THE DEVELOPMENT OF "ELDO NGANO 1": THE WORLD

1 The wheat black stem rust disease is a virulent race of fungus, Puccinia graminis, which affects wheat plants and is caused by a strain of fungus known as Ug99.

Named for its place and year of origin, Ug99 was first discovered on wheat in Uganda in 1999. The spores of this plant disease are airborne and can be easily spread by wind. If not prevented, the disease can destroy 70 to 100 per cent of the yield of wheat crops. Annually on average 8.3 million tonnes of wheat grain is lost to this disease, costing US $1.23 billion per year. Ethiopia, Kenya and Uganda are hot spots for this disease.
(Photo: Miriam Kinyua, School of Agriculture and Biotechnology, University of Eldoret, Kenya)

2 In 2009, growing international concern regarding the horrific impact of Ug99 on wheat led to the establishment of IAEA project INT/5/150, Responding to the Transboundary Threat of Wheat Black Stem Rust (Ug99).

This project has involved over 18 countries and 5 national and international institutions, and examined possible mutation induction treatments to deal with the challenges posed by Ug99. Meetings and workshops to facilitate the project efforts have been held in Kenya and Turkey.
(Photo: IAEA)

3 Mutation induction treatments were carried out in 2009 at the IAEA Plant Breeding and Genetics Laboratory (PBGL) in Seibersdorf. This involved irradiating seeds of selected wheat varieties from participating countries using gamma rays. Radiosensitivity testing of seedlings was carried out to determine the optimum dose of irradiation.

The seeds were transferred between the PBGL and Member States using the IAEA Standard Material Transfer Agreement which guarantees access and benefit sharing among Member States. (Photo: IAEA)

4 Irradiated seeds were sent to Eldoret, Kenya in 2009 where the disease is prevalent. IAEA support to Kenya also included the establishment of irrigation systems which allowed for two generations of wheat to be grown and tested each year from 2009 onwards.

Thirteen resistant mutant lines were selected in wheat varieties from 6 countries: Algeria, Iraq, Kenya, Syrian Arab Republic, Uganda and Yemen. (Photo: IAEA)

D'S FIRST UG99 RESISTANT MUTANT WHEAT VARIETY

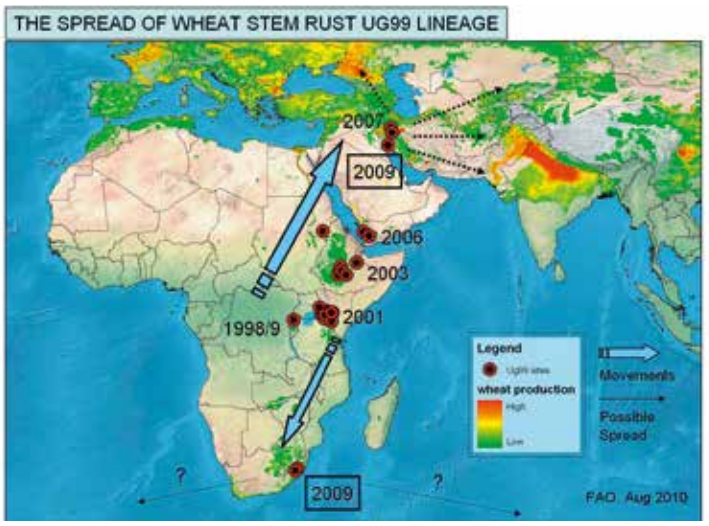
5 In 2012, in parallel with the field testing for Ug99 resistance in Kenya, a fellowship training programme was established at the PBGL for Mr Amos Ego from Kenya to learn skills in mutation induction, mutation detection, advancement of mutant lines and their validation using DNA analyses. (Photo: IAEA)

Certificate of "Eldo Ngano 1" Published by Authority of the Republic of Kenya

6 The first successful mutant variety of wheat resistant to Ug99 was released in February 2014 and named "Eldo Ngano 1". Six tonnes of seeds were produced for distribution to farmers in Kenya and a "Farmers' Day" was organized to demonstrate the disease resistant mutants and to explain the project.

Recently, a second advanced mutant line was tested for varietal status. In addition, a promising advanced mutant line in Uganda is being prepared for official testing and release in 2015.

7 Extrabudgetary funding was used to support a special training workshop in December 2013 at the IAEA in Vienna and the laboratories in Seibersdorf to discuss the next steps and challenges. This included exchanging seeds of resistant mutant lines for breeding, biotechnologies to speed up the introgression of the mutant resistant genes into elite lines from other Member States, and DNA methods to screen for disease resistance. (Photo: IAEA)



8 Ug99 continues to spread globally and has now reached the Islamic Republic of Iran. There are also reports of suspected disease occurrences in Europe.

It is essential that work continues on developing mutant lines for further crop protection that can be utilized worldwide to safeguard the wheat crop from this devastating disease.

(Photo: Food and Agriculture Organization of the United Nations, Ug99 Lineage Overview — April 2011)

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