2023 TALE #4 Archive PDF FINAL Varieties Released 1915 – 2022 May 15, 2023 (File name)

ABOUT TALES OF ALES:

TALES of ALES: Celebrating the Past, and Changing the Future - Stories about some University of Alberta Professors and their activities from the past

The TALES are a series of stories written in retirement by Keith Briggs in 2021 – 2023 as Emeritus Professor of the Department of Agricultural, Food and Nutritional Science (AFNS), Faculty of Agricultural, Life and Environmental Science (ALES) at the University of Alberta. The TALES place into the record some notable agricultural science events and activities for the Archives, stories not previously told or elaborated that may be of interest to the academic, scientific and public communities. They feature Professors or other staff all found in the history of AFNS. The TALES author of record is Keith G. Briggs (AFNS / ALES, on staff 1969-199), with additional authors in some cases.

ABBREVIATED TITLE:

TALE #4 About University of Alberta crop plant varieties released between 1915 and 2022: An update

FULL TITLE:

TALE #4 'Fertile Ground: ALES pioneering journey alongside plant genetics': About plant varieties released by the University of Alberta between 1915 and 2022 (An update)

AUTHOR:

Briggs K. G. 2023 (Emeritus Professor AFNS/ALES, University of Alberta, Edmonton)

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Many were in the 'soil stresses' program

Index notes:
PART 1 of this #4 TALE of ALES is a 'snip and e-copy' version obtained directly from an original article published in the Faculty of ALES magazine 'Greenhouse', authored by Helen Metella (Faculty Extension writer) and Keith Briggs, in 2016. The original can be viewed online in the Winter 2016 ALES 'Greenhouse' magazine archived format at the following URL.

https://www.ualberta.ca/agriculture-life-environment-sciences/alumni-giving/greenhouse-magazine.html

It is republished here in an easier to access format, with additional information that brings it up to date to 2022. Information about which Professors bred each variety is also included in this TALE #4 to make the document more complete for archival purposes.

ACKNOWLEDGEMENTS:

Reviewers of this TALE #4 of TALES of ALES included Professors Dean Spaner and Zenon Kondra, as well as Dr. Joseph Nyachiro (retired, past program leader of the Alberta barley breeding program of Alberta Agriculture, Food and Rural Development at Lacombe, Alberta). Several non-scientists also read the script and all suggestions, editorial comments and corrections received are gratefully acknowledged here. The senior authorship of Helen Metella and her editorial skills in publishing the original shorter story on this topic in 2016 is also especially acknowledged.

ABSTRACT (Albeit a lengthy one!)

This TALE describes the history of crop and other variety breeding carried out at the University of Alberta by professors in the Faculty of Agriculture from its inception in 1908 through to the 21st century. From the very beginning academic staff appointed to the Faculty realized the importance of breeding suitable varieties for production by settlers and farmers, that would be specially suited to the Northern Alberta short seasons and generally harsh climatic and growing conditions. In the early 1900's immigrants brought with them seed of the varieties which they grew in the countries from where they came, but many of these varieties proved unsuitable for Prairie conditions. They were therefore pleased to change to locally bred varieties better suited to production on their homesteads. In later years this essential need for access to locally bred and adapted crop varieties has remained pivotal for successful cropping. The University of Alberta was the first research center in Alberta to address this need and has released many varieties over the years. By 2022 The Department of Agricultural, Food and Nutritional Science (AFNS) in the Faculty of ALES (Agricultural, Life and Environmental Science) can count in its history release of over 69 plant varieties in 15 different plant species. In 2023 plant breeding research continues with a special emphasis on canola and early maturing spring wheat varieties.

This TALE #4 has several different sections. Part 1 is the republishing of the 'out of print' 2016 article by Helen Metella and Keith Briggs that describes the parallel tracks of the discovery of Mendelian genetics and its practical application in crop variety development at the University of Alberta up until 2016. That article was based on an earlier (unpublished) article by Briggs '100 Years of Plant Genetics and Plant Breeding in the Faculty of ALES'. Part 2 of the TALE brings the story up to date to 2022.

Part 2A describes the 'Early Years' of plant breeding in the Faculty. Highlights in this section include reference to Professor Guthrie Sanford starting the very first barley breeding program in the Province (with an emphasis on malting barley for beer production). A long list of other academic staff also contributed varieties and related plant genetic research throughout this period . It includes Robert Newton (UofA 1931-1942), who excelled in research about crop production, frost and drought resistance in plants, and the bread-making quality of wheat. He also worked on forage crops and was the originator of the term 'pesticide'. Other important plant genetics/crop breeding researchers in this era were James

Fryer (UofA alfalfa and corn breeding 1920-1949), Olaf Aamodt (UofA cereal breeding 1928-1935), Kenneth Neatby (UofA genetics and plant breeding 1935-1940), John Unrau (UofA wheat and sunflower breeding 1949-1961) and Arthur McCalla (UofA cereal physiology and biochemistry 1941-1971). A Department of Horticulture was formed in 1935, including George Harcourt (UofA tree breeding 1915-1935) and James Shoemaker (UofA ornamentals breeder 1935-1946). In 1946 the Prairie Fruit Tree Breeding Project and the Native Fruit Station at Rocky Mountain House were also established jointly with the Canada Department of Agriculture.

These Faculty plant breeders also became internationally famous, individually and as a group, for the impact of their research discoveries in the field of applied plant genetics. Of particular note was Clayton Person (PhD student,1958-1961 and first PhD graduate in the Faculty of ALES, later appointed as Professor), who increased the understanding of how the genetic structure of a parasitic population (eg. a disease) interacts with that of its host population (eg. plants). John Kuspira (1955-1961), developed unique ways to manipulate the chromosomes of wheat which enabled a new understanding of the chromosomal control of wheat traits, later used to learn about which individual grass species were the ancestors of modern wheat species. This plant genetics group in the 1950's was unquestionably the premier plant genetics group at any University in the world, as the Clayton/Kuspira discoveries were complemented by discoveries of other staff appointed in the 1940's and 1950's. International reputations for their research in plant genetics were earned by several staff: Karlis Lesins (Plant Science 1954-1961) became a renowned *Medicago* taxonomist, whose 3000+ alfalfa and *Medicago* germplasm collection was donated to the USDA *Medicago* collection on his retirement. He also developed the first self-pollinated alfalfa germplasm. Rustem Aksel (Plant Science 1957-1961) developed much of the foundational research methodology and literature for the genetic study of quantitative traits in plants, those that are controlled by multiple genes, and for quantification of maternal inheritance in plants. Leroy Johnson (Plant Science 1948-1961) focused on barley breeding and the genetics of cereal disease resistance. Other plant genetics researchers in the team included George Walker (UofA plant cytogenetics 1954-1961), Jan Weijer (UofA plant and microbial genetics 1957-1961), Rene Berg (UofA rye breeding), Jack Fitzsimmons (UofA variety evaluation), and Edward Smith (UofA barley and flax breeding 1947-1961). Most of these internationally plant geneticists transferred to the Faculty of Arts and Science in 1961.

Part 2B of this TALE focuses on the Faculty staff renewal and investment in the new genetics for plant breeding that occurred since the early 1960's. Three new plant breeders were hired into the Plant Science Department in 1969, this author Keith Briggs (UofA 1969-1999), Zenon Kondra (UofA 1969-1986) and Peter Walton (1969-1991). The new extra strong gluten spring wheat variety Glenlea was a direct product from the Briggs PhD research project at the University of Manitoba. At the University of Alberta Briggs initially established a barley breeding program (subsequently transferred to the Alberta Provincial government program under their breeder Dr. Jim Helm) and then switched mainly to spring wheat research and cereal agronomic research. His plant breeding specializations included breeding for acid soil conditions, selection for scald tolerance in barley and, in wheat, the genetics of selection methods for grain quality, early maturity, straw strength, stripe rust resistance, stress tolerances to heat, drought and lodging, and to toxic levels of soil aluminum, manganese and acidity, and on wheat sensitivity to soil copper deficiency. Unique varieties released from the University by Briggs included an acid soil tolerant spring wheat names Alikat, the earliest maturing wheat ever released in Canada (Cutler), the first scald tolerant barley (Windsor), making the cross and early generation selections for Samson barley (the first semi-dwarf barley, later released in Canada by Dr. Helm), the first strong strawed extra strong gluten spring wheat (Laser, with co-breeder associate Dr. Solomon Kibite), and an oat and a fall rye variety (from prior research programs at the University of Alberta). Briggs also spent three years seconded via the University of Manitoba to the CIDA funded Kenyan Wheat breeding Station in Njoro, Kenya, where he was program leader and supervised the release of new wheat varieties for Kenyan production. Following Briggs retirement Dr. Dean Spaner (UofA 1999-cont.) was appointed as cereal breeder / agronomist who set additional spring wheat breeding goals including yellow rust and Fusarium resistance, combining high yield potential into earlier maturing varieties, and the breeding of varieties especially designed for organic production. Varieties released by Spaner are described in Part 4 of this TALE.

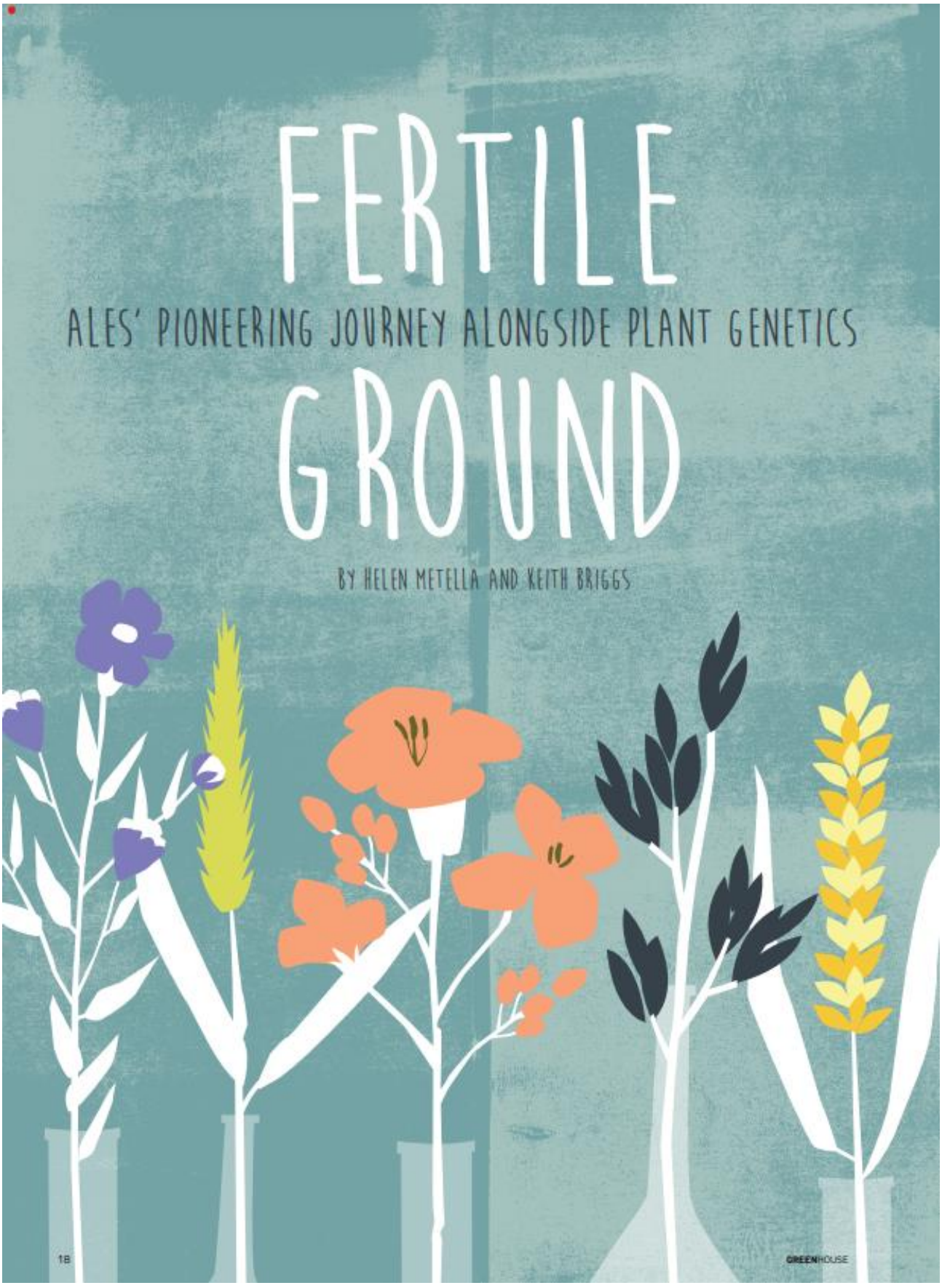
Professor Zenon Kondra was appointed in 1969 as breeder /agronomist for oilseeds and special crops, and focused on breeding earlier maturing canola varieties suitable for the short season Parkland zone of W. Canada, not yet available at that time. He set up his breeding program from scratch but brought extensive experience to the task as he was, with Dr. Baldur Stefansson at the University of Manitoba, the co-breeder of the very first canola variety released in Canada, named Tower. At the University of Alberta Kondra released a number of popular, high acreage canola varieties, and developed both the facilities for and an extensive short-season adapted germplasm base later used by the canola breeders that followed on when he retired. When Kondra retired, Plant Science Department Chair Briggs was then able to negotiate the merger of the Alberta Wheat Pool Canola breeding program with that of the University, forming a Tripartite breeding program also funded by Agriculture and Agri-Food Canada (AAFC), Alberta Agriculture, and the Canola Council of Canada. Dr. Gary Stringam (UofA 1988-2003) from AAFC was appointed as the program breeder, and Delbert Degenhardt (UofA 1970-2003) continued as senior technician and co-breeder until his retirement. Stringam released a number of significant canola varieties, the most important of which was Quantum, the first blackleg resistant variety in Canada, which saved the canola industry from collapse due to the widespread growing threat from this devasting canola disease. In 2003 Dr. Habibur Rahman (2003 - continuing) was hired as Canola breeder in the Faculty, to focus on genetic research and the breeding of individual and novel traits in Canola. He provided a significant transition phase into the routine use of molecular DNA technologies for breeding improved canola varieties. Varieties released by Stringam and Rahman are also described in this TALE.

Peter Walton (UofA 1969-1991) was appointed as Full Professor to carry out teaching, genetics, breeding research and extension about forage crops. He specialized in forage management studies in the field, as well as physiological and disease studies of numerous forage species, including disease resistance in alfalfa. Walton's plant breeding work included genomic and chromosome studies of the origins of forage species in the *Triticeae* grass family, and the transfer of useful genes between forage species, such as cold tolerance, drought and salinity tolerance, and genes for high forage yield and quality. Between 1981 and 1983 plant breeders Walton and Briggs were separately seconded full-time to lead and train staff in the cereal breeding programs of Kenya and Zambia, respectively, in development programs funded by the Canadian International Development Agency. Professor William Skoropad (UofA 1959-1982) also was seconded to CIDA to do research on Kenyan oilseed crop diseases and E. African wheat rust race development and management, and to train Kenyan field staff in pathology..

Part 3 of this TALE provides commentary by the author about the challenges of maintaining long-term funding for plant breeding programs at Universities, sufficient to support viable variety breeding programs. Costs are very high to maintain the infrastructure and skilled technical support needs for greenhouses and growth-rooms, laboratory facilities equipment, Province-wide field testing, data management systems, seed storage and maintenance systems and seedstocks maintenance. The more recent move in W. Canada is described towards more multi-agency, long-term funding for breeding programs based on agreements about coordinated breeding priorities and capabilities at different research organizations, including Universities.

Part 4 of this TALE presents a complete listing of all varieties released by the Faculty of ALES at the University of Alberta, including those from the canola and spring wheat programs still continuing in 2023. Appendix 1 includes some information about the unique acid soil tolerant variety Alikat released by Briggs, and the funding that supported this development. Appendix 2 provides notes about the career-long research topics of plant breeding graduate students in the Briggs program, and their own subsequent careers at Universities, in Government and in the private sector, both national and international.

PART 1: TALE #5 of TALES OF ALES (Metella and Briggs, 'Fertile Ground', 2016)



Almost every edible plant that the modern world calls food is a result of plant breeding, says **Keith Briggs**, a professor emeritus in plant breeding and crop science, and founding chair of the Department of Agricultural, Food and Nutritional Science.

"Plant breeding is very applied and links into the second biggest industry in Alberta — agriculture," he says.

Plus, he adds, there would be no animal industry without plants and forage.

"And the U of A was in it from day one," says Briggs, which begs the question: how closely related is the study of plant genetics to the Faculty of ALES?

WHICH CAME FIRST, ALES OR PLANT GENETICS?

The field of genetics is just barely older than what is now the Faculty of ALES. Gregor Mendel's famous laws of inheritance, deduced by studying peas, and his terms, "recessive and dominant traits," were published in 1865. But Mendel's studies were not recognized until 1900, when the new science was dubbed "genetics." Fifteen years later, the Department of Field Husbandry was established at the University of Alberta.

Very quickly, genetic research and plant-breeding experiments became a high priority with the department because agricultural settlers to Alberta needed to know which plants they'd brought with them would thrive here. New varieties were also bred that could be specially adapted to local growing conditions, including diverse soil types, short and cool growing seasons, long days, unpredictable drought and high risk of frost, as well as specific insect and disease threats.

NAMING NAMES

Before the current era, in which seed companies have a say in naming new plant varieties, the breeders named them. Many varieties developed in ALES over the years were named by its researchers. Altex and Andor canola, for instance, were named by **Zenon Kondra** after his sons Alex and Andrew. In 1990, Briggs named AliKat wheat, the first wheat in Canada bred with specific tolerance to acidic soils, after aluminum (of which acidic soil has a lot) and the wheat variety Katepwa, on which his acid-soil-tolerant germplasm was based.

Less known is the naming legacy of **Robert Newton** — the faculty's dean from 1940 to 1942 and then the university's president. Throughout the 1930s, he excelled in research about crop production, frost and drought resistance, and the bread-making quality of wheat.

He coined the term "pesticide." It's a blend of "pestis," the Latin word for plague and "biocide," a chemical substance or micro-organism that destroys or deters harmful organisms.

OTHER FIRSTS

During the 1950s, ALES was a hotbed of high achievers in plant genetics. Researchers here became the discipline's foremost university group in the world with their groundbreaking studies. Among them:

Clayton Person increased the understanding of how the genetic structure of a parasitic population (e.g. a disease) interacts with that of its host population (e.g. plants).

John Kuspira developed unique ways to manipulate the chromosomes of wheat, which led to an understanding of which individual grass species were the ancestors of modern wheat species. That was important knowledge for wheat breeders, because when there's a problem with a species, plant breeders go looking for a genetic explanation. If they can't find the gene in the species they're working with, they go looking for relatives.

Karlis Lesins developed the first self-pollinated alfalfa germplasm and also became a renowned Medicago taxonomist (Medicago is the genus of flowering plants of which alfalfa is the best example.) His collection of more than 3,000 alfalfa and Medicago samples was donated to the USDA's Medicago collection upon his retirement.

Rustem Aksel produced much of the foundational research methodology for the genetic study of quantitative traits in plants (those that are controlled by multiple genes), and for the quantification of maternal inheritance in plants. "If you are taking quantitative genetics (courses) today, the theories he developed are probably part of the curriculum," says Briggs.

Seed royalties: In the 1990s, Briggs developed a first-in-western Canada policy allowing the U of A to collect royalties on seed sales of faculty-released varieties. As a result, in canola alone, seed royalty income has already returned many millions of dollars.

A CHAMPIONS OF CEREALS

When the faculty re-established a research focus on cereals in 1969, Briggs arrived to work on barley and wheat.

In wheat breeding, he emphasized selection methods and the genetics of grain quality, early maturity, straw strength, stripe rust resistance, stress tolerances, toxicities in soil and sensitivity to copper deficiency.

After studying acidic soils during a stint in Africa, Briggs developed AliKat wheat, bred with specific tolerance to acidic soils by altering a single gene in the wheat variety Katepwa. That led to joint studies with other research groups

in the science faculty on gene isolation and DNA characterization of the single gene. By discovering how the single gene worked, they could apply it to many other species.

In barley, Briggs also developed methods to select for straw strength and for resistance to a common disease known as leaf scald.

After Briggs retired in 1999, wheat-breeding breakthroughs in the faculty continued, with resistances for yellow rust and Fusarium, both of which can be devastating to crops.

"Yellow rust is a threat to grain productivity and farmers' income," said Briggs. "Fusarium is a threat to the food and feed industry because infected grain is poisonous."

Since 2012, ALES wheat breeder **Dean Spaner** has registered four new varieties of wheat. All improved on a wheat that's already esteemed internationally due to its high protein content and excellent bread-making qualities. His Thorsby and Coleman varieties of Canada Western Hard Red Spring Wheat both have good resistance to leaf and stripe rust, while the latter has better resistance to Fusarium head blight. The Go Early variety has very good resistance to lodging and bunt, and very good protein quality. The Parata variety also has good lodging resistance, plus good flour yield and good stem and yellow rust resistance.

TAKING THE LEAD ON CANOLA

Oilseeds researcher Zenon Kondra came to the U of A in 1969, having already helped develop two new "double-zero" rapeseed varieties that formed the basis of a new specialist rapeseed crop called canola.

But when both varieties proved to mature too late for Alberta's Parkland region, he bred for early maturity and high yield, to produce Altex and Andor canola.

A few years later, Briggs, by now the plant science department chair, negotiated the merger of the Alberta Wheat Pool canola breeding program with that of the U of A, and formed a tripartite breeding program funded by Agriculture Canada, Alberta Agriculture and the Canola Council of Canada.

"If we hadn't succeeded (in that) we probably would have folded the canola program because we didn't have enough funds to do it," says Briggs.

In the 1980s, a disease called blackleg threatened to destroy the canola industry. **Gary Stringam** successfully bred a line of blackleg-resistant canola called Quantum canola. The resistance gene he discovered is now found in most varieties of canola.

Since diseases adapt and re-emerge, canola breeder **Habibur Rahman** and plant pathologist **Stephen Strelkov** created canola varieties that are resistant to the clubroot pathogen.

Rahman also introduced genes from cabbage and cauliflower species into canola to produce early flowering canola, and recently developed the first line of canola hybrid that offers double-resistance to clubroot, the crop's most significant disease threat.

FOOLING THE ENEMIES OF FORAGE

Disease-resistant alfalfa was developed at ALES by **Peter Walton** in the 1970s. His followup research showed growers that companion crops could optimize the establishment of cultivated grasses, that quackgrass could be controlled in cultivated land using new herbicides and tillage, and that variety research could assist "alfalfa sick" soils.

Walton's genome- and chromosome-level research into understanding the evolutionary origins of the Triticea grass family showed that useful traits in wild species, including cold, drought and salinity tolerance, could be transferred into adapted or newly created species.

ALES' COMMERCIAL IMPACT

ALES has bred numerous commercially successful plant varieties. Some with the greatest commercial impact include Banff Kentucky bluegrass, a major continuing component of lawn and turfgrass mixes that's still earning royalties that support a student scholarship in ALES (developed in 1960); AliKat, the first wheat in Canada bred with specific tolerance to acidic soils (1990); and Quantum, the first blackleg-resistant canola variety in Canada (1995).

Research for this piece is from 100 Years of Plant Genetics and Plant Breeding in the Faculty of ALES, *a 2014 article by Keith Briggs, professor emeritus in plant breeding and crop science, former chair of the Department of Plant Science and first chair of the Department of Agricultural, Food and Nutritional Science.*

GENETICS BY THE NUMBERS

HOW MANY COMMERCIALLY SUCCESSFUL VARIETIES HAVE BEEN CREATED BY ALES PLANT BREEDERS?

FLAX VARIETY

CANOLA VARIETIES

KENTUCKY BLUEGRASS VARIETY

RYEGRASS VARIETY

TIMOTHY GRASS VARIETY

SPRING WHEAT VARIETIES

BARLEY VARIETIES

OAT VARIETIES

FALL RYE VARIETIES

RED CLOVER VARIETY

SWEET CORN VARIETY

ALFALFA VARIETY

FLINT CORN VARIETY

GLADIOLUS VARIETIES

APPLE VARIETIES

PART 2:

107 years of Plant Genetics, Plant Breeding and Variety Development in the Faculty of Agricultural, Life and Environmental Sciences (ALES Varieties, 1915 – 2022)

Author: Keith G. Briggs (Emeritus Professor, AFNS, Faculty of ALES)

Author's Notes: re TALE #4 of TALES of ALES

As of March, 2023 the full story about all the University of Alberta varieties that have ever been released was still an unpublished document of the author. In addition to several interviews with him in 2015, Helen Metella drew content from a very detailed unpublished historical account by Briggs of variety development in the Faculty of ALES from its beginnings and wrote her article 'Fertile Ground' for the Faculty magazine 'Greenhouse'. Helen's article (Metella and Briggs, 2016) is republished in this script as PART 1 of TALE #4, TALES OF ALES. The Briggs very much longer script from 2015 is also presented in this document as PART 2 in its original but updated form to ensure that the complete record is not lost. The vision is that the record is best preserved here for later reference online in a readily available electronically archived format, hosted by the University of Alberta. It was very difficult to compile this historical account from what were very old, diverse and sometimes contradictory sources. The author believes it to be an important account of how the Faculty of ALES (originally the Faculty of Agriculture when formed in 1917) continually carries out important work for the benefit of Canadian crop producers and society at large. That story needs to be kept alive as this essential long-term crop variety R&D work continues into the future.

PART 2A : The Early Years

The science of genetics has not been around for much longer than the age of the Faculty of ALES. Gregor Mendel's famous laws of inheritance deduced by studying peas were only published in 1865. They were not then rediscovered until 1900, when his findings were recognized under the newly named discipline of 'Genetics'. Although plant breeding had been previously practiced for thousands of years, mostly by selecting the 'best' plants from natural sources of variation, this was done without any scientific understanding of the inheritance processes involved, and not by making directed crosses between chosen parents to create desirable new variations. Perhaps the first recorded instance of the latter approach being used was the release of the Garton seed company oat variety Abundance, released in the UK in 1892. Expansion of this approach would only become possible in the 20th century once there was a better understanding about the basic genetics of crop plants. It turned out that the Faculty of ALES Professors of plant breeding would play an important role in those discoveries both in Alberta and internationally, especially in cereals, and later in a newly invented Canadian crop to be called Canola, and even included the development of an entirely new quality type of wheat.

The first Deans of the Faculty and Heads of the Department of Field Husbandry (formed in 1915) were quick to recognize the potential of this new science of genetics in plants, so that new varieties could be bred that would be specially adapted to the very variable local growing conditions throughout Alberta. These conditions encompass diverse soil types, for shorter and cooler to longer and warmer growing seasons, for long days with a high risk of fall frost, regionally specific disease and insect threats, and unpredictable drought in different zones. New agricultural settlers in Alberta also wanted to know which field crop, horticultural and amenity plant varieties would grow best for them, from the many kinds they brought with them from Europe and from other regions around the world.

Thus, crop genetics research and regional variety testing and extension were high priorities in the new Departments of Field Husbandry and Horticulture in the early decades of the Faculty, and several breeding programs were quickly initiated. This included one for malting barley started in 1919 by Guthrie Sanford (University of Alberta = UofA 1918-1955), the first barley breeding program in Alberta. Of particular note was Robert Newton (UofA 1931-1942), who

excelled in research about crop production, frost and drought resistance in plants, and the bread-making quality of wheat. He also worked on forage crops and was the originator of the term 'pesticide'. He later became Dean of the Faculty of Agriculture and then President of the University of Alberta. Other important plant geneticists/crop breeding researchers in this era were James Fryer (UofA alfalfa and corn breeding 1920-1949), Olaf Aamodt (UofA cereal breeding 1928-1935), Kenneth Neatby (UofA genetics and plant breeding 1935-1940), John Unrau (UofA wheat and sunflower breeding 1949-1961) and Arthur McCalla (UofA cereal physiology and biochemistry 1941-1971). A Department of Horticulture was formed in 1935, including George Harcourt (UofA tree breeding 1915-1935) and James Shoemaker (UofA ornamentals breeder 1935-1946). In 1946 the Prairie Fruit Tree Breeding Project and the Native Fruit Station at Rocky Mountain House were also established, jointly with the Canada Department of Agriculture.

Other results from this investment in plant genetics and related research were also very evident by the 1950's. In 1953 the University conferred its first two PhD's on campus, both to individuals studying plant genetics in the Department of Plant Science, to researchers who would then become Professors at the University of Alberta and distinguish themselves internationally for ground-breaking discoveries in their study areas. The first was Clayton Person (PhD student, Plant Science Department 1958-1961), who increased the understanding of how the genetic structure of a parasitic population (eg. a disease) interacts with that of its host population (eg. plants). The other was John Kuspira (Plant Science Department 1955-1961), who developed unique ways to manipulate the chromosomes of wheat. This enabled a new understanding of the individual chromosomal control of wheat traits and was used to unravel the knowledge about which individual grass species were the ancestors of modern wheat species, fundamental information needed by cereal breeders everywhere.

The plant genetics group assembled in the Faculty of ALES through the 1950's was at that time unquestionably the premier plant genetics group at any University in the world, as the Clayton/Kuspira discoveries were complemented by parallel ground breaking discoveries of other staff appointed in the 1940's and 1950's. International reputations for their research in plant genetics were earned by several staff: Karlis Lesins (Plant Science 1954-1961) became a renowned *Medicago* taxonomist, whose 3000+ alfalfa and *Medicago* germplasm collection was donated to the USDA *Medicago* collection on his retirement. He also developed the first self-pollinated alfalfa germplasm. Rustem Aksel (Plant Science 1957-1961) developed much of the foundational research methodology and literature for the genetic study of quantitative traits in plants, those that are controlled by multiple genes, and for quantification of maternal inheritance in plants. Leroy Johnson (Plant Science 1948-1961) focused on barley breeding and the genetics of cereal disease resistance. Other plant genetics researchers in the team included George Walker (UofA plant cytogenetics 1954-1961), Jan Weijer (UofA plant and microbial genetics 1957-1961), Rene Berg (UofA rye breeding), Jack Fitzsimmons (UofA variety evaluation), and Edward Smith (UofA barley and flax breeding 1947-1961). As described in 'A Century of Solutions - A History of the Faculty of ALES 1915-2015' (Gillespie, 2014), most of this internationally renowned group of plant geneticists transferred from the Faculty of Agriculture to the Faculty of Arts and Science in 1961.

PART 2B: Staff Renewal and Investment in the New Genetics for Plant Breeding

Three new plant breeding positions were created in the Department of Plant Science in 1969, to re-establish the Faculty focus on crop variety research, teaching and variety development in cereals, oilseeds and forages. In cereal breeding Keith Briggs (UofA 1969-1999) was hired to work on barley and wheat. He had completed his PhD at the University of Manitoba, where he developed the novel strong gluten spring wheat variety Glenlea as part of his thesis studies. Glenlea was the first extra strong gluten spring wheat released in W. Canada and became a very widely grown variety for producers in the Canadian Prairies. At the University of Alberta Briggs soon focused on wheat breeding with emphasis on selection methods and the genetics of grain quality, early maturity, straw strength, stripe rust resistance, stress tolerances to heat, drought and lodging, and to toxic levels of soil aluminum, manganese and acidity, and on wheat sensitivity to soil copper deficiency. Briggs also developed special acid soil tolerant germplasm based on the wheat variety Katepwa, which led to joint studies with Professor Gregory Taylor's group in the Faculty of Science to understand the related physiological mechanisms. This then led towards gene isolation and DNA characterization of the single gene by other research groups. A number of Briggs' graduate students who studied plant breeding later went on to very successful careers as practicing crop breeders / agronomists / researchers in academic, government or industry programs. A listing about some of those researchers can be found in Appendix 2 of this TALE #4.

Additional plant breeding research by Briggs with barley focused on developing methods to select for better straw strength (lodging resistance), and the genetic characterization of leaf scald resistance in different varieties. Wheat breeder Dr. Solomon Kibite also worked as an associate in Briggs program for several years, whilst Briggs was on assignment with CIDA in Kenya from 1981-1983, and subsequently moved on to be a very successful oat breeder with Canada Agriculture at Lacombe, Alberta. When Briggs retired, wheat breeding in the Department continued with the appointment of Dr. Dean Spaner (UofA 1999-cont.) who has set additional objectives, including yellow rust and Fusarium resistance, combining high yield potential into earlier maturing varieties, and the breeding of varieties especially designed for organic production.

Dr. Zenon Kondra (UofA 1969-1986) occupied the newly established oilseeds position in 1969 and started the Faculty Canola breeding program, bringing germplasm and his expertise in canola seed quality and trait breeding from the University of Manitoba. His story is also told in the TALES OF ALES. As a post-doctoral fellow Kondra had been instrumental with Dr. Baldur Steffanson at the University of Manitoba in developing the grain quality components of rapeseed that allowed 1970's release of the University of Manitoba varieties Tower and Regent. These novel 'double zero' varieties, with zero erucic acid in the oil, and zero glucosinolates in the meal, formed the foundation of the brand new 'Canola' crop for Canada. Tower and Regent were both too late maturing for the Parkland region of Alberta, so in Edmonton Kondra successfully focused his efforts on breeding for early maturity with high yield. When Kondra retired, Plant Science Department Chair Briggs negotiated the merger of the Alberta Wheat Pool Canola breeding program with that of the University, forming a Tripartite breeding program also funded by Agriculture and Agri-Food Canada (AAFC), Alberta Agriculture, and the Canola Council of Canada. Dr. Gary Stringam (UofA 1988-2003) from AAFC was appointed as the program breeder, and Delbert Degenhardt (UofA 1970-2003) continued as senior technician and co-breeder until his retirement. In 2003 Dr. Habibur Rahman was hired as Canola breeder in the Faculty, to focus on genetic research and the breeding of individual and novel traits in Canola. By this time most Canadian Canola varieties in production were from the private sector, and the need for variety releases from the University of Alberta had diminished, although demand for new genetic discoveries in canola had skyrocketed, a need that could be serviced very well by the continuing University of Alberta program.

Peter Walton (UofA 1969-1991) was appointed as Full Professor in the Plant Science Department to carry out teaching, genetics, breeding research and extension about forage crops. He specialized in forage management studies in the field, as well as physiological and disease studies of numerous forage species, including disease resistance in alfalfa. Research resulted in recommendations to growers about the use of companion crops that could be used to optimize establishment of cultivated grasses, about quackgrass control in cultivated land using newly available herbicides and tillage, about variety selection in 'alfalfa sick' soils, and about the effects of forage management systems on carbohydrate reserves for overwintering alfalfa and bromegrass. Walton conducted considerable genomic and chromosome level research into understanding the evolutionary origins of forage species in the *Triticeae* grass family. His interest in this was to see whether useful traits in wild species could be transferred into adapted forage species (or newly created species) for the Parkland zone. Target traits for moving between species included cold tolerance from *Elymus canadensis*, drought tolerance from *Pseudoregneria* species, and salinity tolerance, high forage yield and quality from *Elymus trachycaulis*.

Between 1981 and 1983 plant breeders Briggs and Walton were seconded full-time to lead and train staff in the cereal breeding programs of Kenya and Zambia, respectively, in development programs funded by the Canadian International Development Agency. Three stripe rust resistant spring wheat varieties that had been developed by Kenyan breeders were registered in Kenya during this period and were released in Kenya by Briggs. Plant Science Department pathologist Professor William Skoropad (UofA 1959-1982) also went to Kenya full-time with CIDA in this period, to do research on Kenyan oilseed crop diseases, to advise about wheat rust race development and management in East Africa, and to train Kenyan technicians in plant pathology.

The 1980’s and 1990’s saw the global development of new DNA technologies that allow plant breeders to move desired genes between species in ways that require special laboratory techniques. Genetically modified (GM) varieties are defined by the World Health Organization as 'varieties in which the genetic material (DNA) has been altered in a way that does not occur naturally by crossing and/or natural recombination'. In Canada up to 2023 no GM wheat or barley varieties

have ever been released because there is no world or domestic GM grain market for such crops. Consistent with this, the Faculty cereal breeding programs have never worked on GM wheat or barley varieties. In contrast to this, products from GM Canola varieties have been widely accepted in domestic and world markets, so the Faculty Canola program did develop GM germplasm as part of its mandate for industry and has released a number of GM canola varieties.

PART 3: Varieties released by the Faculty of ALES over 107 years – further commentary

The use of locally adapted plant varieties is the key to successful crop and horticultural production and re-vegetation in Alberta and other regions. Numerous varieties bred at the University of Alberta have been released during its first 100 years, resulting in very substantially improved income and better family farm outcomes for Alberta growers. The cumulated economic impact of these varieties has been enormous, for early immigrant farmer settlers through to today's high-tech and large-scale grain crop producers. For example, up to 2005 the value to industry of the University released Canola varieties was estimated at over $276 million in the Province of Alberta alone. Value to the Alberta seed industry of Kodiak fall rye in the late 1980's exceeded $2.5 million.

In the 1990's Plant Science Department Chair Briggs and Professor Zenon Kondra developed a 'first in W. Canada' policy and program which allowed the University to collect royalties on seed sales of Faculty released grain crop varieties, to further add value. This program provides exclusive rights for successful bidders in the W. Canadian seed industry to market new varieties for the University. As a result, in Canola alone seed royalty income to the University had already exceeded $7 million by 2005. Royalties were also earned on later Canola variety releases, on Kodiak fall rye, on Banff Kentucky bluegrass, and on Cutler, Laser and Alikat spring wheat.

Some of the field crop varieties with greatest commercial and/or research impact through the 107 year period at the University of Alberta included: (a) Early Red Fife wheat (1932); (b) Glenlea CWRS spring wheat, the first variety of this quality type in Canada, derived from Briggs PhD studies at the University of Manitoba, and later registered by the University of Manitoba (1972); (c) Laser, an early maturing, strong strawed, strong gluten wheat (1996); (d) Alikat, the first wheat in Canada bred with specific tolerance to acidic soils (1990); (e) Gateway and Gateway 63 malting barleys (1953, 1963); (f) Victory oat (1904 widely grown for over 50 years, with high grain quality); (g) Kodiak fall rye, with seed sales to South Korea by the Alberta Wheat Pool for more than 5 years in the late 1980's worth over $0.5 million per year. Korea grew Kodiak in its rice rotation as a preferred feed for cattle; (h) Altex canola (1978 with improved agronomic traits adapted to Alberta conditions); (i) Quantum (1995) the first blackleg resistant canola variety in Canada, solving a major problem for the entire W. Prairies, widely grown and setting a new standard for high yield; (j) Banff Kentucky bluegrass (1960) for turf and lawns, a major continuing component of lawn and turfgrass mixtures, still earning royalties that support a student scholarship in ALES; and (k) Redwing flax (1934), a dominant variety in N. Alberta in its time. In recent years many new University of Alberta varieties of canola and spring wheat have also been added to the list of released varieties, with very significant impact on W. Canadian crop productivity.

The improved genetic understanding in many crops gained by ALES plant breeders over the many years definitely resulted in the release of many commercially successful varieties. The Metella and Briggs article indicated that this numerically included 11 spring wheat varieties, 8 barley varieties, 3 oat varieties, 2 fall rye varieties, 1 alfalfa variety, 1 red clover variety, 13 canola varieties, 1 timothy grass variety, 1 ryegrass variety, 1 Kentucky bluegrass variety, 1 sweet corn variety, 1 flint corn variety, 1 flax variety, 2 gladiolus varieties, and 2 apple varieties. By 2022 the total number of released varieties is much higher.

For archival purposes a complete listing of all varieties released up until 2022 is reported in Part 4 of this script, that indicates their date of release, indicates which Professors were involved, and presents a few notes about each variety. (Author's Note: This catalogue style list is very long, and is a credit to the University of Alberta, but does not make for easy reading! The detail recorded in Part 4 is presented mainly for historical reference purposes).

What does an Institution need in order to run an effective Plant Variety Breeding Program?

Before the reader learns in PART 4 what has actually been achieved in plant breeding at the University of Alberta this author, whose main experience is with field crops breeding, wishes to make them aware that success from running a breeding program requires not just very large and long-term operating budgets, but also access to very well trained, dedicated technical field, greenhouse and laboratory personnel with experience, and a very large array of costly infrastructure and facilities support. The process of plant breeding requires long-term investment because it may take as long as ten years or more to create a new variety and bring it into production on farmer's fields. Also, the breeding itself is an extremely interdisciplinary process requiring a high level of coordination of the science with program management skills, all essential to optimize the genetic improvement process with whatever budget level is at hand.

The Faculty of Agricultural, Life and Environmental Sciences (ALES) since its very beginnings has been continually invested in plant breeding and has been proactive in supporting its' staff in their research grant applications so that they can have access to the most modern facilities for use in their basic scientific and applied research endeavors. Such support is also necessary for the training of the undergraduate and graduate students who will later lead the crops and plants industry into the future. The plant breeding activities highlighted in this Tale #4 of TALES of ALES required a vast array of technologies and infrastructure in order to breed a new variety. This includes specialist field management, planting, spraying and harvesting equipment, trucks and trailers, and specialist 'high tech' laboratory and grain evaluation equipment, access to suitable research plot land (both on University property and in the fields of producers and collaborating Research Institution, plant growth-room and greenhouse space, access to use of winter nurseries (such as in California or New Zealand), and seed and grain storage, management and data management facilities at the University home sites and in the field.

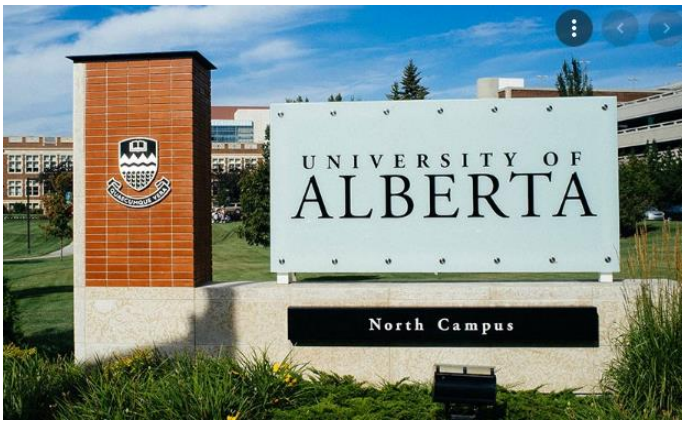
The reader who wishes to learn more about the very extensive facilities required and in use by the ongoing 2022 University of Alberta breeding programs in Canola and spring wheat can review those at the Department of Agricultural, Food and Nutritional Science (AFNS) website where they are described in detail:
https:// https://afns-labs.ualberta.ca/ (Click on Central Labs, Research Stations or Lab Equipment for details about each)

The extent of inter-Institutional collaboration that now typically occurs between Canadian field crop breeders and their various funders can be reviewed in the example for wheat from the Western Grains Research Foundation (WGRF) Research 2018 Summary Report. WGRF now takes on a central role in managing breeding research funds available to the Canadian National Wheat Improvement Program, of which the University of Alberta spring wheat breeding program is one major beneficiary. The kinds of wheat research projects supported are described at: The Canadian Wheat Research Cluster website at: https://www.wheatresearch.ca/wheat-cluster

Specific detail about the many wheat breeding research projects currently funded through WGRF can be found at: https://wgrf.ca/special-initiatives/the-harvest-canadian-national-wheat-improvement-program/ This 58 page report is an excellent, easy to read account about all aspects of breeding new wheat varieties for W. Canada, introduces the reader to the current researchers who do this work, and describes their current research and objectives, including the training of future plant breeders.

Please now read on to learn about all those University of Alberta Varieties!

(Photo credits: External Relations, University of Alberta)



PART 4: Details of all ALES Plant Varieties Developed and Released (Year, Name, Breeder(s) and Notes):

PART 4a: Plant species where University of Alberta breeding programs have been discontinued

Apple

1948 George (A tree purchased by Professor Bob Hilton, sourced for the price of $1,000 from the Edmonton residential garden of a Mr. and Mrs. Robert George)

1955 Harcourt (Selected by the University of Alberta from Wilson Orchards, Gleichen AB and named after Professor George Harcourt, fruit tree expert; Formerly named Algod and All Good))

Alfalfa

1941 Ferax (James Fryer)

Barley

1935 Newal 6-row feed barley (Olaf Aamodt and W.H. Johnson)

1940 Sanalta 2-row feed barley (Garnet Cutler and Guthrie Sanford)

1943 Titan 6-row feed barley (Arthur McCalla) Smut resistant

1953 Gateway 6-row malting barley (LeRoy 'LPV' Johnson)

1963 Gateway 63 6-row malting barley (LeRoy 'LPV' Johnson)

1967 Centennial 2-row malting barley (Jack Fitzsimmons) Short, strong straw

1974 Windsor 6-row feed barley (Bred by 'LPV' Johnson, registered by Keith Briggs) The first W. Canadian barley with resistance to prevailing races of leaf scald disease. The single major resistance gene used unfortunately quickly became ineffective against newer races of scald during the years of seed increase, before it was even available as a new variety for growers, and never went into commercial production

1985 Samson 6-row feed barley (Registered by Dr. Jim Helm, Dyson, D.H. and Stewart, W.M, Alberta Agriculture) from a cross and early generation selections made at the University of Alberta by Keith Briggs). It was the first semi-dwarf, strong-strawed, high yielding and fertilizer responsive barley in W. Canada, especially suited to fields with high levels of pig manure applied to them and intended for harvest as sileage

Fall rye

1957 Sangaste (Rene Berg) Introduced and developed from an 1875 Estonian landrace of fall rye

1971 Kodiak (Bred by Rene Berg, registered by Keith Briggs after Berg's retirement from the University of Alberta) Seed sales of Kodiak to South Korea by the Alberta Wheat Pool for more than 5 years in the late 1980's were worth over $0.5 million per year to Alberta seed growers. Korea grew Kodiak in its rice rotation as a preferred feed for cattle

Flax

1934 Redwing (Olaf Aamodt)

Flint corn
1921 Howes Alberta Flint (Garnet Cutler) A yellow flint corn, very high yielding in its day

Gladiolus
1930's 2 varieties, names not located (James Shoemaker)

Grasses
1925 Swallow timothy (Garnet Cutler)
1940's Frya ryegrass (Kenneth Neatby)
1960 Banff Kentucky Bluegrass for golf greens, turf and lawns (Hugh Knowles)

Red clover
1919 Altaswede (Robert Newton) Selected from Swedish seed-stock around 1919, this variety wass still in demand for use in forage mixtures in 2015. Well suited to Grey Wooded soils and to more moist regions of the Black soils

Sweetcorn
1940 Altagold (James Fryer)

Oat
1904 Victory oat: Introduced from the Svalof Plant Breeding Station, Sweden, selected from the variety Milton and maintained by the Faculty. It set the Alberta standard for high quality oat grain, and is a parent in many modern oat varieties
1967 Grizzly oat (Rene Berg) A feed/forage variety recognized for its excellent forage yield

PART 4b: Plant species where University of Alberta breeding programs continue in 2022

Canola (All are *Brassica napus* unless otherwise indicated):
1974 Tower (Baldur Stefansson and Zenon Kondra) The first Canola ('double low') *B. napus* variety developed in Canada, registered by the University of Manitoba where Zenon had been an undergraduate and graduate student and also a PostDoctoral Fellow working with Stefansson, and was a co-breeder of this ground-breaking start-up variety of the Canola crop. The full story about Kondra's role in developing this iconic 'first of its kind' variety is told by Briggs in detail in a separate TALE of ALES : Citation: Briggs, K. G. 2022. About Professor Kondra's work developing the first Canola variety for Canada. (Unpublished as of March, 2023)
1978 Altex (Zenon Kondra) Early maturing variety for the Parkland zone, with improved yield
1981 Andor (Zenon Kondra) Early maturing, higher yield than Altex
1988 Alto (Zenon Kondra) Improved agronomic characteristics compared to Altex and Andor
1990 Eclipse *Brassica rapa* (Registered by Delbert Degenhardt, Gary Stringam and Zenon Kondra) The first *Brassica rapa* variety adapted to Northern Alberta
1991 Eldorado *Brassica rapa* (Registered by Delbert Degenhardt, Gary Stringam and Zenon Kondra) Adapted to all of Western Canada
1995 Quantum (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) First blackleg resistant Canola variety, solving a major problem for the entire W. Canadian Canola acreage. It also set a new standard for high yield and occupied a major area of the W. Canadian Canola acreage for several years
1998 Q2 (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) Widely adapted to all of W. Canada, like Quantum
1999 Hi-Q (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) Improved yield, oil and protein quality

2000 Conquest (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) First University of Alberta Roundup Ready© Canola variety

2001 Peace (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) Open pollinated variety; 44% increase in yield over check varieties in the short season zone

2001 Kelsey (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) University of Alberta Roundup Ready © Canola variety Improved quality

2002 Roper (Gary Stringam, Delbert Degenhardt, Mohan Thiagarajah, and Vipan Bansal) Open pollinated variety, higher yielding than the check varieties

2003 Cougar CL (Habibur Rahman) Clearfield herbicide tolerant variety with blackleg resistance

2011 Clearfield (Habibur Rahman, Gary Stringam and Delbert Degenhardt) Clearfield herbicide tolerant variety

2015 UA AlfaGold (Habibur Rahman) An Imidazoline herbicide resistant open-pollinated variety

2007 UA BountyGold (Habibur Rahman et al.) An Imidazoline herbicide resistant open-pollinated variety

2022 UA CountyGold (Habibur Rahman) An Imidazoline herbicide resistant open-pollinated variety

2012 Canterra 1918 (Habibur Rahman/DL Seeds) Glyphosate © herbicide resistant

2015 PV580GC and PV585GC (Nutrien AgSolutions and Habibur Rahman) Both are Glyphosate herbicide © resistant, with stacked clubroot resistance genes

Spring wheat

(CWRS = Canada Western Red Spring wheat; CPS = Canada Prairie Spring wheat; SWS = Soft White Spring wheat; CWES = Canada Western Extra Strong spring wheat)

1920 Renfrew CWRS (Garnet Cutler) Reselected from Marquis, popular in AB and SK, but late maturing

1926 Red Bobs 222 CWRS (Garnet Cutler) A reselection of Early Triumph, distributed around 1925/1926

1929 Canus CWRS (Selected by Professor O. Aamodt from a University of Minnesota cross of Marquis x winter wheat Kanred, mainly for its resistance to root rots and covered smut.)

1903 Early Red Fife CWRS (Robert Newton) Bred in Ottawa, reselected in 1934, and then managed by the Faculty of Agriculture in Alberta

1958 Kenhi SWS (John Unrau)

1972 Glenlea CWES (Laurie Evans, Leonard Shebeski, Bob McGinnis, Keith Briggs, and Didzus Zuzens) Registered by the University of Manitoba, selected by Briggs and a product of his UofM PhD Thesis). The entire story about the breeding and commercial production of Glenlea in a newly developed Market Class called the Canada Western Extra Strong Spring Wheat Market Class, is told in a separate TALE of ALES :: Briggs, K. G. and DePauw, R. M. 2023. 'Keith Briggs describes research that led to the Canada Western Extra Strong (CWES) spring wheat Crop for W. Canada.' Pp 22. Unpublished as of March, 2023. Glenlea was the sole variety in the Class for much of its 32 years of production in the W. Canadian Prairies in the CWES wheat Class. The CWES spring wheat Class averaged 0.65million acres per year from 1974 to 2000, plus an additional average of 0.24 million acres per year from 2001 to 2007

1990 Alikat CWRS (Keith Briggs and Kurt Kutschera) High level of acid soil tolerance (from its aluminum tolerance gene), first of its kind in Canada, a variety very similar to Katepwa with an aluminum (= acid soil tolerance) gene transferred into it from an aluminum tolerant Brazilian variety named Maringa

1990 'Alikat' isogenic lines for research. A number of isogenic lines were developed that were sister lines to Katepwa where the single gene that controls soil aluminum tolerance (= acid soil tolerance) from the Brazilian variety Maringa was transferred into the variety Katepwa. Seed of these isogenic lines was registered with and sent to the Canadian Government Germplasm Storage Bank in Ottawa for long-term storage and maintenance. Seed is available on request for any researcher who wishes to study the fine genetics, DNA control and physiology of how this plant tolerance to soil acidity is achieved in wheat plants. Seed was also shared with University of Alberta collaborator Dr. Gregory Taylor's research team in the Faculty of Science, for the same purpose. Appendix 1 shows a photo of the performance of acid soil tolerant Alikat compared to the non-tolerant variety Katepwa when evaluated in acidic nutrient solution conditions in Dr. Taylor's nutrient solution laboratory testing protocol

1991 Cutler CPS (Keith Briggs, Solomon Kibite and Kurt Kutschera) Strong strawed semi-dwarf, the earliest maturing wheat ever registered in Canada, well adapted to the short season Parkland zone, but not much chosen by producers because of the low grain yield potential penalty that was associated with the extreme early maturity

1996 Laser CWES (Keith Briggs and Kurt Kutschera) Extra strong gluten wheat; Early maturing, high yield, very strong straw, adapted to the short season Parkland zone. Occupied around 20% of the CWES spring wheat Class acreage in the W. Canadian Prairies from 2001 to 2005. With its extremely strong straw and somewhat earlier maturity Laser was a preferred spring wheat variety for straight cut harvesting in the Parkland region and other crop zones

University of Alberta spring wheat varieties registered by Professor Dean Spaner since 2013

(Source: Dean Spaner University of Alberta website. Professor Spaner's spring wheat breeding team also includes Dr. Kassa Semagn, Klaus Strenzke, Izabela Ciechanowska and Joe Moss)

This section in TALE #5 of TALES OF ALES is included to place on record the unprecedented and remarkable successes achieved by Professor Dean Spaner with his spring wheat breeding program at the University of Alberta. The list of varieties that follows includes general information about each of the varieties. The casual reader can certainly skip over many of the details but should note that the varieties variously achieve at least two major breeding successes not previously gained in spring wheat varieties intended for the short season conditions of the Parkland Zone of the W. Canadian Prairies. Those two notable spring wheat breeding outcomes are:

- Combining significantly higher grain yield potential with significantly earlier maturity, without losing protein content or other grain qualities. Achieving this combination has always been a major challenge for spring wheat breeders in all wheat growing regions worldwide.

- Maintaining or improving the number of different genetic resistances for multiple wheat diseases that occur in W. Canada and combining them into single varieties. These diseases include leaf, stem and stripe rusts, common bunt, leafspots and Fusarium head blight (FHB), and the lowering of the levels of DON toxin that is associated with infected grain. DON (= deoxynivalenol) is also known as Vomitoxin, and is a micro-toxin associated with FHB infected cereal food grains that is extremely toxic to humans and other vertebrates. Previous Canadian spring wheat varieties have not always had good resistance levels to FHB or to stripe rust. With an increasing threat from these two diseases, better levels of resistance are now needed in new varieties. Resistance to both stripe rust and FHB has been very difficult for breeders to maintain sustainably in wheat cropping systems, so these breeding priorities will remain in place for very many years.

Canada Western Red Spring Wheat Varieties, products of Professor Dean Spaner's breeding program at the UofA

(Variety name, year of registration, seed marketing licensee, and notes about the variety)

Abbreviations for the descriptions:

FHB = Fusarium resistance, usually with low DON toxin level in the grain; Variety notes are drawn from the 2018 WGRF Research report, or from the variety licensee descriptions.

Coleman 2015 (Lefsrud Seeds) Awned, hollow-stemmed cultivar of high yield potential, higher yielding than Katepwa by 8.5%. Higher test weight than the checks; Maturity, height and lodging resistance in the same range as the checks; Good resistance to leaf, stem and stripe rust; FHB resistance greater than check varieties, and DON levels lower than checks

Thorsby 2014 (Canterra Seeds) Early maturity without sacrificing yield potential; Broad geographic fit to all production areas; Resistant to stripe rust; Awnless

Go Early 2014 (Mastin Seeds) Bred from CDC Go with similar large kernel size, but 5% higher yield, better disease resistance and matures two days earlier

Parata 2016 (SeCan) Very early maturing, 4 days earlier than AC Carberry, 2 days later than AC Splendor; Yield similar to AC Carberry and 106% of AC Splendor

Zealand 2018 (Lefsrud Seeds) An early-maturing, standard height variety similar to Katepwa and AC Unity V; High yielding line; Improved lodging resistance compared to cultivars of similar height; Good yellow and leaf rust resistance

CS Tracker 2018 (Canterra Seeds) An early maturing variety with excellent disease protection and quality properties; High yielding potential with improved protein content over current varieties; Early, similar to CDC Go (-3 days vs. AAC Brandon); Broad adaptability due to its excellent overall disease resistance

CS Jake 2018 (Canterra Seeds) An ultra-early maturing variety with excellent stripe rust protection and higher protein content

RedNet 2018 (SeedNet) Yield similar to check varieties; Resistant to FHB, stem rust, leaf rust and stripe rust; Excellent Resistance to sprouting in the head; It is a taller semi-dwarf in height and is moderately susceptible to Common bunt

Ellerslie 2018 (SeCan) It is an awnletted variety with very high grain yield potential (108% of AC Carberry), medium maturity (2 days earlier than AC Carberry), and very good straw strength. It is medium in height with very good lodging resistance equal to AC Carberry, with good resistance to leaf, stem and stripe rust and intermediate resistance to FHB. Well suited to all growing regions of W. Canada. Has superior resistance to preharvest sprouting.

Sheba 2018 (Penwest Seeds) An excellent standing, high yielding, awnless variety. Very good disease package. Similar harvesting characteristics as AAC Brandon. It is described as an easy threshing variety.

Noor 2021 (Lefsrud Seeds) It is hollow stemmed with medium maturity and strong straw; Resistant to stem, leaf and stripe rust, and Intermediate for Common bunt and FHB resistance

Donalda 2022 High yiied, short strong straw, breadwheat

Redcliff 2022 High yield, early maturity, good disease resistance, breadwheat

Other Spring Wheat Varieties that are products of the University of Alberta / Spaner breeding program

Forefront 2021 (Penwest Seeds) Canada Prairie Spring (CPS) Description not yet available

GP250 2022 (Secan) Canada Western Special Purpose (CWSP) Highest yielding spring wheat in W. Canadian trials, full description not yet available

As long ago as 2014 Dr. Brian Beres (Senior Research Scientist at Agriculture and Agri-Food Canada, Lethbridge, and Adjunct Professor, Faculty of ALES), offered opinion about the new kinds of early maturing varieties coming from the Spaner program. “Game changers” Brian called them in his role as 2014 Chair of the Prairie Grain Development Committee responsible for testing, evaluating and recommending wheat, rye and triticale candidate cultivars for registration.

“I think that’s what they’ll be known as. If you’re talking CWRS, there are probably less than a handful of varieties you can successfully grow in Alberta’s Parkland, and none of them available to date are so all-inclusive. The challenge for wheat breeders is the inverse relationship between maturity and yield. Typically, the higher the yield, the more growing degree days a variety requires to reach maturity” explained Beres. “As such, varieties bred to successfully grow in Alberta’s cooler, shorter-season Parkland have, until now, been characterized by lower yields”.

“That problem has been a tough nut to crack,” said Beres. “But what Spaner has provided are early-maturing varieties that have maintained both yield and protein levels. You can’t overstate the value and importance of that, especially since there are more arable acres in the Peace River region than in all of Manitoba. In addition to the maturation and yield benefits, Spaner’s varieties also offer above-average disease tolerance to the most serious disease issues affecting the Parkland region. Spaner’s varieties have good resistance to stripe rust, and some offer improved tolerance for Fusarium head blight”.

Professor Spaner has regularly pointed out that his success was only possible due to the support of the agriculture industry, as in his 2014 comments later reported in the Spring 2020 issue of GrainsWest that featured a report on his early maturing varieties Jake and Tracker.

Quoting Spaner….."The development of wheat varieties, especially at a University, involves long-term funding commitment. I am very grateful to the Alberta Crop Industry Development Fund and the Western Grains Research Foundation funded by the check-off supported by all wheat growers. And the program looks forward to long-term collaboration with the Alberta Wheat Commission."

As a past spring wheat breeder at the University of Alberta Briggs, author of this article, was very pleased to note a considerable recent uptick in investment by the agricultural community in Professor Spaner's wheat breeding program. In February of 2021 the Western Grains Research Foundation awarded a grant of $288,550 for a replacement plot seeder and combine. In 2022 the Canadian Wheat Research Coalition (CWRC) also approved a $2 million grant over 5 years to support operational costs of the continuing Spaner spring wheat breeding program. The CWRC is a collaboration of the Alberta Wheat Commission, Saskatchewan Wheat Development Commission and the Manitoba Crop Alliance, aimed at improving the profitability of wheat for Western Canadian producers.

Please scroll down…Thank you

FERTILE GROUND

'GENETICS BY THE NUMBERS' (2016)– Updated to 2022

Q. How many commercial varieties of different plant species were released by ALES plant breeders since 1915?

A. An impressive number in 15 different species, 69 varieties in total up to 2022

Check out Figure 1, next page, to see how many there were in each plant species

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Photo credits (for p21 Figure 1)
Photos by the following photographers are all acknowledged here, generously made accessible through Unsplash.com

Apples: Priscilla Du Prez Alfalfa: Joszef Koler Barley: Simon Godfrey Rye: Natasha Arefyeva
Flax: Tsuyoshi Kozu Flint Corn: Julian Scholl Gladiolus: Roger Stornes Timothy: Harry Dona
Ryegrass: Kai Blossom Kentucky Bluegrass: Courtney Cox Red Clover: Joseph Vary
Sweetcorn: Andre Ouellet Oat: Outi Marjaana Canola: Waldemar Brandt Spring wheat: Erik Karits

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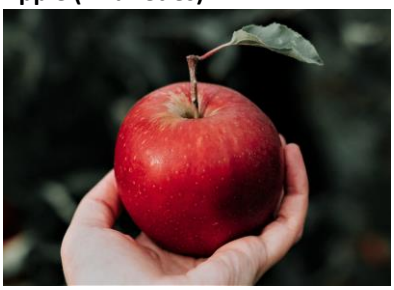
Please scroll down to continue reading….Thanks!

Number of University of Alberta Varieties Released, 1915 to 2022 (Figure 1)

Apple (2 varieties)



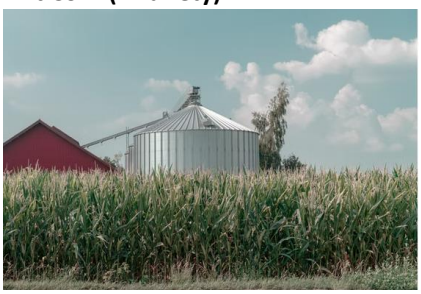
Alfalfa (1 variety)

Barley (8 varieties)

Fall Rye (2 varieties)

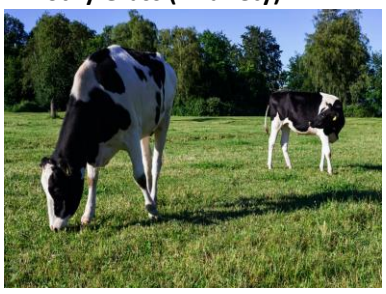
Flax (1 variety)

Flint Corn (1 variety)



Gladiolus (2 varieties)

Timothy Grass (1 variety)



Ryegrass (1 variety)

Kentucky Bluegrass (1 variety)

Red Clover (1 variety)

Sweetcorn (1 variety)

Oat (2 varieties)

Canola (20 varieties)

Spring Wheat (25 varieties)

Appendix 1:

Figure 2 re: Alikat (CWRS) spring wheat breeding, funding and related acidic soils research

Photo: Roots of Katepwa CWRS spring wheat (L) and Alikat CWRS spring wheat (R) growing in acidified complete nutrient solution, simulating conditions in acidic soils. The acidic soil tolerance is provided by a single aluminum tolerance gene from the Brazilian acid soil tolerant variety Maringa, transferred into the intolerant Canadian Katepwa spring wheat variety

(Photo source: Briggs personal photo library, 2022)

Left: Katepwa, acidic soil intolerant Right: Alikat, acidic soil tolerant

Some related notes about the Briggs University of Alberta acid soils breeding / research program

Briggs interest in breeding plants tolerant to high and toxic levels of soil aluminum, which occurs in acidic soils, developed after a sabbatical year in W. Australia (at the University of W. Australia, Perth) and during 3 years spent leading the Kenyan cereal breeding program at Njoro, Kenya. Both locations have soils with high levels of acidity and aluminum toxicity, and Canada also has small areas of cereal production which are acidic and that can limit crop production in the absence of expensive soil liming treatments. On return to Canada from Kenya in 1983 Briggs noted that no Canadian wheat breeders were working on the topic of genetic tolerance to acid soil conditions, so started the research program that resulted in the registration of Alikat CWRS wheat in 1990. The very early maturing CPS spring wheat variety Cutler released by Briggs also proved to have a high level of tolerance to acidic soils.

During this period Briggs was fortunate to acquire a number of significant grants in support of his acid soil tolerance and related research, including a number of grants held jointly with Dr. Gregory Taylor (Faculty of Science) and others who were conducting basic research about the physiological mechanisms and effects on plants of soil toxicity and nutrient deficiencies. Most of the grants (personal and joint) were competitive ones awarded by NSERCC (National Science and Engineering Research Council of Canada) and included funds to support graduate students in ALES and/or in the Faculty of Science, wheat variety development, and also the initiation of an international conference series on the topic. Taylor and Briggs organized the first international conference on 'Plant-Soil Interactions at Low pH' held at Grande Prairie, Alberta in 1987, and it has continued to be run very successfully every three years at many of the different global locations that have significantly acidic agricultural soils. (The most recent was the 10th International Symposium on Plant-Soil Interactions held at Putrajaya, Malaysia in 2018, but the 11thSymposium, scheduled in 2021 for Nanjing, China, was postponed because of Covid concerns.

Grants included:

Operating Grants:

NSERCC (Briggs) 1984-1987 Genetic studies of aluminum tolerant wheat

NSERCC Strategic Grant (Briggs/Taylor/Hoddinott) 1986-1989 Basic and applied aspects of aluminum and manganese tolerance in Canadian wheat cultivars

NSERCC Strategic Grant (Briggs/Taylor/Hoddinott) 1990-1993 Development and characterization of acid soil, aluminum tolerant wheat cultivars for Canadian agriculture

NSERCC Strategic Grant (Briggs/Taylor/Hoddinott) 1993-1996 The physiological and genetic basis of aluminum resistance in Al-resistant, near isogenic lines of wheat

NSERCC (Briggs) 1992-1995 Effects of genetic variation for aluminum tolerance on wheat development in acid soils

Kenyan Government (Briggs) 1990-1993 Copper deficiency studies of wheat

Conference Grants:

NSERCC Conference Fund (Briggs/Taylor) 1986 Plant-Soil Interactions at Low pH

Crop Industry Conference Fund (Briggs/Taylor) 1986 Plant-Soil Interactions at Low pH

University of Alberta Conference Fund (Briggs/Taylor) 1986 Plant-Soil Interactions at Low pH

Appendix 2:

Graduate students in plant breeding supervised by Briggs (Thesis title, year and career paths)
(Many were in the 'soil stresses' program)

This author is able to report that his program benefitted greatly from the academic excellence and diligence of all of the graduate students that were recruited to carry out research in his acid soils research and related programs. A high proportion of them became totally fascinated with the science of plant breeding during their time in the Faculty program and went on to very successful careers in plant genetics and/or agronomy. For a Professor in academia, having a positive influence on a student's subsequent career is always very satisfying to note, as in any teaching profession. The author is pleased to record here notes about some of those accomplished graduate students who went on to very productive

careers in plant research, breeding and agronomy, either in academia, in government research or in private industry. They are listed here in no particular order of priority. Their thesis topics are also noted.

Professor Shauna Somerville
MSc 1978 Evaluation of harvesting methods and maturity assessments in wheat and barley

Shauna subsequently obtained a PhD in Agronomy/Plant Physiology from the University of Illinois Urbana-Champaign, followed by an illustrious career publishing about the frontiers of *Arabidopsis* genetics, plant pathogen/plant defense mechanisms and DNA molecular science techniques. After an Associate Professorship at Michigan State University and an extended period as Staff Scientist at the Carnegie Institute of Science, Washington D.C., Somerville then headed up a large plant physiology / genetics / molecular biology research program as Full Professor at the University of Berkeley, California until her retirement in 2022. In 2006 she received a Fellowship in the American Association for the Advancement of Science in recognition of her *Arabidopsis* studies and the genetic modelling of plant disease genetics and its control

Peter Kireru
MSc University of Nairobi 1983 Sprouting resistance in Kenyan wheats

I was able to oversee some aspects of Peter's research work for his Nairobi MSc program as I was on assignment in Kenya at that time. I lost contact after his completion but heard second-hand that he went on to be a Lecturer in the Faculty of Agriculture at the University of Nairobi

Dr. Joseph Nyachiro
MSc 1986 Response of wheat genotypes (*Triticum aestivum* L.) to acidic and high aluminum conditions
PhD 1997 Differential response of wheat cultivars (*Triticum turgidum* L. *and T. aestivum* L.) to drought stress

This author came to know Joseph and his family very well during his time in 1981 – 1983 in Kenya and identified him as a candidate for graduate studies at the University of Alberta. After graduation Joseph worked as a Research Associate with Dr. Ron DePauw at Agriculture Canada, Swift Current, Saskatchewan. Subsequently he became the barley breeder in Dr. Jim Helm's program at Alberta Agriculture, Lacombe where he eventually became the barley breeding team leader. He became very well-known there and in all of W. Canada for his easy and helpful rapport with barley producers and the institutional release of many excellent new varieties of barley well adapted to the region, that each occupied a large production acreage. His program significantly moved the upper yield targets attainable on production fields of feed barley varieties in Alberta. Joseph retired in 2022 but continues his excellent work as a consultant to various members of the Seed Industry.

Dr. Janice Zale
MSc 1987 Screening methodologies and the genetics of aluminum tolerance in spring wheat

Based on Janice's outstanding academic performance in his undergraduate Cereal and Oilseeds Crops course Briggs suggested that Janice should enter graduate studies, which she had not previously considered. Janice completed her MSc at the University of Alberta and then gained her PhD with Dr. Graham Scoles working on genetic transformation systems in wheat, at the Crop Science Department, University of Saskatchewan. The author has no information about the intervening years but in 2021 Janice as occupied the senior scientist position of Mature Citrus Coordinator at the Citrus Research and Education Center, Florida Agriculture and the University of Florida. Her publication record in many different

crop species has been prolific and encompasses all the newest research methods in plant physiology, biochemistry and biotechnology, including DNA and RNA technologies.

Lecturer (Professor) Sergio Moroni

MSc 1991 Studies on the origin, screening methodologies, and inheritance of manganese tolerance in spring wheat (*Triticum aestivum* L.): Keith Briggs, Supervisor

PhD 1997 Studies on the efficiency of rapeseed (*Brassica napus* L.) for the acquisition and the utilization of inorganic nitrogen (Supervisor : Dr. Gary Stringam, AFNS, University of Alberta)

When he was still an undergraduate student and took this author's Crops and Oilseeds course Sergio told Briggs that he 'wanted to do something meaningful with his life that would be of worldwide significance'. He not only achieved that but maintained very high standards throughout his academic career, which continued to focus mostly on crop adaptation to acidic soils and other environmental stresses, particularly those in the Australian cropping systems which he now serves. After his MSc degree Sergio also completed his PhD at the University of Alberta. He then moved to a research position at the new South Wales Agriculture Department, Australia, followed by a stint as PostDoctoral Fellow and then Research Fellow at the Graham Centre, School of Agricultural and Wine Science, Charles Sturt University, Wagga Wagga, NSW. Following some time spent at the Australian National *Brassica* Germplasm Improvement Program, he is now Lecturer (equivalent to the N. American Professor designation) at Charles Sturt. With a very large, effective and well-funded research program and many graduate students, the results from his group are both widely published and internationally recognized, with Sergio clearly achieving his personal goal that he had shared with Briggs in Edmonton many years earlier.

Joanna Pinto

MSc 1991 Genetics of stripe rust resistance (*Puccinia striiformis* Westend.) resistance in the soft white wheat cultivar, Owens

Joanna conducted all her research for her MSc thesis at the Agriculture and Agri-Food Canada Research Station, Lethbridge, a location where stripe rust is common on irrigated soft spring wheat, a crop which is not grown in the Edmonton region because of its very late maturity. On completion of her MSc thesis Joanna worked as a senior technician in the wheat breeding program at Lethbridge. Briggs later learned that she had passed away from medical complications at age 37, a tragedy indeed, as she was a very effective researcher, both meticulous and enthusiastic about her work and her new discoveries about plants and plant diseases.

Lecturer (Professor) James Owuoche

MSc 1992 Copper requirements of wheat (*Triticum aestivum* L.) cultivars

After thesis completion James, originally recruited from Kenya, continued his academic career with a PhD in Plant Breeding from Kansas State University, USA, followed by a Postdoctoral Fellowship there, working on leaf rust, wheat protein content, various disease and insect resistances, and molecular marker methods. He became Associate Professor and Senior Lecturer in the Department of Crops, Horticulture and Soil Sciences at Egerton University, Kenya. He had previously worked at the Njoro Research Station as Kenya Agricultural Research Institute breeder and geneticist and has released several varieties of wheat and sorghum for use in Kenya. He was also Lecturer for four years at Moi University in the Faculty of Agriculture and Biotechnology. His multiple interests included development of wheat and small grains resistant to biotic and abiotic stresses with suitable quality for industrial and food applications, using both conventional and molecular breeding techniques. He has published over twenty papers in refereed journals and has supervised over seventeen graduate students. His contributions to the crop agricultural sciences and agricultural and research personnel development in East Africa have been major.

Senior Lecturer, Professor and Dean Oliver Kiplagat

MSc 1995 Moisture-stress induced sterility and outcrossing in spring wheat (*Triticum* aestivum L.)

PhD 1999 (Wageningen, Netherlands) The Russian wheat aphid (*Diuraphis noxia* Mord.) damage on Kenyan wheat (*Triticum aestivum* L.) varieties and possible control through resistance breeding

Also from Kenya, after completing his MSc supervised by Briggs, Oliver went on to complete a PhD in Plant Breeding at Wageningen University, The Netherlands. In Kenya Oliver is now the Senior Lecturer at the School of Agriculture and Biotechnology, Eldoret University in W. Kenya, where he is also the Dean. He has a strong research program there, has supervised many graduate students and has published over forty peer reviewed papers. One of his particular strengths has been the development of many institutional linkages with other groups and with international funding sources. These continuing linkages are paramount in supporting the emerging needs of the Kenyan crop industry, crop research funding and personnel training. Oliver has proven to be an accomplished scholar, researcher and administrator.

Dr. Tom Jensen (Past Regional Director, International Plant Nutrition Institute)

PhD 1996 The effect of three tillage systems on the growth of cultivars of canola (*Brassica napus* L.), barley (*Hordeum vulgare* L.) and field pea (*Pisum sativum var arvense*)

A brief summary of Tom's career path by the International Plant Nutrition Institute (IPNI) written as long ago as 2007, best described the numerous important positions he has held during his career and is presented verbatim here. It is also a very good description of his more recent interests and accomplishments. He subsequently became Regional Director of IPNI, and is now retired

'A native of southern Alberta, Dr. Jensen received his B.Sc. in 1979, his M.Sc. in 1985, and his PhD in 1996, all at the University of Alberta. From 1979 until 1982, he was a research agronomist in the Soil Science Section of Agriculture and Agri-Food Canada. He worked for Alberta Agriculture and Food from 1982 through 1995 out of Lethbridge and later Edmonton, primarily in soil conservation, specializing in conservation tillage research and extension. From 1995 to 2003, Dr. Jensen was Corporate Agronomist for Agrium Inc. in Calgary. Since April 2003 he was employed with Agricore United, based in Calgary with the title of Agronomic Research and Development Manager. Throughout his career, Dr. Jensen has been active in community and professional organizations, including recent service as a representative on the Nutrients in the Environment Committee of the Canadian Fertilizer Institute. He is a Certified Crop Adviser and a member of the American Society of Agronomy, Soil Science Society of America, and Alberta Institute of Agrologists'. The latter part of his career was spent with IPRI, N. America.

Professor Alireza Navabi

PhD 2001 Genetics of adult-plant resistance to leaf and stripe rusts wheat

Briggs' involvement in Alireza's (Ali) PhD program started in 1998 when Ali was accepted into his University of Alberta PhD program with funding from CIMMYT, as a student for further training as part of their wheat research linkage with Iran. Ali had already completed a MSc program in Iran. When Briggs retired in 1999 Ali's supervision was taken over by Professor J. P. Tewari, plant pathologist in AFNS, although Briggs remained on his supervisory committee until its completion. Much of Ali's field data was collected at the high altitude site of Toluca, Mexico where yellow rust is very virulent, and for which Briggs organized special arrangements with CIMMYT for him to grow his thesis materials in their nurseries there. CIMMYT was surprised at the extent of the data Ali personally collected in their nurseries, but Briggs was not, as he was already familiar with Ali's extraordinarily high level of dedication to his work. Some parts of his program were also conducted in collaboration with the Canada Agriculture and Agri-Food Research Station at Lethbridge, who also had ongoing programs studying yellow rust in Southern Alberta. Ali was a very hard working, competent and well-liked individual and researcher

with far more high-level technical skill sets than most plant breeders. He very soon became much in demand for collaborative projects throughout Canada and jointly published many leading-edge papers on many topics. He very tragically died of cancer in 2019. His research and teaching skill practiced as a Professor of cereal breeding at the University of Guelph and elsewhere have been greatly missed, but his scientific contributions remain as important core knowledge from which future crops researchers will always benefit. He and his family became Canadian citizens soon after he completed his PhD, when he also spent some time as a postdoctoral fellow in the University of Alberta wheat program. Ali published 65 peer reviewed papers in prestigious Journals and his papers receive a very high level of citation. He achieved 30 variety disclosures and gave over 100 conference presentations both nationally and internationally. In 2016 he was inducted as a Fellow of the Canadian Society of Agronomy and in 2018 was recognized as a Seed Champion by the Ontario Seed Growers' Association. Ali was also an executive board member for Plant Canada from 2015-2017 and was the President of the Canadian Society of Agronomy from 2016-2017.

Dr. Behzad Sorkhilalehloo
PhD 2005 Slow scalding in barley

Like Ali Navabi, when Behzad arrived in Edmonton for a PhD program with Briggs he had already completed a MSc program in Iran, had his own funding and was fully sponsored by CIMMYT. When Briggs retired in 1999 he arrangemed for Behzad to be supervised by Professor J. P. Tewari, which was very appropriate as Tewari was already a world authority on scald resistance of barley on which Behzad would work. Behzad was able to carry out his work on 78 barley varieties using facilities both at the University of Alberta and in CIMMYT nurseries in Toluca, Mexico. He was a very diligent and methodical researcher and his results were also published in prestigious journals. On completion he returned to Iran and became leader for their barley breeding program. Briggs heard third-hand that Behzad had gained a high position in the Iranian cereal breeding research structure. Cereal acreages in Iran are very large and this position would carry a very high level of responsibility in support of Iran's agriculturally very extensive and productive cereal crop industry.

Dr. Brian Beres 2000 MAg Special project: The value of (sic *Alberta*) Regional Data compared to Coop data (*sic 'for describing variety performance'*)

As part of Brian's MAg program, the first one of a brand-new program in the Faculty of ALES at that time, Briggs supervised the development and completion of Brian's research report about the merits of Regional Variety Testing Trials in Alberta. His question for the study was whether the extra cost of the multi-location Alberta Regional testing program provided a significantly more useful description of local varietal adaptation compared to the very few locations of data collected and used to Federally register a new variety for production in Canada/Alberta. The answer was 'Yes, and farmers will always need to see the data that describe those differences!' In 2011 Brian completed his PhD at the University of Alberta, entitled 'Integrating the building blocks of agronomy into an IPM (*sic Integrated Pest Management*) system for wheat stem sawfly'. He then took a position with Agriculture and Agri-Food Canada, Lethbridge, where he is now Senior Research Scientist in Agronomy. He has very diverse project interests and has been a prolific contributor to extension and journal publications. Brian's online bio states……'Dr. Beres is internationally recognized as an authority who develops integrated crop management tools and solutions to sustain the economic and environmental viability of farming systems in Western Canada'.

End Note:
This TALES of ALES is a substantial October 20, 2022 update / rewrite of an unpublished November 2014 article by Keith Briggs. (Plant Science and AFNS 1969-1999), Emeritus Professor in Plant Breeding and Crop Science, former Chair of Plant Science and first Chair of the Department of Agricultural, Food and Nutritional Science (AFNS). As the founding Chair of

AFNS, Keith led the development of the vision, goals and Departmental structure that still continue as the foundation of AFNS activity as it moves forwards through its' second 100 years in the Faculty of ALES. As of 2022 active genetic studies and variety breeding research continue in AFNS both in Canola and spring wheat.

(Photo source: unsplash.com)