



McHenry County
Nursery, Inc.

MARKETING 'SCENTS'

Why Flowers Make Scents (Part 1)

The Competitive Landscape

We may like to believe that sweet-smelling flowers were created by plants for our enjoyment, but plants have scented flowers in order to reproduce. Instead of releasing their pollen to the wind, many flowering plants require animal or insect pollination to produce seeds or fruit set. When a floral scent is present, it is the most important means of long distance attraction for pollinators, especially for moths searching for flowers at night.

Plants did not adapt to produce fragrance for our benefit, but sometimes if a plant was pleasantly scented, it influenced whether it was selected for cultivation.

Floral scent is a variable trait, making it easy to acquire and easy to lose. Much of modern plant breeding has unfortunately resulted in the loss of fragrance because they are selected for other traits (color, shape, long lasting flowers).

Almost 3/4 of agriculture crops depend on insect pollinators attracted by scents of flowers.

Honey bees are responsible for pollinating 1/3 of US crops.

Increasing selection of plants for floral scent traits could make landscapes more appealing, and improve yield and quality of crops.

Product Definition

The mission of most flowering plants is to survive and procreate. In most cases this requires pollination to produce fruit and seed set. Some flowering plants take care of it in-house (self-pollinating), but others require a specific pollinator, usually an insect, to pollinate their flowers.

In order to attract and keep pollinating customers, flowers of many plants produce a scent as part of their marketing plan. The scent is targeted to the desired pollinator, who develops brand loyalty after being rewarded with nectar or pollen after visiting the flower.

The scents plants use to target pollinators are complex mixtures of chemical compounds. There are no two floral scents exactly the same, and there is wide variation among species. Plants use these scents mostly to attract pollinators, but they can also be used to repel harmful pests.

Did you know?

Scents can also help protect the plant by attracting natural predators of harmful pests, or sending airborne signals to activate disease resistance defense genes in healthy plants near an infected plant.

Packaging & Distribution

The scent is usually produced in the petals of a flower, in a layer of epidermal cells. The scents are various types of fragrant oils (essential oils), and are very complex, made of as few as 5 or as many as 100 different chemicals. The oils are stored in special empty cells while the flower is closed. When the flower opens, the oil is activated, and chemicals form vapor that floats in air. These oils are known as volatile compounds, because they easily activate in warm weather.

In the book: *The Botany of Desire – A Plant's Eye View of the World*, author Michael Pollan writes that without flowers and their resulting fruits and seeds, warm-blooded mammals like ourselves would not exist today, and that plants and animals probably domesticated humans, instead of the other way around.

Timing

Plants have the ability to react to a changing environment relatively quickly by varying a flower's scent in both total output and composition. It takes resources to produce the scent oils, so flowers don't waste it. They produce the most scent when the chances are best for attracting their target pollinator.

Flowers also do not produce scent until the flower is open, when flower parts are fully formed and ready to be pollinated. Once pollinated, flowers will usually stop producing scents to help direct pollinators to the other flowers.

Timing of Fragrance	Target Pollinator
Warm evenings and night	Bees, nocturnal moths
Warm sunny calm days	Bees, butterflies

At McHenry County Nursery/Glacier Oaks Nursery, we use flowering timing of indicator plants in our IPM program to determine when certain pests are likely to be active. For more information see the book *Coincide: The Orton System of Pest Management (Timing Pest Management with Ornamental Plant Development)* by Donald A. Orton.



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Why Flowers Make Scents (Part 2)

Target Marketing

Flowers and their parts come in all shapes and sizes, just as insects and their parts come in all shapes and sizes. Plants and insects have adapted together in relationships where a certain insect fits perfectly in a certain flower, and the insect takes the nectar or pollen it needs, and the flower has help getting the pollen to the right place. Insects are able to distinguish different complex scents, and have certain preferences, so flower adaptation targets scents to the insect needed. Some flowers can change their scents over time to attract general pollinators if the flower hasn't been pollinated yet.

It is no surprise that flowers of plants pollinated by bees usually have sweet scents, and flowers pollinated by beetles have musty, spicy, or fruity scents.

Some flowers that we think smell nasty are extremely attractive to certain insects. The flowers that attract flies will smell like other things we see flies visiting! For instance, Hawthorn and Cotoneaster flower scents contain trimethylamine, which also occurs in early stages of putrefaction.

Horticultural note: Hawthorn make oils in the stamens instead of petals, so double flowered forms that are stamen-less don't smell as bad

Plants are masters of targeting attracting their specific pollinator, rather than a general pollinator that might disperse pollen non-productively.

Did you know?

- Flowers that have thick waxy petals give off scent longer than those with thinner petals.
- Typically the more color in a flower petal, the less essential oils are produced, which is why white flowers smell strongest, then pale yellow, pale pink, and mauve pink.

White suddenly becomes one of the most interesting flower colors!

Brand Loyalty

In order to develop loyalty, most flowers keep a consistent scent, and provide nectar and/or pollen as a reward. Insects are capable of associative learning, so it benefits the plant to advertise truthfully when rewards are really available, and stop advertising when they are no longer available. Insects learn to associate a particular scent with rewards, and will develop loyalty to that type of flowering plant, and visit more flowers with the same scent. If insects are cheated of a reward, they will be less likely to visit the same scent in the future, and take their business elsewhere.

Advertising and Public Relations

The fragrant oils can also be used as 'word of mouth' advertising. When bees pollinate some types of flowers, the scent molecules stick to their back or legs and are carried back to the hive, creating a 'buzz' in the hive, and attracting more bees to that particular plant. Most plants are satisfied with one visit per flower, but some plants benefit from repeat visits. Many of the edible fruits must be pollinated multiple times, which can determine size and quality of the fruit (e.g. Strawberries take 25 visits to maximize size).

Did you know?

- We are born with ability to detect scents, and can distinguish up to 10,000 different smells, which are odor particles, molecules carried in air. We catch the molecules in the roof of the nasal cavity, in the olfactory epithelium, which contains smell receptors that send messages to the brain to interpret what we smell. Some animals have a better sense of smell because of a larger olfactory epithelium area, and they can smell odors that we cannot.
- We have 1000 genes that code for smell receptors, but over half are genes that have lost function, and each person has a different combination of functioning and non-functioning genes that create an individual's sense of smell. Smelling is also psychological, linked closely to memory. It will come as no surprise that this is why a smell can remind us of an event.

References: 'Biochemical and Molecular Genetic Aspects of Floral Scents'
by Natalia Dudareva and Eran Pichersky, Plant Physiology, March 2000 (www.plantphysiol.org)