

Proceedings of the 3rd International Workshop on

# GLUTEN PROTEINS

*Budapest, Hungary*

*May 9-12, 1987*

*Editors:*

**R. LÁSZTITY**

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# **GLUTEN PROTEINS**

## PREFACE

After the successful first international workshop on gluten proteins held in Nantes (France) and second one held in Wageningen (Netherlands), the place of the 3rd International Workshop on Gluten Proteins was held in Budapest (Hungary). This meeting was attended by about 80 participants from 17 countries all actively engaged in research on wheat protein chemistry and biochemistry. More than 40 papers and additional posters of high scientific level were presented on various aspects of gluten proteins. The increasing role of genetical and molecular biological aspects in wheat protein research as well as the problems of structure-functional properties relationships were clearly expressed during the discussions.

This book contains the edited proceedings of this workshop. The editors hope that the contributions from well known specialists will make the Proceedings a valuable source of information for agronomists, food scientists, plant biologists, food technologists in the improvement of cereal breeding and cereal processing.

Editors

**The Workshop was organised by:**

**International Association of Cereal Science and Technology (ICC)**

**Hungarian Biochemical Society**

**Hungarian Scientific Society for Food Industry**

**Hungarian Grain Trust**

## WELCOME TO THE PARTICIPANTS

On behalf of the Hungarian Scientific Society for Food Industry, Hungarian Biochemical Society and Hungarian Grain Trust I am pleased to welcome you to the 3rd International Gluten Workshop organized under sponsorship of the International Association for Cereal Science and Technology. It is a great honour and pleasure for us that this important international scientific event will take place in Budapest in Hungary: Cereal growing will always play an important role in Hungary so it is understandable that in every period great attention is paid to cereal breeding and cereal research. Wheat varieties produced by Hungarian breeders, quality controlling methods developed by such scientists as Kosutány and Hankóczy, first high milling technology all originate from Hungary.

This workshop provides an opportunity for experts in wheat gluten research from all parts of the world to meet and exchange views about the newest results in this field and about future trends in wheat protein research. I also hope that this scientific event will be an opportunity for the participants to obtain information about the Hungary scientific institutions working in this field to have a better knowledge about cereal science and technology in Hungary.

I hope you will find the workshop useful and that the discussions will help further the progress in this field and also in international cooperation and understanding. We also invite you to take time to visit the city of Budapest and eventually other places in our country. I wish you all a successful workshop and a pleasant stay in Hungary.

Dr. Daniel Lacfi, Professor  
General Manager, Grain Trust, Hungary

## CONTENTS

Preface .....	v
 <b>ORAL LECTURES:</b>	
<b>The Molecular Genetics of the High Molecular Weight Subunits of Wheat Glutenin</b> <i>N. Halford, J. Forde &amp; P. B. Shewry</i> .....	3
<b>Genetic Control of LMW Glutenin Subunits in Bread Wheat and Association with Physical Dough Properties</b> <i>R. B. Gupta &amp; K. W. Shepherd</i> .....	13
<b><math>\gamma</math>-Gliadins with <math>\alpha</math>-type Structure Coded on Chromosome 6B of the Wheat (<i>Triticum aestivum</i> L.) Cultivar "Chinese Spring"</b> <i>D. D. Kasarda, A. E. Adalsteins &amp; N. F. Laird</i> .....	20
<b>Organization, Variability and Stability of the Family of the Gliadin-Coding Genes in Wheat: Genetic Data</b> <i>E. V. Metakovsky &amp; A. A. Sozinov</i> .....	30
<b>Effect of Allelic Variation for Glutenin Subunits and Gliadins on Bread-Making Quality, Exploitation of Novel Alleles Found in Wild Relatives of Wheat</b> <i>W. J. Rogers, E. J. Sayers, P. A. Harris, C. N. Law &amp; P. I. Payne</i> .....	46
<b>Studying Somaclonal Variation in Wheat with the Help of Biochemical Markers</b> <i>A. Yu. Novoselskaya, V. P. Upelniek, J. Sutka, G. Galiba, E. V. Metakovsky &amp; A. A. Sozinov</i> .....	57
<b>Lack of Expression of Certain Storage Proteins in Bread Wheats: Distribution and Genetic Analysis of Null Forms</b> <i>D. Lafiandra, R. Splendido, C. Tomassini &amp; E. Porceddu</i> .....	71



Fractionation, Gel Electrophoresis, and Breadmaking Studies of Wheat Proteins in Relation to Structure-Function Properties <i>K. Khan &amp; K. Chakraborty</i> . . . . .	91
Use of Two-Dimensional Electrophoresis Procedure to Characterize Wheat Proteins <i>R. Tkachuk &amp; V. J. Mellish</i> . . . . .	111
Characterization of Individual RP-HPLC Prolamin Peaks, of Two Closely-Related Wheat Genotypes that Differ in Baking Quality, by Acid and SDS-PAGE <i>G. L. Lookhart &amp; L. D. Albers</i> . . . . .	125
Investigation of Wheat Proteins by High Performance Gel Chromatography <i>F. Örsi, E. Pallagi, F. Békés &amp; R. Lásztity</i> . . . . .	141
Experiences of Gliadin Gel-Electrophoresis in Wheat Breeding <i>R. Nehéz</i> . . . . .	161
Prediction of Wheat Quality by Computer Evaluation of Reserved-Phase High-Performance Liquid Chromatograms of Gluten Proteins <i>J. A. Bietz &amp; F. R. Huebner</i> . . . . .	173
Separation and Characterization of Reduced Glutelins from Different Wheat Varieties and Importance of the Gliadin/Glutelin Ratio for the Strength of Gluten <i>H.-D. Belitz, J.-J. Kim, R. Kieffer, W. Seilmeier, U. Werbeck &amp; H. Wieser</i> . . . . .	189
Relationship between High Molecular Weight Subunits of Glutenin and Breadmaking Quality of Canadian Wheats <i>W. Bushuk &amp; P. K. W. Ng</i> . . . . .	206
The Use of Near-Isogenic Lines with Different HMW Glutenin Subunits in Studying Bread-Making Quality and Glutenin Structure <i>P. I. Payne, L. M. Holt, K. Harinder, D. P. MacArtney &amp; G. J. Lawrence</i> . . . . .	216

Structure-Function Studies on Gluten Proteins: Reassembly of Glutenin Proteins after Mixing <i>R. J. Hamer &amp; W. J. Lichtendonk</i> . . . . .	227
Structure and Functionality of Gluten Proteins <i>A. Graveland &amp; M. H. Henderson</i> . . . . .	238
Identification of "Quality Components" of Gluten Protein Using Fractionation and Reconstitution Methods <i>F. MacRitchie</i> . . . . .	247
The Relative Contribution of Proteins and Other Components to the Bread-Making Quality of Varieties Determined Using Chromosome Substitution Lines <i>A. F. Krattiger, P. I. Payne &amp; C. N. Law</i> . . . . .	254
Characterization and Quantification of Low-Molecular- Weight Glutenins in Durum Wheats <i>J. C. Autran, B. Laignelet &amp; M. H. Morel</i> . . . . .	266
Proteins Deposition in Developing Durum Wheat. Implications in Technological Quality <i>G. Galterio, E. Biancolatte &amp; J. C. Autran</i> . . . . .	284
Dasypyrum Villosum (L.) Cand. Chromosomes Affecting Durum Wheat Proteins <i>P. Resta, D. Lafiandra &amp; A. Blanco</i> . . . . .	299
Variation for Protein Components Associated with Quality in Durum Wheat Lines and Varieties <i>B. Margiotta, G. Colaprico &amp; D. Lafiandra</i> . . . . .	314
Biochemical and Genetical Analysis of the Nonprolamin Proteins of Wheat Endosperm <i>S. A. Forsyth, R. D. Thompson, P. J. Sharp &amp; P. I. Payne</i> . . . . .	331
Characterization of the "Triplet Proteins" (TRITICIN) from Wheat Endosperm <i>N. K. Singh, K. W. Shepherd, P. Langridge, L. Clem Gruen &amp; J. H. Skerritt</i> . . . . .	339

Protein-Lipid and Protein-Carbohydrates Interactions in the Gluten Complex	
<i>R. Lásztity, F. Békés, F. Örsi, I. Smied &amp; M. Ember-Kárpáti</i> . . . . .	343
The Influence of Lipid Complexes on the Baking Potential of Wheat	
<i>W. Nierle</i> . . . . .	364
Surface Hydrophobicities of Purified Gliadin Components Studied by Different Methods	
<i>Y. Popineau &amp; F. Pineru</i> . . . . .	376
Durum Wheat Protein Fraction Rich in —SH plus S — S Relationship with the Cooking Quality	
<i>K. Kobrehel, R. Alary &amp; C. Reymond</i> . . . . .	391
Some Analytical Data of Protein Behaviour in Developing Wheat Kernel	
<i>J. Kaczkowski, H. Pior &amp; J. Kwinta</i> . . . . .	400
Hydrolysis of Gamma Gliadin from Common Wheat by Pepsin	
<i>P. Masson &amp; Y. Popineau</i> . . . . .	417
Microsequence Analysis of Prolamins with Gas-Phase Protein Sequencer	
<i>Ts. A. Egorov &amp; T. I. Odintsova</i> . . . . .	434
Uses and Functionality of Wheat Gluten	
<i>J. M. Hesser</i> . . . . .	441
Solid State NMR Studies of Wheat Gluten	
<i>P. S. Belton, S. L. Duce &amp; A. S. Tatham</i> . . . . .	456
Wheat Protein Properties and Puff Pastry Structure	
<i>A. P. Davies, D. W. Patient, S. J. Ingman, S. Ablett, M. Drage, M. Asquith &amp; D. J. Barnes</i> . . . . .	466
Determination of Prolamin Configuration and Dimensions by Viscometric Analysis	
<i>J. M. Field, A. S. Tatham &amp; P. R. Shewry</i> . . . . .	478

The Configuration of Three Synthetic Peptides Corresponding to the Repeat Motifs of Two Cereal Prolamins <i>A. S. Tatham, A. F. Drake, J. M. Field &amp; P. R. Shewry</i> . . . . .	490
Accumulation of Gluten Proteins in Developing Wheat Grain <i>J. Dietrich &amp; J. Landry</i> . . . . .	497
Viscoelastic Properties of Starch Gels with Added Gluten and of Dough Systems <i>L. Lindahl &amp; A. C. Eliasson</i> . . . . .	507
Thermal Properties of Gluten <i>R. C. Hoseney, P. C. Dreese, L. C. Doescher &amp; J. M. Faubion</i> . . . . .	518
POSTERS	
Gel Electrophoresis for Controlling the Homogeneity of Hybrid Wheat <i>J. Kramarikne-Kissimon, Z. Bedó &amp; L. Balla</i> . . . . .	531
Reciprocal Monosonic Analysis of SDS Test in Hexaploid Wheat <i>F. Örsi, E. Pallagi &amp; J. Sutka</i> . . . . .	535
Influence of HMW Subunits of Glutenin and Gliadins on Baking Quality in Wheat. I. Relationship between HMW Glutenin Subunits Composition and Baking Quality in Norwegian Breeding Material <i>A. K. Uhlen &amp; E. Mosleth</i> . . . . .	543
Influence of HMW Glutenin and Gliadins on Baking Quality in Wheat. II. The Use of Partial Least Squares (PLS) Regression for Evaluation of Protein Quality and Prediction of Baking Quality from the Electrophoretic Pattern <i>E. Mosleth &amp; A. K. Uhlen</i> . . . . .	548
Relation of SDS Soluble and Insoluble Wheat Proteins to Flour Quality <i>E. Pallagi &amp; F. Örsi</i> . . . . .	553

Hydrophobic Behaviour of Gluten Proteins from Wheats of Various Maturity <i>J. Kaczowski, H. Pior &amp; S. Kos</i> . . . . .	561
The High-Molecular-Weight Glutenin Subunit Composition on Wheat Varieties Bred in Finland <i>T. Sontag, H. Salovaara &amp; P. I. Payne</i> . . . . .	567
The Role of Gluten in Wheat Processing in the GDR <i>U. Lehrack &amp; E. Gebhardt</i> . . . . .	572
Lipid-Protein Interactions and Durum Wheat Gluten Viscoelasticity <i>F. P. Monnet, B. Laignelet &amp; J. C. Autran</i> . . . . .	575
Analytical Ultracentrifugal Investigation of Gliadin Fractions <i>J. Gaugecz, F. Békés &amp; R. Lásztity</i> . . . . .	578
Inactivation and Stabilization of Glucose-6-Phosphate Dehydrogenase in Extracts from Germinating Wheat <i>A. Salgó &amp; U. Feller</i> . . . . .	588
Comparison of Different Quantitative Evaluations of Gliadin PAGE Separations <i>B. Békés, A. Kemény, P. Merész, J. Varga &amp; L. Demeter</i> . . . . .	598
Prediction of the Bread Wheat Quality from HMW Glutenins and Gliadins <i>G. Branlard</i> . . . . .	604
CLOSING SESSION	
Summary of the Third International Workshop of Gluten Proteins <i>W. Bushuk</i> . . . . .	615

## ORAL LECTURES



## The Molecular Genetics of the High Molecular Weight

### Subunits of Wheat Glutenin

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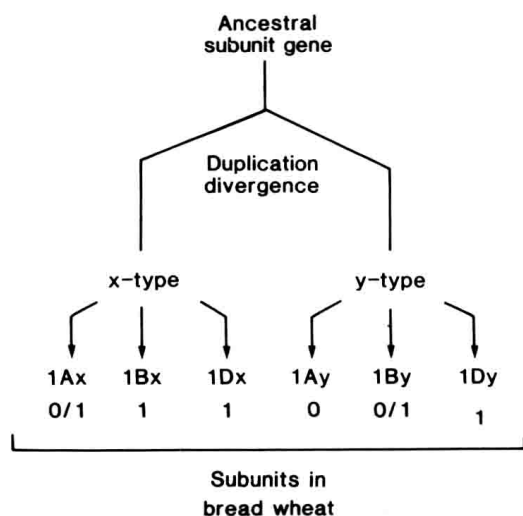
#### Introduction

Two lines of evidence suggest that the High Molecular Weight (HMW) subunits of glutenin are important in determining the structure and functionality of wheat gluten. Firstly, experiments in a number of laboratories have shown that the presence of specific allelic forms of HMW subunits is closely correlated with breadmaking quality in *Triticum aestivum*. Secondly, the subunits are predominantly located in high molecular weight polymers, the amounts of which are also correlated with breadmaking quality. Because of this we have made detailed studies of HMW subunits at the molecular and chemical levels. The former are discussed in the present paper, while the latter are described in one following.

#### Polymorphism of HMW Subunit Genes

Analysis of many genotypes of bread wheat, notably by Payne and co-workers, have shown the presence of between 3 and 6 individual HMW subunits (see Payne and Lawrence, 1983). There are 0 or 1 subunits encoded by chromosome 1A, 1 or 2 encoded by chromosome 1B and 2 encoded by chromosome 1D (see Fig. 1). Payne *et al.* (1981) classified these subunit pairs into high  $M_r$  x-types and low  $M_r$  y-types and more recent molecular analyses (discussed below) indicate that this is a valid distinction, in that there is a closer structural relationship between the y-type subunits encoded by the A, B and D genomes than between the x





**Fig. 1** Hypothetical pathway for the evolution of the HMW subunit genes of hexaploid bread wheat (*T. aestivum*).

and y-type subunits encoded by chromosome 1D. This suggests that the divergence of the ancestral x-type and y-type genes pre-dated that of the progenitors of the A, B and D genomes, as shown in Fig. 1.

Despite the fact that 1Ay subunits are never found in bread wheat, and that 1Ax and 1By subunits may also be absent, analysis of five genotypes by 'Southern Blotting' showed that all had six hybridizing fragments, corresponding to the x- and y-type genes from the three genomes (Harberd *et al.*, 1986). Each of these fragments appeared to contain one gene, and be present as one copy per haploid genome.

Similar analyses of DNA from the AABB tetraploid *T. dicoccum* and diploid species considered to be related to the progenitors of the A and D genomes of bread wheat (*T. monococcum* and *Aegilops squarrosa* respectively) also show the presence of two hybridizing *Bam* H1 fragments