

PURDUE UNIVERSITY
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BILLING

**PORTUGAL UNIVERSITY
INSTITUTES
DEVELOPMENT PROJECT**

(Contract AID/NE-C-1701)

**REPORT ON
SHORT-TERM STAFF ASSIGNMENT**

**Submitted by
DR. BARRY M. CUNFER
Department of Plant Pathology
University of Georgia
Georgia Experiment Station
Experiment, Georgia**

July 1 - 30, 1984

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REPORT ON
SHORT-TERM STAFF ASSIGNMENT
AT THE
INSTITUTO UNIVERSITARIO DE TRAS-OS-MONTES E ALTO DOURO
VILA REAL, PORTUGAL

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INTRODUCTION

The following technical report covers my assignment as an advisor at the research program on diseases of wheat and triticale at the Instituto Universitario de Tras-os-Montes e Alto Douro (IUTAD) in Vila Real, Portugal. This assignment was completed during July 1-30, 1984, as part of the USAID project between Purdue University and IUTAD (Contract AID/NE-C-1701). During the assignment I visited several experiment stations involved in research on small grains and diseases of various other crops in Portugal. This gave me an excellent overview of research and teaching programs in these areas of the country. It provided a base to see how work at IUTAD can interact with that at other locations. An itinerary is presented as Appendix I.

This consultancy assignment was completed while I was on annual leave from my position as Professor of Plant Pathology at the University of Georgia, Georgia Experiment Station, Experiment, GA 30212.

The observations and opinions presented in this report are solely my own and do not represent an endorsement by the University of Georgia.

Barry M. Cunfer
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REPORT ON SHORT-TERM STAFF ASSIGNMENT

Submitted by
Dr. Barry M. Cunfer
Department of Plant Pathology
University of Georgia

AREA OF CONSULTANCY

The consultancy was to advise on the disease control program for wheat and triticale in the Tras-os-Montes region of Portugal. More specifically, it was to advise Mr. Carlos Abreu of the Plant Protection Department at IUTAD on research for his Ph.D. thesis. The thesis problem concerns the epidemiology and control of the septoria nodorum blotch disease of triticale caused by the fungus Leptosphaeria nodorum (asexual stage of Septoria nodorum). This disease is important on both wheat and triticale in many areas of the Tras-os-Montes region, whereas it is unimportant in other regions such as the Alentejo. Because the crop is new to the Tras-os-Montes area, this topic was chosen for study by Mr. Abreu. Triticale, a man-made cross between wheat and rye, is also a new crop in many other parts of the world.

Leptosphaeria nodorum is a serious pathogen on wheat in the southeastern United States. I have conducted research on this fungus in Georgia for ten years. Mr. Abreu visited Georgia in 1983 to discuss his proposal and to learn specific techniques useful to his research. Because L. nodorum usually causes only minor losses on wheat in Indiana, Mr. Abreu requested that I assist him with this project rather than a staff member from Purdue.

The consultancy also included visits to two research stations and the National Agronomy University to discuss ongoing research programs in plant pathology and small grains, and agricultural education. I presented seminars at two experiment stations to promote exchange of information. An additional seminar was presented at Vila Real to IUTAD staff and members of the Regional Service (see Appendix II). These conferences, plus the opportunity to visit several portions of the Tras-os-Montes region and to interact with IUTAD faculty, allowed me to evaluate the research programs on small grains diseases in Portugal.

SPECIFIC OBJECTIVES

1. Become familiar with the program in Portugal for development of small grains and learn about research on control of important diseases.
2. Learn about agricultural production practices in the Tras-os-Montes region, especially in relation to small grain production and disease problems.
3. Observe the occurrence of septoria nodorum blotch on wheat and triticale in breeding nurseries and production trials in the various climatic zones of Tras-os-Montes to gain a better understanding of the problem.
4. Observe other diseases of small grains in Tras-os-Montes to evaluate how control of them can be integrated with control of septoria nodorum blotch.

5a. Review Carlos Abreu's thesis research during the past year and plan research projects for the next two years.

5b. Evaluate requirements for equipment and operating supplies, and time release from teaching and other activities to complete the thesis research satisfactorily.

6. Evaluate long-term needs for the small grains program at IUTAD and its interaction with other research units in Portugal.

IDENTIFICATION OF PORTUGUESE COUNTERPARTS

Vila Real -- IUTAD

Dr. Fernando Nunes Ferreira Real, Rector of IUTAD

Dr. Jose Torres Pereira, plant physiologist, AID liaison

Henrique Guedes Pinto, Department of Biology, Division of Plant Breeding

Olinda de Conceicao Pinto Carnide, small grain breeding

Maria Teresa Rangel de Figueiredo, small grain breeding

Armando Mascarenhas Ferreira, Animal Sciences Department, forage production

Jose Ribeiro, Plant Production Department, weed science

Antonio Alberto de Oliveira Cardoso, technician working with Mr. Abreu

Oeiras -- National Agronomy Experiment Station, Plant Pathology Department

Oscar Sequeira, department head and virologist

Carmo E. Freitas, cereal pathologist

Marcelo Fernandes, bacteriology

Joao Martins, bacteriology

Sara Maia de Loureiro, potato diseases

Coffee Rust Institute, Head: Carlos Rodrigues

Lisbon -- Agronomy University

J. Pedro Amaro, Professor of plant pest management,
advisor to Mr. Abreu

Lisbon -- American Embassy

Jose Luis Almeida Pinheiro, AID staff

Luisa Gomes, AID staff assistant

Elvas

Manuel Torres Barradas, Station Director, grain breeder

Maria Julia Antunes Goncalves, plant pathologist, Septoria tritici and other diseases. Works closely with S. Fuentes

Manuel C. N. Guerra, plant pathologist

Santiago Fuentes, International Maize and Wheat Improvement Center (CIMMYT), plant pathologist with headquarters in Lisbon

Henk Bonthuis (CIMMYT), cereal rust pathologist and epidemiologist, located at Wageningen, The Netherlands (visitor at Elvas)

In addition to the persons identified in this list, I visited for varying amounts of time with numerous other faculty at the various institutions. Each contributed to my awareness of several agricultural programs in Portugal. I also visited with extension personnel from Tras-os-Montes during a conference at Vila Real and at regional headquarters in Mirandela and Mogadouro.

ACCOMPLISHMENTS WITH RESPECT TO OBJECTIVES
OF THE ASSIGNMENT

Ph.D. Research -- Carlos Abreu

The Ph.D. program of Mr. Carlos Abreu is proceeding very well. Several preliminary phases of his research program have been completed or are near completion. In the discussion I had with him in 1983 when he visited my laboratory at the University of Georgia, I learned that Mr. Abreu has a good basic understanding of plant pathological principles and the application of these principles to practical use. He also had a good knowledge of his thesis topic and the fundamental needs of his work.

The foundation was greatly supplemented during 1983 by his interaction with personnel in the Department of Botany and Plant Pathology at Purdue University, his visit with me, and perhaps the most by his participation in the International Workshop on Septoria Diseases of Cereals at Montana State University. There, Mr. Abreu was able to interact with many of the leading researchers on Septoria diseases from around the world and get a wide perspective of current research and techniques. These experiences have enabled him to focus his research objectives and have provided him with knowledge about several experimental techniques that will enable him to conduct meaningful research.

Mr. Abreu is dedicated to a career in plant pathology teaching and research, especially in areas that have practical application to the economy of Tras-os-Montes and Portugal as a whole. In my opinion, he has the qualifications and dedication to complete a Ph.D. program and continue to serve well on the faculty at IUTAD.

During my visit at IUTAD, considerable time was spent reviewing experiments conducted in the past year and establishing research plans for the next two years. These experiments have been well-designed and Mr. Abreu has a thorough knowledge of the techniques needed to conduct these studies. An outline of the thesis research is presented below.

A. Preliminary studies

1. Growth of fungus in response to temperature and growth medium (completed)
2. Effect of carbon and nitrogen source on sporulation of L. nodorum (partly completed)

B. Characterization of the disease (experiments in progress or planned)

1. Survey of region of prevalence of disease
2. Comparison of several triticales lines for differences in resistance characters
 - a. compute area under disease progress curve
 - b. compute apparent infection rate
 - c. determine progress of infection during autumn and winter
 - d. determine spore production by L. nodorum on leaves of field grown plants
 - e. determine resistance response of triticales to the length of time leaves remain wet

- C. Primary infection (experiments in progress)
 - 1. Determine effects of varying levels of seed infection upon seedling infection, plant emergence, rate of disease development, yield components, and seed infection of subsequent crop.
- D. Yield loss (experiments in progress)
 - 1. Compare the effects of varying levels of disease on the foliage throughout the season upon disease progress and yield components.
- E. Additional studies (planned)
 - 1. Determine susceptibility of various small grains to isolates of L. nodorum from triticale.
 - 2. Determine presence of Leptosphaeria stage of the fungus in the field.

Research Program at IUTAD for Control of Wheat and Triticale Diseases in Tras-os-Montes

I was able to obtain a good understanding of the goals of the small grains research program in Tras-os-Montes through discussions with faculty at IUTAD, visits to sites of regional trials, and observation of cultural practices in farmer's fields. The researchers at IUTAD have a good understanding of the disease problems in the region and have a viable program in place to solve these problems. There is good interaction with other workers in Portugal, other European countries and, to a more limited extent, the United States.

The Regional Extension Service appears to be strong and there is good interaction between the Regional Service and IUTAD. I was

asked to give a seminar on small grain diseases on July 20 at IUTAD primarily for Extension personnel. I do not know the exact number of Extension personnel that attended, but it appeared that there were at least 12-15.

IDENTIFICATION AND ANALYSIS OF PROBLEMS ENCOUNTERED

Equipment Needs

Mr. Abreu has a critical need for an incubator with controlled temperature and light (programmable daylength). A significant portion of Mr. Abreu's thesis will involve assaying triticale seeds and leaves for infection by L. nodorum on agar media. The critical temperature for these investigations is 20 C at which the fungus grows optimally. Above 20 C, fungal growth declines rapidly. Mr. Abreu is currently doing much of this work in a makeshift enclosure in his laboratory without temperature control. Room temperature is often 24-27 C. L. nodorum grows poorly in this range and meaningful data cannot be obtained. A chamber with 3-4 shelves, each with approximately 0.7 m² (about 30 x 36 inches) of usable space is required. A significant amount of shelf space is needed because leaf assays from field samples must be collected at critical times. These assays take approximately two weeks to run at each sampling date. Samples will be collected several times during each season. The chamber will also be used for seed assays and for samples collected from greenhouse and laboratory studies at other times of the year. It is also needed to increase cultures of L. nodorum to conduct the experiments.

A controlled environment chamber for plants is available but needs major renovation of its electrical system. This renovation has been planned with current funds. It is important that this chamber be kept in good operating condition. Both the incubator and controlled environment chamber will also be needed for ongoing research on other disease problems in the future.

Rapid data analysis is important to complete a research project successfully. Facilities for data analysis are limited at present at IUTAD. Mr. Abreu has assistance from a statistician in Lisbon, but the time lag and lack of direct contact has resulted in significant delays in the interpretation of his data. Michigan State University has recently released a software package for personal computers called MSTAT. It is designed especially for research related to small grain breeding although it has wide applicability for other areas of agricultural research. In addition to a wide range of statistical analyses, it has the capability to randomize experimental treatments and print labeled data sheets, plot labels and plot maps. The cost of the software and manual is only \$100 (U.S.). It is available in English now. French and Spanish versions may be available now or will be in the near future. I do not know if a Portuguese version is available. The program can be run on a number of different personal computers such as the IBM PC and the Apple IIE. This system would be particularly helpful to the Plant Breeding Department and, of course, be useful for numerous other applications. It would accelerate data processing for Mr. Abreu's thesis and for other faculty members also.

Teaching and Extension Assignments

The most critical factor that needs to be resolved is the time that will be available to Mr. Abreu to pursue his thesis research. The most important period each year is from March 1 to August 1 when a large amount of field data and samples will be collected. Mr. Abreu currently has a heavy teaching load each semester, and the teaching load is higher in the spring semester. His teaching time for the spring semester of 1984 was 18 contact hours per week (lecture and laboratory) for more than 40 students.

The heavy teaching load has resulted from a vacancy in the department and a leave of absence by another faculty member for Ph.D. studies at Purdue. This individual will be at Purdue for about two more years. Mr. Abreu is presently assisted by one technician. A second technician will be employed soon to help with laboratory and field work. This will help reduce the work load for the research responsibilities. A means to reduce the teaching load is needed. Just prior to my departure from IUTAD, Mr. Abreu was assigned his teaching duties for the upcoming academic year. Administrators at IUTAD are aware of the need for a reduced teaching load. Therefore, his teaching assignments have been reduced considerably. A further reduction may be needed in 1985-86 when Mr. Abreu completes his thesis research and data analysis.

In addition to teaching, he is frequently called upon to consult with farmers and colleagues for diagnosis of plant disease problems. Mr. Abreu also assists the Plant Breeding Department in evaluation of small grain cultivar trials and advanced breeding material for disease

resistance. In order for him to make satisfactory progress, a means to reduce the extension commitments is needed during the next two years when intensive research is required to complete the Ph.D. degree.

Access to Scientific Literature

Work on a new central library at IUTAD is near completion. This will be an important improvement for both students and faculty. Access to journals with literature on plant diseases is limited at present. Mr. Abreu and other faculty often must rely on an abstracting journal (Review of Plant Pathology) to be aware of recent literature.

As funds permit, additional journals should be added to the library. Furthermore, issues of journals from previous years are needed. These could be added as microfilm or microfiche copies to reduce costs and storage space.

RECOMMENDATIONS AND PROPOSED ACTION

Several of the major needs within the scope of this assignment have been addressed in the last two sections. Some of these will be discussed further in this section.

I was requested by personnel in Portugal to get information from manufacturers about specifications and prices of various equipment items. I will send this information as soon as I get it from sales representatives. Until additional equipment is available at IUTAD, it will be necessary for Mr. Abreu to use facilities in other departments occasionally. Various faculty agreed to share equipment whenever possible.

The expansion of facilities for the Plant Breeding Department is critical. Current work areas, laboratories, and office space are inadequate. Expansion plans in progress need to be completed in the very near future.

The plans for field testing of small grains at additional sites in Tras-os-Montes needs to be implemented as soon as possible. This will allow better testing for disease resistance as well as agronomic performance in areas with differing environmental conditions. There should also be continued coordination of some varietal trials with extension personnel in the region. Demonstration plots provide an excellent link between the Regional Service and farmers on one hand and IUTAD researchers on the other.

There is good cooperation between IUTAD and the National Plant Breeding Station at Elvas. There should be continued evaluation at Elvas and Vila Real of breeding material from both research programs. Tests at other sites should be conducted also as labor, etc., is available. Testing at several locations is essential because different diseases occur under the varying environmental conditions of the Alentejo and Tras-os-Montes. It is important to know the response of advanced breeding lines to several diseases although a future variety may be planted only in one region. The same is true for the response of agronomic characters in several environments.

Exchange of germplasm is essential to advancements in a plant breeding program. Because climatic conditions are similar in some areas of Portugal and the southeastern U.S., small grain varieties from one location may perform well at both locations. Lines with superior disease resistance or agronomic characters can be used for crosses with

local varieties. I have discussed plans to exchange germplasm of wheat, triticale, and rye with the staff at Vila Real and Elvas. This exchange may be beneficial to the small grains program in Georgia as well as Portugal.

Research should be initiated on the scald disease caused by the fungus Rhynchosporium secalis. This disease, along with L. nodorum, is a major limiting factor in the development of triticale for the region near Montalegre. Mr. Abreu was the first person to describe this disease on triticale although it is well-known on barley and rye. Because scald disease occurs on triticale at very few other locations in the world, there is a unique opportunity to contribute to knowledge of this disease. Mr. Abreu will need to concentrate most of his efforts on L. nodorum in the next two years. As time permits, additional work on resistance to scald should be conducted.

The Annual Wheat Newsletter is published each year by the United States National Wheat Improvement Committee. The Newsletter is available to all who request it without cost. Contributors submit summaries of work in progress at their institution once each year. The Wheat Newsletter fosters international exchange of information on new techniques, the direction of research programs, and especially new germplasm prior to publication in scientific journals. There have been only infrequent contributions to the Newsletter from Portugal in recent years. The research on small grains at IUTAD and Elvas deserves international recognition. The Wheat Newsletter is an excellent means for the work in Portugal to be recognized. Furthermore, IUTAD scientists can benefit from the information available from other countries in the Newsletter.

Mr. Quedes-Pinto of the Plant Breeding Department said he had requested a copy from the publisher in the U.S. last year but did not receive it. I will correspond with the editor to request again that IUTAD be added to the mailing list. I will also request that reports from Portugal be solicited for inclusion in future volumes.

During my visit at IUTAD, informal discussions were held about the possibility that I might serve on the examining jury for the Ph.D. degree for Mr. Abreu when he has completed his thesis research. The anticipated time is the autumn of 1986. I plan to continue to correspond with Mr. Abreu and to evaluate his research results as his work continues. If the administrators at IUTAD think it is appropriate, I will be happy to serve as a juror for the final examination.

APPENDIX I

Itinerary of Dr. Barry M. Cunfer

July 1 - 30, 1984

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Itinerary - Barry M. Cunfer

- July 1 - 6:00 PM, Depart Atlanta to J. F. Kennedy Airport, New York via Delta flight 512.
- 8:30 PM, Arrive New York. TAP flight 319 delayed until July 2 because of severe weather in New York.
- July 2 - 1:00 PM, Depart New York on TAP flight 315.
- July 3 - 1:00 AM, Arrive Lisbon. Travel by car to National Plant Breeding Station at Elvas. Visit with Director Barradas, plant pathologists, breeders, and two CIMMYT staff.
- July 4 - Visited field plots in morning. Presented a seminar to staff. Continued consultation with staff. Returned to Lisbon.
- July 5 - Visited Plant Pathology staff at National Agronomic Experiment Station in Oeiras. Visited Coffee Rust Institute in Oeiras. Visited National Agronomy University in Lisbon and consulted with staff.
- July 6 - Continued visit with staff at National Agronomic Experiment Station at Oeiras. Presented a seminar at 11 AM.
- July 7 - Traveled by car to Vila Real. Remained in Vila Real until July 27.
- July 8 - Open
- July 9 - Met with IUTAD faculty and Dr. J. Torres Pereira, AID liason. Discussed thesis research with Mr. Abreu.
- July 10 - Continued consultation with IUTAD faculty and discussion of thesis research. Met with Rector of IUTAD, Dr. Fernando Nunes Ferreira Real.
- July 11 - Visits to local small grain field trials and discussion of thesis research.
- July 12 - Continued discussion of thesis research.
- July 13 - Continued discussion of thesis research.
- July 14-15 - Open
- July 16 - Traveled by car to small grain field trials at Montealegre. Collected specimens of diseases on small grains. Observed small grain production in region.

- July 17 - Traveled by car to small grain field trials at Mirandela and Macedo de Cavaleiros. Visited government operated farm; observed field trials.
- July 18 - Continued discussion of thesis research. Made isolations from diseased specimens collected on July 16. Consulted with staff of Department of Animal Science about utilization of cereal grain and straw for animal production.
- July 19 - Continued discussion of thesis research.
- July 20 - Continued discussion of thesis research. Presented a seminar at IUTAD at 11 AM for regional extension personnel.
- July 21-22 - Open
- July 23 - Traveled by car to the Terra Quente (hot region) of Tras-os-Montes. Visited the Nordeste food processing facilities at Chacao. Traveled to Mogadouro and visited with Extension personnel. Observed wheat and rye production in region. Returned to Vila Real by way of Macedo de Cavaleiros and Mirandela.
- July 24 - Consulted with H. Quedes-Pinto and faculty of Plant Breeding Department about small grain breeding and regional trials in Tras-os-Montes.
- July 25 - Continued discussions with Plant Breeding faculty. Began final review of Mr. Abreu's research plans for the next two years.
- July 26 - Completed review of Mr. Abreu's research plans.
- July 27 - Traveled by car to Lisbon.
- July 28-29 - Open
- July 30 - Visited with Jose Luis Almeida Pinheiro of the USAID office at American Embassy to discuss my work in Portugal. Departed Lisbon on TAP 312 at 2 PM.
- 8:30 PM, Departed from New York on Air Atlanta 977.
- 10:30 PM Arrived at Atlanta. Returned by car to Griffin, GA.

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APPENDIX II

Announcements for Seminars Presented at
Elvas, Oeiras, and Vila Real, Portugal

INSTITUTO NACIONAL DE INVESTIGAÇÃO AGRÁRIA E DE EXTENSÃO RURAL
ESTAÇÃO NACIONAL DE MELHORAMENTO DE PLANTAS
Centro de Documentação e Informação

COLÓQUIO - 5/84

Elvas, Quarta-Feira
4 de Julho de 1984
no auditório
às 10 horas

"Septoria glume blotch of wheat and other small grains in Southeastern US"

Por

Prof. Barry N. Cunfer
(Universidade da Georgia - USA)

O Prof. Barry N . Cunfer, da Universidade da Georgia (USA), proferirá uma conferência no próximo dia 4 de Julho, pelas 10 horas, no auditório da E.N.M.P. subordinada ao tema "Septoria glume blotch of wheat and other small grains in Southeastern US".

Instituto Nacional de Investigacao Agraria
Estacao Agronomica Nacional

July 6, 1984
11:00 AM
Colloquium

"Septoria glume blotch of wheat and other diseases of small grain cereals in the southeastern U.S."

Presented by Barry M. Cunfer, University of Georgia

(original announcement not available)



INSTITUTO UNIVERSITÁRIO
DE
TRÁS-OS-MONTES E ALTO DOURO
VILA REAL — PORTUGAL

C I R C U L A R N.º 26/84

O Prof. BARRY M. CUNFER, da Universidade de Georgia, Estados Unidos da América do Norte, proferirá no próximo dia 20 de Julho, pelas 11 horas, no auditório do IUTAD, uma conferência subordinada ao título "*Diagnosis and occurrence of diseases of small grain cereals*", que será comentada em português.

Dado o interesse da referida conferência convidam-se os Senhores docentes e alunos a assistirem.

Vila Real, 13 de Julho de 1984.

O REITOR,

FERNANDO NUNES FERREIRA REAL

- Prof. Cat. -