

AC Eatonia hard red spring wheat

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DePauw, R. M., McLeod, J. G., Clarke, J. M., McCaig, T. N., Fernandez, M. R. and Knox, R. E. 1994. AC Eatonia hard red spring wheat. *Can. J. Plant Sci.* 74: 821-823. AC Eatonia hard red spring wheat (*Triticum aestivum* L.) has several improved traits relative to Leader: increased stem solidness and resistance to cutting by the wheat stem sawfly, resistance to common bunt, common root rot and seed shattering, and higher grain yield potential. It is adapted to the Brown and Dark Brown soil zones.

Key words: *Triticum aestivum* L., cultivar description, solid stem, disease resistance

DePauw, R. M., McLeod, J. G., Clarke, J. M., McCaig, T. N., Fernandez, M. R. et Knox, R. E. 1994. Cultivar de blé roux vitreux de printemps AC Eatonia. *Can. J. Plant Sci.* 74: 821-823. Le cultivar de blé roux vitreux de printemps AC Eatonia (*Triticum aestivum* L.) présente plusieurs améliorations par rapport au cultivar Leader: chaumes plus pleins, et donc meilleure résistance aux attaques des cèphes, résistance à la carie commune, au piétin commun et à l'égrenage sur pied ainsi que productivité supérieure. Il est destiné aux régions de la Rivière de la Paix et de la Prairie-parc de l'Ouest canadien.

Mots clés: *Triticum aestivum* L., description de cultivar, tige pleine, résistance aux maladies

AC Eatonia, hard red spring wheat (*Triticum aestivum* L.), was developed at the Agriculture and Agri-Food Canada Research Station, Swift Current, Saskatchewan, by the Arid Prairie Wheat Program. On 9 July 1993 the Food Production and Inspection Branch of Agriculture and Agri-Food Canada issued registration No. 3796 for AC Eatonia.

Pedigree and Breeding Method

AC Eatonia derives from the cross Leader/Lancer made in 1983 at the Research Station of Agriculture and Agri-Food Canada, Swift Current as part of the Arid Prairie Wheat Program. Leader and Lancer originated from separate F₂ plants of the cross Fortuna/Chris. We used a modified pedigree breeding procedure to select for the recombined desirable traits of Leader and Lancer. The F₂ seed of this cross was inoculated with common bunt and grown as individual plants in a leaf and stem rust epiphytotic nursery where the stems of rust resistant plants were assessed for filling of the lumen with pith. Agronomic performance of experimental lines was measured in the F₄, F₆, and F₈ generations by growing replicated trials at two locations. In addition, reaction to leaf and stem rust was measured in an epiphytotic nursery near Glenlea, Manitoba, and reaction to the wheat stem sawfly was assessed in an insect nursery near Swift Current. A sample of remnant seed from the yield trials was used to assess grain quality and kernel characteristics. The better 20% of the population was selected in each generation. Heads were selected prior to harvest in the

F₄ and F₆. The F₃, F₅ and F₇ generations were grown as head rows in a winter nursery near Brawley, California, to multiply seed for early generation replicated yield tests. The F₈ was screened for reaction to both loose smut and common bunt. A line designated 8304-M5C was evaluated in the Western Bread Wheat 'A' and Western Bread Wheat 'B' in 1988 and 1989, respectively, and entered in the Western Bread Wheat Cooperative test in 1990 as BW642.

Performance and Adaptation

AC Eatonia has exhibited several advantages over Leader, the solid-stemmed check cultivar. Using the method of DePauw and Read (1982) to assess stem solidness, it was concluded that AC Eatonia has a more solid stem than Leader, especially internodes 1 and 4 (Table 1) and was cut less by the wheat stem sawfly than Leader (Table 2). AC Eatonia yielded similar to Leader in Zone 1 and 2.9% more in Zone 2, with an overall advantage of 2.6% ($P \leq 0.10$ (Table 3)). It yielded less than wheat stem sawfly susceptible cultivars Katepwa, Laura, and Neepawa (Table 3). The time to maturity and plant height of AC Eatonia are similar to those of Leader. AC Eatonia has slightly weaker straw than the checks. AC Eatonia has larger kernel size than Leader and similar test weight. Pre-harvest sprouting resistance, as measured by the technique of DePauw and McCaig (1991), of AC Eatonia is similar to Leader and RL4137, and significantly better than Roblin, Laura, and Neepawa (Table 4).

Table 1. Degree of filling the lumen with pith for each internode of the main culm of AC Eatonia and check cultivars

| Entry | Internode ^y | Solidness rating ^z | | | |
|------------|------------------------|-------------------------------|------|------|------------|
| | | 1991 | 1992 | Mean | SE of mean |
| Neepawa | 1 | 2.0 | 2.5 | 2.2 | 0.09 |
| | 2 | 1.4 | 2.0 | 1.7 | 0.06 |
| | 3 | 1.1 | 1.4 | 1.2 | 0.05 |
| | 4 | 1.0 | 1.2 | 1.1 | 0.03 |
| | 5 | 1.1 | 1.1 | 1.1 | 0.04 |
| Lancer | 1 | 4.1 | 4.4 | 4.3 | 0.09 |
| | 2 | 3.7 | 4.5 | 4.1 | 0.10 |
| | 3 | 3.4 | 4.3 | 3.9 | 0.11 |
| | 4 | 2.1 | 3.5 | 2.8 | 0.11 |
| | 5 | 2.7 | 3.5 | 3.1 | 0.10 |
| Leader | 1 | 2.9 | 4.2 | 3.5 | 0.11 |
| | 2 | 2.9 | 4.0 | 3.5 | 0.10 |
| | 3 | 2.5 | 4.0 | 3.3 | 0.12 |
| | 4 | 1.4 | 3.3 | 2.4 | 0.12 |
| | 5 | 1.7 | 3.4 | 2.4 | 0.13 |
| AC Eatonia | 1 | 3.3 | 4.4 | 3.9 | 0.12 |
| | 2 | 3.1 | 4.4 | 3.7 | 0.12 |
| | 3 | 2.9 | 4.2 | 3.5 | 0.11 |
| | 4 | 1.6 | 3.7 | 2.7 | 0.13 |
| | 5 | 2.0 | 3.4 | 2.6 | 0.13 |

^zSolidness rating based on 10 plants per entry per rep. per year. 1 = no pith in lumen of internode; 5 = pith fills entire lumen of internode.

^yInternodes numbered consecutively from base of plant (1) to base of spike (5).

Table 2. Percentage of stems cut by the wheat stem sawfly of AC Eatonia and check cultivars

| Entry | Percentage cutting | | | | | |
|-----------------------|--------------------|------|-------------------|----|------|------|
| | 1988 | 1989 | 1990 | | 1991 | 1992 |
| | SC | SC | Leth ^z | SC | SC | SC |
| Neepawa | 60 | 36 | 38 | 75 | 19 | 23 |
| Katepwa | 60 | 31 | 32 | 71 | 28 | 28 |
| Leader | 25 | 20 | 21 | 62 | 16 | 16 |
| AC Eatonia | 15 | 16 | 15 | 57 | 15 | 14 |
| LSD ($P \leq 0.05$) | 9 | 7 | 5 | 11 | 5 | 6 |

^zLeth, Lethbridge, AB; SC, Swift Current, SK.

Table 3. Agronomic performance of AC Eatonia compared with check cultivars, based on data from the Western Bread Wheat Cooperative test, 1990-1992

| | Yield (t ha ⁻¹) | | | Maturity (d) | | | Plant height (cm) | Lodging ^x (1-9) | Test weight (kg hL ⁻¹) | Kernel weight (mg) |
|-----------------------|-----------------------------|--------|-------------------|--------------|--------|-------|-------------------|----------------------------|------------------------------------|--------------------|
| | Zone 1 ^z | Zone 2 | Mean ^y | Zone 1 | Zone 2 | Mean | | | | |
| Neepawa | 3.56 | 3.60 | 3.59 | 102.9 | 100.3 | 100.8 | 91 | 3.2 | 78.9 | 32.5 |
| Katepwa | 3.54 | 3.64 | 3.62 | 101.8 | 99.2 | 99.6 | 92 | 3.1 | 79.0 | 32.4 |
| Leader | 3.37 | 3.40 | 3.39 | 102.9 | 101.3 | 101.6 | 89 | 3.2 | 79.6 | 31.2 |
| Laura | 3.64 | 3.74 | 3.72 | 103.5 | 101.9 | 102.2 | 90 | 3.5 | 79.2 | 32.4 |
| AC Eatonia | 3.39 | 3.50 | 3.48 | 102.9 | 101.4 | 101.6 | 91 | 3.7 | 79.4 | 33.1 |
| LSD ($P \leq 0.05$) | 0.18 | 0.17 | 0.12 | 1.2 | 1.1 | 0.9 | 2 | 1.3 | 0.7 | 0.8 |
| No. of tests | 6 | 21 | 27 | 3 | 14 | 17 | 26 | 6 | 26 | 26 |

^zZone 1, locations in the Brown soil zone of southwestern Saskatchewan and southeastern Alberta; Zone 2, locations in the Dark Brown soil zone of Saskatchewan and Alberta.

^yAll Means are weighted by the number of tests within a zone.

^x1, all plants vertical; 9, all plants horizontal.

Other Characteristics

SPIKES: Oblong to tapering, mid dense, mid long, inclined to erect, apically awnleted; glumes mid wide, mid long, glabrous, white; glume shoulders square to elevated, some slightly rounded, mid wide; glume beak short, acute.

KERNEL: Red color, mid size, mid long, mid wide, oval to ovate; cheeks angular to rounded; brush mid size with mid long hairs.

MATURITY: Mid season, similar to Leader.

STRAW: Medium length, mid strong, solid.

SAWFLY REACTION: Better than Leader.

SHATTERING: Resistant, similar to Katepwa.

DISEASE REACTION: Resistant to prevalent races of common bunt (caused by *Tilletia laevis* Kuhn in Rabenh., and *T. caries* (DC.) Tul. & C. Tul.) and to common root rot (caused primarily by *Bipolaris sorokiniana* (Sacc. in Sorok.) Shoem.) (Table 5). Moderately resistant to prevalent races of leaf rust (caused by *Puccinia recondita* Roberge ex Desmaz.) and moderately resistant to moderately susceptible to stem rust (caused by *P. graminis* Pers.: Pers.). In 3 out of 4 years of testing with loose smut (caused by *Ustilago tritici* (Pers.) Rostr.), AC Eatonia expressed intermediate resistance, whereas in 1992 a susceptible reaction was obtained. Because only one or two heads were inoculated with loose smut each year, AC Eatonia may be genetically heterogeneous for reaction to loose smut.

PREHARVEST SPROUTING RESPONSE: Resistant, similar to Leader.

PHOTOPERIOD RESPONSE: Insensitive.

END-USE SUITABILITY: Eligible for grades of the Canada Western Red Spring wheat class. AC Eatonia exhibited higher flour yield potential and loaf volume than Neepawa, but lower water absorption.

Table 4. Pre-harvest sprouting resistance of AC Eatonia and check cultivars

| Entry | Sprouted spikes (%) | |
|------------|---------------------|-------------------|
| | Time one | Time two |
| Neepawa | 10.0 ^{ab} | 36.7 ^b |
| Leader | 0.0 ^b | 3.3 ^c |
| Laura | 30.0 ^a | 53.7 ^b |
| Roblin | 33.3 ^a | 80.7 ^a |
| RL4137 | 0.0 ^b | 3.3 ^c |
| AC Eatonia | 3.3 ^b | 0.0 ^c |

a-c Values within a column followed by the same letter do not differ significantly according to Duncan's Multiple Range test ($P \leq 0.05$).

Maintenance and Distribution of Pedigreed Seed

The 117 breeder lines, grown in isolation near Swift Current in 1991 and again as rows near Indian Head in 1992, derive from random plants of an F₆ derived F₁₁ single plant progeny row. Breeder seed will be maintained by the Seed Increase Unit of the Experimental Farm, Indian Head, Saskatchewan, Canada S0G 2K0. Plant Breeders' Rights have been requested. Distribution and multiplication of pedigreed seed stocks will be handled by Proven Seeds, UGG, Crop Production Services, 433 Main Street, Winnipeg, Manitoba, Canada R3C 3A7.

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Table 5. Disease reactions of AC Eatonia and check cultivars, based on data from Western Bread Wheat Cooperative tests 1990-1992

| Entry | Loose smut ^z (%) | | | | Common root rot ^z (%) | | | Common bunt ^z (%) | | |
|------------|-----------------------------|------|------|------|----------------------------------|------|------|------------------------------|-------|------|
| | 1989 ^y | 1990 | 1991 | 1992 | 1990 | 1991 | 1992 | 1990 | 1991 | 1992 |
| Neepawa | 6R | 2MR | 7R | -R | 51 | 37 | 25 | 30 I | 21 I | 10I- |
| Katepwa | 3R | -MR | 13MR | 0R | 61 | 29 | 25 | 6 R | 3 R | 4R |
| Leader | 8R | 6MR | 20MR | 31MR | 74** | 55** | 42 | 16 I | 10 R+ | 10I- |
| Laura | 73HS | 20S | 57S | 62S | 44 | 20** | 18 | 63 S | 56 S | 26S |
| AC Eatonia | 21MR | 2MR | 43MS | 68S | 67 | 38 | 33 | - ^x | 4 R | 4R |

Field rust reaction

| Entry | Field rust reaction | | | | | |
|------------|-----------------------|--------|------|-----------------------|------------|--|
| | Leaf ^z (%) | | | Stem ^z (%) | | |
| | 1990 | 1991 | 1992 | 1990 | 1992 | |
| Neepawa | 20RMR | 30MRMS | 50MR | 20MR | 30RMR, 5MS | |
| Katepwa | 20RMR | 20MR | 50MR | 10MR | 20RMR | |
| Leader | 5VR | 20MR | 10M | 5MRMS | 30RMR, 5MS | |
| Laura | 10M | 10M | 10M | 5R | 30R/MR | |
| AC Eatonia | 5VR | 5MR | 10M | 10MRMS | 20RMR/MS-S | |

^z Percent infection and type of reaction: VR, very resistant; R, resistant; I, intermediate resistance; M, medium resistance (unique reaction); MR, moderately resistant; MS, moderately susceptible; S, susceptible; HS, highly susceptible.

^y Loose smut reactions based on Western Bread Wheat 'B' test 1989.

^x AC Eatonia not tested for common bunt in 1990 as it was rated as 'R' in 1989 WBWB.

*, ** denote values that differ from those of Neepawa at the 5 and 1% level of significance using Duncan's multiple range test ($P \leq 0.05$).