

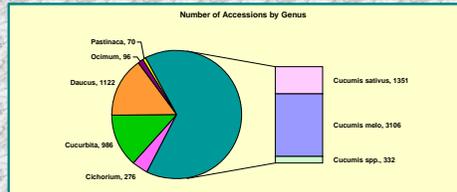
NCRPIS Vegetable Curation Project

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Program Objectives.

The NCRPIS Vegetable Project is focusing on the following objectives:

- Regeneration and maintenance of germplasm to preserve genetic diversity and increase accession availability.
- Collect and disseminate morphological, molecular, and evaluation data characterizing the germplasm collections.
- Develop improved methods of regenerating and processing germplasm to increase efficiency and efficacy.
- Acquire additional germplasm, especially wild species, to broaden the genetic diversity within the collections.



Cucurbita pepo

Crop History. There are five domesticated species of *Cucurbita*. The NCRPIS has maintenance priority for only *C. pepo* which originated in Mexico and eastern USA. Collectively known as squashes, pumpkins, and gourds, the *C. pepo* collection includes acorn, crookneck, zucchini, patty-pan, pie and jack-o-lantern types as well as ornamental gourds. [1]

Collection Description. The collection has 986 accessions from 51 countries. Plants are monoecious (having separate male and female flowers on the same plant) and require cross pollination for fruit and seed production.

Impact and Uses of Germplasm. Fruits of squashes are consumed raw when immature or cooked when mature. *Cucurbita* fruit are a natural source of magnesium, phosphorus, selenium, zinc, Vitamin A and C. Seeds can be consumed raw, roasted, or ground into a butter and contain iron, B vitamins, and trace minerals. Oil can be extracted from the seeds for use in cooking. Fruits are also consumed by livestock.

Maintenance and Regeneration. *Cucurbita* accessions are direct seeded into peat pots in the greenhouse in May. Seedlings are tested for the presence of virus upon emergence and positive seedlings are destroyed. Healthy plants are transplanted into field cages in June, and immediately screened to prevent feeding by cucumber beetles which are the primary vectors of virus transmission. Honey bees are used for pollination.



Pastinaca

Crop History. *Pastinaca sativa* is native to the region between the western Mediterranean and Caucasus Mountains. [3]

Collection Description. The collection is small with only 70 accessions, many of which are cultivated varieties.

Impact and Uses of Germplasm. Parsnips are grown for their edible carrot-like roots which are prepared by steaming or roasting, and are most often used in stews or casseroles.

Maintenance and Regeneration. *Pastinaca* is a biennial crop which we direct seed into flats in the greenhouse in October, allow the plants to grow and develop a tap root until early February, vernalize, then transplant into field cages for pollination by honey bees. A challenge with this collection is that seed viability is short-lived.



Cucumis

Crop History. *Cucumis* is a diverse genus with two major crop groups: *Cucumis sativus* (cucumber) which originated in India with China as the secondary center of genetic diversity, and *Cucumis melo* (melon) which is believed to have originated in Africa, though some suggest India as the center of domestication because melon has been cultivated there for centuries and inedible forms grow wild in the region. The wild species of *Cucumis* are more closely related genetically to *C. melo* and originated in Africa with *C. anguria* var. *anguria* and *C. metuliferus* considered minor crops. [1]

Collection Description. The collection has almost 4800 accessions from 98 countries. Plants are monoecious (each plant has separate male and female flowers), dioecious (male and female flowers on separate plants), or andromonoecious (perfect and male flowers on the same plant). Cross pollination is required for seed production. *C. sativus* has always been maintained at the NCRPIS.



C. melo and the wild species were transferred to Ames in 1987 because this station had an established controlled pollination program using isolation cages and honey bees as insect pollinators.

Impact and Uses of Germplasm. Cucumbers are usually eaten fresh in salads or pickled, but in some countries they are cooked before eaten. Cucumbers are used in the production of cosmetics such as lotions, soaps, and shampoos. Melons are typically thought of as dessert-like fruits such as honey dew, cantaloupe, and muskmelon but there are vegetable types consumed fresh like cucumbers or cooked. Two species associated with the wild *Cucumis* group are considered minor crops.

Fruits of *C. anguria* var. *anguria* (bur gherkin, West Indian gherkin) are pickled. Fruits of *C. metuliferus* (African horned melon, kiwano) fruits are eaten raw, and its roots are used to impart nematode resistance in other cucurbits. Other wild species are collected and used for food or medicine.



Maintenance and Regeneration. Seeds of cucumber and melon are direct seeded into peat pots in the greenhouse in May. Seedlings are transplanted into field cages in June and immediately screened to prevent feeding by cucumber beetles the primary vectors of virus transmission. The *C. sativus* collection is generally easy to regenerate with only a small percentage of accessions needing application of growth regulators to promote male or female flower development, or manipulation of day-length to induce flowering. Regenerating *C. melo* has proven more challenging. A high percentage of the accessions with open pollination histories develop few or no fruit even though male and female flowers are present; they often produce fruits not only diverse in appearance, but also in maturity with resulting seed increases providing a poor representation of the diversity; accessions may require a longer growing season; and some accessions no longer resemble the descriptions provided by donors. The wild *Cucumis* species are primarily regenerated in greenhouse isolation cages because they often require a longer growing season to mature and can pose a potential weed problem. Insect pollinators such as honey bees, bumblebees, and alfalfa leaf cutter bees are used to effect pollination.



Ocimum

Crop History. *Ocimum* (basil), one of the most popular herbs grown in the world, is a member of the mint family and originated in the tropical regions of Asia, Africa, and Central and South America. [2]

Collection Description. The collection has 96 accessions from 24 countries representing 7 species.

Impact and Uses of Germplasm. Sweet basil is used as a fresh and dried herb in cooking. *Ocimum* leaves are also a source of essential oils which are extracted for use in flavoring foods, in fragrances, and in traditional rituals and medicines. Its attractive foliage and flowers can also be used as an ornamental in the flower garden. One *Ocimum basilicum* L. from Yugoslavia, PI 358465, was used to develop 'Sweet Dani', an ornamental lemon basil.



Maintenance and Regeneration. *Ocimum* seeds are direct seeded in the greenhouse in April or May. Seedlings are transplanted to field cages in June for pollination by honey bees. Partial harvests are made as seeds mature.



Daucus

Crop History. *Daucus* is one of the largest of the *Umbelliferae* genera with the majority of the species originating from the Mediterranean, North Africa, or Europe. [3]

Collection Description. The *Daucus* collection has 1122 accessions from 63 countries with 964 accessions of *Daucus carota* (carrot) and 158 accessions representing 12 other *Daucus* species.

Impact and Uses of Germplasm. *D. carota*, carrot, is a root vegetable eaten raw or cooked. The roots are high in beta carotene which is important source of Vitamin A. Carrots are rich in dietary fiber, antioxidants, and minerals.

Collection Description. The *Daucus* collection has 1122 accessions from 63 countries with 964 accessions of *Daucus carota* (carrot) and 158 accessions representing 12 other *Daucus* species.

Maintenance and Regeneration. *Daucus* can be annual, biennial, perennial or of mixed life cycles. Accessions with mixed life cycles provides a regeneration challenge. In general, *Daucus* accessions are direct seeded into greenhouse pots in October. Plants are allowed to grow until late January. By mid February, annual plants generally start to bolt and are maintained in the greenhouse for pollination by flies in isolation cages. Biennial plants are vernalized and transplanted to field cages for pollination by flies and honeybees. Partial harvests are made as seeds mature. The annual greenhouse portion is bulked with the biennial field cage increases prior to inventory and storage.



Cichorium

Crop History. *Cichorium* is widely distributed around the world with *C. endivia* (endive) reported to have first appeared in India, though some authors say Sicily is the origin. *Cichorium intybus* (chicory) probably originated in the Mediterranean. [4]

Collection Description. The collection is comprised of 111 accessions of *C. endivia* and 165 *C. intybus* from 23 countries. About 80% of the accessions are cultivated varieties primarily from Europe.

Impact and Uses of Germplasm. Endive and chicory leaves are high in iron, calcium, and copper and used in salads. Chicory roots are dried and ground for use as a coffee additive or substitute. The roots contain inulin, a prebiotic, which can be extracted for use as a dietary fiber in human and pet foods, and nourishes beneficial bacteria to promote a healthy digestive system. Inulin can also be converted to fructose for use as a sweetener. Chicory is also used as a forage crop for sheep and cattle.

Maintenance and Regeneration. *Cichorium* can be annual to perennial. Seeds are direct seeded into flats in the greenhouse in January, seedlings are allowed to develop until late February or early April, plants are then vernalized, and then transplanted to field cages for pollination by honey bees.



References.

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- [2] Simon, J.E., et al. (1999). Perspectives on new crops and new uses. J. Janick (ed.), ASHS Press, Alexandria, VA
- [3] Rubatzky, E.V., C. F. Quiros, and P.W. Simon (1999) Carrots and Related Vegetable Umbelliferae, CAB International, Wallingford, Oxon OX10 8DE, UK.
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