CHAPTER V
CONCLUSION

5.1 Production of residue glycerine from transesterification of *Jatropha curcas* oil

Jatropha curcas oil (100 g) was transesterified mixed with a solution of 2 g NaOH in 22.5 g methanol to produce biodiesel (fatty acid methyl esters) and glycerine (modified method from Foidl et al. 1996). The mixture was stirred gently at 70 ^{0}C stirred at 200 rpm for 3 hour and then transferred to a separatory funnel to separate both biodiesel and glycerine. Two layers were properly separated that the bottom layer was residue glycerine and the top layer was the methyl ester. The yield of 73.34% methyl esters and 25.46% of residue glycerine was weighed and calculated from the original sample oil.

5.2 The compositions analysis of biodiesel from transesterification of *Jatropha curcas*

The composition analysis of biodiesel from transesterification was studied by GC-MS. The fatty acid methyl ester composition of biodiesel compared with some reported values. The fatty acid methyl esters found common in oil sample were methyl palmitoleate, methyl palmitate, methyl linolenate, methyl linoleate, oleic methyl ester and methyl stearate. The results obtained are very similar to those reports (Banerji et al., 1985; Foidl et al., 1996; Gubitz et al., 1999; Nasir et al., 1988). Based on comparing retention time of this chromatogram, it was indicated that this biodiesel consisted of 0.82% methyl palmitoleate,14.66% methyl palmitate, 35.21% methyl linoleate, 42.36% oleic methyl ester and 6.93% methyl stearate, respectively.

5.3 Purification of residue glycerine from transesterification of *Jatropha curcas* oil

5.2.1 Purification of residue glycerine by conventional method

Firstly, the chemical compositions of glycerine standard and residue glycerine by several techniques were determined such as glycerine content, ash content, moisture content, matter organic non-glycerine, acidity and pH. The analysis of residue glycerine found 50.05% glycerine content, 23.71% ash content, 9.98% moisture content, 16.26% matter organic non-glycerine content, 0.81% density and pH at 10.11, respectively. The analysis of compositions of purified glycerine by conventional method that average compositions obtained were: 70.35% glycerine content, 12.92% ash content, 10.76% water content, 5.97% MONG content, at density 1.22 and pH 6.57.

5.2.2 Purification of residue glycerine by improved method

1) The purification using cation exchange chromatography indicated that the optimized conditions for batch experiment were 1:3(w/w) of ratio of cation exchange resin to glycerine, 90 min of contact time and 50 rpm of agitation rate, respectively. The results showed that it contained 74.25% glycerine, 9.69% water, 10.95% ash, 5.11% MONG at density 1.23 and pH 6.84.

2) The purification using anion exchange chromatography presented that the optimized conditions for batch experiment were 1:3(w/w) of ratio of cation exchange resin to glycerine, 90 min of contact time and 50 rpm of agitation rate, respectively. The result shown that contain 74.58% glycerine, 9.78% water, 10.68% ash, 5.36% matter organic non-glycerine (MONG) at density 1.44 and pH 6.82.

3) The purification using the mixing of both cation and anion exchange resin indicated that the optimized conditions for batch experiment were 1:3(w/w) of ratio of mixed both cation exchange and anion exchange resin to glycerine, 90 min of contact time and 50 rpm of agitation rate, respectively. The results showed that it composed of 83.06% glycerine, 9.12% water, 6.20% ash, 1.62% MONG at density 1.27 and pH 6.77, as shown in Table 5.1.

Table 5.1 Comparison composition of glycerine with improved method by using ion exchange chromatography

Methods	Glycerine (%)	Ash (%)	Water (%)	MONG (%)	Density (g/cm^3)	pH
Standard glycerine	99.50	0.01	0.44	0.02	1.25	6.86
Cation exchange resin	74.25	10.95	9.69	5.11	1.23	6.84
Anion exchange resin	74.58	10.68	9.78	5.36	1.44	6.82
Mixing of both cation and anion exchanger resin	83.06	6.20	9.12	1.62	1.27	6.77

The comparison purified of residue glycerine by improved methods was investigated. Several methods in these experiments, purified by using ion exchange chromatography can increase glycerine content while ash content decreased. Owing to, both cation exchange and anion exchange resin can exchange both positive charge ions and negative charge ions from ionization of salts and other impurity, constituted the ash. Therefore, ash content decreased resulting in the higher purity of glycerine was obtained by the improved method. Moreover, MONG, which comprised mainly partial glycerides, free fatty acid, oxidation products and the polymerized compounds of glycerine, was reduced because some MONG was removed by acidification step.