EFFECT OF PROTEIN COMPOSITIONS OF WHEAT FLOURS ON THE RHEOLOGICAL PROPERTIES OF DOUGH AND THE QUALITY OF DEEP-FRIED GL

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ABSTRACT

THE WHEAT FLOURS MILLED FROM DIFFERENT VARIETIES OF WHEAT AND COLLECTED AT A EXTRACTING RATE OF 60% WERE USED AS RAW MATERIALS IN THIS STUDY. THE PROXIMATE COMPOSITIONS, FARINOGRAPHIC AND EXTENSOGRAPHIC DOUGH PROPERTIES, AND THE PROTEIN COMPOSITIONS OF THESE WHEAT FLOURS AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS PREPARED FROM THESE FLOURS WERE ANALYZED. THE EFFECT OF THE PROTEIN COMPOSITIONS OF DIFFERENT WHEAT FLOURS ON THE RHEOLOGICAL DOUGH PROPERTIES AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS WERE ALSO STUDIED. IN THE ASPECTS OF RELATIONSHIP BETWEEN FLOUR PROXIMATE COMPOSITIONS AND FARINOGRAPHIC DOUGH PROPERTIES, THE CRUDE PROTEIN CONTENT, WET AND DRY GLUTEN CONTENTS OF FLOUR WAS POSITIVELY CORRELATED WITH THE WATER ABSORPTION, DEPARTURE TIME AND VALORIMETRIC INDEX OF FARINOGRAPHIC PROPERTIES, HOWEVER, NEGATIVELY CORRELATED WITH THE WEAKNESS OF FARINOGRAPHIC PROPERTIES. THE ASH CONTENT OF FLOUR WAS POSITIVELY CORRELATED WITH THE DOUGH EXTENSIBILITY OF EXTENSOGRAPHIC PROPERTIES, AND THE WATER CONTENT OF FLOUR WAS POSITIVELY CORRELATED WITH DOUGH RESISTANCE OF EXTENSOGRAPHIC PROPERTIES. IN THE ASPECTS OF RELATIONSHIP BETWEEN THE QUALITY OF DEEP-FRIED GLUTEN BALLS AND RHEOLOGICAL DOUGH PROPERTIES, THE SENSORY EVALUATION SCORE OF APPEARANCE OF DEEP-FRIED GLUTEN BALLS WAS POSITIVELY CORRELATED WITH THE WATER ABSORPTION OF FARINOGRAPHIC PROPERTIES, HOWEVER, THE PEAK FORCE, BRITTLENESS BREAKDOWN, AND HUNTER COLOR B VALUE OF DEEP-FRIED GLUTEN BALLS WERE NEGATIVELY CORRELATED WITH THE WATER ABSORPTION OF FARINOGRAPHIC PROPERTIES. THE HUNTER COLOR A VALUE OF DEEP-FRIED GLUTEN BALLS WAS NEGATIVELY CORRELATED WITH THE DEPARTURE TIME AND VALORIMETRIC INDEX OF FARINOGRAPHIC PROPERTIES. THE SENSORY EVALUATION SCORE OF COLOR OF DEEP-FRIED GLUTEN BALLS WAS ALSO NEGATIVELY CORRELATED WITH THE WEAKNESS OF FARINOGRAPHIC PROPERTIES. THE QUALITY OF DEEP-FRIED GLUTEN BALLS SHOWED NO CORRELATION WITH EXTENSOGRAPHIC DOUGH PROPERTIES. IN THE STUDY OF THE RELATIONSHIP BETWEEN FLOUR PROTEIN COMPOSITIONS AND RHEOLOGICAL DOUGH PROPERTIES, THE FLOUR PROTEIN COMPOSITIONS WERE GROUPED INTO SIX FRACTIONS ACCORDING TO THE RESULTS OF PROTEIN ELECTROPHORESIS. THE MOLECULAR WEIGHT OF THE PROTEINS IN THESE SIX FRACTIONS WAS AS FOLLOWS, I: 116~97.4, II: 66.2, III: 45.0, IV: 36.0~24.0, V: 24.0~19.7, AND VI: 19.7~6.5 KDA. THE RESULTS SHOWED THE CONTENTS OF PROTEIN FRACTIONS OF I, II, III, IV, AND V WERE POSITIVELY CORRELATED WITH THE WATER ABSORPTION OF FARINOGRAPHIC DOUGH PROPERTIES. THE CONTENTS OF PROTEIN FRACTIONS OF V AND VI WERE POSITIVELY CORRELATED WITH THE DEPARTURE TIME OF FARINOGRAPHIC DOUGH PROPERTIES. THE CONTENTS OF PROTEIN FRACTIONS OF I, III, V, AND VI WERE POSITIVELY CORRELATED WITH THE VALORIMETRIC INDEX OF FARINOGRAPHIC DOUGH PROPERTIES. THE CONTENTS OF PROTEIN FRACTIONS OF I, IV, AND V WERE NEGATIVELY CORRELATED WITH THE WEAKNESS OF FARINOGRAPHIC DOUGH PROPERTIES. IN ADDITION, THE CONTENTS OF GLUTENINS (PROTEIN FRACTION I + III), GLIADINS (PROTEIN FRACTION II + IV), AND ALBUMINS AND GLOBULINS (PROTEIN FRACTION V + VI) WERE POSITIVELY CORRELATED WITH THE WATER ABSORPTION AND VALORIMETRIC INDEX OF FARINOGRAPHIC DOUGH PROPERTIES, BUT WERE NEGATIVELY CORRELATED WITH THE WEAKNESS OF FARINOGRAPHIC DOUGH PROPERTIES. THE CONTENTS OF DIFFERENT PROTEIN FRACTIONS SHOWED NO CORRELATION WITH EXTENSOGRAPHIC DOUGH PROPERTIES. THE RESULTS OF THE STUDY OF THE RELATIONSHIPS BETWEEN FLOUR PROTEIN COMPOSITIONS AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS SHOWED THAT THE CONTENTS OF PROTEIN FRACTIONS OF I, II, AND V WERE NEGATIVELY CORRELATED WITH THE EXPANSION VOLUME, PEAK FORCE AND HUNTER COLOR B VALUE OF THE

DEEP-FRIED GLUTEN BALLS, AND WERE POSITIVELY CORRELATED WITH THE HUNTER COLOR L AND A VALUES AND THE SENSORY EVALUATION SCORE OF APPEARANCE OF THE DEEP-FRIED GLUTEN BALLS. IN ADDITION, GLUTENINS (FRACTION I + III), GLIADINS (FRACTION II+IV), AND ALBUMINS AND GLOBULINS (FRACTION V+VI) WERE NEGATIVELY CORRELATED WITH THE PEAK FORCE, BRITTLENESS BREAKDOWN, HUNTER COLOR A AND B VALUES OF DEEP-FRIED GLUTEN BALLS, AND WERE POSITIVELY CORRELATED WITH THE SENSORY EVALUATION SCORES OF APPEARANCE, COLOR AND TOTAL ACCEPTANCE OF DEEP-FRIED GLUTEN BALLS. IN THE STUDY OF THE RELATIONSHIP BETWEEN THE CONTENTS OF PROTEIN FRACTIONS EXTRACTED USING VARIOUS SOLVENTS AND THE RHEOLOGICAL DOUGH PROPERTIES, THE CONTENTS OF GLIADINS, GLOBULINS AND RESIDUES WERE POSITIVELY CORRELATED WITH THE WATER ABSORPTION OF FARINOGRAPHIC DOUGH PROPERTIES, AND THE CONTENTS OF GLIADINS AND RESIDUES WERE POSITIVELY CORRELATED WITH THE DEPARTURE TIME AND VALORIMETRIC INDEX OF FARINOGRAPHIC DOUGH PROPERTIES, AND THE CONTENTS OF ALL PROTEIN FRACTIONS WERE NEGATIVELY CORRELATED WITH THE WEAKNESS OF FARINOGRAPHIC DOUGH PROPERTIES. HOWEVER, THE CONTENTS OF PROTEIN FRACTIONS EXTRACTED USING VARIOUS SOLVENTS ALSO SHOWED NO RELATION WITH EXTENSOGRAPHIC DOUGH PROPERTIES. IN THE STUDY OF THE RELATIONSHIP BETWEEN THE CONTENTS OF PROTEIN FRACTIONS EXTRACTED USING VARIOUS SOLVENTS AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS, THE CONTENTS OF GLIADINS AND RESIDUES WERE FOUND TO BE NEGATIVELY CORRELATED WITH THE EXPANSION VOLUME, PEAK FORCE, BRITTLENESS BREAKDOWN, AND HUNTER COLOR A AND B VALUES OF DEEP-FRIED GLUTEN BALLS, AND WERE POSITIVELY CORRELATED WITH THE SENSORY EVALUATION SCORES OF APPEARANCE, COLOR, AND TOTAL ACCEPTANCE OF DEEP-FRIED GLUTEN BALLS. THE RESULTS OF PROTEIN ELECTROPHORESIS SHOWED THE CONTENTS OF HIGH-MOLECULAR WEIGHT GLUTENINS AND Ω-GLIADINS WERE SIGNIFICANTLY CORRELATED WITH THE RHEOLOGICAL DOUGH PROPERTIES AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS. THE RESULTS OF PROTEIN FRACTIONATION USING VARIOUS SOLVENTS SHOWED THE CONTENT OF GLIADINS WAS ALSO SIGNIFICANTLY CORRELATED WITH THE RHEOLOGICAL DOUGH PROPERTIES AND THE QUALITY OF DEEP-FRIED GLUTEN BALLS. ALL OF ABOVE RESULTS CAN BE USED AS EVIDENCES THAT GLUTENINS AND GLIADINS OF WHEAT FLOUR ACTUALLY PLAY IMPORTANT ROLES ON THE RHEOLOGICAL DOUGH PROPERTIES AND THE QUALITY OF FLOUR PRODUCTS.

Keywords : GLUTEN、DEEP-FRIED GLUTEN BALL、PROTEIN COMPOSITION、 PROTEIN FRACTIONS 、RHEOLOGICAL DOUGH PROPERTIES、GLIADINS、GLUTENINS

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