CHAPTER V
CONCLUSION AND RECOMMENDATIONS

5.1 Germinated brown rice contained significantly higher protein, crude fiber, carbohydrates, GABA, vitamin B1 and phenolic compounds than brown rice. DPPH and ABTS value also found significantly higher. Greater protein, GABA and phenolic compounds were found in 'Chainat 1' germinated brown rice than KDML 105 germinated brown rice.

5.2 Pregelatinization by all equipments in this study had no effect on GABA content. Vitamin B1 content was decreased with the increasing of temperature in pregelatinized flour from single screw extruder and hot air oven. In spray dryer and spouted bed dryer, temperature had no significant effects on vitamin B1.

5.3 Varieties of rice, water:flour ratio and temperature had significant effects on pasting temperature and viscosity and the interaction between water:flour ratio and temperature were found in pregelatinization by single screw extruder and hot air oven. Increase water and temperature decreased pasting temperature and viscosity. Temperature had no significant effects on pasting temperature in spray dryer and spouted bed dryer.

5.4 In thermal properties, varieties of rice, water:flour ratio and temperature had significant effects on all gelatinization parameters (T_o, T_p, T_c, ΔH and degree of gelatinization), ΔH of retrogradation (ΔH_r) and % retrogradation. Water:flour ratio and temperature had significant interaction in pregelatinization by single screw extruder. Increasing water and temperature decreased the value of T_o, T_p, T_c, ΔH and ΔH_r but increased degree of gelatinization and % retrogradation. In hot air oven, these parameters were only affected by temperature. While in spray dryer and spouted bed dryer, temperature had no significant effects on gelatinization and retrogradation parameters.

5.5 Varieties of rice, water:flour ratio and temperature had significant effects on all parameters in rheological properties during heating and cooling.

Interaction between water:flour ratio and temperature was found in pregelatinization by single screw extruder. Pregelatinized flour produced by single screw extruder and hot air oven had lower $T_{oG'}$, $T_{G'max}$, G'_{max}, G''_{max}, G'_5 and G''_5 when water and temperature were increase. In spray dryer and spouted bed dryer, temperature only had significant effects on G'_{max} and G''_{max}.

5.6 Varieties of rice, water:flour ratio and temperature had significant effects on swelling power pregelatinization by single screw extruder and hot air oven. Interaction between water:flour ratio and temperature was found in pregelatinization by single screw extruder. Swelling power was increased with temperature and water. Temperature had no significant effects on swelling power of pregelatinized flour by spray dryer and spouted bed dryer.

5.7 Varieties of rice, water:flour ratio and temperature had significant effects on solubility. Interaction between water:flour ratio and temperature was found in pregelatinization by single screw extruder and hot air oven. Low temperature and high water content gave pregelatinized flour with high solubility. Temperature had no significant effects on solubility of pregelatinized flour by spray dryer and spouted bed dryer.

5.8 From SEM micrographs, morphological properties of ‘Chainat 1’ and KDML 105 were similar. Morphological properties of pregelatinized flour was relevant with reported physical properties, high and low destruction of flour were found in pregelatinized flour produced by single screw extruder and hot air oven, respectively. Resemble morphological properties to germinated brown rice flour were found in pregelatinized flour produced in spray dryer and spouted bed dryer.

5.9 In morphological properties determination should use starch as a sample instead of flour to observe the starch fragmentation caused by pregelatinization from different equipments.

5.10 Specific usage of pregelatinized flour produced in this study needs further investigation.