



The Poinsettia: History and Transformation

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The beautiful poinsettia, known for its scarlet bracts, comes to us encrusted with myth and legend as befits a royal plant of the Aztecs. The Nahuatl people in Mexico called it *cuetlaxochitl*; *xochitl* is ancient Nahuatl for an ornamental flower. This plant did not flourish in their high altitude capital, Tenochtitlan (now Mexico City), but every winter the rulers imported thousands of the plants from warmer regions. Extracts of the plant were used to dye cloth and its milky sap, or latex, was used for medicinal purposes. The Spanish conquerors and missionaries attempted to erase all evidence of the preceding pagan Aztec religion but records have survived showing that the plants were used for religious ceremonies in the winter (Anderson and Tischer, 1997). Once the Spanish friars took over they adopted the brilliant red plant as part of the Christmas ritual. The Spanish-speaking Mexicans named it *flore de nochebuena*, the flower of the Holy Night (Christmas Eve), and the French later named it *etoile d'amour* (star of love). The vivid red bracts of poinsettia that emerge in mid-winter have signified the festive mood at Christmas and the joy of the season for many for over 150 years in the United States and Europe. The purpose of this article is to establish the actual story of its arrival in the United States and Europe attempting to clear away all the accumulated misinformation and cobwebs, and to review its extraordinary development as an important horticultural crop.

INTRODUCTION

The poinsettia (*Euphorbia pulcherrima* Willd. ex Klotzsch.), a member of the large and diverse family *Euphorbiaceae*, originated in southern Mexico and northern Guatemala (Fig. 1). In its native habitat this species is a winter-flowering shrub that grows over 3 m and is a common

Figure 1. Plants of the *Euphorbiaceae* (Meyer, 1902).



landscape plant (Fig. 2). The sap is milky and may produce dermatitis in susceptible individuals. The umbel-like cymes are subtended by many showy, red bracts but breeders have produced many different colors including white, pink, and purple. Globally, Europe accounts for about two-thirds of the poinsettia market and the United States for the remaining one-third. Poinsettia is presently the most valuable potted flowering plant in the United States with a wholesale value of \$145 million in the top 15 producing states (U.S. Department of Agriculture, 2010).

JOEL ROBERTS POINSETT AND THE POINSETTIA PLANT

The common name, poinsettia, honors the American Joel Roberts Poinsett, 1779-1851 (Fig. 3), who, legend says, observed it in Southern Mexico in 1825 (Anon., 1888). For years it has been assumed that Poinsett came across the gorgeous plant in Taxco, southern Mexico, as part of a nativity scene, and sent cuttings or plants to Charleston, South Carolina in 1828. From Charleston cuttings or plants were sent to Colonel Robert Carr, a nurseryman in Philadelphia, Pennsylvania, whose wife Ann was the granddaughter of John Bartram, the self-taught American botanist of the colonial era. Carr entered the plant as "a new *Euphorbia* with bright scarlet bracts or floral leaves, presented to the Bartram Collection by Mr. Poinsett, United States Minister of Mexico" at the Pennsylvania Horticultural Society's flower show in June 1829

Figure 2. The poinsettia is a common landscape plant in the tropics (Huang, 2007).



where it was seen and admired by hundreds of people (Fry, 1995).

Almost no evidence exists to support much of this charming and delightful story. The facts are as follows. The plant is indeed endemic to Southern Mexico. Specimens were received in the United States in 1828 and by 1829 it was on display in Philadelphia and its arrival was associated with the name of Joel Roberts Poinsett. There is no evidence the plant first arrived in Charleston South Carolina before reaching Philadelphia but its movements after Philadelphia are well documented.

Figure 3. Joel Roberts Poinsett (Longacre and Herring, 1837).



The next step in its dissemination was taken by Robert Buist, a Scottish nurseryman in Philadelphia who was so enthralled by the new plant that he took cuttings to his friend James McNabb in Edinburgh. From Scotland it reached the distinguished German botanist Karl Willdenow in Berlin who named it *Euphorbia pulcherrima* in 1834. This remains the accepted botanical name. Two years later Robert Graham in Edinburgh published his taxonomic findings and changed the name to *Poinsettia pulcherrima* but this generic name has not been accepted (Britton and Brown, 1913).

The biography of Poinsett by Fred Rippey (1935) devoted one paragraph to the poinsettia story and in a footnote the author indicated he had been unable to find any correspondence to validate the claim that Poinsett introduced the plant. Rippey dryly commented that "It is generally acknowledged in the horticultural guides that Mr. Poinsett introduced the flower." Rippey cited the only reliable document of the era, a discussion of Poinsett in the 1887 *Charleston Yearbook* by Charles Stille who had spent a day with Poinsett as a lad of 12. Together, Charles and Poinsett visited the Reverend John Bachman, a Lutheran minister and noted naturalist who once worked with Audubon. The *Yearbook* article states:

"Mr. Poinsett was rewarded for the interest he took in science by having a beautiful flower named after him... There is some difference of opinion as to whether Mr. Poinsett discovered it himself or simply introduced it to this country. At all events it is always known now as being named after him."

The flower was originally called either "Mexican flame flower" or "painted leaf" in the United States, though neither of these seemed satisfactory. The occurrence of a plant acquiring an enduring common name after it received its formal name, rather than the other way around, is rare. The choice of Poinsett's name is attributed to William Hickling Prescott, the author of the classic 1843 book *The History of the Conquest of Mexico*, but this too is a myth (Fry, 1995), since Robert Graham used the name *poinsettia* in his taxonomic identification of 1836.

Poinsett was a very well educated, cosmopolitan Southern gentleman of Huguenot descent from Charleston, South Carolina, who spoke French, German, Italian and Spanish (Rippey, 1935). He was appointed the first American minister to the newly independent Mexico by President James Monroe in 1825 but was recalled by President Andrew Jackson in 1830. Poinsett subsequently acted as Secretary of War in President Martin van Buren's cabinet after terms in the South Carolina state legislature and the United States House of Representatives where he was a staunch foe of nullification in the 1832-1833 crisis in South Carolina. His book about his first

tour of duty in Mexico, *Notes on Mexico* (Poinsett, 1824), contains no mention of the plant. Poinsett was a founder of the National Institute for the Promotion of Science, the predecessor of the Smithsonian Institute.

Poinsett never enjoyed very robust health. He started out to be a physician like his father but could not complete the course. His lifelong interest in natural science stemmed from the preliminary studies. Poinsett carried on an extensive correspondence about horticulture, exchanging seeds and cuttings with friends and colleagues in the United States. He believed that the exchange of plants and seeds helped to promote stronger ties between the United States and Mexico.

The American Philosophical Society in Philadelphia elected him to membership in 1827 (Fry, 1995). This broadened his correspondence to include members of the society and other Philadelphia savants. These connections appear to be the most likely route through which the new red-bracted plant reached the United States. There are fairly strong indications that it may have traveled directly from Mexico to Philadelphia. Four different collections of Mexican seeds and plants were dispatched to Philadelphia between 1828 and 1829. Poinsett himself remained in Mexico until 1829.

William Maclure, the president of the Academy of Natural Sciences, and Thomas Say, a descendant of John Bartram, visited Poinsett in Mexico for three months in January 1828 traveling to both Veracruz and Mexico City. Later that year Maclure again visited Poinsett and returned to Philadelphia in the fall with many seeds and plants. Say also collected more than 100 types of seeds but was not meticulous about identifying them. Number 65, a "Fine Red flower, perennial" could be *poinsettia*.

In November 1828 James Ronaldson, a Scottish enthusiast in Philadelphia, wrote to Poinsett that he had received a box of seeds from Veracruz and assumed it came from Poinsett. The fourth possibility was William Keating, a geologist who went to prospect in Mexico and met Poinsett. On occasion, Keating acted as a courier for Poinsett.

In summary, there is no doubt that the plant was growing in Philadelphia when Colonel Robert Carr exhibited it at the first flower show of the Pennsylvania Horticultural Society in June of 1829. Poinsett was still in Mexico but it was generally accepted he was instrumental in its transfer. Perhaps the following extract from a letter from one of Poinsett's friends in 1830 clinches the argument that these plants did not enter the United States via South Carolina:

"Mrs Herbemont [of Charleston] has been very vexed with you when she learned by the papers that several northern gardeners had received seeds and plants you had sent them from that land of vegetable beauties, Mexico, and that you had not in one instance remembered her..." (Fry, 1995).

POINSETTIA IN MEXICO

The specimen received in Philadelphia was not a wild plant but had been cultivated and modified for many years in its native Mexico. Doña Fanny Calderon de la Barca, wife of the Spanish minister to Mexico, commented in her letters home that her church courtyard was lit by these gorgeous scarlet flowers at Christmastide (Calderon de la Barca, 1843).

For reasons which are not clear Mexican growers still believe that Poinsett himself devised a hostile mechanism to prevent them from developing or benefiting from this growth purely out of spite. Various publications in Mexico indicate that he obtained a "patent" in the United States which led to this embargo (Fuentes Mares, 1984; Miranda, 2004). An exhaustive search through old patents and treaties has failed to turn up such an instrument. While the United States patent laws began in 1795 to protect inventors against their mechanical devices being pirated, plants were not covered. The first US law that protected new cultivars of plants, the Townsend-Purnell Act of 1930, excluded seed propagated plants, tuber propagated plants (to exclude potato), and wild plants (Janick et al., 1983). At present, international protection for plants is controlled by a 1961 treaty, International Union of the Protection of New Varieties (UPOV) and seed-propagated plants in the United States are now protected by the Plant Variety Protection (PVP) Act of 1970, administered by the United States Department of Agriculture. Poinsett did negotiate a commercial treaty with Mexico as part of his ministerial duties and it was ratified by the United States but the plant was not part of the treaty.

The current animosity to Poinsett in Mexico has some basis in fact and this may have contributed to the myth of the United States patent. Poinsett tended to meddle in Mexico's internal affairs, supporting one party over another (Rippey, 1935). At one point death threats were made against him. All this contributed to his recall by the President Jackson. The term *poinsettismo* is still in use today in Mexico to express arrogance and high handedness.

POINSETTIA IN THE UNITED STATES

North American nurserymen rapidly propagated the plants and distributed them widely throughout the United States over the last part of the 19th century. The modern phase of *poinsettia* development took place in the early 20th century. *Poinsettias* have led the sales of potted plants year after year and are one of the mainstays of the commercial floriculture industry. This phenomenal growth is associated with the Eckes, a German immigrant family which settled in Southern California (Ecke et al., 2004).

Albert Ecke and his family stopped over in California in 1900 en route to Fiji where they



planned to open a health spa. They saw such an excellent opportunity in California that they settled there, remaining until the present. Albert began farming in the Eagle Rock Valley, near Los Angeles but then moved to Hollywood. They planted orchards and also large fields of chrysanthemum, gladiolus and poinsettia for the cut flower market. By 1909 they narrowed their floral crops down to poinsettia alone. Ten years later, both Albert and his eldest son Hans had died and the business was taken over by the second son, Paul Ecke (Fig. 2), who moved south to Encinitas where the company remains.

The early poinsettias were still fragile. Their leaves fell off quickly and the scarlet bracts only lasted for about a week to 10 days. Bahr (1937), author of one of the earliest texts on floriculture, complained: "Perhaps no other plant or flower we handle during Christmas week is short lived, wilts quicker or is more disappointing to those who receive it; yet, when the next Christmas comes around, there comes again the same demand for poinsettias and the disappointments of a year ago are all forgotten." Up to the 1950s it was very difficult to get them into perfect condition by Christmas and maintain their quality in the homes of consumers.

The history of the poinsettia production in the United States in the 20th century has some well defined landmarks. Major advances in flowering physiology came about with the discovery of photoperiodism in plants by Garner and Allard (1920) and photoperiod control techniques were developed in the floricultural industry to shorten the day length with black cloth and "force" floriculture crops into flower for specific market dates (Post, 1942, 1950). This was essential because poinsettia, among other floriculture crops, is a short day plant where flowering is induced with a night length of at least 11.75 hours (it is the night length not the day length that is critical). Shortening the day length with black cloth (increasing the dark period) induces flowering in poinsettia (Fig. 4). Adding photoperiodic lights to interrupt the dark period pre-

Figure 4. Poinsettia production in greenhouses; note the black cloth.



Table 1. Seminal cultivars in poinsettia improvement.

Year	Cultivar	Distinguishing characteristics
1923	Oak Leaf	Dwarf, long lasting bracts
1988	Eckespoint® Lilo	Dark leaves, early flowering
1963	Paul Mikkelsen	Stiffer stem; improved bract longevity
1992	Eckespoint® Freedom	More consistent branching; withstands careless handling
1998	Eckespoint® Haddon Winter Rose Dark Red	Very dark leaves; "curly" incurving bracts and leaves

Figure 5. Paul Ecke Sr. (1895-1991).



vents flowering and keeps the plant vegetative. Management of day length permits scheduling of flowering in order to get plants to flower for the Christmas season.

While the ability to control flowering has had the most profound effect on poinsettia production, improvement of plant quality attributes through breeding efforts has greatly improved today's commercial cultivars (Table 1). Some of this was due to the establishment of various breeding programs across the country in the mid 1950s, including Pennsylvania State University, the USDA Research Center at Beltsville, Maryland, and the University of Maryland. However, the greatest advances have been made through the efforts of some private companies including Ecke, in California; Azalealand, in Lincoln, Nebraska; Mikkelsens in Ashtabula, Ohio; Earl J. Small, in Pinellas Park, Florida; and Yoder Brothers, in Barberton, Ohio. Considerable efforts of breeding programs have focused on improving ornamental characteristics such as color and bract size (Fig. 5). However, major efforts have also been made to improve the post-harvest quality of poinsettia including delayed leaf senescence and abscission as well as reduced ethylene sensitivity, traits which plagued poinsettias for years.

Other major innovations in the poinsettia resulted from the remarkable discovery by Gregor

Gutbier, a poinsettia breeder in the 1980s, that grafting poorly branched (branching-restricted) plants to well-branched (free-branching) plants increased branching in the propagules from the restricted-branching scion (Fig. 6). This effect was demonstrated to be due to the transmission of a phytoplasma that was transmitted from an infected to a non-infected plant (Lee et al., 1997; Dole and Wilkins, 1999; Huang, 2007). The phytoplasma was shown to be caused by an infectious agent related to peach X disease and spirea stunt, but was otherwise benign in poinsettia. Once the role of the virus was recognized it became a standard procedure to induce the beneficial pathogen to new poinsettia seedlings by grafting. Vegetative propagules (cuttings) from grafted plants kept their free-branching trait.

Other innovations in poinsettia production (Fig. 7) include plant pruning (pinching) to increase branching and the use of growth regulators (PGRs) to reduce stem elongation and final plant height. By increasing branching and controlling plant height, poinsettia producers can produce compact, high-quality plants that may also be packed, shipped, and sold on a cart in retail locations. The industry height standard in the United States for plants grown in 15 cm containers is between 36 to 41 cm. Florist-quality poinsettias were originally produced from several un-pinched cuttings in a single container known as "straight ups." However, a high-quality poinsettia may be produced by planting a single cutting in the container and pinching the cutting to induce branching (a 3- to 4-cm "hard pinch" is most effective) after rooting has been established in the container (Berghage et al., 1989). This allows several branches to develop from axillary buds and produce a "full" plant.

Compact poinsettias may be produced using applications of PGRs to control stem elongation during production. There are several active ingredients currently applied to poinsettias, including ancymidol, chlormequat chloride, daminozide, ethephon, flurprimidol, paclobutrazol, and uniconazole (Ecke et al., 2004). PGR solutions may be applied by foliar sprays (chlormequat, daminozide, and ethephon) or drenching the growing substrate (Hammer and Barrett, 2001). Timing of PGR applications is important. Plant growth retardant applications made close to or during short days can reduce bract size; therefore applications are best made early in

Figure 6. Variation in modern poinsettia cultivars: Ecke 'Orange Spice', deep orange bracts with dark green leaves; Syngenta 'Carousel Dark Red', curled dark red bracts against dark foliage; Syngenta 'Sonora White Glitter', red bracts with cream speckling; Syngenta 'Whitestar', bright white bracts and medium green leaves; Ecke 'Ice Punch', bright, rosy-red bracts with a blaze of white down the middle of each bract; Syngenta 'Cinnamon Star', early flowering cultivar with cinnamon-pink bracts; Ecke 'Polly's Pink', bright, fluorescent-pink bracts with dark foliage; Ecke 'Winter Rose Dark Red', incurved dark red bracts and incurved dark green foliage; Selecta 'Pink Candy', dark-pink bracts with darker pink flecks; Dümmen 'Pink Cadillac', large pink bracts with very dark green foliage; Ecke 'Tapestry', red bracts and leaves with variegated margins; Dümmen 'Viking Red', large, rounded, medium-red bracts (photos by R.G. Lopez).



production when plants are vegetative or late when bracts are nearly fully developed to minimize any negative impact on bracts (Currey and Lopez, 2011).

Poinsettia propagation has also changed over time. Seedling plants are only used in breeding programs. Poinsettias produced commercially are started from stem-tip cuttings. In the early

1900s, dormant 1- to 2-year-old plants were bare-root harvested in late winter or early spring from fields located primarily in California, Florida, and Texas and shipped to commercial growers in the eastern United States (Post, 1950). Upon receipt by producers, the bare-root plants were potted and stem-tip cuttings were harvested in April or May. Poinsettia mother plants

Figure 7. Phytoplasma-infected red poinsettia (Huang, 2007).



are no longer grown in the continental United States on a large scale. Almost all cultivation is now done in South America with its tropical climate and associated lower costs. Cuttings are air freighted into the U.S. or Europe where they are rooted and plants are then "finished" by specialty growers for sale to the consumer in supermarkets and garden centers.

In the past decade, the cost to heat greenhouses has more than doubled and thus threatens poinsettia production. For greenhouse operations in northern latitudes, energy costs for heating alone account for 10 to 30% of their total operating cost. Research at the University of New Hampshire, Clemson, and Purdue University has demonstrated that cultivars produced earlier in the season (6 to 8 week response time), have moderate vigor with naturally large bracts that are well adapted to cold finishing (late growth under cool temperatures). Under this system, growers can take advantage of naturally warm outdoor temperatures in August and September to "bulk" up the vegetative plant. When outdoor temperatures began to fall, typically in mid-October, greenhouse temperature set points (day/night) are reduced to 20 to 21°C/14 to 17°C for "cold finishing" to reduce energy consumption. In addition to energy and growth regulator savings, the timing of cold finished plants is not excessively delayed and bracts and final height are not negatively affected (Lopez and Krug, 2009).

The Paul Ecke Ranch

The Eckes began growing two cultivars of poinsettia before 1920: 'True Red' and 'Early Red'. Their neighbors in Southern California used these plants in their gardens. 'Early Red' was more useful for commercial purposes both as a cut flower and as a potted plant as it held its foliage longer.

Three new cultivars were released in the 1920s but 'Oak Leaf', introduced by a Mrs. Enteman in Jersey City, New Jersey, dominated the field for the next 40 years. It was the first cultivar suitable for growing in a pot and also retained its leaves and bracts for an



extended time. The 1920 sport 'Hollywood' had wider, more compact bracts than 'Early Red' and the 1924 'St Louis' from Louis Bourdet in St Louis, Missouri attained some popularity in its day.

Paul Ecke devoted himself to selecting and developing better cultivars based on 'Oak Leaf'. His introductions included 'Henriette Ecke', 1927, and 'Mrs. Paul Ecke', 1929. The latter, a sport of 'Oak Leaf', was shorter and had wider bracts than its parent. Poinsettias had become a commercial reality and several firms across the United States grew them successfully in greenhouses. In Indianapolis, Bauer and Steinkamp came across another sport of 'Mrs. Paul Ecke' which they named 'Indianapolis Red'. Each of these sports offered improvement in habit and bract size.

Not all the new cultivars lasted well, in spite of their undoubted novelty. 'Henriette Ecke' had "double" incurved bracts. Its offspring, which made the plant almost look like a dahlia, seemed very promising but the bracts were deemed to be too small and the plants did not perform well in the greenhouse. Many years later novelties were in great demand. 'Winter Rose Dark Red' was introduced in the 1990s and by 2004 it was available in seven different colors. Another series with curly bracts, 'Renaissance', came in at about the same time specifically for the cut flower market. These cultivars do well as cut flowers. 'Paul Mikkelsen' from the Mikkelsen nursery in Ashtabula, Ohio, had a stiffer stem and greater longevity than any preceding cultivar. Eckespoint® 'Lilo' was the first poinsettia with dark leaves and early flowering. It retained its foliage well but needed some special treatment to ensure good branching. Eckespoint® 'Freedom' had all the above good points but more consistent branching. It was also ready to be shipped a week or two before Thanksgiving, allowing for a head start on the holiday marketing season. Another excellent quality was the ability to withstand careless handling by untrained staff at large non-specialty stores. In 1998 Eckespoint® 'Winter Rose Dark Red' was the first cultivar to have "curly" incurved bracts and very dark, incurved foliage.

The public likes the traditional red poinsettia but also finds new colors and styles very exciting (Lopez et al., 2010). Breeders have to respond to these needs and accommodate the public's slightly fickle reactions. Since 2002, Ecke has introduced Eckespoint® 'Plum Pudding', with purple bracts, Eckespoint® 'Chianti' with darker wine red bracts, Eckespoint® 'Shimmer Pink', pink with white flecks, and many others (Ecke et al., 2004). Eckespoint® 'Prestige Red' has become the standard modern cultivar and it already has many variations.

POINSETTIA IN EUROPE

The poinsettia was widely distributed across Europe by the mid-19th century. It enjoyed great popularity for the same reasons it was so successful in North America but the plant had to be grown in heated greenhouses and so was an expensive luxury.

Poinsettia breeding has also been carried out in Europe. Thormod Hegg, a Norwegian breeder, introduced 'Annette Hegg Red' in 1964. This cultivar was the first in a series of multi-flowered plants produced by pinching and in a previously unknown range of colors. They could be made to produce between 5 and 8 inflorescences per stem. This cultivar was also easy to propagate and grow commercially. The Hegg cultivars were important up to 2002.

In Germany, the Zeiger Brothers in Hamburg also instituted a breeding program. Gregor Gutbier in Linz, Austria, introduced another dazzling series of colorful cultivars, including the 'V-14 Glory' Angelikas in 1979. Ten years later

they reached the United States. One advantage they offered was an ability to withstand slightly cooler night temperatures.

THE FUTURE

Innovations in the breeding and production of poinsettia have made this plant the most widely produced pot plant in the United States although its premier position is currently being threatened by the increasing sales of potted orchids. As its popularity has largely been restricted to the Christmas season because of its attractive red bracts, expansion of the current market is threatened. The introduction of many different hued bracts, such as pink, cream, white, purple and flecked could lead to the plants becoming a mainstay of interior decoration. Furthermore, using cultivars with orange bracts such as 'Orange Spice' could expand marketing during the fall and especially at Halloween. The challenge will be to duplicate the vision and marketing skills of past innovators in the industry.

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