Mt. Cuba Center

GARDENING ON A HIGHER LEVEL

RESEARCH REPORT

Echinacea

FOR THE MID-ATLANTIC REGION

Sam Hoadley, Manager of Horticultural Research

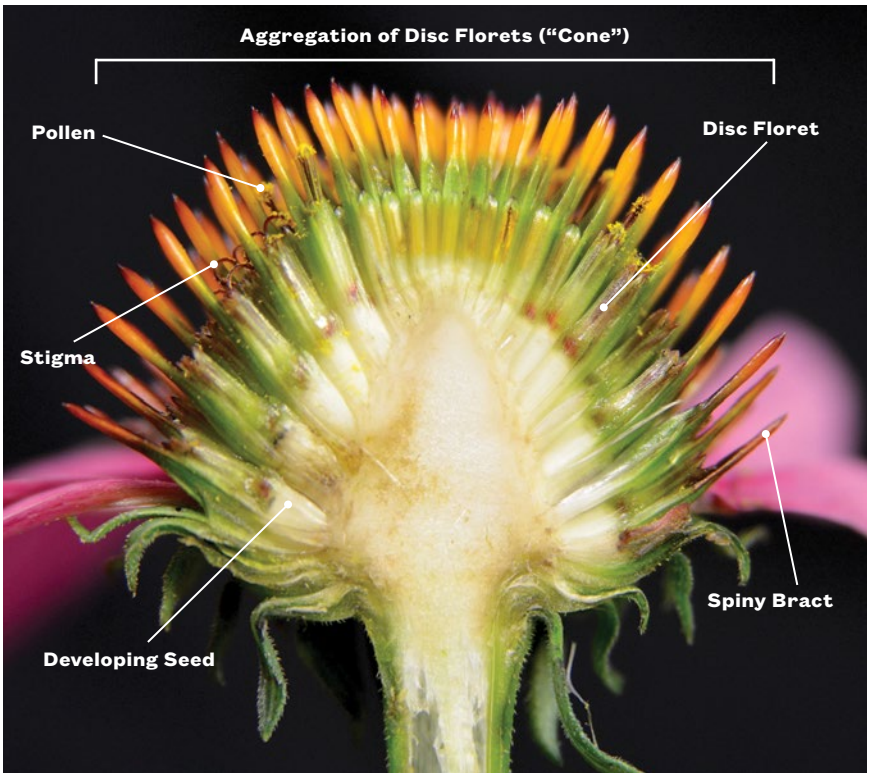
Skipper butterfly feeding on *Echinacea* 'Glowing Dream'

***ECHINACEA*, COMMONLY KNOWN AS CONEFLOWERS**, are among the most iconic and recognizable native plants in North America. The earliest documented horticultural use of *Echinacea* can be traced to the late 17th century when *Echinacea purpurea* seeds were sent to England by the Virginia clergyman and naturalist John Banister. Medicinal use dates back even further as Native Americans used *Echinacea* to treat a variety of ailments, a tradition that has carried into modern times. *Echinacea* has enjoyed continued popularity for treating colds and for boosting the immune system. Although there is little scientific evidence of its benefits, *Echinacea* is currently one of the most popular commercially traded herbal supplements.

The nine species of *Echinacea* are North American natives and predominantly occur in the central and eastern United States. The majority of wild coneflowers display pink, purple, and rarely white flowers from late spring to summer. Only one species, *Echinacea paradoxa*, breaks this color trend and produces canary yellow blooms in June. Dr. Jim Ault of the Chicago Botanic Garden was among the first plant breeders to intentionally cross multiple species in the 1990s. Since that time, the breeding and selection of coneflower species has further unlocked the horticultural potential of this genus resulting in a staggering variety of new cultivars in American and European horticultural markets. Today, *Echinacea* are available in an array of colors including, white, yellow, orange, red, pink, purple, and even green. Double, or pompom, flower forms also add to the diversity of coneflowers.

Although common in gardens, some coneflowers are threatened in the wild. *Echinacea laevigata* is federally endangered due to habitat loss and the suppression of fires that are key to its survival. *Echinacea tennesseensis* was also considered endangered but was delisted in 2011 thanks to conservation efforts. However, it still only exists in a relatively small range in Tennessee. Other species, particularly *Echinacea angustifolia*, are under pressure from unsustainable wild harvests due to their purported medicinal qualities. Thankfully, an increased availability of commercially farmed *Echinacea* has reduced some of the stress on wild coneflower populations. To ensure the future of wild coneflowers, it is important to only purchase commercially produced herbal supplements and nursery propagated plants.

Single flower, *Echinacea purpurea*

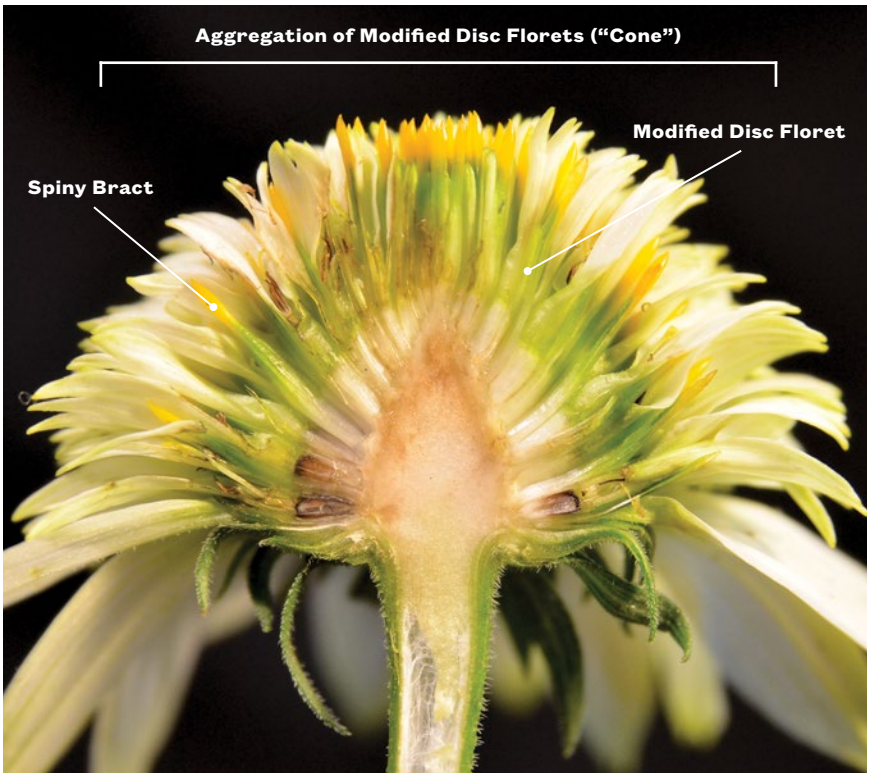


Single flower, bisection (*Echinacea purpurea*)

Echinacea, like the previously trialed *Coreopsis* and *Helenium*, are members of the aster family (Asteraceae). An *Echinacea* "flower" is a composite inflorescence made up of hundreds of individual ray and disc flowers, or florets. Fertile disc flowers form the center, or cone, of the flower. Each disc flower is accompanied by a single spiny bract that together gives coneflowers their signature bristly appearance. In fact, the genus name *Echinacea* originates from "echinos," the Greek word for hedgehog. Individual disc flowers are short lived but collectively offer pollen and nectar to pollinators for an average of five weeks from late spring through summer. The individual colorful "petals" of *Echinacea* blooms are actually specialized ray flowers that serve to attract pollinators. With ray flowers included, most coneflower inflorescences range from 3-5" in diameter.

Double-flowered *Echinacea* represent significant breakthroughs in coneflower breeding that have increased the variety of the genus in the horticultural market. They have become popular in gardens because of their showy flowers and prolonged bloom times but have proved to be less favored by pollinators (see pages 18 and 19). Double flowers occur when genetic mutations result in the production of petals that replace other functioning floral parts, thus limiting their ability to produce pollen, nectar, and seeds. This tradeoff for style over substance directly limits their ability to attract and benefit insects and birds.

Double flower, *Echinacea* 'Marmalade'



Double flower, bisection (*Echinacea* ‘Meteor Yellow’)


Double flower, *Echinacea purpurea* ‘Butterfly Kisses’


Echinacea purpurea foliage


Echinacea pallida buds and foliage

Echinacea are clump-forming herbaceous perennials that emerge each spring to form a lush rosette of lanceolate foliage. Some species, including *Echinacea purpurea,* produce leaves with relatively few foliar hairs while others, like *Echinacea pallida* and *Echinacea tennesseensis*, are densely pubescent. In mid to late spring, flowering stems push their way above the basal foliage and eventually reach a height of 2'–4' depending on the species or cultivar. Seeds ripen in late summer and are readily consumed by birds, particularly goldfinches.

Most coneflowers produce taproots that allow them to grow in competitive habitats where water is at a premium. In contrast, *Echinacea purpurea* produces roots that are more fibrous and are consequently better suited for average garden soil. All coneflowers, however, require soils that are well drained in order to persist and thrive in a garden setting.


MT. CUBA CENTER RESEARCH REPORT 2009

Coneflowers for the Mid-Atlantic Region

MT. CUBA CENTER HAS EVALUATED native plants since 2002, and first examined coneflowers in 2007–2009. We have revisited this charismatic genus with the primary goal of evaluating cultivars that have been introduced in the subsequent decade. We also aimed to see how some of the original top performers held up against the new, and presumably improved, *Echinacea* cultivars.

The most notable difference between this and the previous trial is the added component of a pollinator study. Pollinator visitations were observed and recorded for each of the trialed *Echinacea* in both 2018 and 2019, allowing a detailed analysis of pollinator-preferred plants. The 15 *Echinacea* that averaged the most pollinator visits between the two years of observation were awarded with an additional 0.3 points to their final score. These plants are also identified with the following icon throughout this report:

ECHINACEA TOP PERFORMERS

A few coneflowers, specifically *Echinacea purpurea* 'Pica Bella' and *Echinacea purpurea* 'Fragrant Angel' were included in our 2007–2009 and 2018–2020 *Echinacea* trials and constituted some of the best performing plants in both evaluations. Top performing *Echinacea* overall had sturdy, semi-compact habits that resisted flopping and largely omitted the need for staking, a trend that was also observed in our first evaluation of the genus.

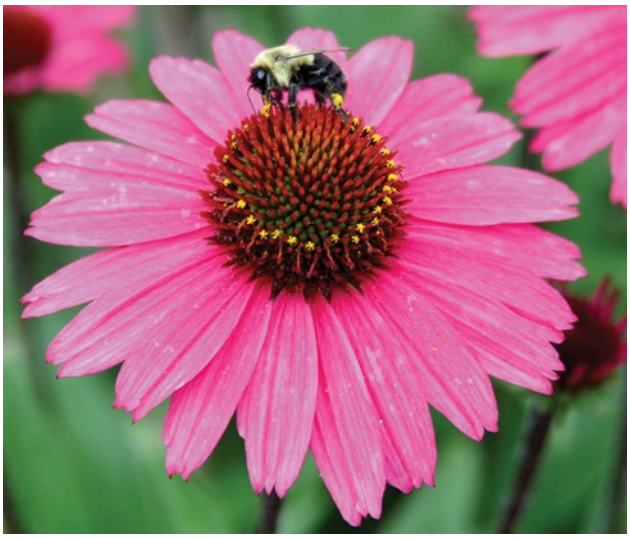
One common problem with coneflowers is that some do not live long in the garden. It has been theorized that cultivars grown from seeds are longer lived and generally more vigorous than coneflowers that are produced clonally in tissue culture. Unfortunately, due to the infection rates of a disease called aster yellows (see page 17) it was difficult to determine what the natural life span of various cultivars would be in the absence of the pathogen. What follows are the top rated coneflowers for the mid-Atlantic from a horticultural and ecological perspective.

Echinacea purpurea 'Pica Bella' ★★★★★

Echinacea purpurea 'Pica Bella' ranked among the top performing coneflowers in our first trial in 2009 and is again one of the most outstanding cultivars we evaluated. 'Pica Bella' is a compact and floriferous form of the species that originated as a seedling of *Echinacea purpurea* 'Abenstem'. While many *Echinacea* cultivars in the market today showcase vibrant blooms that can look out of place in a naturalistic setting, the floral display of 'Pica Bella' resembles that of *Echinacea purpurea*, allowing for its effortless incorporation into a broad range of garden designs. In addition to excelling in all horticultural aspects, this cultivar was also a favorite among pollinators that flocked to its prominent orange cones. *Echinacea purpurea* 'Pica Bella' has withstood the test of time and proven once again that it deserves a place in gardens of the mid-Atlantic region.

Echinacea 'Sensation Pink' ★★★★★

A product of the breeding efforts of Marco van Noort in the Netherlands, *Echinacea* 'Sensation Pink' produced one of the most vibrant displays in our trial. Intense, neon-pink flowers are held on dark stems that further accentuate their otherworldly floral color. In contrast to the exuberant blooms, 'Sensation Pink' manifests a restrained and more compact habit relative to its wild counterparts. While 'Sensation Pink' is undoubtedly a horticultural standout, it proved to have substantial ecological value as well. In fact, this cultivar was one of the five most pollinator-visited *Echinacea* in the trial. This is one truly sensational plant!



Echinacea 'Santa Fe' ★★★★★

Echinacea 'Santa Fe' is a seed-produced cultivar from the Proven Winners® LAKOTA™ Series of coneflowers. Despite some expected variation in seed strains, *Echinacea* 'Santa Fe' showed remarkable consistency in our trial and was similar in many ways to *Echinacea* 'Balsomcor' (SOMBRERO® Hot Coral), although 'Santa Fe' was decidedly more vigorous. This tidy and well branched plant reaches 2' tall and wide at maturity. Striking coral-red flowers are produced en masse from late June through late July before eventually fading to attractive shades of pastel pink. *Echinacea* 'Santa Fe' not only scored as a top performer in the trial, but it was also popular with Trial Garden visitors who voted it among their top five favorites in both 2018 and 2019.

Echinacea 'TNECHKR' (KISMET® Raspberry) ★★★★½

Echinacea 'TNECHKR', also known by the trade name KISMET® Raspberry, is one of several Terra Nova Nurseries introductions that were evaluated in this trial. KISMET® Raspberry was a standout in the trial thanks to its strong vigor, saturated color, and oversized blooms. The glowing raspberry-pink petals are at their peak in early July and, while comparable to the blooms of *Echinacea* 'Sensation Pink' and *Echinacea* 'Purple Emperor', KISMET® Raspberry maintains the slightest floral edge over these close competitors because of the sheer vibrancy of its blooms. KISMET® Raspberry hybrid coneflower has an attractive and consistent 3' by 3' habit, similar to that of *Echinacea purpurea* 'Pica Bella'.

Echinacea 'Snow Cone' ★★★★½

Echinacea 'Snow Cone' is an outstanding cultivar introduced by Intrinsic Perennial Gardens in Hebron, Illinois. This pocket-sized hybrid is one of the most compact coneflowers in our trial. Fully grown, it reaches 2.5' in height and width, making it a perfect choice for container gardens or the front of a border. Despite its modest size, 'Snow Cone' puts on a first-class floral display from the middle of June through late July. During peak bloom, this cultivar's foliage is almost completely obscured by a profusion of 3" snowy white blossoms. In addition to a standout floral display, 'Snow Cone' is reputed to be a long-lived plant, a trait associated with its *Echinacea tennesseensis* parentage.

Echinacea 'POST301' (Postman) ★★★★½

Echinacea 'POST301' (Postman) is a member of the Butterfly™ Series from Arie Blom of AB-Cultivars in the Netherlands. Each cultivar in this series is named for a different butterfly, in this case the Mexican and Central American postman butterfly (*Heliconius* sp.). This coneflower is known for its large, intensely colorful flowers and prominent dark cones. Beginning in June, showy oversized buds with attractive dark centers are held well above the foliage, a feature that greatly expands its season of interest. The buds are then followed by 4.5" marigold-yellow flowers that transition to crimson-red in early July and eventually fade to shades of watermelon pink later in the month. The sheer size and quantity of blooms can cause some flopping later in the season, although timely deadheading can counteract this tendency.

Echinacea 'Glowing Dream' ★★★★½

Echinacea 'Glowing Dream' is a Terra Nova Nurseries hybrid that has incredible tropical pink blooms. A profusion of luminous flowers is held well above the foliage for six weeks in mid-June to mid-July, establishing 'Glowing Dream' as one of the longest blooming non-double *Echinacea* in our trial. This cultivar is most similar in form and color to 'Sensation Pink', although 'Glowing Dream' lacks the contrasting dark stems of the former cultivar. Like 'Sensation Pink,' 'Glowing Dream' was also one of the most visited coneflowers in our pollinator study.

Echinacea 'Purple Emperor' ★★★★½

Echinacea 'Purple Emperor' is one of three members of the Butterfly™ Series from AB-Cultivars that excelled in the trial. This particular cultivar is named after a species of *Apatura* butterfly that is native to Europe and Asia. 'Purple Emperor' hybrid coneflower distinguishes itself from other medium sized cultivars thanks to its vigorous and uniform growth and its large 4.5" flowers produced in late June though early July. An interesting feature of 'Purple Emperor' is the slightly reflexed, two-toned petals that are dark pink at the cone and fade to a lighter pink toward the outer edges of the flowers.

Echinacea purpurea 'Fragrant Angel' ★★★★½

A Terra Nova introduction, *Echinacea purpurea* 'Fragrant Angel' was the highest rated white flowering cultivar during our first coneflower trial and it remains impressive more than a decade later. The large, pleasantly fragrant, 4.5" flowers present their porcelain-white petals to great effect from early July into August. Other white cultivars such as *Echinacea purpurea* 'Baby Swan White' and *Echinacea purpurea* 'Happy Star' have slightly reflexed petals, but 'Fragrant Angel' has horizontal petals that contribute to its more substantial appearance. In addition to these notable horticultural qualities, 'Fragrant Angel' is also popular with bees, wasps, and butterflies. In fact, this cultivar averaged the most pollinator visits, including the most butterfly visits of any coneflower in our trial between 2018 and 2019.

Echinacea 'TNECHKIO' (KISMET® Intense Orange) ★★★★½

From Terra Nova's KISMET® Series, *Echinacea* KISMET® Intense Orange features the same breeding strategies as *Echinacea* KISMET® Raspberry and is similarly advertised to have increased numbers of flowers and greater garden adaptability. This coneflower was often compared to *Echinacea* 'Santa Fe' and *Echinacea* 'Balsomcor' (SOMBRERO® Hot Coral) due to similarities in habit and flower color and, like 'Santa Fe', it was also voted a top five favorite by visitors. KISMET® Intense Orange coneflower produced some of the most saturated red-orange flowers in our trial that eventually faded to handsome apricot tones in late summer.

Echinacea 'Balsomcor' (SOMBRERO® Hot Coral) ★★★★½

Echinacea 'Balsomcor', commonly known as SOMBRERO® Hot Coral, is a coneflower in the SOMBRERO® Series from Darwin Perennials. In our trial, SOMBRERO® Hot Coral produced a compact and well-branched plant that is very similar to *Echinacea* 'Santa Fe'. The individual flowers of SOMBRERO® Hot Coral are some of the smallest in the trial at 3.5" wide, but they bloom in abundance over a prolonged period from early July though early August. During that time, the flowers undergo some changes, not just in color but also in shape. While the tops of the petals are a bright monarch-orange, the undersides are a contrasting pink and white. The petals are curled as the flowers begin to bloom allowing both colors to be seen simultaneously creating a kaleidoscope effect. The petals eventually unfurl, reflex, and intensify in color before fading to subtle pink pastels in late summer.

Echinacea 'Julia' ★★★★½

The flowers of *Echinacea* 'Julia' are particularly noteworthy and share similar orange tones to the South American Julia butterfly for which it is named. The petals of 'Julia' showcase the same two-tone quality that SOMBRERO® Hot Coral displays in the early season but on a larger flower. As the petals mature, they begin to express an attractive bicolor effect. The petals are a deep rosy pink closest to the cone and vibrant tangerine at their tips. Near the end of the five-week bloom period in mid-July the flowers trade their vibrancy for soft pastels in a manner similar to *Echinacea* 'POST301' (Postman).

HONORABLE MENTIONS

The following *Echinacea* received ratings between 4.0 and 4.3, just shy of the top performers, but they still deserve consideration for mid-Atlantic gardens. *Echinacea* SOMBRERO® Blanco, *Echinacea* PowWow® White, and *Echinacea purpurea* 'Ruby Star' were also among the top ten pollinator-preferred plants in our trial and would make excellent additions to pollinator gardens in the region.

***Echinacea* 'Balsomblanc' (SOMBRERO® Blanco)**

***Echinacea purpurea* 'Baby Swan White'**

***Echinacea* 'Balsomenco' (SOMBRERO® Flamenco Orange)**

***Echinacea purpurea* 'PAS702918' (PowWow® White)**

***Echinacea purpurea* 'Ruby Star'**

***Echinacea purpurea* 'Vintage Wine'**

ECHINACEA SPECIES

Echinacea species are the building blocks of many of today's coneflower hybrids and cultivars. Although they often lack the intense colors of their progeny, these plants appeal to gardeners who prefer the subtle beauty that the various coneflower species offer. Several *Echinacea* species were included in our trial, although none were designated a top performer. The soil conditions in our Trial Garden are not ideal for plants that prefer to grow in leaner soils and, as a result, many species suffered in ratings due to floppy habits. With additional thought and planning, several species could be excellent garden subjects. The five *Echinacea* species showcased below represent frequently encountered and commercially available *Echinacea* included in our trial.

Echinacea angustifolia

(narrow-leaved purple coneflower)

Echinacea angustifolia inhabits a large range in central North America stretching from Texas north to Alberta and Saskatchewan. Highly ornamental in its own right, this species is prized for its herbal and medicinal qualities. Native Americans commonly utilized *Echinacea angustifolia* for this purpose, and it has even been suggested that human transport of seeds may have contributed to the far-reaching range of the species. *Echinacea angustifolia* displayed poor vigor and an ungainly habit in our trials. Well drained, prairie-like conditions would have likely resulted in more robust plants.

Echinacea pallida (pale purple coneflower)

The flowers of *Echinacea pallida* are delicate and graceful with petals that hang from the cone like tassels on an antique lamp. While *Echinacea pallida* tolerated the conditions in the Trial Garden, they would be more at home in drier soils surrounded by other plants to help maintain an upright habit. Their native range is primarily in the southeastern and central US where they grow happily in well drained prairies and grasslands. One species not included in our trial, *Echinacea simulata*, appears very similar to *Echinacea pallida* but can be distinguished by its yellow instead of white pollen.

Echinacea paradoxa (yellow coneflower)

Echinacea paradoxa is a unique species among coneflowers. All other *Echinacea* species produce flowers that are variations of purple, pink, and white, while the flowers of *Echinacea paradoxa* are a pure and unapologetic yellow. Incorporation of this trait in breeding programs has broadened the spectrum of coneflower colors to include yellows, oranges, and reds. In our trial, *Echinacea paradoxa* produced vigorous, disease-free plants that were some of the first to bloom in mid to late June. Like many other species, *Echinacea paradoxa* flopped early in the year, likely due to the excess moisture and nutrients in the Trial Garden soil. This species is taprooted and is very tolerant of dry conditions in its native range in the Ozarks.

Echinacea purpurea (purple coneflower)

Echinacea purpurea is the most popular and widely available species in the market. This is partially due to its adaptability to average garden conditions and its tolerance for light shade and rich soils. Many of the plants in our trial, including top performer *Echinacea purpurea* 'Pica Bella', trace their origins to this plant. While many cultivars of this species feature more compact and sturdier habits, the straight species reaches a height of 4' and has a tendency to list late in the season. Purple coneflower was the preferred species of pollinators in our trial, ranking second overall for its ability to attract bees, wasps, and butterflies.

Echinacea tennesseensis (Tennessee purple coneflower)

Native to only a handful of counties in Tennessee, *Echinacea tennesseensis* is a conservation success story. Once a federally endangered plant, concerted conservation efforts resulted in its delisting as an endangered species in 2011. Our trial included the straight species and the widely grown cultivar *Echinacea tennesseensis* 'Rocky Top', both of which performed similarly. A unique feature of this species is its predominately eastward-facing flowers that feature attractive upturned petals. The drought tolerance of the species is well documented in its natural habitat, and the floppy habits observed in the trial could be mitigated in leaner soils.

Additional, but less frequently encountered species include *Echinacea atrorubens*, *Echinacea laevigata*, *Echinacea sanguinea*, and *Echinacea simulata*.

ECHINACEA CULTIVATION

Echinacea are versatile perennials that are used to great effect in both formal and informal settings at Mt. Cuba Center. Our top performing coneflowers make excellent low-maintenance additions to gardens thanks to their bright colors and tidy appearance. Many *Echinacea*, both cultivars and species, would perform well in informal gardens and naturalistic designs if provided with excellent drainage and neighboring plants for support.

Echinacea purpurea 'Pica Bella' in Mt. Cuba Center's formal gardens

Deadheading/Cutbacks

While the majority of the *Echinacea* in our trial bloomed for a five-week period from the end of June through July, gardeners can prolong the display of many coneflowers through deadheading. By removing flowers that have finished blooming, the energy that would typically be channeled to seed production is rerouted into producing more flowers. This practice might benefit pollinating insects due to an extended flowering time, however the food source for seed-eating birds, particularly goldfinches, would be delayed or eliminated altogether. We recommend allowing *Echinacea* to naturally complete their blooming cycle to provide a balance of benefits for birds and insects. Delaying a garden cutback until spring additionally allows the ornamental qualities of the *Echinacea* seed heads to be enjoyed in the winter landscape.

Volunteer seedling amongst *Echinacea* 'Julia' in the Trial Garden

Echinacea Garden Seedlings

A common complaint about *Echinacea* is their perceived tendency to "revert" to different color forms in garden settings. While it can appear that some plants make spontaneous changes in color and habit after years of consistency, seedlings are most often at the core of this confusion. Coneflowers are not self-fertile, meaning that they can't produce seed without being fertilized by pollen from a different flower. Seedlings will remain consistent in appearance if the two coneflower parents share similar traits or are of the same species. If there is a diversity of genetically distinct *Echinacea* present, as in the Trial Garden, seedlings have the potential to be highly variable. The ability for *Echinacea* to hybridize has been used to great advantage by plant breeders but can just as easily occur in a garden with the help of pollinating insects. After pollination, any seeds that are not consumed by goldfinches in late summer germinate the following spring, each of them a unique and potentially beautiful plant. While most of these seedlings were removed in the Trial Garden, they occasionally evaded detection. In some cases, these rogue plants appeared very similar to an intentionally planted cultivar, at least until they bloomed. These garden volunteers can potentially outcompete a struggling parent plant or simply fill gaps where the original coneflower has died, making it appear that a plant has undergone a sudden change. Even with their potential for variability, garden origin seedlings can ensure the persistence of *Echinacea* in cultivated settings beyond the lifespan of the parent plants.

DISEASES AND PESTS

There were several diseases that were observed in our *Echinacea* trial. Some of these, including powdery mildew and eriophyid mites, proved to be superficial and did not result in any major concerns for the overall health of the infected plants. However, one disease, aster yellows was a significant problem in our evaluation.

Aster Yellows

Aster yellows is an incurable systemic disease that was responsible for the greatest loss of *Echinacea* plants in the trial (24%). The pathogen itself is a phytoplasma, a microorganism that is spread from plant to plant by leafhopper insects. Since there is no remedy for this disease, the most effective means for control is the prompt removal of infected plants when obvious symptoms are observed. Fortunately, the symptoms of aster yellows are easily identified in *Echinacea*. Infected plants often display apple-green flowers that produce aberrant, leafy growths, particularly from the center of the flower. Yellowing foliage can also indicate infection but is less reliable and easy to confuse with other plant health issues such as nutrient deficiencies. Due to the large number and proximity of susceptible plants in the Trial Garden, the rates of infection were much higher than would be observed in average garden conditions.

Floral deformities

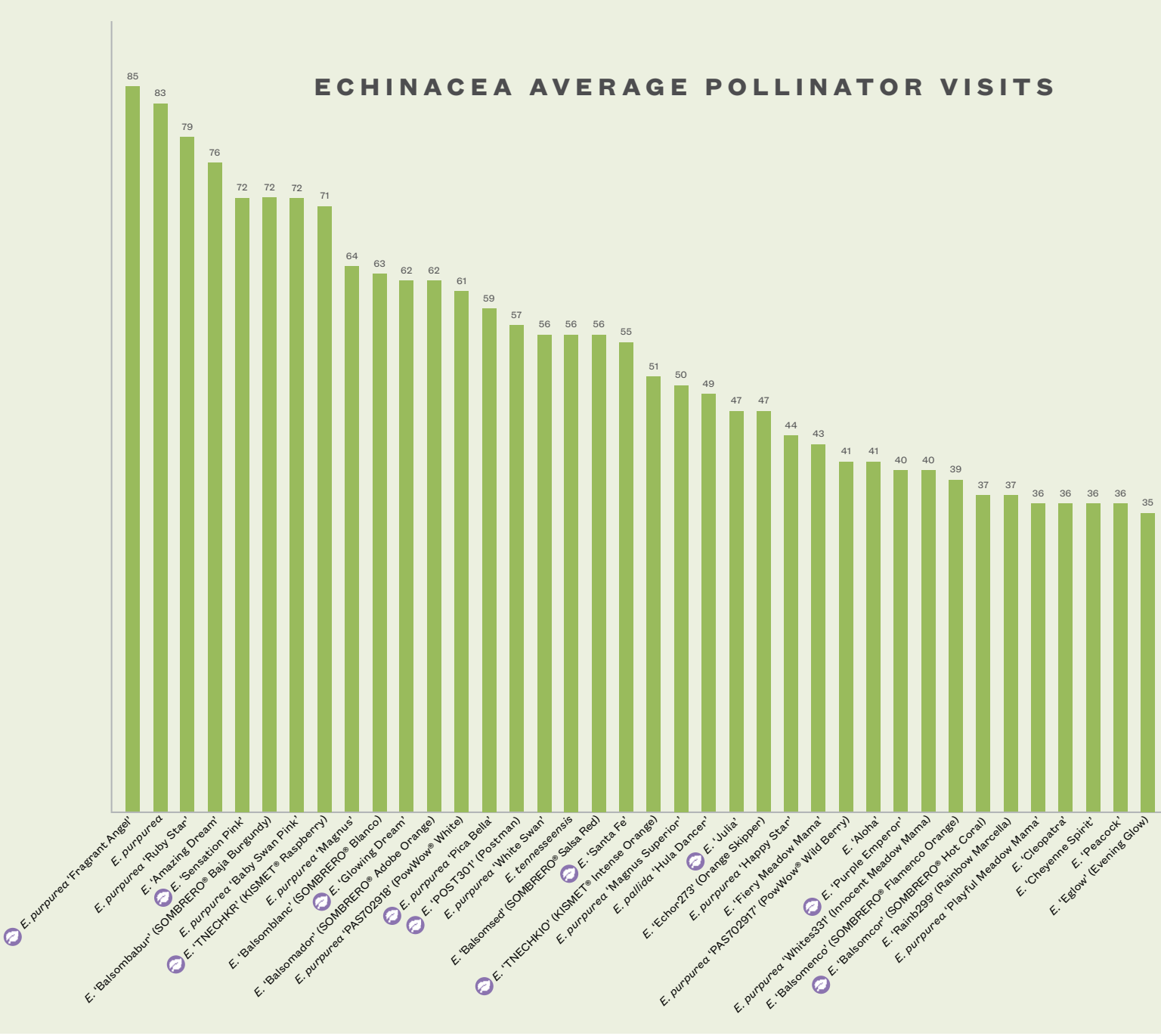
Greening flowers and yellowing foliage

Eriophyid mite damage

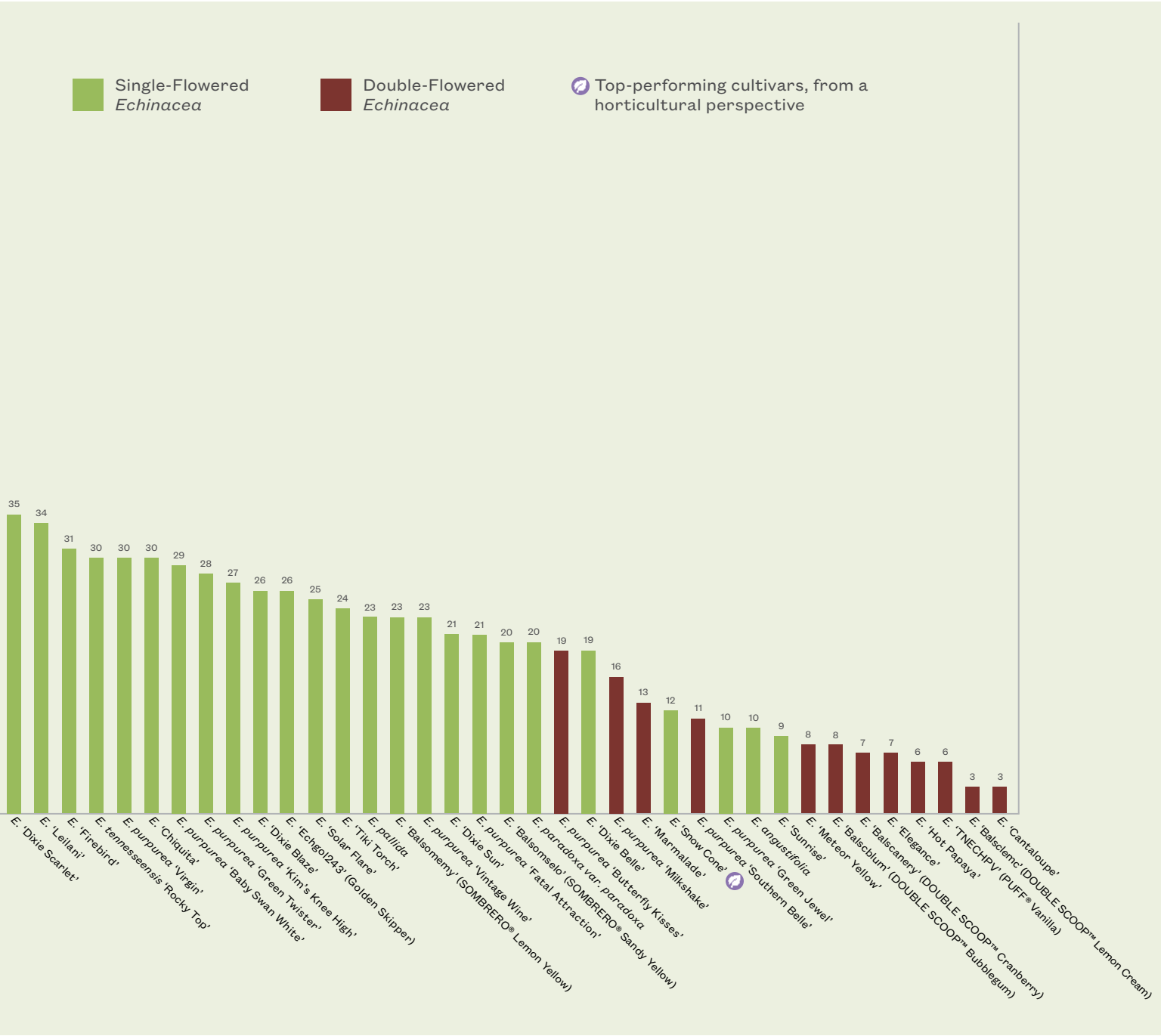
Eriophyid Mites

The presence of eriophyid mites in *Echinacea* can cause floral symptoms that appear similar to aster yellows but are far less detrimental to the health of the plant. These mites live and reproduce in the flowers of *Echinacea* and cause unusual growth in the floral cones. Symptoms caused by eriophyid mites can be differentiated from an aster yellows infection by the localized damage and by the lack of green leafy growths originating from the flowers. Eriophyid mites can be controlled by removing and disposing of infected flowers, a less drastic alternative than the removal of an entire plant.

MT. CUBA CENTER'S VOLUNTEER POLLINATOR WATCH TEAM observed and recorded the number of pollinating insects visiting each of the coneflower accessions in our trial in 2018 and 2019. The primary goal of these observations was to determine which *Echinacea* cultivars attracted the most pollinating insects, with an eye for comparing the differences between single and double flowers. On a near-daily basis during the *Echinacea* blooming season, one plant of each accession was observed for a single minute, and any bees, wasps, and butterflies that visited that plant were recorded. Insect observations were then averaged between 2018 and 2019 to determine the *Echinacea* most visited by pollinators in our trial. The top 15 pollinator-preferred *Echinacea* were single-flowered species and cultivars. Of those, 7 were representations of *Echinacea purpurea* and its related cultivars.



While double-flowered coneflowers made up 16 percent of the total trialed *Echinacea*, they received just 4 percent of average pollinator visits. No double-flowered cultivar received more than 20 visits over the length of the evaluation, and the majority received less than 10. On the other hand, the top 15 ecological performers (all single-flowered plants) received an average of 69 visits. Another interesting result of this pollinator evaluation was the intersection between top horticultural performers and top ecological performers. Six of our top horticultural performing coneflowers, *Echinacea purpurea* 'Fragrant Angel', *E.* 'Sensation Pink', *E.* 'TNECHKR' (KISMET™ Raspberry), *E.* 'Glowing Dream', *E. purpurea* 'Pica Bella', and *E.* 'POST301' (Postman), received top marks from pollinators as well. This short list makes plant selection easy for those who want a great garden plant that also supports insects.

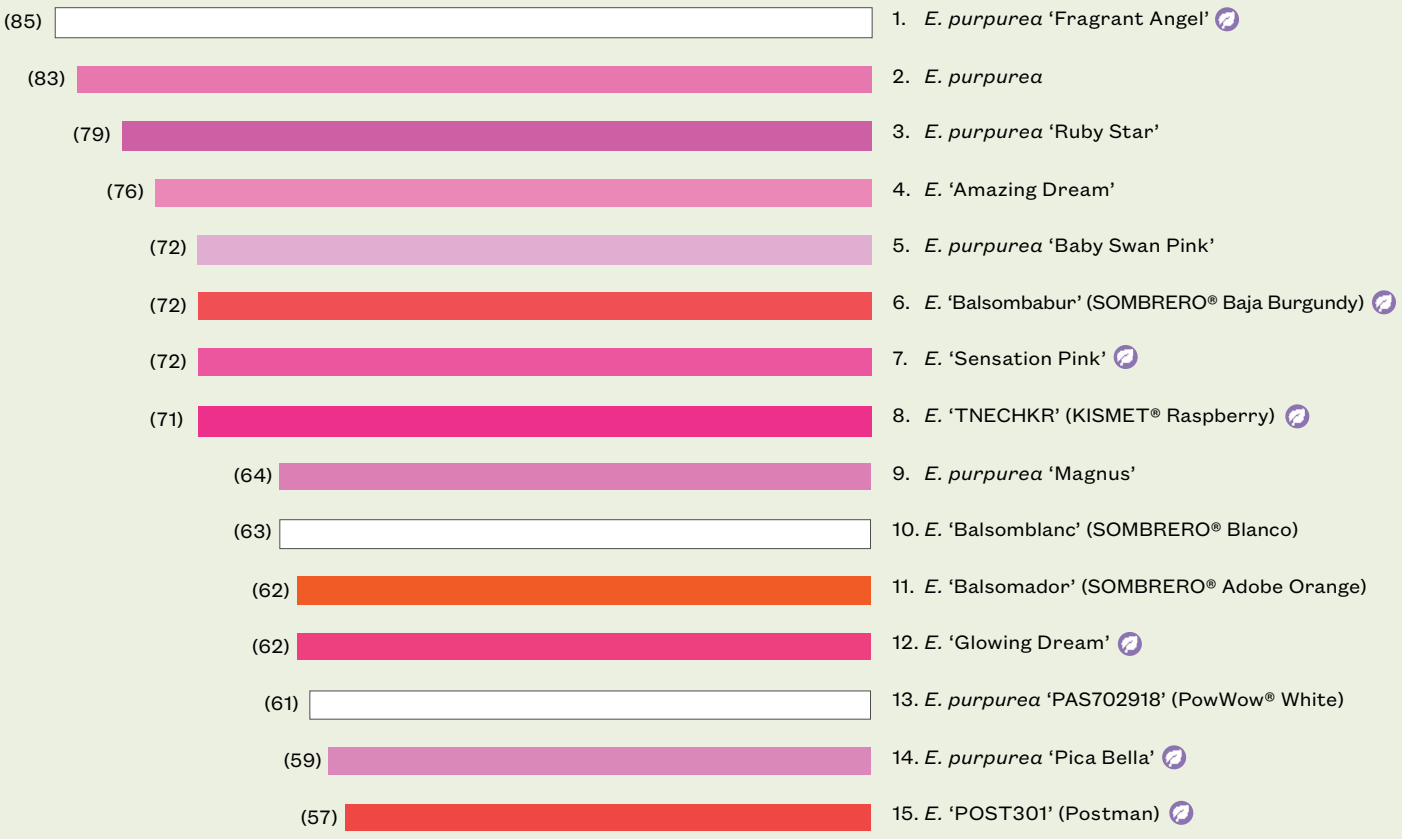


Bumblebee (*Bombus* sp.) feeding on flowers of *Echinacea purpurea* 'Fragrant Angel'

BEST *ECHINACEA* FOR BEES, WASPS, AND BUTTERFLIES

The majority of the top 15 pollinator-preferred *Echinacea* are cultivars with pink and purple flowers, although this group only constituted 40 percent of the 75 *Echinacea* accessions in the trial. Pink and purple were followed by white, red, and orange. While the color of the rays may play a role in insect attraction, other factors such as colors and patterns beyond our visible spectrum, fragrance, floral morphology, and plant habit, can all have an effect on pollinators. However, it is clear that there was a strong relationship between top horticultural and ecological performing plants with six cultivars appearing on both lists. Top-performing cultivars, from a horticultural perspective, are indicated with this symbol in the chart below:

BEST ECHINACEA FOR POLLINATORS



Monarch butterfly (*Danaus plexippus*)

Red admiral butterfly (*Vanessa atalanta*)

Butterfly Visitation

The vast majority of the pollinators that visited the *Echinacea* in our trial were bees and wasps, with butterflies making up only 5 percent of the total visitations. Most *Echinacea* in our trial averaged two butterfly visits each year. The one exception to this rule was *Echinacea purpurea* 'Fragrant Angel', the coneflower with the most pollinator visitations in the trial. Fourteen percent of the pollinators that visited *E.* 'Fragrant Angel' were butterflies, a factor that propelled this coneflower to the top of the list. While butterflies remained a minor visitor overall, they always seemed to be present in the Trial Garden. Though individual species of butterflies were not differentiated in our tallies, it was apparent that a large proportion of the butterflies that visited *Echinacea* were comprised of red admirals and monarchs.

American goldfinch (*Spinus tristis*) feeding on *Echinacea* seeds

Goldfinches

The *Echinacea* trial plot was a favorite spot for American goldfinches. They were a common sight in the Trial Garden in late summer and early fall as they fed on the ripening coneflower seeds. While no official data were collected on their preferred plants, the observations indicated the majority of their efforts were focused on single-flowered species and cultivars that produced plentiful and accessible seed.

Echinacea	Rating		Avg. HxW	Flower Color	Bloom Time	Flower Type	Pollinator Rank
E. 'Aloha'	3.7	★★★½	36" x 29"	orange	late June–early Aug	single	28
E. 'Amazing Dream'	3.1	★★★	32" x 37"	pink	late June–late July	single	4
E. angustifolia	2.0	★★	26" x 23"	pink	mid June–early July	single	66
E. 'Balscanery' (DOUBLE SCOOP™ Cranberry)	3.4	★★★½	28" x 38"	pink	late June–late July	double	71
E. 'Balscblum' (DOUBLE SCOOP™ Bubblegum)	3.6	★★★½	30" x 34"	pink	late June–late July	double	69
E. 'Balsclemc' (DOUBLE SCOOP™ Lemon Cream)	2.2	★★	22" x 24"	yellow	late June–late July	double	75
E. 'Balsomador' (SOMBRERO® Adobe Orange)	3.3	★★★½	28" x 28"	orange	late June–late July	single	11
E. 'Balsombabur' (SOMBRERO® Baja Burgundy)	3.8	★★★★	26" x 26"	pink	late June–late July	single	6
E. 'Balsomblanc' (SOMBRERO® Blanco)	4.2	★★★★	27" x 25"	white	late June–late Aug	single	10
***E.* 'Balsomcor' (SOMBRERO® Hot Coral)**	**4.3**	**★★★★½**	**21" x 22"**	**coral**	**late June–mid July**	**single**	**33**
E. 'Balsomenco' (SOMBRERO® Flamenco Orange)	4.2	★★★★	34" x 30"	orange	late June–late July	single	31
E. 'Balsomsed' (SOMBRERO® Salsa Red)	3.8	★★★★	22" x 28"	red	late June–early Aug	single	18
E. 'Cantaloupe'	2.6	★★½	26" x 28"	orange	mid June–early Aug	double	74
E. 'Cheyenne Spirit'	3.8	★★★★	26" x 24"	mixed	mid June–late July	single	34
E. 'Chiquita'	2.2	★★	24" x 27"	yellow	early July–early Aug	single	44
E. 'Cleopatra'	2.5	★★½	28" x 30"	yellow	late June–mid July	single	36
E. 'Dixie Belle'	2.2	★★	18" x 24"	pink	early July–early Aug	single	60
E. 'Dixie Blaze'	3.0	★★★	38" x 36"	orange	late June–late July	single	48
E. 'Dixie Scarlet'	3.6	★★★½	29" x 22"	red	late June–mid July	single	39
E. 'Eglow' (Evening Glow)	3.5	★★★½	35" x 36"	orange	late June–late July	single	38
E. 'Fiery Meadow Mama'	2.7	★★½	30" x 36"	orange/pink	late June–late July	single	26
E. 'Firebird'	2.6	★★½	34" x 24"	orange	late June–mid July	single	41
***E.* 'Glowing Dream'**	**4.5**	**★★★★½**	**32" x 32"**	**coral**	**mid June–mid July**	**single**	**12**
E. 'Echgol243' (Golden Skipper)	2.2	★★	18" x 16"	orange	late June–late July	single	49
E. 'Hot Papaya'	2.7	★★½	36" x 34"	red	late June–late July	double	72
***E.* 'Julia'**	**4.3**	**★★★★½**	**24" x 20"**	**orange**	**late June–mid July**	**single**	**24**
E. 'Leilani'	3.1	★★★	43" x 40"	orange	late June–late July	single	40
E. 'Marmalade'	2.6	★★½	38" x 46"	orange	mid June–mid July	double	62
E. 'Meteor Yellow'	3.3	★★★½	34" x 34"	yellow	early July–mid Aug	double	68
E. pallida	3.6	★★★½	40" x 40"	pink	mid June–early July	single	52
E. pallida 'Hula Dancer'	3.7	★★★½	44" x 44"	pale pink	mid June–early July	single	22
E. paradoxa var. paradoxa	3.7	★★★½	38" x 40"	yellow	early June–late June	single	58
E. purpurea 'Playful Meadow Mama'	3.6	★★★½	30" x 24"	orange/pink	late June–early July	single	35
***E.* 'POST301' (Postman)**	**4.6**	**★★★★½**	**34" x 32"**	**orange/red**	**late June–mid July**	**single**	**15**
***E.* 'Purple Emperor'**	**4.4**	**★★★★½**	**34" x 25"**	**pink**	**late June–mid July**	**single**	**29**
E. purpurea	3.6	★★★½	48" x 40"	pink	late June–late July	single	2
E. purpurea 'Baby Swan Pink'	3.5	★★★½	30" x 33"	pink	late June–late July	single	5
E. purpurea 'Baby Swan White'	4.2	★★★★	30" x 20"	white	late June–late July	single	45
E. purpurea 'Fatal Attraction'	3.4	★★★½	23" x 20"	pink	late June–mid July	single	55
***E. purpurea* 'Fragrant Angel'**	**4.4**	**★★★★½**	**38" x 34"**	**white**	**late June–late July**	**single**	**1**
E. purpurea 'Green Jewel'	2.8	★★★	36" x 20"	green	mid July–mid Aug	single	65
E. purpurea 'Green Twister'	3.3	★★★½	36" x 30"	green/pink	early July–early Aug	single	46
E. purpurea 'Happy Star'	2.8	★★★	37" x 28"	white	late June–mid July	single	25
E. purpurea 'Kim's Knee High'	2.2	★★	24" x 20"	pink	late June–late July	single	47
E. purpurea 'Magnus'	3.9	★★★★	40" x 40"	pink	early July–late July	single	9
E. purpurea 'Magnus Superior'	2.6	★★½	44" x 45"	pink	early July–late July	single	21
E. purpurea 'Milkshake'	3.4	★★★½	30" x 30"	white	late June–late July	double	61

Echinacea	Rating		Avg. HxW	Flower Color	Bloom Time	Flower Type	Pollinator Rank
E. purpurea 'PAS702917' (PowWow® Wild Berry)	3.1	★★★	22" x 18"	pink	late June–early Aug	single	27
E. purpurea 'PAS702918' (PowWow® White)	4.2	★★★★	36" x 28"	white	late June–early Aug	single	13
***E. purpurea* 'Pica Bella'**	**5.0**	★★★★★	**34" x 30"**	**pink**	**late June–mid July**	**single**	**14**
E. purpurea 'Ruby Star'	4.1	★★★★	44" x 46"	pink	late June–late July	single	3
E. purpurea 'Vintage Wine'	4.0	★★★★	24" x 24"	pink	late June–late July	single	53
E. purpurea 'Virgin'	3.1	★★★	28" x 27"	white	early July–early Aug	single	43
E. purpurea 'White Swan'	2.7	★★½	44" x 30"	white	early July–late July	single	16
E. 'Rainb299' (Rainbow Marcella)	3.4	★★★½	30" x 30"	pink/orange	late June–mid July	single	32
***E.* 'Santa Fe'**	**4.8**	★★★★★	**24" x 26"**	**red/pink**	**late June–late July**	**single**	**19**
***E.* 'Sensation Pink'**	**4.9**	★★★★★	**31" x 32"**	**pink**	**mid June–late July**	**single**	**7**
***E.* 'Snow Cone'**	**4.6**	★★★★½	**24" x 19"**	**white**	**late June–late July**	**single**	**63**
E. 'Sunrise'	2.3	★★½	32" x 24"	yellow	late June–mid July	single	67
E. tennesseensis	3.5	★★★½	40" x 42"	pink	late June–mid July	single	17
E. tennesseensis 'Rocky Top'	3.3	★★★½	40" x 50"	pink	late June–late July	single	42
E. 'Tiki Torch'	3.6	★★★½	38" x 36"	orange	late June–early Aug	single	51
***E.* 'TNECHKIO' (KISMET® Intense Orange)**	**4.4**	★★★★½	**23" x 25"**	**orange**	**late June–early Aug**	**single**	**20**
***E.* 'TNECHKR' (KISMET® Raspberry)**	**4.7**	★★★★½	**32" x 32"**	**pink**	**late June–late July**	**single**	**8**
E. 'TNECHPV' (PUFF® Vanilla)	3.5	★★★½	24" x 20"	white	mid June–early Aug	double	73

Rating Key: 5=excellent, 4=good, 3=fair, 2=poor, 1=very poor. Plants in **bold** are top performers. Visit **mtcubacenter.org/research/trial-garden** for detailed information.

PLANTS THAT DID NOT COMPLETE THE TRIAL

Echinacea	Years of Survival	Avg. HxW	Flower Color	Bloom Time	Flower Type	Pollinator Rank
E. 'Balsomemy' (SOMBRERO® Lemon Yellow)	2	24" x 24"	yellow	late June–early Aug	single	54
E. 'Balsomselo' (SOMBRERO® Sandy Yellow)	1	28" x 33"	yellow	early July–early Aug	single	57
E. 'Dixie Sun'	1	28" x 28"	orange	late June–early Aug	single	56
E. 'Elegance'	1	38" x 25"	pink	late June–early Aug	double	70
E. purpurea 'Whites331' (Innocent Meadow Mama)	1	26" x 20"	white	early July–late Aug	single	30
E. 'Echor273' (Orange Skipper)	1	22" x 24"	orange	late June–late July	single	23
E. 'Peacock'	2	30" x 25"	orange pink	late June–mid July	single	37
E. purpurea 'Butterfly Kisses'	1	24" x 21"	pink	late June–early Aug	double	59
E. purpurea 'Southern Belle'	1	33" x 33"	pink	mid June–mid Sept	double	64
E. 'Solar Flare'	1	34" x 30"	red	late June–late Aug	single	50

ABOUT THE ECHINACEA TRIAL

This evaluation took place at Mt. Cuba Center, located near Wilmington, DE (USDA Hardiness Zone 7a/6b). Seventy-five taxa, including five species, were trialed over a three-year period (2018–2020). Plants were evaluated to assess their habit, vigor, floral display, and disease resistance. Five plants of each taxon were placed linearly on 2' centers. They were grown in full sun in a soil best described as clay-loam with a pH near 6.5. Each species or cultivar was measured weekly and assigned two different ratings, each on a scale of 1–5 (1 being very poor and 5 being excellent). The floral display rating was based on flower coverage and overall appeal and then adjusted for bloom periods longer or shorter than average. The rating for plant/foliage quality included attributes such as habit, vigor, and foliage retention. The plant and floral ratings were then averaged, after which points were added or deducted for the death of two or more plants. Additionally, 0.3 points were awarded to the final score of the top 15 pollinator-preferred *Echinacea*. Throughout the trial, plants were given minimal care. No fungicides were used, and supplemental water was provided only during the first year to encourage establishment and during any extremely dry periods. This strategy is designed to test the plants in a manner similar to how most landscapes are maintained.

MT. CUBA CENTER
3120 Barley Mill Road
Hockessin, DE 19707
302.239.4244
mtcubacenter.org

ABOUT MT. CUBA CENTER

Mt. Cuba Center is a botanical garden that inspires an appreciation for the beauty and value of native plants and a commitment to protect the habitats that sustain them. Over the past 80 years the landscape at Mt. Cuba Center has been transformed from fallow cornfields into thriving, ecologically functional gardens, thanks to the initiative of the late Mr. and Mrs. Lammot du Pont Copeland.

The gardens at Mt. Cuba Center now represent a variety of habitats, from upland forests and meadows to lowland ponds. With its support of biodiverse communities, Mt. Cuba Center serves as a model for environmentally beneficial gardening. Mt. Cuba Center also conducts original research on native plants in the Trial Garden and manages over 1,000 acres of natural lands. Mt. Cuba Center is open for visitation April-November and classes are offered year-round.

ABOUT TRIAL GARDEN RESEARCH

Mt. Cuba Center's Trial Garden, managed by Sam Hoadley, evaluates native plants and their related cultivars for their horticultural and ecological value. The goal of this research is to provide gardeners and the horticulture industry with information about superior plants for the mid-Atlantic region as well as to highlight the important ecosystem services native plants provide. Mt. Cuba Center has conducted Trial Garden research since 2002, including previously completed evaluations of *Helenium, Phlox, Monarda, Baptisia, Coreopsis, Heuchera, Echinacea,* and asters.

REFERENCES

Boggs, Joe. *Coneflower Cleanup.* The Ohio State University, Buckeye Yard & Garden Online, 27 August, 2017, **https://bygl.osu.edu/node/881**

Carey, Davis and Avent, Tony. *Introduction to Echinacea – Purple Coneflowers.* Plant Delights Nursery, Inc., October, 2012, **https://www.plantdelights.com/blogs/articles/purple-coneflower-echinacea-purpurea-plant**

Commercial Echinacea Production. Alberta Agriculture, Food and Rural Development, 2015, **https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/agdex10531/$FILE/188_20_1.pdf**

Coneflowers. Chicago Botanic Garden, **https://www.chicagobotanic.org/plantinfo/coneflowers**

Klingman, Gerald. *Plant of the Week: Echinacea Hybrids: Sombrero Coneflowers.* University of Arkansas Cooperative Extension Service, 26 June, 2016, **https://www.uaex.edu/yard-garden/resource-library/plant-week/Sombrero-coneflowers-06-26-2105.aspx**

Martin, Susan. *Echinacea – Americana in the Garden.* Piedmont Master Gardeners, June, 2020, **https://piedmontmastergardeners.org/article/echinacea-americana-in-the-garden/**

"*Echinacea* 'Purple Emperor'." Plants Nouveau, **www.plantsnouveau.com**

"*Echinacea* purpurea 'Pica Bella'." Missouri Botanic Garden, **www.missouribotanicalgarden.org**

"*Echinacea* 'Sensation Pink'." **www.perennials.com**

"*Echinacea* 'Snow Cone'." Intrinsic Perennial Gardens, **www.intrinsicperennialgardens.com**

"*Echinacea*." **www.natureserve.org**

"*Echinacea*." **www.usda.gov**

FRONT COVER
Echinacea 'Purple Emperor'