Kiettipong Songprom 2011: Bioethanol Production from Oil Palm Trunk Pretreated by Steam Explosion. Master of Science (Biotechnology), Major Field: Biotechnology, Department of Biotechnology. Thesis Advisor: Assistant Professor Pramuk Parakulsuksatid, Ph.D. 142 pages.

Oil palm trunk is an alternative raw material for bioethanol production. Due to its structure from lingocellulosic materials, pretreatment is required to improve the rate of enzymatic hydrolysis. The oil palm trunk chips were steam exploded at temperature 200 and 210°C for 2, 4 and 6 min. The steam exploded fiber was washed by hot water at temperature 80°C for 30 min to eliminate contaminants. The optimum condition of steam explosion was 210°C for 4 min (severity factor = 3.84). The cellulose, pentosan and lignin contents were 58.83, 4.03 and 27.12 %, respectively. The pentosan content was decreased 86.35 % from the chips. Taguchi method with 3 factors with 3 levels was used to optimize the delignification by alkaline extraction. The factors of NaOH concentration (15, 20 and 25 % w/v), temperature (70, 80 and 90°C) and time (30, 60 and 90 min) were studied. The optimum condition of the alkaline extraction was 15 % w/v NaOH, temperature at 90°C and 60 min. The content of cellulose, pentosans and lignin were 87.14, 1.40 and 6.13 %, respectively. The cellulose content was increased 53.14 % from untreated oil palm trunk chips, while the pentosan and lignin contents were decreased 95.26 and 71.67 %, respectively. A simultaneous saccharification and fermentation (SSF) was used to produce ethanol by using pretreated oil palm trunk fiber as substrate. Yeast extract, peptone and 10 % w/v fibers in citrate buffer pH 4.8 solution was added with Celluclast 1.5L (15 FPU/g substrate), Novozym 188 (15 IU/g substrate) and *Saccharomyces cerevisiae* Sc90 in a total volume of 300 mL. The SSF was run at temperature of 40, 45 and 50°C for 96 h. Ethanol concentrations between SSF at 40°C and 45°C were not statistically different ($p \geq 0.05$). The highest ethanol concentration (C_P) of 44.25 g/L, ethanol productivity (Q_p) 0.45 g/L h, ethanol yield ($Y_{P/S}$) 0.46 g/g and theoretical ethanol yield 90.40 % were achieved after fermentation at 40°C. In addition, the prehydrolysis and simultaneous saccharification and fermentation (PSSF) gave the ethanol concentration 31.22 g/L and theoretical ethanol yield 63.29 %. It was revealed that PSSF did not enhance the efficiency of bioethanol production. Steam explosion and alkaline extraction to enhanced enzymatic hydrolysis of oil palm trunk chips. SSF at 40°C showed the potential process to produce ethanol from oil palm trunk fiber.

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