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UNCLASSIFIED  
CLASSIFICATION

931181  
5/1/79

PROJECT EVALUATION SUMMARY (PES) - PART I

Report Symbol U-447

1. PROJECT TITLE Aflatoxin Reduction in Maize		2. PROJECT NUMBER 931-1181	3. MISSION/AID/W OFFICE DS/AGR/FCP 931181(3) PD-440-26
		4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) 01 4p	
		<input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	

5. KEY PROJECT IMPLEMENTATION DATES			6. ESTIMATED PROJECT FUNDING (000)	7. PERIOD COVERED BY EVALUATION	
A. First PRO-AG or Equivalent FY 77	B. Final Obligation Expected FY 78	C. Final Inout Delivery FY 80		A. Total \$ 414	B. U.S. \$ 414

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., telegram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
1. Analyze 1978 research data when the P-3 lab is operational	Zuber/UMC	8/79
2. Submit annual reports on completion of analysis.	Zuber/UMC	9/79
3. Develop cooperative network with international centers and LDC institutions	ZUBER/UMC	10/79

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS			10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT
<input type="checkbox"/> Project Paper	<input type="checkbox"/> Implementation Plan e.g., CPI Network	<input type="checkbox"/> Other (Specify) _____	A. <input checked="" type="checkbox"/> Continue Project Without Change
<input type="checkbox"/> Financial Plan	<input type="checkbox"/> PIO/T	<input type="checkbox"/> Other (Specify) _____	B. <input type="checkbox"/> Change Project Design and/or
<input type="checkbox"/> Logical Framework	<input type="checkbox"/> PIO/C		<input type="checkbox"/> Change Implementation Plan
<input type="checkbox"/> Project Agreement	<input type="checkbox"/> PIO/P		C. <input type="checkbox"/> Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)	12. Mission/AID/W Office Director Approval
Keith M. Byergo Chief, DS/AGR/FCP <i>Keith M. Byergo</i>	Signature: <i>John R. Wilson</i>
Seen by By P.C.	Typed Name: John R. Wilson
	Date: 4/13/79

Summary: The attached field trip report summarizes activities and accomplishments to date of the Maize Aflatoxin Research Project contracted to the University of Missouri. While data analysis of the first year's research is being delayed, pending completion of the P-3 lab which results in a delayed annual report, field research progress is on schedule. Tentative evaluation indicates sufficient genetic variability exists in the maize germ plasm to provide significant resistance to fungus and to the formation of aflatoxins.

Another area requiring attention is the development of linkages with international centers and LDC institutions. UMC staff and administrators are aware of the problem and will initiate corrective action.

Depending on a positive evaluation by a team review subsequent to the analysis of the second year's research data, it is expected that a three year extension of the project will be required to realize the project objectives of identifying maize genotypes with resistance to fungus and aflatoxin synthesis and incorporate these into breeding lines in LDC maize breeding programs.

## TRIP REPORT

NAME: Keith M. Byergo *MB*  
Chief, DS/AGR/FCP

PERIOD OF TRAVEL: December 10-13, 1978

ITINERARY: Washington, DC to Columbia, Missouri and Return

PURPOSE: To review the Maize Aflatoxin Project

PERSONS CONTACTED: \* Dr. Mark Zuber, Project Principal Investigator  
\* Dr. Larry Darrah, Plant Breeder  
\* Dr. Jack Wallin, Plant Pathologist  
\* Dr. Dan Mertz, Plant Physiologist  
\* Dr. Art Karr  
\* Mr. James Woods, Safety Specialist  
Dr. Wendel McKinsey, Associate Dean, Agriculture  
Dr. Ken Larson, Associate Dean, Teaching, Agriculture  
Dr. Bill Phander, Associate Dean, Research, Agriculture  
Dr. Melvin G. Blaze, Director, International Programs  
Dr. Ed Runge, Head, Agronomy Department  
Dr. Bill Murphy, Agronomist  
Dr. Milt Poehlman, Agronomist  
Dr. Charles Cramer, Head, Agricultural Economics Department  
Dr. Jim Rhodes, Agricultural Economist  
Dr. Yarity, Columbia, Missouri Cancer Hospital

### RESULTS &

ACCOMPLISHMENTS: Dr. Zuber and staff discussed preliminary findings of the five year research. Detailed analysis awaits the completion of a University of Missouri funded sampling room with a protection rating of P-3. Due to the high potential toxicity factor of the aflatoxin and mold on the maize samples, safety regulations require strict handling procedures. Field workers are required to wear helmets that direct a flow of filtered air over the face to prevent mold spore inhalation. A battery powered fan in the back of the helmet provides the air flow required.

A health hazard exists both from the aflatoxin produced by the *Aspergillus* fungus and by allergy to the fungus spores. The aflatoxins are credited as hepatoma causing agents in humans and for causing debilitation and death in livestock and poultry

\*Project staff and campus cooperators

Over 5,000 maize samples have been collected from 1978 production and await the completion of the P-3 laboratory for analysis. Contracts have been negotiated with Hawaii, Universities of Florida and Clemson for planting selected material. Cooperative work is being conducted with the USDA Northern and Southern regional laboratories and sites in Georgia, Iowa, and Illinois. Maize strains have been used from Central and South America and Mexico. Plans have also been made for cooperative activity with Pioneer Hybrid S.A. Division.

No cooperative activities have been established with DC institutions as yet. Part of the problem is the lack of identified resistant material to distribute until analysis can be conducted. Development of these linkages was strongly recommended both in discussions with Dr. Zuber and staff and with Dr. Blaze, Director, International Programs.

The cancer hospital in Columbia, Missouri is studying the metabolism of aflatoxins in the laboratory. They have recorded over 100 cases of hepatoma over the past four to five years in Missouri. However, positive correlation between aflatoxin and hepatoma has not been confirmed in these cases. Monsanto Laboratories, the Washington University Medical Center in St. Louis and Midwest Research, Kansas City are also doing research on hepatoma.

Preliminary results indicate that particular temperature stress greatly increases *Aspergillus* formation. In this year's tests, seven times more *Aspergillus* fungus was formed under hot, dry conditions than on the control group of ambient temperature and moisture. Hot, humid conditions produced five times more fungus.

Trials are being run on all types of corn, with flinty grains and tight shucks being the most resistant. Initial data indicates genetic variance is sufficient to provide considerable potential for this method of control.

A number of tests show ammonia treatments effective in decontaminating aflatoxins in corn and cotton seed yet FDA has not as yet accepted this method of decontamination for human consumption. Livestock have not shown adverse effects from 100 P/billion contamination. FDA has set tolerances of 20 P/billion for livestock and zero for humans. Better measuring techniques are required. Black light, the common grain elevator test, is only an indication of radioactivity and even with fungus present the aflatoxin may not be present. Also, detecting contamination below 20 ppb is difficult and requires highly sophisticated equipment. Simpler and less expensive techniques are required.

Recent tests show that aflatoxins can be translocated from the soil into stem and leaf tissue and eventually transferred to the seed. Also the possibility exists that the winter forage could be contaminated from the soil where the forage follows a heavily contaminated corn crop whose residues were plowed under. The effect of aflatoxin contaminated soils on rhytobia and other soil flora and fauna needs to be studied.