

Peony—A Future Crop for Alaska?

4 Doreen Fitzgerald

Whether commercial growers in Alaska might someday export peonies for the cut flower market is the subject of a ten-year research project at the Agricultural and Forestry and Experiment Station (AFES). The peony is a long-lived, low-maintenance, and cold-tolerant plant that produces a high-value crop. Exporting flowers from as far north as Fairbanks may seem unlikely, but the late bloom period of high-latitude peonies actually provides a commercial advantage: they would be marketed when they're unavailable from other North American producers. A commercial crop from Alaska could extend the peony season for national cut flower markets.

The peony plant produces a succession of blooms over about eight weeks. At lower latitudes, they bloom mostly in May and June. At Dutch flower auctions, according to the *International Cut Flower Manual*, 52 percent of all peony cut flower stem sales occur in May, 44 percent in June. Peonies are also grown commercially in Chile, where they are ready for market in January and February. In Alaska, due to the late spring, peonies bloom from mid to late summer (July and August).

"For someone motivated to develop and commercially produce them, peonies are an interesting alternative crop," said economist Hans Geier, research associate at the School of Natural Resources and Agricultural Sciences and AFES. "Along with the seasonal advantage, we have adequate air freight service to both Europe and the Orient, as well as the contiguous United States." Because peonies are a perishable, high-value crop, they are usually shipped air freight to the wholesale buyer, who pays the freight charges.



Above: *Paeonia lactiflora*, Chinese Peony.
—PHOTOGRAPH © 1999 DR. NICK V. KURZENKO

Below: pink single blossoms of the domestic peony, a variety called *Sea Shell*.
—2001, GEORGESON BOTANICAL GARDEN COLLECTION



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letter from the dean:

The mission of the School of Natural Resources and Agricultural Sciences and the Agricultural and Forestry Experiment Station is to generate and provide knowledge that is important for the successful long-term management of natural resources in Alaska and the circumpolar world, and to discover, describe, and interpret the spatial characteristics of the northern regions of the Earth. This issue of *Agroborealis* highlights the diversity of the school and the experiment station and directs your attention to what we do.

We provide information that will help all of us ensure that management of the state's natural resources leads to sustainable development of these resources. New floral crops, alternative livestock appropriate to the circumpolar north, use of electronic tools to monitor the circumpolar ecosystem, and public forums concerning wildlife interaction with the human population are but a few of our areas of interest. We look to the past to bring you information relevant to the future. Aldo Leopold embarked on a career that led him to establish the field of wildlife management nearly a century ago. Our students found that his information is relevant today. We also look to the future in the partnerships we are creating. The USDA Agricultural Research Service and the Forest Service are working with us to provide cutting edge information to not only food and fiber producers, but also to managers of public and private lands. The North and West Alaska Cooperative Studies Unit and interdisciplinary graduate studies in regional resilience and adaptation will provide research and instruction opportunities for the natural resource managers of tomorrow.

I think this is one of our more exciting issues of *Agroborealis*. We are shaping new and diverse directions for the School of Natural Resources and Agricultural Sciences and the Agricultural and Forestry Experiment Station. At the same time, we are maintaining our traditional emphasis in agriculture and forestry, but with a new look at new crops and livestock. I hope you share my enthusiasm for our work. I also welcome you to share your ideas with us about natural resource management and sustainable development.

Sincerely,
Carol E. Lewis



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letter from the associate director:

As this issue of *Agroborealis* goes to press, the governor is reviewing the budget passed by the Twenty-third Alaska Legislature and has promised the largest gubernatorial veto package in the state's history. Most state agencies and the University of Alaska will undoubtedly feel the pinch in their FY04 general fund budget. The Agricultural and Forestry Experiment Station continues to address potential shortfalls and resulting program reductions with assistance from our federal legislative delegation. Selected early results of federal partnerships being pursued are outlined in this issue. These include USDA Special Grants for new crops such as peonies ("Peony—A Future Crop for Alaska?"), USDA Hatch and Special Grants for research with alternative animal species ("Alternative Livestock in Alaska: Bison to Yaks"), and new cooperative research programs with the newly established Subarctic Agricultural Research Unit in Fairbanks and Palmer. The latter marks the long-awaited reestablishment of the USDA Agricultural Research Service in Alaska. We will continue to report to our stakeholders on many more new programs and projects resulting from these and other university, state, and federal cooperative ventures in natural resources and agricultural sciences.

G. Allen Mitchell

Peonies belong to the family *Paeoniaceae* and the genus *Paeonia*, within which there are a number of species and many cultivars. Both herbaceous and tree peonies are perennials, but tree peonies, which grow to eye level on woody stems with few branches, are not used for cut flowers. The more commonly grown herbaceous peony is a bushy plant, with green, pink, or red stems that grow two to four feet tall and turn green by the time they are cut down in the fall. Each cultivar has leaves a particular shade of green, with shapes ranging from broad to grass-like. Flower colors are white, yellow, cream, pink, rose, and deep red. Peonies are grouped into types according to the petal shape: single, Japanese, anemone, semidouble, bomb, and double. After winter, the plant emerges as dark red shoot that in just a few weeks will become a lush, two- to four-foot bush. The large blooms last only a week or so, but in the home garden, selecting early, mid-season, and late cultivars can provide up to eight weeks of bloom.

“Our AFES research project aims to identify which peony cultivars are suitable for commercial cut flower production in Alaska and what potential pest and disease problems exist that might influence management of commercial fields,” said Pat Holloway, associate professor and director of the Georgeson Botanical Garden. Conducting the study with her are horticultural assistant Janice Hanscom, and Grant Matheke, superintendent of the botanical garden. “Because no large-scale commercial production exists here, little is known about peony cultivation as a field-grown cut flower in Alaska,” Holloway said. “In home gardens, given ample snow cover and a warm, sunny location, they are known to bloom reliably for many years.”

The report of the first year’s research will be published this year by AFES as a research progress report. Because peonies are not commercially harvested until at least the fourth year after planting, the AFES research data for the first year is preliminary. The research is funded by a special grant sponsored by U.S. Senator Ted Stevens through the U.S. Department of Agriculture (USDA) Cooperative States Research, Education, and Extension Service.

The Peony Market

According to the Kansas Cooperative Extension Service, there is a revived market for peonies, which in the United States traditionally were sold for Memorial Day grave decoration. Today they’re used in flower arrangements, wedding bouquets, and special large arrangements for such clients as hotels. Most wholesalers want large quantities, and have an apparent preference for white peonies over red or pink. Whatever market is chosen, peonies are sold in the bud stage with instructions to the buyer on how to open the flowers for the longest vase life. The USDA has established standards for grading commercial peonies.

Before investing in roots, plants, or equipment, a potential grower should understand the cut flower market and identify market strategies. A profitable and sustainable business

requires the producer to be flexible, identify more than one outlet. Outlets for commercially grown flowers are:

- Direct retail markets: farmers markets, roadside markets, restaurants, caterers;
- Local wholesale markets: florists, grocery stores, flower brokers, freeze-drying operations;
- Regional, national, and international wholesale markets: cooperatives, flower brokers, craft supply markets.

For the peony grower, there are several important concerns:

- suitability of varieties for commercial cutting and handling;
- recognition of the proper stage of maturity for cutting (varies widely among varieties);
- the speed with which flowers can be cut, graded, and stored;
- proper storage conditions before shipping;
- proper crating, packing, and identification of grade.

The best plants for commercial production bloom freely and reliably from year to year and produce a single bud or a stem with few laterals, because this requires less labor for disbudding. The qualities of a highly marketable peony include: good color and attractive form through all stages of development, preferably with a double flower; desirable fragrance; stiff, wiry, straight stems of uniform length (20–32 inches); low-set foliage of good color and quality; tolerance for abuse during shipping; and responsive to storage and water treatments.

First Year Trials in Fairbanks

One hundred fifty peonies purchased during fall of 2000 were potted into ProMix horticultural peat-lite mix, and stored at 40° C until April 2001, when the pots were moved to a greenhouse with a minimum night temperature of 100° C. On June 1 they were moved to a cold frame for hardening and further growth. The containerized peonies were planted between August 15–20 into a south-facing plot at the Georgeson Botanical Garden on the AFES farm in Fairbanks.

The peonies were planted in Tanana silt loam soil in double-row raised beds covered with landscape fabric for weed control. Each row was equipped with a double row of Ro-drip trickle irrigation. On a raised bed one meter wide, plants were spaced 46 centimeters (about 18 inches) apart within the row with approximately 18 inches between rows. Holloway said that the second phase of her project will investigate the effects of this spacing, which is tight compared to garden standards.

The experimental design consisted of six plants for each of thirty cultivars, some of which are shown in the list on page 6. To account for the growth advantage at the outside edge of the plot, guard rows of Sarah Bernhardt peonies were planted at the ends of each row and along the length of each row on the east and west edges. Plots were mulched with spruce branches in October, 2001. Because stems were not harvested, no data were analyzed statistically during year one.

6 Most peonies survived the winter despite a lack of early season snow. The cultivars varied widely in vegetative growth, ranging from less than one vegetative stem per plant to more than twelve stems. Plant height is related to latitude and duration of winter chilling temperatures. For instance, average stem length in Fremont, California, is 25 cm; in Pantego, North Carolina, 45 cm; and in the upper Midwest states, 60–90cm, according to Stimart. The first-year stem length in the trials averaged 46 + 12 cm and ranged from 0.3 cm to 63 cm.

All cultivars except Jaycee, Mrs. FDR, and Shawnee Chief bloomed. All were listed in commercial sources as early or midseason bloomers at lower latitudes, with May and June bloom times given by Stimart (1985) and Gast (2000). In their first year grown in Alaska, the bloom season began June 30 and extended through August 7. Some differences in bloom times were recorded for the Alaska-grown plants, but factors such as number of blooms per plant and number of plants with blooms influence the length of bloom season.

“This first-year project has shown that a variety of cultivars may be grown in Alaska and that it may be possible to select plants for various seasonal bloom times,” said Holloway. “Selecting additional cultivars for late-season cultivars may extend the harvest season into late August.”

Floral stem lengths were well within the range of cut flower production from lower latitudes, but as Holloway pointed out, one season is too early to predict flower quantity and quality in each cultivar. “During our first season, no disease or insect pests were recorded on any of the cultivars,” she said.

The most common diseases of peonies are gray mold (*Botrytis cinerea*), Peony leaf blotch (*Cladosporium paeoniae*), Phytophthora blight (*Phytophthora cactorum*), root rots (*Fusarium* sp., *Rhizoctonia solani*, *Sclerotinia sclerotiorum*, or *Thielaviopsis basicola*) and root-knot nematode (*Meloidogyne* sp.). Gray mold can be so severe as to jeopardize cut flower production for many years, according to Stevens (1993) and Stimart (1985).

Economics

Establishing a commercial peony growing operation is no small investment in either time or money. The grower must wait five years for full production, and initial costs could be as high as \$350,000, including fixed and operating expenses

for five years. However, it appears that a successful one-acre operation could be very profitable.

Flowers are not harvested for at least the first three years after planting. During this time, the buds are merely pinched off, leaving as many leaves as possible on the plant to increase plant size. According to the Kansas Cooperative Extension Service, each plant can be expected to produce 20–30 flower stems in the fourth year. Only one-third of these should be harvested. The remaining flower buds should be pinched off to maximize leaf surface area and plant development. From the fifth year on, a mature, vigorous plant should produce 36–50 flower stems, half of which should be left unharvested to maintain the health and productivity of the plant.

As a senior thesis, 2002 graduate Marie Klingman investigated the production and transportation considerations for exporting peonies from Fairbanks, Alaska. She cites the *International Cut Flower Manual* in her analysis of plant yield at ten blooms per plant. She reported that a spokesman for Mayesh Wholesale and Retail in California said that in 1999, for example, peony prices ranged from 75 cents to \$4.00 a stem.

Because an acre of peonies can sustain 10,000 plants, at a modest 10 stems per plant the plot would produce 100,000 stems a year. If a moderate wholesale price of \$1.50 per stem was obtained, the acre of peonies would gross \$150,000; 20 stems per plant would gross \$300,000 a year.

According to Klingman’s analysis, the startup cost for a one-acre, drip-irrigated peony bed in Fairbanks (2001) would be about \$173,060, of which \$138,000 is the cost of a vacuum cooler for post-harvest refrigeration. This cost could be reduced if another means of refrigeration was obtained. The 10,000 peony crowns for a tightly spaced acre would cost from \$19,000 to \$37,000, depending on the variety. Klingman also included a small service building (\$12,000) constructed in the second year, and a truck purchased in year three. The refrigeration would not have to be in place until the fourth year, before the first harvest.

Operating costs in the second and third years would be low (\$3,353) because there is no harvest or packing expense. In year four, the first harvest year, operating costs would rise to about \$32,000, largely due to labor and the cost of packing and shipping materials.

Klingman’s analysis shows that during the first five years (two of which are harvest years), the total gross income could

Peony Cultivars in Year One

Better Times
Bowl of Beauty
David Harum
Doris Cooper
Duchess de Nemours
Felix Crouse
Felix Supreme
Festiva Maxima
Florence Bond
Gardenia
Gay Paree
Jaycee
Kansas
Karl Rosenfield
Louis Van Houtte
Mighty Mo
Mons. Jules Elie
Mrs. FDR
Nancy Nicholls
Pink Parfait
Princess Bride
Sara Bernhardt
Shawnee Chief
Therese
Vivid Rose

vary from \$112,500 to \$600,000. Five-year total expenses would range from \$331,000 to \$348,000. If 10 stems per plant were sold at a moderate price, the first five years of operation could cover the startup and fixed expenses.

Peony plants have a productive life of up to twenty-five years. In years five to twenty-five, the gross income could range from \$75,000 to \$400,000 a year. Expenses for full production would be about \$55,000 annually, most of which is the cost of labor, which was estimated at \$12 an hour.

Growing Peonies

Soil

Herbaceous peonies do well in a wide range of climates and soil types, but prefer a fertile, clay loam, with well-drained subsoil, which helps prevent root rot and fungal disease. The optimum soil pH is 6.5. The plants grow from an underground crown and have either pointed or large, bulky roots. After the blooming season, stem buds called eyes form at the stem base, and these buds are the source of new stems in the spring. Flowers are terminal, with one to three lateral buds. Before planting, as much organic matter as possible should be added to the soil. This is done well in advance of planting to allow the soil to settle and prevent the plants from sinking. The soil is plowed to a depth of one to three feet and allowed to settle. Deeper plowing facilitates root growth, with a corresponding increase in the plant size and amount of bloom.

Planting

Plant peonies in full sunlight, away from the competitive effects of tree roots. Choosing a sheltered location will protect the plants from wind damage. The location should be permanent, because after transplanting, peonies should not be harvested for the next three years.

Peonies, which go dormant in late August, can be planted between September 1 and freeze up. Allow enough time before frost for the soil to settle in around the roots. Stock dug the previous fall and kept in cold storage over winter can be planted in the spring, but such peonies will be less vigorous the first year because the root system will have had a shorter time to develop.

Plant spacing depends on cultivation method. For cross cultivation, space four feet every direction. Peonies are more commonly planted in rows, with a 24- to 36-inch spacing between plants and four feet between rows. The AFES study will look at the effects of tighter spacing. Dig each hole large enough to accommodate the root without crowding it. In heavy clay soil, plant so the buds are one to two inches below the soil surface. If the soil is light and friable, two to three inches is the proper depth. If the roots are planted too deep, a gnarly and much-branched stem develops between the roots and the shoots. These plants are predisposed to de-

cay or develop galled overgrowth. Too-shallow planting allows root displacement by frost during winter or early spring, and roots too near the surface may become exposed, increasing the chance of rot or injury from cultivation. Small divisions need extra care and should be planted no deeper than two inches.

Care should be taken not to plant the root upside down. Because air pockets in the soil will dry out and kill roots, fill soil in around the roots until no voids are left below the plant or among the rows. Firm the soil well and fill in until it just covers the roots and buds. Pour in about a gallon of water and let it settle, then fill in with loose soil, mounding it a few inches for winter protection and to keep the roots from heaving. Normally, the mound will sink to proper level. If it does not, level it in the spring. As the peony grows older, the crown naturally pushes upward and has to be covered with soil.

Mulching

After the ground freezes, mulch plants with leaves, wheat straw, or other material to prevent them from being heaved out of the ground through alternate freezing and thawing. An Alaska grower probably should mulch every winter as insurance against a lack of snow cover. In general, mulching after the first winter is usually not necessary, except in the case of tiny divisions or young seedlings, which should be mulched for several years. Do not use manure or dead peony leaves and stems as a mulch. The mulch is removed as soon as the shoots break through the ground in spring. Young peony plants are particularly slow in shoot appearance and may be a month later than established plants. When the soil is sufficiently dry, shallow cultivate to break up the soil crust, being careful not to injure roots near the soil surface.

Disbudding

Disbudding is the removal of lateral flower buds growing in the leaf axis so that all of the plant's resources contribute to one flower per stem, which enhances growth of the terminal flower bud. It is done when the auxillary buds are barely



A hardy early bloomer, possibly a hybrid, donated to the garden by Jana Gordon.

—PHOTOGRAPH COURTESY GEORGESON BOTANICAL GARDEN COLLECTION

large enough to handle. For specific markets and with certain cultivars, the terminal bud is removed to promote lateral bud development or spray types. If quantity is desired and smaller flowers with little stem length are acceptable, lateral buds may be allowed to develop. Because peonies grown for cut flower markets are cut when in bud, the plants may not require staking in normal weather conditions.

Water

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Peonies need a liberal supply of water, especially while blooming. Although they can withstand dryness to the point of drought, a reasonable amount of moisture is essential for the best development. Attempting commercial production without supplemental irrigation would be unwise, due to the crop's value and market demands. Drip irrigation is recommended, because overhead watering could physically damage the flowers, cause spotting on the petals, splash soil onto the foliage and promote the spread of disease. The amount and frequency of water required will vary with the weather and crop maturity. The irrigation schedule is based on soil moisture in the root zone. Care should be taken to avoid over watering, which promotes root rot.

Fertilizers

Before a fertilizer program is initiated, the soil always should be tested for nutrient content. The increased water requirement of cut flowers increases fertilization requirements. Fertilizer is applied as needed. One to two pounds of actual nitrogen per 1,000 square feet of production area per year of a 1-1-1 ratio fertilizer is adequate for plant growth and flower production. One half of the annual amount of fertilizer is applied at the time of shoot emergence in the spring. The second half can be applied after the plants go dormant in the fall. Keep all fertilizers away from the crowns and spread it over the area where the roots grow, 6–18 inches from the crown. The fertilizer is worked thoroughly into the soil around the plants. Avoid applying too much nitrogen.



Peony blossoms.

—GEORGESON BOTANICAL GARDEN COLLECTION

Weeding

Growers must control weeds in field production of peonies, because competition with weeds reduces flower quantity and quality. A bed full of weeds also increases the time required to harvest, raising labor costs. Several options are available to combat weed growth: herbicides, barriers or mulches, hoeing, and hand-weeding.

Dried & Preserved Flowers

While not a subject of current AFES research, peony buds and blossoms may be dried by the home gardener or for the commercial market, which includes craft outlets and florists. When dried, both bud and blossom retain good color and shape. The double types are used for Victorian style winter bouquets, the single and semidouble types for contemporary arrangements. For immediate drying, flowers are harvested at the desired stage of development, or buds can be harvested and opened the desired stage before drying.



Charm peony at the Georgeson Botanical Garden, July 24, 2002.

—GEORGESON BOTANICAL GARDEN COLLECTION



Left: *Paeonia californica*, California Peony, a wild species

—PHOTOGRAPH © 2003 BY CHARLES E. JONES

Right: wild Mountain Peony, *Paeonia brownii*, growing in California

—PHOTOGRAPH © 2001 BY JEFF ABBAS

Below: Peonies at the Georgeson Botanical Garden, summer 2002. Martha Bullock is the light variety at lower left, Kansas the darker blooms at upper right.

—GEORGESON BOTANICAL GARDEN COLLECTION



Both buds and blooms can be dried by hanging upside down or by the surround and cover method. Freeze drying also works well, but requires expensive equipment. If drying for commercial use, bunching and grading can be done in the field when flowers are to be dried immediately. Strip foliage from the bottom one-third of the stem and bunch the flower heads together. Cut the stems to the longest uniform length and secure with two rubber bands, one near the cut end and one farther up the stems. Hang the bunches to dry in a dark room at 50°F or higher with 50–60 percent relative humidity.

Single, Japanese, and semidouble flowers should be dried using the surround and cover method because it best preserves the flower shape. If using this method for double peonies, they should be only partly open. First, remove most of the stem, because the flowers dry most efficiently in shallow containers.

Choose a drying substance such as white cornmeal, sand, borax, kitty litter, silica gel, or a specially formulated product. Avoid anything that will soil the flower or be difficult to remove. Place the flowers with stems removed on a ½- to ¾-inch layer of drying substance in a container two to three inches deep. Carefully pour the drying substance over, around, and through the petals to cover the flowers. Instructions regarding light, temperature, and timing vary with the drying material. Books such as the one listed in Further Reading at the end of this article describe specific handling methods for each material.

History

In Alaska, peonies have been a favored garden flower for more than fifty years, but worldwide their cultivation history is much longer. There is evidence of their extensive use in both the Far East and Europe as long ago as two thousand years. According to Luoyang Flowers and Trees Company of Luoyang, China, the herbaceous peony, called the “queen of flowers” in China, has been cultivated there for 2500 years. The Chinese have cultivated tree peony, or “king of flowers,” for more than 1500 years, and the plant is the Chinese national flower (see <http://www.peonyworld.com/sinopeony.htm>).



PIVOINE MÂLE

—ILLUSTRATION BY JEAN HENRI JAUME SAINT-HILAIRE,
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In both Europe and the Far East, peonies have been used as food and medicine, for garden beauty, and as sources of artistic inspiration. The first use of peonies by humans may have been medicinal, and many parts of the plant are used. In texts describing traditional Chinese medicine, three peony preparations are common. Mu Dan Pi, made from tree peony bark, is said to cool the blood and have antibacterial properties. Chi Shao Yao, made from herbaceous peony root, is thought to cool the blood and relieve pain. Bai Shao Yao, made from the same root, but with bark removed, is used to nourish the blood. The medicinal use of peonies in the west has been uncommon since medieval times, when two peonies were widely used: *P. officinalis* and *P. mascula* (respectively known as the female and male peony). Peonies apparently were used for childbirth, warding off evil spirits, curing jaundice and gall stones, controlling epileptic seizures, and soothing teething pain. Peony seeds have been swallowed whole to prevent bad dreams or used in a poultice to relieve stomach aches; flower petals have been dried and used to make a tea for soothing a cough. Modern research involves evaluating the medical potential of the chemical compounds in peonies. In Asia, the peonies grown for medicinal use come from China, Korea, and Taiwan. Most of the peonies harvested are grown for that purpose, though some peonies are still taken from the wild. Research there is underway to improve yields and increase the concentration of desired compounds.

Peony Societies

In 1903, the American Peony Society was organized to “increase the general interest in the cultivation and use of the peony, to improve the methods of its cultivation, to increase its use as a decorative flower, to properly supervise the nomenclature of the different varieties and kinds of peonies, to encourage the introduction of improved seedlings and crosses, and to hold exhibitions with all members participating in the showing of their homegrown peonies.” This and several other societies have web sites, all of which provide more information and some of which have photographs of many peony cultivars.

The American Peony Society
250 Interlachen Road
Hopkins, MN 55343, USA
www.americanpeonysociety.org

The Canadian Peony Society
c/o Royal Botanical Gardens
P.O. Box 399
Hamilton, ON
L8N 3H8, Canada
www.peony.ca
e-mail: admin@peony.ca

The Peony Society
(formerly the British Peony Society)
www.paeonia.org
Secretary Hugh Bennison
rhbennison@waitrose.com

Heartland Peony Society
Membership c/o Jim Crist
15738 Horton Lane, Overland Park
KS, 66223, USA
www.peonies.org
(photos of 256 peony cultivars)

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