The phanerogamous root parasite *Striga hermonthica* (Del.) Benth. causes major yield reductions in the principal cereal crops of semi-arid Africa. A workshop on breeding for *Striga* resistance in cereals was held at the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, from 18 to 20 August 1999. The meeting was organized by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), IITA, the University of Hohenheim, Eberhard-Karls University of Tubingen, and the Rockefeller Foundation. Funding was provided by the Bundesministerium fur wirtschaftliche Zusammenarbeit (BMZ), Germany, the Rockefeller Foundation, and the International Fund for Agricultural Development (IFAD). The 56 participants comprised 26 cereal breeders or weed specialists from national agricultural research systems (NARS) of 17 African countries, and 30 scientists or representatives from the International Maize and Wheat Improvement Center (CIMMYT), Centre de cooperation internationale en recherche agronomique pour le developpement (CIRAD), ICRISAT, IITA, John Innes Centre (JIC), the Natural Resources Institute (NRI), Pan African *Striga* Control Network (PASCON), ProAgro Seed Company, the Rockefeller Foundation, Cornell University, University of Hohenheim, Purdue University, University of Sheffield, University of Tubingen, West Africa Rice Development Association (WARDA), and the Weizmann Institute of Science.

Objectives of the workshop were two-fold: 1) to summarize the "state of the art" of cereal breeding for *Striga* resistance (including conventional and biotechnological approaches), and; 2) to develop with NARS scientists future strategies for *Striga* control in sorghum, maize, millet and rice, emphasizing host plant resistance. The workshop included presentations related to physiological of the host/parasite interaction; resistance mechanisms; inheritance of resistance; new sources of resistance in wild relatives of sorghum; actual breeding programs for *Striga* resistance in maize, sorghum, millet, and rice; molecular markers for *Striga* resistance; identification of *Striga* tolerance genes in maize using transposable elements; other biotechnological approaches for *Striga* control; diversity of *Striga* populations and consequences for resistance breeding; and breeding towards integrated *Striga* control. Since so many presentations dealt with molecular markers, the workshop was preceded by a two-day training course on the application of molecular markers in plant breeding programs (16-17 August; training manual available on-line at http://www.icrisat.org/gt1/mol/molecular.htm). Participants visited the IITA screenhouses at Ibadan, and several field trials (on-station and on-farm) at Mokwa. On the final day, working groups discussed future strategies in *Striga* research and developed the following recommendations.

Strategies essential for efficient conventional breeding for *Striga* resistance include:

- careful definition of target environments;
- determination of the most important selection traits for each target environment;
- identification of adapted parents for use in a backcross program;
- training of NARS scientists to use both laboratory and field screening methods;
- transfer of available resistance into farmer-selected varieties, through combined use of laboratory (e.g., agar-gel and paper-roll assay) and field screening methodologies;
- combining different resistance mechanisms and tolerance to *Striga* in individual varieties; and
- networking and exchange of useful plant genotypes.

Population improvement through development of a random-mating population combining several different resistance genes could be very useful, but would have to be carried out on a large scale by a dedicated, able breeder. Targeted searches for new resistance sources in pearl millet, sorghum, and their wild relatives are important using recently perfected field and laboratory screening methodologies.

Marker technology and QTL analyses were considered to be potentially very useful. Verification of results is essential, as preliminary results suggest complex QTL patterns and low repeatability of individual QTL across environments and different mapping population samples.
Future research efforts should continue to
• develop universal marker systems, especially allele-
specific markers;
• develop isogenic lines to quantify QTL effects for
Striga resistance;
• create an integrated, PCR-based sorghum reference
map (begin by integrating Striga resistance mapping
populations);
• identify adapted sorghum parents for use in marker-
assisted selection programs;
• determine whether the low-stimulant genes in SRN 39
and IS 9830 are identical; and
• develop a sorghum data base (ICRISAT leadership).

Once resistance genes have been identified, efforts
should be made to exploit syntenic in sorghum, maize,
rice and millet. Transfer of resistance genes from cowpea
into cereals was not considered a priority.

The continued search for resistance mechanisms and
their genetic basis should always run parallel to the
marker approach, with a final aim of identifying allele-
specific markers. Enhanced knowledge of the physiology
of the host/parasite interaction is urgently required to:
• examine interactions between host root exudates and
exudates from the Striga radicle;
• determine how Striga induces its strong sink reaction;
• study how early host plant flowering minimizes the
"bewitching" effect of Striga on its host;
• clarify the role of ABA; and
• study mechanisms of antibiosis.

An unconventional approach to Striga control would
reduce Striga vigor by genetic engineering. In this
approach enzymes are identified that reduce the vigor of
Striga, using deleterious transposons (DTs) to reduce
Striga vigor. First model studies are underway at the
Weizmann Institute of Science.

The development of cultivars with target site
resistance to acetolactate synthase (ALS) inhibiting
herbicides was considered to be (probably) appropriate
for maize in Africa and pearl millet and sorghum in Asia
(i.e., in regions where the crops do not have feral or
weedy relatives). It seems less appropriate for rice in Asia
and Africa, pearl millet in West Africa, and sorghum in
Africa (i.e., in crop/region combinations where feral or
weedy relatives are present).

Transposon-based mutation breeding may allow
researchers to:
• find resistant phenotypes that previously did not exist,
due to transposon insertion into relevant genes;
• tag genes that are involved in host response to Striga
(forward genetics);
• isolate and clone the gene; and
• use the cloned gene in both the host and other host
plant species.

Future research related to Striga variability should:
• study inheritance of isoenzyme and DNA markers;
• analyze linkage between markers;
• perform cytological studies on Striga chromosome
number and degree of polyploidy;
• develop 10 to 15 micro-satellites for Striga diversity
studies;
• estimate polymorphism in Striga hermonthica populations
that are naturally adapted to different hosts;
• test more populations from wide geographic sites
across Africa, and from a variety of different resistant
and susceptible hosts;
• extend host range tests;
• standardize sampling procedures;
• include farmer consultation on field history;
• create genetic stocks of various Striga strains by
developing full-sib families;
• develop a set of host plant differential lines; and
• elucidate mechanisms and inheritance of Striga
virulence focussing on Striga sensitivity to germination
stimulants, Striga penetration into host roots, and the role
of exoenzymes.

Inter-Center collaboration is highly encouraged in this
respect.

With respect to integrated Striga control, methodologies
immediately available for technology transfer/extension
services include:
• maize/legume (groundnut, soybean, cowpea) inter-
cropping, plus weeding and fertilization: 100-120 kg
N and 50-60 kg P\textsubscript{2}O\textsubscript{5} for moist savannas;
• sorghum/cowpea intercropping: two rows sorghum +
four rows cowpea, strip planting;
• rotations of cereals and legumes; and
• tied ridges for the Sahel.

Further research on integrated Striga control should
focus on:
• location-specific laboratory screening of cultivars of
non-host species for their ability to germinate Striga
(cowpea, soybean, groundnut, cotton, pigeon pea,
Phaseolus beans, cassava, sorghum, millet, maize,
Stylosanthes, and sesame);
• participatory, on-farm development of individual,
integrated Striga control packages, adapted to each
target area; especially consider rotation or intercropping
of sorghum/maize with legumes (soybean, cowpea,
groundnut, Phaseolus bean); and
• impact studies.

Individuals/organizations have been identified to carry
forward on most of the above topics. A CD proceedings
of the workshop is in preparation.