

TRIP REPORT

Walnut Germplasm Collection in Kyrgyzstan, 1994

Gale McGranahan¹, Chuck Leslie¹, and Maxine Thompson²

¹Department of Pomology, University of California, Davis CA 95616

²USDA/ARS National Germplasm Repository, Corvallis OR 97333

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SUMMARY

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Gale McGranahan, Maxine Thompson, and Chuck Leslie

In September, 1994, Chuck Leslie, Maxine Thompson, and Gale McGranahan travelled to Kyrgyzstan, formerly of the Soviet Union, to discuss and collect walnut germplasm. Kyrgyzstan, located south of Kazakstan, west of China, north of Tadjikistan, and east of Uzbekistan, is a small country which contains over 600,000 hectares of native walnut forests. Scientists here have been studying and selecting superior individuals from these native forests for over five decades. We landed in Almaty, Kazakstan and travelled by car to Bishkek, the capitol of Kyrgyzstan. There we met with Dr. Bronislav Venglovsky, Director of the Institute of Forestry, and Oleg Kolov, Vice Director and planned our expedition to the experiment stations located in the walnut forests of southern Kyrgyzstan. We travelled with two entomologists (Nina Gabrid and Natalia Abdrashitova) and a biochemist (Igor Lukashevich) from the Institute. In Jalal-Abad we joined up with Viktor Shevchenko, walnut breeder and scientist, and Kamil Asimov, Director of the Biosphere Institute. We stayed in guesthouses in Jalal-Abad, Yaradar and Ak-Terek and explored the local collections and wild forests. In all, we made 75 collections of walnut, mostly those that had not lost their flowers to a frost on April 20. We also collected *Corylus*, *Pyrus*, *Crataegus* and *Mentha*. Plant materials will be available from the National Plant Germplasm Repository in Davis, CA or Corvallis, OR. The traits we expect to find in the walnut germplasm are precocity, lateral bud fruitfulness, cold hardiness and late leafing. The following report gives details on the expedition and lists the germplasm collected.

Kyrgyzstan



Native walnut forests
Planted walnuts

Рис. 1. Схема распространения грецкого ореха в Кыргызии.

INTRODUCTION

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Kyrgyzstan is located in Central Asia and is bordered in the north by Kazakstan, in the east by China, in the south by Tadjikistan and in the west by Uzbekistan (Fig.1). Located between 69 and 80 degrees east longitude and 39 and 43 degrees north latitude, it is in the same latitude as Italy, northern Spain, southern Oregon and northern California. The country is small (198,500 sq km), less than half the size of California. The longest distance between points east and west is 925 km and north and south 454 km. Altitude ranges from 401 meters to 7,439 meters above sea level.

The population of Kyrgyzstan (about 4.5 million) includes about 52% of the Kyrgyz ethnic group, 22% Russian, 13% Uzbek, 2% Ukrainian. The rest are German, Tartar, Kazakh, Dungan and Uigur. The official language is Kyrgyz but most people also speak Russian.

Kyrgyzstan has a continental climate with hot dry summers and cold winters. Average temperatures in the lowlands range from -4 to -6 C in January to 17 to 27 C in July. In the highlands average temperatures range from -14 to -20 C in January to 8 to 12 C in July. Precipitation varies extremely due to the effect of the mountains. On the slopes above the Fergana valley annual precipitation is more than 1000 mm while other areas range between less than 200 mm to over 600 mm.

The vegetation can be divided roughly into three belts. Above 4000 m alpine grasses predominate. The middle, between 1500m and 4000 m is richest in vegetation with forests of conifers, walnut, apple and pistachio and prairies. Typical steppes of central Asia are found in the lower belt, under 1500 m.

The country is divided by the East-West oriented Tien Shan mountain range. This has resulted in 2 different ecological and socio-economical zones. The northern zone includes Tala, Bishkek (the capitol), and the Lake Issyk-Kul region. The southern region includes the Fergana valley and the cities of Jalal-Abad and Osh.

Walnuts are found primarily in the southern zone of Kyrgyzstan and overall they make up 4% of the forests there (Fig. 2). They are associated with an understory of maple, honeysuckle, blackthorn, apple and buckthorn. Estimates of the changes in forested land in Kyrgyzstan indicate that the area in walnut forests has decreased from 45,000 hectares in 1930 to 28,000 hectares in 1978. About 5,000 m³ of walnut wood is harvested annually but the major threat to the walnut forests is grazing which prevents regeneration. Excessive harvesting could be a threat in the future unless the country develops a sustainable forestry policy.

Research on walnuts in Kyrgyzstan is conducted under the auspices of the Academy of Sciences. Prior to January, 1994, almost all walnut research was coordinated through the Institute of Forestry (aka Institute for Forests and Nut Culture) in Bishkek which is also responsible for almond, walnut, pistachio, apple, pear and jujube as well as the timber species. Recently, however, the Academy of Sciences has converted what was the South-Kyrgyz Experiment Station of the Institute of Forestry into the Institute for the Biosphere. The relationship between the two institutes is still being worked out and responsibilities are unclear.

Collections of walnut germplasm are found at six experiment stations: Bishkek, Issyk-Kul, Jalal-Abad, Sary-Chelek, Yaradar and Ak-Terek. The latter three are in the area of the native walnut forests. We were able to visit the collections in Bishkek, Jalal-Abad, Yaradar and Ak-Terek. We saw and visited some of the wild forests in the surrounding area but found very few nuts because a severe frost in April had killed the flowers. This is apparently a frequent occurrence.

DAILY LOG

Walnut Germplasm Collection in Kyrgyzstan, 1994

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9/13/94 - 9/15/94. Travel from Sacramento to Almaty, Kazakstan. We arrived in Almaty at about 5:00 AM and were met by Max, a member of the American Embassy staff. He saw us through customs and had arranged for a driver to take us to Hotel Otrar where we had reservations. Maxine had missed a connection and was delayed

9/16/94. Friday morning we went to the Embassy to try to track down the whereabouts of Maxine. No information was available from the airlines about passengers on the flight arriving the next day, so we called and sent faxes to the US trying to locate her.

In the afternoon we went to the Almaty market and purchased two lots of walnuts wrapped in newspaper cones for \$1.00 each. One we selected for its light smooth shell (K-1); the other was typical of market walnuts (K-2) exhibiting much variation. At the time, without an interpreter, we could not establish the country of origin but later we found out that many of the walnuts at the market come from Uzbekistan. Whole kernel shelled walnuts (both halves still attached) were also being sold at a higher price. We debated whether these were unique types that shell out whole or simply the result of careful hand labor. The latter seems most likely.

We had dinner with Tom Unruh, USDA/ARS entomologist, from Yakima who was in Kazakstan collecting parasites of codling moth from apple. He was the one who had alerted the embassy of our arrival and we are most grateful to him. He also provided us with additional microfuge tubes and further instructions for insect collection.

9/17/94. Early Saturday morning Chuck went to the airport to meet the next Lufthansa flight from Frankfurt in hopes that Maxine would arrive and she did. The embassy (with help from Tom Unruh) arranged both travel to the airport and our transportation to Bishkek, Kyrgyzstan.

We left for Bishkek by car and driver at about 10:00 AM. Our packs barely fit in and on the car (bring more bungie cords next time) and we overloaded the suspension so that the car clunked loudly over every bump. The country between Almaty and Bishkek was mostly flat rolling hills, steppes, with some grazing and grain production. We witnessed a serious car/truck accident which put a heavy pall on the remainder of the drive. Accidents are apparently common in these countries and from our viewpoint it might attributed to lack of regulations: traffic lanes as we know them are non-existent and several lanes may be going in opposite directions depending on how many vehicles can fit on one piece of road at a time.

We crossed the border into Kyrgyzstan with no interruption and arrived at Hotel Dostuk in Bishkek in time for a late lunch.

9/18/94. Sunday we spent walking around Bishkek. The town is filled with many parks and grand avenues but all are getting only minimal maintenance. The art museum was open and had impressive displays of Kyrgyz rugs and Russian art.

9/20/94 - 9/22/94. We spent Monday, Tuesday and Wednesday at the Forestry Institute, Bishkek. Chuck and several others left Wednesday morning on the two day overland trip to Jalal-Abad.

Bronislav Venglovsky is the Director of the Forestry Institute and Oleg Kolov is the Vice-Director. We had expected to travel with them to the walnut stations in the South of Kyrgyzstan but they had been invited to Switzerland to discuss a proposal, funded by the Swiss government, to inventory forests and develop sustainable forestry management policies for Kyrgyzstan. Venglovsky and Kolov, however, were able to spend several days with us reviewing the Institute's work on walnuts, discussing the Specific Cooperative Agreement on "Preservation of Wild Walnut Forests and Survey of Associated Fauna" and planning our expedition.

We toured the walnut collection on the grounds of the Institute. The collection was old and uncared for and the identifications were questionable but we collected a few nuts (K6-8). We discussed walnut collections and were told that Ak-Terek and Yaradar, both in the South, have the best collections. We were also told that due to a late spring frost the wild walnut forests had no yield this year. Venglovsky was interested in increasing the collection near Lake Issy-kul because he said that it has less frost due to the moderating effect of the lake.

Regarding research we discussed the difficulties that have arisen due to the change in government. Not only are researchers poorly paid (\$20.00/mo) but there is no support money. Walnut research, especially exploration, evaluation, and breeding have been impossible since 1991 because of lack of support. In addition, international literature, formerly available through Moscow is no longer accessible and Soviet Union-wide meetings on topics such as nut crops are curtailed. Later we found that there were even insufficient funds to publish an important monograph on walnuts by Shevchenko.

Our discussions of the specific cooperative agreement included a verbal translation of the agreement and discussion of specific goals which are included in this report (USDA/ARS version).

One afternoon was devoted to planning our trip for the next two weeks. We specifically requested a stop in Jalal-Abad to visit the Biosphere Institute, but otherwise left it to Venglovsky to select the locations to be visited. He also arranged for three scientists and a driver from the Forestry Institute to accompany us: Igor Lukashevich, a biochemist who had worked on walnuts; Natasha Abdrashitova, Entomologist; Nina Gabrid, Entomologist; and Ilya Kulyabin, driver.

Igor, Natasha, Ilya and Ruslan (interpreter) left with Chuck in a packed van for the two day overland trip to our next stop, Jalal-Abad. Maxine, Nina and I planned to fly there on Thursday. What follows are Chuck's notes from his trip across the country:

The van left for Jalal-Abad with Ilya driving and Igor, Ruslan, Natasha, and Chuck as passengers. While still in suburban Bishkek we passed a very recent accident in which a young school girl had been hit by a car and was lying in the road, the second bad traffic accident of the week. We stopped shortly after that at a Dungan village. Dungans are another ethnic group, apparently similar to the Uigurs of western China. Later we passed an almond experiment station affiliated with the institute and then began to climb into the mountains. I was surprised that the mountains were almost entirely barren except for some overgrazed grass. There was fresh snow on the ground as we climbed to 10,000 ft elevation and passed through a 3 km long tunnel with very few lights inside. Soon after emerging, we stopped for lunch along the side of the road at what was in effect a mountain truck stop. A woman was serving food at two tables set up beside a stream among several lean-to tents. She had a large pot of lamb

stew boiling and served each customer a bowl of stew, bread, and tea, refilling the pot from the stream. The place was doing a brisk business. We continued downhill to a fork in the road. The left fork went to China. We took the road to the right which was flat for a ways and then rose to cross a second 10,000 ft pass. A number of trucks had gone off the road in the steeper sections, perhaps during the winter as the road was not narrow. Vehicles over the banks had been thoroughly stripped, with even the wooden boards from the beds removed. The road, in general, was not dangerous in that it was once a good two lane paved highway with obvious military importance, but several years of neglect were rapidly taking their toll. In many places the road was partly blocked by large boulders or earth slides, or pieces had slid away. Pot holes were becoming more prevalent than pavement on many sections and parts are now entirely gravel. Some heavy road equipment was clearing particularly bad slides but clearly the attempt to maintain the road is being rapidly lost. The Kyrgyz commented numerous times on the deterioration of the road and the increased time now required to travel it.

We saw a large Eagle-like bird sitting on a low bluff along the road and passed a large herd of horses being driven across the range like cattle. One family was packing up their yurt, apparently getting ready to move to lower elevation for the winter. As we descended from the second pass we saw a few junipers and *Abies sinensis*. We stopped briefly after dark in a small village/truck stop and checked on staying for the night but the Kyrgyz said it was too dangerous because there were a lot of young people drinking. We kept going for several hours and finally stopped to eat dinner about 11:00 at night. We just pulled to the side of the road and ate sliced ham, bread, and watermelon. After driving a little further, we pulled off the main highway on to an old section of the road that dead-ended at a reservoir. The driver and Igor got out and wandered around for a while and picked out a spot where it was safe to put down sleeping bags. They were looking for a place where there were no boulders, as many, some as large as the van, had rolled off the hill above the road.

Thursday, 9/22/94

In the morning we were awakened by an approaching engine which proved to be a fisherman on a motorcycle. Breakfast was much the same as dinner the night before, and then we continued toward Jalal-Abad. We followed along what recently had been a free flowing river but was recently dammed. Part of this reservoir was filled only last year. The water was a very clear blue-green color somewhat like Crater Lake. We began to see pistachio trees as we descended and stopped at some of the highest ones to look for nuts but found and collected only a few. Spring frost had killed most. We saw the first walnut tree of the trip planted in a garden in a small village. Then we passed a coal mining town, that also manufactures electric equipment. This is also a fruit growing area with peaches, apples, and grapes.

9/22/94. Maxine, Nina and I had an uneventful flight from Bishkek to Osh where we hired a car to take us to the Biosphere Institute in Jalal-Abad. At the Biosphere Institute we met the director, Kamil Asimov, and Victor Shevchenko, the walnut breeder and propagator, as well as Chuck and

the party from Bishkek. We spent the early afternoon visiting a park and hot springs which overlook the city of Jalal-Abad. The hillsides were covered with planted pistachio trees and the views were impressive. Later in the afternoon Shevchenko took us through the walnut collection located next to the Biosphere Institute and showed us nuts that he had already collected. Shevchenko is a gruff fellow and initially answered all our questions with "its in the monograph". Later he warmed up to us. He has been working on walnuts for years, has published numerous papers on breeding, selection, cultivation and propagation (see Literature collected). Shevchenko joined us for the rest of the trip and was an invaluable source of information on walnuts.

9/23/94. Our first stop on Friday was at the headquarters of the Regia Company, an American company involved in harvesting walnut timber and burls from the wild forests. We were accompanied by the members of the expedition and the director of the Biosphere Institute. Shevchenko arrived a bit later. We met with Tom Lea who is the manager for operations in Kyrgyzstan. He was very cordial and open about their plans. Since it had come up in conversation earlier with the Kyrgyz scientists, we asked about the proposed method of repropagation (rooted cuttings) and the feasibility of repropagating with seedling walnut, or grafted seedlings since rooting cuttings is so difficult. This apparently had not been discussed. He asked us what we thought about rooting cuttings using bioponics and we admitted that we had no evidence that it would work. Before leaving we invited Tom Lea to have dinner with us on Friday, September 30, the day we were to return from the mountains and our last night in South Kyrgyzstan. He agreed and told us other members of the company might be there as well. After we left, Shevchenko stayed at the company headquarters and berated Mr. Lea to such an extent that he notified his superiors.

After lunch at the local tea house we left for Yaradar, the site of one of the main walnut collections. One section of road, still in the flatlands, was lined with walnut trees. As we ascended the mountain valley we could see hillsides covered with walnuts, their vibrant yellow color differentiating them from the grey-green *Crataegus*, pistachio and apple. We arrived at dusk, took a brief tour of the collection and the rest of the evening was spent reviewing evaluation data while our hosts cooked a meal of freshly killed sheep, killed in our honor.

9/24/94. Saturday we spent most of the day looking at the walnut collection on the grounds. It included several species and hybrids and many grafted selections. There were very few nuts available for collection due to the April 20 freeze. The most prolific clone was "Uighur" or "Wing-wur" and we assumed that it must be a late blooming cultivar, i.e. blooming after the April 20 freeze. We collected "Uighur" nuts from 3 trees (K-9, K-10, K-14). We were also able to collect from seedlings in the nursery (K-15). The female parent source of the nursery seedlings was "Kyzl-Mehnat", a precocious selection. Shevchenko preferred this cultivar as a seed source of precocious seedlings because the nuts were bigger than "Ideal" (K-11), another precocious cultivar, and the branches did not die back like "Ideal". We also collected green scionwood from selections of interest (K-16 to K-29, K-31) but by the time the wood had been through storage, fumigation and the US inspection it was moldy and we eventually discarded it.

Maxine collected three selections of hazelnut (*Corylus avellana*) which were also in the collection. These were MTT94001 (scions) and MTT94002 (seed) of 'Cherkeski' from Krasnodar; MTT94003 (scions) and MTT94004 (seed) of 'Adygei' from the Caucasus mountains and MTT94005 (scions) and MTT94006 (seed) of 'Panakei'. All three varieties had been selected from wild populations in the Caucasus. Also collected were scions (MTT94007) and seed (MTT94008) of an attractive *Crataegus sp.* which had been introduced from Bishkek. Fruit was

bright red, 17-22 mm long and 15-21 mm wide, borne in clusters of 3-5, and edible. The local name is 'Kroviano krahnii' (= red blood).

9/25/94. Sunday morning Nina Gabrid examined our scionwood collection for insects. We were concerned about *Erschoviella musculana* Ershov. (aka *Sarothrips musculana* Ershov.) and *Octneria dispar* (aka *Porthetria dispar* or *Limantra dispar*). The former only attacks walnuts and can be very serious. It usually goes into the husk and nut but will also burrow into the new shoots if fruits are not available. The latter is gypsy moth and is a serious problem on many species including pistachio, apple and various *Prunus*. At about 11:00 we took a walk up the valley behind the station. On the return we visited a local home for dinner. Sitting on the floor in a room surrounded by bright patterned fabrics we had a first course of tea, fried bread (barsok), and dips of honey, jam, thick cream, and salsa. Our second course was big plates of pilaf with chunks of chicken on top. Custom has it that you cannot leave a meal such as this until every bit of food has been consumed. We failed, but as foreigners we were forgiven and allowed to leave. Our host told us how he and a few friends can consume a whole lamb at one sitting.

Later in the afternoon we drove to Arslanbob village. This area is famous for its walnut trees and we saw, in a park-like setting, impressive old walnut trees with enormous burls. These wild trees have almost no nuts. We picked up all we could find (K-32). Burls are worth their weight in silver we are told. These burls are what make the forests so desired by lumber companies. We discussed the cause of burls: 1) genetic predisposition, 2) response to damage (rolling stones), or 3) disease, maybe virus or mycoplasma. Chuck added grazing as a cause of burls and, except that we find them 15 ft up the trunk, his hypothesis makes sense. The burls often send out multiple shoots which the grazing animals quickly consume. Fifty years of suckering and a genetic predisposition to burling could account for these massive growths.

9/26/94. Chuck was sick and we left him in bed while we went up into the Aral forest behind the station. We saw more nurseries and collections of selections and cultivars, evidence of years of selection, still no nuts. In the afternoon we examined a putative pecan-walnut hybrid (K-30). The female parent was a late-flowering *J. regia* which was hand-pollinated with pecan. The tree and nuts looked distinctly like *J. regia* and we are skeptical. We were told that there are other pecan-walnut hybrids at Ak-Terek.

9/27/94. This morning we packed up and left for Ak-Terek. Something was wrong with our van so we walked down the valley road while Ilya and Igor fixed the van. About two hours later the van was fixed but Ilya's hand was broken; the van had rolled over it as he was working on the gears. At first Igor tried to drive but after many stalls, Ilya drove the remaining two hours to Ak-Terek. There we were able to splint his hand and arm with a splint from our first aid kit.

After lunch we toured the collection behind the station. There were about 5 hectares of their best selections of walnuts from the wild forests. Here we saw and collected from two more pecan-walnut hybrids (K-35, K-36). The nuts look like walnuts but the kernel looked and tasted like pecan. We concluded that they were indeed hybrids but were not convinced that pecan was the male parent. What are the nuts of a *J. regia* x *J. ailantifolia* hybrid like?

We also collected seed from 3 *Pyrus korshinsky* trees (MTT94009, MTT94010 and MTT94011). This species is said to be drought-resistant and compatible with all *Pyrus communis* cultivars. It is the preferred rootstock for pears in Central Asia. All three trees were very productive, with small fruits (25-35 mm in diameter) and long stems (30-38 mm). These trees were growing near some *Pyrus communis* trees so the seeds may be interspecific hybrids.

9/28/94. Wednesday Kamil drove us in his jeep into the Khurmaidan region. Here there were 200 hectares set aside for experimental work by the Biosphere Institute. This area was once forested but wild walnut trees can be found only in the draws. Beginning in 1964 walnuts were replanted on terraces. They plant 3-4 year old seedlings and care for them for a few years. Survival only occurs where grazing is prohibited. We collected from the precocious seedlings on the terraces (K37 - K40) and from the lower orchards (K41 - K45; K48 - K52). At least one (K39) was probably a seedling of 'Ideal' and exhibited the chicken-foot growth habit.

On the open dry hillsides along the road from Ak-Terek to Khurmaidan, *Crataegus pontica* and *C. turkestanica* were the dominant trees. We collected seed from a *C. pontica* (MTT94012) which had edible, yellow, oblate (21-26mm x 17-21mm) fruits. Later we saw similar fruits being sold in the bazaar in Jalal-Abad.

9/29/94. Thursday, our last full day in the mountains, we walked to orchards up the road from the Ak-Terek Station. These included one collection from the Ukraine with trees noted for resistance to anthracnose (K60) as well as a species/hybrid collection (K56-K59). We also visited the Ak-Terek weather station (altitude 1748 meters) which is noted on many maps. They take air and soil temperatures (at 5 depths) every 3 hours as well as record precipitation, humidity, wind speed and phenological data on trees in the area.. Last year the precipitation was 1369mm (average is 1100mm); the low temperature was -15C which is typical (+/- 3C) and the high was 34C. The last frost occurs in late April and the first frost in mid-October.

Near the guesthouse at Ak-Terek we collected roots and an herbarium sample of mint (*Mentha longifolia*) (MTT94013). A few scions (MTT94014) and seeds (MTT94015) from a small group of *Corylus avellana* trees introduced from the Moscow region were also collected.

In the evening, in a rather confusing episode, we were given "secret walnuts" (K64 - K72). These were clean-looking nuts from cultivars that we had been told had no nuts this year.

9/30/94. We returned to Jalal-Abad Friday and all our material was taken to be fumigated with methyl bromide. Victor Shevchenko gave us nuts of 'Ak-Terek' and 'Oct..' (K73 and K74) which he had drying in an office at the Biosphere Institute. We had dinner at the Regia Company headquarters with Tom Lea (Manager of Kyrgyz Operations), Victor Mirontschuk (Secretary/Treasurer), and William Keyes (President and CEO). There was much concern about our interfering with their harvesting operations which was not our intent. We did suggest that they take advantage of the local expertise in walnuts to be sure their repropagation efforts were not futile.

10/1/94. Saturday we flew directly back to Almaty and spent the rest of the day looking for hotel rooms. The American Embassy helped us locate rooms at the Hotel Shanyrak, about a half hour outside of town. One problem with finding rooms was that our visas for Kyrgyzstan which were supposed to be good for "in transit" in Kazakstan, were not accepted by the smaller hotels, and the big hotels were all full.

10/2/94 - 10/3/94. These were days of rest and sight seeing. We had hoped to visit the market again on Monday but it was closed for cleaning. On Monday night our "taxi" was involved in a minor accident on the way to the hotel. (A "taxi", even if it is hired in front of a hotel, is simply a private car and driver. There are some regulated taxis in Almaty, but they are available only to guests of the finest hotels.) After our taxi was pushed to get it started again, it ran out of fuel a few miles down the country road but we managed to catch a ride on a bus flagged by Chuck.

10/4/94. We left the hotel early, caught our plane to Frankfurt and had an uneventful trip back.

CONTACTS & ADDRESSES

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American Embassy, Kyrgyzstan
Erkinik Prospekt #66
720002, Bishkek
contact: Nicolai Savitisky

Interpreter
Ruslan Jarashev
Volgogradskaya 71/62
Bishkek, Kyrgyzstan

Institute of Forestry
Kyrgyzstan Academy of Sciences
720015 Bishkek, Kyrgyzstan
contacts: Dr. Bronislav Venglovsky, Director
Oleg Kolov, Vice Director
Igor Lukashevich, biochemist
Nina Gabrid, entomologist
Natalia Abdrashitova, entomologist
Ilya Kulyabin, driver

Biosphere Institute
130 Uzbekistanskaya
Jalal-Abad, Kyrgyzstan
contacts: Kamil Asimov, Director
Viktor Shevchenko, walnut specialist
Fat Ayupov, lab director

LITERATURE COLLECTED (all in Russian)

Walnut Germplasm Collection in Kyrgyzstan, 1994

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WALNUT GERMLASM COLLECTED

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COLL. NO.	SITE NO.	DATE	TYPE	SOURCE/ PARENT	QNT. NO.	GERM. NO.	UC ACC. NO.	NOTES.
K1	1	9/17/94	SEED					ALMATY MARKET, SELECTED FOR LIGHT SMOOTH SHELL & UNIFORMITY
K2	1	9/17/94	SEED					ALMATY MARKET, MIXED
K3	2	9/19/94	SEED					BISHKEK MARKET, FROM OSH
K4	2	9/19/94	SEED					BISHKEK MARKET, FROM OSH
K5	2	9/19/94	SEED					BISHKEK MARKET, FROM OSH, MIXED
K6	3	9/20/94	SEED		1			INSTITUTE, VERY PRECOCIOUS
K7	3	9/20/94	SEED		2			INSTITUTE, NOT PRECOCIOUS
K8	3	9/20/94	SEED					INSTITUTE, NO INFO.
K9	4	9/24/94	SEED	UIGHUR	6			YARADAR, LATE, COLD HARDY, FROM ONE TREE, LARGE NUTS
K10	4	9/24/94	SEED	UIGHUR	4			YARADAR, LATE, COLD HARDY, FROM SEV. TREES, LARGE NUTS
K11	4	9/24/94	SEED	IDEAL	3			YARADAR, PRECOCIOUS, ORIG FM. BOSTANDYK, SMALL NUTS
K12	4	9/24/94	SEED	HYBRID	2			FROM ? J REGIA X J. CINEREA
K13	4	9/24/94	SEED	MIXED	13			RANDOM NUTS
K14	4	9/24/94	SEED	UIGHUR	6			YARADAR, LATE, COLD HARDY, FROM ONE TREE, LARGE NUTS

K15	4	9/24/94	SEED	KYZYL-MEHNAT	13			YARADAR NURSERY, PRECOCIOUS
K16	4	9/24/94	WOOD	IDEAL	---	---		PRECOCIOUS
K17	4	9/24/94	WOOD	OSH	---	---		NOT PRECOCIOUS, HIGH% K,
K18	4	9/24/94	WOOD	UIGHUR	---	---		ONE OF FEW BEARING CVS
K19	4	9/24/94	WOOD	AKTEREK	---	---		
K20	4	9/24/94	WOOD	FORMA	---	---		ANTHRACNOSE RESISTANT
K21	4	9/24/94	WOOD	CLUSTER NUT	---	---		18 NUTS/CLUSTER
K22	4	9/24/94	WOOD	GAVA	---	---		LIGHT COLORED SHELL
K23	4	9/24/94	WOOD	DESERTNI	---	---		SWEET NUT, THIN SHELL, ORIG. YARADAR
K24	4	9/24/94	WOOD	KYRGYZ BOMB	---	---		20 G NUTS, 18% K
K25	4	9/24/94	WOOD	JUBILEE	---	---		11-12 G NUTS, BEAUTIFUL, LARGE, ORIG FROM UZBEC., EARLY LEAF, EARLY DROP
K26	4	9/24/94	WOOD	RODNI	---	---		NUTS LARGE AND BEAUTIFUL LIKE EGGS, EASY TO REMOVE, LATE LEAFING
K27	4	9/24/94	WOOD	BOSTANDYK	---	---		HIGH YIELDING
K28	4	9/24/94	WOOD	PANFILOV	---	---		SELECTED FOR HIGH YIELD
K29	4	9/24/94	WOOD	GUARDESKI	---	---		ORIG. BOSTANDYK, 5-6 DAYS LATER LEAFING
K30	4	9/26/94	SEED	HYBRID				FROM J REGIA X PECAN HYBRID, LOOKS LIKE J. REGIA
K31	4	9/26/94	WOOD	HYBRID	---	---		FROM J REGIA X PECAN HYBRID, LOOKS LIKE J. REGIA
K32	5	9/25/94	SEED	WILD BURLY	13			FROM ARSLAMBOB WILD TREES
K33	6	9/27/94	SEED	CLUSTER NUT	4			

K34	6	9/27/94	SEED	MIXED				FROM BEHIND AKTEREK STATION
K35	6	9/27/94	SEED	HYBRID	62			FROM SMALLER-LEAFED REGIA X PECAN HYBRID
K36	6	9/27/94	SEED	HYBRID	29			FROM LARGER-LEAFED REGIA X PECAN HYBRID
K37	7	9/28/94	SEED		2			FROM PRECOCIOUS TREE REPLANT, KURMAIDAN
K38	7	9/28/94	SEED		18			FROM PRECOCIOUS TREE REPLANT, KURMAIDAN
K39	7	9/28/94	SEED		2			FROM PRECOCIOUS TREE REPLANT, KURMAIDAN, PROB. IDEAL SDLNG
K40	7	9/28/94	SEED		9			FROM PRECOCIOUS TREE REPLANT, KURMAIDAN
K41	7	9/28/94	SEED		9			FROM PRECOCIOUS TREE REPLANT, LOWER KURMAIDAN
K42	7	9/28/94	SEED		16			FROM PRECOCIOUS TREE REPLANT, LOWER KURMAIDAN, LARGE NUTS
K43	7	9/28/94	SEED		21			FROM PRECOCIOUS TREE REPLANT, LOWER KURMAIDAN, VERY SMALL TREE
K44	7	9/28/94	SEED		17			FROM PRECOCIOUS TREE REPLANT, LOWER KURMAIDAN
K45	7	9/28/94	SEED	MIXED	8			FROM PRECOCIOUS TREE REPLANTS, LOWER KURMAIDAN
K46	7	9/28/94	SEED	MIXED	15			LOWER KURMAIDAN
K47	8	9/28/94	SEED	SELECTION	10			LOWER KURMAIDAN SELECTION BLOCK
K48	8	9/28/94	SEED		2			PRECOCIOUS TREE, LOWER KURMAIDAN SELECTION BLOCK
K49	8	9/28/94	SEED		4			PRECOCIOUS TREE, LOWER KURMAIDAN SELECTION BLOCK
K50	8	9/28/94	SEED		4			PRECOCIOUS TREE, LOWER KURMAIDAN SELECTION BLOCK

K51	8	9/28/94	SEED		10			VERY LATE, PRECOCIOUS TREE, LOWER KURMAIDAN SELECTION BLOCK
K52	8	9/28/94	SEED		11			LARGE POINTED NUTS, ROUGH SHELLS, PRECOCIOUS TREE, LOWER KURMAIDAN SELECTION BLOCK
K53	8	9/28/94	SEED	AKTEREK	2			LOWER KURMAIDAN SELECTION BLOCK
K54	8	9/28/94	SEED	SHARP-TOP	2			LOWER KURMAIDAN SELECTION BLOCK
K55	9	9/28/94	SEED	MIXED	2			FROM OLD (1936) EXP. BLOCK
K56	10	9/29/94	SEED	HYBRID	17			J REGIA X J. HINDSII HYBRID
K57	10	9/29/94	SEED	HYBRID?	1			J. CINEREA?
K58	10	9/29/94	SEED	HYBRID?	3			J AILANTIFOLIA?
K59	10	9/29/94	SEED	HYBRID?	3			J. REGIA X J. CALIFORNICA
K60	10	9/29/94	SEED		6			TREES FROM UKRAINE, SELECTED FOR ANTHRACNOSE RESISTANCE
K61	10	9/29/94	SEED		8			PRECOCIOUS SEEDLING TREE
K62	10	9/29/94	SEED		5			RANDOM NUTS FROM TERRACES
K63	6	9/29/94	SEED	HYBRID	17			SUPPOSED TO BE J HINDSII FROM TASHKENT, HULLS DEHISCENT
K64	11	(9/29/94)	SEED	SHARHRNSKY				
K65	11	(9/29/94)	SEED	KAZAKSTAN				
K66	11	(9/29/94)	SEED	AKTEREKSKI				
K67	11	(9/29/94)	SEED	RODUNA				
K68	11	(9/29/94)	SEED	UIGHUR				
K69	11	(9/29/94)	SEED	BOMBA				

K70	11	(9/29/94)	SEED	UIGHURSKI				
K71	11	(9/29/94)	SEED	SLATKAYA				
K72	10	9/29/94	SEED	HYBRID				
K73	12	(9/30/94)	SEED	AKTEREK				
K74	12	(9/30/94)	SEED	OCT....				
K75	13		SEED	MIXED				

Sites

1. Market, Almaty, Kazakstan
2. Market, Bishkek, Kyrgyzstan
3. Institute of Forestry, Bishkek, Kyrgyzstan
4. Yaradar Research station, South Kyrgyzstan
5. Arslanbob Village, South Kyrgyzstan
6. Ak-Terek Research Station, South Kyrgyzstan
7. Khurmaidan Terraces, Ak-Terek Research Station, South Kyrgyzstan
8. Khurmaidan Orchard below terraces, Ak-Terek Research Station, South Kyrgyzstan
9. Ak-Terek Research Station, 1936 orchard, South Kyrgyzstan
10. Hybrid orchard between weather station and Ak-Terek Research Station, South Kyrgyzstan
11. Laboratory, Ak-Terek Research Station, South Kyrgyzstan
12. Biosphere Institute, Jalal-Abad
13. Random nufs, South Kyrgyzstan

OTHER GEMPLASU COLLECTED

MTT 94001	<i>Corylus avellana</i> L. cv. Cherkeski	scions
MTT 94002	<i>Corylus avellana</i> L. cv. Cherkeski	seeds
MTT 94003	<i>Corylus avellana</i> L. cv. Adygei	scions
MTT 94004	<i>Corylus avellana</i> L. cv. Adygei	seeds
MTT 94005	<i>Corylus avellana</i> L. cv. Panahei	scions
MTT 94006	<i>Corylus avellana</i> L. cv. Panahei	seeds
MTT 94007	<i>Crataegus</i> sp. 'Kroviano Krahni'	scions
MTT 94008	<i>Crataegus</i> sp. 'Kroviano Krahni'	seeds
MTT 94009	<i>Pyrus korshinskyi</i> Litw.	seeds
MTT 94010	<i>Pyrus korshinskyi</i> Litw.	seeds
MTT 99011	<i>Pyrus korshinskyi</i> Litw.	seeds
MTT 94012	<i>Crataegus pontica</i> C. Koch	seeds
MTT 94013	<i>Menta longifolia</i> (L.) Huds.	root cuttings
MTT 94014	<i>Corylus avellana</i> L.	scions
MTT 94015	<i>Corylus avellan</i> L.	seeds