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30 June 1989

Dr Benjamin H Waite
Plant Pathologist
USAID/S&T/AGR
Washington, DC 20523

Dear Ben

Here is the final report of the *Striga* research meeting. I apologize for the delay in submitting it. I have incorporated the comments which were sent me after the meeting by participants as well as a copy of the letter to APHIS regarding quarantine measures.

I hope you will continue to be an advocate at USAID for *Striga* research in the United States and can direct us as to the next step in getting American scientists more involved in this work, especially in collaboration with African institutions.

Do not hesitate to contact me if I can be of any assistance.

Best personal regards,

Sincerely

Lytton J Musselman
Professor

cc:Participants

Encl:Final report

AMERICAN STRIGA RESEARCH

Introduction

The importance of *Striga* species (witchweeds) as a constraint on food production in the semi-arid tropics is well known. The severity of the problem has led to the convening of numerous meetings in affected countries for the discussion of research results, to make recommendations to potential donors and to establish priorities in research, especially applied research. A summary of these meetings is appended. While recommendations are pertinent and well thought out, outcomes from such meetings are disappointing largely because there is no single body to coordinate donor agencies and research.

It has only been during the past decade or so that American scientists have become involved in basic research on witchweed. While the number of laboratories involved with witchweed are only a few, there are perhaps more U S scientists working with *Striga* today than at any other time. Recent, significant findings during the last five years have raised new questions and stimulated additional research. Some of this research includes the elucidation of haustorium initiation, description and characterization of the host-parasite chemical communication system, and continuing work on the germination stimulants. Concurrent with this basic research is on-going work on breeding for resistance and the development of cultural practices to limit *Striga* damage. What is worth noting is that basic scientists including those not at agricultural institutions have become involved in witchweed research. At the same time, there has been a increased awareness of the damage caused by witchweeds, especially *Striga hermonthica*, and their direct and often devastating effect upon food production particularly in Africa. Thus, increased research activity at the basic level is coupled with increased knowledge of the damage done by these parasitic weeds. These two factors have resulted in more people knowing about *Striga* both as a research organism and as an agricultural problem.

However, American scientists involved in basic research typically have little experience with African witchweeds unlike plant breeders and agronomists. Opportunities for basic research on witchweeds in Africa are limited despite the potential for the development of possible control methods from such work. Quarantine regulations prohibit the import of any living *Striga* in the United States so that U S workers do not have access to the most serious species.

To address these points and to increase collaboration, a meeting was held on the Old Dominion University (ODU) campus, sponsored by ODU and USAID, on 2 March to discuss current research and to attempt to lay out a strategy for further collaboration, communication, and seeking of funding. Every laboratory with an active *Striga* research program was represented. The names and addresses of participants are in appended.

The objectives were: to (1) to coordinate *Striga* research in American institutions; (2) discussion of possible projects on the biology and control of *Striga*, especially *S. hermonthica* in Africa; (3) establishment of an advisory group to work with donor agencies to develop collaborative research projects with African institutions and relevant IARCs.

The recommendations of the group follow.

Recommendations to USAID Regarding *Striga* Research in the United States

1. We have added considerably to the understanding of how *Striga asiatica* works, especially in the areas of chemical communication, haustorial development, and germination physiology. But it is not clear that the biology of other species, especially the most important in terms of crop yield loss in Africa, *Striga hermonthica* and *Striga gesnerioides*, works in the same ways. We therefore recommend that similar research be done on these two species in the United States and at the same time develop cooperative work with scientists in affected countries.

2. We request that APHIS clearly define what type of quarantine facilities would be necessary in order to do research on other species of *Striga* since comparable research needs to be done on witchweed species which are not currently in the United States but which are of potential danger to American agriculture. Dr Eplee was directed by the group to communicate with APHIS on this matter; copy of this request is appended.

3. We recommend that the parasitic plants newsletter, HAUSTORIUM, be funded and expanded to include all current literature as well as an annual summary of research achievements of this (and perhaps other) working groups on *Striga*. The 1956 USDA annotated bibliography on |Striga| should be reprinted. Literature retrieval and republication of earlier works should be coordinated with ICRISAT, Pantacheru Center who are anticipating a computer based retrieval system of *Striga* literature.

4. The USDA APHIS laboratory at Whiteville, North Carolina is internationally recognized as the center of control methods and technology for witchweeds and is therefore frequently visited by foreign scientists. We recommend that the training component of this program be formally recognized and funded to enable researchers and technicans from developing countries to maximize use of this facility.

5. The possibility of a collaborative research endeavor involving American labs in association with established *Striga* research programs elsewhere, eg, the International Institute of Tropical Agriculture (IITA), should seriously be considered. It is especially important to have provisions to make cooperative graduate student research programs more easily administered among institutions. We recommend that USAID investigate the possibility of establishing a program to address this need. Such a program could be appropriately included into the "Special Constraints For International Centers" program or as a separate component of the PSTC grant program.

SUMMARY: Exciting results from recent research invovling state-of-the-art techniques were discussed at the meeting; technical aspects are not presented here. What is obvious is that there is a great deal of interest and enthusiasm for several facets of basic witchweed research in American laboratories. We feel strongly that this is an unique opportunity to harness this energy through the development and funding of collaborative research with African countries. USAID can play an essential role in such a program.

SUMMARY OF RECOMMENDATIONS AT STRIGA WORKSHOPS 1978-1988

Following are abbreviated summaries of Recommendations of the Striga workshops at Khartoum 1978, Ouagadougou 1981, Charlottesville 1981, Dakar 1983, Ibadan 1988, and Banjul 1988.

Khartoum 1978 Sponsored by the Sudan Government and IDRC

1. Continue research on the GR compounds.

2. Establish a *Striga* newsletter.

3. Develop resistant varieties.

4. Examine resistance mechanisms.

Ouagadougou 1981 Sponsored by ICRISAT and IDRC

1. Reinforcement of *Striga* research and control with increased scientific manpower.

2. Investigate agronomic methods of *Striga* control.

3. Assess crop loss due to *Striga*.

4. Investigate biocontrol possibilities.

5. Raise the general awareness of the *Striga* problem and train more technicans.

6. Start the proposed USAID/SAFGRAD control program in Africa.

Charlottesville 1981 Sponsored by University of Virginia and USDA

Research

1. Discover, isolate, identify and synthesize stimulants or regulators of witchweed seed germination and haustoria development.

2. Discover physiological factors regulating haustorial development and anatomical interactions.

3. Discover biological factors involved in host plant resistance and susceptibility to parasitism by witchweed.

4. Discover physiological factors regulating seed dormancy and germination.

5. Determine environmental factors on growth, development, and distribution.

6. Develop a better understanding of witchweed classification, biotype variations, and reproductive biology.

7. Develop new and improve current technques of detecting witchweed in the soil.

Policy

1. Review quarantine procedures.

2. Recommend to CSRS a program of research.

3. Establish a southern regional witchweed research committee by CSRS.

4. Recommend to AID a cooperative weed research program to be conducted by a university in cooperation with a foreign country with emphasis on exchange of visiting scientists and students.

5. Recommend to ARS that it utilize PL-480 funds for research.

6. Raise the general awareness in the U S of the *Striga* problem and emphasis worldwide domestic technology transfer and awareness.

Dakar 1983 Sponsored by IDRC and ICSU

1. Establish a consortium of donor agencies to fund a *Striga* program for research at all levels and appoint an agronomist as a liaison officer.

2. Strengthen the ICRISAT *Striga* project in Africa emphasizing breeding for resistance.

3. Strengthen the IITA research projects on cowpea and maize.

4. Intensify biocontrol research.

5. Produce at least 200 kg of GR24 for field experiments.

6. Support basic research on *Striga* at a range of institutions.

7. Establish national *Striga* research projects in a range of *Striga*-affected countries.

8. Prepare and disseminate information on *Striga* for popular

scientific journals as well as national news media.

Ibadan 1988 Sponsored by IITA and IDRC

Basic Research

1. Resistance/tolerance mechanisms in crops should be elucidated.

2. Develop simple laboratory screening techniques

3. Knowledge of the mechanism by which *Striga* affects its host.

4. Study seed biology in order to develop a database for a predictive model.

5. Explore the intergeneric transfer of genes for resistance.

6. Examine the biology and potential threat of *Striga aspera* and *S. forbesii*.

7. Biocontrol.

Breeding for Resistance

1. Development of simple and reliable screening methods.

2. Continue to screen a large amount of germplasm.

3. Develop stable and high yielding varieties.

Adaptive and Applied Research

1. Study the environmental and ecological factors which affect the growth and development of *Striga*, the host parasite relationship, and the dissemination mechanisms.

2. Integrated control based on agronomic practices.

3. Surveys for crop losses.

4. Establish a facility/staff/resource infrastructure in order to facilitate applied research efforts.

Information Networking

1. Provide access to past and current literature.

2. Support HAUSTORIUM

Banjul 1988 Sponsored by FAO and OAU

1. Continued support for national programs.

2. Identify suitable herbicides for small scale farmers.

3. Reduce the seed bank in the soil through harvest of flowers and legislation to prevent flowering in fields.

4. Develop alternate control strategies which do not rely on herbicides.

5. Have the first African *Striga* Network meeting with the Fifth Symposium on Parasitic Weeds.

PARTICIPANTS AT THE STRIGA WORKSHOP 2 MARCH 1989, ODU

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REQUEST TO APHIS FOR QUARANTINE REGULATIONS

UNITED STATES
DEPARTMENT OF
AGRICULTURE

Animal and Plant
Health Inspection
Service

Science and Technology
Whiteville Plant Methods Center
P. O. Box 279
Whiteville, North Carolina 28472
Phone: 919-648-4115

Subject: Permits for Striga Species

Date: March 15, 1989

To: John Lightfield
USDA, APHIS, PPQ, BASS
Room 633
Federal Building
Hyattsville, MD

The parasitic weeds with the greatest damage to food crops is in the genus Striga. Striga asiatica was detected in the U.S.A. in 1955. This species is at last approaching eradication as a result of more than 30 years of research and control activities. In 1978 a race of Striga gesnerioides was found in Florida. Fortunately, research revealed that this race attacked no crops of economic importance in the U.S.A. Other races of this species have inflicted serious losses to a wide variety of broadleaf crops throughout Africa.

Another species of Striga that is deemed one of the most destructive of the parasitic weeds is Striga hermonthica which attacks cereal crops such as maize, sorghum and millet. The threat to U.S. agriculture by Striga hermonthica and Striga gesnerioides is considered great. Unlike Striga asiatica, relatively little applied research has been conducted to develop control methodology for these two species of plant pests.

At a Striga planning session in Norfolk, Virginia on March 2, 1989, concerns were expressed about the lack of research being conducted on Striga hermonthica and Striga gesnerioides. It is felt that this situation leaves U.S. agriculture vulnerable because of the difficulty of detection/exclusion and the potential for introduction into the U.S.A.

I was asked to assimilate the conditions and requirements necessary to obtain permits for study of these weeds in the U.S.A. I could readily elucidate the biological particulars that would provide necessary security while facilitating the needed research. However, the need to obtain Agency input concerning entry of these species precludes the development of security procedures and standards.

I am hereby requesting that an Agency review be made to consider the ramifications of permitting research on Striga hermonthica and Striga gesnerioides in the U.S.A. From this review, it can be determined if and how to proceed with the acquisition of the necessary permits.

If you determine the necessity for further information or consultation, please let me know.

Robert E. Eplee, Ph.D.
Center Director

REE:cb

Attachment

REE:3/15/89:WPMC:jl31589