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IN MEMORIAM OF PROFESSOR TADEUSZ WOLSKI

Professor Tadeusz Wolski passed away on March 11, 2005 in age of 81. He is a great person in the history of plant breeding in Poland. In the text below we recall Professor Tadeusz Wolski's work and achievements as our homage to him.

1. Personality and contribution to agricultural sciences

Plant breeding is a scientific profession that has had, and continues to have, a profound impact on the survival of mankind. Plant breeding is the key to increasing the world's food supply to meet the increasing population, which is expected to reach 9 billion people by 2040. There are many plant breeding techniques used in improving food production that are well founded in science. However, there are many successful plant-breeding approaches to increasing world food production that involve and will continue to involve the creative activities of man and are indeed a fine art.

In a speech celebrating the 50-year anniversary of his professional life, Prof. Wolski said, "The attractiveness of breeding *cereals* appears to be directly connected to bread multiplication." During the entire span of his scientific career, he treated his plant breeding profession as a vocation, which always fascinated and absorbed him. He was never satisfied with his work and he was always asking for and exploring ways to improve his research.

He was born into the Janasz family, a traditionally relevant Polish plant breeding family, which was initiated in 1880 when his grandfather, Aleksander Janasz, owned a Polish plant breeding company. As a 16 year-old, Tadeusz Wolski started his professional career under the tutelage of his mother Maria Janasz- Wolski. He took secret courses at an underground high school during German occupation of Poland. Following World War II, in 1948, he graduated from the Warsaw Agriculture University. In 1967, he received a Ph.D. degree with his thesis research on in-breeding in rye. In 1976, he got a docent position at the Institute of Plant Breeding and Acclimatization. In 1989, he was granted the honor of Professor in Agriculture from the President of Poland.

During his productive plant breeding career, Prof. Wolski and his colleagues registered 57 new varieties of cereals: rye, wheat, and triticale. These new cultivars were developed in breeding programs carefully designed by Wolski based on solid scientific methods and the knowledge of genetics, cytology, biochemistry, phytopathology, soil science, fertilization techniques, and nutritional science and technology. However, he never lost sight of the art of his profession and the impact of always questioning his methods and approaches to variety improvement.

Professor Wolski is widely known authority and highly respected throughout the world, because of his depth of knowledge, experience, and accomplishment in development of new varieties of rye, wheat, and triticale. His varieties are grown in several European countries from Scandinavia to Portugal as well in the USA, Canada, Brazil, Australia, New Zealand, and South Korea. His success as a breeder was achieved by hard work and skill in the utilization of scientific knowledge and techniques which were developed in close cooperation with other Polish scientists: Professors Czeslaw Tarkowski and Danuta Miazga from the Agricultural University in Lublin; Professors A. Aniol and M. Rakowska from the Institute of Plant Breeding and Acclimatization in Radzików; and Professor A. Biskupski from the Agricultural University in Wroclaw, as indicated in his published papers. In addition, he developed a strong working relationship with cereal scientists all over the world, which resulted in many new techniques and new germplasm being utilized in Poland.

Despite the Janasz family breeding enterprise, as well as Wolski's native farm in Danków being nationalized in 1952 he did not stop his work on plant breeding and variety improvement. He was the main plant breeder in the nationalized Poznan Breeding Company and later in the Danko Company. His attitude and enthusiasm for cereal improvement became a model to young students in plant breeding not only in Poland, but also worldwide. Polish students worked tirelessly with him despite low salaries and modest financial rewards that resulted from the registration of new varieties.

Prof. Wolski was very active and participated in many national and international meetings including several Eucarpia symposia on wheat, rye, and triticale, and the world congresses on plant genetics and breeding. Very often he was an invited keynote speaker. His expertise and willingness to share his knowledge and participate in long discussions was always very much appreciated. His knowledge has had considerable impact around the world. His approach to breeding out-crossing species such as rye has been adapted by many breeders. He always stated that when working with out-crossing species a breeder should not try and produce a variety. In stead they should concentrate on producing a "morphologically uniform population" with the desired agronomic and value-added traits. This is an outstanding comment, which has had a profound influence on breeders around the world. This approach led Prof. Wolski to become one of the worlds most successful cereal breeders.

In recognition of his merits in the field of agriculture, he was elected member of Royal Academy of Agricultural Sciences of Sweden and the Agricultural Academy of France. In 2000, he was nominated a Corresponding Member of the Polish Academy of Sciences. As an acknowledgement of Prof. Wolski's contribution to science

and the practice of plant breeding, a degree of Doctor Honoris Causa was awarded to by the Warsaw Agricultural University (1992) and the Agricultural University of Lublin (1998).

Prof. Wolski's work is well known to the Polish and world community of plant breeders through his publications. He has published 130 scientific manuscripts in Polish, in spite of fluent knowledge of three foreign languages, because he regarded his work to be addressed primarily to Polish breeders and cereal producers. This was one of the many ways in which Prof. Wolski continuously expressed his patriotism and dedication to the improvement of Polish cereals.

One of the most difficult of all cereal breeding programs to be successful is in open-pollinated rye breeding, which has been described in detail in the book "Rye Biology" (PWN 1983) edited by Prof. C. Tarkowski. It contains a substantial and landmark contribution from Prof. Wolski titled "History of rye breeding in Europe and in Poland; specific methods of breeding and evaluation of rye lines; achievements in creation of new varieties of rye and estimation of progress in the field" that has been studied and copied by breeders and students all over the world.

Prof. Wolski has always seen a continuous and prosperous future for rye production in Poland, provided that any newly-created varieties of rye maintain unique traits including: low demand for soil fertility and moisture-due to its extremely large root system; tolerance to weeds, soil acidity, and aluminum toxicity, as well as resistance to plant diseases most important for rye production in Poland. Prof. Wolski has always felt that in Middle and Eastern Europe, rye will continue to remain one of the main sources of tasty and nutritious bread for humans and as food and fiber for animal use.

2. New rye variety improvement

The rye variety "Dankowskie selekcyjne" developed by Aleksander Janasz at the end of 19th century was the starting material for Wolski's highly successful variety 'Dankowskie Złote', which has been widely grown in Poland and other European countries for over 20 years. The improved variety of this rye named 'Danko', with significantly better resistance to lodging and pre-harvest sprouting, was registered in 1976 and has been under continuous cultivation since in the majority of Middle and Eastern European countries.

Prof. Wolski's recent work on rye improvement has focused on better baking quality. This was achieved by crossing several Swedish, Austrian, German, Finish, and Dutch varieties of rye. The first rye variety 'Amilo' with improved baking quality released in Poland by Prof. Wolski in 1989 and was followed by several varieties of this type: 'Warko' (1991) and 'Modeno' (1996).

3. Achievements in wheat improvement

Utilizing the principle of improved "harvest index" via semi-dwarf variety production, Norman Borlaug located at the International Maize and Wheat Improvement Center CIMMYT in Mexico developed highly productive semi-dwarf wheat varieties. These varieties were introduced to production on a world scale, especially in India and Pakistan where they were part of the success known as the "Green Revolution," which alleviated hunger in these countries. In recognition of

this Dr. Borlaug was awarded the Noble Peace Prize in 1970. Prof. Wolski used the same principle and developed the short strawed, highly productive, and resistant to lodging winter wheat variety 'Grana', registered in 1976. This variety was a great breakthrough in Polish wheat production, and has been continuously grown on about 50% of the Polish wheat acreage for almost 20 years. Further efforts of Prof. Wolski and his group have been devoted to the improvement of wheat baking quality, resistance to diseases, and increased productivity. The first variety incorporating those characteristics was 'Begra', which was registered in 1988. Following Begra have been several varieties including 'Lanca', 'Panda', 'Luna', and 'Alba'.

4. Progress in triticale breeding.

Triticale, the first man-made cereal, obtained by crossing wheat and rye, started to be of interest to breeders in the last 50 years. Prof Wolski started his research on triticale in 1968 using hexaploid forms that contained a full rye genome. Prof. Wolski saw that the high photosynthetic potential of triticale, as compared to other cereals, created the possibility of obtaining considerable gains in productivity. As the primary breeder at the Danko Company, Prof. Wolski has continued to be very active in Triticale breeding. According to Prof. Wolski, the value-added traits of triticale are remarkably suitable to the climatic and soil conditions, which exist in Poland. Triticale grain composition is better for monogastric animals (pigs and poultry) when compared to rye, and its straw is more delicate, nutritious and is suitable for large animals. The soil requirements of triticale allow it to grow on very good and/or marginal rye soils, so it can be used as an alternative cereal for Polish farmers and to reduce the Polish overproduction of rye grain, which despite its poor quality, has been a major source of grain for animal feeding. The improvement of triticale varieties in terms of their suitability for bread, cookies and breakfast cereals production, clearly showed Prof. Wolski that the potential for its application to human nutrition was very good.

The breeding of triticale in the Danko Company has been conducted at two, stations Laski in the middle part of Poland with severe climatic conditions, and at Choryn in Western Poland where there is a milder climate. After several years of triticale breeding, Professors Wolski and Tarkowski designed a model variety of that was highly suitable for Polish cereal production. The characteristics of such a model variety were formulated in 24 points, representing instructions to other triticale breeders. In order to obtain the desired traits, Prof. Wolski introduced several methods of testing which were based on earlier biochemical studies:

1. Testing of seedlings for sensitivity to low soil pH and toxicity of aluminum ions according to Anioł (1977),
2. Hagberg-Perten test of grains for pre-harvest sprouting,
3. Determination of protein content,
4. Amino acid composition of protein,
5. Testing of seeds for contamination with pests,
6. Feeding tests for chicken for growth, digestibility on laboratory rats in the grain storage facilities when more grain is available,
7. Tests for milling efficiency and baking quality in unified laboratory conditions.

Classical surveys were also performed to test productivity, the length of spikes, number of grains per spikelet, number of spikelets per spike, number of spikes per square meter, and 1000-grain mass. All of these methods involved plenty of hard work for lots of students, scientists, and technicians because the measurements were taken in the field over many years on millions of individual plant selections. A special design for experimental fields was used by Prof. Wolski for each of the different cereal species depending on whether or not they were self or cross pollinated, which has been studied and adopted by other breeders in Poland and elsewhere around the world. Prof. Wolski wrote several invited book chapters: "Directions in triticale breeding and its evaluation" and "Methods of triticale breeding," which represented excellent and unique contributions defining his approaches to cereal breeding for variety improvement. They are contained in the book "Biology of Triticale".

Prof. Wolski has always felt that the proper choice of parental wheat and rye genotypes is one of the most important aspects of triticale breeding and improvement. An open-minded close cooperation between Prof. Wolski and the group of scientists at the Agriculture University of Lublin under the supervision of Prof. Tarkowski was of great importance. Prof. Wolski also cultivated a very active exchange of ideas, and triticale, wheat, and rye germplasm in cooperation with CIMMYT in Mexico, and Canadian, US, and European breeders.

In his Doctor Honoris Causa ceremony speech Prof. Wolski said, "new creations of plants are born by the effort of the whole group of cooperating humans in the world." For example, the first Polish variety 'Lasko' originated from Hungarian and American triticale parents, which were crossed with Polish wheat and rye. Lasko was registered in Germany (1982) and has been widely produced in the world. However, because of low winter hardiness, Lasko was never registered in Poland, but it has been one of the parents of most all of the current Polish triticale varieties.

5. New improved varieties of triticale.

The new triticale varieties 'Grado' and 'Dagro' with improved winter hardiness have been in commercial production in Poland since 1986. The pedigree of these varieties is based on Hungarian and Canadian variety of Triticale crossed to the Polish wheat 'Grana', a French-Mexican wheat and the Polish rye 'Danko'. This is a clear indication of the varied germplasm and approaches that Prof. Wolski used in his triticale breeding program to produce the best possible varieties for the Polish farmers. In 1989, 'Presto', 'Tewo', 'Moreno', and 'Wero Wolski' varieties with improved productivity, resistance to lodging and winter hardiness were released for commercial production. Mexican spring triticale varieties from CIMMYT in Mexico were utilized as parents in crosses to Polish triticales, which resulted in baking quality improvement in the varieties 'Salvo', 'Bolero', and 'Moniko', which were released for commercial production in 1990s. The introduction of these varieties to Polish farmers, together with varieties from the Institute of Plant Breeding and Acclimatization, resulted in a triticale production area increase in Poland from about 20 000 ha in 1985 to 800 000 ha in 1992. This is the largest triticale acreage increase in the world.

In Europe, Prof. Wolski's excellent variety 'Presto' was registered and produced in Sweden, Germany, Denmark, and France under the name 'Alamo'. The newest variety, 'Prego', originated from introducing the gene for dwarfing *HI* in rye from Dr. Kobylanski Institute in Petersburg into the Polish triticale 'Lasko', which resulted in significantly improved winter hardiness and resistance to diseases and lodging. Significant progress in new varieties production was achieved by Prof. Wolski when he created two dwarf triticales 'Fidelio' and 'Pinokio', which had a much larger, deeper root system, and high mass of 1000 kernels than did previous varieties, and were registered in Poland, Sweden, and Finland,

In summary, it can be concluded that Professor Tadeusz Wolski was the most outstanding figure in Polish plant breeding during the second half of the 20th century. The cereal breeding programs developed at the breeding stations where Professor Wolski worked resulted in many varieties of cereals including the winter whet 'Grana', rye 'Dankowskie Zlote', and the triticale 'Fidelio', which have had a profound impact on cereal production in Poland and the rest of Europe. With these cultivars, the most advance methods of cereal breeding and the best germplasm were introduced to Polish agriculture as well as the rest of Europe and around the world. Cereal grain yield increased from approximately 2 tons/ha in the early 1960s to the present levels of over 4 tons/ha and this was in large part due to the new cultivars generated from Professor Wolski's breeding programs.

The successes of Professor Wolski as a plant breeder/scientist/teacher have been the result of his personality; his utilization of advances in science related to breeding; to his ability to select and apply new methods and breeding approaches; and to his utilization of new sources of germplasm for important value added traits. His warm, outgoing personality made possible friendly relations with scientists in Poland and around the world, which resulted in the adaptation of the world's technology and germplasm for cereal improvement in Poland. Last, but not least, his hard work and breeders intuition known as "good breeders nose," which is very important, was not only based on good science, but also involved a high degree of art, lead to his cereal cultivars being grown in many countries, in addition to being used as a valuable source of germplasm for other plant breeders in their quest for cereal improvement.

Presented by Prof.dr hab. Maria Rakowska