

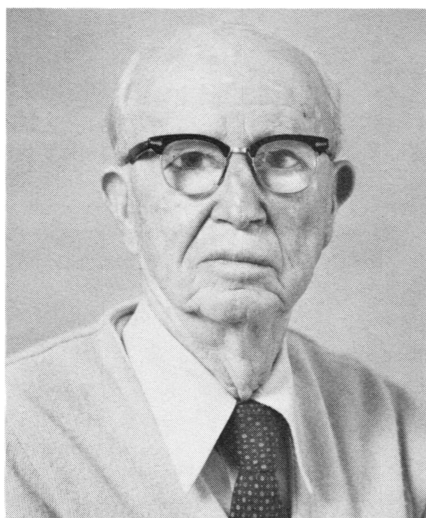
Collecting Lettuce Germplasm in Turkey and Greece

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Production of commercial lettuce *Lactuca sativa* L. is plagued by a wide range of diseases and insects not yet controlled or only imperfectly controlled. These include the viral, virus-like, and mycoplasma diseases such as lettuce mosaic, cucumber mosaic, broad bean wilt, western yellows, big vein, and aster yellows; the fungal diseases—downy mildew and sclerotinia drop; and such insect pests as cabbage looper, beet army worm, white flies, and several species of aphids.

Lettuce is an important crop in the following states (listed alphabetically): Arizona, California, Colorado, Florida, Michigan, New Jersey, New Mexico, New York, Texas, Washington, and Wisconsin. Losses to each one of the diseases and pests mentioned have been serious and sometimes even disastrous.

Plant breeders in the United States have had access to only a limited spectrum of germplasm of *Lactuca sativa* and those related species which gave rise to cultivars of

modern lettuce. These species, such as *L. serriola* L., *L. saligna* L., and *L. virosa* L., are not well represented in the arsenal of lettuce plant breeders. Actually, several cultivars from which modern head lettuce descended are not available to plant breeders at present because they are not listed in seed catalogues or have disappeared from seed bank collections.

As a contribution towards remedial action, the Agricultural Research Service, Plant Germplasm Committee, funded a team of plant collectors to search the Mediterranean area, where these species are indigenous and where lettuce was domesticated originally. Turkey and Greece were chosen as the most likely target areas. Both authors have had previous experience as plant collectors on foreign assignments. We were given much assistance in the field by Mrs. Tulin Bas, Regional Agricultural Institute, Turkey, and G. Apostolados and A. Zamanis, in Greece. Kasif Temiz, Director, Regional Agricultural Institute, Menemen, Izmir, Turkey, placed the facilities of the Institute at our disposal and helped with the planning. Mr. Angelides, Director, Agricultural Research, Ministry of Agriculture, Athens, Greece, kindly provided for our transportation needs while we were collecting in Greece. We are grateful for the unselfish cooperation of these individuals. Our efforts would have been much less rewarding without their enthusiastic support.

Turkey

Our collection of *L. sativa* and the related species were not nearly as numerous as we anticipated. We hope, however, the materials we did collect, and those for which we made arrangements to be collected later in the season, will be of significance for future lettuce breeding, as plant breeders strive to develop disease- and insect-resistant cultivars. We offer this account in the hope that future expeditions may profit from our experiences.

We arrived in Ankara, Turkey, on June 7, 1982. After making the necessary political and scientific contacts in this attractive capital city, we travelled to Izmir (Smyrna) to commence the active collecting portion of the trip. Our host in Izmir was Kasif Temiz, Director, Aegean Regional Agricultural Institute, at Menemen (13 miles from Izmir). The Institute is the site of a Regional Seed Bank, and Temiz is much interested in increasing the inventory of this facility with significant native material.

Nature has been kind to Turkey. It is one of the most important countries in the world as a center for plant genetic resources. With its varied environmental features such as topography, climate, and soils and its long cultural history, there is an abundance of the progenitors of several crop species within the boundaries of the country. Native materials of cereal, forage, drug, narcotic, and vegetable crops in Turkey need to be intensively collected and catalogued before their habitats

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Fig. 1. Map of Turkey; the dotted line indicates the route followed during collecting expedition.

are swamped in housing developments and roadways.

We commenced our collecting endeavors by making 2 reconnaissance trips into the countryside in the vicinity of Izmir. It soon became apparent that we had arrived in Turkey 2–4 weeks before the best collecting period for wild lettuce species. The Eastern Mediterranean in 1982 experienced a late, cold spring and late, unseasonal spring rains. The wild species of *Lactuca* in the neighborhood of Izmir had mostly produced flower stalks, but the flowers of the inflorescence were in the bud stage and few if any were open. In the face of this dilemma, we decided to travel southward along the Turkish Aegean-Mediterranean Coast, with the hope that higher temperatures and longer photoperiod in this region had induced earlier flowering. Accordingly, we travelled south, parallel to the Aegean Coast to the city of Antakya (Antioch), a few miles from the Turkish-Syrian border (Fig. 1). We returned to Izmir via the

inland route, crossing the Anatolian Plateau through the cities of Nigde, Nevsehir, Konya, Afyon, Usak, and others. Thus, we covered about 3000 miles within the boundaries of Turkey in our search for *Lactuca* germplasm.

The Aegean Coast of Turkey in many places is a scenic gem, where the high, snow-covered Taurus Mountains plunge almost directly into the sea. In areas where the mountains recede from the coast, a narrow belt is formed, allowing a lush agriculture to develop. The main crops are citrus, banana, tobacco, and such vegetable crops as tomato, eggplant, bean, cucumber, watermelon, and muskmelon. In the more arid areas, olive orchards are common. Near the Syrian border, around the cities of Adana and Antakya, large areas are devoted to cotton. There is a thriving greenhouse industry (mostly under plastic) in the area, where winter tomato, pepper, cucumber, eggplant, and bean are grown. Some small towns, as viewed from the hills above, appear to be drowning in a sea of greenhouses.

By necessity, Turkey has an incredibly large fleet of trucks that move produce to markets. In keeping with the importance of motor transport, most of the main roads in Turkey are black-topped and in reasonably good repair. In mountainous areas, roads are likely to be narrow, winding, and dangerous if the speed limit is exceeded. Side roads are mostly gravel and are rutted and dusty.

After the 2 short exploratory trips in the vicinity of Izmir, it became clear that the *Lactuca* species of interest to us were universally associated with the activities of man, probably because they are well-adapted to weedy habitats. Additionally, *Lactuca* species flower, and produce mature achenes rapidly. Also, the mature achene is equipped with an efficient dispersal mechanism, the pappus. Thus, the most favorable collecting locations were: roadsides, particularly where large areas were cleared for construction (Fig. 2); the banks of drainage and irrigation canals; in fields of wheat and other cereals (as a weed); along the fence rows of backyard vegetable gardens; in city parks and vacant lots; and, most spectacular of all, growing in



Fig. 2. A pure stand of *Lactuca serriola* growing along roadside cleared for construction.

the crevices of stone walls that lined the roads (Fig. 3).

During the 3000-mile journey in Turkey, we collected 71 samples of *L. sativa* and 48 of prickly lettuce (*L. serriola*), 4 of *L. virosa*, 2 of *L. saligna*, 2 of *L. tenerrima* and 18 unidentified species of *Lactuca* (see Table 1).

Most of the lettuce cultivated in Turkey and other areas of the Middle East is of the Romaine type. An important part of the collection is seed of the so-called "land races" (Fig. 4). Farmers and mini-farmers with small vegetable plots around villages and cities tend to produce their own seed. This is done by allowing a dozen or more plants to produce seed after market harvest. This procedure is followed year after year. It is not inconceivable that such procedures would allow individual differences to develop that might provide highly useful genes.

Among the wild species the following were located, identified, and collected: *L. aculeata* Boiss. & Kotachy ex Boiss. (Fig. 5), *L. scarioloides* Boiss. (Fig. 6), and *L. serriola* L., *L. saligna* L., and *L. viminea* F. W. Schmidt (Fig. 7). *L. serriola* and *L. scarioloides* were the most common and abundant. Each displayed a great range of diversity and a number of variants could be identified. *L. saligna* was less frequently encountered and generally prospered only where competition for survival was in its favor. This species is slow-growing, hence it does well in isolated locations or with other species which are less competitive. *L. aculeata* was found in a few locations, whereas *L. viminea* was detected only in Cappadocia, a region of Central Anatolia.

Greece

After 20 days in Turkey, we arrived in Athens, Greece on June 27. The next day, under the guidance of officials in the American Agricultural Attache's Office, U.S. Embassy, we met with the Administrative Officers of the Greek Ministry of Agriculture. They designed a collecting program satisfactory for our purposes. The Director of Research,



Fig. 3. *Lactuca saligna* growing in crevice between stone wall and asphalt pavement, near Olympic Village, Greece.

Table 1. Inventory of species collections in Turkey and Greece.

Species	Common name	Number collected		
		Turkey	Greece	Total
<i>Lactuca</i> sp.		18	---	18
<i>L. sativa</i> L. (land races)	Maurel, lettuce	71	14	85
<i>L. serriola</i> L.		48	22	70
<i>L. virosa</i> L.		4	---	4
<i>L. saligna</i> L.		2	4	6
<i>L. tenerrima</i> Pourret		7	---	7
<i>Other Species</i>				
<i>Allium ampeloprasum</i> L.	Leek	1	---	1
<i>Apium graveolens</i> L.	Celery	---	1	1
<i>Beta vulgaris</i> L.	Table beet	---	1	1
<i>Capsicum annum</i> L.	Pepper	1	---	1
<i>Cichorium endiva</i> L.	Endive	---	1	1
<i>Cucumis melo</i> L.	Muskmelon	---	1	1
<i>Cucumis sativa</i> L.	Cucumber	1	---	1
<i>Cucurbita pepo</i> L.	Squash	---	1	1
<i>Ecballium elaterium</i> (L.) A. Rich.	Squirting cucumber	---	1	1
<i>Gerbera</i> sp.	Gerbera	1	---	1
<i>Lupinus</i> sp.	Lupine	2	---	2
<i>Lagenaria siceraria</i> (Mol.) Standl.	Gourd	---	1	1
<i>Phaseolus vulgaris</i> L.	Common bean	---	5	5
<i>Raphanus sativa</i> L.	Radish	---	2	2
<i>Solanum melongena</i> L.	Eggplant	---	1	1
<i>Spinacia oleracea</i> L.	Spinach	---	1	1
<i>Vicia faba</i> L.	Horse bean, broad bean	---	1	1
<i>Vigna unguiculata</i> (L.) Walp.	Cowpea	1	---	1

Ministry of Agriculture, kindly offered to furnish transportation for the field work and a scientist who would act as guide and interpreter—an offer we hastily and gratefully accepted.

The following day we visited several scientific institutions in Athens, among them the Benachi Phytopathological Institute. This Institute trains many of the scientific personnel engaged in plant protection in Greece. There is much research in progress in entomology, bacteriology, virology, weed control, and others. We also visited the Goulandris

Natural History Museum. The most extensive herbarium in Greece is housed at the Museum. We were able to determine the species of *Lactuca* likely to be found in Greece by examining the herbarium specimens on deposit in the Museum.

We left Athens on June 30 for a 5-hr bus ride to Pirgos on the west coast of the Peloponnese. En route we passed through the cities of Corinth and Patras. This is a thriving agricultural area of well-kept orchards of citrus, olives, apricots, peaches, and vineyards. As we travelled south, watermelons appeared

to be the main crop. Surprisingly, 'Crimson Sweet' was the main cultivar grown.

Our headquarters while collecting in the Peloponnese was the city of Pirgos and our hosts were G. Apostolatos and his wife Marietta. Apostolatos, trained as a biochemist at Purdue University, is assigned to the Vegetable Research Institute, located near the small town of Gastouni.

The following day we visited the Institute and toured the area in the immediate vicinity in search of *Lactuca*. We found several 'land races'. There were many locations with young



Fig. 4. T.W. Whitaker standing among a group of 15 plants of *Lactuca sativa* with mature seed. This is a good example of a so-called 'land race' of this species. A banana plantation in the background; Mediterranean Coast of Turkey.



Fig. 5. *Lactuca aculeata* Boiss. & Kotschy ex. Boiss. (left) and *L. saligna* L. (right). These species are usually found growing on rocky infertile soil.

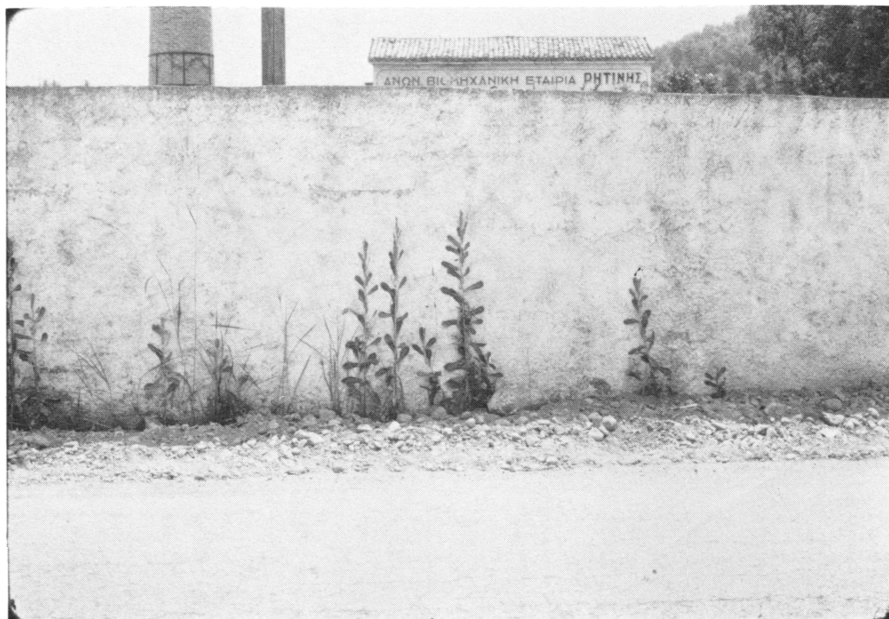


Fig. 6. *Lactuca scarioloides* Boiss. growing in crevice between wall and highway shoulder.

plants of *L. serriola* and *L. saligna*, none with mature seed. The next day we followed the coast southward through Pilos as far southward as Methoni (Fig. 8). Our collections are recorded in Table 1. As in Turkey, we were too early for best collecting. We concluded our visit to Southern Greece by turning inland to Olympia, site of the Olympic Village. The next day we returned to Athens. Before leaving Pirgos we made arrangements with our collaborators to collect seed of *Lactuca* species not in flower at the time of our visit.

We stayed overnight in Athens and the



Fig. 7. *Lactuca viminea* F.W. Schmidt in Turkey.

next day travelled by air to Thessaloniki in Northern Greece. There we were met by our host, A. Zamanis, of the Cereal Breeding Institute, Thessaloniki. Zamanis directs the seed bank effort in Northern Greece. They are mainly interested in cereals, but Zamanis agreed to take us on 2 short survey trips to the north and south of Thessaloniki in search of *Lactuca*. In this area we made about 15 collections of lettuce seed, mostly "land races" (Table 1). *L. serriola* and *L. scarioloides* were the only wild species we found in northern Greece. Plants of *L. serriola* were extremely variable with respect to leaf shape and lobing, location and number of spines, and perhaps other characters. After 3 days of collecting in northern Greece, we returned to Washington, D.C., via Athens and New York City.

Follow-up

In both Turkey and Greece, we made arrangements to have seed collected from those species that we were able to locate and identify. We have learned recently that Mrs. Tulin Bas, our colleague at the Regional Agricultural Research Institute, Menemen, Turkey, made 2 collecting trips which yielded 71 samples of wild *Lactuca* species. The first trip, from July 10 to 14, covered the Antalya-Kumluca-Finike areas. The second trip, from July 29 to August 1, included the territory around Milas, Bodrum, Fethiye, Golhisar, Demizli, and Aydin. One-half of the seeds of each collection made by collaborators has been forwarded to the U.S. Department of Agriculture.

In Greece, the Peloponnese offered a great range of material of *L. aculeata*, *L. scarioloides*, *L. serriola*, and *L. saligna*. In Macedonia, *L. serriola* and *L. scarioloides*

appeared to be most prevalent. Plants of these species also displayed a wide range of variability. Consulting the herbarium of the Goulandris Museum of Natural History of Athens convinced us that further explorations are justified in order to collect seeds of those species not located during our brief exploration trip.

In summary, based upon our experience in Greece and Turkey, the ingredients of a successful plant exploration expedition are the following:

1) It is essential to have reliable local contacts with some familiarity and interest in the crop species to be collected. Normally, a professional person trained in plant science, with a knowledge of the customs and dialects of rural people can make the most effective contribution.

2) Adequate transportation is a necessity. Vehicles adapted to poor roads and with adequate space for personal needs and collecting gear are the best.

3) Before actual field work commences, collectors should refurbish their knowledge of the species of interest to the expedition by a study of the flora of the host country in herbaria where such specimens are deposited.

4) Spade work for the expedition should be planned and executed before departure for the host countries. This means that contacts should be made with diplomatic, political, and scientific personnel in the host countries. These people establish the ground rules for the expedition by issuing visas, collecting permits, and other necessary documents.

Inquiries concerning our collections should be directed to George A. White, Plant Introduction Officer, Bldg. 001, Rm. 322, BARC-West, Beltsville, MD 20705, USA.



Fig. 8. Map of Greece; note the 2 independent dotted lines. One shows the route followed in the Peloponnese; the second indicates the 2 short trips centered around the city of Thessaloniki in Northern Greece.