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REPORT ON TRIP TO TRINIDAD

4 - 10 March, 1980

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The purpose of this trip was to determine what microbiological problems existed in our joint project on biological nitrogen fixation with the University of the West Indies, and how we at Cornell could facilitate the work being done in Trinidad.

To date Fred Donowa, the soil microbiologist in Soil Science at the University of the West Indies, has not been actively involved in the joint Cornell-UWI project on symbiotic BNF. I discussed this fact with Spider, Fred and Professor Ahmad and we all agreed that Fred's active and full participation was needed for a successful program. Several aspects of his participation follow.

Fred has been advising students who are already working on Rhizobium projects with pigeon pea in the greenhouse. They are investigating competition for nodulation between antibiotic resistant mutants and the parent strain. He will be the advisor to two graduate students at UWI who are to receive scholarships from the BNF project. Numerous applications for these scholarships have already been received and are being screened by Fred, Professor Ahmad and Spider. They expect to decide very soon and have the students begin work as soon as they are available.

Fred is planning to attend the Rhizobium training course in Hawaii this summer. He expressed an interest in stopping at Cornell on his way back to Trinidad in August. I agreed it would be worthwhile and suggested that he let us know as soon as he had some firm dates. Fred was also concerned that if Martin and Doug are planning a trip to Trinidad in late spring that they

visit before he leaves for the Hawaii course.

At present Jane Awai is working full time as technician to Spider. As Donawa becomes involved in the program he should be able to work closely with Jane. Her input so far has been mainly to prepare inoculum for Spider's field and greenhouse experiments. The strains used are those that Spider and I used in 1977. These had been selected on the basis of results of greenhouse effectiveness tests with soybean (carried out previously by Jane) and pigeon pea (carried out by Peter Quilt). However, there is a need to look at a broader array of strains for soybean and cowpea than the few being used presently; there is a need to compare the better strains in field tests. Furthermore, the testing has to include parameters such as competition for nodulation by indigenous strains, and survival in Trinidad soil for introduced strains.

I showed Spider, Jane and Fred the three outlines sent us by Lloyd Frederick for cooperative international experiments that are being organized by CIAT, INTSOY and NIFTAL. They expressed interest in cooperating especially with soybean and cowpea. In addition, I suggested that they write to the various international centers and obtain the appropriate symbiotically effective Rhizobium strains for testing. With two students and a technician, it should be possible to incorporate further strain testing with the field program. I left with Jane and Spider a scheme for testing strains.

Some acetylene reduction assays are also being carried out by Jane as a measure of fixation. Usually only a single measurement is made at time of plant harvest. I offered that a single time point during the growth of the plant could provide very misleading data and recommended, if such assays were to be done, several measurements be made during the life of the plants.

Problems have arisen with seed inoculation procedure: concern that the peat carrier is not sticking to the seeds and that the rhizobia are not

surviving on the seeds until planting. The latter concern arose as a result of an inoculation experiment with soybeans at Longdonville in which none of the soybeans became nodulated. We discussed the many possible causes of non-nodulation and I suggested a series of experiments to test how many rhizobia are sticking to seeds with several carriers as sticking agents and to determine if sufficient numbers remained alive up to the time of planting. If attempts to maintain adequate numbers on seeds failed, I suggested, strictly as an interim measure, that Spider and Jane try direct inoculation of soil at the time of planting.

Late last year Professor Ahmad proposed that our project hire Richard Graham as a postdoctoral fellow. Graham's Ph.D. thesis is on the peanut-Rhizobium symbiosis. Since then he has decided not to accept the position and has returned to Barbados.

Cooperation

Besides the growing cooperation between soil microbiology and soil fertility are the following:

R. P. Ariyanayagamis getting involved in breeding of cowpeas mainly for seed size and color. Students of his are working with Spider.

C. Braithwaite has taken samples of Spider's seeds to determine if some of the diseases found are seed-borne. He found lower germination rates in fungicide-treated seeds.

T. Ferguson, head of the grain legume program at UWI, and Spider are going to work together on the next experiments. Ferguson is an agronomist in Crops Sciences.

L. Kromah, a graduate student in Crops Sciences, is working on winged bean. He was getting valuable help regarding inoculation, strains, etc. from R. Graham before the latter left. Spider has also been helping to advise Kromah and

introduced him to me. We discussed some of the problems of selecting and testing various Rhizobium strains on winged beans and what might be done to overcome the problems. Donawa expressed his interest in providing microbiological advice for the winged bean research project and told me he would discuss this with Kromah and his advisor in Crops.

Spider has travelled to several Caribbean countries on his own time on weekends and on his own money and made numerous informal contacts with people working on major agricultural projects. These folks have asked him to help organize some experiments on cowpeas and winged beans. It is my opinion that these contacts be encouraged and that whatever cooperation he can stimulate be considered a formal part of his work at UWI, supported both verbally and financially. Spider has contacted IITA regarding their work on cowpeas and is interested in visiting Ibadan to discuss their mutual problems. Questions of low yields, disease and pest resistant varieties and variations in nitrogen fixation would be dealt with.

Field Trips

On the morning after I arrived, I was helping Spider and two laborers plant and fertilize cowpeas at the University Experimental farm. The experiment is to determine if cowpeas respond to nitrogen or inoculation during the dry season. So far no response has been reported. Irrigation units were being set up in order to provide water.

A second field trip took Spider, Fred, Jane and myself to soybean plots at a Piarco site run by the Ministry of Agriculture. The purpose of this experiment is to determine the need for reinoculation of soybeans for the second year of planting. Unfortunately an irrigation pump broke down shortly after planting and germination was erratic. However, we could see nodules on inoculated plants, none on uninoculated. Although yield data may not be meaningful the first year,

Spider was planning on collecting information during development of the soybeans, and continuing the experiment into the second year.

Another trip to Wallerfield showed an experiment on cowpeas comparable to the soybean one above.

Summary

1. Most importantly, Fred Donovan is becoming actively involved as a microbiologist in the joint project. Two UWI students are soon to join the project to work with Fred.

2. Spider, Jane, Fred and I discussed a number of problems and concerns regarding the present program and future experiments.

3. Cooperation between Spider and students at UWI, other faculty at UWI, and institutions and people in other Caribbean countries is growing.