ABSTRACT

Tjahja Muhandri. F261020071. Rheological Characteristic of Corn Noodles Made with Extrusion Process. Under the supervision of Dr. Ir. Adil Basuki Alza, MS as the chairman, Prof. Dr. Ir. Rizal Syarief, DESS, and Dr. Ir. Sutrisno, MAgr as advisory committee members.

This research generally aimed to prepare corn-based noodles which have good elasticity and low cooking loss by using extrusion process. In detail, this research has the objective to: (1) study the effects of particle sizes, amounts of corn flour and corn starch in water, concentration of salt in corn flour and corn starch on gelatinization profile; (2) to optimize corn noodle extrusion using RSM, and (3) to study the effect of salt addition and number of passing in extruder on corn noodle characteristics.

The gelatinization profile of corn flour and corn starch were characterized by Brabender Visco Amylograph type D-4100 Duisburg. Corn noodles were prepared by Scientific Laboratory Single Screw Extruder type LE25-30/C from Labtech Engineering Co. Ltd., Thailand. Process optimization was conducted by using response surface methodology (RSM) with four parameters, i.e., 1) firmness; 2) stickiness; 3) elongation and 4) cooking loss. Firmness and stickiness was set in range, elongation was set in maximum, and cooking loss was set in minimum.

It was found that the initial temperature and maximum temperature of gelatinization increased and peak viscosity decreased with the increase of particle sizes. Increasing concentration of corn flour and corn starch in water tended to decrease maximum temperature of gelatinization and increase peak viscosity, but it had no significant effect on initial temperature. The addition of sodium chloride in corn flour increased significantly initial gelatinization temperature, maximum temperature of gelatinization, peak viscosity and cold viscosity. In the case of corn starch, the addition of sodium chloride 1% increased initial temperature and peak viscosity, but the addition more than 1% of concentration had no significant effect. The addition of sodium carbonate in corn flour and corn starch increased the initial temperature and peak viscosity, but decreased maximum temperature of gelatinization and cold viscosity.

Process optimization showed that the optimum condition, with a desirability of 0.835, was achieved by the combination of 70% (dry basis) dough’s moisture content with the extruder temperature is 90°C and screw speed is 130 rpm. The RSM model predicted that the corn-based noodles prepared with optimum condition has firmness of 3039.79 gf, stickiness of -116.2 gf, elongation of 318.68%, and cooking loss of 4.56%.

In general, this research showed that firmness of corn noodle decreased by the increased of salt addition and by number of passing in extruder. In sodium carbonate addition, the optimum condition was obtained at moisture content of 80% (dry basis), salt concentration of 0.11 or 0.12%, and number of passing in extruder for 3 times (desirability 0.836). Under this optimum condition, predicted by RSM, corn noodles has firmness of 2242.29 gf, stickiness of -58.83 gf, elongation of 418.81%, and cooking loss of 3.66%. In sodium chloride addition, the optimum condition was achieved at moisture content of 80% (dry basis), salt concentration 2%, and number of passing in extruder for 3 times (desirability 0.877). Under this condition, predicted by RSM, corn noodles has firmness of 1855.23 gf, stickiness of -35.86 gf, elongation of 576.38%, and cooking loss of 2.62%.

Key words: corn noodle, rheology, extrusion, salt, number of passing