PLANT GERMPLASM COLLECTION REPORT

USDA-ARS
FORAGE AND RANGE RESEARCH LABORATORY
LOGAN, UTAH

Foreign Travel to:

Pakistan
October 2-26, 1985

U.S. Participants

Douglas R. Johnson -Plant Physiologist
USDA-Agricultural Research Service
Logan, Utah U.S.A.

Melvin D. Rumbaugh, Research Geneticist
Crops Research Laboratory
Logan, Utah U.S.A.

GERMPLASM COLLECTIONS

Purpose of trip:

1) To develop detailed plans of cooperative research involved in USDA\CSRS Project #85-CRSR-2-2733 entitled "Biological Nitrogen Fixation in Co-Evolved Rhizobium and Medicago falcata Ecotypes,"

2) To collect seed and nodule samples of perennial Medicago species,

3) To interview Pakistani candidates for a Ph.D. research assistantship position at Utah State University.

Summary:

The Pakistan Agricultural Research Council (PARC) is responsible for administering agricultural research in Pakistan and is well organized to carry out its responsibilities. The Chairman of PARC is Dr. Amir Muhammed, a most impressive man who has a keen awareness of Pakistan's agricultural problems and who is very supportive of cooperative research project that address critical needs in Pakistani agriculture. PARC provides funding to the National Agricultural Research Center (NARC), which is a recently constructed research facility located in Islamabad. The U.S. as well as other donor countries have financially supported NARC very well so that is an excellent facility which is well equipped with modern instrumentation. Detailed work plans and a formal Work Agreement of our cooperative research project were developed. On a field trip to the Northern Area of Pakistan we observed that alfalfa (Medicago sativa) is a major forage

crop in northern Pakistan and is used widely for winter feed. A total of 29 samples of soil, seed, and nodules from alfalfa were collected in northern Pakistan. In addition, 27 seed samples of various other forage and crop species were collected. Graduate student candidates were interviewed and a recommendation was made. A great opportunity exists for cooperative agricultural research between the U.S. and Pakistan that would be mutually beneficial to bother countries. Cooperative projects between the U.S. and Pakistan involving forage and range management research are almost non-existent and should be expanded.

Travel details:

October 2-9; Logan to Islamabad

We traveled from Logan, UT through Cairo, Egypt to Islamabad, Pakistan. During our stay in Islamabad, we learned that agricultural research in Pakistan is managed by the Pakistan Agricultural Research Council (PARC), which is an autonomous organization of the Federal Ministry of Food, Agriculture, and Cooperatives. PARC's major objective is to increase the agricultural productivity in Pakistan through well-organized research. PARC provides leadership to the federal and provincial agricultural research organizations and agricultural universities in identifying research priorities, developing nationally coordinated research programs, and strengthening their research capabilities. PARC has been in existence since 1979 and was organized in accordance with the recommendations of joint U.S.- Pakistan Agricultural Research Review Teams of 1968 and 1973. The address of PARC is:

Pakistan Agricultural Research Council
L-13, Almaraz F-7
Post Box 1031
Islamabad, Pakistan

Overall PARC direction is determined by a Board of Governors consisting of 41 persons representing federal government organizations, provincial governments, agricultural universities, progressive farmers, and agricultural scientists/experts. Day-to-day operation of PARC is directed by the Executive Committee which consists of the Chairman and five full-time members who oversee the Divisions of Crop Sciences, Natural Resources, Animal Sciences, Social Sciences, and Finance. PARC is presently housed in temporary quarters; however, construction is proceeding on a new PARC Headquarters Building in Sector G-5 in Islamabad. This uniquely designed, multi-story, modern office complex will represent a significant improvement over the present office building. PARC presently employs over 1,800 personnel including more than 500 scientists.

During our visit, we were fortunate to arrange a visit with Dr. Amir Muhammed, Chairman of PARC. He is a most impressive man who has a keen awareness of Pakistan's agricultural problems and is a very effective manager of agricultural research in Pakistan.

Dr. Amir Muhammed earned his Ph.D. in molecular genetics and biochemistry at Oxford University in England. He has a working knowledge of recent advances in biotechnology fields and is interested in supporting efforts in these research areas. However, the Chairman has a firm

belief that the more traditional agricultural research areas will continue to enhance agricultural productivity in Pakistan. He believes that new areas of biotechnology research should be supported, but not that the expense of the more traditional agricultural disciplines. Dr. Amir Muhammed is well respected by staff and non-staff throughout Pakistan and is an extremely capable administrator.

During our discussions with Dr. Amir Muhammed, he also stressed the importance of educational training to Pakistan's agricultural research. He identified the development of trained manpower in agricultural research as one of the most critical concerns facing agriculture in Pakistan. He indicated that a shortage of trained manpower is a nationwide problem and that most agriculturally-related research institutes were operating without even a minimum number of qualified scientists on their staff. Since the early 1980's, education training in foreign countries (the U.S. in particular) leading to a M.S. or Ph.D. degree has been a main area of emphasis. In 1986 alone over 100 Pakistani's will be sent for Ph.D. training in the U.S. The Chairman is very insistent that the trainees work on research that is relevant to Pakistan's agricultural problems. Where possible, the Chairman prefers to arrange training programs where the students complete their academic coursework in the U.S. and return to Pakistan to conduct their thesis or dissertation research in Pakistan. Through this program Dr. Amir Muhammed hopes to stimulate the pace of agricultural research in Pakistan. The Chairman has instituted a comprehensive National Training Program giving priority to disciplines where deficiency is serious and need is greatest.

In 1975, 565 hectares of land in southeast Islamabad were purchased by PARC for establishing the National Agricultural Research Center (NARC). Through the financial support of the U.S. and the World Bank, an impressive research facility has been constructed and laboratories have been equipped. An additional laboratory wing, which will house Range Management and Forestry Research Programs is currently under construction. The main NARC building was dedicated in 1984. NARC is the central laboratory center for agricultural research in Pakistan and was established to conduct research in areas of national importance, that can best be done at a central institution. The address of NARC is:

National Agricultural Research Center
P.O. National Health Laboratories
Islamabad, Pakistan

NARC was established to conduct mission-oriented, long-range, high-risk basic research and to serve as a program resource and service support to provincial research institutions. NARC has an agricultural library, a computer-based data processing facility, a center for plant introduction and genetic resources, and a center for farm machinery development. In addition NARC has a Training Institute for in-country training workshops, short-courses, and seminars for manpower

development. During our initial stay in Islamabad we were housed at the Training Institute. It has accommodations for about 30 persons and has excellent conference facilities. The NARC cafeteria is located near the Training Institute.

NARC activities are overseen by the Director-General, Dr. C. M. Anwar Kahn, who was ill during our visit. He earned a Ph.D. from the University of Wyoming in range management. The activities of NARC are divided in three main divisions, including: Research , Technical Support, and Administrative Services. The Research Division is subdivided into the Central Laboratory, Plant Sciences Institute, Animal Sciences Institute, and Farm Machinery Institute. The Central Laboratory is a centralized facility for instrumentation and repair of laboratory equipment. Major thrusts in the Plant Sciences Institute involve: wheat, barley, and triticale; rice; maize, sorghum, and millets; sugar crops; oilseeds; food legumes; horticultural crops; potatoes; forage and fodder; forestry and range management; pest management; soil and water management; honey-bee management; plant introduction and genetic resources; and tissue culture. The main thrusts in the Animal Sciences Institute include: livestock and poultry breeding and genetics; animal nutrition; disease control and prevention; animal reproduction; and general farm management. The Farm Machinery Institute thrusts involve: designing, developing, and adapting farm machinery for Pakistani farmers; developing local production of farm equipment; undertaking market research and planning studies for farm implements; and coordinating agricultural machinery research and development activities among federal, provincial, and industrial organizations. NARC currently had about 200 scientists and 150 technical support persons on its staff.

Other research establishments besides NARC that are directed by PARC include: Central Diseases Research Institute in Islamabad, Arid Zone Research Institute in Quetta, Pest Management Research Institute in Karachi, Southern Zone Agricultural Research Center in Sujjawal, National Herbarium in Islamabad, Karakoram Agricultural Research Station in Juglote, and Hill Agricultural Research Station in Kaghan.

The main purpose of our visit to Pakistan was to pursue cooperative research involved in USDA\CSRS Project entitled "Biological Nitrogen Fixation in Co-Evolved Rhizobium and Medicago falcata Ecotypes." We discussed our project with Dr. Amir Muhammed (Chairman of PARC), Dr. G. R. Sandu (PARC Member, Natural Resources), Dr. Muhammad Iqbal (PARC Director of Land and Water Resources), Dr. Noor Mohammad (Co-Principal Investigator of our project who is National Coordinator of the Forage and Fodder Program at PARC) and Mr. Mohammad Athar (Cooperating Scientist on our project who is Officer in Charge of the Biological Nitrogen Fixation Project at NARC). They were very supportive of our project and assisted us in developing a formal Work Agreement for our project, interviewing potential graduate student candidates, and arranging our field trip to the Northern Area of Pakistan. Because of the importance of alfalfa (Medicago sativa) to agricultural in Pakistan, they suggested we place more emphasis on M. sativa in our project compared to M. falcata.

We visited the National Herbarium in Islamabad where we met Professor E. Nasir and Dr. Yasin Nasir. Their address is:

National Herbarium
H-28, ST. 56, F-7/4
Islamabad, Pakistan

Professor Nasir and his staff are extremely helpful. They are working on the Flora of Pakistan and gave us appropriate volumes covering the legumes and grasses that were interested in. In addition, we examined specimens of Medicago falcata that were in the Herbarium. Specimens of M. falcata were primarily collected prior to 1950 during the months of July and August at elevations ranging form 2,400 to 3,050 m. Locations where these specimens were collected included:

Utrore, Kalam Gurez to Chorwan
Guriokot, Astor Valley Kalam to Utrot, Swat
Kharbu Dras, Ladak Kasurmik, Baltistan
Lamayuru, Ladak Chunagund near Kargil, Ladak
Thala, India Dras to Pan Dras, Ladak

October 10-12; Islamabad to Kalam

We finished obtaining the necessary travel permits for our trip to the Northern Area. We were accompanied on our trip by Mr. Sarfraz (driver of our Volkswagen van), Mr. Sarwat Naz (Scientific Officer in Range Management), and Mr. Mohammad Athar (Officer in Charge of the Biological Nitrogen Fixation Project). We traveled west form Islamabad towards Peshawar, turned north before reaching Peshawar, and went through Malakand on our way through the Swat Valley to Kalam where we stayed at the Forest guest house.

En route to Kalam, on a trip west of Kalam to Utrot, and on a trip north of Kalam to Lake Mahidond we attempted to collect M. falcata. Most of the non-cropped areas in Swat Valley were heavily grazed or were cut by hand for winter forage. Consequently, we were not able to locate M. falcata. In discussions with the Range Forest Officer at Kalam, we were informed that it would be difficult to collect M. falcata in the upper Swat Valley at this time of year. He indicated that by October the forest areas have been heavily grazed by sheep, goats, and cattle, all the way to permanent snow. Also, most forage plants would have been hand-harvested by October. He thought that late July or early August would be the best times to collect M. falcata. We did collect seed of a number of grasses and soil samples from the Kalam area.

While in Kalam we visited with Mr. Fahru, PARC Scientific Officer assigned to the Swiss potato project at Kalam (KIDP, Kalam Integrated Development Project). Most of the potatoes produced in this area are transported to Punjab where they are used for seed potatoes. He informed us of their project which is examining ways of increasing potato production in Kalam. Specific studies include: on-farm potato variety trials, fertilizer application trials, pesticide trials for potato leaf blight, and crop rotation trials with corn, turnip, cabbage, peas, and cauliflower.

October 13-14; Kalam to Chilas

On the road south of Kalam near Peshmal we stopped and searched through a farmer's haystack. We collected seed of a number of forage grasses and did find a few seeds of diploid M. sativa. Near Behrain (south of Kalam) we obtained soil and nodule samples of M. sativa. We drove south to Mingora through Khwazahela and overnighted in Mingora. The next day we traveled via Shangla, Besham, Patan, Kamila, and Dasu to Chilas and did not find either M. falcata or M. sativa. We overnighted in Chilas where we met Mr. Ali Gohar, Scientific Officer at the Karakoram Agricultural Research Station in Juglote. He spoke the local dialects and accompanied us on the rest of our trip in the Northern Area. Many of the villagers in the Northern Area did not understand Urdu, the national language of Pakistan, so a person who speaks the local dialect is almost a necessity.

October 15-18; Chilas to Passu

During the next four days, we collected seed, nodule, and soil samples of M. sativa and a number of forage grasses in the spectacularly scenic area between Chilas and Passu. Alfalfa is widely grown throughout Hunza Valley and is a valued winter forage. It is grown in fields irrigated by snowmelt runoff transported along hand-dug canals in the rocky, steep Himalayan Mountains. Outside of some flat alluvial fan areas, most of the alfalfa fields were on steep, rock-terraced hillsides. One terrace where alfalfa was growing measured less than 0.5 m in width. The farmers used local alfalfa cultivars that were plagued with numerous diseases and pests, including nematodes, leafhoppers, rust, mildew, and root rot. It appears that potential exists for increasing the productivity of alfalfa through the use of adapted cultivars that have been selected for resistance to the particular pest problem.

We had particularly good success in collecting M. sativa and forage grasses on a day trip to Naltar Valley. We rented a jeep and driver in Gilgit to get to Naltar Valley. The road was steep, narrow, and winding so that a 4-wheel drive vehicle was a necessity. This valley area was not as heavily grazed as the lower elevation areas in the Hunza Valley. Other relatively remote valley areas reachable only by 4-wheel drive that may be good collecting areas would be Astor Valley and Bubusar Valley. However, because of time, we were not able to get to these areas. We were told that farmers in these high elevation valleys sow their fields near 1 May. Therefore, seed of native species such as M. falcata should be available in June or July with seed at higher elevations available in August.

While in the Northern Area, we visited the Karakoram Agricultural Research Station (KARS) located at Juglote between Gilgit and Chilas. The Deputy Director of the station is Dr. Rash Khan, and the station address is:

Karakoram Agricultural Research Station
Juglote (Gilgit)
Northern Area, Pakistan

The station was established in 1984 and conducts research on irrigated grain crops, deciduous fruit trees, vegetables, forestry, fodders, forages, and range and water management. An active research program has been established at KARS with credit going to Dr. Rash Kahan and Mr. Ali Gohar, the only two scientists presently at KARS. Research being initiated at KARS will greatly contribute to the economic utilization of the natural resources in this dry (125 to 150 mm annual rainfall), cold region of Pakistan.

October 19-20; Gilgit to Islamabad

We traveled form Gilgit through Ghilas, Dasu, Kamila, and Patan to Besham where we stayed at the Forest Rest House. The next day we traveled from Besham through Manshera, Abbottabad, and Taxila to Islamabad.

October 21-26; Islamabad to Logan

Upon returning to Islamabad we went to the National Herbarium where Miss Rubina Akhter taxonomically verified the dried specimens of our collected seed samples. We threshed the M. sativa seed samples at NARC and left part of the seed at Islamabad for seed increase. The rest of the seed was packaged for shipment to Diplomatic Pouch to the Plant Germplasm Quarantine Center in Beltsville, MD. The US AID office was extremely helpful in sending our seed samples and making appropriate airline reservations for our return trip. We discussed our trip to the Northern Area with Dr. Douglas W. Butchard, Agricultural Officer at AID. Although he is retiring in January 1986, the address for his office in Islamabad, is:

Agricultural Officer
USAID/Islamabad, Pakistan
Agency for International Development
Washington, DC 20523

We discussed our trip with Dr. Noor Mohammad and Dr. G. R. Sandua and made detailed plans of the work to be conducted in Pakistan. We visited with the Plant Genetic Resources group at NARC. We discussed our trip to the Northern Area and a future collecting trip with Dr. Zahoor Ahmad, Mr. Rashid Anwar, and Mr. M. S. Bhatti. We completed our business arrangements and returned to our duty station at Logan, Utah.

Seed Samples Collected in Pakistan

Species	**Number of Samples**
Chrysopogon grullus	1
Dactylis glomerata	2
Elymus borianus	3
Elymus caninus	3
Elymus nutans	1
Elytrigia repens	1
Elymus stewartii	1

Koelaria sp. or Trisetum sp.	1
Medicago lupulina	2
Medicago sativa	16
Rosa mushata	1
Pennisetum oriental	2
Phacelurus speciosus	1
Piptatherum gracile	1
Saccharum ravannae	1
Trifolium pratense	1
Trifolium sp.	2
Trigonella gracilis	1
Zea mays	2
TOTAL	**43**