PLANT GERMPLASM COLLECTION REPORT

USDA-ARS
FORAGE AND RANGE RESEARCH LABORATORY
LOGAN, UTAH

Foreign Travel to:
USSR
August 16-September 14, 1982

U.S. Participants

Melvin D. Rumbaugh - Research Geneticist
USDA-Agricultural Research Service
Logan, Utah U.S.A.

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

GERMPLASM ACCESSIONS

Purpose of Trip:

1. To collect seeds and Rhizobium nodules of Astragalus, Medicago, and other legumes adapted to arid and semiarid rangelands.
2. To collect seeds of Agropyron, Elymus, Hordeum, and related species; particularly A. cristatum, A. desertorum, and E. junceus.

SUMMARY

A 30-day plant collecting trip to the U.S.S.R. by K. H. Asay and M. D. Rumbaugh resulted in 412 accessions being added to USDA plant germplasm resources. These included 168 forage legume and 171 forage grass collections. The remainder of the accessions consisted of grain and horticultural crop seed samples. A total of 79 genera were represented by the collection. Twenty-two accessions of legumes included Rhizobium bearing nodules from the roots of plants from which seeds also were obtained.

Areas visited were near the cities of Stavropol, Elista, Kherson, Tashkent, Samarkand, and Leningrad. Thus, a number of ecosystems were examined. Accessions collected near Elista in the Kalmyk Republic may prove to be well adapted to the Great Plains of the United States, those from Stavropol and Kherson to more humid regions, and those from Tashkent and Samarkand to more arid zones. The collections obtained from Leningrad were of populations which had been tested and found to be superior in one or more attributes. The time at which the trip necessarily took, place (August 16-September 14) prevented the collection of many species of desirable forage grasses and legumes which had matured and shattered.

Although the expedition was successful, certain changes in time, routing, and procedures would have maximized the opportunity to obtain additional germplasm of value to plant breeders in the United States. Our recommendations follow:

1) The geographic region in the U.S.S.R. of most promise for plant materials adapted to the semiarid and arid rangelands of the United States extends from the Tien-Shan Mountain Range westward to the Aral Sea and northward within the Kazakh S.S.R.

2) The desert flora of the U.S.S.R. includes many shrubs of value for rangeland improvement. More than 150 ecotypes of Kochia prostrata have been catalogued by Soviet botanists. Plant materials experts from the United States should collect seeds of desert shrubs in the southeastern U.S.S.R. during the months of October and November.

3) Future trips to obtain seeds of forage grasses and legumes in the southern part of the U.S.S.R. should take place in late May and June.

4) All expeditions should be planned to include U.S. scientists, specialists from the N. I. Vavilov Institute and Leningrad, and botanists from the region in which the collecting is to take place. Expeditions should be equipped with four-wheel drive vehicles and/or horses to permit obtaining of germplasm in more remote areas. Most of the previous collections have been made near urban centers and adjacent to highways where the flora may not adequately represent the germplasm of more remote and less heavily used sites.

TRAVEL DETAILS

August 13: Traveled from Logan, Utah, to Washington, D. C. We were met and briefed ont eh arrangements and itinerary of the trip by Eric Erickson of the OICD Staff.

August 14-16: Traveled from Washington, D. C., to Moscow with a 1-day layover in Frankfurt, Germany.

August 17: The USDA wheat study and the plant germplasm collection teams met with a delegation from the U.S.S.R. Ministry of Agriculture and the Vavilov Institute to discuss our respective itineraries. Those in attendance included:

U. S. Team Members:

1) Keith R. Severin, FAS, USDA, Washington, D. C.

2) Arthur F. Shaw, Agronomist, Montana State University, Bozeman, MT

3) Don Loeslie, Spring Wheat Farmer, Warren, MN.

4) Kay H. Asay, Research Geneticist, USDA, Logan, UT.

5) Melvin D. Rumbaugh, Research Geneticist, USDA, Logan, UT.

6) Dale M. Posthumus, Agricultural Officer, U.S. Embassy, Moscow.

N. I. Vavilov Institute of Plant Industry:

1) Enver T. Meshcherov, Head, Plant Introduction Dept., Leningrad.

2) Stanislav V. Kuznetsov, Head, Division for Foreign Relations, Leningrad.

U.S.S.R. Ministry of Agriculture:

1) Alexander A. Konygin, Chief, Main Administration for Foreign Relations, Moscow.

2) A. I. Zholohov, Chief, Administration for Grains, Moscow.

3) Y. Buryakov, Deputy Chief, Administration for Grains, Moscow.

4) Valery K. Merzlov, Executive Secretary-Counselor, U.S.S.R. Secretariat, U.S.S.R.-U.S. Joint Committee on Agricultural Cooperation, Moscow.

5) Valentina V. Gorobets, Scientific Worker, Science and Technical Information Department, AURRI, Krasnodar.

I pointed out that I expected to collect nodules as well as seeds of the legumes and this was acceptable. Mr. Konygin repeatedly stated that we were to have access to the seed collection of the institutes we were to visit. We also learned the Mr. Kuznetzov was to accompany us and to act as interpretor. He subsequently proved to be both very capable and diligent and contributed greatly to a successful collecting trip. His command of English is excellent, he has experience in breeding forage sorghum and is an excellent administrator.

August 18: Traveled by air from Moscow to Stavropol. At Stavropol we met members of the staff and toured the grounds and laboratories of the Agricultural Research Institute. The most important contacts here were:

1) Alexander Kitaev, Assistant Director and Head of the Selection Program.

2) Victor Kravzov, Head, Division of Perennial Grasses. Dr. Kravzov traveled with us throughout our stay in the Stavropol area.

The Institute is conducting research with forage crop rotations and mixed species plantings. There is considerable interest in using plantings of corn and soybeans for silage in a ratio of two rows of corn to one row of soybeans.

August 19-21: We met the staff of the Stavropol Botanical Garden.

1) Stanisla Ledovskoi, Director of the Botanical Garden.

2) Vadim Tanfiljev, Botanist.

3) Djantemir Dzibov, Botanist.

Professor Tanfiljev is a very competent botanist and maintains an extensive planting in the Botanical Garden. However, he is 79 years old and only works part of the time. Mr. Dzibov accompanied us during our collections in the vicinity of Stavropol. Plantings on the grounds of the garden have been established by mass seeding of collections from the virgin steppe land and by transplanting sod. The flora is quite rich with as many as five legume species within one square meter.

We were permitted to collect seeds within the Botanical Garden and at three locations near Stavropol. Two locations were steppe grasslands on a large state farm 20 km west of the city. The most frequently observed legume was Medicago romanica (2-3 plants/m^2) with Coronilla varia, Lathyrus silvestris, Lotus cancasicus. Vicia angustifolia, and Vicia tetrasperma also being abundant. The grasses included several species of Agropyron, Bothriochola, Brachypodium, Dactylis, Phleum, and Stipa. The third location was game preserve 20 km south of Stavropol. Elevation was 800 m and the annual precipitations was said to be above 600 mm. There were few legumes but Astragalus falcatus, Lotus caucasisus, Medicago lupulina, Trifolium repens, and Vicia tenuifolia were obtained. Species of grasses still bearing seed included Brachypodium rupestra, Festuca valesiaca, Lolium perenne, Melica transivancia, and Phleum pratense. A number of forb, shrub, and tree species also were collected here. Dr. Tanfiljev added to the collection by contributing 8 accessions of legumes and 18 of grasses. I requested samples of Hedysarum and Sanguisorba but they were not included. Although our work at Stavropol resulted in the 108 accessions being added to the USDA Plant Introduction System, we were concerned that many of these accessions duplicate previous collections. Douglas R. Dewey, A.

Perry Plummer and other USDA scientists previously have collected in the vicinity of Stavropol and the vegetation in these ecosytems has been adequately sampled.

August 22-15: Traveled by car to Elista in Kalmyk Republic. We were met at the border by a delegation of the following people:

1) V. I. Usalko, Deputy Minister of Agriculture, Kalmyk Autonomous S.S.R. An aggressive administrator who would do well in the United States.

2) P. D. Bakaev, Director, the Kalmyk Scientific Research Institute of Meat Cattle Production.

3) E. M. Bayanov, Director, Chernozemelsk Experimental Farm.

4) Olga A. Lachko, Botanist. An excellent taxonomist who was very helpful and who is an authority of Kochia prostrata.

We later met and had discussions with the following:

1) I. E. Bugdaev, Minister of Agriculture, Kalmyk Autonomous S.S.R.

2) I. A. Abushinov, Director, State Farm "Sorok Let Komsomola."

3) U. S. Karibov, Director, Collective Farm "Lenin."

4) I. G. Chub, Agronomist, Collective Farm "Novii Mir."

The area along the highway nearest Stavropol is irrigated and intensively managed. Irrigation systems observed were of the "Frigate," "Valley" center pivot, and moveable line sprinkler types. A high percentage of the crop land is used for silage crops including corn, sorghum, and sunflowers. As we approached the Kalmyk Republic the land form and vegetation changed to superficially appear to be much like that of the drier parts of the Great Plains. According to the Minister of Agriculture, livestock products account for 70% of the total agricultural output of the

republic. In 1981 the Kalmyk Republic produced 58,000 tons of red meat of which 40-43% was beef, 30-35% mutton, 6-8% pork, and the remainder horse. Wool production was 21,900 tons. There are 64 million hectares of native grasslands, 25,000 hectares of irrigated alfalfa, 37,000 hectares of irrigated and dryland sudan grass, and 7,000 hectares of irrigated rice. Only local populations of alfalfa are seeded and all irrigation water is from two rivers draining from the Caucasus. Little high quality ground water is available and there is no possibility of a substantial increase in the irrigated crop area. The major factor limiting agricultural production is a shortage of water. Much of the republic has soils with high salt content and water in some of the larger lakes is not suitable for irrigation of crops because of salt.

The Kalmyk Republic has one major research facility, the Kalmyk Scientific Research Institute of Meat Cattle Production, and smaller substations investigating problems in forestry and in the production of rice and other irrigated crops. The institute has crossed the local strain of cattle with the Santa Gertrudis and Limousine breeds to achieve a 30-35 kg increase in body weight at 18 months of age. Plant species included in breeding and agronomic research programs are corn, millet, rape, rice, and wheat. The institute is responsible for seed production of all species. Bromus inermis yields 2-3 centerns of seed per hectare when grown in 300 mm precipitation areas. Irrigated alfalfa is cut 4 times and yields 80-90 centerns/ha.

We only observed rangelands to the north and west of the capital city of Elista. All were in good conditions and rotational grazing was practiced. We were told that approximately 40,000 ha of rangelands have been reclaimed by sowing species such as Colliginum aphhyllum and Eurotia ceratoides. Other species cited as being of value for range improvement were Artemisia austriaca, A. lercheana, A. pauciflora, Eurotia ceratoides, Glycyrrhiza glabra, Haloxylon aphyllum, and Kochia prostrata. More than 150 ecotypes of Kochia prostrata are recognized. Haloxylon aphyllum from the Uzbek Republic is being evaluated in 200 mm annual precipitation areas. Eurotia ceratoides is highly valued for sites with sandy soils. The locations where we collected received 250 mm precipitation annually and often were dominated by Echinopsilon sedoides (Syn. Bassia sedoides or Kochia sedoides). Legume species observed were of the genera Coronilla, Glycyrrhiza, Lathyrus, Medicago, Melilotus, Trifolium, and Trigonella. Grass collections included Agropyron, Bromus, Calamagrostis, Elymus, Elytrigia, Eragrostis, Festuca, Poa, Puccinellia, and Poa. A total of 89 accessions of all species were collected. Many should be of value for pasture and range improvement in semiarid regions with salty soils.

August 26: Traveled by air to Kiev.

August 27-29: Traveled by air to Kherson and visited the Ukrainian Scientific Research Institute of Irrigated Farming. We met the following staff:

1) V. I. Ostapov, Director

2) S. A. Gladkov, Alfalfa Breeder

3) T. B. Nemolovskaya, Corn Breeder

4) V. I. Zaveryukhin, Head, Division of Agrotechnics and Soybean Breeding

Mr. Gladkov is 70 years old but maintains an aggressive alfalfa breeding program. He is very much interested in research on saponin content. Mr. Zaveryukhin speaks English very well and has traveled to the United States. He would be an important contact person for any soybean scientist planning to visit the U.S.S.R. Although we asked for seed samples, none were received.

We also visited the Ukrainian Scientific Research Institute of Animal Breeding for Steppe Regions and the Askania Nova Nature Preserve located approximately 150 km east of Kherson. Scientists who assisted us there were:

1) P. S. Golovanyev, Deputy Director

2) E. P. Veden'kov, Head, Division of Virgin Steppe Lands

3) L. H. Panova, Botanist

This institute has developed four breeds of sheep, two breeds of swine, and some improved lines of cattle. It maintains a large arboretum and zoo as well as 11,000 ha of virgin steppe grasslands.

We arrived too late in the season to collect most of the species growing here. Only a few accessions of Agropyron pectiniforme, Bromus inermis, Elytrigia repens, Koelaria gracillis, Poa angustifolia, and Stipa capillata were obtained. The non-grass components of the vegetation consisted primarily of coarse forbs of limited value. Legumes were scarce although Coronilla varia, Medicago romanica, and Trifolium diffusum were observed. If this site were to be re-visited it should be during May-June with the objective of obtaining germplasm of grasses.

August 30: Traveled by air to Kiev

August 31-September 3: Traveled by air to Tashkent in the Uzbek Republic. Near Tashkent we met the following people:

The Central Asian Branch of the N. I. Vavilov Institute of Plant Industry.

1) I. I. Pugachev, Director

2) L. S. Kolokol'tseva, Alfalfa Specialist

The institute appeared to be staffed with qualified people and to have ample laboratory and field space, but lacked appropriate equipment to conduct highly technical research. The biochemistry laboratory seemed quite primitive with the exception of a spectrophotometer and two centrifuges. Several basement rooms in the laboratory were equipped with shelving and were said to be climatically controlled for seed storage but were not being used. We were told that the seeds were sent from Leningrad. The institute has developed over 200 cultivars of fruit, flowers, cotton, and vegetables.

We viewed the alfalfa field plots which consisted of a single replicated planting of 35 U.S. and 35 Spanish cultivars and populations for forage yield measurements with a duplicate planting

being used for a seed yield trial. These were irrigated and it was obvious that water application had not been uniform throughout the test and that the data were unreliable. Many of the cultivars being evaluated are adapted to Canada and the northern United States rather than the southwestern states which have a climate more like that of Uzbek. The two highest yielding U.S. cultivars were

`Salton' and `WL-508'. The seed yield trail was severely damaged by powdery mildew (pathogen not identified), lacked pollinating insets, and showed evidence of improper water management. We also viewed plots of forage soybeans, cow peas, field beans, and sesame. The grape research program was more impressive with 1,500 populations under test. We recommend that an exchange of grape breeders from Tashkent and the United States be initiated. We were not shown any plots of forage grasses. Seeds of two alfalfa cultivars were obtained from the institute. These were the only seeds made available to us. Repeated requests for additional materials were answered by saying that all seeds came from Leningrad and we could obtain them there.

The third day we were taken to the headquarters of the Chatkal Mountain Forest Reservation in the village of Parkent, 50 km southeast of Tashkent. We met the following scientists:

1) V. M. Yesikov, Director

2) O. V. Savitch, Deputy Director

3) Yu. G. Bululookov, Head, Division of Mountain Land Reclamation

The preserve was founded in 1947 and is Uzbekistan's oldest protected territory. It consists of 35,000 ha on the western spurs of the Chatkal Ridge of the Tien-Shan Range. Elevation varies from 1,100 to 4,000 m. Precipitation at the lowest and highest elevations averages 600-700 mm annually but the zone between 2,500 and 3,000 m received 900 mm from clouds and mists. It soon became apparent that the headquarters personnel were not prepared for our visit. No 4-wheel drive vehicles were available to take us into the forest. When we inquired about horses we were told that they had 50, but none were made available to us. At 2:00 p.m. we drove to a small village near the reserve and walked approximately 6 km to the reserve boundary. Our guide stated that this was a typical area and that we were to collect there. However, it was badly overgrazed, very dry, and we had arrived too late in the season to collect most of the forage species. It is know that 91 legume and 101 grass species occur within the reserve over a wide range of ecosystems. An expedition to obtain this germplasm should be considered.

September 4-9: Traveled by air to Samarkand. We were met by the Minister of Agriculture who had arranged our program. It consisted of a series of visits and interviews with no arrangements for collecting seeds. Mr. Kuznetsov asked that the program be revised and this was attempted. We did go to the Uzbek Grain Research Institute located about 75 km northeast of Samarkand and met the following people:

1) M. A. Amanov, Director and Physiologist

2) D. P. Baigulov, Head, Division of Forage Production

3) P. P. Olenyk, Grain Legume Breeder

4) Yu. A. Arinov, Head, Division of Barley Breeding

We participated in the customary briefing about the activities of the institute, but were not able to obtain any seed samples there. We collected in parks within the city of Samarkand, purchased seed samples at the Farmer's Market within the city, and collected at two outlying locations. One location was approximately 75 km west of Samarkand and 10 km south of the town of Kattakurgan. The major crops are pistachio and wheat. We examined the pistachio orchards throughly, but they had been grazed and few forage plants escaped. A large irrigation reservoir is located near Kattakurgan. As the water was used and receded, crops were planted in the bed of the reservoir. Beans, melons, sunflowers, sesame, and forage grasses were being grown in that way in an area that would otherwise have been too arid. We also collected in a mountainous region about 25 km south of Samarkand. This region also had been intensively grazed, was very dry, and we arrived too late to obtain very many desirable accessions.

September 9: Traveled by air to Leningrad.

September 10-13: Our contacts in Leningrad were scientists on the staff of the N. I. Vavilov

Institute of Plant Industry. These included the following:

1) Dr. Vesvolod L. Vitkovsky, Deputy Director

2) Dr. Enver T. Meshcherov, Head, Department of Plant Introduction

3) Dr. J. N. Shsherbakov, Plant Breeder

4) N. A. Mukhina, Clover Breeder

5) Z. P. Shutova, Grass Breeder

6) Anatoly A. Tiurin, Foreign Relations. He speaks German but not English.

Dr. Vitkovsky briefed us on the organization and activities of the institute. The major tasks relate to the collection, preservation, and evaluation of plant germplasm. Both crop species and wild plants are obtained and the collection now contains more than 300,000 accessions. A network of 18 research stations have been established as a part of the institute to evaluate and characterize the collections. The most promising accessions are increased and made available to plant breeders. Breeders are acquainted with this material through publications and "field seminars." As may as 2,000 accessions of wheat are grown out of one location at one time. Breeders are provided an opportunity to examine each accessions and to request those that they wish to use in their research programs. The institute has a staff of 6 Academicians, 40 Doctors of Science, 400 Candidates of Sciences, and adequate support personnel.

We were given a copy of the 1982-85 seed list published by the institute and told to indicate those accessions that we wanted to acquire. We requested all available accessions of Astragalus, Hedysarum, and Medicago legumes and a number of Agropyron, Dactylis, Elymus, Elytrigia, Festuca, Hordeum, Lolium, and Psathyrostachys grass species. The grass plots at the Field Laboratory near Pushkin were visited and some superior populations and cultivars of Festuca, Lolium, and Poa noted. Seeds also were requested of those populations.

We were given 112 accessions of Medicago species and 43 accessions of grasses. It was understood that other accessions will be mailed on a later date. Dr. Meshcherov gave us a list of plant cultivars developed in the United States and requested that we send seed of them to him.

September 14: Traveled from Leningrad to Moscow by overnight train. We made an oral report on the trip to Dr. V. K. Merzlov at the U.S.S.R. Ministry of Agriculture and then traveled to London, Great Britain.

September 15: Returned to Logan, Utah.

Table 1. Legume seed and nodule collections obtained in the Soviet Union in 1982 by K. H. Asay and M. D. Rumbaugh

	Number of Collections		
	Nodules only	Seeds and nodules	Seeds
Austragalus sp.			2
" *captiosus*			1
" *cicer*			1
" *falcatus*			2
" *glycphylloides*			1
" *neasimus*			1
Citisus ruthenicus	1		
Coronilla varia	1	4	1
Genista tinctoria			1
Lathyrus sp.			1
" *silvestris*			1
" *tuberosum*			1
Lespedeza dahiorica			1
Lotus caucasicus	1		2
Medicago carstiensis			1
" *falcata*		1	2
" *lupulina*		3	
" *romanica*	1		4

" romanica x M. sativa		1	
" sativa		2	7
Melilotus albus		1	1
" officinalis	1	2	2
Onobrychis inermis	1		1
" viciifolia			1
Trifolium sp.	1	1	1
" ambiguum		1	
" arvense		1	2
" diffusum			1
" montanum			1
" pratense		1	1
" repens		1	
" striatum		1	1
Trigonella orthocerus			1
Vicia sp.	1		
" angustifolia		1	1
" tenuifolia			1
" tetrasperma			1
TOTAL	7	22	46

Table 2. Forage grass species collected in the Soviet Union in 1982 by K. H. Asay and M. D. Rumbaugh

Species	Number of Collections
Agropyron intermedium	4
" lavrenkoanum	1
" pectinatum	4
" " X Elytrigia elongatiformis	1
" pectiniforme	11
" " X Elytrigia sp.	1
" repens	2
" scythicum	1
" trichophorum	3
Agrostis alba	1
Brothriochloa sp.	2
" ischaemum	2

Brachypodium rupestre			3	
Briza media			1	
Bromus sp.			1	
" arvensis			1	
" inermis			2	
" riparius			3	
Calamagrostis epigeios			2	
Cynodon dactylon			4	
Dactylis glomerata			2	
Deschampsia caespitosa			1	
Eragrostis minor			2	
Elymus giganteus			1	
" junceus			3	
" ramosus			5	
Elytrigia elongata			3	
" elongatiformis			1	
" intermedia			1	
" repens			3	
Eremopyrum triticeum			1	
Festuca sp.			1	
" orientalis			1	
" pratensis			3	
" valesiaca			4	
Hordeum sp.			2	
Koeleria gracilis			7	
Lolium perenne			2	
Melica transsilvanica			1	
Phleum sp.			1	
" phleoides			1	
" pratense			2	
Phragmites communis			1	

Table 2. Forage grass species collected in the Soviet Union in 1982 by K. H. Asay and M. D. Rumbaugh

Species	Number of Collections
Poa angustifolia	2
" bulbosa	4
" nemoralis	1
Puccinellia distans	3
Stipa sp.	2
" capillata	8
" dasyphylla	1
" nirainua	1
" pontica	1
" pulcherrima	1
" sareptana	1
" sibirica	1
" tenacissima	1
Unidentified species	2
TOTAL	128

Table 3. Rangeland forb species collected in the Soviet Union in 1982 by K. H. Asay and M. D. Rumbaugh

Species	Number of Collections
Agrimonia eupatoria	1
Aster amellodies	1
Calliginum spinosum	1
Centaurea delbatafolium	1
Echium vissicum	1
Eurotia ceratoides	1
Hypericum perforatum	1
Kochia prostrata	1
Lavatera thuringiaca	1
Lavatera tuirgiaca	1
Lavatera turingiaus	1
Linum sp.	1
Linum austriacum	1
Linum hirsutum	5
Poterium ploygamum	2
Salvia tesquicola	1

Salvia verticillata			1	
Sanguisorba sp.			1	
Thalictrum rosaceae			1	
Tulipa schrenkeana			1	
Unidentified spp.			4	
TOTAL			29	

Table 4. Tree, shrub, and berry species collected in the Soviet Union in 1982 by K. H. Asay

and M. D. Rumbaugh

Species	Common Name	Number of Collections
Acer compestris	Hedge-maple	1
(probably A. campestre)		
Betula sp.	Birch	1
Crataegus sp.	Hawthorn	3
Euonymus europaeus	European	1
Haloxylon aphyllum		1
Juglans sp.	Walnut	1
Malva sp.	Mallow	1
Morus rubra	Mulberry	1
Pistachio vera	Pistachio	2
Prunus divaricata	Plum	1
Prunus domestica	Plum	1
Prunus persica	Peach	1
Pyrus sp.	Crab apple	1
Pyrus caucazica	Pear	1
Robinia sp.	Locust	2
Rosa spinosa	Rose	1
Rubus sp.	Blackberry	1
Rubus friseus	Bramble	1

Tilia sp.	Linden	1
Unidentified Rosaceae	Sedonnia	1
TOTAL		24