Maize Doubled Haploid (DH) Facility for Africa

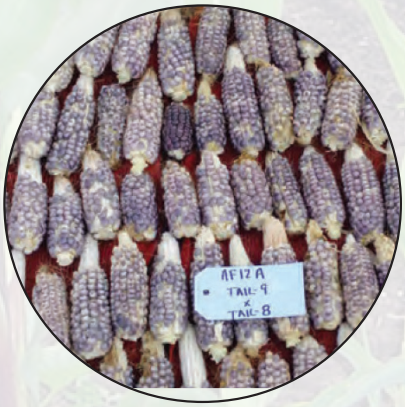
KARI-Kiboko Station, Makueni County, Kenya

Background

- The doubled haploid technology is one of themost important modern ways of accelerating the development of improved maize varieties.
- The state-of-the-art maize doubled (DH) facility for Africa has been established by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with the Kenya Agricultural Research Institute (KARI) on a 20 hectare land in KARI-Kiboko station, Makueni County.
- CIMMYT's long-standing partnership with KARI continues to be highly successful in developing and disseminating an array of high-yielding maize varieties with resilience to biotic (foliar diseases, pre-and post-harvest insect pests, and the parasitic weed Striga) and abiotic stresses (drought and low soil nitrogen), and improved nutritional quality.
- A US$6 million funding support has been provided by the Bill and Melinda Gates Foundation (BMGF) to CIMMYT for establishing the Maize DH Facility for Africa in Kiboko, Kenya and to sustain its first four (4) years of operation.

How does the DH Facility help maize breeders?

- Double haploid process is a strategic and cutting-edge technology to produce instant parental inbred lines needed in maize cultivar and hybrid development. Unlike conventional breeding which takes at least 7 to 8 generations or crop seasons to develop parental lines, the DH lines are generated within just 2 to 3 seasons, saving very significant time, labor, and other resources.



- Doubled haploidy involves a multi-step process that does not require any transgenic technology, and can be undertaken in just two crop seasons. CIMMYT-derived haploid inducers are special maize genetic stocks which are used to cross with the elite source (traits donor) populations submitted by the breeders, from which the DH lines are generated. Some of the seeds resulting from this crossing are haploids which could be identified by color markers on the seed. Identified haploid seeds are germinated and chemically treated under a controlled condition to double the haploid chromosome during the process of cell division in one or few cells at the growing point of the maize seedling. Treated seedlings are then taken care of at the greenhouse and subsequently transplanted at the field nursery. By selfing the fertile plants, seeds of doubled haploid lines are derived. These seeds now become the parent lines for the maize breeder to advance his breeding program(s).

- DH lines are highly uniform, genetically pure, and stable. Thus, it enables the maize breeding process more rapid and more efficient. DH technology allows breeders to evaluate significantly more hybrid combinations, thus significantly reducing the time required for inbred or cultivar development and deployment. For instance, the time required for developing maize cultivars with resistance to maize lethal necrosis (MLN) in Eastern Africa can be significantly shortened using the DH technology. DH also facilitates the application of advanced breeding technologies such as marker-trait association studies, marker-based introgression, functional genomics, molecular cytogenetics, and genetic engineering.
- Thus DH is a powerful tool for the maize breeders to reduce the time required for inbred line development, and accelerate development of improved cultivars. For instance, the time required for developing maize cultivars with resistance to maize lethal necrosis (MLN) in

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What is unique about the DH Facility for Africa at Kiboko and what it offers:

- While DH technology is being used routinely by the multinational companies, mostly through DH facilities in the USA and Latin America, this DH facility is especially targeted at strengthening the maize breeding programs by the public sector institutions (NARS, CIMMYT and IITA) as well as small and medium-size enterprise (SME) seed companies in Africa.
- Kiboko has an ideal environment for growing both tropical and subtropical materials and for developing DH lines throughout the year, without any significant problems of disease and insect pressure during the crop cycle.
- Complemented by 5 management-technical staff and a 120-labor crew at peak season, the Facility includes an administrative building cum seed quality laboratory and training resources, artificial dyer, a cold storage-seed room, a chromosome doubling laboratory, greenhouse, and a state-of-the-art irrigation system to support an all-year round DH production in the 17-ha. nursery.
- CIMMYT's capacity to generate stress resilient and nutritionally enriched maize germplasm for as the Drought Tolerant Maize for Africa (DTMA), Water Efficient Maize for Africa (WEMA), Improved Maize for African Soils (IMAS), Insect Resistant Maize for Africa (IRMA), Maize Harvest Plus in Africa, and other future projects will be strengthened significantly by this new facility
- The facility with specially trained manpower will also serve as a hub for training young researchers and students in Africa on the DH technology and how it can help in accelerating development of new maize varieties.

With the establishment of the maize DH facility in KARI-Kiboko through CIMMYT-KARI partnership, the station emerges as a "center of excellence" for maize breeding in sub-Saharan Africa.

Services Offered by the DOUBLED HAPLOID FACILITY for AFRICA:

- Haploid induction
- Haploid selection/identificatio
- Chromosome doubling
- Doubled haploid (D1) seeds generation

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