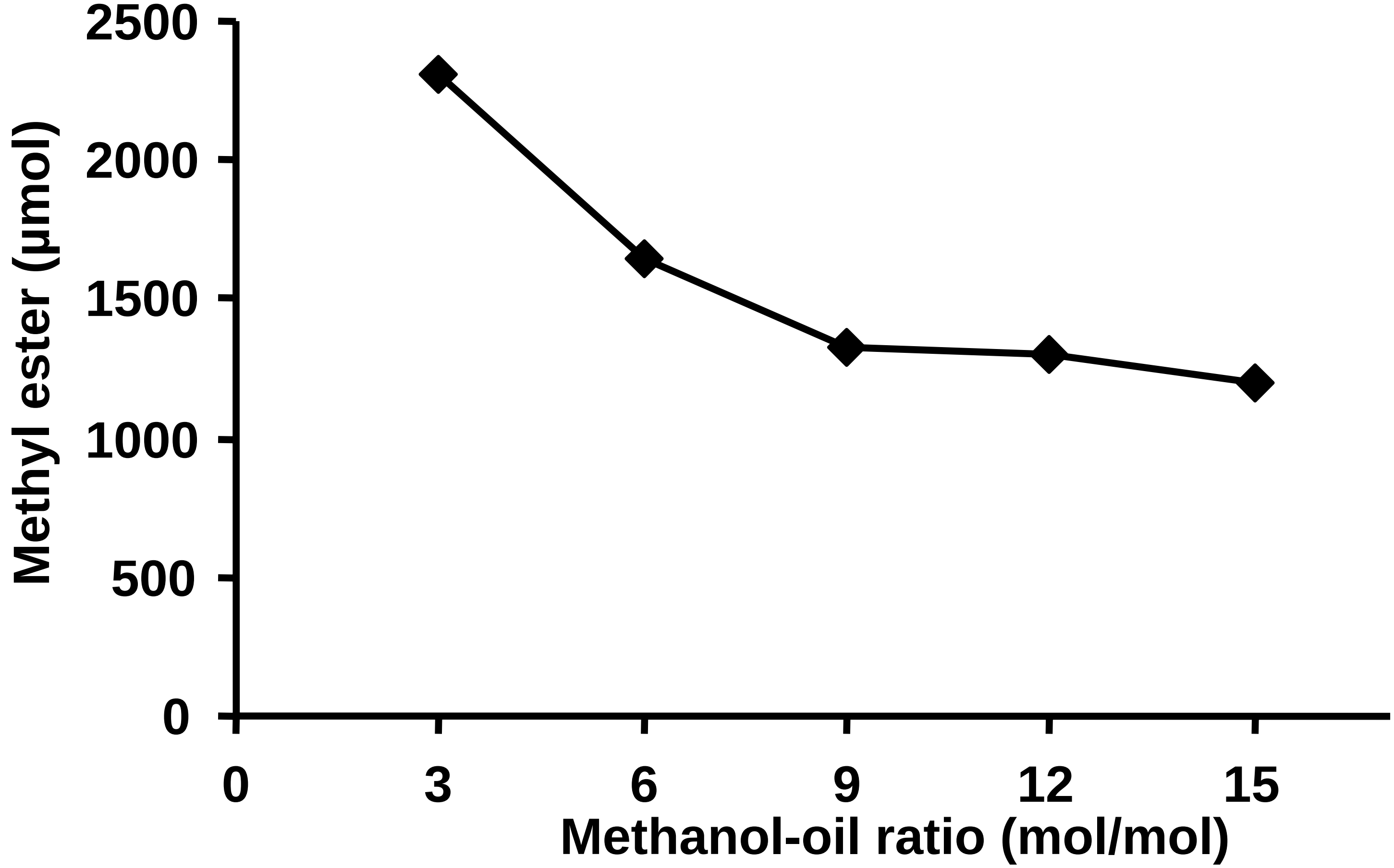


Fig 3. The effect of methanol and oil ratio on the forming of methyl ester on 3 stepwise reaction at 30 °C, for 48 h. Lipase and water concentration were 20% and 55%, respectively.

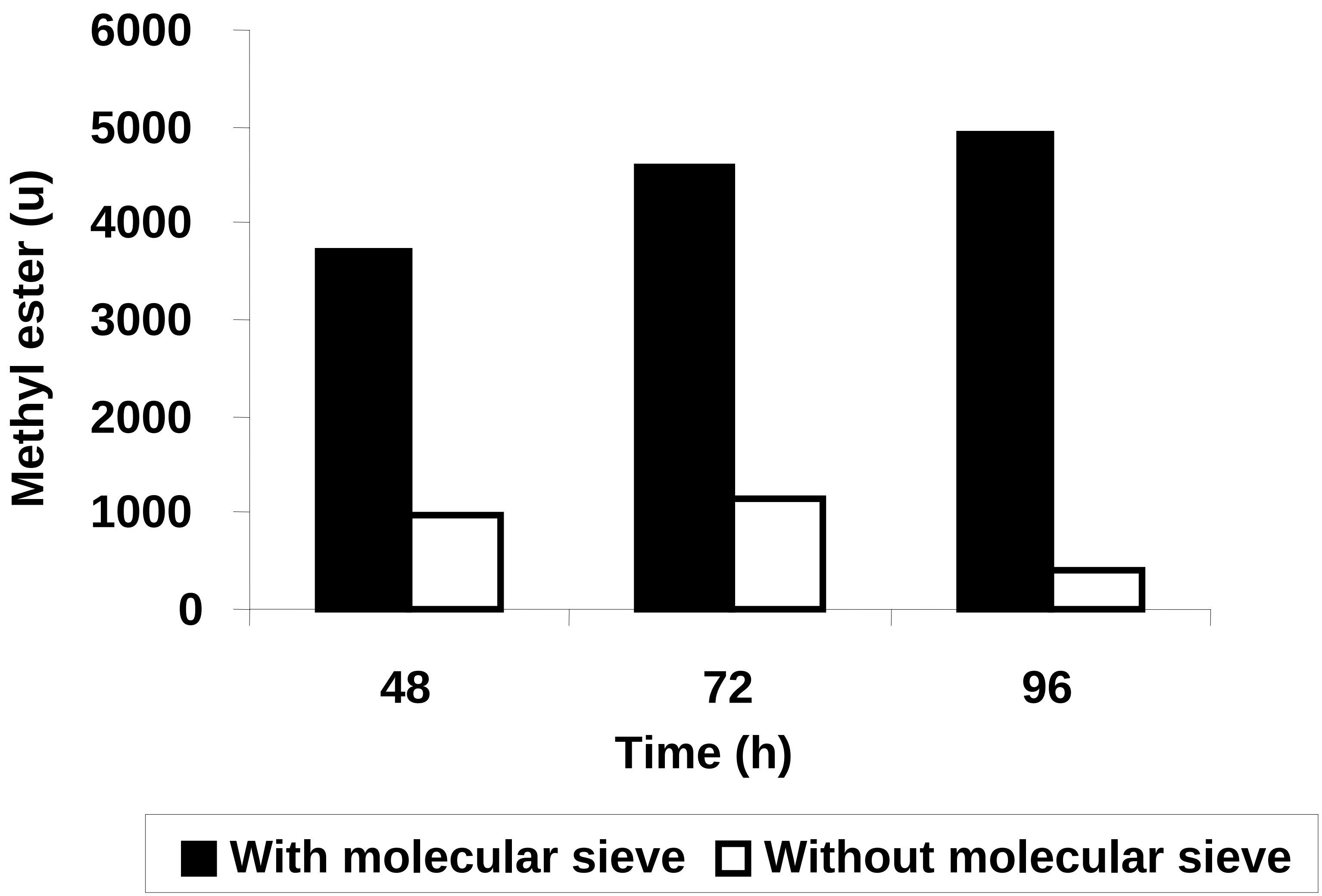


Fig 4. The effect of molecular sieve on the forming of methyl ester on 3 stepwises reaction at 30 °C. Lipase and water concentration were 20% and 55%, respectively. Molecular sieve (20% (w/w)) was added after 24 h reaction.

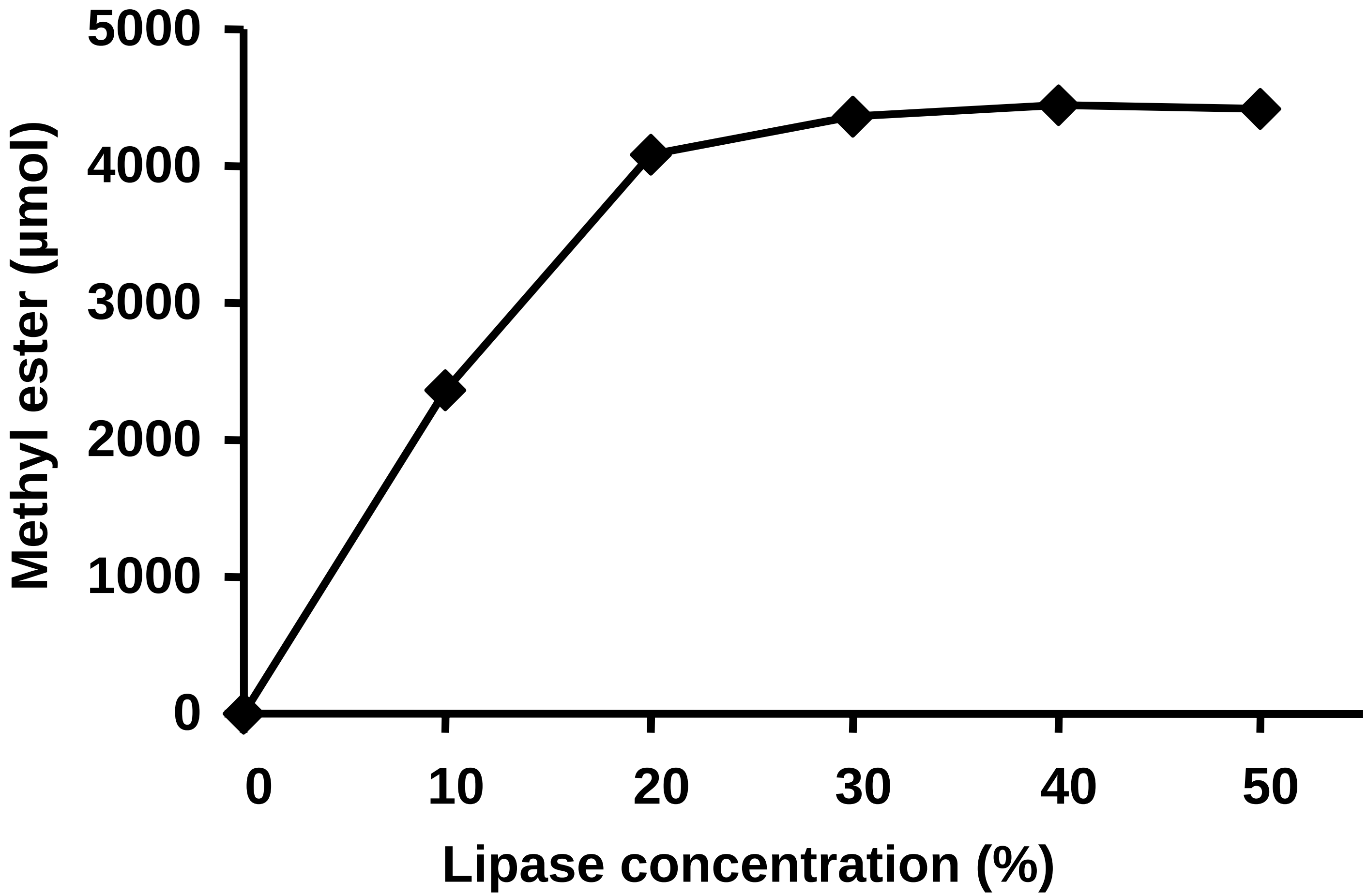


Fig 5. The effect of lipase concentration on the forming of methyl ester on 3 stepwises reaction at 30 °C for 72 h. Molecular sieve and water concentration were 20% and 55%, respectively. Molecular sieve was added after 24 h reaction.

Conclusion

- Germinated *jatropha curcas* lipase has a capability as biocatalyst for the synthesis of methyl ester
- Molar ratio of methanol and oil on the synthesis of methyl ester has significant effect on the forming of methyl ester
- Adding 20% molecular sieves into the system resulted in about 50 times increase in the forming of methyl ester