

**Commission of the European Communities**

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**ECLAIR Programme**

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**Contract n° AGRE 0052**

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**Coordinator: IRTAC, 16 Rue Nicolas-Fortin 75013 Paris, France**

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**To Explore and Improve the Industrial Use  
of EC Wheats**

**NEWSLETTER N° 3**

**Progress Report from 1-1-1993 to 15-6-1993**

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**Progress Report from 1-1-1993 to 15-6-1993**

**Introduction (J.C. Aufran, Scientific Coordinator)**

This second newsletter summarizes the activities of the ECLAIR programme 'To Explore and Improve the Industrial Quality of EC Wheats' from 1-1-1993 to 15-6-1993.

It comprises the reports of all participants in subprogrammes A, B and C, respectively. The reports are presented by each partner according to the new 2-page format. Each section is introduced by a review of activities by the Subprogramme Manager:

A - Industrial Processes, by Dr. R.J. Hamer

B - Functional Components and their Interactions, by Dr. J.J. Plijter

C - Biochemical-Genetics and Physiology, by Dr. N.E. Pogna.

### **1. Administrative aspects**

The 1992 progress report and cost statements were submitted to the Commission of the European Communities on 15th April 1993 and were provisionally accepted in May 1993. The 1993 payment was initiated by the Commission on 16th June 1993 and distributed from July 1993 by IRTAC to all partners with the exception of the two who had some minor problems of cost justification and who received the funds a few weeks later.

Because the Commission does not have money available all through the year to pay for all programmes at any time, **it is essential that our scientific reports and financial statements be sent in time (i.e. within 1 month after the end of the reported period)**. We must fall into this period of time to have our payment initiated early in the year, otherwise, we may miss the period in which funds are available (and have to wait *e.g.* that new supplies are voted by the Parliament). Concerning the **1993 annual report**, it is stressed that the individual contributions must be sent to the Subprogramme Manager by **15th November 1993** using the same 2-page format as for the last Newsletter (and putting any table of figure in annexed pages). The scientific reports will be compiled by each Subprogramme Manager and sent to the Commission by 31st January 1994. In contrast to what we did in 1992 and 1993, we will not wait any longer for the backward reports to not incur the risk of making all the programme late. The same holds true in respect of the **1993 cost statements** that will have to be sent to IRTAC by the end of January 1994. The scientific reports + cost statements will be sent to Brussels on **31st January 1994** as they will be at this date, and it is likely that the partners who will not be able to comply with this deadline will be paid at a next funding wave.

As we did for the present Newsletter, a stapled version of the report will be sent to the Commission before the deadline. A better-produced document will then be prepared by the Coordinator and distributed to all partners a few weeks later.

### **2. Progression of the work**

In this newsletter, another solid flow of new results and data sets of high value is presented, indicating that the programme as a whole develops according to expectations, witness the following main results obtained:

## 2.1 Main results obtained

### a) Industrial processes

- Progress in the development of a comprehensive model combining image analysis data and ash content of the endosperm to predict **milling quality**.
- Completion of a miniaturized decanter centrifuge for **gluten/starch extraction** and identification of critical parameters of the process (enzymatic and microbiological status of the raw materials, pentosan content, pH of process water, residence time), especially when using wholemeal flours.
- Completion of white and wholemeal **breadmaking** studies, making it possible from now to use the developed techniques to evaluate the new wheat varieties.
- In **flour blending**, further characterization of the glutenin macropolymer using dynamic rheometry, giving (when added to previous studies based on biochemical composition and quantity) new insights on the glutenin structure.
- Dynamic rheological measurements indicate that only equilibrium modulus ( $G_e$ ) allows the discrimination of **flour slurries**, while the structure of the most concentrated slurry systems approach that of a dough.
- The effects of processing conditions on biochemical components of flour, the effects of type of flour and starter, and of storage, on some biochemical characteristics of breads possibly provide the basis for an expert system to improve **sour dough breadmaking** process.

### b) Functional components and their interactions

- Confirmation of the respective influence of the low-molecular-weight (LMW) and high-molecular-weight (HMW) subunits of glutenin on the amount and size distribution of the **glutenin polymers**, based on studies of lines deleted at two or three storage proteins loci.
- Progress in the characterization of **LMW subunits of glutenin** and of their charge distribution, opening the way for a better explanation of the physico-chemical basis of baking quality.
- More accurate characterization of **HMW subunits** in connection with their functionality in mixing and breadmaking, especially if a reduction/oxidation is used in the system.
- Description of the **relaxation behaviour of gluten** and of purified HMW subunits by nuclear magnetic resonance (NMR) techniques and description of the gluten network in a dough as a three-phase system (water, lipid, and hydrated protein) by electron spin resonance (ESR) spectroscopy, with more differences showed by spin labelling of lysine and cysteine.
- Discovery of close relationships between the basic **friabilins** (proteins related to the genetically determined hard or soft milling quality of the endosperm of common wheat) and the lipid-binding Triton X-114 protein **puroindoline** - the latter showing foaming properties - opening the way for a better understanding of the physico-chemical bases of the gas phase expansion on proof stage and baking of bread doughs.
- New information's on the behaviour of **pentosans** (arabinoxylans) based on combined immunological (monoclonal antibodies) and microscopic studies, indicating their possible role in the functionality of gluten.

### c) Biochemical-genetics and physiology

- Estimation of potential yield and quality characteristics as well as genotype  $\times$  environment interaction of the **top European bread wheat cultivars**, based on three-year agronomic trials in South Europe and North-Western Europe.
- New description of the **allelic variation** at the Glu-3 and Gli-1 loci, and demonstration of the specific effects of both LMW subunits of glutenin and w-gliadins on dough characteristics.
- Effect of **substituted chromosomes** of the homeologous groups 1 and 7 on grain hardness and viscoelastic properties of gluten.
- Production of **near-isogenic lines**, mutants lacking specific storage proteins and somaclonal variants in view to explore new biochemical and genetic bases of rheological characteristics of wheat gluten.
- Purification of an endogenous germination inhibitor from wheat and selection of progenies showing a wide variation in **dormancy**.

### 3. Coordination

Since the end of the last reporting period, the crossed working groups that were created in 1992 have started their activities:

- The "Pentosans/Pentosanases" group held its meeting in Delft, The Netherlands, on 11th December 1992 (see **Annex I**).
- The "Rheology" group held its meeting on 18-19th March 1993 in Nantes, France (see **Annex II**).
- The "Glutenins" group held a special meeting in association with the meeting of subprogramme B and with the 5th International Gluten Workshop, on 10th June 1993 in Detmold, Germany. Because many of the ECLAIR participants involved in protein biochemistry, physico-chemistry, genetics and molecular biology, in connection with functional and technological aspects, were already attending the Gluten Workshop, our ECLAIR meeting was almost a plenary meeting of the programme. In addition to our German colleagues (K. Niebuhr, W. Nierle, W. Seibel) who hosted the meeting, the discussions on wheat glutenins were opened to several outside distinguished specialists of wheat proteins (A. Graveland, J. Bietz, W. Bushuk, R. Gupta, D. Kasarda, F. MacRitchie, P. Payne) who clearly contributed to improve further the level of the discussions. Moreover, we welcomed at this occasion, Dr. Stephanie Hardy, our Scientific Officer at the Commission, who explained her opinions on the various aspects of our programme and gave a number of recommendations on how to improve the management of the present programme and on the sectors which are more likely to be supported by the Commission in the next Agro-Industrial calls for proposals.

### 4. Future

We are now entering the final phase of our 1991-1994 programme. We will less and less launch out new developments of the research. In contrast, it is essential that we verify and settle more firmly the results already obtained, and prepare a maximum of publications especially in referred journals. It is encouraging that a number of papers have already be published, or accepted (23, in my knowledge) and 18 others

sent for publication (see **Annex III**). On the basis of the estimations of the potential number of papers made at the last meetings of subprogrammes, we must devote all our energies to this task in the next months. Beyond the annual reports and newsletters, we must keep in mind that the work we will have carried out together during these four years will be measured by the yard-stick of the number of good papers we will have produced.

On the other hand, it is now part of the job of the Coordinator to prepare synthesis papers in popular journals on the basis of the main results of the programme, as well as to prepare more finalized presentations of the scientific reports, bringing out the progress achieved in the study of each process development and of its expression in terms of processing requirement and of specific quality determinants (*e.g.* new specific markers made available for use in breeding programmes).

Right now, we also have to think about how to keep our collaborative activity in the future. Unfortunately, it seems very likely that no big programme having the objectives of exploring and improving the food uses of wheats will be supported by the Commission in the coming years. In contrast, Dr. Hardy clearly indicated in Detmold that good collaborative projects on new non-food uses of wheats were much more likely to be considered for funding in the European calls.

Because an excellent job was carried out between all the partners, with a very good atmosphere of cooperation, it would be very bad, however, to suffer a dispersion of our present network. This is why we have to explore from now any opportunity to keep the network, *e.g.* in the shape of concerted actions. It is essential that this aspect be discussed during the next meetings of subprogrammes in November-December 1993.

#### Next meetings

- 28 October 1993: Meeting of the Scientific Management Committee in Paris
- 4-5 November 1993: 7th Meeting of subprogramme B at Long Ashton Research Station, Bristol, UK
- December 1993: 6th Meeting of subprogramme A at BSN, Paris, France
- 13-14 December 1993: 6th Meeting of subprogramme C at Station d'Amélioration des Plantes INRA, Clermont-Ferrand, France

**PARTICIPANT NAME: IRTAC****ROLE:** Coordinator**PARTICIPANT N°:** 01**ADDRESS:** Institut de Recherches Agro-Alimentaires des Céréales  
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75013 Paris France.**TEL:** (33) 1 45 86 70 40**FAX:** (33) 1 45 70 83 89**PERIOD OF REPORT:** January - June 1993**TASKS:** Coordination of the Programme**TEAM:** Monique Richard (Administrative Coordinator)  
Jean-Claude Autran (Scientific Coordinator)**ACTIVITIES IN THE REPORTING PERIOD****Administrative and Financial Aspects:**

In the course of the report period, the administrative activities of the Coordinator were as follows:

- January 1993: Preparation of the bank statements to allow payment of the 1992 funds to every partner, on the basis of the 1991 cost statements accepted by the Commission.
- Call letter to all partners for the 1992 cost statements.
- March 1993: Preparation of the memorandum of the 1992 cost statements and transmittal to M. Martin Coppens in Brussels on April 14th.
- Meeting with M. Muel (UNIP) (ECLAIR Programme on Pea) on April 27th.
- Meeting in Brussels with Mrs Stephanie Hardy to restate the question of format of reports and delay of submission.
- Call letter to all partners about the new format requested for the next progress reports and newsletters, to be sent within one month after the end of each reporting period (June 30th for the Newsletter; January 31st for the Annual Report).
- Contacts with the partners ITCF and TNO about cost statements.
- Financial support of the meeting of the Programme (45 people) in Detmold, June 10th.

**Scientific Aspects**

- March 1993: The profile sheets of participants (consisting of updated information: name, address, phone, fax, languages spoken, involvement in ECLAIR tasks, field of expertise), as well as the updated version of the Technical Annex of the Programme, were finalised, printed and distributed to all participants.
- April 1993: The Second Annual Progress Report (1992) was compiled from the three reports received from the subprogramme managers, R.J. Hamer, J.J. Plijter and N.E. Pogna, then brought in Brussels on April 14th and distributed to all participants.

**MEETINGS/VISITS**

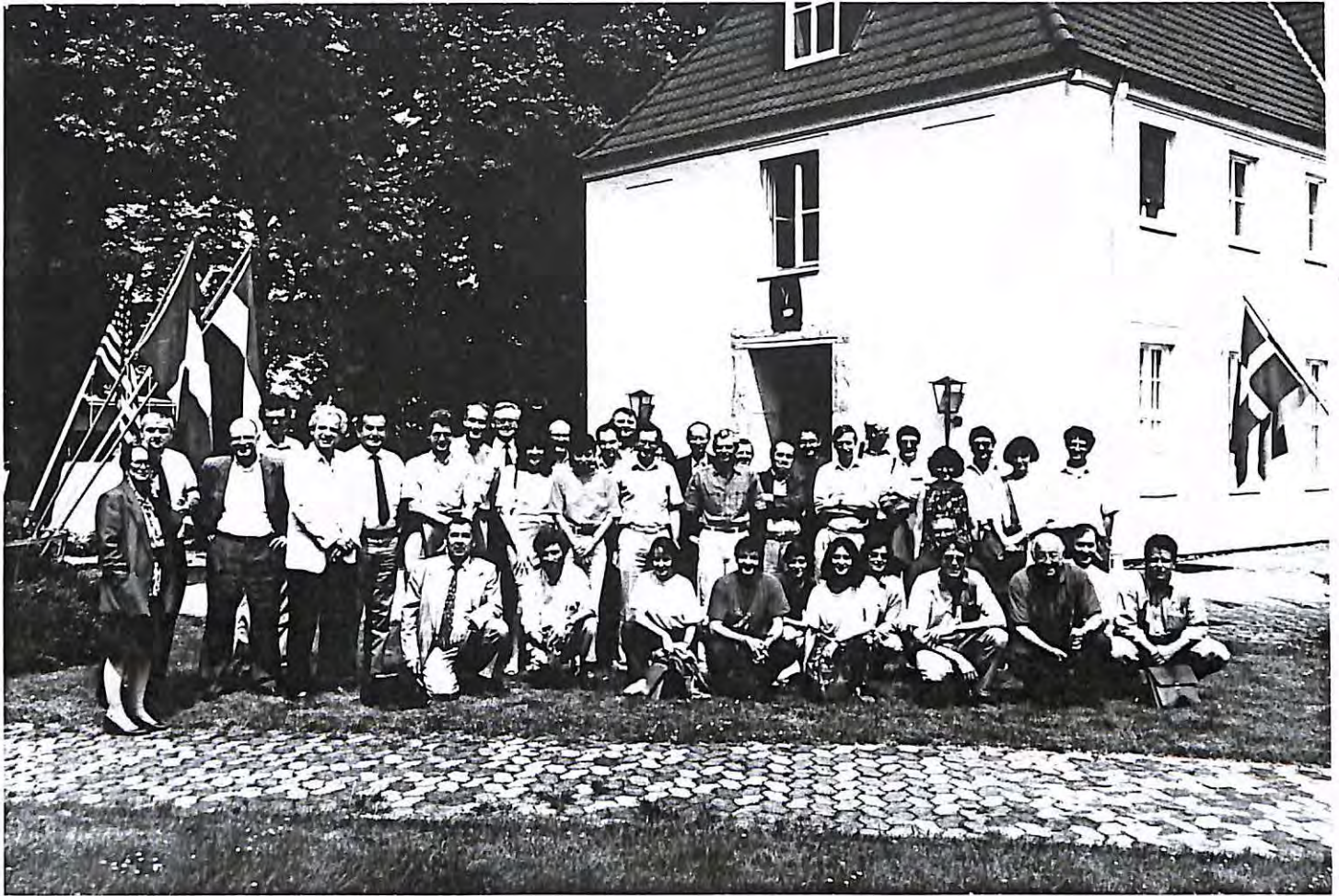
- Monique Richard and Jean-Claude Autran attended the ECLAIR meeting of the Scientific Management Committee, 3 May in Brussels, with Mrs Stephanie Hardy. Jean-Claude Autran attended the following scientific meetings of the programme:
- Meeting of the ECLAIR crossed group "Rheology", 16-17 March in Nantes
  - Meeting of subprogramme A, 6-7 May in Caserta (Italy),

- Meeting of subprogramme C, 17-18 May in Bologna (Italy).
  - Meeting of subprogramme B, open to an international discussion on glutenins, 10 June, following the 5th Gluten Workshop, 7-9 June in Detmold (Germany).
- Jean-Claude Autran also visited FMBRA (partner 14) on 15-16 June, at the occasion of the International Conference on Bread - from Breeding to Baking.

#### **PUBLICATION**

A mention of the ECLAIR Programme AGRE 0052 has been made in the February 1993 (N° 140, p. 19) issue of *Biofutur* (see annex), as part of the review on the 9th International Meeting on Cereals and Bread (1-4 May 1992) in Paris.





Meeting of subprogramme B, extended to international specialists of wheat proteins,  
10th June 1993, Detmold (Germany)