



# The flowering of *Symplocarpus*

Heat generation, smelly volatiles and bear food are all part of the appeal of skunk cabbage. GRAHAM RICE has experienced it all

**W**HEN I WAS a student at Royal Botanic Gardens, Kew, many years ago, I was intrigued by a strange aroid that grew by the stream in the Rock Garden. In January, before almost anything else except snowdrops was in flower, the curious, hooked, purple cowls of skunk cabbage, *Symplocarpus foetidus*, emerged.

Of course, they are more interesting than beautiful but valuable for providing a unique garden feature at

a time of year, and in a situation, when nothing else is stirring.

Now, I have hundreds of these plants growing wild by the stream that runs through the patch of Pennsylvania woods where I live with my wife. And they are proving even more fascinating than when I first saw them at Kew all those years ago. In particular, the flowers can melt snow, and both roots and foliage are an important food source for our local black bears.

## **In the wild**

Skunk cabbage, *Symplocarpus foetidus*, is native to eastern North America, from Ontario and Quebec south to North Carolina and Tennessee (where it is endangered) (Thompson 2008). It is also native to northeast Asia, in eastern Siberia, northeast China, Korea and Japan (Li *et al.* 2010). It grows in wet places, often in marshy areas alongside streams and lakes, but not in continuously standing water. It prefers shade.



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The flowers of *Symplocarpus foetidus* have the ability to generate heat. As well as providing a warm chamber for pollinators, the heat helps vaporize odoriferous compounds which also attracts them

Spring comes much later to northeast Pennsylvania than it does to Kew and here flowering is usually in April but can be as early as November further south. As spring temperatures quickly rise, the large, paddle-shaped leaves emerge, looking a little like a pale 'Hispi' spring cabbage.

The first year we were here it was quickly clear that the form at Kew is not typical. The dark purplish red colouring of that Kew form, with a few green streaks, represents one extreme of the colour spectrum. At the other extreme is the opposite: green with a few purple speckles. Completely purple or completely green flowers seem rare. And in the wild, even in rich river silt, clumps with more than three or four inflorescences are uncommon – broad, crowded clusters of flowers, as at Kew, are not seen.

As with many aroids, the inflorescences of *S. foetidus* go through a series of sexual phases.

The female flowers, gathered at the base of the spadix, mature first. The male flowers, towards the top, mature later; pollination by simple gravity is unlikely. However, there is a phase when both male and female flowers in the central area are mature at the same time. This seems to be a process which favours outcrossing but retains an option for self-fertilization, although the latter seems relatively unsuccessful. Where an individual plant has more than one inflorescence, they do not mature concurrently but one after the other, so extending the flowering period of individual plants.

Those flowers have another interesting quality. As they metabolize, the flowers give off heat. The temperature of the inflorescence ranges from 10°C to 35°C above the ambient temperature. Even at an ambient temperature of -10°C, the frost-tender inflorescence remains above freezing for a number of days

and will melt snow and ice alongside it. They are at their warmest when the female flowers are mature, at which time yellow droplets of foetid liquid appear on each flower (Thorington 2000). The heat, which melts the snow through which the inflorescences sometimes emerge, also helps vaporize the compounds that make up the rather foetid odour.

The rotting-meat smell of this liquid has also been reported to be reminiscent of garlic, apple, turnip and carrion but varies from one inflorescence to the next – some inflorescences have no smell. It seems little like the smell of skunk. These reports of the smell may be hurried: it is, after all, necessary to get down on hands and knees – in boggy soil – in order to sniff samples.

### Pollination and fruit development

Honeybees are the main pollinators, attracted by the smell and the sight of the inflorescences; they visit scentless flowers less often, it seems. They also collect pollen which has become attached to the inside of the spathe, as well as from the spadix.

Both the warmth and the foetid smell attract other insects which may have a role in pollination at a time of year when relatively few insects are usually active: in particular flies, coneheads, springtails, thrips and stone flies. Other invertebrates found in the inflorescences include slugs and spiders, perhaps attracted by the shelter as well as the warmth. Tests in a wind tunnel have determined that while wind pollination can take place, although it does not result in a significant number of fertilizations (Camazine & Niklas 1984).

The fruits ripen at the end of the season as the leaves deteriorate, but a relatively small proportion of ➤



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**SYMPLOCARPUS FOETIDUS AND OTHER SPECIES**



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*Symplocarpus foetidus* (above) is a herbaceous perennial member of the *Araceae*, most closely allied to *Lysichiton* and *Calla*. Stout vertical rhizomes carry many, large, oblong to ovate leaves about 55 × 45cm which are truncate or heart-shaped at the base and acute to obtuse at the tip. Emerging after the flowers, they are erect at first, then arching and broadening, and held on petioles as long as or shorter than the blade. Fresh, bright green when newly opened, the leaves mature to a darker shade. The whole inflorescence is held on a short peduncle which is usually buried.

The 10–15cm spathe varies from yellowish green to dark reddish purple, and is spotted or streaked. Hooked at the tip, the edges overlap at the base leaving a relatively small opening through which pollinators and other invertebrates can visit. The spadix is 3–5cm long, usually blood red, more-or-less globose, entirely enclosed by the spathe, and crowded with tiny 4-tepalled flowers, the male towards the top, female towards the base. The dark purple to brown berries are partially embedded in the spadix, in some inflorescences only a few may develop, or none at all; when fully fertilized they crowd the spadix.

Four Asian species complete the genus: *S. egorovii* is from E Russia; *S. nabekuraensis*, from Japan, may be a variant of *S. renifolius*; *S. nipponicus*, from Japan and Korea, has foliage described by Li *et al.* (2010) as 'rarely variegated' (!) and with fruit ripening the year after flowering; while *S. renifolius*, from Japan and E Russia, has almost circular leaves. These are very rarely seen in gardens, although John Grimshaw reports seeing *S. renifolius* in Belgium (<http://lists.ibiblio.org/pipermail/pbs/2007-March/016404.html>).

In eastern USA black bears graze on the leaves

pollinations lead to the development of mature fruits; in one study only 6% of inflorescences produced mature fruit (Thorington 2000). This is partly the result of unsuccessful pollination; many honeybees visit, but in collecting much of their pollen from the base or sides of the spathe may never touch female flowers. An exception to this would be when they become trapped in an inflorescence, whose shape is not bee-friendly, as they may do for some hours.

Mammals feeding on the developing fruits are also a factor. In our woods, over-abundant white-tailed deer certainly eat the developing fruits of this, and also of the related (planted) *Lysichiton camtschatcensis*. Fruit flies also damage maturing fruits. In one summer, I checked almost every plant on our property, two to three hundred, and failed to find a single ripe fruit.

It has been suggested that honeybees have supplanted a native



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The large, paddle-shaped leaves of *Symplocarpus foetidus* emerge after flowering and give a fresh green feel to marshy areas where the species thrives

pollinator that co-evolved with skunk cabbage and which would have ensured a higher fertilization rate and more mature fruit. Having

said that, it cannot be said that there is now a shortage of skunk cabbage in our woods. Those bears will always have rich and nutritious food as they emerge from their winter hibernation.

plant. Later, when the fresh green foliage emerges, before the foliage of most other plants, this too is a target and bears may simply bite chunks out of mature leaves or snap through the whole heart of the plant.

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#### Bear food

There is also another aspect to that 'fragrance'. It catches the heightened attention of black bears, fresh out of hibernation and looking to replenish their diminished reserves after many months without food. For those hooked flowers, with a smell that bears can pick up at some distance, sit on top of long, fat, starchy, vertical rhizomes. Bears know where to dig and will tear up many plants in a colony, often leaving some rhizomes half eaten.

These vertical, trunk-like rhizomes develop contractile roots. These lock the rhizomes in ground which is wet in summer and frozen and subject to frost heave in winter. Bears sometime become frustrated at being unable to remove whole rhizomes and move to the next

#### Cultivated variants

No cultivars of *S. foetidus* are, or have been, available to gardeners although plants with marginal variegation have occasionally been found. One collected by Massachusetts *Epimedium* enthusiast Darrell Probst was passed to Tony Avent at North Carolina's Plant Delights Nursery. Unfortunately, it proved too difficult to propagate to be made available.

Occasional plants with pale, almost golden, foliage are also seen. These do not seem to be consistent in the long term and, when seen by roadsides, may be the result of pollution from spillages.

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