6TH INTERNATIONAL TRITICALE SYMPOSIUM

Proceedings of oral and poster presentations

3 – 7 September 2006
Stellenbosch, South Africa

Organized and hosted by
Stellenbosch University Plant Breeding Laboratory (SU-PBL)
and
International Triticale Association (ITA)
Sponsors

The ITA and the organizing committee of the the 6th International Triticale Symposium would like to thank the following companies for sponsorships:

Platinum: Wintersteiger, Stellenbosch University Plant Breeding Laboratory - Welgevallen
Gold: Allens Real Estate, BASF SA, UAP Crop Care
Silver: SSK, Afgri Seed

International Triticale Association

Executive

President H. Roux
Treasurer/Newsletter R. Jessop
Honorary President N. Borlaug
Executive Secretary N. Darvey
Past President E. Arseniuk

Country Representatives

Algeria A. Benbelkacem
Brazil A. Nascimento (Jr.)
China S. Shu
India S. Dhindsa
Poland E. Arseniuk
South Africa H. Roux
Benelux G. Haesaert
Canada D. Salmon
Germany G. Oettler
Mexico I. Ortiz-Monasterio
Romania G. Butnaru
U.S.A. R. Myer

6th International Triticale Symposium

Organizing Committee

H. Roux (Chair)
L. Snyman
G.F. Marais
W.C. Boles
K.W. Pakendorf

Editorial Committee

W.C. Botes
N. Darvey
R. Jessop
G. Oettler
D. Boros
P. Gustafson
G.F. Marais
D. Salmon

Edited by SU-PBL, Welgevallen Experimental Farm, Stellenbosch, South Africa
Phone: +27-21-808-4860, Fax: +27-21-808-3767, E-mail: web@sun.ac.za
Website: http://www.sun.ac.za/genetics

Copyright © 2006 Stellenbosch University Plant Breeding Laboratory & International Triticale Association

ISBN 0-620-37008-4
Table of contents

In memorial

In memoriam of Professor Tadeusz Wolski .................................................. 2

Oral presentations

The association of managed drought stress regimes in Mexico with global triticale yield evaluation environments
  R. M. Trethowan, K. Ammar, M. P. Reynolds and J. Crossa ........................................ 7

Aluminum tolerance in Triticale as compared to its parental species
  A. Aniol .......................................................................................................................... 15

Pollen grain expression for osmotic adjustment in triticale genotypes
  M. Barary, N.W.M. Warwick, A.M. Taji and R.S. Jessop .............................................. 19

Thinopyrum distichum – can it be used to improve the salt tolerance of triticale?
  G.F. Marais, A.S. Marais and M. Ghai ........................................................................ 25

Occurrence and relative importance of triticale diseases in Poland
  E. Arseniuk, T. Oleksiak, A. Strzembicka, E. Reszka and W. Poznan ................... 28

Geomyza tripunctata in Belgium
  V. Derycke, G. Haesaert, J. Latré and B. Heremans ................................................ 33

An approach to developing a marker assisted selection system for tolerance to pre-harvest sprouting in Triticale

Creation of new initial material for triticale breeding
  U. K. Kurkiev, K. U. Kurkiev ..................................................................................... 45

Genetic mapping and marker assisted breeding in Australian triticale
  J.L. Reinheimer, R.L. Fox and H. Kuchel ................................................................... 48

Evolution of disease pressure on triticale under Belgian growing conditions: overview of the last 20 years
  G. Haesaert, V. Derycke, J. Latré and B. Heremans .................................................. 53

Triticale fodder and grain production by small-scale dairy farmers in North West Bangladesh
  Z.I. Sarker, S.R. Waddington, M.A. Sufian, M.E. Haque and M.A. Hoque ............. 59

Developing a hybrid seed production system and evaluation of heterosis levels in hybrids from CIMMYT's spring triticale germplasm

The Pampa rye cytoplasm as a male sterilizing agent for hybrid breeding of triticale
  B. Lapiriski and J. Fryczkowska .................................................................................. 68

Progress in CMS development for hybrid triticale
  R. Warzeicha and K. Salak –Warzych ................................................................. 72

Microspore regeneration system for triticale transformation via agrobacterium
  S. Oleszczuk, S. Sowa and J. Zimny ........................................................................ 76

Isolated microspore culture in a cyclical breeding system for the production of inbred lines and hybrids
  N.L. Darvey, X. Zhao and R. Trethowan .................................................................. 77

The South African Triticale breeding programme: current status
  H.S. Roux, G.F. Marais, J.E. Snyman and W.C. Botes ........................................... 80

Canadian Triticale Biorefinery Initiative
  F. Eudes ..................................................................................................................... 85

Genetic variation for ethanol production in winter triticale
  E.M. Thiemt, T. Senn and G. Oettler ....................................................................... 89

Proceedings of the 6th International Triticale Symposium
Evaluations of triticale grain in pig diets
R.O. Myer and M.J. Azain

Triticale is a quality fodder, feed and food for small-scale farmers in Bangladesh
M.E. Haque, M.A. Sufian, S.R. Waddington, Z.I. Sarker, N.R. Sarker and C.A. Meisner

Triticale production and possible use as milk for small ruminants in Algeria
A. Benbelkacem, Y. Dib and K. Ammar

Triticale fodder and grain utilization by dairy cattle and poultry in Bangladesh
N.R. Sarker, M.E. Haque, K.S. Huque, Q.M.E. Huque and S.R. Waddington

Antioxidants in triticale grains

Triticale of high end-use quality enhances opportunities to increase its value in world cereals market
D. Boros

Poster presentations

Effect of genotype (G) and genotype-environment interaction (GE) of yield components in triticale, rye and durum wheat across South Banat conditions
G. Butnaru, I. Sarac and S. Ciulea

Mitotic analysis of triticale, wheat and rye

Direct somatic embryogenesis and regeneration in triticale: application to genetic engineering
F. Eudes

Anthocyanin expression in transgenic triticale embryos
K.M. Doshi, F. Eudes, A. Laroche and D. Gaudel

The influence of D(R) substitutions on uptake and utilization of nitrogen and phosphorus in hexaploid triticale
T. Oracka and B. Lapiński

Resistance to Fusarium head blight and accumulation of ATP, ergosterol and secondary Fusarium metabolites in kernels of doubled haploid lines of winter triticale cultivar Bogo
T. Góral, M. Busko and J. Perkowski

Resistance of Polish winter triticale cultivars to Fusarium head blight and accumulation of Fusarium-mycotoxins in grain
T. Góral and P. Ochodzi

Development of PCR-based DNA markers linked to partial resistance of triticale to Stagonospora nodorum biotch
E. Reszka, E. Arseniuk and P.P. Ueng

Blumeria graminis sp – an emerging problem of triticale breeding in Poland
A. Strzembińska, E. Arseniuk and W. Poznań

Effectiveness of triticale breeding at DANKO
Z. Banaszak and K. Marciniak

Isolated microspore culture of Canadian 6x triticale cultivars
F. Eudes and E. Amundsen

BRS Minotauro, the first truly Brazilian triticale cultivar
A. Nascimento Junior, A.C. Baier and A.C.S. Albuquerque

Methods for fusarium head blight field screening used at Embrapa, Brazil
M.I.P.M. Lima and A. Nascimento Junior

Selectivity and efficacy of herbicides for use on winter cereals
L. Vargas, E.S. Roman and A. Nascimento Junior
Progress in triticale breeding in Romania for short straw type
Gh. Ittu, N. N. Saulescu, M. Ittu, P. Mustatea ................................................................. 158

Spring triticale breeding program at Embrapa, Brazil
A. Nascimento Junior and A. C. S. Albuquerque ............................................................... 160

Current status of triticale in Poland
T. Oleksiak and E. Arseniuk .............................................................................................. 162

Breeding triticale for sprouting resistance and baking quality
M. S. Pojmaj and R. Pojmaj .............................................................................................. 164

Studies on the cultivation of winter triticale and rye seeded in early winter in a heavy snow area of Hokkaido, Japan
T. Yoshihira and S. Kosaka .............................................................................................. 165

Selection response after four cycles of recurrent selection for improved falling number
E. M. Thiemt, G. Wahle, B. Schinkel and G. Oettler ......................................................... 169

Triticale outcrossing risk to related species
F. Eudes, R. Graf, B. Beres and L. Hall ........................................................................... 172

Gluten strength screening of triticale breeding lines from the Florida breeding program

Dynamics of falling number during ripening of different winter triticale genotypes
A. Kronberga ....................................................................................................................... 176

Seeding rate: Its contribution to the performance and quality of triticale (X Triticosecale Wittmack) blends for forage production
L. A. Lekgari, P. S. Baenziger, K. P. Vogel and D. D. Baltensperger ................................ 180

Incorporation of breadmaking quality to winter triticale breeding program
H. Wos, E. Arseniuk, W. Brzezinski and M. Stachowicz ........................................... 182

Triticale Malting and brewing performance
D. F. Salmon, R. McCaig, D. Dyson, W. Chapman and S. Albers ................................... 184

List of participants .......................................................................................................... 187
Spring triticale breeding program at Embrapa, Brazil

A. Nascimento Junior and A.C.S. Albuquerque

National Wheat Research Center, Brazilian Agricultural Research Corporation (Embrapa Trigo) P.O. Box 451, 99.001-970 Passo Fundo, Brazil

Triticale research in Brazil started in the beginning of sixties with an introduction of octoploid collection. CIMMYT collections are the main genotype source. At Embrapa Trigo the programme is focused on broad adaptation, high yield and aluminum and disease tolerance. Beyond the CIMMYT cooperation, at Embrapa Trigo many crosses are made annually to improve genetic variability with new local octoploids to develop secondary hexaploid triticales, followed by strong grain, disease tolerance, plant type selection and others.

Introduction

Triticale (X *Triticosecale* Wittmack) is an important crop for the winter growing season in Southern Brazil. The total triticale area in 2005 was approximately 131,000 hectares and, the same area is estimated for 2006 in Brazil. The average grain yield was 2,200 kg ha⁻¹ in 2005, without irrigation. Although, triticale production costs through the years were slightly lower than wheat, mainly due to a superior resistance to foliar diseases, the rainy environment associated to no-till system, with more humidity and stubble on surface soil, resulted in an increase on diseases selection pressure. Many released cultivars previously characterized as resistant to foliar diseases are now moderately susceptible or even susceptible. For more than a century, rye and wheat have been bred and grown in Brazil, contributing to the accumulation of favorable genes through natural selection. The adaptive value of these genes and genetic variability should be brought into national triticale breeding programs. Developing new hexaploid triticales will certainly need improved octoploid types. Crosses among these improved octoploid and hexaploid triticales, rye or wheat genotypes by back crosses to hexaploid triticale cultivars, need to be continuously made, in order to guarantee better selection efficiency.

The major challenges for Brazilian triticale breeding programs are increasing grain yield potential, disease resistance, and nutritional value; reducing pre-harvest sprouting; and improving or maintaining the adaptation to acid soils.

Materials and Methods

Two hundred and fifty to three hundred crosses between hexaploid triticales are carried out each year. Germplasm introduction is important source to increase the genetic variability and used to be the main source for developing new cultivars in Brazil, but currently, the genetic basis is increased and new triticale genotypes are developed by crossing wheat and rye cultivars adapted to Brazilian conditions. Field selection for plant type and diseases resistant plants is carried out from F₂ onwards followed by severe screening for grain formation. Due to the great environment pressure, striken disease selections are...
possible under natural conditions in early generations. In advanced stages (F6 or more), all lines selected are submitted to artificial inoculation for screening evaluation to scab, spot blotch, tan spot and blast and to agronomics evaluations and characterizations parallel to the yield and official trials.

Results and Discussion

The varieties Embrapa 53 (LT1117.82/Civet/Tatu), BRS 148 (Yoguil/Tatu) and BRS 203 (LT-1/Rhino) developed by Embrapa Trigo with CIMMYT’s cooperation, represented more than 70% of triticale seed availability in Brazil in 2004. In 2005, 'BRS Minotauro', the first truly Brazilian triticale cultivar, was registered. 'BRS Minotauro' is derived from a cross, made at Embrapa Trigo, between the primary octoploid 'OCTO 92-3' [hexaploid wheat line 'PF 89358' (BR 35’3//BR 14’2/LARGO) and the Brazilian rye 'Centeio BR 1'] crossed with the hexaploid triticale 'Triticale BR 4' (Beagle/Cinamon/Muskox).

New lines have been improved by crosses and selections to fulfill the requirements of cereal growers aiming, resistance or tolerance to the most important diseases, grain quality and broad adaptation.

Acknowledgements

The authors thank the devotion of Dr. Augusto Carlos Baier, researcher retired of National Wheat Research Center, for the triticale progress in Brazil. Certainly the phrase "Triticale in Brazil" it will always come associated with the humble and diligent person of Dr. Baier.