the ratio of photosynthetic pigments in arsenic may be considered an adaptive response of the assimilation apparatus of the wheat seedlings to excess of it in the solution. Thus, arsenic leads to changes in the photosynthetic pigment content resulting in a reduction of chlorophyll a and increased levels of auxiliary chlorophyll and carotenoid pigments.

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## ITEMS FROM KENYA

**CIMMYT**
**Nairobi, Kenya**

### *Stem rust resistance screening facilities in Kenya.*

Sridhar Bhavani.

**National Performance Trials of high-yielding elite lines carrying stem rust resistance and new cultivars in the pipeline.** Three lines, selected from the CIMMYT–Kenya shuttle breeding program, were promoted to the National Performance Trials and tested at seven diverse agroecological sites (Njoro, Eldoret, Naivasha, Narok, Rongai, Kitale, and Lanet) distributed over the predominant wheat-growing areas of Kenya. The trials were conducted under the guidelines of the Kenya Plant Health Inspectorate Service, who is the authorized body for national variety testing and release. The 2008–09 data showed that of the three lines, two CIMMYT lines outperformed the check cultivars at a majority of the sites in terms of yield and resistance (Table 1). These lines carry a combination of seedling and APR genes. In addition, these lines were found to be early maturing and produced high-quality grain. The two cultivars, Kenya Robin and Kenya Eagle10, are currently under large-scale multiplication.

**Table 1.** CIMMYT lines outperforming the check cultivars in the National Performance Trials in Kenya, 2008–09.

| Cultivar | Parentage | Level of resistance | Amount of seed for multiplication |
|---|---|---|---|
| Kenya Robin | BABAX/LR42//BABAX*2/3/TUKURU | 10MR | 20 tons |
| Kenya Eagle 10 | EMB 16/CBRD//CBRD | 10MR | 20 tons |

### *Evaluation of wheat materials received from different countries against stem rust (Ug99) in Kenya during 2010.*

The 2010 off-season screening nurseries accommodated more than 18,000 entries from 16 countries/institutes (Argentina, Australia, Bangladesh, Egypt, France, India, Kazakhstan, Kenya, Pakistan, PR China, South Africa, Tajikistan, Uruguay, the USA, CIMMYT, and ICARDA). Disease development was very good, but a disturbed the soil profile, probably because of land leveling, caused problems in germination and plant development in some areas.

The 2010 main season nursery accommodated over 27,000 entries of which 5,000 entries were winter materials and 3,000 were barley accessions. Samples were sent from 19 countries and institutions (Afghanistan, Australia, Bangladesh, Canada, Ethiopia, India, Iran, Iraq, Israel, Kazakhstan, Kenya, Nepal, Pakistan, PR China, South Africa, Turkey, the USA, and segregating populations from CIMMYT and ICARDA). The 2010 main season was the best in terms of crop growth, management practices, and disease pressure for screening.

For both seasons, communications/logistics were established with relevant scientists/originators for scoring their material and assistance was provided to collaborating countries for collecting data. Data was recorded, documented, and exchanged timely with the respective collaborators.

### *Field management strategies and developments at the Kenyan Agricultural Research Institute, Njoro.*

**Land management.** Screening international nurseries was carried out over the last two years had some serious setbacks on leveling and soil fertility. For the nurseries, 14 ha of land, with varying topography and soil profile/maintenance, is used with a land rotation practice of 3 ha each season. The land was split into 10 leveled terraces at a 1.5% slope after developing contour topographical maps to maximize the full potential of the facilities by improving irrigation, germination, and plant growth. The field layout was designed to avoid border effects with deficiencies, and the field was divided in to smaller subplots to accommodate the nurseries

**Improving soil fertility.** Plot leveling, even though a good practice, damaged by disturbing the top fertile layers (the soil was not deep enough) and led to copper deficiency that resulted in sterility and stunted growth in some areas of the offseason nurseries in 2009. A comprehensive soil analysis was performed to identify and rectify soil deficiencies. An application of lime at 5t/ha and copper-oxychloride at 3 ppm, and cover crop of peas and beans, was advocated in the main season 2010.

**Irrigation facilities.** Over the years, one persistent problem for screening was irrigation, especially during the off-season, and the irrigation system of the KARI could not meet the demand for the field activities. The entire area now is equipped with a dual-drip and sprinkler irrigation system. A borehole submersible pump dedicated only to this facility was established. A reservoir tank of 1,000 cubes is under construction to store water pumped from underground for periodic drip irrigation during both seasons. After construction and implementation of the reservoir, KARI will have a well-developed irrigation system adequate for 12 ha.

**Outcome.** These changes had a tremendous impact on the 2010 main season crop growth and establishment. Drips served the purpose in the first week of crop establishment, however plenty of rain ensured good growth and the build up of disease for screening. Several improved practices, such as leveling, drips, soil amendments, and crop rotation, definitely showed a significant impact on main season nursery in 2010

**Green house operations.** At this stage, the greenhouse is functional. An investment was made to renovate, however additional funds would be needed to keep it operational to meet the demand of several collaborators expressing interest in screening their materials for major genes in the greenhouse. Protocols for in-house screening against Ug99 have been optimized. Close to 1,500 lines have been screened so far, including mapping populations developed at CIMMYT and the Plant Breeding Institute, Sydney, Australia.

**Pathogen surveys and race identification.** ***Stem rust.*** Apart from the known virulence within the Ug99 lineage (*Sr31*, *Sr24,* and *Sr36* virulent races) no new race(s) have been detected. The predominant race is Ug99+*Sr24* virulence, which is used for screening activities. Isolates collected during surveys are collected and sent to Minnesota for further characterization.

***Strip rust.*** The main season of 2010 experienced a fair amount of natural stripe rust infestation. Samples were sent to Denmark. Mogens report from Denmark suggests that the Kenyan race is unique with virulence to *Yr27*. This aggressive strain has evolved and has acquired virulence for *Yr1*, which needs further confirmation by DNA fingerprinting.