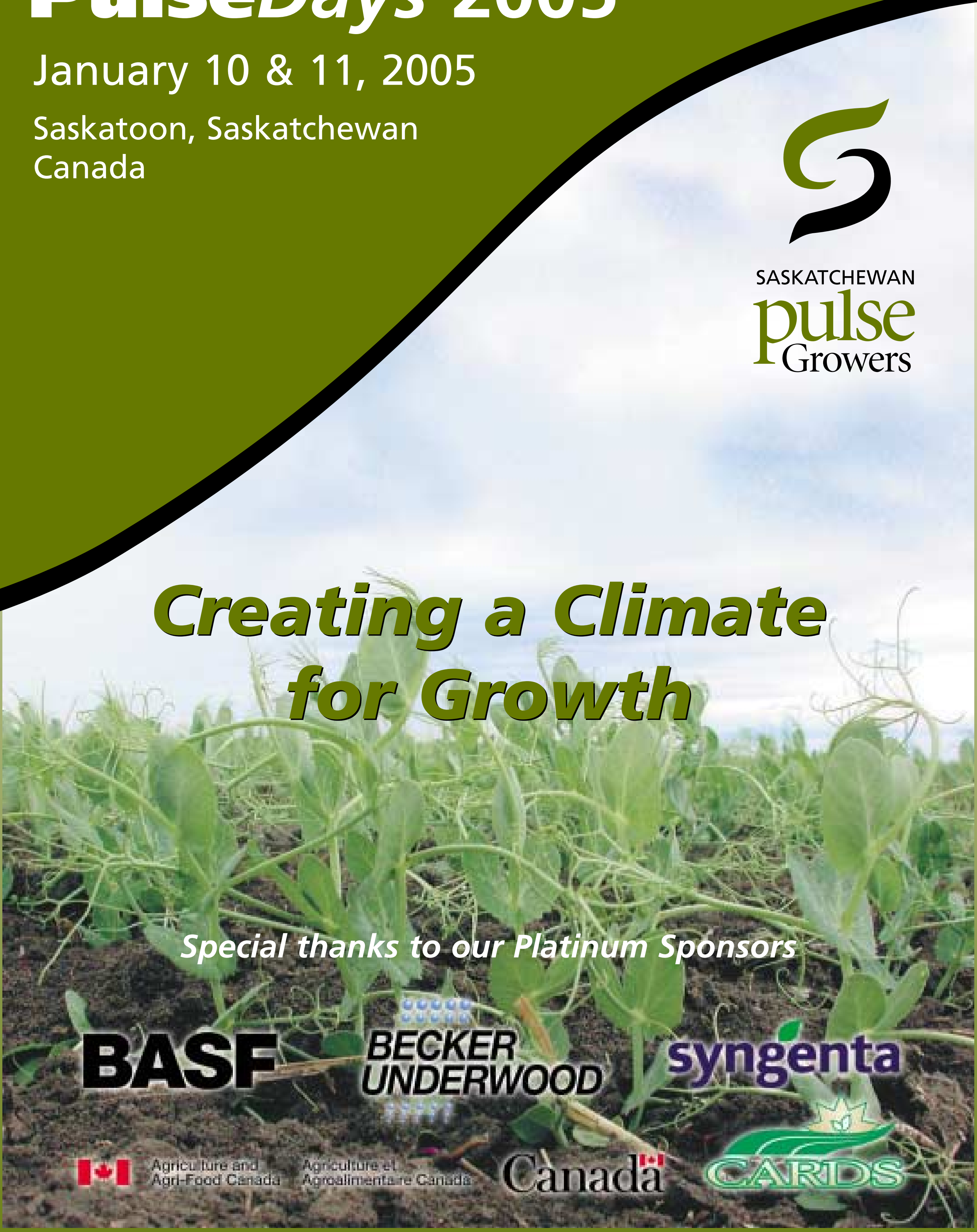
Pulse*Days* 2005

January 10 & 11, 2005

Saskatoon, Saskatchewan
Canada



SASKATCHEWAN pulse Growers

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CARDS

Pulse*Days* **2005**

Saskatoon Inn (live) &
Prairieland Park (video feed)
Saskatoon, Saskatchewan, Canada

AGENDA

Monday, January 10, 2005

11:00 am	Registration
12:30 pm	Annual General Meeting
2:00 pm	Break

2:15 pm **Pulse Days Opening Remarks**
Shawn Buhr, Chairman
Saskatchewan Pulse Growers
(Lucky Lake, Saskatchewan)

2:30 pm ***Keynote Presentation:***
Global Weather Cycles
Bruce Burnett
(Winnipeg, Manitoba)

3:15 pm Questions/Discussion
3:30 pm Refreshment Break

Session 1: Spotlight on Agronomy

3:50 pm **Success With New Lentil Varieties**
Darren Watson
(Avonlea, Saskatchewan)

4:15 pm **New Disease Threats for Pulse Growers**
Penny Pearse
(Regina, Saskatchewan)

4:40 pm **Advanced Harvesting Techniques**
Bryan Nybo
(Swift Current, Saskatchewan)

5:00 pm Questions/Discussion
5:15 pm Finalize AGM if needed

7:00 pm Wine & Cheese Reception and Pulse Research Poster Session at Prairieland Park

* *

*** * Crop Production Show * ***
Open from 6:00 pm to 9:00 pm
Use your Pulse Days nametag for free access to the Crop Production Show and SPG Wine & Cheese Reception

* *

Tuesday, January 11, 2005

8:00 am Registration
8:30 am Announcements

Session 2: Uncovering Opportunities

8:50 am **Emerging Opportunities in the Functional Food Market**
Steve Allen
(Glendale, California, USA)

9:35 am **Pulse Products in the Health Food Industry**
Jerry Bigam
(Edmonton, Alberta)

10:00 am Questions/Discussion
10:15 am Refreshment Break

Session 3: Market Focus – SPAIN

10:35 am **Changes Affecting the Spanish Market for Canadian Pulse Products**
Marc Gagnon
(Madrid, Spain)

11:00 am **The Spanish Edible Pulse Market: What Growers Need to Know**
Paco (Francisco) Navarro
(Valencia, Spain)

11:35 am Questions/Discussion
12:00 pm Luncheon
12:20 pm **SPG Awards Ceremony**

Session 4: Marketing Pulses in 2005

1:30 pm **Grower Production and Delivery Contracts**
Rob Tisdale
(Winnipeg, Manitoba)

1:50 pm **Price/Production Outlook for 2005**
Moderator: *Jack Dawes*
(Saltcoats, Saskatchewan)
Panel: *Shaun Wildman*
(Regina, Saskatchewan)
Ivan Sabourin
(St. Jean-Baptiste, Manitoba)
Greg Kostal
(Winnipeg, Manitoba)

2:35 pm Questions/Discussion

3:00 pm ***Keynote Presentation:***
Enjoy a Strong Pulse!
Pauline Van Roessel
(Calgary, Alberta)

3:20 pm Questions/Discussion

3:30 pm Closing Comments/Door Prizes
3:35 pm **Pulse Days Wind-Up and Social**

4:45 pm Day Ends

PulseDays 2005

Monday, January 10 & Tuesday, January 11
Saskatoon, SK Canada

SASKATCHEWAN pulse Growers

Conference Presenters

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Thanks to the staff of Food Focus Saskatoon, Inc. and the College of Agriculture students for their assistance with this event

PulseDays 2005

RESEARCH POSTER SESSION

Table of Abstracts

Posters are arranged by name of presenter

Investing in Research:
The New Pulse Field Lab

Artist's rendering

The rapid expansion of the Canadian pulse industry has created an infrastructure gap in pulse research. Existing field lab facilities are insufficient to meet the current and future needs of the industry.

Saskatchewan Pulse Growers is constructing a world-class pulse crop field research facility in partnership with the University of Saskatchewan to address the most critical infrastructural shortfall. The new multi-user facility is being built as a 14,000 square foot addition to the existing Crop Sciences Field Laboratory on campus in Saskatoon. This field lab expansion will provide enhanced capacity in breeding, physiology, agronomy and pathology research and will allow these programs to operate more efficiently.

The whole industry will benefit

A 2003 study showed that every dollar of producer investment in pulse crop research led to a $15.60 return for farmers and a $31.30 return for the industry as a whole. The pulse field lab will mean better product quality and new varieties designed to meet the needs of processors, farmers and the marketplace.

The Agri-food Innovation Fund has contributed $1.5 million towards this $3 million project. Several companies and organizations have also stepped up to the plate to make a contribution towards the development of the pulse industry.

Whether you're a farmer, a small business owner or represent a larger company, you can show your support by making a contribution.

For more information, contact:

Jackie Blondeau, Special Projects Manager
Saskatchewan Pulse Growers
104 – 411 Downey Road
Saskatoon, SK S7N 4L8
Tel. 306-668-0193
Fax. 306-668-5557
Email: jblondeau@saskpulse.com

WHY IS THE NEW LAB NEEDED?

"The industry's ability to continue capitalizing on pulse crops is in jeopardy without an increased investment in crop development. With our $50,000 contribution, Bourgault Industries Ltd. has proudly agreed to invest in the future of the pulse crop industry by supporting the new crop development laboratory."

- Gerry Bourgault, President
Bourgault Industries Ltd.

"The new facility will allow us to expand our program and run many of our research activities much more efficiently. Locating our laboratory next to other pulse research laboratories will facilitate daily interaction, which will make cross-discipline activities run smoother and faster."

- Dr. Sabine Banniza, Plant Pathologist
Crop Development Centre
University of Saskatchewan

"The new lab facilities will really help us in our efforts to improve quality, disease resistance and yield in all pulse breeding programs. This investment will help us do our work better, faster and more efficiently. We intend to generate a higher rate of return for the pulse industry."

- Dr. Bert Vandenberg, Plant Breeder
Crop Development Centre
University of Saskatchewan

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Directors of the Board

Shawn Buhr *Chairman – retiring*
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Saskatchewan Pulse Growers
104 - 411 Downey Road, Saskatoon, SK S7N 4L8
Tel: (306) 668-5556   Fax: (306) 668-5557
Web: www.saskpulse.com

PULSE PRODUCTION AND GLOBAL WEATHER CYCLES

Bruce Burnett
Director, Weather and Crop Surveillance
Canadian Wheat Board
PO Box 816 STN MAIN
Winnipeg, MB R3C 2P5

Biography

Bruce Burnett has tracked weather and monitored crops for the Canadian Wheat Board since 1988.

After 10 years as an analyst in the Department, Bruce became Director of Weather and Crop Surveillance in 1998. He heads a department that uses computer modeling and satellite technology to track crop conditions around the world.

In addition to directing the department, he monitors weather and crop production prospects in Western Canada.

Bruce, 45, grew up on a mixed farm in Binscarth, a town in western Manitoba. He holds a Bachelor of Agricultural Science degree and a Masters degree in Soil Science from the University of Manitoba.

Outline

Major Pulse Production Areas

- India
- Australia
- North Africa
- Middle East
- Canada

India
- Cropping areas
- Weather cycles influencing production
- Monsoon performance – How important is it to Indian Agriculture?
- El Nino/Southern Oscillation
- Prospects for 2005

Australia
- Cropping areas
- Weather Cycles influencing production
- El Nino/Southern Oscillation
- Prospects for 2005

North Africa
- Cropping Areas
- Weather Cycles influencing production
  - Polar Front
  - North Atlantic Oscillation
- El Nino/Southern Oscillation
- Prospects for 2005

Middle East
- Turkey, Iran Syria
- Major Growing areas of pulses
- Weather Cycles influencing production
  - North Atlantic Oscillation
  - El Nino/Southern Oscillation
- Prospects for 2005

Canada
- Will 2005 be a repeat of 2004?
- How out of the ordinary has the weather been in the past 5 years?
- Is it a trend or just bad luck?
- El Nino/Southern Oscillation and PDO influence on winter weather
- Spring 2005 moisture conditions

Conclusion

SUCCESS WITH NEW LENTIL VARIETIES

Darren Watson
Producer
PO Box 329
Avonlea, SK S0H 0C0

Biography

Darren Watson is a pulse producer in the Avonlea and Wilcox areas of Saskatchewan. He will be discussing new lentil varieties developed by the Crop Development Centre through support from Saskatchewan Pulse Growers.

Darren has participated in the pulse seed industry in the lentil and chickpea markets. He is involved in the processing sector with involvement in Blue Hills Processors Ltd. and Walker Seeds Ltd. He has also worked for Bayer CropScience as a Territory Manager for Seed Treatments. This job provided access to many of the best farm managers and seed growers in Saskatchewan.

Darren holds a Bachelor of Commerce degree and a Master of Business Administration degree from the University of Saskatchewan.

Outline

Background
- Darren, Ron and Carol Watson
- Farm located in Avonlea and Wilcox areas of Saskatchewan

The New Lentil Varieties
- Characteristics of the varieties available
    - yield, maturity, size, disease
- Choosing the right variety: Which varieties are right for your operation?
    - Remember the golden rule: make money!
    - What are your strengths and weaknesses?
    - Production versus market risk

- Market factors
    - New varieties must have markets
- Red lentils are a special case
    - Have been plagued by poor agronomic qualities
    - New varieties are a huge improvement

Growing these varieties
- Pulse Production Manual is very helpful
- Seeding
- Inputs
- Managing diseases
- Harvesting and handling
- How do the new varieties compare to older varieties?
    - Less susceptible to yield limiting factors
    - Differences are greater when good growing conditions prevail
    - Easier to grow
- Differences between reds and greens

Lessons learned
- What works for us
- What didn't
- Why grow the newer varieties?

Final thoughts
- Plan, be proactive, adopt technology
- Innovation for global competitiveness

NEW DISEASE THREATS FOR PULSE GROWERS

Penny Pearse
Provincial Plant Disease Specialist
SK Agriculture, Food and Rural Revitalization
3085 Albert St.
Regina, SK S4S 0B1

Biography

Penny Pearse has been employed as the Provincial Plant Disease Specialist by the province of Saskatchewan for the past six years. Penny grew up on a mixed grain farm near Tisdale, Saskatchewan, where her interest in agriculture first began. She attended the University of Saskatchewan and earned a degree in Agriculture in 1992, followed by her Masters of Science in 1995. The focus of her graduate research was in plant pathology, and specifically on the environmental and agronomic impacts of the disease sclerotinia rot in sunflowers.

Before joining SAFRR, Penny managed a ginseng farm in British Columbia for four years. Although she enjoyed her time in the mountains, she was happy to return to beautiful Saskatchewan to continue her career in plant pathology.

Penny truly enjoys her work and the variety of people it enables her to meet. Penny appreciates the multifaceted nature of her position, especially serving as a voice between farmers, research, industry and government.

Outline

Diversification into pulse crops and increased pulse acres in the prairies has led to questions about new diseases. The 2004 season was cool and moist, which resulted in abundant foliar growth and delayed crop maturity. Many of the more common pulse diseases were evident this season, although they did not have a significant impact on final quality and yield—at least not compared to the problems of frost, insects, stained and green seed. However, some unusual diseases were witnessed in 2004 that sparked pathologists' interests and left farmers wondering "what is this new disease and is it a threat to my crop?"

There have been some unique diseases observed in recent years. New diseases of concern in lentil include: stemphylium blight, fusarium root rot, and increased levels of sclerotinia. In pea, new diseases include pink seed, anthracnose, downy mildew and bacterial blight. In bean, bacterial wilts and blights may be a concern.

Although the list of diseases may seem long, the real question is: “Which of these new diseases are a result of a unique season and unlikely to occur again; and, which of these have the potential to limit production and will need control efforts?”

The answer isn’t easy. The 2004 season was not normal (whatever that means!) as rainfall was above average and temperatures below average in many regions. This resulted in abundant crop growth and high yield potential, but also delayed crop maturity. The early frost on August 20 and less-than-ideal harvest conditions further impeded seed maturity. In addition, the years previous have also been unique. The 2002 and 2003 seasons were drier than normal and disease issues were put on the back burner – except for a few that could still prevail under dry conditions, including ascochyta blight in chickpea, root rots of lentil, and powdery mildew in field pea.

“New” Diseases to Watch For

The following diseases are the most important new (or at least new to us) disease threats on the horizon:

Stemphylium blight of lentil caused by the fungal pathogen, *Stemphylium botryosum,* has been occurring more frequently in recent years and was quite common in 2004 as a result of the cool, moist conditions and dense canopies. The leaf spots led to premature leaflet drop on the lower stems. Little is known about the impact of stemphylium on lentil development and yield, nor about its spread and the conditions that favour it. Symptoms of stemphylium are similar to ascochyta blight and may often be misdiagnosed. Research is currently underway to look at the biology of the stemphylium pathogen, how the various cultivars respond to infection, and the effectiveness of foliar fungicides. Another leaf disease similar in symptomology to ascochyta blight of lentil is **septoria leaf spot**. No research is currently underway on this pathogen. The provincial Crop Protection Lab can help confirm which pathogens are present.

Fusarium root rot of lentil and other pulses has been observed with increasing frequency in recent years, especially during dry conditions when the root systems are stressed. Soil-borne pathogens such as *Fusarium, Rhizoctonia,* and *Pythium* can attack plants at any growth stage causing seed rot, seedling blight and root rot. Of these pathogens, *Fusarium* is the one of most concern since some of the species are responsible for the important cereal disease: fusarium head blight. Research has found that some Fusarium species, in particular *F. poae, F. avenaceum* and *F. graminearum,* can be isolated from non-cereal roots such as pulses and oilseeds. Hence, crop rotation will not be an effective way of reducing *Fusarium* in the soil. More work needs to be completed on the importance of this pathogen on pulse production and whether seed-infection plays a role.

Sclerotinia stem and pod rot, also known as **white mould**, is not a new disease to Saskatchewan. The pathogen (*Sclerotinia sclerotiorum*) has a wide host range including pulses, canola, sunflower, and forage legumes—basically all non-cereal crops common in crop rotations on the prairies. Even though we tend to forget about sclerotinia in the dry years, it reminds us of its presence in the wet years. Unfortunately, sclerotinia is difficult to control because of its wide host range, ability of the fungal bodies to remain in the soil for years, and far-travelling spores. The good news is that we now have a foliar fungicide registered for use in pulse crops, with more fungicides on the horizon. Research into sclerotinia forecasting and the best timing for application is still necessary. In 2004, sclerotinia was damaging to lentil and bean crops, but was also found in chickpea and field pea.

Bacterial wilt of bean (*Curtobacterium flaccumfaciens* pv. *flaccumfaciens*) has been found in Alberta and research is now underway on this new pathogen. Although bean production in Saskatchewan is still limited, this could be a disease of concern for the future.

Another potential disease threat is **soybean rust**, even though our soybean acres are very small, it is a disease that Manitoba is watching out for. Furthermore, some disease pathogens and nematodes, although insignificant to pulse production in Canada, may **serve as barriers when it comes to exporting pulse seed** to other countries.

Diseases of Less Importance

Although the following diseases may be of interest to pathologists and researchers, they are more likely an anomaly of the season and/or not a threat to production. **Downy mildew of pea and lentil** (caused by *Peronospora* spp.) is very different than the more common powdery mildew (caused by *Erysiphe polygoni*). It is favoured by cool, moist conditions so it is typically only present early in the growing season. Secondly, downy mildew sporulation is greyish brown in colour and is present on the underside of leaves, whereas powdery mildew is more white in colour and primarily attacks the upper leaf surface. Downy mildew was not found at a high incidence and a more normal (dry, warm) season in 2005 would once more remove it from the radar screen.

Another unique disease in 2004 was **anthracnose in peas** (yes, it's not just in lentils!) found primarily in the north-central region of the province. Anthracnose of pea is rare and not likely to develop into a major pest in the future. Field pea canopies were very dense in 2004 and also suffered from **ascochyta foot rot** as well as **ascochyta leaf spot**. There are at least three pathogens that contribute to these symptoms: *Mycosphaerella pinodes, Ascochyta pisi,* and *Phoma medicaginis* var. *pinodella.* Different species will be more prevalent and severe depending on the type of season. Although such severe ascochyta levels as seen in 2004 are unusual, remember that there will be abundant disease inoculum on pea residue and on seed. Be especially diligent in seed selection, seed treatment, crop rotation and field scouting in field pea this coming season.

Pink seed of pulse crops is caused by a bacterium, *Erwinia rhapontici.* Although pink seed has been observed on pea and lentil sporadically for a number of years, it has recently been given more attention. Recent research has shown that the bacterium can infect weak or injured plants at seed set, leading to seed infection and poor seedling establishment the following season. Although the shrunken, pink-stained seed can result in dockage during seed cleaning and grading, it is not considered to be of economic importance in the field.

Bacterial blights (*Psuedomonas syringae* and *Xanthomonas campestris* pathovars) occasionally occur on beans and peas produced in Saskatchewan, especially when grown under irrigation. For the most part, bacterial blights are not considered to be of economic importance except for concerns regarding the export of infected seed. Bacterial blights are controlled using genetic resistance, clean seed, and copper-based fungicides. **Viral diseases** occur occasionally in pulses on the prairies and are rarely of economic importance.

Remember The Success Stories

So although new diseases may be daunting, we can look at the success stories and learn from them. Growers, industry, researchers and government have been responding to change:

- The Crop Development Centre at the University of Saskatchewan has been a leader in developing pulse varieties with improved agronomic traits and disease resistance (Appendix 1).
- Various researchers have been working on understanding how diseases develop and spread, improving fungicide application timing and technology, and agronomic practices to lower disease risk (Appendix 1).
- Industry has also been responding by creating safe, effective and diverse fungicide chemistries. Five years ago, there were limited seed treatments and foliar fungicides available to pulse growers, but now there are at least eight seed treatments and six foliar fungicides registered for pulse crops.
- Government helps fund research projects through the Agriculture Research Fund (ADF); as well, government specialists have been part of teams to help get production information out to farmers. An example of this is the development of the CD ROM *Management of Ascochyta Blight of Chickpea in Saskatchewan* (for more information call 306-787-5297).
- Of course, the cornerstone contributors to these success stories are experienced pulse farmers who are willing to take a risk, whether it is in trying new crops or new control techniques. The Saskatchewan Pulse Growers is a leading organization when it comes to supporting research and promoting crop diversification.

But Remember The Lessons You've Learned!

You are here today because you are pioneers in pulse production. As new frontiers are met, new diseases and new lessons can be expected. For example, a **long crop rotation** (at least 3 years) between the same type of pulse crop is necessary to allow for the breakdown of old residue on which disease pathogens survive. This has especially been important for ascochyta blight in chickpea and anthracnose in lentil.

Another lesson is to **rotate fungicides with different chemistries** when multiple fungicide applications need to be made. Recent research has found that an isolate of *Ascochyta rabiei* has resistance to a fungicide in the strobilurin chemistry group. The risk of developing resistance has been high for ascochyta blight in chickpea because of the multiple uses of strobiluron fungicides, as well as the genetic diversity of the pathogen. Make sure you use different fungicide chemistries to prevent a resistant pathogen population to prolong the effectiveness of the strobiluron products.

For those of you in canola and pea growing regions, you are already aware of **sclerotinia stem rot**. With the expansion of red lentils into these regions, there is an increased risk of developing sclerotinia. Make sure you are using good crop rotation, field scouting and fungicides on your farm.

Proper timing of foliar fungicides. Anthracnose in lentil and ascochyta blights in all pulses were at low risk in the early part of the 2004 season; however, July temperatures were warm and the crops responded by rapid vegetative growth. Once the canopy closes in and creates a humid environment underneath for disease development, it is virtually impossible to get foliar fungicides down through the canopy where they need to be to protect the crop. Another lesson regarding timing of fungicides is to make sure they are applied before rain events to be most effective. Crop scouting is key.

Conclusion

Being asked to give a talk on upcoming disease threats is a bit like trying to predict when the Roughriders will win the Grey Cup! My predictions will not necessarily come true and I may have overlooked some serious disease threats. Hopefully, I have erred on the side of caution and new diseases will not be limiting to pulse production.

Regardless, Saskatchewan farmers and their producer organizations have proven to be highly adaptable. Sometimes it may seem like the speed for change and new research is a slow moving giant, but it is a powerful one and we do have success stories—keep that in mind and look forward to upcoming challenges.

APPENDIX 1: PULSE DISEASE RESEARCH IN THE PRAIRIES:

PROJECT DESCRIPTION:	RESEARCHERS:	LOCATIONS:
Ascochyta Blights		
Improvement of chickpea disease control through spray application delivery methods	S. Banniza T. Wolf G. Chongo	Crop Development Centre, University of Saskatchewan (CDC, U of S); Agriculture & Agri-Food Canada (AAFC) Saskatoon
Development of cost-effective fungicide application strategies for the control of ascochyta blight in chickpea / integrated ascochyta blight management	S. Banniza T. Wolf B.D. Gossen Y. Gan	CDC U of S; AAFC Saskatoon; AAFC Swift Current
Population studies of *Ascochyta rabiei* on chickpea crops in SK.	S. Banniza G. Chongo	CDC U of S
Ascochyta rabiei population study	S.F. Hwang	Alberta Research Council (ARC), Vegreville
Developing cultural and alternative tools to manage ascochyta blight in chickpea	Y. Gan T. Warkentin S. Banniza B.D. Gossen T. Wolf	AAFC Swift Current; CDC U of S; AAFC Saskatoon
Characterization and integrated cultural and chemical control of ascochyta blight of chickpea	S.F. Hwang B.D Gossen	ARC Vegreville; AAFC Saskatoon
Investigation into the population structure of *Ascochyta lentis* in lentil	S. Banniza A. Vandenberg	CDC U of S
Sclerotinia / White mould		
Control of sclerotinia stem rot in small-seeded lentil production in the black soil zone	S. Banniza A. Vandenberg H.R. Kutcher B.D. Gossen	CDC U of S; AAFC Melfort; AAFC Saskatoon
Field studies to develop a decision support system for the application of fungicides for white mould of dry bean	D. McLaren R.L. Conner G. Platford	AAFC Brandon, MB; AAFC Morden, MB; P&D Agro Consulting
Field validation of bacterial blight resistance genes	R.J. Howard	Alberta Agriculture, Food & Rural Development (AAFRD) Brooks, AB
Effectiveness of the biocontrol agent *Coniothyrium minitans* in reducing severity of white mould in dry bean	D. McLaren H.C. Huang	AAFC Brandon, MB; AAFC Lethbridge, AB
Other Diseases		
Investigation into the biology of *Stemphylium botryosum,* a potentially new pathogen in lentil production in SK.	S. Banniza A. Vandenberg	CDC U of S
Epidemiology of *Erwinia rhapontici* (pink seed) in pea	H.C. Huang	AAFC Lethbridge, AB
Integrated control of Rhizoctonia root rot in pulses	S.F. Hwang B.D. Gossen	ARC Vegreville; S.F. Hwang

Characteristics of fusarium diseases of pea in AB and their integrated control	S.F. Hwang	ARC Vegreville
Common bacterial blight, anthracnose and root rots in bean	S. Parks P. Balasubramanian R.L. Conner K. Yu F. Kiehn H. Muendel	AAFC Harrow, ON; AAFC Morden, MB; AAFC Lethbridge, AB
Determining the cause of early yellowing syndrome on dry bean in AB	R.J. Howard	AAFRD Brooks, AB
Understanding the epidemiology of bacterial blight diseases on dry beans in AB	R.J. Howard	AAFRD Brooks, AB
Disease Resistance & Breeding Programs		
Chickpea breeding program	T. Warkentin	CDC U of S
Identifying genetic resources for resistance to ascochyta blight in chickpea	B.D. Gossen S. Banniza T. Warkentin	AAFC Saskatoon; CDC U of S
Identifying resistance genes in chickpea accessions	A. Diedrichsen L. Buchwaldt	AAFC Saskatoon
Off-season evaluation of ascochyta blight reaction in chickpea.	T. Warkentin A. Vandenberg S. Banniza G. Chongo R.S. Malhotra	CDC U of S
Improving *Ascochyta rabiei* resistance in chickpea	M. Lulsdorf T. Warkentin B. Tur'an S. Banniza A. Diedrichsen N. Mallikarjuna	CDC U of S; AAFC Saskatoon; ICRISAT
Lentil breeding program	A. Vandenberg	CDC U of S
Canopy and stem stiffness contribution to disease resistance in lentil	R. Ball A. Vandenberg A. Sarkar S. Banniza T. Warkentin	CDC U of S
Identification of resistance genes in lentil	A. Diedrichson L. Buchwaldt	AAFC Saskatoon
Integrated long-term strategy for genetic improvement of resistance to ascochyta blight and anthracnose in lentil	A. Vandenberg A. Tullu M. Lulsdorf J. Valkoun L. Buchwaldt A. Sarker S. Banniza	CDC U of S

Development of a cDNA based rapid screening method for ascochyta blight resistance in lentil	A. Vandenberg P. Vijayan S. Banniza T. Warkentin	CDC U of S
Pea breeding program	D.J. Bing T. Warkentin	AAFC Morden, MB; CDC U of S
Screening of *Pisum* species (field pea) with potential new sources of mycosphaerella resistance	R.L. Conner S.F. Hwang B.D. Gossen	AAFC Morden, MB; ARC Vegreville; AAFC Saskatoon
Improved genetic resistance to mycosphaerella blight of field pea	S.F. Hwang	ARC Vegreville
Bean breeding programs	S. Parks P. Balasubramanian F. Kiehn H. Muendel A. Vandenberg	AAFC Harrow, ON; AAFC Morden, MB; AAFC Lethbridge; AB; CDC U of S
Molecular markers for disease resistance	A. Vandenberg A. Tullu B. Tur'an K. Bett T. Warkentin S. Banniza	CDC U of S

ADVANCED HARVESTING TECHNIQUES – ADDRESSING QUALITY ISSUES AND HARVEST LOSSES IN PULSES

Bryan Nybo
Manager
Wheatland Conservation Area Inc.
PO Box 2015
Swift Current, SK S9H 4M7

Biography

Bryan Nybo was born in Swift Current and raised on a farm in the Hodgeville area that has been operated by the family since 1909. He has been actively involved in the farm from an early age and has recently taken over the operation from his father.

In 1986, he received a Bachelor of Science in Agriculture with a degree in Mechanized Agriculture. He has been employed by the Wheatland Conservation Area Inc. since 1987, working with various salinity diagnostic programs, and in the Agriculture Canada Salt Lab studying salt tolerant forages. In 1996, he helped set up and managed an Applied Research Farm in Swift Current under the AFIF Hub and Spoke program, studying agronomic issues in pulses and special crops. In 1999, he was involved in the development of a network of Applied Research sites called AgriARM, which was formed in 2002. As a member of AgriARM, his studies expanded beyond agronomics, and branched into business development projects aimed at fostering local agri-business.

Bryan earned his Professional Agrologist designation (P.Ag). from the Saskatchewan Institute of Agrologists in 1991.

Outline

Research conducted at Oregon looked at header modifications for decreasing harvest losses in chickpea (Siemens et al., 2003). By utilizing different modifications and header types available, losses could be decreased by as much as 43% in chickpea. New generation stripper headers designed for pulses are very gentle on crops, have zero or no foreign material in the grain sample, leave standing stubble for snow catch/soil conservation and are easier on the combine with less wear and faster operation. The issue this research did not address was the quality of the samples produced by each treatment.

Issues with grain quality and consistency were raised during the Saskatchewan Agriculture, Food and Rural Revitalization/Saskatchewan Pulse Growers Pulse Processing Conference in December 2003. Assad Abdelnour from CLIC foods elaborated on his concerns with buying Canadian pulses. Quite often, quality and consistency are problems they deal with and his firm would rather source from other higher-quality producers. It was clear from the processor's conference in December that we in Saskatchewan need to address quality issues to meet the buyers' needs such as CLIC in order to solidify our place as a premium grower of pulse commodities.

This project, funded by the Saskatchewan Pulse Growers, utilized commercial equipment and commercial scale plots to obtain harvest samples from the header types (treatments) available. The three header types included: (1) a Shelbourne Stripper header, (2) a rigid straight cut header with a bat type reel, and (3) a pick-up header with a Victory pick-up. Yield, harvest losses, dockage, and mechanical damage were measured in lentils and chickpeas only. A single year of data was collected; therefore, results are far from conclusive. In 2004, we saw no significant yield differences between treatments in either chickpeas or lentils and very small differences in header losses (Table 1). In lentils, there were no significant differences in dockage or mechanical seed damage.

Table 1: Lentil Yields and Losses

Treatment	Yield (bus/ac)	Header loss (%)	Pre-harvest loss (%)	Total loss (%)
Stripper	24.6	3%	2%	5%
Straight Cut	24.6	2%	2%	4%
Pick Up	26.6	2%	nil***	2%

***The swathing operation itself showed no losses. However, swaths are very vulnerable to wind damage and significant pre-harvest losses are common.

The main objective of this study was to demonstrate an alternative harvesting tool to producers, and explore potential avenues for future development. We propose to further investigate potential benefits from stripper-type headers such, as ethanol and fibre production, fuel efficiencies and harvest speed, harvest timing and harvesting "green crops", recropping tall stubbles left behind from stripper headers and reduced herbicide drift in these taller stubbles.

NOTES

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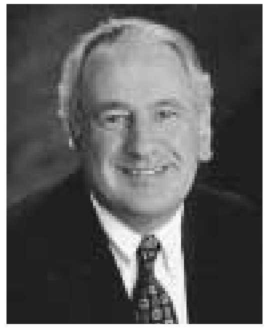
THE MARKET FOR FUNCTIONAL FOODS



Steven Allen
Vice-President, Nestlé USA
Glendale California
800 N Brand Blvd
Glendale CA USA 91203

Biography

Steve Allen is Vice-President, New Business Development for Nestlé based in Glendale California. He has been in the food industry for over twenty years. Steve gained experience working in Africa, the Middle East, the Far East and Switzerland. Prior to moving to the USA he was head of the Nutrition Division of Nestlé in Canada. He has responsibility for sale and licensing of Intellectual Property for Nestlé (brands, patents and technologies).

Steve was born in England and has an undergraduate degree from the University of Leeds and a graduate degree from the University of London.

Nestlé established a Euro 150 million Fund, Life Ventures by Nestlé two years ago. The Fund invests in enabling technologies (genomics, proteomics, bio-informatics etc.) as well as in products and processes in Food and Nutrition. The Swiss-domiciled Fund invests worldwide and has an objective of long-term capital growth and to develop relevant businesses that are of a high-risk nature or do not fit with the immediate strategic priorities of Nestlé. The Fund is managed by Inventages.

Nestlé is a limited partner in a US-based Nutraceutical venture fund managed by Burrill & Co. and Steve represents Nestlé's interests with that Fund.

Outline

1. What are Functional Foods?
   i. Definitions – Nutraceuticals, Bioactives, Cosmeceuticals
   ii. Market size and structure

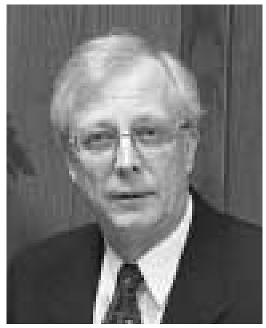
iii. Regulatory background
iv. Product Examples

2. New Functional Foods – Why do they succeed?
    i. Category Busters and Category creators
    ii. The challenge for “Bioactives”
    iii. Products to watch

3. Opportunities for Pulses
    i. Lessons from other commodities
    ii. Value-added products

4. Questions and Answers
    i. Take your pulse!

GLUTEN-FREE MANUFACTURING AND THE MARKET FOR PULSE PRODUCTS



Jerry Bigam
Kinnikinnick Foods
10940 - 120 St
Edmonton, AB T5H 3P7

Biography

Jerry Bigam is currently Chairman and CEO of Kinnikinnick Foods Inc. which is a specialty food manufacturer and one of the leading brands in the Gluten Free food market in North America.

The company supplies specialty foods throughout North America through retail stores to complement its well established direct home delivery program.

Mr. Bigam is currently a Director of both the Alberta Food Processors Association, and the Agriculture and Food Council. He has presented a number of seminars and lectures relating to ecommerce, export development and business development to a variety of audiences. He is actively involved in the Celiac Associations as well as a CEO Club for Food Processors.

Outline

Background
- Products and ingredient makeup

Gluten free manufacturing and its uptake for pulse ingredients

Substitutability of pulse products for conventional and unconventional grains

Forms of ingredients required
- Starch, protein, fibre, flour

Processing requirements and the scale of processing needed

- Potential markets versus scale-up issues
- Market opportunities in consumer products

Emerging problems with pulses as an ingredient

Mid term opportunity for pulses in the specialty food business

SPAIN: CHANGES AFFECTING ONE OF THE MOST IMPORTANT MARKETS FOR CANADIAN PULSE PRODUCERS

Marc Gagnon
International Trade Canada
Canadian Embassy
Nuñez de Balboa,
35, 3°, 28001 Madrid
Spain

Biography

Marc Gagnon gained his professional experience in the private sector mainly with the pension and investment fund CDP in Montreal where he held the position of strategic planning analyst for the international department.

He has worked for International Trade Canada since 1999 as a Commercial Attaché at the Canadian Embassy in Madrid, working primarily in the areas of in agriculture/agri-food.

After earning a bachelor degree from the University of Montréal and a master's degree in international economics from the Graduate Institute of International Studies in Geneva, Switzerland, Mr. Gagnon continued his studies in a graduate program at FLACSO, Quito, Ecuador.

Outline

Pulses have been a mainstay of the Spanish diet for centuries, particularly chickpeas, kidney beans and lentils. Yet in recent years, their share of the household food basket in this country has been falling. There are in fact two clearly distinguishable trends at work:

- On the one hand, demand for dried pulses is decreasing in Spain because of changes in how the country's households are organized. Any future increase in consumption of these products would therefore appear unlikely.

- And on the other hand, the volume of pulses in processed foods purchased by consumers is growing. The key to this trend is the ease of preparing these new products—often simply a matter of heating and serving. Consumption of these products is certain to increase in Spain over the next few years.

Canadian pulse producers will be affected by the new strategies of Spanish importers who are positioning themselves in this tumultuous market:

  - Some companies are directing their efforts at encouraging year-round consumption of their products (Spanish consumers traditionally favour pulses more in winter).

  - Others are working with technical institutes, laboratories or universities to design altogether new products.

  - Yet other companies are attempting to introduce new prepared dishes and presentations.

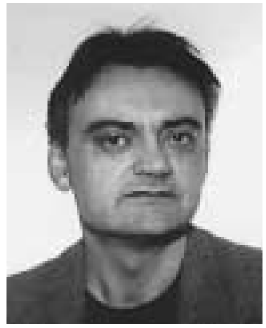
In all cases, producers are guided by the same realization, namely that they must retool to meet new consumer demands because the traditional market for dried pulses is saturated, making further gains in that area impossible. At the same time, companies offering pulses in Spain must bear in mind three important factors:

- Spain does not produce enough pulses to meet national demand.
- Spanish consumers are highly sensitive to price changes.
- There is a segment of consumers willing to pay more for pulses, but in exchange, they will demand higher quality.

Self-serve outlets are gaining market share with respect to pulse products. Thus, distribution through traditional grocery stores is declining, while the opposite is true for supermarkets and big-box stores which now account for the majority of sales of both dried and processed legumes on the Spanish market. It appears that the gap will continue to rise in coming years.

Finally, a few groups with interests relating to the pulse sector have been attempting to obtain government aid for the production and distribution of these types of products. Among their arguments is the complaint about countries that produce abundant amounts of pulses at competitive prices, but pay little heed to the quality of their products. Their demands are unlikely to succeed, however, since the low prices offered by these countries—such as Canada—play a vital role in a sector with such slim profit margins.

THE SPANISH EDIBLE PULSE MARKET



Paco (Francisco) Navarro
Owner- Brokerval
International Food Broker
Cl. Juan Verdeguer, 4 'A'
46024 Valencia, Spain

Biography

Paco Navarro was born and raised in the port city of Valencia, Spain where he pursued studies in the international commerce sector of agricultural commodities from 1983-1985, developing his professional activities in representation and consulting with companies in the edible pulses industry.

In 1997 he founded his own company, BROKERVAL, continuing his specialty in representations and consulting in agricultural commodities in five continents, primarily edible pulses.

Outline

Consumption Statistics

- The market for dried pulses has decreased by 2% according to Nielsen, with only lentils having growing consumption of 1%.
- For cooked pulses, there has been an increase of 4% and again it is the lentils that have had the best results, with a 10% growth in consumption even though they only represent 14% overall.
- '"White Brand" (private labels) continue to grow, representing almost 50% of the volume in both the dried and cooked pulses. ("White brands" are what we would call the generic or store brand in the USA and Canada.)

Varieties Of Products For Each Business Segment

- The market for cooked pulses has the most growth potential, but it is also the one that is more susceptible to price wars. This signifies that the pulses destined for cans / jars have to be the cheapest in price, while the quality has to be equal to the quality being packaged in dry form, the price savings are achieved with the smaller sizes.

- For example:
  - white beans that are 210 grains per 100 grammes for canning against 185 grains per 100 grammes for packaging;
  - dark red kidney beans 200 grains per 100 grammes for canning against 180 grains per 100 grammes for packaging;
  - chickpeas: 9mm for canning against 10mm for packaging.

Market Characteristics in Spain

- In the canning market, for the most part, Canada simply cannot compete in this segment unless it comes up with cheaper product equivalent to pulses being imported from countries like China and Argentina. The estimate for this segment of the Spanish market is approximately 50,000 metric tons.
- In the case of dried, packaged pulses, the products customarily imported from Canada are cranberry beans, dark red kidney beans, black beans, kabuli chickpeas (8, 9 and 10mm size), B-90 chickpeas, Laird lentils, Richlea lentils and Eston lentils, Great Northern beans and peabeans. For all of these products, there are alternative sources of supply, which means that the prices at the time of making purchasing decisions are the only relevant factor.

National Production

- Approximately 20,000 metric tons of beans, 30,000 metric tons of lentils and 55,000 metric tons of chickpeas.
- Beans: primarily local varieties that are consumed domestically and do not interfere with the imported products. These varieties include: Palmeña, Blanca Riñon, Canela, Planchada, Manto De La Virgen, etc.
- Chickpeas: varieties produced are the Castellano, Blanco Lechoso and Pedrosillano. These chickpea varieties, produced in Spain, can interfere with product imported from Canada when prices are competitive because their culinary qualities are superior to Canadian product (ie, they cook better).
- Lentils: varieties produced in Spain include Castellana and Pardina. Both of these varieties can interfere and/or compete with equivalent Canadian product when Spain has a bountiful crop and competitive pricing.
- Furthermore, all of the crops produced in Spain are harvested earlier than Canada. Beans are harvested in August/September, chickpeas in July and August and lentils in June and July.

New Consumption Trends

- The increase in the number of Spanish women in the workforce, and the smaller families that are increasingly the rule rather than the exception, are all factors that motivate new trends in consumption.
- The lack of time to prepare meals from scratch has led to the birth of prepared products. However, Spain does not exhibit the clear tendencies of other countries like France, Belgium or Germany. Spain's culinary traditions do not lend themselves to large growth spurts. The Spanish housewife still prefers to feed her family with dishes made at home.

- While it is true enough that there is an increasing niche market for prepared (pre-cooked) food products, Spain has a long way to go to achieve high levels of sales for these products.
- In the case of pulses, this fact is even clearer. To cook dried pulses, in any Spanish home, with the fast pressure cookers available these days, it does not take much more than 10 minutes. By contrast, rice, which is consumed in large tonnages in Spain, needs almost 20 minutes.
- Furthermore, the precooked (canned) pulses have given a considerable advantage to those Spaniards that have less disposable time, because in 5 minutes they can have a dish fully prepared and ready to eat.
- Some of the precooked and ready-to-eat pulse dishes are not successful at the moment in the Spanish market. Other ready-to-eat dishes based on potatoes, meat, and pasta have suffered losses in consumption in the past few months.

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GROWER PRODUCTION AND DELIVERY CONTRACTS FOR PULSES AND SPECIAL CROPS

Rob Tisdale
Manager, Pulse Division
Agricore United
1200 - 201 Portage Ave
Winnipeg, MB R3B 3K6

Biography

Rob Tisdale graduated from the University of Manitoba with his Agriculture degree in Plant Science in 1970, receiving the Silver Medal in Horticulture.

Rob has worked in the seed and special crops industry since graduation in 1970. He has held various positions in marketing and management, process and operations management and market development. Throughout his career, he has traveled extensively throughout North and South America, Western and Eastern Europe, India and Japan. Since 1988, Rob has worked with Agricore United (formerly Xcan Grain) in Winnipeg.

Rob is involved in numerous professional associations, including the Canadian Seed Trade Association, Canadian Spice Association, and the Canadian Special Crops Association. He has served on several committees of the Canadian Grain Commission and is presently part of Agriculture Canada's Value Chain Roundtable on Special Crops.

Outline

Current Pulse Market Situation

- What's happening in pulse markets today?

The need for standard contracts

- Tremendous growth of the industry in a relatively short time: many new players, some inexperienced

- Can lead to chaos
- Group of industry and growers worked together to develop standard contracts to reduce chaos

Overview of Production and Delivery Contracts

- Why use contracts?
- Contract elements
- How they can be used to reduce risk
- What to watch for

Contract Objectives

- Two contract forms producers and dealers can read and understand
- Contract should cover the general understanding of volume, grade, price, delivery and payment.
- Specific details for producers and buyers are described on the face of the contract.
- Should result in a business environment with the increased security and trust that both parties have intended.

Where To Get Copies Of Standard Contracts

- Pulse Days registration desk
- SPG website (www.saskpulse.com) or office: (306) 668-5556
- Canadian Special Crops Association (CSCA) website (www.specialcrops.mb.ca) or office: (204) 925-3780.

Points to remember

- When things are not working out, it is a good time to get back to the basics.
- While contracts can form a common understanding between growers (sellers) and grain companies (buyers), it is the inherent trust in the actual relationship that is of primary importance.
- The intention of these documents is to provide an accurate memory of what was intended at the time of signing. The contract will minimize uncertainties about the obligations when, over time—however brief or extended it may be—the circumstances of reality change.

2005 PRICE/PRODUCTION OUTLOOK SESSION (MODERATOR)

Jack Dawes
Manager, Sales & Market Development
Milligan BioTech
Saltcoats, SK S0A 3R0

Biography

Jack Dawes is a Manitoba boy by birth. He took grade school in Portage la Prairie, high school in Lynn Lake and university at Brandon. Somehow, he ended up with a BA degree. But more importantly, at Brandon he met Jeanette, also a Manitoba farm girl, and mother of their three children.

Jack manages sales and market development for Milligan Bio Tech, a group of canola entrepreneurs from Foam Lake, Saskatchewan. The company produces canola-based diesel fuel conditioner, penetrating oil and a canola-based dust suppressant. Prior to joining Milligan Bio Tech, Jack was an agriculture radio journalist for about 16 years in Yorkton, Saskatchewan, and Dauphin, Manitoba.

Jack began his work-life as a school teacher, later switching to radio broadcasting, but he also gained experience in both newspaper and television reporting along the way, and has worked as a freelance writer. In between some of those assignments, Jack learned about sales, marketing and promotion through a variety of work experiences, including several years as promotions and operations manager at a Yorkton shopping mall.

Outline

- I am particularly honoured to be asked to be part of what to me is one of three or four major agriculture events in Canada on an annual basis. I rank Crop Production Week on par with events such as Canadian Western Agribition, The Farm Progress Show and the Toronto Royal Agricultural Fair.

- I look forward to our three speakers' perspectives on what is in store for this year's prices and production outlook.
- I encourage your questions!

PRICE/PRODUCTION OUTLOOK FOR PULSES IN 2005

Shaun Wildman
Senior Merchandiser
Saskatchewan Wheat Pool
2625 Victoria Ave
Regina, SK S4T 7T9

Biography

Shaun Wildman grew up on a grain and oilseed farm near Flaxcombe, Saskatchewan. Since graduating with a degree in Agriculture from the University of Saskatchewan he has worked in a number of capacities related to grain marketing including cash grain brokerage, commodity futures brokerage as well as working on the trading floor of both the Winnipeg Commodity Exchange and the Chicago Board of Trade.

Since 2000, Shaun has been working with Saskatchewan Wheat Pool, originally merchandising lentils and chickpeas and most recently as the Senior Merchandiser for Peas.

Outline

Review of 2004 Field Pea Production Fundmentals

- Producer selling has been slow on account of historically poor prices.
- Record field pea production is leading to record expected December 31 stocks on farm.

Projection for 2005 Field Pea Acreage

- What will the change in acreage mean for price?
- Saskatchewan production is moving from north to south. What does this mean for the industry?

- How important is Saskatchewan pea production in Canada? In the world?
- What percent of the pea crop normally grades as feed and what percent normally trades as feed?

External Factors Affecting Values

- Does a 3 MMT pea crop matter when feedstuff traders are focusing on US corn production of nearly 300 mmt?
- Will ocean freight rates and the Canadian dollar ever go down?

PRICE/PRODUCTION OUTLOOK FOR PULSES IN 2005

Ivan Sabourin
President, Roy Legumex
PO Box 40
St Jean Baptiste, MB R0G 2B0

Biography

Ivan Saboruin graduated with a Commerce Degree majoring in Finance from the University of Manitoba in 1990. After working with the Government of Manitoba in Debt Finance, he started working with the family company - Roy Legumex Inc. as a trader. Initially Ivan was dealing primarily with lentils but has since added edible beans which is now his main product. In 2001, Ivan became the President of the company.

Outline

Kabuli Chickpeas
- Last year's Canadian crop / problems
- Mexico's crop
- Turkey's crop
- The future of kabuli chickpeas in Canada
- Domestic Demand?
- Buy Canadian or offshore?

Eston lentils
- Supply and demand
- Future output outlook
- Competition for acres with red lentils

Trends to watch for in the year ahead
- Your questions?

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PRICE/PRODUCTION OUTLOOK FOR PULSES IN 2005

Greg Kostal
Kostal Ag Consulting
23 Royal Park Cr
Winnipeg, MB R2J 3Z1

Biography

Greg Kostal is an independent analyst and consultant operating in Winnipeg. Greg's firm conducts market analysis and personalizes that with a consulting and advisory service tailored specifically to commercial and farm business operations. His primary goal is to provide big-picture fundamental guidance on marketing.

Related work experience includes employment with Sparks Companies, Continental Grain and UGG. He grew up and is still involved with the family farm in Red River Valley, just south of Winnipeg, Manitoba.

Outline

Overview:
In 2004, Canada may be quality-challenged, but isn't short on quantity. Therefore, price-spreads will resolve the imbalance as opposed to an outright need to ration demand. The top three fundamental points for 2005 are:

- for higher Canadian pulse acreage
- a shift from yellow to green pea plantings
- strong global demand, but only if the price is right.

Major price trends into 2005 include:

- a cyclical peak in large kabuli chickpeas
- flat price trend desi chickpea

- flat to lower lentil prices but with a major narrowing of price spreads
- flat pea market, but with tight green-yellow price spreads
- challenge to turn the overall price trend around (particularly for peas) until existing strong ocean freight and Canadian dollar trends reverse.

Lentil Overview

The past five years has really been about a maturing market, understanding the depth of demand, specifically the seasonality of;

- consumptive pricing
- price elasticity of demand
- substitution, either into another yellow-pulse alternative or into a lower-priced lower-quality lentil.

If the price is right, product will clear. These are solid traits that can be taken into 2005.

A low grain/oilseed price cycle and decent absolute lentil prices should boost prairie acreage. Ramadan starts on October 5, eleven days sooner than in 2004. As this progressively occurs earlier in the calendar year, demand will require greater reliance from old crop inventory. Assuming a normal quality outcome in 2005, price spreads should tighten, medium and small greens move to surplus, with large greens claiming a price leadership role. If Canada is to export 0.6 MMT or more lentils in 2005/06 to support a larger crop, prices will need to soften overall. Quality and logistical problems from recent years should reduce forward contracting initiatives. As the market anticipates greater 2005 production in coming months, users are apt to defer purchases.

Red Lentils

- Competitive pressures from Turkey, Syria and Australia
- Challenges and opportunities

Green Lentils

- Seasonal offshore demand considerations
- Demand difference between small, medium and large green lentil
- Role of price discovery in 2005

Field Pea Overview

Despite flat price prospects into 2005, agronomic/yield success and lower nitrogen requirements support a flat to higher acreage trend. A higher mix of green-yellow plantings is expected as more opt to seek out premiums. The job of the market in 2005 is to find a demand-surprise to clear 2004 surplus. That will be difficult amid a depressed soymeal environment. The most likely market candidate is the Indian subcontinent, but import politics need closure and right now, India is reluctant to lose control over imports. In addition, it will be challenging to the turn price trend around until existing ocean freight rates and the Canadian dollar trend reverse.

- India & European situation
- Expanding US production
- Price perspective on what the market needs to do in 2005/06

Chickpea Overview

Large Kabulis have been on a rising price trend for over a year because global supply growth has been smaller than global demand growth. Since Canadian production is small, our role in price discovery is negligible. Higher relative prices to encourage increased global seeded area have consistently been the missing ingredient. However, higher absolute price strength and lower relative prices of competing crops will now likely suffice to create the required boost in global seedings in the 2005 crop cycle. This will likely begin with the Mexican harvest in March-May 2005.

Smaller-Caliber Kabulis are caught in the cross current of cheap and plentiful yellow pulses and needing to clear as a desi, and an expensive large kabuli.

Desi Chickpea – Global fundamentals reflect an environment that balances ongoing demand from India against the need to be price-competitive with other pulses (examples mung beans, peas).

- Global production and trade trends
- Linkage to price

NOTES

ENJOY A STRONG PULSE

Pauline Van Roessel
Rowing Athlete
c/o Alberta Pulse Growers Commission
4301 - 50th St
Leduc, AB T9E 7H3

Biography

The second-youngest of six children, Pauline was born and raised on a mixed farm in Bow Island, Alberta. Growing up, she helped feed the cattle, stacked bales, hoed acres of sugar beets, moved irrigation pipes, chased cattle, operated an open swather in plus 30-degree heat, and many of the other scenarios familiar to farm life.

Pauline played basketball for a number of years with the University of Lethbridge Pronghorns. She graduated with a Bachelor of Education degree from the University of Lethbridge and taught math and physical education for six years.

After the inspirational performance of Canada's rowing athletes at the 1996 Olympics, Pauline took a sabbatical from teaching, enrolled at the University of Alberta in Edmonton, and took up the sport of rowing. By the spring of 1998, Pauline had been invited to join Canada's National Rowing Team.

In the midst of a grueling training regime, Pauline graduated with Distinction with a degree in Industrial Design in 2002. Later that year, she competed for Canada in the World Cup and World Rowing Championships, earning silver medals at both.

In 2003, Pauline kept up her training scheme, rowing two and three times a day, six days a week. She raced in the Women's Eight in the Henley Royal Regatta, the Remenham Cup, World Cup Regatta, and the World Rowing Championships, winning among the top three and setting new personal best records.

In 2004, Pauline reached the pinnacle of athletic competition by representing Canada in women's rowing at the 2004 Olympic Games in Athens.

Outline

- Second-youngest of six children
- Born and raised on a mixed farm in Bow Island, Alberta
- Sports background, University days

Values Attained From Being Raised On A Farm
- Well-acquainted with farm work
- Developed discipline and perserverance
- Avoided injuries

Introduction of the sport of rowing
- Inspirational rowers in 1996 Olympics
- Training regime
- Olympic Race Video

Journey to the Olympics
- First National team experiences
- The training road to Athens
- Importance of diet in training and benefits of pulse foods

Frequently-Asked Questions

The Importance of Dreams
- The doors they can open
- Olympic summary video: the training, the racing, and general ups and downs of the Olympics in Athens

Closing Comments

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NOTES

EFFECT OF DAY LENGTH AND NIGHT TEMPERATURES ON CROP GROWTH AND FLOWERING IN FOUR PULSE CROPS

Poster Category: Sustainable Production/Agronomy

Manjula Bandara and Forrest Scharf
Crop Diversification Centre South
Brook, AB, Canada, T1R 1E6
manjula.bandara@gov.ab.ca

Preliminary field studies conducted on mung bean (*Vigna radiata,* cv. AC Harosprout), pigeon pea (*Cajanus cajan,* line P 8304 B), moth bean (*Vigna aconitifolia,* unnamed cultivar) and black gram (*Vigna mungo,* unnamed cultivar) at the Crop Diversification Centre South, Brooks, AB in 2003, have revealed that all these crop species had a slower growth rate and late flowering tendency, compared to lentils and chickpeas grown at the same site. Consequently, they were subjected to frost damage in mid September prior to crop maturity. Longer day length and cooler night temperatures at the test site were considered to be the major contributing factors for the slow crop growth and development.

A growth cabinet study was conducted to examine the impact of day length and night temperature on seedling emergence, growth and flowering of these four crop species. The plant species were grown under four different growing conditions:

- 12h/12h day/night at 24 ˚C/ 6 ˚C,
- 12h/12h day/night at 24 ˚C/ 12 ˚C,
- 16h/8h day/night at 24 ˚C/ 6 ˚C
- 16h/ 8h day/night at 24 ˚C/12 ˚C.

Regardless of night temperature, long day conditions accelerated seedling emergence in all crop species. Longer day length combined with warmer nights enhanced the crop growth in all crop species except moth bean. Despite the day length, warmer night conditions were essential for flowering in pigeon pea and mung bean. For black gram and moth bean, warmer night conditions were crucial for flowering, when grown only under short day conditions. These results suggest that cooler night temperatures are the main impediment for production of these tropical-origin crop species on the Canadian Prairies.

CONTROL OF SCLEROTINIA STEM ROT IN SMALL-SEEDED LENTIL

Poster Category: Pest Management

S. Banniza[1], R. Kutcher[2], B. Gossen[2], A. Vandenberg[1]
[1]Crop Development Centre, University of Saskatchewan, Saskatoon S7N 5A8, Canada
[2]Agriculture and Agri-Food Canada, Saskatoon S7N 0X2, Canada

Sclerotinia stem rot, caused by the fungal pathogen *Sclerotinia sclerotiorum,* has been a serious problem in lentil production in years when late-season precipitation occurs. Resistance to the pathogen is not currently available and recommendations on efficient disease management are not available in this crop. Management strategies for Sclerotinia stem rot in small-seeded lentils in the Black Soil zone were investigated at Rosthern, Saskatoon and Melfort over a period of 5 years. The objective was to study the influence of plant density (50 and 100 plants m^{-2}), the efficacy of different fungicides (Benlate, Rovral Flo, Lance) and the timing of fungicide application (early flowering and late flowering) on the development of the disease.

Three lentil varieties (‘CDC Milestone’, ‘CDC Robin’ and ‘Crimson’) were tested and showed different levels of resistance to white mold. Plant density, regulated through row spacing, had no significant effect on disease severity. Fungicide treatment significantly reduced disease in comparison to the control in some years but not in others. Individual fungicide efficacy and optimal timing of application was influenced by location and varieties. Yield increase through fungicide application was dependent upon disease severity and was only observed at some locations and in some years. Flower petal infection, although reflecting weather conditions during flowering, appeared to be a weak predictor of final disease severity, suggesting that flower petal infection in lentil is not the only strategy of the fungus to infect the plant. Results suggest that fungicide strategies for white mold control in lentil have limited benefit.

CAN AN ORBITAL SORTER BE USED TO IMPROVE MILLING EFFICIENCY IN RED LENTIL?

Poster Category: Genetic Improvement

Jesse Bruce, Kirstin Bett, Brent Barlow and Bert Vandenberg.
Department of Plant Sciences/Crop Development Centre, University of Saskatchewan,
51 Campus Drive, Saskatoon, SK S7N 5A8

Seed shape of red lentil affects visual appearance of whole and dehulled seeds. We are developing laboratory techniques for rapidly assessing the roundness of lentil seeds. Using an orbital sorter, we studied the effect of environment on diameter and thickness of red lentil seeds for a set of genotypes known to vary in seed shape. The results will be used to set objectives for lentil breeding efforts to improve milling efficiency and cooking quality of red lentil.

CHICKPEA ASCOCHYTA BLIGHT MANAGEMENT

Poster Category: Disease Management

Rajamohan Chandirasekaran[1] Yantai Gan[2], Tom Warkentin[1] and Sabine Banniza[1]
[1] Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK
[2] Agriculture and Agri-Food Canada, Swift Current, SK

Producers rely heavily on fungicides to control ascochyta blight in chickpea. Research was initiated to develop cultural and alternative tools to manage ascochyta blight with less reliance on fungicides.

This project has two objectives:

(i) to evaluate and rank varieties in the Saskatchewan regional trials for their susceptibility to ascochyta blight on leaves, stems, and pods,

(ii) to determine the effect of alternative seeding arrangements in managing chickpea ascochyta blight, as well as in reducing fungicide costs.

In 2004, significant differences were detected among kabuli varieties in ascochyta blight severity on leaves, stems and pods, while desi varieties had similar severity levels on these three tissues.

MANIPULATION OF ROW SPACING AND SEEDING RATE FOR THE MANAGEMENT OF ASCOCHYTA BLIGHT OF CHICKPEA

Poster Category: Pest Management

K.F. Chang, H.U. Ahmed, S.F. Hwang and R.J. Howard.
Field Crop Development Centre, Alberta Agriculture, Food and Rural Development
Lacombe, AB T4L 1W1, Canada; (S.F.H) Alberta Research Council, Vegreville, AB T9C 1T4, Canada; (R.J.H.) Crop Diversification Centre South, Alberta Agriculture, Food and Rural Development, Brooks, AB T1R 1E6, Canada

The major factor that limits the production of chickpea (*Cicer arietinum* L.) in Canada is ascochyta blight caused by *Ascochyta rabiei.* Plant density and row spacing may have a profound effect on the epidemiology of ascochyta blight. Two chickpea cultivars, three row spacings and three seeding rates were sown and monitored for disease incidence and severity of infection by *Ascochyta rabiei* at Brooks, Alberta in 2004. Disease data were compared for each treatment throughout the growing season. Analysis of variance indicated significant differences in disease levels between cultivars, among seeding rate treatments and among row spacings later in the season. The interactions of these variables were not statistically significant except cultivar X spacing, and cultivar X seed rate for disease incidence data recorded after 69 days of seeding. Disease progress was slower in the desi cultivar 'Myles' compared to the kabuli cultivar 'Dwelley'. Later in the season, both disease incidence and severity increased rapidly in the desi cultivar. Higher plant populations, due to reduced row spacings and higher seeding rates, significantly increased disease levels.

These preliminary results suggest that wider row spacings and reduced seeding rates, in addition to the use of cultivar resistance, crop rotation and fungicides, could be used to manage ascochyta blight of chickpea. The trial will be repeated in the coming year to confirm these results.

SURVEILLANCE OF ASCOCHYTA BLIGHT OF CHICKPEA IN SOUTHERN ALBERTA IN 2004

Poster Category: Pest Management

H.U. Ahmed, K.F. Chang, S.F. Hwang and R.J. Howard.
Field Crop Development Centre, Alberta Agriculture, Food and Rural Development, Lacombe, AB T4L 1W1, Canada; (S.F.H) Alberta Research Council, Vegreville, AB T9C 1T4, Canada; (R.J.H.) Crop Diversification Centre South, Alberta Agriculture, Food and Rural Development, Brooks, AB T1R 1E6, Canada

Ascochyta blight caused by *Ascochyta rabiei,* is a serious threat to chickpea (*Cicer arietinum L.*) production in Canada. Monitoring the disease situation is a prerequisite for developing effective disease management strategies.

A survey was conducted to determine the occurrence of ascochyta blight of chickpea in southern Alberta in 2004. A total of 28 fields comprising 2579 acres were scouted for the disease. Average disease incidence and disease severity were 23.4% (range 0-100%) and 0.75 (range 0-3 where 0= no disease; 3= 100% plant disease severity), respectively. Kabuli type chickpeas were predominantly grown in this area. Growers reported that crop performance was satisfactory where they took early preemptive disease management precautions. The implications of cultural practices, variety selection and field location on the variability of ascochyta blight in the surveyed areas will be discussed.

PHENOTYPIC DIVERSITY IN LENTIL GERMPLASM AT PLANT GENE RESOURCES OF CANADA

Poster Category: Pest Management

Axel Diederichsen, Peter M. Kusters, Lone Buchwaldt and Ken W. Richards
Plant Gene Resources of Canada, Saskatoon Research Centre, Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, Saskatchewan, S7N 0X2, Canada

Germplasm of 1,156 lentil accessions originating from more than 50 countries is preserved by Plant Gene Resources of Canada (PGRC). Morphologic and agronomic traits were used for characterization of 906 lentil accessions under Western Canadian growing conditions during 2000-2003. A greenhouse screening for anthracnose and ascochyta resistance was conducted with 842 accessions. Phenotypic diversity in lentil is particularly obvious through wide ranges of seed weight and seed colouration. Seed weights occurred from 13.3-78.7 g/1000 seeds. Resistance to anthracnose and ascochyta were found in germplasm from different origins. All germplasm is stored under cool and dry conditions ensuring its long-term preservation. Seeds, passport information and evaluation data are available from PGRC and can be requested via Internet (http://www.agr.gc.ca/pgrc-rpc).

EVALUATION OF LENTIL GERMPLASM TO ANTHRACNOSE RESISTANCE

Poster Category: Genetic Improvement

Jane Fiala[1], Bert Vandenberg[1], Abebe Tullu[1], Sabine Banniza[1] and Ginette Séguin-Swartz[2]
[1] University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5A8, Canada
[2] Agriculture and Agri-Food Canada, Saskatoon Research Centre, Saskatoon, Saskatchewan, S7N 0X2,Canada

Pathological research shows that there are two major strains of lentil anthracnose in western Canada. Screening of cultivated lentil shows no resistance to race Ct0 anthracnose. Evaluation of wild lentil species shows resistance to both strains of anthracnose in an inoculated disease nursery. Crosses were initiated with the objective of transferring resistance to adapted breeding lines. Evaluation of developed hybrids for anthracnose resistance will help develop a better understanding of the genetic control of disease resistance.

Methods and Materials

Field evaluation of lentil varieties to anthrancose resistance was completed in 2001. Wild lentil accessions with resistance to race Ct0 were crossed with cultivated lentil. Embryo rescue was used to facilitate the recovery of hybrids and micrografting was used to maintain embryos with poor root development. Backcrossing was used to maintain fertility. Parental populations were assessed for resistance to anthracnose races Ct1 and Ct0. Hybrid populations were assessed for race Ct1 resistance at the F3 generation. Populations were developed to the F6 generation and assessed for race Ct0 resistance. Disease rating was done according to the classification determined by Buchwaldt et al, 2004. Six severity disease classes based on quantitative and qualitative ratings of stem lesions are done at 7, 14 and 21 days post-inoculation

Results

Two populations are currently being assessed for resistance to race Ct0. Cross Eston x L-01-827(A) was evaluated at the F_3 generation for resistance to race Ct1. Evaluation at the F_6 generation showed that there were several hybrid lines that showed resistance to race Ct0. Comparison of disease ratings will be done to help determine the genetic control of resistance to race Ct0.

Population 2 is a cross between 971-16 x ILWL 430 (*Lens lamottei*). 971-16 is a lentil line developed by the CDC at the University of Saskatchewan. This population is currently at the F_3 generation. Development of this population has been hampered by lack of fertility and poor rooting of hybrids. The population size for evaluation is very small (< 20 lines) and cuttings will be used to evaluate resistance to both races of anthracnose.

Conclusion

Successful transfer of race Ct1 and Ct0 from wild lentil has been achieved. Further evaluation of the hybrid lines will help determine the genetic control of race Ct0 resistance.

DEVELOPMENT OF A NEAR INFRARED REFLECTANCE SPECTROSCOPY METHOD FOR PREDICTING THE CANNING QUALITY OF PULSES

Poster Category: Quality and Utilization (Food & Feed)

J.Y. Han and R.T. Tyler, Department of Applied Microbiology and Food Science
University of Saskatchewan, Saskatoon, Saskatchewan S7N 5A8

The canning quality of pulses has long been determined directly by textural measurement of canned samples. However, conventional canning tests are expensive, labour intensive, and time consuming. Furthermore, the canning protocol requires a relatively large amount of seed, whereas the amount of seed available from breeding programs is usually limited. The objectives of this study are to develop a near infrared reflectance spectroscopy (NIRS) method for predicting the canning quality of dry bean, kabuli chickpea, and yellow and green field pea that is more rapid and less consumptive of sample and resources than currently employed methods.

For the 2003 crop year, 1,038 samples of six market classes of beans (black, Great Northern, navy, pink, pinto and red), 411 samples of three market classes of pea (yellow, green and marrowfat) and 252 samples of kabuli chickpea were canned, quality tested and scanned with NIRS. Correlations between three quality traits (hydration coefficient, percent washed drained weight and texture, and near infrared reflectance (NIR) spectra), were statistically analyzed. The textures of canned black bean, Great Northern bean, pinto bean, red bean, green pea, marrowfat pea and kabuli chickpea exhibited high correlations with their NIR spectra, i.e. coefficient of determination (RSQ) values ranged from 0.71 to 0.99. Black bean, marrowfat pea and chickpea, especially, showed highly reliable correlations with RSQ values of 0.99, 0.88 and 0.93, respectively. On the other hand, the textures of canned navy bean, pink bean and yellow pea were not as highly correlated with their NIR spectra, i.e. RSQ values were 0.66, 0.61 and 0.54, respectively. An additional year's data may improve correlations between texture and NIRS data for navy bean, pink bean and yellow pea.

STEMPHYLIUM BLIGHT A POTENTIAL LIMITING FACTOR TO THE PRODUCTION OF LENTIL IN SASKATCHEWAN

Poster Category: Pest Management

P. Hashemi, A. Vandenberg, S. Banniza.
Crop Development Centre, University of Saskatchewan,
Saskatoon S7N 5A8, Canada

Stemphylium blight caused by *Stemphylium botryosum* has been reported and observed increasingly in lentil in Saskatchewan. Yield losses of more than 90% have been reported under severe conditions in Bangladesh and India. Although this disease is not a limiting factor to the production of lentil crops in Canada at this point, it could develop into a more serious pathogen once competition with other fungi on lentil has been eliminated through resistant varieties. *S. botryosum* is a poorly researched fungus and no information is available on the pathogen on lentil. Initial experiences with the pathogen have shown that it is difficult under laboratory conditions to induce and harvest spores for pathogenicity studies.

Five separate experiments using randomized complete block design were conducted to identify a suitable media for high sporulation, to optimize temperature and incubation requirements for maximum sporulation, and to determine optimum spore concentration for causing infection in experiments. Testing of various media has identified a V8 juice-based medium as the best medium for sporulation. Comparison of sporulation on various additions to this V8 juice medium showed that a mixture of V8 Juice, Potato Dextrose Agar and Difco Agar resulted in the highest sporulation of the fungus. A temperature of 27 ˚C was found to be the optimum for maximum sporulation. For incubation of plates, a treatment consisting of 11 days in light, 3 days dark followed by 11 days' light was found to increase sporulation significantly. For determining the optimum concentration for use on plants, plants of cultivar CDC Glamis were inoculated with different concentration 2 weeks after seeding. The result showed that optimal concentration to cause infection was 2x105spores mL^{-1}. These experiments are part of an effort to develop reliable screening methods to test lentil cultivars and breeding lines for resistance to stemphylium blight.

PATHOGENIC AND GENETIC VARIATION IN *MYCOSPHAERELLA PINODES* FROM FIELD PEAS IN ALBERTA

Poster Category: Pest Management

H. Su, S.F. Hwang, K.F. Chang, R.L. Conner,
T. Warkentin, R.J. Howard, and G.D. Turnbull.
Alberta Research Council, Morden Research Station, Agriculture and Agri-Food Canada,
Crop Development Centre, University of Saskatchewan, Alberta Agriculture,
Food and Rural Development

Eighty-three isolates of *Mycosphaerella pinodes* (Berk. et Blox.) Vestergr. collected from Alberta in 2001 were analyzed for their pathogenicity on ten field pea (*Pisum sativum* L.) differentials, including 'JI96', 'JI181', 'JI190', 'Eclipse', 'Carrera', 'Danto', 'Radley', 'Miko', 'Espace', and 'Majoret' under greenhouse conditions in 2003. Genetic variation was detected by DNA polymorphism using the Random Amplified Polymorphic DNA (RAPD) technique. Six pathotypes of *M. pinodes* were classified according to the average lesion size caused by the pathogen on the differentials. Three pathotypes comprised 72% of the isolates and were avirulent or only virulent on the most susceptible lines 'JI181'and 'JI190', and on the less susceptible differentials 'Eclipse', 'Carrera' and 'Danto'. 'JI96' and 'Radley' were only susceptible to the most virulent pathotype (7% of the population), which caused large lesions on all differentials.

The distribution of isolates causing various levels of disease on susceptible cultivars was nearly normal. The more virulent isolates identified were sampled from the northwest area of central Alberta, where moisture levels are usually higher than in the southeast region. Most of the isolates (74%) from central Alberta were very similar in genotype, while the others could be divided into three additional genotypic groups. No correspondence was found between the groupings in terms of genetic variation and pathotype.

SEEDING CONDITIONS: POTENTIAL FOR MANAGEMENT OF MYCOSPHAERELLA BLIGHT OF FIELD PEAS

Poster Category: Pest Management

S.F. Hwang, R.L. Conner, K.F. Chang, B.D. Gossen,
H. Su, R.J. Howard and G.D. Turnbull.
Alberta Research Counci,l Morden Research Centre, Agriculture and Agri-Food Canada,
Alberta Agriculture, Food and Rural Development

Mycosphaerella blight (*Mycosphaerella pinodes* (Berk. et Blox.) Vestergr.) causes moderate to severe losses in field pea (*Pisum sativum* L.) production throughout western Canada. Field trials to quantify yield losses associated with mycosphaerella blight near Edmonton, AB showed approximately 20% greater yield in plots protected with fungicide throughout the growing season compared to unprotected controls. Field trials were conducted at Edmonton, AB and Morden, MB in 2002 and 2003 to assess the impact of seeding rate, seeding depth and seed infection on blight severity.

Foliar mycosphaerella blight severity increased somewhat at higher seeding rates, so that treatments seeded at 30 plants.m^{-2} had significantly ($P \leq 0.05$) lower levels of disease than those seeded at more than 100 seeds.m^{-2}. However, yield potential was significantly lower at 30 than at 60 plants.m^{-2} and lower at 60 plants.m^{-2} than at 120 or 150 plants.m^{-2}. Seed infection level (infected, mixed, or healthy seed) did not affect disease levels in the crop, but 1000-seed weight and seed yield and were 11% and 17% lower, respectively, in treatments sown with infected seed than in those sown with healthy seed. Depth of seeding did not affect seedling density, severity of disease, yield or seed weight in adult plants.

ISOXAFLUTOLE AND SULFENTRAZONE – POTENTIAL BROADLEAF HERBICIDES FOR CHICKPEA

Poster Category: Pest Management

E.N. Johnson[1], D.A. Ulrich[1], R.E. Blackshaw[2], W.E. May[3],
F.A. Holm[4] and K.L. Sapsford[4]
[1]Agriculture and Agri-Food Canada (AAFC), Scott, SK; [2]AAFC, Lethbridge, AB;
[3]AAFC, Indian Head, SK; [4]Crop Development Center, Saskatoon, SK

Some pulse crops (eg. chickpea, lentil) have few broadleaf weed control options available. Screening of potential herbicides is ongoing with support from the Saskatchewan Minor Use Program, and more recently, the Federal Pesticide Risk Reduction Initiative. Two herbicides have shown potential for broadleaf weed control in chickpea. Isoxaflutole is a carotenoid biosynthesis inhibitor registered in corn in eastern Canada. It is a soil-applied herbicide with a mode of action not available in western Canada.

Chickpea has exhibited good tolerance to isoxaflutole; however, some injury occurred at a 2 to 2.5 X rate on a low organic matter loam soil (Scott) in 2004. Isoxaflutole requires soil moisture to activate and did not provide adequate weed control in Saskatoon in 2003. However, control of weeds such as wild mustard, kochia, and lambs-quarters has been good when moisture is present. Other pulse crops such as field pea, lentil, or dry bean have **no tolerance to isoxaflutole**. Isoxaflutole does not control wild buckwheat.

Sulfentrazone inhibits the protoporphyrinogen oxidase enzyme, which is also a unique mode of action. It is marketed in the United States by FMC and is not presently available in Western Canada. Chickpea has good tolerance to sulfentrazone. Studies in 2004 indicate that field pea has acceptable tolerance, while dry bean and lentil tolerance is poor and very poor, respectively. Sulfentrazone also requires moisture to activate and has been effective on kochia, lambs-quarters, and wild buckwheat. It is not as effective on cruciferous weeds such as wild mustard.

THE EFFECT OF VARIETY AND ENVIRONMENT ON THE COLOUR OF PINTO BEANS

Poster Category: Quality and Utilization (Food & Feed)

Donna Junk, Bert Vandenberg, Kirstin Bett
Department of Plant Sciences/Crop Development Centre,
University of Saskatchewan, Saskatoon, SK

Post harvest darkening of pinto beans is a natural phenomenon that causes the cream coloured background of the beans to change to an unattractive brown colour. The colour change can create a major problem as traders and consumers want fresh, light coloured beans and darkened beans receive a lower price. Although darkening occurs naturally over time, studies have shown that darkening is accelerated when beans are exposed to high temperature, light and humidity. We tried to determine if darkening is influenced by location/growing conditions and if darkening occurs differently among 10 commonly grown pinto varieties as well as a new, upcoming variety that darkens more slowly. The pinto beans were grown in 2004 at Saskatoon, Outlook (irrigated), Davidson, and Oxbow.

At all four locations, seed coats of the slow-darkening variety had a lighter colour at harvest and darkened much more slowly then the conventional varieties. Traders indicated that this new variety could receive a premium price. For current varieties, Maverick and CDC Pintium appear to be slightly superior to the other varieties, but when colour scores are tested statistically, there is no significant difference between any of the current varieties.

We observed differences in colour among locations – these were ranked from best to worst as Outlook, Oxbow, Saskatoon and Davidson. Since the 2004 growing season was difficult for bean production, due to an early frost (and hail at Saskatoon), we cannot make conclusions about the effect of location on the colour of beans.

We learned that both variety and environment influence the colour of pinto beans and that the range of colour difference is enough to influence price. We expect that new varieties with slow-darkening seed coats will attract commercial interest.

EARLY MATURITY STRATEGIES IN CHICKPEA: PYRAMIDING KEY GENETIC TRAITS

Poster Category: Genetic Improvement

Yadeta Anbessa Kabeta, Tom Warkentin, Rosalind Ball and Bert Vandenberg
Department of Plant Sciences,
University of Saskatchewan, Saskatoon, SK S7N 5A8

Chickpea (*Cicer arietinum L.*) is a highly indeterminate species which continues to grow and produce pods through fall, especially in cooler and wetter seasons. This exposes the crop to frost damage, resulting in reduced yield and quality. We hypothesized that earliness could be induced through some strategic traits, including double podding, reduced internode length and early flowering. The objective of this study was, therefore, to determine the individual and combined effects of these traits on earliness in chickpea.

Four single crosses were made: two with the early flowering parent, and one each with the double podding and short internode length parents. Segregating populations of F_2–F_4 generations were evaluated along with their parents in greenhouse and field trials. Significant genetic variability was observed for days to maturity of lower pods and percent pod maturity at four months after planting.

In general, each trait had some effect on earliness, though the magnitude differed, and combining them into a single genotype may help to achieve the desired earliness in chickpea. The F_2 population from the multiple cross (gene pyramiding) showed a wide range in maturity. Several had nearly complete maturity of pods at four months after planting. These were more determinate types as judged by smaller increases in height between flowering and maturity stages and uniform maturity of pods.

STEMPHYLIUM BLIGHT OF LENTIL: FINDING SOURCES OF RESISTANCE

Poster Category: Pest Management

P. Kumar, S. Banniza, A. Vandenberg
Crop Development Center,
University of Saskatchewan,
Saskatoon S7N 5A8 Canada

Stemphylium blight is a foliar fungal disease of lentil. The disease cycle begins with the appearance of small pin-headed light brown to tan color spots on the leaflets. The spots enlarge rapidly, covering the entire leaf surface within 2-3 days. The foliage and stems gradually turn dull yellow, giving a blighted appearance to the affected crop. The infected leaves shed severely, leaving only the terminal leaves on the stems. The disease attacks the crop in the early pod setting stage. This disease is a serious problem in some parts of the world and is widely distributed in Saskatchewan where it is considered to be a minor but not well-understood pathogen. Research projects were initiated to investigate the pathology and genetics of stemphylium blight of lentil. The objectives of the present study were (1) to determine the optimum plant age for inoculation of plants under controlled condition, and (2) to characterize all the susceptible and resistant parents involved in RILs.

The effect of plant age on the development of disease was studied using CDC Milestone and Eston. The results clearly indicated that 2 weeks old plants were less susceptible than 4, 6 and 8 weeks plant age of both cultivars. In another experiment,12 lentil cultivars and parents of breeding lines were inoculated with the fungus to determine whether there were differences in the level of resistance to stemphylium blight. Significant differences in the level of resistance were observed. The local cultivars Eston and CDC Blaze showed equal levels of resistance to that of Barimasur-4, a known source of resistance from Bangladesh. Further studies are underway to study the genetics of resistance.

THE PERFORMANCE OF FERN AND UNIFOLIATE LEAF TYPES OF KABULI CHICKPEA UNDER MODERATE AND HIGH PLANT POPULATION DENSITIES

Poster Category: Sustainable Production/Agronomy

Lin Li[1], Rosalind Ball[1] and Yantai Gan2
[1]Department of Plant Sciences, University of Saskatchewan,
51 Campus Drive,
Saskatoon , SK S7N5A8;
[2]SPARC-AAFC, Swift Current, Saskatchewan

Kabuli chickpea (*Cicer arietinum* L.) has two kinds of leaf types, the fern and unifoliate. The best leaf to use for rapid leaf development in the short growing season of the Northern Great Plains is not yet known. The objectives of this research were to determine the best leaf type and the relationship between leaf type and radiation interception under moderate and high plant population densities.

The study was conducted in the field at Saskatoon and Swift Current in Saskatchewan in 2003 and 2004. The experimental treatments consisted of a factorial combination of 6 commercial *kabuli* chickpea cultivars and two plant population densities: 45 and 85 plants m^{-2}. At Swift Current, under both the moderate and high population densities, the fern leaf trait had higher maximum light interception than the unifoliate leaf trait. At Saskatoon, the fern leaf trait had higher light interception than the unifoliate trait only, at 45 plants m^{-2}. The fern leaf trait produced higher maximum biomass than the unifoliate leaf trait only at Swift Current. Unifoliate chickpea cultivars had a higher maximum biomass under 85 plants m^{-2} than 45 plants m^{-2} at Swift Current. Harvest index and yield were higher for the fern leaf trait in 2003. Tentatively, and in the absence of disease, the fern leaf trait appears to be physiologically superior in terms of yield.

IN SEARCH OF SUPERIOR ASCOCHYTA BLIGHT RESISTANCE FOR CHICKPEA

Poster Category: Genetic Improvement

M. Lulsdorf[1], B. Tar'an[1], F. Ahmad[2], K. Allen[1], S. Banniza[1],
T. Dament[1], A. Diederichsen[3], T. Warkentin[1]
[1] Crop Development Centre, University of Saskatchewan, Saskatoon SK
[2] Botany Department, Brandon University, Brandon MB
[3] Agriculture & Agri-Food Canada, Saskatoon SK

Ascochyta blight is one of the major constraints to chickpea production in western Canada and has contributed to a drastic reduction in acreage over the past three years. No immunity has been found in current varieties and germplasm collections. Furthermore, recent research has shown that there has been a shift in the ascochyta (*A. rabiei*) population to more aggressive strains, which suggests that the disease severity will likely increase in the future. Therefore, new sources of ascochyta blight resistance are urgently needed.

Wild related species have often been used as sources of disease and pest resistance in crop breeding. Hence, we screened a number of annual accessions from wild related chickpea (*Cicer*) species for blight resistance. To date, one accession each from *C. bijugum* and *C. judaicum* were found to have greater resistance than the best commercial varieties. Both accessions have been crossed with breeding lines in order to transfer blight resistance. Experiments are in progress to regenerate viable hybrids. In addition, the search for improved sources of resistance has been expanded to include perennial chickpea (*Cicer*) species.

Cultivars developed from this project will have improved ascochyta blight resistance and hence, will make chickpea more attractive and sustainable in western Canada.

PROGRESS TOWARDS A DOUBLED-HAPLOID PROTOCOL IN PULSE CROPS

Poster Category: Genetic Improvement

M. Lulsdorf[1], R.Grewal[1], J. Croser[2], K. Allen[1], T. Dament[1], T. Warkentin[1]
[1] Crop Development Centre, University of Saskatchewan, Saskatoon, SK
[2] CLIMA, The University of Western Australia, Perth, Australia

Canadian and Australian researchers are collaborating with the objective of developing doubled-haploid protocols for chickpea, field pea and lentil.

Flowers contain female (pistil) and male (anthers) reproductive organs. Anthers contain pollen grains, which are unique in the life cycle of the plant because they contain only one (haploid) set of chromosomes. Given the appropriate tissue culture conditions, plants can be regenerated directly from the immature pollen grains (microspores). Consequently, these plants are haploid. Upon doubling of the chromosome set, either spontaneously or by induction, a normal 'doubled-haploid' plant can be regenerated. These doubled-haploid plants are completely true breeding. Using regular plant breeding methods, this is normally only accomplished after many years of selfing. Doubled-haploid plants are of considerable value to pulse breeding and molecular mapping efforts.

To date, our research has determined the following factors to be important for doubled-haploid production:

- genotype (variety)
- microspore developmental stage
- tissue culture medium composition
- microspore density.
- microspore donor plant growth conditions
- isolation procedure
- pre-treatments

The highest frequency of microspore induction was obtained from field pea cultivars CDC April and Highlight; lentil cultivars CDC Crimson and CDC Robin; chickpea cultivars CDC Cabri, Narayen and breeding line WACPE 2095.

In all three species, symmetrical microspore nuclei division was observed. Some of these induced pollen grains continued to divide and eventually developed into embryos. In rare cases, embryos could be regenerated into plants. Efforts continue to optimize the protocol in order to improve induction rates, embryo development and recovery of plants.

INVESTIGATION INTO THE POPULATION STRUCTURE OF *ASCOCHYTA LENTIS,* CAUSAL AGENT OF ASCOCHYTA BLIGHT

Poster Category: Pest Management

S. McHale, C. Cho, S. Banniza
Crop Development Centre, University of Saskatchewan,
Saskatoon S7N 5A8, Canada

Breeding material is challenged with the pathogen throughout the breeding process and material with higher levels of resistance is selected for further advancement into cultivars. If the population of the fungus does not show any specialization with respect to cultivars, (i.e. if all isolates of the population react similarly to the same cultivar, selection of isolates for pathogenicity testing of breeding material is irrelevant and any field isolate can be used). If, however, specialization within the population has taken place, different isolates may react differently to cultivars in which case it is important to carefully investigate the cultivar-isolate interactions and select suitable isolates or a mixture of isolates for the screening and selection process. Previous investigations into the population structure of *A. lentis* in W-Canada (Ahmed *et al.,* 1996) showed that the fungus is able to change in aggressiveness in a relatively short period of time. Although cultivar specialization was not present in 1992, an increase of cultivars with different sources of resistance during the past decade may have led to the co-evolution of a more diverse and specialized fungal population.

We selected 16 lentil cultivars and breeding lines with different sources of resistance and are in the process of screening at total of 70 isolates on this lentil material. A proportion of these isolates originates from before 1985 and is evaluated alongside isolates collected from 2003 and 2004 to investigate whether recent isolates are more aggressive than isolates from the early 1980s, and whether isolates show specific reactions on certain cultivars. We also intend to analyze the isolates by molecular means. By doing so, we will be able to determine whether the population of isolates we find in fields today has diverged from that present in the early 1980s. We will also be able to use this data to determine whether the sexual stage of the fungus is of important.

IS THERE A RESURGENCY OF *ASCOCHYTA PISI* IN WESTERN CANADA?

Poster Category: Pest Management

R.A.A. Morrall
Department of Biology, University of Saskatchewan,
112 Science Place, Saskatoon, S7N 5E2 (Canada), morrall@sask.usask.ca

Three species of *Ascochyta* cause diseases of pea, *Ascochyta pinodes* (sexual state = *Mycosphaerella pinodes*), *Ascochyta pisi* and *Ascochyta pinodella* (syn: *Phoma medicaginis* var. *pinodella*). Symptoms caused by the three species overlap, and the morphological distinction between asexual spores of *A. pisi* and *A. pinodes* is subtle. In the 1960s, *A. pinodes* was reported to have replaced *A. pisi* as the main foliar blight and seed-borne pathogen of pea in Canada (3). This was attributed to the introduction of Century, a variety resistant to *A. pisi,* and the resulting diminished competition between *A. pisi* and *A. pinodes.* The predominance of *A. pinodes* in western Canada, where the majority of Canadian pea crops are grown, was supported in several subsequent reports, in particular by a study involving isolations from samples collected over a wide area in the 1990s (5). However, in one study in 2000 in Alberta (4) *A. pisi* was more frequently isolated from diseased foliage.

Saskatchewan has an arable area of about 450 km X 550 km and produces pea on 2.5 million acres per year. In tests for seed-borne *Ascochyta* at commercial labs in Saskatchewan, *A. pinodes* has historically been the dominant species found. However, in recent years *A. pisi* has become common, and is dominant in samples from non-traditional pea-growing areas in the south (1, 2). In tests at one commercial lab, the percentages of total *Ascochyta* isolates identified as *A. pisi* in samples from the 2001 crop were 73% for southern areas, 10% for central areas and 1% for northern areas. The corresponding figures for the 2002 crop were 66%, 7% and 0%, and for the 2003 crop were 97%, 28% and 19%. *Ascochyta pinodes* has remained dominant in traditional pea production areas to the north. It is unclear whether the apparent resurgence of *A. pisi* on pea seed in parts of western Canada is related to the introduction of European varieties, which may have been selected where *A. pisi* is not prevalent, or to weather. It is noteworthy that in 2001, 2002, and 2003, average levels of total seed-borne *Ascochyta* for Saskatchewan were lower than in any of the previous three years (1). In 2001 and 2002 rainfall in the growing season was higher in the normally more arid south than in central and northern regions.

Little experimental work has been done in western Canada on *A. pisi,* and practical information is lacking on yield loss, risk assessment for fungicide application, and tolerances for *A. pisi* in seed. Recommendations based on *A. pinodes* may not apply in areas where *A. pisi* predominates. Thresholds for fungicide spraying depend on potential yield losses caused by pathogens and in 1965 Wallen (3) concluded that *A. pinodes* caused greater losses than *A. pisi.* Wallen also concluded that arbitrary scales of seed grade have been set for the three *Ascochyta* species on pea without any knowledge of their relative importance to disease spread in the field. Little has changed in the last 40 years.

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EFFECT OF CULTURE AGE, TEMPERATURE, INCUBATION TIME AND LIGHT REGIME ON GERMINATION OF *STEMPHYLIUM BOTRYOSUM* ON LENTIL (*LENS CULINARIS*)

Poster Category: Pest Management

E. Mwakutuya, A. Vandenberg, S. Banniza
University of Saskatchewan, Department of Plant Sciences, 51 Campus Drive
Saskatoon S7N 5A8

Stemphylium blight, a defoliating fungal disease caused by *Stemphylium botryosum,* has been detected regularly in lentil fields during the past years, but it is still poorly understood. In other countries, it is considered to be a major disease and up to 62% yield losses have been reported from Bangladesh. The fungus produces asexual spores called conidia by which it spreads from plant to plant. These spores are carried by the wind, but require water on leaves to germinated and infect a lentil plant.

A research project was initiated to study the behaviour of these conidia in detail. Experiments were conducted to determine whether the age of a fungal culture has an influence on the behaviour of the spores with respect to germination, what germination rates can be observed at temperatures ranging from 5˚ to 35˚C, how germination rates change over a period of time ranging from 1 to 48 hours, and whether spores germinate more readily in light, dark or an alternation of light and dark. Results showed that culture age and different light regimes did not influence the germination rate of the fungus. High temperatures favor the germination of S. bortyosum and the optimum temperature for conidial germination is between from 25 to 30˚C. This is similar to the temperature optimum of *Colletotrichum truncatum,* the pathogen that causes anthracnose of lentil.

SPINY ANNUAL SOW-THISTLE (*SONCHUS ASPER*) AND VOLUNTEER CLEARFIELD CANOLA (*BRASSICA NAPUS*) CONTROL IN PEAS (*PISUM SATIFUM*)

Poster Category: Pest Management

L. Raatz[1], J. Newman[2] and L. Hall[1]
[1]Alberta Agriculture, Food and Rural Development/University of Alberta, AFNS, 4-10 Ag/For, University of Alberta, Edmonton, T6G 2P5
[2]Alberta Research Council, Bag 4000, Vegreville, AB, T9C 1T4

Spiny annual sow-thistle is a late-germinating weed that is poorly controlled by imidazolinone herbicides used in peas. Volunteer Clearfield canola is also not controlled by standard imidazolinone herbicides, including Odyssey and Pursuit. Trials were conducted in 2003 and 2004 in Ellerslie and Vegreville, AB to test the efficacy and application timing of bentazon (Basagran Forte) on these weeds. Bentazon was applied at 480, 600 and 1200 g ai/ha at the 5 node and early flowering stages of peas. Efficacy, crop tolerance and seed yield were compared to an untreated weedy check.

The earlier time of application was more effective on both spiny annual sow-thistle and volunteer Clearfield canola. Control of volunteer Clearfield canola in the late application was variable between sites and years. At the earlier time of application, bentazon at 600 g ai/ha provided consistent control of spiny annual sow-thistle and volunteer Clearfield canola at both sites and years. There were no significant differences in pea seed yield between treatments and the untreated control at both sites and years. A User Requested Minor Use Label Expansion (URMULE) for bentazon (Basagran Forte) at the 600 g ai/ha applied at the 5 node stage on peas will be submitted to the Pest Management Regulatory Agency (PMRA).

LINKING POLLINATING BEES & PULSE SUSTAINABLE PRODUCTION

Poster Category: Sustainable Production/Agronomy

MarÌa Jose Suso
IAS-CSIC , Apdo 4084, 14080 Córdoba (Spain), ge1susom@uco.es

Breeding for sustainability is mostly a process of fitting cultivars to an environment instead of altering the environment by adding inputs. A crop's biotic environment includes beneficial organisms, such as pollinating bees, which can be employed to increase crop yield and stability. Pulses are pollinated by solitary bees, honey bees and bumble bees. Pollinators help seed and pod setting, but more importantly, by moving pollen from one plant to another, helps to increase the rate of crossing and consequently helps to maintain yield and vigour and to avoid inbreeding depression.

In addition to seeds rich in protein, pulses provide several ecological services for the development of sustainable agro-ecosystems. Among these services, pulses provide nesting places as well as foraging plants for bees. Within the agricultural ecosystem, the pollination of some pulses by bees and the conservation of bees are interdependent. Low-input farming systems must be based on a relation of mutual benefit between the three partners, plant, pollinator and human. Thus, the development of appropriate selection strategies should take into account plant-pollinator interaction.

Great amount of heterosis for yield has been reported by numerous pulse breeders. The exploitation of hybrid vigour in composite and synthetic varieties requires an effective means of cross pollination. Effective cross pollen dispersal largely depends on the types of pollinator visiting flowers and the manipulation of the pollinator behaviour by plant reproductive traits. The characteristics of individual flowers, including their structure, colour, scent and reward (floral design) and the number of flowers open at one time and their arrangement in inflorescences (floral display) are expected to play an important role in the mating pattern. To ensure a reliable pollinator behaviour for seed setting and fruit production, a crop designed to fit to pollinators is needed.

My results provide evidence that floral design and display fairly determine the level of pods and seeds per plant in faba beans. Efficient utilization of the services of bees for the development of hybrid seed technology in pulses requires a massive effort focused on the understanding of variation patterns of both the plant and pollinators and consequently breeding crops with flowers more closely adapted to their pollinator. Exploitation of the potential of nature for pulse production depends on the extension of basic information available on several aspects of pre-mating floral traits tools available from the study of the biology of pollination.

BREEDING FOR HIGHER LEVELS OF RESISTANCE TO ASCOCHYTA BLIGHT IN CHICKPEA

Poster Category: Genetic Improvement

Bunyamin Tar'an, Parvaneh Hashemi, Carmen Breitkreutz, Monika Lulsdorf, Tom Warkentin, Abebe Tullu, Sabine Banniza, Kirstin Bett and Bert Vandenberg
Crop Development Centre, University of Saskatchewan
51 Campus Drive, Saskatoon, SK S7N 5A8

Breeding for higher levels and durability of resistance to ascochyta blight caused by the fungus *Ascochyta rabiei* L. in chickpea has been limited by several factors, including the narrow genetic base and the lack of sources of good resistance in the cultivated chickpea. Several cultivars and breeding lines locally adapted to western Canadian environments, including CDC Frontier and Amit, have moderate levels of resistance to ascochyta blight. Under high disease pressure, these lines typically score 4-5 on a 1-9 scale, where 1=no disease, and 9=completely blighted.

This research examined the genetics of partial resistance to ascochyta blight in the moderately resistant (MR) lines currently available. A series of F_2 populations from crosses between a susceptible (S) line x MR varieties were evaluated for ascochyta blight reaction in the greenhouse and in the field in Saskatoon in 2004. The distribution of the F_2 plants from four F_2 populations derived from S x MR crosses for their reaction to AB suggested a complex genetic control. Also, a set of F_2 populations derived from MR x MR crosses are under analysis. Additionally, several F_2 populations derived from crosses between locally adapted varieties and MR germplasm introduced from ICARDA and ICRISAT were also evaluated in the greenhouse and in the field. Preliminary results suggested that it is possible to increase the level of resistance to ascochyta blight (scores of 3-4 on the 1-9 scale) by intercrossing among selected resistant materials.

New sources for resistance to ascochyta blight from the annual and perennial wild species were tested for reaction to ascochyta blight. Higher levels of resistance (scores of 3-4) were identified in *C. bijugum* and *C. judaicum*. Plantlets have been recovered from the rescued-embryos of interspecific crosses involving these species and cultivated varieties. Tissue culture protocols need to be refined to convert the plantlets into normal plants.

METABOLIC FINGERPRINT (CHEMICAL ANALYSIS) OF LENTIL CULTIVARS AND GERMPLASM ACCESSIONS

Poster Category: Sustainable Production/Agronomy

Apollinaire Tsopmo, Alister Muir, Kendra Fesyk, Axel Diederichsen
Agriculture and Agri-Food Canada,
107 Science Place, S7N 0X2, Saskatoon SK, Canada

Lens culinaris Medik., the most commonly consumed lentil, has mainly been studied for its content of nutrients such as carbohydrates and proteins. Here, a High Performance Liquid Chromatography (HPLC) method was developed to obtain metabolic fingerprints of all compounds without distinction of chemical classes. Extracts (MeOH and MeOH:H_2O (1:1)) of 12 lentil cultivars and 100 representative accessions from the PGRC collection were analyzed by RP-HPLC and the total UV-Vis absorbance profile was plotted using MaxPlot (210-360 nm). The cultivars were all grown on a single plot under the same conditions to avoid chemical variations due to environmental variation. The HPLC data were processed by Cluster analysis. The cultivars were first analysed separately and clustered in two groups (Figure 1). The grouping was not directly related to the green, red, or black classification of lentils. A representative on each group was selected for fractionation and purification of its chemical constituents. The cluster analysis and chemical composition of the lentils will be presented.

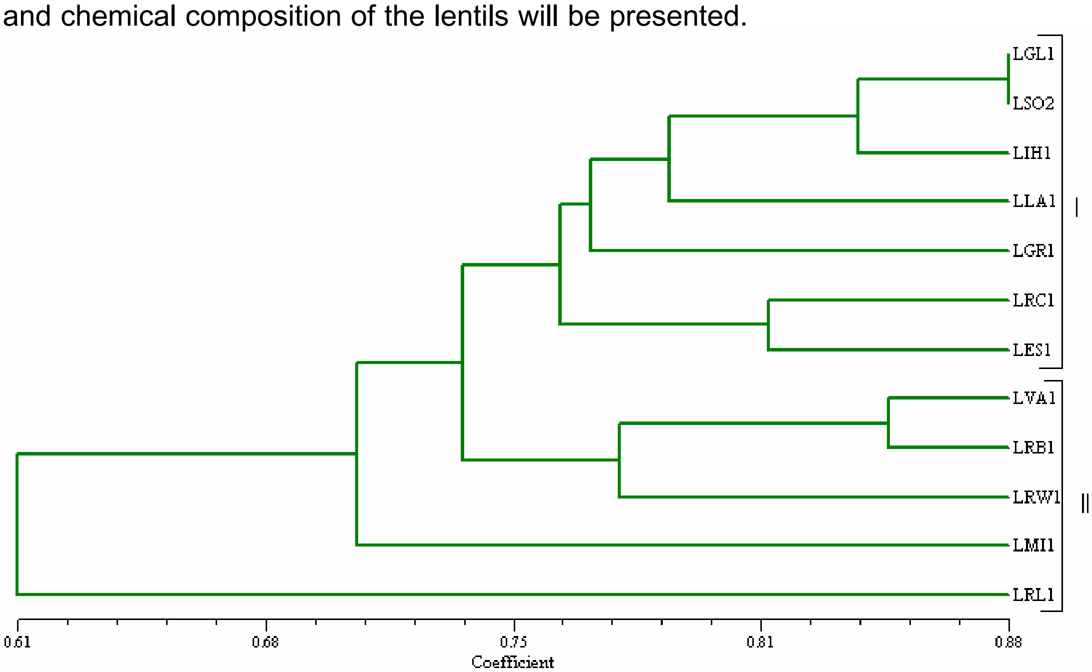

Figure 1. Dendogram of the methanol extract of the12 commercial lentil cultivars.

GENES FOR ASCOCHYTA BLIGHT RESISTANCE ARE LOCATED CLOSE TO A GENE FOR ANTHRACNOSE RESISTANCE IN LENTIL

Poster Category: Genetic Improvement

Abebe Tullu, Bunyamin Taran, Carmen Breitkreutz, Sabine Banniza, Lone Buchwaldt, Stephanie McHale, Brent Barlow, Scott Ife, Tom Warkentin and Bert Vandenberg

Ascochyta blight is one of the most important diseases of lentil in western Canada. It results in reduced grain yield, seed size and grain quality. Sources of resistance have been identified and various inheritance models have been suggested within the lentil germplasm. Indianhead, ILL-5588, ILL-7537 and ILL-4607 are among the few that have been utilized in North America, New Zealand and Australia. Experiments to determine whether the genes are the same or different have not been well documented. This makes it more difficult to pyramid genes from different sources in our breeding program. When growing conditions (such as prolonged rains beginning near flowering, like in 2004) highly favour development of ascochyta and anthracnose in lentil crops, we find that the level of resistance in our varieties may not be enough to withstand disease pressure. As breeders, we should continuously be looking for resistance sources in the germplasm. One such source of resistance is PI320937, which was previously identified as having resistance to anthracnose. This germplasm is also resistant to some isolates of ascochyta blight.

We tested a population developed from a resistant line, PI320937 and a susceptible line, Eston for resistance to ascochyta blight, isolate 3C-2. Results indicated that resistance is controlled by more than one gene in PI320937. We also screened the population for various types of genetic markers, including Amplified Fragment Length Polymorphism (AFLP), Randomly Amplified Polymorphic Markers (RAPD) and Simple Sequence Repeats (SSR) or microsattelites. Using computer programs, (a) we identified the locus controlling resistance to ascochyta blight; (b) we also located a known marker previously identified to be near a locus for ascochyta resistance in the vicinity of this chromosomal region; and (c) the loci for resistance to ascochyta blight in (a) and (b) are also closely associated with a locus for resistance to anthracnose. The availability of genes for resistance to these two pathogens causing ascochyta blight and anthracnose and their use in the breeding program will have a long term beneficial impact on Canadian lentil breeding and the industry.

INTRODUCING FROST TOLERANCE TO COMMON BEAN THROUGH INTERSPECIES HYBRIDIZATION

Poster Category: Genetic Improvement

Gurusamy Valarmathi*, Qiuju Lu, Pat Schryer, Bert Vandenberg, and Kirstin Bett
Department of Plant Sciences, University of Saskatchewan,
Saskatoon, Saskatchewan S7N 5A8, Canada
*Corresponding author guv382@mail.usask.ca

Cultivation of common bean (*Phaseolus vulgaris*) in Saskatchewan is limited by its sensitivity to chilling and sub-zero temperatures. *Phaseolus angustissimus,* a wild bean species, has been shown to be more resistant to sub-zero temperatures. This project involves transferring the frost tolerance trait from *P. angustissimus* into common bean through backcrossing. These species are genetically distant; therefore viable seeds are not easily produced through hybridization. The pods begin to die 3-4 days after pollination. To prevent the embryo from dying, the embryos are removed from the pods and placed on media to grow, a technique known as embryo rescue. Through embryo rescue, nine hybrid plants of common bean (*P. vulgaris*) and wild bean (*P. angustissimus*) have been produced however all are sterile. Backcrosses attempted on these hybrids with common bean have been unsuccessful.

To isolate the problem, pollen studies were carried out with the nine F_1 hybrids microscopically, before and after backcrossing. The sizes of the pollen grains in the hybrids were quite different from the parents. The time interval from pollen germination to fertilization was determined in the individual backcrosses. Successful fertilization occurred between 30-32 hours in the backcrosses, whereas fertilization occurs between 7-8 hours in common bean. These results indicated that fertilization is occurring in our backcrosses. However, the pods and embryos are aborting at a very early stage.

We are currently exploring further treatments to obtain successful backcrosses including:
- increasing the backcross numbers
- application of hormones to the flowers after backcrossing
- improving the tissue culture media to enhance the embryo recovery.

IMPROVING CHICKPEA YIELD THROUGH CANOPY ARCHITECTURE AND POPULATION DENSITY

Poster Category: Sustainable Production/Agronomy

Archie Vanderpuye[1], Rosalind Ball[1], Tom Warkentin[2], Yantai Gan[3]
[1] Dept. of Plant Sciences, University of Saskatchewan, Saskatoon, SK
[2] Crop Development Centre, University of Saskatchewan, Saskatoon, SK
[3] Agriculture and Agri-Food Canada, Swift Current, SK

The two classes of chickpea (desi and kabuli) have two leaf types, namely unifoliate and fern. Desi chickpea cultivars usually have fern leaf types while kabuli have both. Chickpea also have varying growth habits such as branched, narrow or prostrate. Canopy architecture refers to the collective effect of leaf type and growth habit.

Sunlight and water are major requirements for plant growth and as plant population increases, earlier canopy closure is expected to lead to maximum light interception as well as a deceased soil evaporation over the short growing season of the Prairies. We also hypothesized that the fern leaf type would contribute to a lower rate of disease spread. The objective of this study is to select parental genotypes with the best leaf and canopy traits for breeding programs as well as to provide growers with population density recommendations for the brown and black production zones.

Chickpea genotypes with various combinations leaf type and growth habit were grown over three years at three locations (Elrose in 2002, Saskatoon and Swift Current in 2002, 2003 and 2004) at five population densities: 30, 45, 60, 75 and 85 plants m^{-2} (recommended is 44 plants m^{-2}). Measurements of light interception and biomass (every 7 to 10 days), harvest index (HI) and yield (at maturity) and disease ratings were taken. Soil moisture at the beginning and the end of the season were also measured to determine plant water use.

The results show that the fern leaf varieties yielded more in 2002 and 2003 and the narrow and branched growth habits were better than the prostrate type. The highest yields were noted in branched desi genotypes (92-117-25 and CDC Cabri), narrow desi (Myles) and narrow kabuli (Amit). The amount of sunlight intercepted in 2002 was 86% but only 63% was intercepted in 2003. HI was stable across the varying plant population densities in 2002 (about 0.32) and 2003 (about 0.46), the difference being due to an extended late pod-filling period in 2002 and a shortened period in 2003. The observed HI is lower than 0.5, and therefore, chickpea needs improved partitioning of biomass to yield.

IDENTIFICATION AND CHARACTERIZATION OF COLD RESPONSE GENES IN *PHASEOLUS* SPECIES

Poster Category: Genetic Improvement

Grant Woronuk*, Perumal Vijayan, Kari McGowan, Bert Vandenberg and Kirstin Bett
Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK Canada
*Corresponding author gnw631@mail.usask.ca

Introduction of dry bean (*Phaseolus vulgaris*) into Saskatchewan has been limited due to insufficient frost-free growing days and a lack of freezing tolerance in available cultivars. Previous research has identified a wild species, *Phaseolus angustissimus,* which withstands sub-zero temperatures at the first trifoliate in the field. The ability to withstand sub-zero temperatures is related to the ability to turn on protective genes during a period of exposure to low temperatures, also known as cold acclimation. We plan to identify and characterize many of the major genes related to cold acclimation using molecular techniques. Understanding which genes are being turned on during cold acclimation can enable breeders to select for freezing tolerant cultivars of dry bean.

THE NUTRITION VALUE OF ZERO-TANNIN FABA BEANS FOR GROWER-FINISHER PIGS

Poster Category: Quality and Utilization (Food & Feed)

R. T. Zijlstra[1]*, K. Lopetinsky[2], B. Dening[3], G. S. Bégin[4], and J. F. Patience[1].
[1]Prairie Swine Centre Inc., Saskatoon, SK,
[2]Crop Development Centre North, Edmonton, AB,
[3]Alberta Agriculture Food and Rural Development, Barrhead, AB,
[4]Alberta Swine Diet Formulators Corp., Edmonton, AB

Two experiments were conducted to evaluate the nutrient profile of zero-tannin faba beans and to investigate their effects on performance and carcass quality of grower-finisher pigs. In Experiment 1, chemical characteristics were analyzed, and content of ileal and total tract digestible energy (DE), and apparent ileal digestible amino acids (AA) of zero-tannin faba beans were measured using 12 barrows (60 kg; PIC) fitted with an ileal cannula. Standardized ileal digestible (SID) AA content was calculated and net energy (NE) estimated. Faba beans contained (as fed) 27.5% CP, 1.75% lysine, 0.88% threonine, 0.21% methionine, 9.6% ADF, 19.8% NDF, and 1.0% tannins. Pigs were fed either a 96-% faba beans diet to measure energy digestibility or a 62% faba bean with cornstarch to measure AA digestibility. Diets were fed twice daily at 3 x maintenance. After a 6 day acclimation, faeces were collected for 2 days and ileal digesta for 2 days. Ileal and total tract energy digestibility and DE content were 60.2 and 88.5% and 2,362 and 3,471 kcal kg^{-1} (as fed), respectively, and NE was 2,267 kcal kg^{-1}. Apparent ileal digestibility was 85.9, 76.1, and 74.1%, and standardized AA content was 1.54, 0.70, and 0.16% (as fed), for lysine, threonine, and methionine, respectively.

In Experiment 2, 100 grower pigs in 20 pens were fed either a soybean or faba bean-based diet regime from 30 to 115 kg. Diets were formulated to equal NE and SID (Grower (30-60 kg), 2.40/3.95; Finisher I (60-90 kg), gilts 2.38/3.15, barrows 2.38/2.76; Finisher II (90-115 kg), gilts 2.38/2.92, barrows 2.35/2.55; Mcal kg^{-1} NE/g SID lysine $Mcal^{-1}$ NE, respectively) using determined NE and SID values for faba beans. Pigs were weighed, feed intake was measured, and commercial carcass measurements were obtained. From 30 to 115 kg, ADFI (2.58 and 2.56 kg d^{-1}, respectively) and ADG (0.96 and 0.98 kg d^{-1}) did not differ ($P > 0.10$) between faba bean and soybean meal, although minor performance differences occurred. At slaughter, back fat thickness did not differ ($P > 0.10$; 18.4 versus 18.2 mm). However, lean thickness tended to be higher for soybean meal than faba beans ($P < 0.10$; 60.3 versus 64.8 mm). In summary, zero-tannin faba beans have a desirable nutrient profile and do not alter ADFI of grower-finisher pigs at inclusion rates up to 30%. In conclusion, the zero-tannin faba bean is a worthwhile protein ingredient to consider as a replacement for soybean meal.

Attend A Regional Pulse Meeting

Saskatchewan Pulse Growers is organizing three regional pulse meetings this winter. These meetings are your opportunity to:

- hear the latest Market Outlook for pulses
- learn about new varieties and diseases
- get up-to-date on agronomics and SPG activities
- interact with other producers and companies in your area

Pulse Production Meetings

Date	*Facility*	*Location*
Tuesday, February 1, 2005	Palliser Pavilion, Kinetic Exhibition Park	Swift Current, SK
Wednesday, February 2, 2005	Jubilee Hall, Heritage Inn	Moose Jaw, SK
Thursday, February 3, 2005	Exhibition Hall, Exhibition and Rodeo Park	Estevan, SK

All meetings begin at 9AM. For information or to register for any of the above meetings, please contact the SPG office, at (306) 668-5556 or see our website: **www.saskpulse.com**.

Spotlight on Red Lentils

Wednesday, March 2, 2005
Queensbury Centre Salon B
Regina Exhibition Park
Regina, SK

Saskatchewan Agriculture, Food & Rural Revitalization is hosting a meeting to focus specifically on the red lentil industry, including agronomics, marketing, and research. For more information or to pre-register, call SAFRR’s Agriculture Business Centre in Regina at: (306) 787-9773.

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