

Blueberries in Biloxi

Defying heat, humidity, and hurricanes, blueberries have found a home on the U.S. Gulf Coast.

A new form of the blues is taking root in Mississippi, and it has nothing to do with B.B. King or Billie Holiday.

Blueberry bushes, loaded with clusters of nutrient-dense, almost-black fruits, are sprouting up all across the state's southern highlands and valleys. About 2,500 acres of these plants now thrive in Mississippi.

PEGGY GREB (D984-1)



James Spiers, research leader and horticulturist, collects fruit from DeSoto, a new rabbiteye blueberry released by ARS breeders in Poplarville, Mississippi, while geneticist Stephen Stringer selects propagation material from the plant.

Take into account other southern states—including Alabama, Florida, Georgia, Louisiana, North Carolina, South Carolina, and Texas—and that figure jumps to 30,000 acres, or an annual \$100 million worth of fruits. But 30 years ago, you couldn't have found a single, locally raised blueberry in Mississippi, no matter how hard you tried.

A Risk Worth Taking

ARS scientists were the first to introduce the blueberry to Mississippi and

the rest of the Gulf Coast region. One of those who advocated the small fruits, at a time when only a handful of blueberry researchers were working in the South, was James Spiers, who now heads the agency's Southern Horticultural Laboratory in Poplarville, Mississippi.

"When the region's tung oil industry collapsed," he says, "because of competition from imported petroleum and a devastating blow from Hurricane Camille in 1969, ARS began brainstorming ideas for a viable alternative crop."

But why blueberries? The fragile, tender berries hardly seem suited to the hot, humid, and hurricane-prone Gulf Coast. Insect pests are abundant there, exploiting the long growing season for additional feeding and reproduction. And despite its typical balminess, the region still suffers

the occasional late-spring freeze, which can burn plant buds and ruin their chances of sprouting fruit.

Despite the many challenges, ARS researchers in the early 1970s remained confident about blueberries. “For one thing, rabbiteye blueberries are native to the southeastern United States,” says Spiers. “Also, blueberries represented a potentially lucrative opportunity for small growers.”

Thirteen blueberry cultivars later, Spiers and his team of researchers are still committed to meeting the demands of Gulf Coast growers and the blueberry-loving public. Even though some of the laboratory’s releases are so popular they enjoy international acclaim—their Biloxi cultivar is fast becoming a favorite among Mexican growers—Poplarville scientists remain consumed with all aspects of blueberry improvement, from berry quality and marketing issues to blueberry pests and diseases.

The Latest From the Field

Blueberries that can beat the heat—and the clock—are among the most notable achievements of the Poplarville blueberry breeding program, which began in 1971. Its early-ripening fruits have helped growers in Mississippi and surrounding areas capitalize on the early-season blueberry market that precedes the big harvests up north.

But there’s always room for improvement, according to Stephen Stringer, who breeds blueberries and muscadine grapes at ARS’s Poplarville lab. The latest fruits of his labor? Two new southern highbush blueberry cultivars: Dixieblue and Gupton.

“Dixieblue’s berries are light blue, medium in size, with an attractive, slightly flat shape,” says Stringer. “Gupton, which is highly productive, yields berries that are light blue, medium-to-large in size, with excellent flavor and storage quality.”

As for a new rabbiteye variety, the type most commonly grown in Mississippi, Stringer is pleased about his latest release, DeSoto. This blueberry possesses excellent color, flavor, and firmness and has the potential to extend the Gulf Coast rabbiteye season by up to 3 weeks.

“Normally, blueberry growers in our area like to be finished with harvest by the first week of July,” says Stringer. “That’s because higher temperatures and regular afternoon showers can take their toll on vulnerable berries.” But not DeSoto. “It has solid heat tolerance and doesn’t suffer



Fruit of Native Blue, a new release that’s ideal for gardeners.

Stephen Stringer and horticulturist Donna Marshall select cuttings for propagation of Native Blue.

PEGGY GREB (D986-1)



Native Blue: A new ornamental for gardening and snacking

You may have to beat the birds to get its fruit, but ARS breeders in Poplarville, Mississippi, have released a new ornamental blueberry shrub that makes a fine addition to a mature southern garden or small urban patio. Called “Native Blue,” it boasts spectacular foliage that ranges from deep green to light pink, depending on the season.

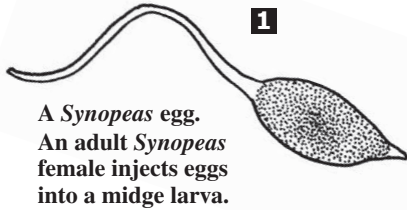
According to ARS plant breeder Stephen Stringer, who developed the shrub, it’s a nice complement to other southern ornamentals, such as azaleas, camellias, and crapemyrtles. It’s also a great attractant for birds and other wildlife.

Native Blue’s manageable size—about 3 feet at maturity—makes it highly desirable for gardeners with limited space or only a container or pot in which to plant.

And what about the berries? “They’re small but sweet and good-tasting,” says Donna Marshall, a horticulturist at the Poplarville laboratory. “They’re also really high in anthocyanins.” Anthocyanins are antioxidants that may reduce the incidence of cancer and other chronic diseases.—By **Erin Peabody**, formerly with ARS.

How *Synopeas* parasitic wasps kill the blueberry gall midge

Drawings by Blair Sampson

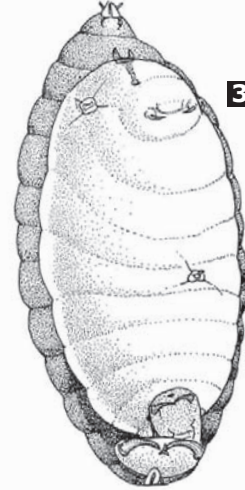
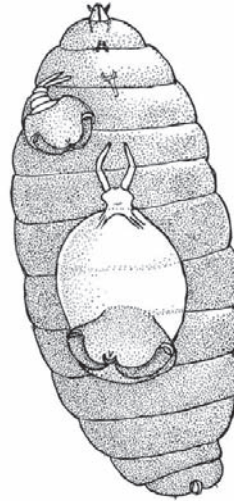


1
A *Synopeas* egg.
An adult *Synopeas*
female injects eggs
into a midge larva.

(D1024-1)

2
Young *Synopeas*
larvae kill the
blueberry gall
midge soon
after engorging
themselves on
their host's
stomach and
brain tissues.

(D1024-2)



3
Only one *Synopeas*
larva can survive
to maturity inside
a gall midge host.
Two of its doomed
siblings can be
seen near the
host's posterior
(at the base of this
drawing).

(D1024-3)

from splitting, which occurs when berries are suddenly waterlogged and burst.”

And a cultivar that Stringer is currently putting his finishing touches on? A Gulf Coast berry that's ideal for processing. This unnamed rabbiteye cultivar loads up with fruit, he says. “Being a smaller berry, it's not suitable for the fresh market, but it's ideal for use in processed-fruit goods, such as health bars, breakfast bars, and other fruit-inspired snacks.”

Boosting Flavor and Anti-Cancer Compounds

“It's tempting for growers to want to pluck berries off the plant the minute

they turn blue,” says ARS horticulturist Donna Marshall. “But these prematurely picked fruits often contain fewer sugars—which means less flavor—and fewer phytonutrients.”

Marshall, who's responsible for running antioxidant analyses on all Poplarville cultivars, says one of the lab's current projects is helping growers know exactly when to pick their berries. There's a science behind knowing when to harvest, she says, to optimize flavor, sugar, and nutrient content.

“It may only be a matter of waiting a few extra days,” says Marshall, “and you could have a berry that boasts exceptional

flavor and elevated levels of anthocyanins and phenolics, the two most abundant antioxidants in blueberries.”

Poplarville scientists are also busy building blueberries that could outlast all the other produce in your fridge. Marshall assesses the endurance of the lab's new cultivars by storing them in incubators and testing them for freshness and firmness at various intervals. Impressively, the lab's latest release, Gupton, remains plump and juicy for 30 days or more under normal refrigeration!

Tiny Killer in the Fields

A late-spring freeze, a torrential summer downpour, or a pervasive fungal disease—any of these can spoil a sweet berry harvest. But no invader plays as dramatic a role in the life of the blueberry plant as the blueberry gall midge.

The midge is the most serious pest affecting Gulf Coast berry growers, says Blair Sampson, an entomologist who spent 6 years with the ARS Poplarville lab but now works down the hall from his former office, for Mississippi State University.

“Midges can destroy up to 80 percent of the buds in a blueberry field,” says Sampson, “and each bud has the potential to produce up to 10 berries.” In the South, the midge is so pervasive that many Florida blueberry growers have abandoned raising rabbiteye blueberries, the type most commonly attacked by the midge.

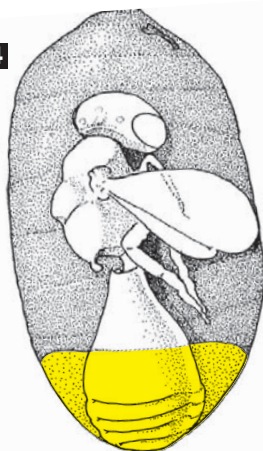
Even diagnosing midge problems is a challenge for growers, given the insect's minute size. “The adult midge is no bigger than a piece of dust flying around

PEGGY GREB (D982-1)



Donna Marshall measures blueberry fruit firmness and quality.

4



Before pupating and emerging as an adult wasp, a mature *Synopeas* larva must eliminate its waste inside its dead, bloated host. Waste appears as a yellow cone-shaped mass at the host's rear.

(D1024-4)

An adult *Synopeas* female is about the size of a grain of freshly ground pepper (about 0.3-0.5 mm). Its small size allows it to crawl through a maze of plant tissue to reach larval hosts deep inside blueberry buds.

(D1024-5)



5

blueberry buds," says Sampson. When seen, this tiny speck is usually the female midge searching for a suitable blueberry bud in which to lay her eggs. These eggs develop into orange, maggotlike larvae that feed voraciously on the most succulent part of the bud, leaving it grossly deformed.

In the 1990s when midge problems intensified along the Gulf Coast, few methods existed for defeating the pest. Then, Sampson and one of his research assistants made an exciting, but rather gruesome, discovery. "We were looking inside a midge larva under the microscope when we saw this pair of little jaws tearing away at something."

As Sampson later realized, those tiny chomping mandibles belonged to an immature parasitic wasp wriggling inside the midge larva's body. But how did it get there?

The female parasitic wasp has built-in radar for locating a plump midge larva nestled deep inside a blueberry bud. She stings the larva, injecting her eggs into its stomach or brain. There, the wasp eggs develop until they're mature enough to battle each other for ultimate access to the midge host. Nature allows only one parasitic wasp per host. The tiny mandibles Sampson observed? These are the weapons the wasp siblings use to duke it out to the death.

Before Sampson's discovery, no one imagined the gall midge was victim of these bizarre natural predators. He's since discovered four other parasitic wasps that target midges. They belong to the genera

Synopeas, *Inostemma*, and *Platygaster*. He has yet to assign them a species name.

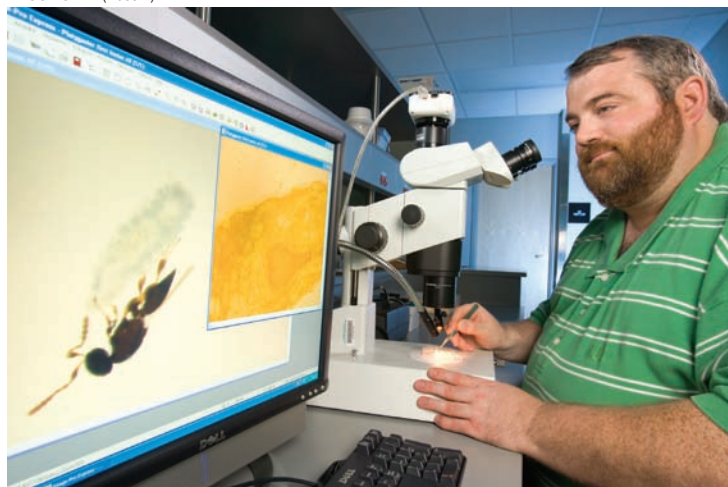
"What's so great about these wasps is that they cost growers nothing," says Sampson. Like tiny torpedoes, they home in exclusively on midge larvae; no other insects interest them. In his studies, Sampson found that a natural population of parasitic wasps in blueberry fields can kill 40 percent of all midge larvae, controlling them for about 200 days.

His next step? To explore the possibility of rearing additional wasps for release in regions of the United States where populations of the beneficial insects have dropped from years of widespread insecticide use.—By **Erin Peabody**, formerly with ARS.

This research is part of Crop Production, an ARS national program (#305) described on the World Wide Web at www.nps.ars.usda.gov.

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PEGGY GREB (D988-2)



Mississippi State University entomologist Blair Sampson watches a *Synopeas* wasp insert eggs into a newly hatched gall midge larvae.