



QUALITY WHEAT CRC PROJECT REPORT

Project 5.2.1 University based education

Communications Workshop and Postgraduate Symposium 15 - 16 July 1999

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Quality Wheat CRC Limited

Communications Workshop and Postgraduate Symposium 15-16 July, 1999



The University of Sydney

Thur 15 July

11.00 - 12.00 Communicating in the workforce (Clare Johnson)

12.00 - 1.00 Oral communication: presenting science in seminars and at conferences
(Les Copeland)

1.00 - 2.00 Lunch

2.00 - 3.30 Scientific writing: literature reviews, papers, posters and theses
(Les Copeland)

3.30 - 4.00 Break

4.00 - 5.30 Intellectual property and patents, with discussion (Monique Ivanhoe, BRI)

6.00 Dinner at the Caribbean Hideaway at 85 Darling St, Glebe.

Fri 16 July

9.00 - 9.30 Hydrogen bonding and the effects of gliadin fortification on wheat flour dough extensibility Murray, D. J.

9.30 - 10.00 Relationships between Dough Chemical Composition and Rheological Properties Tanner, R, Bekes, F., and Hubraq, T.

10.00 - 10.30 Measuring the Rheology of Fermenting Bread Dough Newberry, M.P., Larsen, N.G., Phan-Thien, N., Tanner, R.I.

10.30 - 11.00 Field Flow Fractionation in a study on protein and starch polymers size in wheat Daqiq, L., Stoddard, F., and Bekes, F.

11.00 - 11.30 Break

11.30 - 12.00 Monitoring of farming systems in central-western New South Wales. Factors affecting wheat yield and protein. Verrell, A.G.

12.00 - 12.30 A proteome approach to the analysis and identification of wheat grain endosperm proteins. Skylas, D.J., Walsh, B.J., Mackintosh, J.A., Cordwell, S.C., Harry, J., Blumenthal, C., Wrigley, C.W., Copeland, L., Rathmell, B.

12.30 - 1.00 Cloning and Characterisation of Genes from the Hardness Locus of Wheat Turnbull, KM and Rahman, S.

1.00 Close

The ABC of Scientific Writing

Les Copeland

- **Literature reviews**
- **Poster presentations**
- **Grant applications**



The University of Sydney
AUSTRALIA



CRC

Clarity

Extent to which the meaning given is received

Enhanced by

- Material being organized
- Simplicity of vocabulary
 - use words that convey meaning directly and unambiguously
- Clear sentences
 - a sentence is clearest when it makes a single statement; positive statements are preferable to negative ones
- Lack of grammatical interference, misspelling and incorrect punctuation
- Consistency of style in the use of numbers, names, terms, symbols, abbreviations, spelling, punctuation
- Avoiding excessive use of abbreviations
- Avoiding jargon, cliches and vogue words

Format and style

- Format
 - form, structure
 - for scientific writing use specified format
- Style
 - the manner in which words are put together to create an impression; simple and straightforward is best in scientific writing
 - the set of conventions adopted to make meaning clear (eg, spelling, punctuation, spacing, headings, symbols)
 - dense text is difficult to read
 - one statement or concept per sentence
 - not too many short sentences; occasional use for emphasis is most effective
 - will it be understood by someone whose first language is not English?

Getting started

- Think about the purpose and scope of the composition; make brief notes of ideas and set a timetable
- Prepare an outline of topics and organize into a logical order
- Have an overview in your mind before commencing to write; do not start before you are ready
- Develop the text in stages from the outline; set tasks that can be completed in the time that is available
- Begin with the easiest section
- Write the first draft as though you are telling someone about your work. Correct and polish the text later

Literature searches

- Need to find the most pertinent literature as efficiently as possible
- Use computer and manual searches; recognise the limitations of both methods
- Recent review articles are good sources of information, names of researchers in the area and other references
- Each source yields another group of references
- Be selective
 - do not include irrelevant references
 - avoid references to substandard work (was the article subjected to peer review?)
- Make detailed and accurate records - names and initials, date, volume and page number, titles of article and publication

Revision

- Check for
 - lack of clarity, logic and continuity
 - uninformative sentences
 - rambling sentences and structure
 - paragraphs and sentences that are too long
 - too many successive short sentences
 - incorrect grammar, punctuation, spelling
 - tautologies (unnecessary repetition)
 - redundancies (unnecessary words)
- Setting text aside for several days, reading text aloud, and having someone else read the text are helpful for revision

Use

- Dictionary
- Thesaurus
- Style manuals
- Books on grammar and English usage
- Instructions to authors

Read

- To develop vocabulary and word usage
- To recognise good and bad writing

Poster presentations

Presentation of research at conferences

(also displays, overhead transparencies, slides, Powerpoint presentations, publicity brochures)

- Simple
- Direct
- Visually appealing

Content of posters

- Title
 - Brief positive statement of 6 to 8 words
 - May be a question which is answered in the poster
- Introduction
 - Concise
 - 2 sentences (bulleted points)
- Results
- Conclusion
 - Clear and definite
 - 2 sentences
 - Omit references

Grant applications

Assessors look for

- originality
- scientific, theoretical or technological merit
- soundness of planning, technical feasibility
- scope of the research
- project management
- capability of the researchers - expertise, skills, time to make a serious commitment to the work

Applicants for grants

Need to demonstrate

- realistic prospects for achieving the aims in the time frame of the project
- the impact of the research
- benefits of the expected outcomes
- an awareness of related work by others

Budget

- Usual categories
 - Personnel
 - Equipment (Capital Items)
 - Operating (Maintenance)
 - Travel
- Explain why each item requested is essential to the project
- List priorities
- Be realistic
 - request what is required to do the research properly, not too much or too little

Additional issues

- Certification
 - statutory requirements
 - ethical clearances
 - formal consent of collaborators
- Ownership of intellectual property, third party intellectual property, commercialisation



Commitment in a Working Relationship

- Oral presentation
- System design for records
- Keeping working relationships productive



Why present?

- Accurate understanding
- Effective collaboration
- Respect for others' workloads
- Perception of your ability



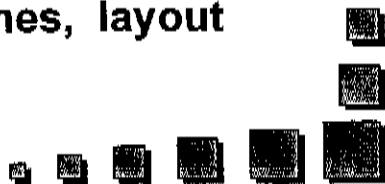
Practical Points


- **Points in Portrait**
 - **Vertical**
 - **Easy to read**
 - **Brief**
 - **White space**
- You can see it is preferable to use brief points than long sentences in Landscape, which take the audience's attention away.




To Gain Attention

- **First / Last remembered**
- **20 minutes wake up**
- **Lead the eye**
 - bullets, frames, layout







Reinforce



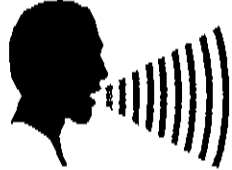
Visual




Taste




Movement




Sound




Smell



Touch

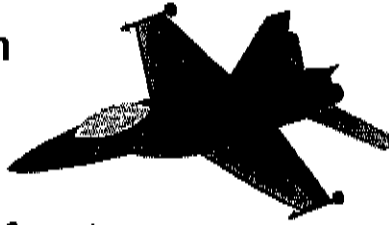


Work out



Voices

- Concorde - yawn
- Tree
- Drinking glass of water
- Hot potato



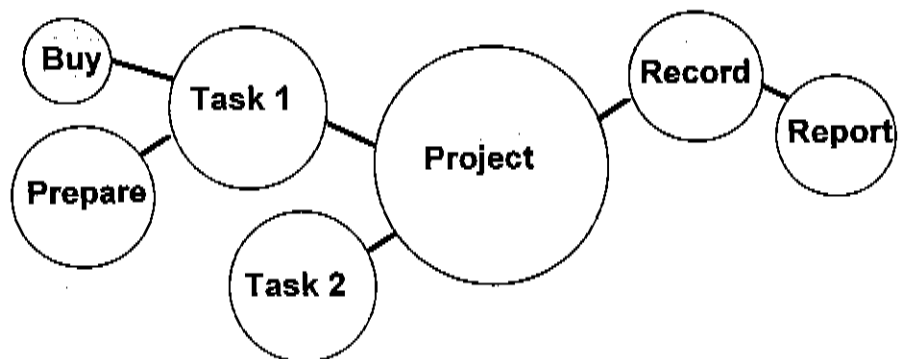


System design for records

- inputs
- processes
- outputs
- self-prompting
- cross-referencing



Maps





Apply to:

- **Reagents / methods** ([Hypertext](#))
- **Bibliographies - software:**
Endnote (PC), Reference Manager (Mac)
- **Culture / strain collections**
- **Written report collections**
- **Team function**



Systematic Nomenclature

Unambiguous, unique identifiers, e.g.

cj98s001 - cj98s999	gene sequences
cj98o001 - cj98o999	oligonucleotides
cj98p001 - cj98p999	plasmids
cj98g001 - cj98g999	glycerols
QW98g001-QW98g999	Company stocks



Productive Working Relationships

- **Constructive feedback**
- **Active listening**
- **Check you've heard right**



Why?

- **Technique becomes unconscious**
- **Less stress**
- **More productive**
- **Opens doors**



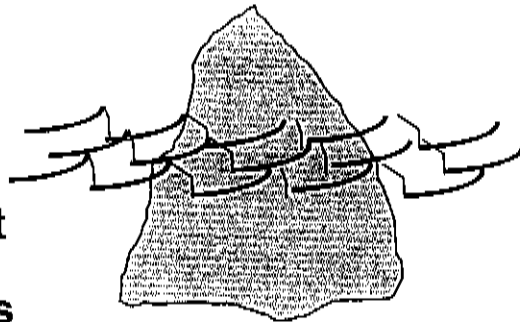
Negotiation tips:

- Positive first
- More / less / same
- Problem not person - use paper
- Same level, same side, "we"
- Goals, priorities and development



Don't assume you know:

- norms
- iceberg
- emotion / fact
- task / process



Hydrogen bonding and the effects of gliadin fortification on wheat flour dough extensibility.

D. J. Murray

Gliadins are defined as being those gluten proteins soluble in 70% ethanol. They are grouped into four classes (α , β , γ and ω) according to their mobility on acid-PAGE. The gliadins are a large group of monomeric proteins that do not form disulfide bridges with other gluten proteins. Instead their interactions with other gluten proteins are mediated by non-covalent forces such as hydrogen bonding. Physical entanglement is also thought to play a role in the effects gliadins have on dough properties. Gliadins are essential to the viscoelastic nature of wheat flour doughs and are known to influence dough rheology. Purified classes of gliadins were added to dough and the effects on the Extensograph parameters; extension (Ext) and maximum resistance to extension (Rmax) were measured. The differences observed between deuterated and protonated gliadins and their effects on deuterated and protonated doughs respectively are discussed.

Abstract

Prof. Tanner, R¹, Bekes, F.^{2,3}, and Hubraq T.^{2,3}

1- Department of Mechanical and Mechatronic Engineering, University of Sydney, Australia

2- Quality Wheat CRC Limited, Locked bag No. 1345, North Ryde, NSW 2113, Australia

3- CSIRO Division of Plant Industry, GQRL, PO Box 7, North Ryde, NSW 2113, Australia

Experiments were conducted to establish suitable rheological methods capable of describing the properties of dough and how the different constituents interact to define such properties. The relationships between dough chemical composition and its rheological properties were investigated by incorporating purified flour components and measuring the changes in the flow behavior of the modified dough.

The mixing process in dough making and the rheological changes that occur to wheat dough during mixing were investigated when using pin and Z- arm mixers. Dynamic dough properties were compared with empirical results obtained from the mixograph and the extensograph in order to investigate the correlation between fundamental and empirical measurements. In this respect, the study would be restricted to flour water systems to simplify the analysis avoiding fermentation.

It is desirable to produce small-scale methods capable of producing suitable data for real dough mixing situations. Laboratory scale extensograph fails to predict dough properties when mixing is done on a larger scale. Dynamic, Viscometric, Elongation and other time- dependent properties of dough would be correlated with the results of the extensograph. This correlation will provide "correction factors" to be used to scale-up the capabilities of the extensograph.

The results of this study could of value for plant breeders for the first stages of producing new wheat varieties, when only small amounts of flour are available.

Measuring the Rheology of Fermenting Bread Dough

M.P. Newberry¹, N.G. Larsen², N. Phan-Thien¹, R.I. Tanner¹

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² The New Zealand Institute for Crop & Food Research, Private Bag 4704, Christchurch 8000, New Zealand.

Rheological tests are used throughout the baking and milling industries in the production and quality control of bread flours. The complicating influence of fermenting yeast in dough rheological properties has been ignored since the advent of empirical rheological testing in 1905. However, yeast plays a vital role in bread production, serving as the leavening source necessary to yield the distinctive aerated structure of baked bread. By studying the rheological properties of yeasted bread doughs, and how these change with fermentation, a greater knowledge of fermentation and therefore of bread production will be gained. Such knowledge then has potential application in improving the control and operation of modern highly automated bread bakeries.

Using rapid freezing with subsequent slow thawing of fermenting dough the activity of the yeast can be halted, allowing direct measurements of the rheological properties of the dough. Without yeast inactivation such measurements are confounded with the effect of gas expansion. Subsequent measurements on the thawed dough, at low strains, revealed an optima after 30 minutes of fermentation. Large-scale strain extension measurements did not exhibit similar optima. Prompted by the large degree of irreproducibility in the measurements, pre-treatment methods to reduce the variation in the data have been developed.

Field Flow Fractionation in a study on protein and starch polymers size in wheat

Daqiq, L., Stoddard, F., and Bekes, F.

CSIRO Plant Industry, GQRL, North Ryde, 1670, NSW.

Quality Wheat CRC, North Ryde, 1670, NSW

One of the general aims in cereal science is to relate the chemical composition of the wheat grain to its functional properties. Scientists have been proving that wheat's composition controls the special dough properties that make wheat flour suitable for its end used products. They found, that wheat biopolymers (starches and proteins) through their size distribution are important components. Therefore it is necessary to study the size distribution of these two types of polymers and find their relationship to functionality of wheat flour. In this study molecular size distribution of biopolymers (carbohydrate and proteins), their shape and their relationship in breadmaking quality will be studied. The directions that need to study for the completion of the thesis are: a. Solubility of biopolymers without altering their polymeric characteristic (size distributions). b. Developing of FFF methodology to elute biopolymers and determine their size and shape. c. Comparison of these parameters with results of another biophysical (analytical ultra centrifugation) and analytical (SE-HPLC) methods. d. Contribution in developing of mathematical model of FFF separation which would allow us to study polymer-monomer and polymer-polymer interactions, and finally utilizing of these methods and techniques in a wide range of samples. This would give us a chance to describe the relationship of polymeric structure and functionality.

To initiate the initial work for this project two approaches have been taken: Solubility of wheat protein by four different novel chemicals which have used for solubilization of proteins for some other studies. Compared to 0.05%SDS-phosphate buffer these novel chemicals on their own or within in a mixture of them, didn't give enough yield after the extraction of flour protein. Next approach is to study the effect of different sonication time on polymer size distribution and then obtaining of estimate average sizes of the unaltered polymeric structure by extrapolating them to zero time sonication. Flow-FFF and SE-HPLC used to detect the differences in molecular size distribution of polymeric protein between the treatments. FFF and SE-HPLC profiles clearly showing that by decreasing of sonication time there would be an increase in sizes distributions of polymeric glutenin. This information would allow us to obtain the estimate average sizes of macro-polymers by extrapolating them to zero sonication time.

In an initial work studying the carbohydrates (starches) the standard molecular weight curves have been successfully produced by using Flow-FFF.

Monitoring of farming systems in central-western New South Wales. Factors affecting wheat yield and protein.

A.G. Verrell, Quality Wheat CRC, PhD Student

Survey and monitoring techniques were used to assess the potential long term consequences of cropping intensity on wheat yield and protein and the relative importance of chemical, physical and biological factors on wheat productivity and quality.

Between 1991 and 1993 a total of 82 wheat paddocks, covering 8 Shires, were selected to encompass a wide range of cropping intensities. Three 10m² areas within a transect across each paddock were selected and monitored intensively for weeds, cereal diseases, pests, soil fertility, water use (by neutron probe) and biomass accumulation. Details of the previous 10 years history on crop rotation, tillage practice, fertiliser use, weed control, yield and quality was collected for each paddock and associated with these measurements.

Due to the diversity of soil types across the survey area cluster analysis was used to classify the paddocks into representative soil groups. The numerical classification identified two major soil groups, the red and red-brown soils and the silty and cracking clay soils. Subsequent analysis was performed separately on the red soil and clay groups.

Wheat yields and protein, in each group, varied widely across the three year period. The red soil group wheat yield ranged from 0 to 7.0 t.ha⁻¹ with an average of 3.2 t.ha⁻¹ while protein ranged from 7.0 % to 16.0% with an average of 10.2%. The clay soil group wheat yields ranged from 0 to 5.8 t.ha⁻¹ with an average of 3.1 t.ha⁻¹ and protein ranged from 7.8 % to 16.5 % with an average of 11.8%.

Multiple regression analysis was used to identify the importance of stored soil water and available soil nitrate at sowing, in-crop rainfall and temperature in September and October on wheat yield and protein. For the red soil group, combinations of these factors explained 76% and 37% of the variation in wheat yield and protein, respectively, while in the clay soil group 56% and 64% of the variation in wheat yield and protein was explained. The importance of water and nitrogen, in a crop season, are supported by these results, however, other chemical and biological factors may be having an influence on wheat yield and protein.

Removing the above factors the balance of the data set was subjected to principal components analysis to simplify the complexity of variables into a few independent components. These factors were then subjected to multiple linear regression analysis against wheat yield and protein for each of the main soil groups.

Organic carbon and concentration of soluble salts, common root rot and grass weeds were related to wheat yield and protein on the red soils. Broad leaf and grass weeds, crown rot, sulphate sulphur and concentration of soluble salts were significantly related to yield and protein on the clay soils. Cropping history factors such as cereal cropping intensity, fallow tillage/spray regimes, age of farming country, fallow lengths, cultivation intensity and oilseed crop intensity also had significant effects on wheat yield and protein in both groups.

The results of this monitoring project indicate that in order to maximise water and nitrogen use efficiency the impact of the highlighted chemical and biological factors need to be addressed through strategic management of the farming system. This would then enable outcomes from tactical nitrogen management programs to be optimised for wheat yield and protein.

A PROTEOME APPROACH TO THE ANALYSIS AND IDENTIFICATION OF WHEAT GRAIN ENDOSPERM PROTEINS

D. J. Skylas^{1,4}, B. J. Walsh⁴, J. A. Mackintosh⁴, S. C. Cordwell⁴, J. Harry⁴, C. Blumenthal^{1,2}, C. W. Wrigley^{1,2}, L. Copeland³, B. Rathmell¹

¹Quality Wheat CRC Ltd., North Ryde, NSW 2113, Australia

²CSIRO Plant Industry, Grain Quality Research laboratory, North Ryde, NSW 2113, Australia

³University of Sydney, Faculty of Agriculture, Sydney, NSW 2006 Australia

⁴Australian Proteome Analysis Facility, Macquarie University, Sydney, NSW 2109, Australia

The word "proteome" is used to describe the protein complement expressed by an organism's genome. Proteomics involves the extraction, separation and identification of proteins from a tissue or organism. We have used a proteomics approach to identify wheat grain proteins from immature and mature samples of the wheat cultivar Wyuna. Wheat grain proteins were extracted, separated by two-dimensional electrophoresis (2D-PAGE) and visualised. Separated proteins were either blotted to PVDF membranes and analysed by N-terminal sequencing to generate N-terminal sequence tags or excised from the 2D-gels, subjected to a tryptic digest and analysed by MALDI-TOF Mass Spectrometry to generate peptide-mass fingerprints (PMF). Both the N-terminal sequence tags and PMFs were used to identify proteins from protein databases. The heterogeneity demonstrated by this means is much greater than previously reported. A few hundred protein components were separated, many of the proteins have been characterised with respect to their identity or their homology to proteins that have been characterised in wheat and other plant species. Wheat grain protein reference maps are being developed to enable the monitoring of environmental effects on protein composition as well as determining the differences between genotypes.

Cloning and Characterisation of Genes from the Hardness Locus of Wheat

KM Turnbull^{1,2} and S Rahman¹

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2 Quality Wheat CRC, Locked Bag No. 1345, North Ryde, NSW 2113, Australia

Grain hardness is an important quality characteristic of wheat. It is used to classify wheat and is one of the primary determinants of wheat end-use. In general, soft wheats are used for cakes and biscuits and hard wheats are used for breads. The principal locus responsible for determining grain hardness in wheat is located on the distal end of the short arm of chromosome 5D. The first biochemical marker for grain hardness was a 15 kDa protein called the Grain Softness Protein or friabilin. This protein consists of three principal components: puroindoline-a, puroindoline-b and grain softness protein-1 (GSP-1). The genes encoding these components have also been genetically mapped to the hardness locus on chromosome 5D. A *Triticum tauschii* bacterial artificial chromosome (BAC) library, constructed at CSIRO Plant Industry, has been screened to isolate clones that contain one or more of the genes associated with the *Ha* locus. *T. tauschii* is the D genome progenitor of modern bread wheat and thus this library is ideal for the purposes of screening for genetic loci controlling hardness - a trait found to be primarily controlled from the D genome. We report on the isolation and characterisation of four overlapping clones that contain combinations of the *Ha* locus markers.