A STUDY OF THE CHEMICAL AND PHYSICAL PROPERTIES
OF WHEAT ENDOSPERM PROTEINS

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   "Changes in Carbohydrate, Protein and Non-Protein
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Jennings, A.C. and Morton, R.K. (1963 a)
"Amino Acids and Protein Synthesis in Developing Wheat Endosperm"


7. Addendum 5

Jennings, A.C. and Watt, W.B. (196-)
"Extraction of Proteins and Nucleic Acids from Plant Tissues. Isolation of Protein Fractions Containing Hydroxyproline from Broad-Bean (_Vicia Faba L._) Leaves"
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SUMMARY

Physical and chemical procedures have been used to study the proteins of wheat endosperm and flour.

The proteins were chemically modified by oxidative sulphotolysis and degraded by treatment with cyanogen bromide or by hydrolysis with dilute hydrochloric acid. The amino acid compositions of several fractions obtained in these treatments were determined.

The proteins were fractionated and characterised by physical methods. These methods included gel electrophoresis, differential extractions with various solvents, column chromatography and average molecular weight determinations.

The results of these studies were supported by a consideration of the ratios of combinations of amino acids found in various protein fractions.

The acidic and basic amino acids appear to be fairly uniformly distributed throughout the polypeptide chains. It seems unlikely that some polypeptide chains are composed predominantly of one amino acid, as the rather high levels of glutamine and proline might indicate.

The results indicate that most, or all, of the proteins found in the 'salt-soluble' and high speed supernatant fractions are storage proteins. It also appears that the proteins in the 'salt-soluble' and 'glutenin' fractions are identical or rather similar, although the
relative proportions of the individual proteins in each fraction may differ.

Two distinct groups of storage proteins appear to be synthesised by the wheat endosperm.

One group is characterised by relatively high electrophoretic mobilities in gels and contains the proteins predominantly found in the 'salt-soluble' and 'glutenin' fractions.

The other group, characterised by relatively low electrophoretic mobilities in gels, contains the proteins predominantly found in the 'gliadin' fraction.

The conclusions of earlier authors, that the synthesis of the 'gliadin' proteins is commenced at a later stage of development of the endosperm and proceeds independently of, and at a faster rate than, the synthesis of the other storage proteins, was confirmed.

The results also indicate that intermolecular disulphide bonds are not present in wheat endosperm proteins or formed during the preparation of dough. A mechanism is proposed to explain the effects of small molecules on the physical properties of doughs. This involves changes in protein conformation induced by physical or chemical interactions with compounds of low molecular weight.

The evidence suggests that the 'gliadin' proteins interact and aggregate independently of the 'glutenin'
proteins, and that intermolecular hydrogen bonds are mainly formed in these interactions. It is also suggested that the 'salt-soluble' proteins may interact specifically and stoichiometrically either with negatively charged molecules or with compounds which alter the conformation of these proteins, so that interaction and aggregation can occur, primarily through hydrophobic bond formation, to give the 'glutenin' fraction.