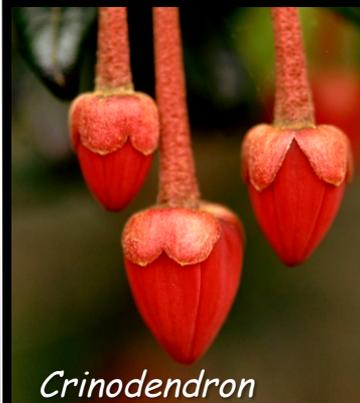


Flowers are Magic



Monodora



Crinodendron



Strongylodon



Dicentra



Thunbergia



Stanhopea



Physoplexis



Orbea

Robert Geneve
Department of Horticulture
University of Kentucky



Flowers are Magic

A closer look at
floral diversity

Pollination



Begonia

Pollination

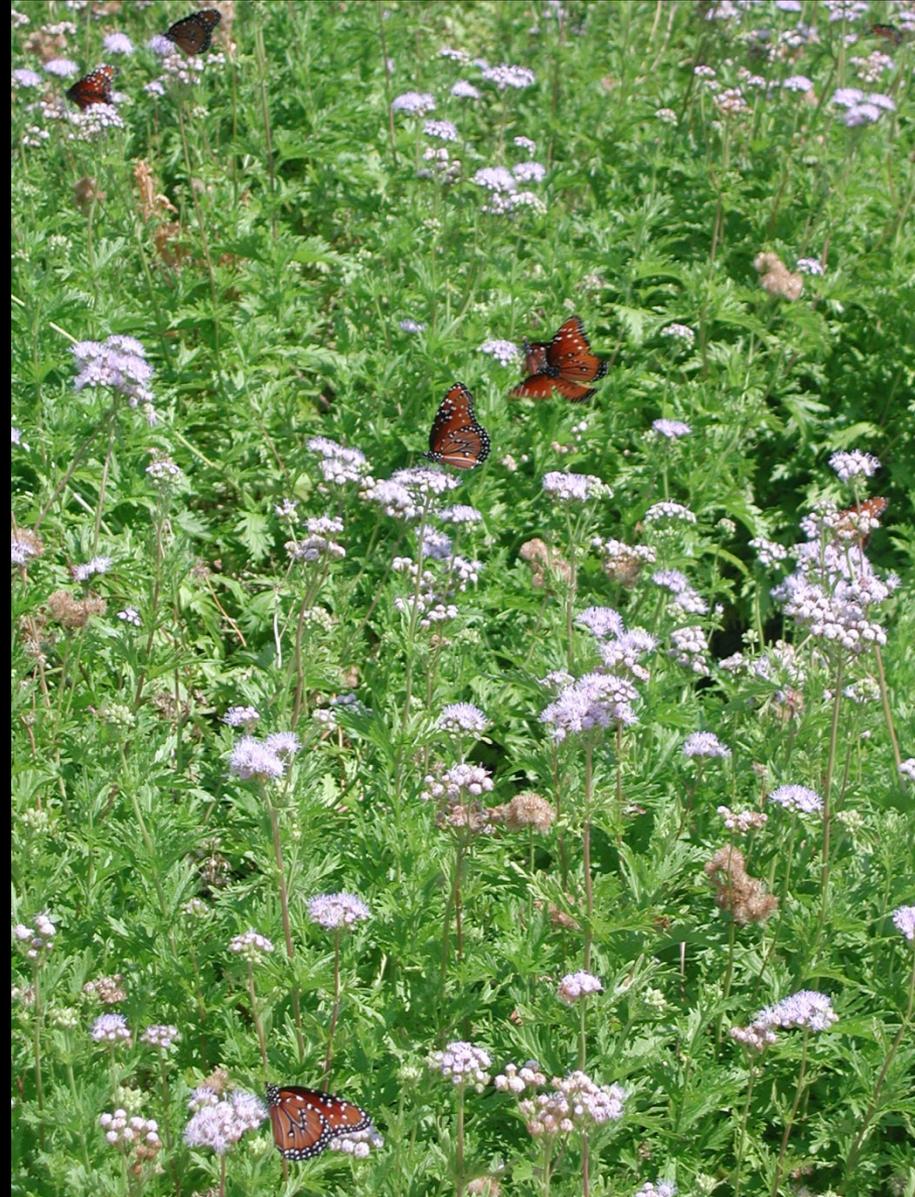
Pollination is the process of transferring pollen from the stamens to the stigmatic surface.



Pollination adaptations

The Flower - Pollinator association

- Nutrient reward for pollinator
- Flower pollination



Pollination adaptations

Pollination syndrome

Adaptations in flowers used to attract specific pollinators is called the Pollination Syndrome.



Pollination adaptations

Pollination syndrome

Common pollinators and related syndromes include:

Bees (Melittophily)

Butterflies (Psychophily)

Moths (Phalaenophily)

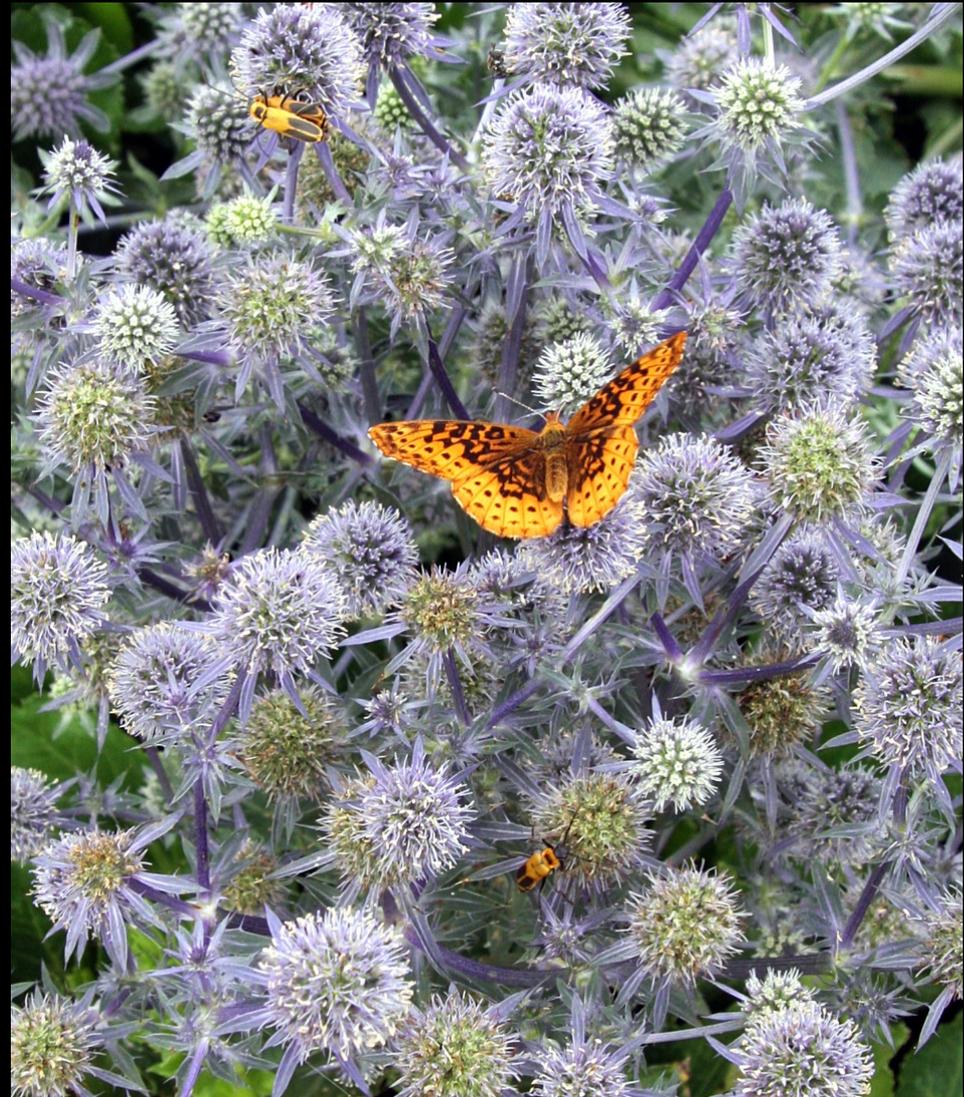
Flies (Myophily)

Carrion flies (Sapromyophily)

Beetles (Canthorophily)

Birds (Ornitophily)

Bats (Chiropterophily)



Pollination adaptations

Floral adaptations

Flowers adaptations related to pollination syndromes include:

Color

Shape

Fragrance

Food rewards



Pollination adaptations

Floral adaptations

Flower adaptations can be designed to attract general pollinators or be highly adapted to attract a limited group of specific pollinators.



Pollination adaptations

Floral adaptations

Specific pollinator



Brighamia

Pollination adaptations

Floral adaptations - Flower shape

Flowers adapted to bee pollination often have colored guides on a landing platform formed by the lower petal.



Monkey flower
(*Mimulus*)

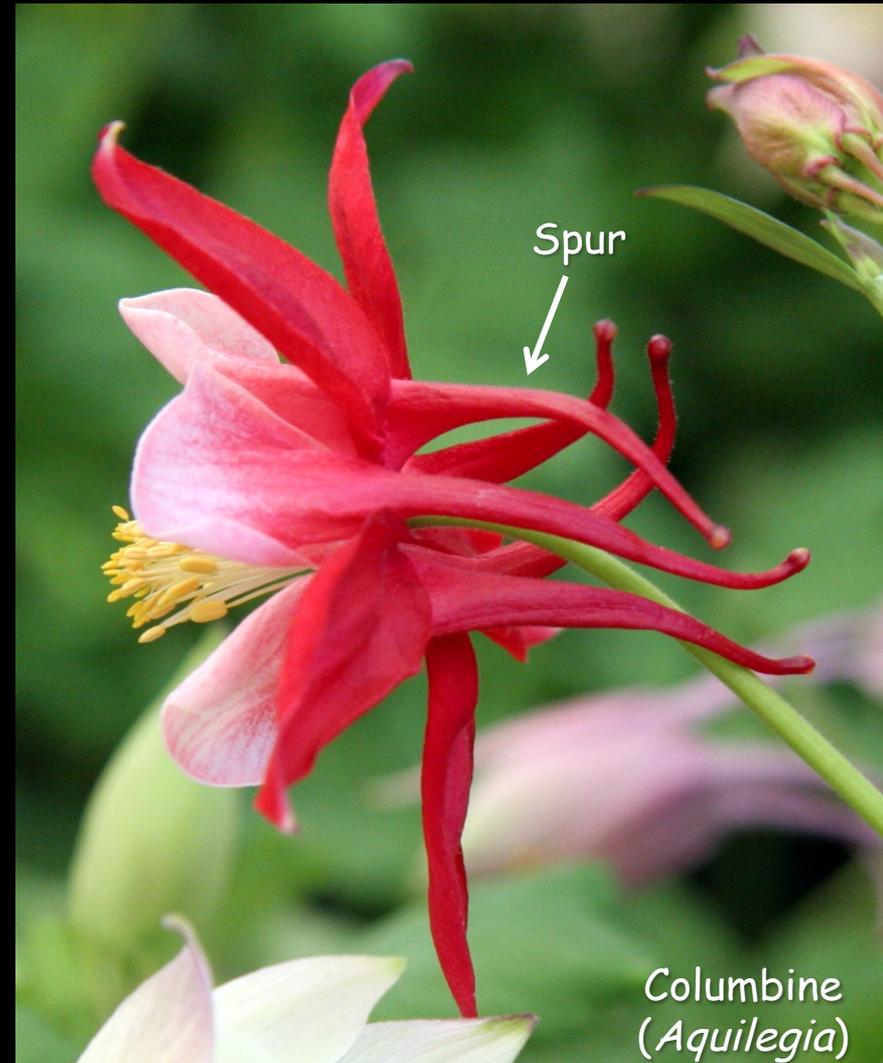
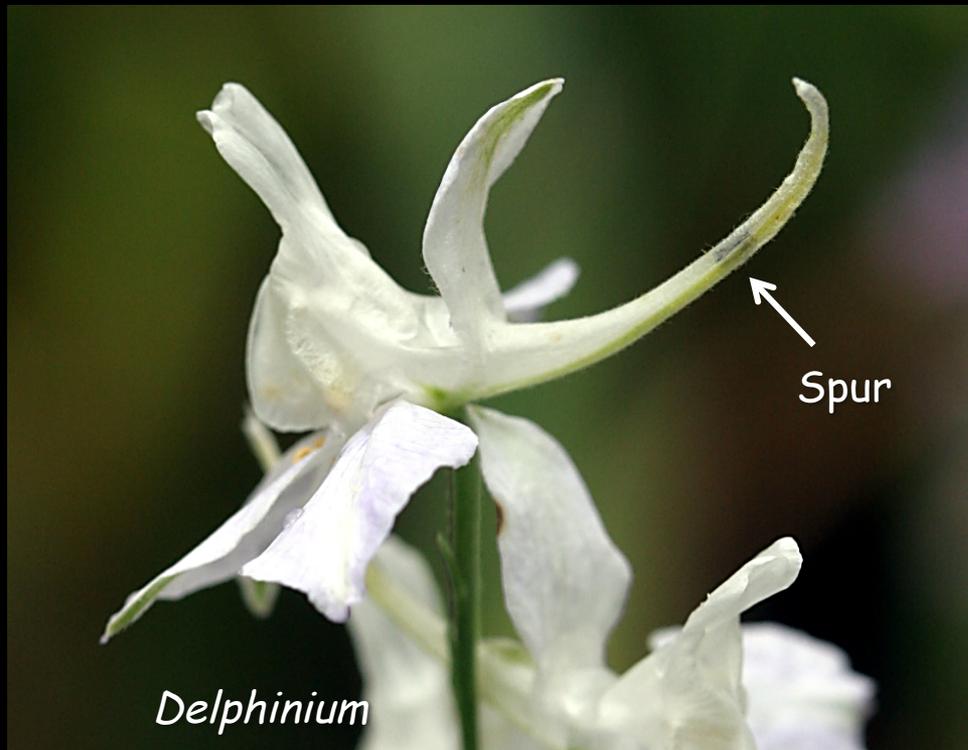


Monk's hood
(*Aconitum*)

Pollination adaptations

Floral adaptations - Flower shape

Flowers adapted for butterfly, moth or hummingbird pollination take advantage of the insect's long mouth parts and produce nectar in spurs at the base of the flower.

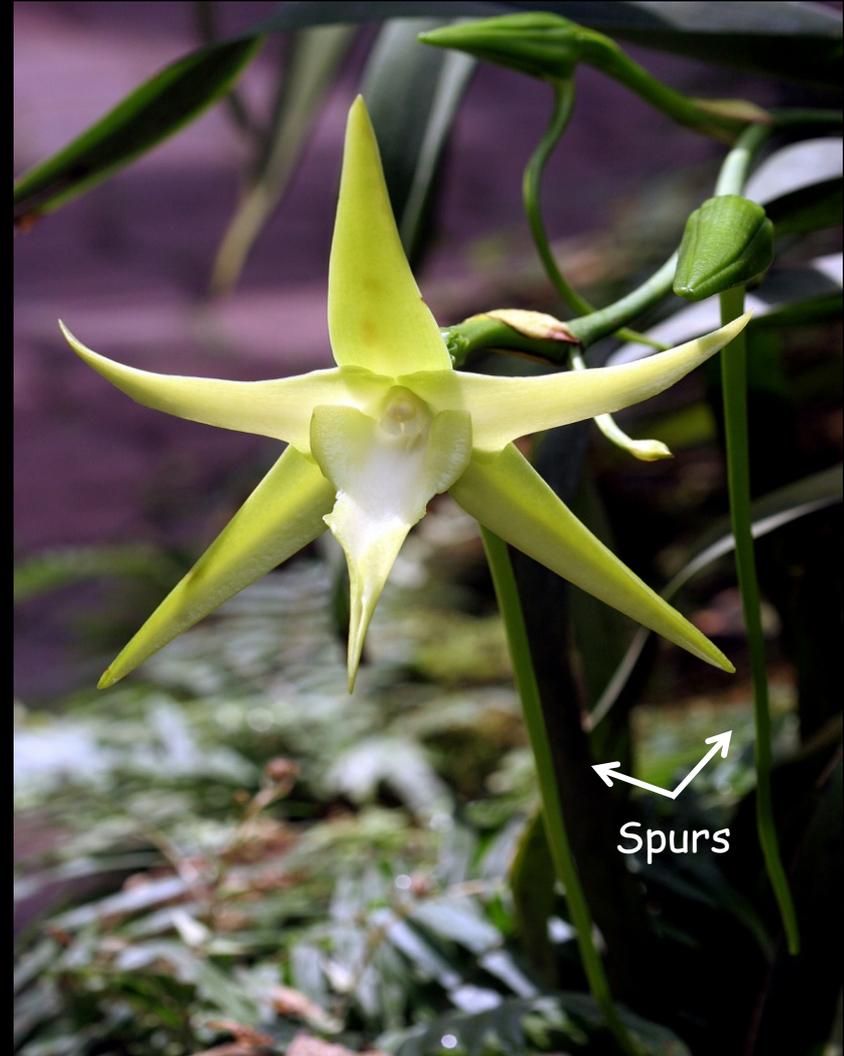


Pollination adaptations

Floral adaptations - Flower shape

Possibly the longest nectar spur occurs in the Darwin orchid (*Angraecum sesquipedale*). The spur can reach 12 inches in length.

Years after Darwin's death, the moth was discovered in Madagascar with a proboscis long enough to reach the nectar in this long spur.



Pollination adaptations

Floral adaptations - Flower shape

Butterflies need to land to feed, so the flowers they visit are often large and open with individual flowers being tubular.



Viceroy butterfly on Zinnia



Morpho butterfly on Heliconia

Pollination adaptations

Floral adaptations - Sweet fragrance

Flower scent is a major pollinator attractant. In many cases, the fragrance is the pleasant perfume odor humans also find appealing.



Tuberose
(*Polianthes*)



Ylang-ylang (*Cananga*)

Flower essential oils are important to the perfume industry such as tuberose and ylang-ylang. Ylang-ylang is the fragrance used to produce Chanel No. 5.

Pollination adaptations

Floral adaptations - Fetid odor

To the opposite extreme in floral odors are those plants that produce a fetid odor to attract carrion flies or dung beetles.



Pollination adaptations

Floral adaptations - Fetid odor

Floral thermogenesis is heat production associated with generating a fetid or strong odor. It tends to enhance and distribute the odor.



Magnolia

Pollination adaptations

Floral adaptations - Fetid odor

Floral thermogenesis occurs in mostly primitive plant families.

Many genera in these families have large flowers with fleshy petals or tepals and emit a strong or fetid odor.



Asimina



Illicium



Nelumbo

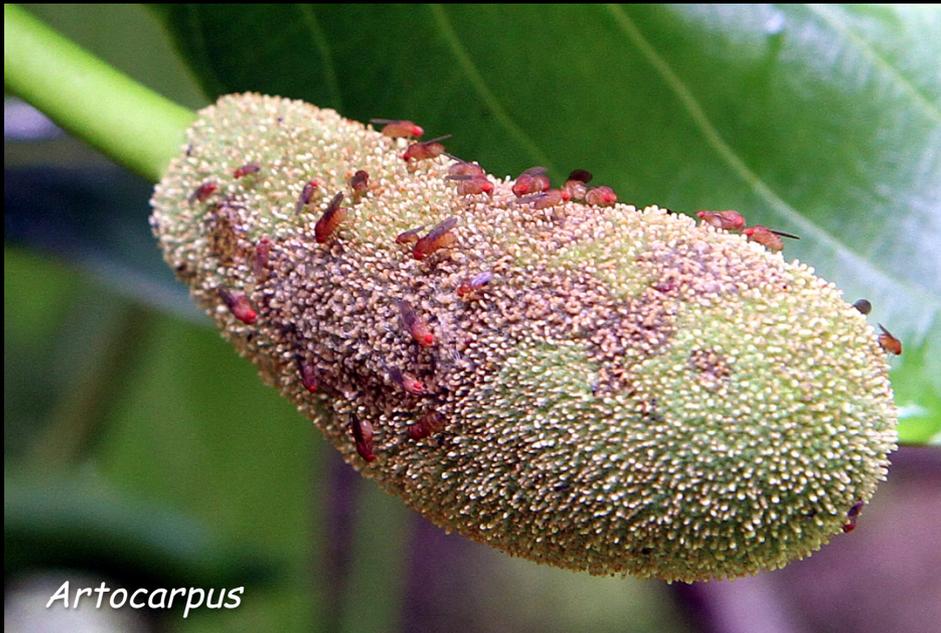
Pollination adaptations

Pollinator rewards

Pollen

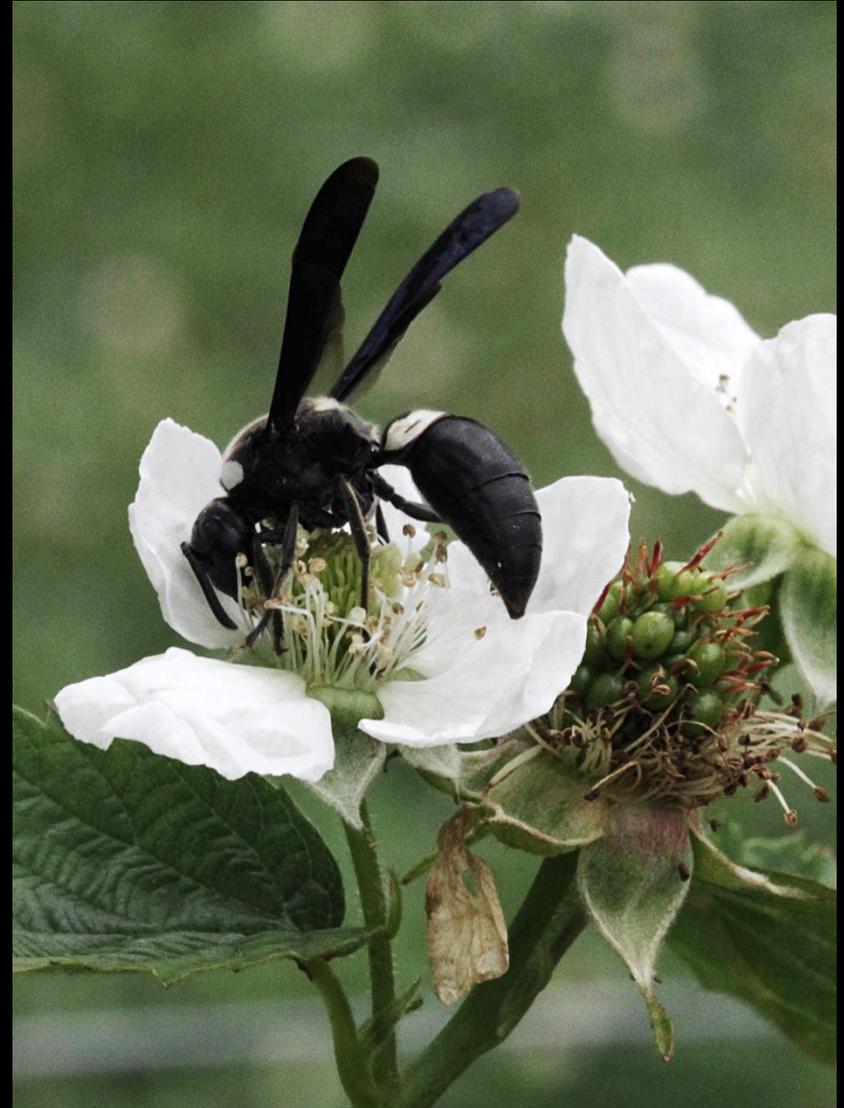
Nectar

Oils and resins



Pollination adaptations

Pollen can be an energy-rich reward.

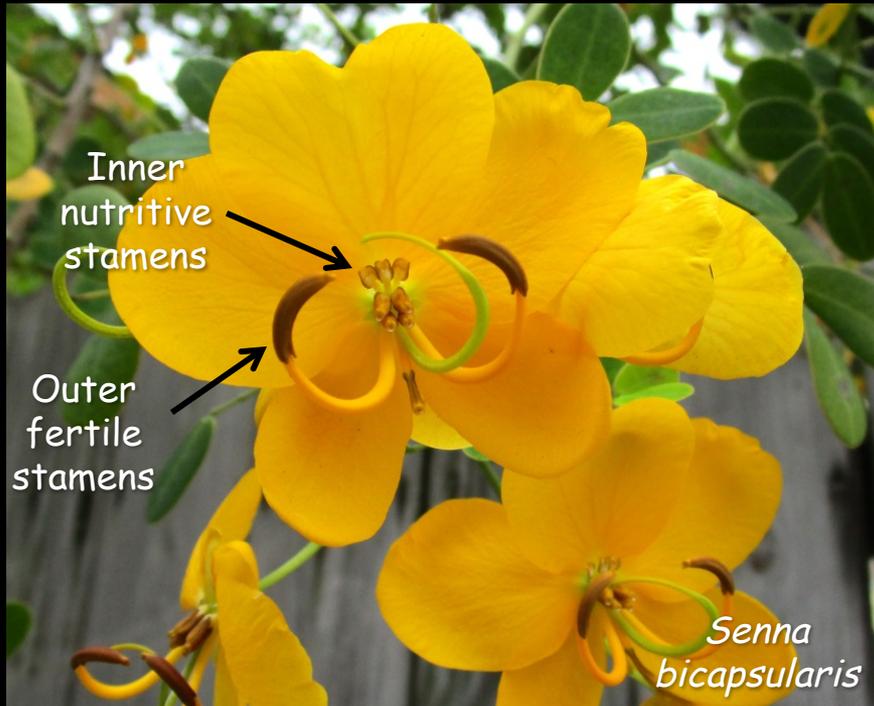


Pollination adaptations

Heteroanthy

The inner stamens are sterile, but provide nutrition for pollinators.

The outer stamens are fertile and dust visiting pollinators.



Pollination adaptations

Floral adaptations - Nectararies

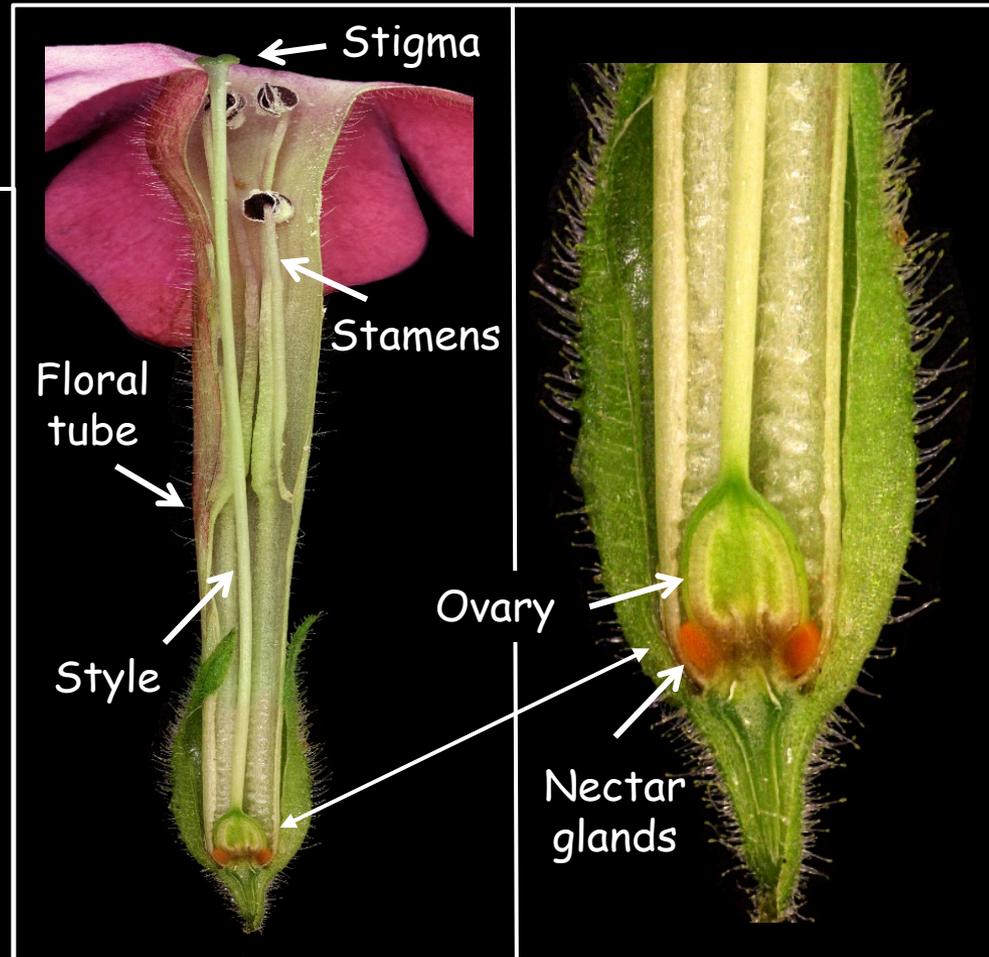
Nectar glands are often produced at the base of long tubular flowers.



Pollination adaptations

Floral adaptations - Nectaries

Flowering tobacco (*Nicotiana*) is a typical tubular flower with floral nectaries on the sides of the ovary.



Pollination adaptations

Floral adaptations - Nectararies

Bumble bee (*Bombus*) is a common "nectar thief".



Pollination adaptations

Floral adaptations - Nectararies

Bumble bees (*Bombus*) can be seen "stealing" nectar from sage and four o'clock flowers. Both flowers have long, narrow floral tubes that would restrict access for bees so they resort to going directly to the nectar source.



Coral Nymph sage (*Salvia coccinea*)



Four o'clock (*Mirabilis*)

Pollination adaptations

Floral adaptations - Nectararies

Ants can also be nectar thieves.



Pollination adaptations

Floral adaptations - Nectararies

Plumbago has sticky trichomes on the sepals to prevent crawling insects from reaching the nectar in the tubular flowers.



Plumbago

Pollination adaptations

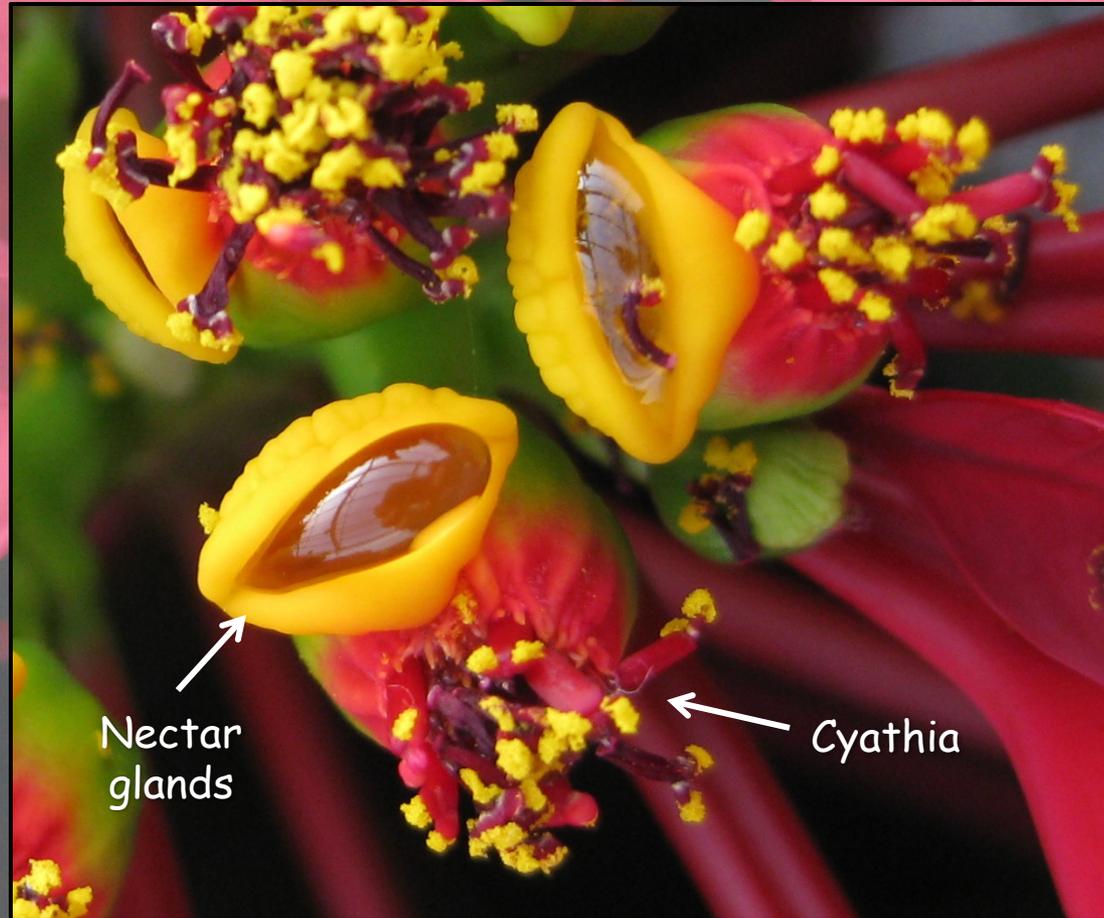
Floral adaptations - Nectararies

Other flowers produce nectar glands at the surface of the flower to attract pollinators.



Pollination adaptations

Floral adaptations - Nectararies



Nectar
glands

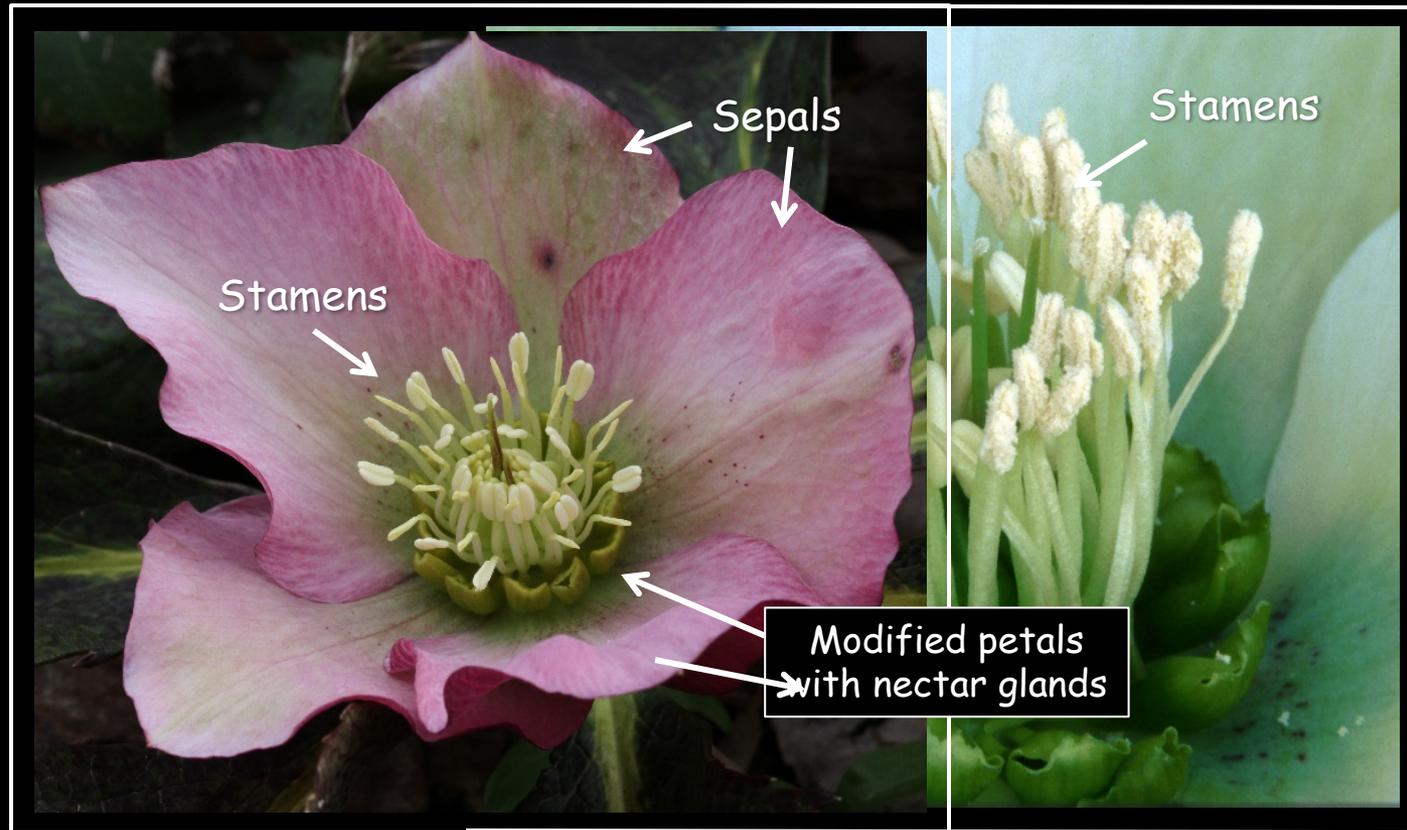
Cyathia

Poinsettia
(*Euphorbia pulcherrima*)

Pollination adaptations

Floral adaptations - Nectaries

Nectar or honey leaves

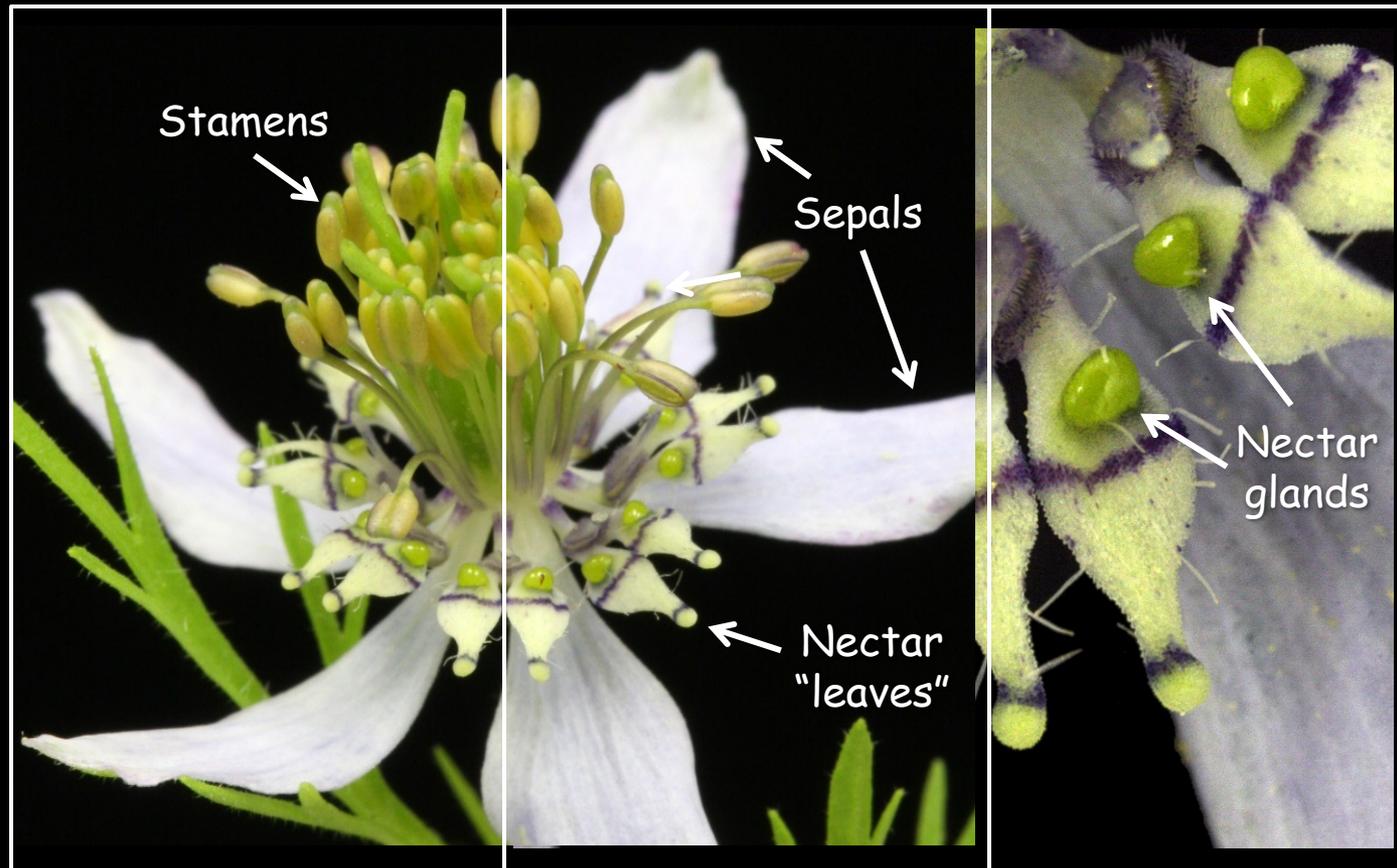


Christmas rose (*Helleborus*)

Pollination adaptations

Floral adaptations - Nectaries

Nectar or honey leaves



Black cumin (*Nigella sativa*)