

# V International Oat Conference



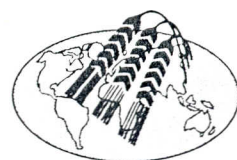
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# VII International Barley Genetics Symposium

Proceedings



Sep.  
14.211



Proceedings  
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# POSTER SESSIONS Volume 2

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Printed in Canada by Mister Print Productions Ltd.

Cover design: Huw Evans, EYECATCHER Graphics & Design

### **Canadian Cataloguing in Publication Data**

International Oat Conference (5th : 1996 : University of Saskatchewan)

V International Oat Conference & VII International Barley Genetics Symposium :  
Proceedings

Proceedings of a joint conference held at the University of Saskatchewan, Saskatoon,  
Sask., Jul. 30 – Aug. 6, 1996.

Includes bibliographical references.

CONTENTS: v.1. Invited papers — v.2–3. Poster sessions.

ISBN 0-88880-347-8 (v.1) — 0-88880-348-6 (v.2) — 0-88880-349-4 (v.3)

1. Oats – Congresses. 2. Barley – Congresses. 3. Oats – Genetics – Congresses. 4.  
Barley – Genetics – Congresses. I. Scoles, John Graham. II. Rossnagel, Brian Gordon.  
III. Fairbairn, Clare, 1953– IV. International Barley Genetics Symposium (7th : 1996 :  
University of Saskatchewan) V. Title. VI. Title: VII International Barley Genetics  
Symposium.

SB188.2.I 5 1996

633.1' 3

C96-920105-2

**Development of barley and wheat genotypes as a function of soil acidity.** J.R. BEN; G. ARIAS. EMBRAPA, National Wheat Research Center (CNPT), P. O. Box 569. 99001-970 Passo Fundo, RS, Brazil.

**Introduction.** The production of barley and wheat in acid soils of southern Brazil is limited by their susceptibility to Al. The acid tolerance of cereal species is not the same and barley is more sensitive than wheat (Minella, 1989). The objective of this experiment was to evaluate the behavior of barley (*Hordeum vulgare*), wheat (*Triticum aestivum*), and durum wheat (*Triticum turgidum durum*) in relation to soil acidity conditions.

**Material and methods.** The experiment was carried out in a greenhouse at EMBRAPA-CNPT, Passo Fundo, RS, Brazil, in a dark red dystrophic latosol (Haplorthox). The soil was treated with four lime levels: 0, 25, 50 and 100 % of the recommended rate to reach pH 6.0 (12.6 t/ha). Plastic pots containing 5 kg of soil were used. The fine milled lime and the air-dried soil were mixed and incubated at a moisture level of approximately the field capacity for three weeks prior to fertilizer application. All the treatments received the same NPK fertilization. The soil pH values in water varied between 4.4 without liming, and 5.7 in soil limed with 12.6 t/ha. Exchangeable Al varied from 2.33 in unlimed soil to 0.05 cmol/L soil (Table 1). The genotypes tested were the Brazilian tolerant wheat, cv BR 35 and the susceptible Mexican cv Anahuac, durum wheat cv Altaika, the Brazilian barley cvs. FM404, MN599, Volla and the barley lines PFC8026, FC85104 and Volla/Dayton (Minella, 1989). Plant height, as well as shoot and root dry matter were determined at anthesis.

**Results and discussion.** The sensibility to acid soil of the susceptible wheat genotype Anahuac, durum wheat (cv Altaika) and all barley genotypes, was indicated by the low dry matter production in unlimed soil, in relation to the production in limed soil (Table 2). The tolerant wheat BR35 produced in acid soil 41 % of the dry matter produced in limed soil. The susceptible cv Anahuac reached in acid soil 4 % of the production in limed soil whereas the durum wheat, cv Altaika, 1 % only. The barley genotype FM404 produced in the no-lime treatment 14 % of the dry matter produced in the 12.6 t/ha treatment. The most susceptible line, PFC8026, produced at the no-lime rate only 3 % of the dry matter produced at the highest lime rate. The height of plants was also affected by soil acidity.

**Conclusions.** Barley genotypes were much more susceptible to Al than tolerant wheat BR35. The results show a better adaptation of Brazilian barley cvs than the susceptible wheat (cv Anahuac) or durum wheat (cv Altaika) with exception of line PFC8026.

**References.** Minella, E. 1989. Aluminum tolerance in barley: Inheritance, chromosome location, genetic relationship of sources of diverse origins, and breeding implications. Ph.D. diss. Cornell University, Ithaca, NY (Diss. Abstr. 50: 9B).

Table 1. Soil analyses of the soil after the application of four lime levels

| Lime levels<br>(%) <sup>1</sup> | pH<br>H <sub>2</sub> O | Al <sup>2</sup>  | Ca <sup>2</sup> | Mg <sup>2</sup> | P <sup>3</sup> | K <sup>3</sup> | Organic<br>Matter <sup>4</sup> |
|---------------------------------|------------------------|------------------|-----------------|-----------------|----------------|----------------|--------------------------------|
|                                 |                        | -----cmol/L----- |                 |                 | --- mg/L ---   |                | --%---                         |
| 0                               | 4.4                    | 2.33             | 1.5             | 0.9             | 10.4           | 154            | 3.3                            |
| 25                              | 4.7                    | 0.80             | 2.8             | 2.2             | 12.1           | 163            | 3.3                            |
| 50                              | 5.1                    | 0.19             | 4.5             | 3.4             | 9.1            | 114            | 3.5                            |
| 100 <sup>5</sup>                | 5.7                    | 0.05             | 5.9             | 4.7             | 9.3            | 138            | 3.1                            |

<sup>1</sup> Percentage of lime to increase soil pH in water to 6.0, according to SMP buffer solution method.

<sup>2</sup> Exchangeable with KCl 1 mol/L.

<sup>3</sup> Mehlich-I extractant.

<sup>4</sup> Wet combustion.

<sup>5</sup> 12.6 t lime/ha.

Table 2. Dry matter of plants and roots and plant height in unlimed soil as percentage of the 12.6 t/ha limed soil treatment

| Genotypes     | Shoot<br>dry matter | Root<br>dry matter | Plant<br>height |
|---------------|---------------------|--------------------|-----------------|
|               | ------(%)-----      |                    | (cm)            |
| <u>Wheat</u>  |                     |                    |                 |
| BR35          | 41                  | 53                 | 88              |
| Anahuac       | 4                   | 11                 | 42              |
| Durum Wheat   | 1                   | 2                  | 10              |
| <u>Barley</u> |                     |                    |                 |
| FM404         | 14                  | 24                 | 64              |
| MN599         | 12                  | 20                 | 58              |
| Volla/Dayton  | 13                  | 23                 | 64              |
| Volla         | 11                  | 10                 | 55              |
| PFC85104      | 8                   | 17                 | 39              |
| PFC8026       | 3                   | 5                  | 37              |
| Blocks        | ns                  | ns                 | ns              |
| Genotype (G)  | **                  | **                 | **              |
| Liming (L)    | **                  | **                 | **              |
| (G x L)       | **                  | **                 | **              |
| CV (%)        | 15                  | 46                 | 9               |

ns, not significant.

\*\* significant at 1 % probability level.