

**PLANT GERMPLASM COLLECTION REPORT**  
**USDA-ARS**  
**FORAGE AND RANGE RESEARCH LABORATORY**

**Foreign Travel to:**  
***USSR***  
***August 4 - August 28, 1988***

**TITLE: Plant Collection Expedition to USSR**

**U.S. Participants**

***Kay H. Asay* - *Research Geneticist*  
*USDA-Agricultural Research Service*  
*Logan, Utah U.S.A.***

***Douglas A. Johnson* - *Plant Physiologist*  
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**GERMPLASM ACCESSIONS**

Leningrad	Aug	5-10
Novosibirsk	Aug	11-12
Altai Mtn. Region	Aug	12-18
Travel to Alma Ata	Aug	19-20
Alma Ata	Aug	20-21
Karaganda Region	Aug	21-22
Aktyubinsk Region	Aug	23-24
Orenburg	Aug	25-26
Moscow	Aug	27-28

**INSTITUTIONS VISITED:**

N. I. Vavilov All-Union Institute of Plant Industry, Leningrad

V. L. Komarov Institute of Botany, Leningrad.

Institute of Plant Growing and Selection of the Siberian Division of the Academy of Agricultural Sciences, Novosibirsk.

Institute of Cytology and Genetics of the Siberian Branch of the USSR Academy of Sciences, Novosibirsk.

Central Siberian Botanical Garden of the Siberian Branch of the USSR Academy of Sciences, Novosibirsk.

Altai Scientific Research Institute of Agriculture and Plant Breeding at Barnaul, a Division of the Siberian Research Institute of Plant Growing and Selection of the Academy of Agricultural Sciences

Cherga Experimental Station, a Branch of the Institute of Cytology and Genetics of the Siberian Branch of the Academy of Sciences.

Institute of Fodder Crops at Alma Ata, a Branch of the Siberian Branch of the Academy of Agricultural Sciences

Administrators and representatives of the Ministry of Agriculture (AGRIPROM) from several regions including Karaganda, Kievka, Aktyubinsk, and Orenburg.

### **PURPOSE OF TRIP:**

1. To collect seeds of the grass tribe Triticeae with emphasis on Leymus, Agropyron, Elymus, Psathyrostachys, and Thinopyrum. Leymus species adapted to production of nutritious forage during the late fall and winter were of particular interest. Collections also were made to expand available germplasm resources for resistance to excess soil salinity, drought, and other facets of environmental stress encountered on semiarid rangelands.
2. To collect seeds of Dactylis glomerata, subsp. woronowii (diploid), Dactylis glomerata subsp. glomerata (tetraploid), and species of Bromus, Festuca, and Poa. Germplasm of these species with tolerance to drought, temperature extremes, and grazing were collected. Diploid Dactylis germplasm was collected to sample a wide range of subspecies diversity (subspecies polymorphism).
3. To make professional contacts with scientists and administrators associated with institutes of the USSR Academies of Sciences and Agricultural Sciences, particularly the N. I. Vavilov All-Union Institute of Plant Industry. A major goal was to develop a more open and productive interaction in terms of germplasm exchange and cooperative agricultural research.

## SUMMARY

We considered the expedition to be an unqualified success.

Excellent contacts were made with scientists and administrators at major agricultural research institutes. Compared to a previous visit in 1982, we found a much more open attitude for cooperative exchange. A strong interest was expressed in establishing closer relationships between scientists of the two countries working with germplasm. It is evident that excellent opportunities exist for germplasm and scientific exchange as well as cooperative research projects. Several administrators suggested that scientific exchange programs be developed and implemented, which would allow scientists to visit specific research laboratories or programs for one to several months. Arrangements to initiate such exchanges should be pursued as soon as possible.

The N. I. Vavilov All-Union Institute of Plant Industry was extremely cooperative and their staff did an excellent job of organizing the expedition. With the exception of Ashkhabad, we collected germplasm and visited research facilities in essentially all areas requested in the original proposal. Travel details were worked out in advance so that very few complications arose during the trip. We would suggest, however, that the itinerary of future expeditions into the same general areas be altered somewhat. Collection in the higher elevations of the Altai Mountains should be delayed until late August to permit species indigenous to these areas to reach maturity. Collections in northern Kazakhstan (areas around Karaganda, Aktyubinsk, and Orenburg) should be made in early August, particularly if species of Leymus or Psathyrostachys are of major interest.

We were able to make plant collections in some very prolific areas. Germplasm, representing 92 species, will provide a valuable reservoir of genetic resources for applied breeding programs and for basic genetic studies. We collected 188 accessions of 31 Triticeae species, including several promising accessions of the crested wheatgrass complex (Agropyron species), Altai wildrye (Leymus angustus and related species), Elymus species, and Russian wildrye (Psathyrostachys juncea). These plant materials will be used in breeding and wide hybridization programs to develop improved cultivars for semiarid rangelands. Grass germplasm collected for the more humid regions included (number of accessions in parentheses): smooth bromegrass, Bromus inermis, (38); orchardgrass, Dactylis glomerata, (38 tetraploid and 8 of the diploid form); meadow fescue, Festuca pratensis, (23); tall fescue, F. arundinacea, (1); and Kentucky bluegrass, Poa pratensis, (20). Forage legumes were a major component of the vegetative complement, particularly at the higher elevations. We collected 64 accessions of legumes including the vetches, Astragalus (3), Hedysarum (2), and Vicia (7); flat pea, Lathyrus, (1); alfalfa, Medicago, (17); sweetclover, Melilotus, (13); sainfoin, Onobrychis, (5); and clover, Trifolium, (16).

We forwarded 478 accessions to the Vavilov Institute (VIR) in Leningrad. We anticipate that approximately 100 accessions will be added to our collection at Leningrad and sent to the USDA-ARS Plant Quarantine Center in Beltsville. In addition, some promising germplasm sources of Agropyron and Psathyrostachys hopefully will be received through VIR from the Institute of Fodder Crops at Alma Ata, a research organization of the Siberian Branch of the Academy of Agricultural Sciences. A listing of plant collections is presented in Table 1.

A writer (Robert Rhoades) and photographer (Lynn Johnson) representing National Geographic Magazine accompanied us during the expedition. They are preparing an article on germplasm, based largely on material and photographs obtained during this expedition to the USSR. The article is scheduled for publication during the latter part of 1989.

#### TECHNICAL REPORT AND DETAILS OF EXPEDITION

Aug 3-4 Team left home stations and traveled directly to Leningrad. We were met at airport by Sergey V. Shuvalov and Alexander Yu. Yurchikov, Foreign Relations Department of the N. I. Vavilov Institute of Plant Industry (VIR). Details of the expedition were briefly discussed and we were taken to our hotel.

Aug 5-10 Visited research facilities and following staff members of the Vavilov Institute of Plant Industry.

-- Vladimir I. Krivchenko - Director of the Institute and Head of the Division of Immunity.

-- Sergey M. Alexanyan - Head of the Foreign Relations Department.

-- Anatoly A. Tiurin, Sergey V. Shuvalov, and Nikolai Tsourikov - Foreign Relations Department.

-- Alexander Yu. Yurchikov - Foreign Relations Department and interpreter during Leningrad visit.

-- Sophia N. Bakhareva - Head of the Plant Introduction Department.

-- Igor Shmaraev - Plant Introduction Department.

-- V. A. Zaitzev - Laboratory Chief, Seed Testing and Standardization.

-- Grigorij E. Shmaraev - Chief of Corn and Small Grain Crops Division.

-- Vladimir F. Chapurin - Forage Crops Specialist, Red Clover.

-- Nikolay P. Agafonov - Doctor of Agricultural Sciences.

-- V. N. Sinelnikova - Laboratory of Plant Resistance Physiology at Pushkin.

-- Tatiana Nikolayevna Ulyanova - Population Botany and Systematics Department and Herbarium.

-- Olga Lassan - Archive Specialist.

-- Natalia Frantzkevich - Specialist for Cereals.

- Leonid Malyshev - Forage Specialist for Agropyron Species.
- Igor Shmaraev - Germplasm Specialist
- Sergey G. Dadurin - Foreign Relations Department and interpreter after Alexander Yu. Yurchikov left.
- Inna Gavriilyuk - Department of Molecular Biology, Pushkin.
- Dr. Sinelnikova - Scientific Secretary, Pushkin.
- A. V. Konarev - Department Head, Biochemistry, Pushkin.
- Dr. Strelchenko - Laboratory of Amino Acids, Pushkin.
- M. Zelensky - Assistant Head, Department of Plant Physiology, Pushkin.
- Leonite Averyanov - Herbarium at the V. L. Komarov Institute of Botany.
- Helen M. Doroshinskaja - Member of the Union of Journalists of the U.S.S.R.

The history and accomplishments of VIR were presented to the team and we had an opportunity to visit the museum, which was established in honor of its founder, Nikolai Ivanovich Vavilov. The Institute actually had its beginning in 1894 when the Bureau of Applied Botany was organized in St. Petersburg under the Ministry of Agriculture to investigate the diversity of cultivated plants in Russia. In 1921, N. I. Vavilov became the Head of the Bureau and in 1924, it was reorganized into the All-Union Bureau of Applied Botany and New Crops, and in 1930, the Institute was renamed the All-Union Institute of Plant Industry. Since 1967, the Institute has carried the name of N. I. Vavilov.

During his distinguished career, Vavilov devoted much of his efforts to the collection and study of plant genetic resources. He conducted expeditions in many regions of the USSR and visited more than 50 countries. His detailed studies of the distribution of cultivated plants and their wild relatives enabled him to develop the theory of "the centers of origin of cultivated plants." This theory is still recognized throughout the world and is used as a basis for plant explorations.

The Institute has continued the germplasm work initiated by Vavilov and now has at its disposal more than 300,000 samples of cultivated plants and their wild relatives. The major objectives of the Institute are to: 1) collect plant germplasm in USSR and abroad and exchange genetic resources with scientific institutions and seed companies throughout the world; 2) maintain samples of the world collection in viable condition and provide for long-term storage; 3) study the germplasm resources throughout the world for promising plant materials; 4) develop Vavilov's theoretical ideas in classification, evolution, geography, and history of cultivated plants, as well as in other basic sciences; 5) supply scientific, breeding, and experimental institutions of the country with initial materials for breeding, and 6) provide scientific and methodological assistance for breeding centers of the country. The Institute was awarded the

Order of Lenin and the Order of Friendship of Peoples in 1967 and 1975, respectively. Plans are now progressing to move a major portion of the research activities from buildings in Leningrad to new facilities in Pushkin.

The Institute is presently organized into several departments and laboratories.

Department of Introduction - Arranges plant collection expeditions, both domestically and internationally. They are also responsible for seed increase and exchange of plant materials. The department publishes a catalogue of germplasm available for exchange entitled "Delectus Seminum."

Department of Foreign Relations - Responsible for international cooperation with scientific institutions in other countries. They organize visits, professional meetings, and cooperative investigations with foreign specialists.

Departments of Plant Resources - Organized on the basis of agricultural crops, these departments study new germplasm collections, conduct theoretical studies on systematics, classification, evolution, breeding methods, and history of cultivation. Departments reproduce accessions, maintain them under long-term storage, and provide breeders with initial plant materials for breeding programs. Current volumes of "Flora of Cultivated Plants of the USSR" are published. These departments are:

- Wheats
- Rye, Barley, and Oats
- Leguminous Crops
- Corn (Zea mays) and Small Grain Crops
- Fodder Crops
- Industrial Crops
- Tuber Crops
- Vegetables and Cucurbits
- Fruits, Small Fruits, Nut Bearing, Subtropical, Ornamental Crops, and Grape
- Population Botany and Systematics

Theoretical (Methodological) Departments and Laboratories - These units conduct research in various fields of biology with emphasis on genetic resources of cultivated species and their wild relatives. A major goal is to identify donors of commercially valuable genetic characters.

Theoretical studies also are conducted to establish a basis for improved breeding methods and to elucidate phylogenetic relationships among plant taxa. These departments and laboratories are:

- Department of Genetics
- Laboratory of Gene Engineering and Tissue Culture
- Department of Molecular Biology
- Department of Immunity
- Department of Plant Physiology
- Department of Photosynthesis and Productivity
- Department of Cytology and Anatomy
- Laboratory of Genetics and Physiology of Productivity
- Laboratory of Plant Biochemistry
- Laboratory of Technological Evaluation of Agricultural Crops
- Department of Seed-Growing and Seed-Testing
- Department of Agricultural Meteorology
- Department of Automatic Information Systems
- Department of Automation of Research and of Artificial Climate
- Department of Economic Research
- Laboratory of Licenses and Inventions
- Editorial and Publishing Department
- Library

Moscow Branch of VIR - This branch was organized in 1957 in Mikhnevo, a town located 80 km from Moscow. Crop species of major interest are cereals, legumes, fodder crops, vegetables, potatoes, and hops. The effect of ionizing radiation and chemical supermutagens are investigated as potential breeding tools. Plant resistance to pests and diseases, and physiology of tolerance to unfavorable environmental conditions also are studied. Improved varieties of hops, green peas, potatoes, and other crops have been developed at this branch and are now used in several regions of the country.

Outlying Centers - These extensions of the Institute are distributed to represent the major climatic zones in the Soviet Union.

-- Astrakhan Experiment Station

-- Central Asia Branch of VIR - Uzbek SSR

-- Volgograd Experiment Station - on flood-lands of river Volga

-- Daghestan Experiment Station - on Caspian Sea shore, 10 km from Derbent

-- Far East Experiment Station

-- Zeya Experiment Station

-- Ekaterininsk Experiment Station - Tambov Province.

-- Crimean Pomological Station - Nakhimov District eSvastopol.

-- Krymsk Experiment and Breeding Station - Krymsk (Krasnodar Province).

-- Kuban Experiment Station - Steppe zone of the Krasnodar Province.

-- Maikop Experiment Station

-- Pavlovsk Experiment Station - A major station 30 km from Leningrad.

-- Polar Experiment Station - Beyond the Polar circle near Kirovsk.

-- Aral Sea Area Experiment Station - Northern border of sand distribution in Western Kazakhstan at Chelkar.

-- Sukhumi Experiment Station - Center of the damp subtropics.

-- Turkmenian Experiment Station - Southwest Turkmenian SSR near Kara-Kala.

-- Ustimovsk Experiment Station - Border of the forest steppe and steppe zones near Kremenchug.

Several publications were exchanged with the Vavilov Institute and arrangements were made for them to send copies of their research reports and bulletins to the National Agricultural Library and libraries at Utah State University and the University of Wisconsin. We were particularly impressed with the open attitude of the administrators and scientists of the Institute. They expressed a strong interest in establishing closer relationships with the National Plant Germplasm System and in the development of cooperative research programs and exchange visits among scientists. They were particularly interested in the establishment of more direct dialogue among scientists from the two countries. In response to our request, they agreed to provide seed from their working collection at Leningrad. A list of desired perennial grasses and legumes was left with them. In exchange, we agreed to send germplasm from our breeding programs. These seedlots are presently being prepared.

A visit was made to the herbarium and specimens of key species were studied. Work to monitor the viability of seeds and research on long-term storage of seeds was discussed. The use of cryopreservation is under study and regeneration of virus-free potatoes through tissue culture is being investigated. The team was favorably impressed with research underway in molecular biology. Dr. Gavriluk and associates appeared to be abreast with latest technology involving such procedures as DNA hybridization and protein characterization to determine biological relationships. Research with photosynthesis was discussed with Dr. Zelensky. He is determining photosynthetic activity in isolated chloroplasts to evaluate genetic differences among cultivars and species of cereal crops.

The team concluded the stay in Leningrad with a visit to the V. L. Komarov Institute of Botany. An effort was made to see N. N. Tsvelev, but he was not available. The keeper of the herbarium, L. Averyanov, toured the facilities with us and we had the opportunity to study specimens of interest. Mr. Averyanov informed us that 5,000,000 specimens are maintained at the herbarium. We also learned that Dr. Tsvelev will visit the United States later this year.

Robert Rhoades, writer and scientist for Centro Internacional de la Papa (CIP) in Peru, and Lynn Johnson, a photographer from the National Geographic Society, joined the team at Leningrad. Robert Rhoades traveled with us for 10 days and Lynn Johnson remained with the team for the duration of the expedition. They are preparing an article on plant germplasm for publication in National Geographic magazine. The article should appear in print during the latter part of 1989. Alexander Yu. Yurchikov, organizer of our itinerary and interpreter for the team, was reassigned to a Soviet project in India and was replaced by Sergey G. Dadurin on Aug. 10. Mr. Dadurin remained with us for the rest of the expedition and did an excellent job. Igor Shmaraev was assigned to the team at Leningrad and made several plant collections for VIR during the expedition.

Aug. 10-12 The team left Leningrad at 11:00 PM on Aug. 10 and traveled by air to Novosibirsk, arriving there at 7:30 AM. We had the opportunity to meet scientists of Siberian Research Institute of Plant Growing and Selection of the Academy of Agricultural Sciences. The major objectives of this institute are to: 1) assemble and study plant genetic resources of the Siberian

Region for subsequent breeding, 2) develop more effective breeding methods, 3) breed new high yielding varieties of the major farm crops, and 4) develop improved farming practices for Siberian conditions. The institute now maintains more than 15,000 plant samples representing 40 countries. Their scientists have developed 42 new varieties of farm crops, including 20 for specific regions. The Institute has six base stations for testing new varieties. Staff visits included:

-- Igor S. Potapiev - Chief, Division of International Cooperation of Science and Technology, Met team at airport and was host during visit to Novosibirsk.

-- V. I. Zhukov - Assistant Director and Head of Plant Resources Department Department, Wheat Breeder.

-- A. V. Goncharova - Forage Legume and Grass Breeder

-- Vasilii Malofeev - Forage Specialist and Taxonomist; organized and led expedition into Altai Mountain Region.

-- Osipova Galina - Institute of Fodder Crops, Krasnoobsk Laboratory of Breeding (Met with her while visiting Institute).

We learned of current breeding programs in cereal crops, vegetables, forage grasses and legumes. As with other Institutes visited, they emphasized that several plant collection expeditions are made each year. Forage grasses receiving the most attention include Bromus inermis, Festuca arundinacea, F. pratensis, Agropyron cristatum, A. desertorum, A. fragile, and Psathyrostachys juncea. The major breeding objective with P. juncea was the development of strains with better seed retention at maturity. Several promising experimental strains of P. juncea were observed in experimental plots. They agreed to send seedlots of these and other plant materials of interest to us through the Vavilov Institute at Leningrad. Breeding research with alfalfa centered on a hybridization program between Medicago sativa and M. falcata. They recently released the alfalfa cultivar 'Tulunskaya' and preparations are being made to release a new cultivar, 'PS-8.'

The team next visited staff and research facilities of the Institute of Cytology and Genetics of the Siberian Branch of the USSR Academy of Sciences.

This Institute has a coordinated program involving breeding of both plants and animals. Breeding programs with sheep and mink were described to us. A new breed of sheep, recently developed by the Institute, now numbers over 300,000 animals. Research is underway to domesticate wild animal species and they suggested that such efforts are fruitful areas for international cooperation. Examples of furs obtained from domesticated foxes and otters were shown to the team. The director pointed out that the institute is doing fundamental research involving molecular genetics, cytogenetics, physiological genetics, stress resistance, immunogenetics, wide hybridization, tissue culture, isozyme analyses and Restriction Fragment Length Polymorphism

(RFLP). He also indicated that state-of-the-art procedures, including electrophoration, are being used to effect direct genetic transfer. Time limitations prohibited us from observing these research programs. Staff visits at the Cytology and Genetics Institute included:

-- Vladimir K. Shumny - Director of the Institute of Cytology and Genetics of the Siberian Branch of the Academy of Sciences, Novosibirsk, and Corresponding Member of the Academy of Sciences, USSR.

-- Galina N. Kiseleva - Scientific Secretary for Foreign Affairs, Institute of Cytology and Genetics of the Siberian Branch of Academy of Sciences.

We then visited staff members and facilities of the Central Siberian Botanical Garden of the Siberian Branch of the USSR Academy of Sciences. Our visit to Olga and Alexander Agafonov's laboratory was particularly meaningful. This husband and wife research team is using electrophoretic analyses of storage proteins to evaluate biological relationships among Triticeae grasses, primarily Elymus species. They have been in contact with D. R. Dewey (USDA-ARS Cytogeneticist at Logan, UT) and are very interested in pursuing cooperative research to elucidate genomic relationships in Elymus. They provided us with seedlots of Triticeae species that are of interest to the USDA-ARS research program in Logan. We were asked to assist them in obtaining peer reviews of a manuscript, recently prepared by the Agafonovs for publication in a scientific journal. Upon our return to the U.S., we forwarded copies of the manuscript to D. R. Dewey at Logan and another to P. D. Walton at Edmonton, Alberta, Canada for their review. Excellent opportunities are evident for establishing a cooperative research program with this research unit. Visits at the Botanical Garden included:

-- Alexander Agafonov - Research Scientist, Central Siberian Botanical Garden, USSR Academy of Sciences

-- Olga V. Agafonova - Candidate of Biological Science, Central Siberian Botanical Garden, USSR Academy of Sciences

Aug 12 - Left Novosibirsk at 7:30 PM on plant collection expedition to Altai Region. The expedition was planned and organized by Vasiliy Malofeev, Forage Specialist and Taxonomist, Siberian Research Institute of Plant Growing and Selection, Siberian Division of the Academy of Agricultural Sciences, Novosibirsk. Nickolay P. Agafonov, N. I. Vavilov Institute of Plant Industry, Leningrad and two research assistants from Novosibirsk also accompanied the expedition. The expedition camped overnight near Berdsk approximately 80 km south of Novosibirsk.

Aug 13 - Plant collections were made at Berdsk and Cherepanovsky en route to Barnaul. Species and site information are listed in Tables 1 and 2. The team then visited staff and research facilities at the Altai Scientific Research Institute of Agriculture and Plant Breeding at Barnaul, a Division of the Siberian Research Institute of Plant Growing and Selection of the Academy of Agricultural Sciences. This institute is part of the scientific and industrial complex at Neva Altai that serves the 7,500,000 ha of the Altai Region. Staff consists of 91 scientific workers (1 PhD and 38 Candidates of Science) and 200 laborers. Research involves collection, breeding, and

evaluation of cereal crops as well as local perennial fodder species. The Institute also is responsible for development of improved farming technology for the Altai Region. Of particular interest to our group, was the breeding and evaluation work being done with Elymus sibiricus, E. dahuricus, Psathyrostachys juncea, Bromus inermis, Medicago varia, Melilotus officinalis, and Gallega officinalis. We met and had lunch with several of the staff. Due to time limitations, most of the interaction was with forage specialists. Specific staff visits included:

-- Dr. Gamzikov - Director of the Institute.

-- Lisov Vladimir Mikhailovich - General Assistant Director.

-- Shukis Yevgeny Raimondovich - Head of Laboratory of Forage Crop Selection. Accompanied expedition to Altai Region.

The collection team left Barnaul at 1:45 PM and flew to Gorno-Altysk. Plant collections were made near Gorno-Altysk and the expedition camped at Ust-Sema near the Katun River.

Aug. 14 - Made collections at Ust-Sema, Shebalino, Kamlak, and Cherga. The team visited the Cherga Experimental Station, which is a branch of the Institute of Cytology and Genetics of the Siberian Branch of the Academy of Sciences at Novosibirsk. Their research involves collection, preservation, and breeding of several forage species, including Elymus, Elytrigia, Bromus, Phalaris, Dactylis, Festuca, Calamagrostis, Beckmannia, Medicago, Astragalus, Malva, Silvfa, Lotus, Onobrychis, Synopsis, and Lupinus. A particularly impressive breeding and hybridization program was in progress with 12 species of Amaranthus. Accessions from their working collections were provided to the expedition. Staff visits included:

-- Anatoliy Zheleznov - Director of Experiment Station and Research Geneticist.

-- Natalia Zheleznova - Research Geneticist.

We camped at Topuchi Pass.

Aug. 15 - Made numerous plant collections at nine sites at Topuchi Pass and en route to campsite near Yubagon Pass.

Aug 16 - Rain!! Made numerous plant collections at seven sites along route to approximately 10 km west of Yubagon Pass. Returned to Cherga and spent the night in cabin owned by Cherga Experimental Station.

Aug 17 - Collected plant samples at seven sites in Cherga vicinity and stayed the night in cabin at Cherga Experimental Station.

Aug 18 - Left Cherga at 6:00 AM and collected in vicinity of Gorno-Altysk. Left Gorno-Altysk at 2:00 PM and arrived at Novosibirsk at 3:45 PM. We received seedlots from the Central Siberian Botanical Garden, Siberian Research Institute of Plant Growing and Selection, and the Altai Scientific Research Institute of Agriculture and Plant Breeding. We left Novosibirsk via train for Alma Ata at 8:00 PM.

Aug 19 - Collected along the railroad at stops between Novosibirsk and Alma Ata.

Aug. 20 - Arrived at Alma Ata at 8:30 AM and visited the Institute of Fodder Crops of the Siberian Branch of the Academy of Agricultural Sciences. They have an active breeding program with Agropyron cristatum, A. desertorum, A. fragile, Psathyrostachys juncea, Festuca sulcata, Artemisia lisingiana, Kochia prostrata, Medicago sativa, Onobrychis caucasica, Melilotus officinalis, and M. alba. We were particularly impressed with the breeding program with Ps. juncea. The cultivar 'Bozoisky' originated from this Institute. They recently developed a tetraploid cultivar ('Start-116') that has significantly better seedling vigor, dry matter production, and higher seed test weight than 'Bozoisky.' They have developed several new cultivars of Agropyron species at the diploid, tetraploid, and hexaploid level. Synthetic strains have been produced from induced octoploid populations. The director enthusiastically endorsed increased cooperation in areas of scientific and germplasm exchange. Excellent opportunities for cooperative research in forage germplasm exist with this Institute. Several collections were made in Medeo area near Alma Ata. Staff visits included:

- Asonov Kasyu - Director of Institute.
- Galliolla Meirmanov - Deputy Director, Head of Breeding Department, and Alfalfa Breeder.
- Borangaziev Kamal - Head of Plant Introduction Department.
- Eliman Shakhanov - Grass Breeder. Accompanied team to Karaganda and Aktyubinsk.
  
- Kim Peter Ivanovich - Head of Plant Quarantine Department.
- Svetlana Zhalgaspaeva - Engineer on Patents.

Aug. 21 - Left Alma Ata at 1:30 PM and arrived in Karaganda at 2:45 PM. We were met by Vladimir Durnev of the Ministry of Agriculture of the Karaganda Region (AGRIPROM), who hosted us during our stay there. Plant collections were made in Karaganda vicinity during the late afternoon and evening.

Aug 22 - Made plant collections at 14 sites extending along a route 200 km northwest of Karaganda. We were accompanied by Victor Ryabukhin, Botanist with AGRIPROM. We visited the Amangeldy State Farm where we were hosted by the chairman, Madeniet Kulamirov. In the

Kievka area, we were met and hosted by Konstantin Poletayev, Chairman of AGRIPROM in that area.

Aug 23 - Left Karaganda by air at 2:00 AM and arrived in Aktyubinsk where we were met at 5:30 AM by the following AGRIPROM staff and VIR scientists:

-- Vladimir Petrovich - First Assistant to the Chairman of AGRIPROM for Aktyubinsk Area.

-- Victor Ichenko - AGRIPROM Staff Member for Aktyubinsk Area.

-- Nikolai Ivanovich Dzubenko - Director of the VIR Aral Sea Area Experiment Station at Chelkar in western Kazakhstan and Research Geneticist with alfalfa.

-- Ilyena Dzubenka - Research Technician at VIR Aral Sea Area Experiment Station at Chelkar working on alfalfa.

We left Aktyubinsk at 10:30 AM on plant collection expedition. Collections were made at 14 sites along a route extending from Aktyubinsk to Kainda State Farm. We were particularly impressed with large native stands of Agropyron fragile in the broad expansive plains of Kazakhstan. Visits were made at Savaldjy State Farm where we were met and hosted by Oldjavay Gapasov, Farm Chairman; and the Kainda State Farm, where we were hosted by Hurmukhanov Osylbek. The night was spent in a yerta (Kazakhstan herdsman tent).

Aug. 24 - Left Kainda State Farm and made plant collections at seven sites en route to Aktyubinsk. While making collections on the Oktober State Farm, we were met and hosted by Seid-Keri Amangosov, Director of the farm. Team arrived in Aktyubinsk at 8:00 PM.

Aug. 25 - Left Aktyubinsk at 9:30 AM by automobile and collected en route to Orenburg. We were met at regional boundary by the following AGRIPROM officials from Orenburg:

-- Victor Belov - Department of Plant Industry.

-- Victor Abaimov - Fodder Crops Specialist.

-- Eugenii Koweschikov - Fodder Crops Specialist.

The team visited Red Banner Collective Farm where we were met by the Director Nicolay Alekseyev. We arrived in Orenburg at 5:00 PM.

Aug. 26 - Made plant collections at five sites east of Orenburg. We visited the Lenin State Farm, where we were accompanied by Samad Mukashev (Agronomist). Later, we visited the Bolshevik State Farm and its director, Vladimir Vlasenko. We also met with Ivan Ponomorenko, chairman of the local branch of AGRIPROM. Mr. Ponomorenko expressed a sincere interest in visiting the United States. We returned to Orenburg at 10:00 PM.

Aug. 27 - Left Orenburg at 9:00 AM by air and arrived in Moscow at 9:00 AM (Moscow time). We were met at the airport by a driver from the Moscow Branch of VIR. We made an inventory of seed samples and prepared them for shipment to Leningrad and the Plant Protection and Quarantine Center in Beltsville, MD. We were unable to contact the Agriculture Office at the U.S. Embassy in Moscow. It was Saturday afternoon and no one was in the office or at home. The switch board was not permitted to take messages.

Aug. 28-29 - Traveled from Moscow to home stations.

Table 1. Plant Species Collected during Expedition to the Soviet Union<sup>1</sup>

SPECIES	NUMBER
Agropyron cristatum	22
Agropyron desertorum	13
Agropyron fragile	12
Agropyron pectiniforme	1
Agropyron spp.	5
Agrostis alba	3
Agrostis vulgaris	1
Allium spp.	2
Alopecurus ventricosus	2
Alopecurus pratensis	2
Altai Region samples	6
Amaranthus	6
Astragalus falcatus	2
Astragalus onibrachys	1
Avena fatua	1
Avena	3

pubescens	
Beckmannia spp.	4
Bromus inermis	38
Bromus spp.	3
Bromus squarrosus	2
Calamagrostis epigeios	4
Calamagrostis spp.	2
Carum carvi	1
Chena sylvestre	1
Citrullus lanatus	2
Critesion brevisubulatum	1
Dactylis glomerata 2X	8
Dactylis glomerata	30
Deschampsia caespitosa	8
Elymus caninus	1
Elymus ciliaris spp. amurensis	2
Elymus dahuricus	10
Elymus excelcus	3
Elymus fedtschenkoi	1
Elymus glaucus	2
Elymus gmelinii	1
Elymus mutabilis	1
Elymus pendulinus	1
Elymus	9

salinatus	
Elumus sibiricus	20
Elymus spp.	1
Elymus trachycaulum	1
Elytrigia capillarus	1
Elytrigia glaucus	1
Elytrigia hybridum	1
Elytrigia imbricatus	1
Elytrigia pectiniforme	1
Elytrigia repens	14
Festuca arundinacea	1
Festuca ovina	3
Festuca pratensis	23
Festuca rubra	2
Festuca sulcata	5
Hedysarum gmelini	1
Hedysarum spp.	1
Koeleria gracilis	1
Lasiagrostis chi	2
Lathyrus sylvestris	1
Leymus angustus	40
Leymus arenarius	1
Leymus racemosus	4
Leymus	3

ramosus	
Lolium perenne	1
Lotus spp.	3
Lycopersicon lycopersicum	2
Medicago falcata	14
Medicago varia	3
Melilotus officinalis	6
Melilotus spp.	7
Onobrychis pas.	1
Onobrychis sibiricus	3
Onobrychis spp.	1
Panicum miliaceum	1
Phalaris arundinacea	2
Phleum alopecuroides	1
Phleum fleoidee	1
Phleum pratense	7
Poa pratense	20
Potentilla	1
Psathyrostachys juncea	13
Rosa spinosissimi	1
Sorghum halepense	2
Stellaria graminace	1
Stipa ioona	1
Stipa sibirica	6
Stipia capillata	10

Trifolium lupinaster	3
Trifolium pratense	9
Trifolium repens	3
Trifolium spp.	1
Vicia cracca	5
Vicia	2

<sup>1</sup> Approximately 100 additional accessions to be received through the N. I. Vavilov All-Union Institute of Plant Industry, Leningrad.