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Progress Report No. 1., February, 1989; to Agency for International Development, Washington, D.C. 20523.
Grant No. DPE - 5542-G-55-8038-00 "The Conversion of Lignaceous Biomass into Nonleaching Nitrogenous Fertilizer by Ammoxidation,"
Principal Investigator: Professor Graham Allan.

The work plan now being implemented involves a close collaboration between the three participating universities, Guadalajara (UG, Mexico), Oviedo (UO, Spain) and Washington (UW, USA). The grant funds to carry out this research were made available to the UW towards the end of September 1988 and allocated to the PI in early October.

Under the direction of Prof. Coca, the UO has begun its component of the program by first moving the small scale fluidized bed reactor from the old chemical engineering building into the new building for the department. This move is now largely complete. The UO has also sent to the UW a number (13) of small samples of oxidized lignin. These were prepared to optimize the conditions which will be later used for the composite reaction of ammoxidation.

To further help define these conditions, extensive discussions have been initiated with the Tennessee Valley Authority whose scientists (Kim, Plain & Hatfield) have carried out some very detailed work in this general area. Drs. Kim and Hatfield have retired, but Wendell M. Plain still works in research in TVA's facility at Muscle Shoals, Alabama. He reports to Joe Gautney in the National Fertilizer Development Center. From these conversations, it was learned that no samples of the TVA ammoxidized product are in storage. All have been consumed in tests.

In the TVA organizational set-up, the Division of Chemical Development makes the fertilizer candidates and then passes them to the agronomic group for evaluation. The agronomic testing was never published, and Joe Gautney doubted that internal TVA reports could be made accessible. However, he did promise to look into the matter, and a formal request for these reports will be made in writing. Despite the lack of the actual reports, it seems certain that the tests did not simulate the semi-tropical conditions and sudden bursts of rainfall that will be later used in this research.

Nonetheless, it does emphasize how vital the process for the evaluation of the candidate fertilizers will be. Accordingly at the UW, initial attention has focused on the possibility of using the growth of rice in the greenhouse as a bioassay for new fertilizers. This test was developed in collaboration with Dr. Steve Roberts, a professor of Agronomy at Washington State

University who has been a visiting scholar for 6 months in Professor Allan's group at the University of Washington. The services of Prof. Roberts have been provided to the project at zero cost. The basis of this new test is the idea that breakdown of complex nitrogenous substances will occur more rapidly under the warm, water-saturated conditions of rice cultivation rather than, for example, in the milder and drier conditions appropriate for most crops.

To attempt to establish the validity of this concept, melamine (2,4,6-triamino-1,3,5-triazine) has been used as an exemplar of a complex nitrogenous heterocycle. The ammoxidation of biomass may create analogous heterocyclic structures. We have previously shown that melamine can function as a fertilizer for rice in California under large scale field conditions. The initial round of testing has been completed and the yields of rice grains have been measured. The precision of the test has been gratifyingly narrow. New tests will now be initiated to attempt to determine if the complex nitrogen heterocycle breaks down more readily in a second cycle of rice growth.

At the UG, the PI there, Virgilio Zuñiga Partida, has been supervising the preparation of the various lignins spelled out in the proposal. He plans to hand-carry these personally to Oviedo around April 3, 1989 and spend a month in the laboratory of Professor Coca.

During his stay, he will use the Oviedo reactor, and this will help him when he returns to Guadalajara in May to build the bigger version needed to prepare field trial quantities of the new fertilizers.

C. Graham Allen
March 28, 1989

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