

Supat Chaiyakul 2008: Development of Extruded High-Protein Glutinous Rice-Based Snack. Doctor of Philosophy (Agro-Industrial Product Development), Major Field: Agro-Industrial Product Development, Department of Product Development. Thesis Advisor: Associate Professor Kamolwan Jangchud, Ph.D. 208 pages.

The purpose of this research was to apply a linear-programming technique to design low-cost formulations containing at least 20 % protein, nutritionally adequate amount of lysine and sulphur amino acids to meet the FAO/WHO/UNU (1985). A factorial design was employed investigate the influence of feed protein content (20 and 30%), feed moisture (20%, 25%, and 30%) and barrel temperature (150 and 180 °C) on the physical, chemical and sensory qualities of extrudates. The acceptability of non-enrobe and enrobe-flavored extrudates were investigated. Result show that two mixtures formulated by linear-programming were 20 % protein formulation (71 % rice, 6 % gluten, 23 % soy) and 30 % protein formulation (54 % rice, 15 % gluten, 31 % soy). Protein content, feed moisture and barrel temperature had significant effect ( $P \leq 0.01$ ) on the qualities of extrudate except the cystine, methionine, serine, and phenylalanine content. The feed protein content had a significant impact on all measured attributes. Increasing protein content resulted in reduced moisture content of the extrudate, more protein and NPN in the extrudate, greater bulk density and BSI, but lower expansion, and high intensity of hardness, noise, crispness but less sticky mouth coating. Increasing feed moisture content had a positive impact on final extrudate moisture, reduced the NPN, improved lysine recovery, increase bulk density and BSI, but reduced expansion, and high intensity of hardness, noise, crispness and brittle but low intensity of colour. The high barrel temperature (180°C) reduced extrudate moisture content, increased the NPN, reduced lysine content, bulk density and BSI but gave a better expansion, and reduced intensity of all sensory attributes except colour. The acceptability results indicated that changes in protein content and extruder variables affected liking scores of the final product. Increasing feed protein content significantly increased flavour, texture and overall liking. Increasing feed moisture content reduced appearance and texture liking score but increased colour and flavour liking score. The high temperature reduced appearance, colour and flavour liking of extrudate. The colour, flavour and texture of extruded snack were improved when coated with 12 % barbecue or 8% chesses seasoning resulting in high acceptability.

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Thesis Advisor's signature