Studies on the flavor and oxidation stability of drrp-fried gluten balls and their frying soybean oil

林炫橦、游銅錫 ; 張基郁

E-mail: 8701209@mail.dyu.edu.tw

ABSTRACT

Deep-fried gluten ball is a traditional Chinese food. Deep-fried glutenballs are produced by deep-frying wet gluten balls in soybean oil at threedifferent temperatures, i.e., 135 °C, 157 °C, and 190 °C. For its specialtaste and good mouth feeling, deep-fried gluten ball is very popular inTaiwan, especially for those vegetarians. The manufacturing processes ofdeep-fried gluten balls include gluten washing, gluten ball shaping bycutting, and gluten ball deep-frying. The quality of soybean oil used in gluten ball deep-frying is the most important factor affecting the quality andthe flavor of deep-fried gluten balls. Deep-fried gluten balls are very easyto undergo lipid oxidation and produce rancidity odor to affect theacceptance of products by the consumers. Therefore, it''''s our purpose tostudy the stability of soybean oil used in deep-frying gluten balls underhigh temperature heating and to search for the best chemical or physicalmethods for the evaluation of the quality of the frying oil and deep-fr iedgluten balls. The relationships between the results of physical or chemicaldeterminations and the quantity of volatile compounds produced in the fryingoil or in deep-fried gluten balls were also studied. The effect of theaddition of antioxidants to the oil or the combination of glucose andvarious amino acids to the wet gluten balls on the oil stability were alsostudied. The research works of this study include into five parts. First part ofthis study investigated the stability of soybean oil under different heatingtime and temperature combinations, and the relationships between eachmeasured quality index of frying oil and the yields of volatile compounds infrying oil. It was found that there was a positive relationship between theheating level and the degree of oil deterioration. The major volatilecompounds in heated soybean oil were found to be the volatile aldehyde s.With increasing in the heating level, the content of volatile aldehydesincreased. When the oil was heated at 135 °C, there was a good linearrelationship between the physical or chemical quality indices of the oil andthe yields of the total volatile compounds, total volatile aldehydes, ortotal volatile ketones in the oil. When the oil was heated at 157 °C, therewas a good linear relationship between the physical or chemical qualityindices of the oil and the yields of the total volatile hydrocarbons in theoil. When the oil was heated at 190 °C, there was a good linear relationshipbetween the physical or chemical quality indices of the oil and the yieldsof the total volatile ketones in this oil. The second part of this study investigated the effects of the additionof several antioxidant combinations to the soybean oil on the inhibition ofoil oxidation during the heating of oil at high temperature. Among theantioxidants used, the combination of BHT and TBHQ at the highest use levelpermitted (100 ppm each) by law had the highest anti-oxidation effect.Through the determination of physical or chemical indices and the yields ofvolatile compounds in the gluten-fried soybean oil, the effects of thecombination of BHT and TBHQ on the inhibition of oil oxidation was furtherproven. The third part of this study investigated the effects of the addition ofthe combination of BHT and TBHQ at the highest use level permitted (100 ppmeach) by law into the frying oil on the storage stability of deep-friedgluten balls. Through the determination of the physical or chemical indicesof the oil in the deep-fried gluten balls and the yields of volatilecompounds in the deep-fried gluten balls prepared in the first day''''s and inthe twelfth day''''s frying, the effects of the combination of BHT and TB HQ onthe inhibition of oil oxidation in the deep-fried gluten balls was alsofurther proven. The fourth part of this study investigated the effects of the additionof glucose and various amino acids in the wet gluten balls to the frying oilstability and the flavor improvement of the deep-fried gluten balls. Throughthe determination of physical or chemical indices of the frying oil and theyields of volatile compounds in frying oil and through the sensorypreference evaluation test of the deep-fried gluten balls prepared in thefirst day''''s and in the twelfth day''''s frying, the addition of the combination of glucose and glutamic acid into the wet gluten balls was found tohave both of the improvement effect on the flavor of deep-fried gluten ballsane the stability of the frying oil. The fifth part of this study investigated the effects of the addition ofglucose and various amino acids in the wet gluten balls to the oil stabilityof the deep-fried gluten balls. Through the determination of physical andchemical indices of the oil in the deep-fried gluten balls and the yields ofvolatile compounds in the deep-fried gluten balls prepared in the firstday''''s and in the twelfth day''''s frying, the addition of the combination ofglucose and glutamic acid into the wet gluten balls was found to have theimprovement effect on the stability of the deep-fried gluten balls.

Keywords : 黃豆油 ; 抗氧化劑 ; 油炸 ; 麵筋球

Table of Contents

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REFERENCES

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