ABSTRACT

Wijaya, Yunita. M.S A.B.E. Purdue University, December, 2007. The Effect of Processing Parameters on Oil Extraction. Major Professor: Martin Okos.

Edible oil processing is an industry that has been started thousands of years ago when Chinese and Egyptians used manual presses to recover oil from crushed oilseeds. Since then, both equipments and methods have been developed. Processing conditions such as temperature, pressure, and moisture content are known to highly affect the oil yield and quality. Optimization of these parameters is likely to improve the seed matrix compaction and the oil flow characteristics thus improving the overall oil extraction, especially under small-scale operations.

In this research, maximizing the recovery oil yield using an extrusion method was accomplished by investigating several processing parameters, including temperature, moisture content, die diameter, screw speed, applied pressure, and also the number of cycle performed during pressing. It was found that higher moisture content of 10% MC resulted a better oil recovery, and the best combination of processing parameters that resulted a more efficient process were as follow: Die diameter of ¼", screw speed of 675 RPM, temperature of 120^{o}C combined with 5 MPa applied pressure with 7 cycles performed during pressing. Time was found to be an important parameter as it can improve the oil recovery yield up to 50% if the pressing is done right after the extrusion.

Rheological behavior of the food material is also known to have significant impact on the quality and texture of the final product and that was investigated using a stress relaxation test in the research. Soybean and peanut flours with different levels of moisture and fat content were used at temperature ranges from 80^{o}C to 120^{o}C. It was found that increases in operating temperature can help soften the food material and hence lower initial pressure. Initial pressure at 120^{o}C is one-third from that of 80^{o}C. In the case of peanut flour, it was found that moisture content is statistically insignificant (p-value > 0.05) on the hypothetic asymptotical value and initial decay rate. Addition of moisture and fat on peanut flour seems to induce an antiplasticizing effect, which shows those materials increasing the rigidity and firmness of the peanut flour. Higher temperature and moisture content applied on soybean flour caused the material to relax faster.