Saving Southern Peas

by David Riley

Southern peas or cowpeas, scientific name *Vigna unguiculata*, is a major legume grain crop produced in tropical to temperate regions around the world. The genetic origin of this crop is Africa, where it has been the mainstay of human and livestock nutrition for thousands of years. It was introduced into Jamaica by 1675 along with the slave trade and was reported in Florida as early as 1775 with some speculation that it was grown there even earlier, 1707. Southern pea has become an iconic southern food that continues to be in high demand for every day southern cooking and holidays.

History in the Deep South

By the 19th century, cowpea was the top legume forage crop for cattle in the southeastern USA and had begun to be common in more northern states by 1909. In the 1920s, folks might be surprised to learn that greater acreage of cowpeas was grown in the USA than soybean. Cowpea field production peaked in 1937 at 5,836,000 acres, nearly all in the Southeast. At that time, cowpea peas were planted for cow grain and hay forage as well as human consumption. Around the time of World War II, soybean acreage grew exponentially, while cowpea acreage collapsed, likely displacing it as the grain legume of choice due to ease of soybean mechanization, reduced pest problems, etc. By 2011 and unlike earlier years, the USA ranked very low in worldwide cowpea production representing a scant 0.1% of world value of this crop. So what happened? Even if you assume that the crop was displaced by soybean, this would only account for the portion of production associated with legume feed grain. There is still the question as to why the portion of the crop associated with human food in the USA has continued to decline as well. Demand, reflected in fresh frozen southern pea prices has consistently climbed over the last several decades, and yet acreage has irregularly declined in various regions of the South. What is going on?

The Mighty Curculio

There can only be one clear answer to this profoundly southern mystery and that is that "the curculio did it". This one insect can shut down economical production and, sadly, has consistently become tolerant to insecticide controls over the decades. Currently in 2016, buyers are leaving curculio infested areas.

Drs. Riley and Sparks

University of Georgia (UGA) vegetable entomologists, David G. Riley and Alton Stormy Sparks, are heading up an effort to solve an on-going major insect pest problem affecting southern peas in the Deep South.
Savannah Meeting
by A. Sparks and D. Riley

The Georgia Fruit and Vegetable Growers Association has kindly agreed to help facilitate a meeting of the minds on the future of southern peas at the South East Regional Fruit and Vegetable Conference (SERFVC, please go to GFVGA’s website at http://www.seregionalconference.com/ for details on the larger meeting). The details for the Southern Pea Workshop are as follows.

- **Location** - Savannah International Trade and Convention Center, in the Pulaski Room
- **Dates** - Thursday Jan 5th to Friday Jan 6th 2017
- **Hours** - 8AM to 5PM Thursday and from 8AM to noon Friday
- The overall goal of this workshop is to implement an economically sustainable program for southern pea production in the southeastern USA by developing critical pest management solutions. This will include:
  - Facilitating discussions on southern pea production needs identified by the growers, pest managers, and fresh frozen buyers/processors.
  - Setting research and extension priorities for southern peas.
  - Developing a pest management strategic plan (PMSP) that can be adapted for SE States like Georgia, South Carolina, Alabama, Tennessee, etc.

### THINGS TO DO NOW

Register for the SERFVC at http://www.seregionalconference.com/

Reserve you hotel room as soon as possible since this meeting of over 3000 attendees fills up hotel rooms in a hurry!

**GENERAL MEETING QUESTIONS:**
http://gfvga.org/contact-us/

if attending the workshop email asparks@uga.edu

Southern IPM Center Grant
by D. Riley

For the last 4 years several researchers and extension specialists have been trying to secure federal or state agricultural research funds to try to address problems facing southern pea growers in the South. Unfortunately, southern pea is a minor crop even among the other minor vegetable crops and typically gets overlooked by granting agencies in deference to crops with larger acreage that might affect more growers. Even so we’ve persisted in trying to draw attention to the crop’s most serious production problems, including curculios.

**SIPMC to the Rescue**

Fortunately, a small planning grant was funded by the USDA Southern IPM Center in 2016 that allows our small group to make some forward progress on addressing southern peas production problems and solutions. The group consists of myself as Project Director, D. G. Riley (UGA), Alton “Stormy” Sparks (UGA), Jason Schmidt (UGA), Bhabesh Dutta (UGA), Timothy Grey (UGA) Tim Coolong (UGA), Greg Fonsah (UGA), Mike Toews (UGA), C.T. Harvey, (Fresh Frozen Foods, Inc.), Matthew Blair (TSU), Fitzroy Bullock (TSU), Finnis Stribling (TSU), Fred Eller (USDA ARS NCAUR), J. Powell Smith (Clemson U), and Henry Fadamiro (Auburn U). The activities the SIPMC grant is helping to fund include the development of a website www.usvigna.org, a southern pea survey, and the planning meeting detailed in the section above.
The Cowpea Curculio

by D. Riley

Where It Is Found

The cowpea curculio, Chalcodermus aeneus Boheman, is a weevil that seems to have originated from the Caribbean / Central America region of the New World. It has never been reported in the Old World, but has been reported as a major pest of southern peas in the SE USA for well over a century. The distribution of the weevil in the SE USA has been reported roughly in the triangle from southern Texas to North Carolina and south to Florida. However, with the tremendous decline in southern pea acreage over the last 50 years, the distribution is more scattered and tends to be reported more in traditional southern pea production areas of Alabama, Georgia, and South Carolina in recent years. Outside of the USA, this weevil or closely related species are found in México, Belize, Guatemala, Honduras, Nicaragua, Peru, Brazil and Jamaica.

Biology of the Curculio

It takes an average of 30 to 40 days for the cowpea curculio to go from egg to adult. The adult lays eggs into the tissue of the pod or all the way through the pod wall into the tissue of the developing pea. Each female can lay up to 280 eggs (avg. 122) over a period of 45 days. Eggs are in the plant tissue 3-6 days before they hatch and begin feeding on the pea. The larva or “grub” has no legs and develops through 4 larval instars over 6-9 days. The larva reaches a length of 7 mm when mature and then eats its way out of the pod, falling to the ground. Once on the soil, the grub quickly digs in 1-6 inches and begins making a pupal cell or cavity in the soil p. The pre-pupal stage can last about 6 days. Once in the pupal cell in the soil, it can be in the pupal stage (top middle – The soil phase Image) for 4-13 days and then as a newly formed adult (top right – The soil phase Image) for 1-5 days before it crawls out of the soil. In the first generation, we typically think that adults emerge ~3 weeks after they have entered the soil.

This last winter, we observed that adults emerging after the second generation can wait for months before they crawl off of the soil surface into collection containers in emergence traps. We detected the greatest emergence rates in November to the first week in January. Therefore, the amount of time that the adult spends in the soil during the winter can be quite long. Adult overwinter on non-reproductive hosts, such as broomedge, ~5 months and can experience up to ~90% mortality due to naturally occurring disease, predators, etc. We begin seeing movement of the surviving adults into southern pea fields as early as April, but only lay eggs once the flowering structures appear on the southern pea crop. Therefore insecticide sprays for curculio are recommended to begin at first bloom in the spring.

Curculio Crop Damage

Both the larval and adult feeding causes damage to the pea (to the right – The plant phase Image) and can make it unmarketable. Heavy feeding by adults can reduce the amount of flowering and therefore fruit set in the crop. As much as 40-60% yield loss can be typical. From our recent studies and based on previous publications we know that specifically cowpea curculio, more so than other major insect pests of cowpea in the USA, is extremely destructive to cowpea crop. This is in spite of cowpea plant “resistance” that has been reported in the literature. The main resistance trait has been the thickness of the pod wall, such as in Green Acre varieties, which also have a small pea and lower shellout weights than a blackeyed pea or pinkeyed purple hull. Our recent data indicated that as little as 10% “stung” peas resulted in losses of 42.6 bushels per acre based on an average of 150 bushels per acre expected yield. Above 30% “stung” peas resulted in no marketable southern pea yield. In 2010 and 2011, multiple reports of curculio outbreaks and control failures led to field tests. Field trials indicate that pyrethroid tolerance or possibly resistance is on the rise in Georgia, similar to that reported by N’Guessan and Chalfant (1990). Pyrethroids are currently the primary insecticides used against cowpea curculio throughout the southeast likely driven by resistance to older insecticides. Due to ongoing damage issues, the acreage of southern has dropped in areas, and in the presence of curculios, fresh frozen pea production appears to be uneconomical.

The harvest phase

Not only does the number of “stung” peas have a direct negative correlation with harvested pea weight, the contamination of stung peas and grubs in the shelled peas can be a major negative issue for buyers.
Cowpea Breeding Programs

by Matthew Blair, Tennessee State University

While cowpea breeding is vibrant in West Africa, few breeding programs currently exist for the USA which has been an impediment to the transfer of molecular marker technologies from advanced labs to developing country situations. One program on cowpea resiliency to climate change exists in University of California Riverside but no other international programs are found at other American universities. By comparison, common bean genetics and marker development benefits from a range of multi-lateral projects between many countries and many US universities. However, cowpeas will be the legume of the future compared to common bean and other temperate season legumes because of their natural adaptation to high temperatures and periodic drought conditions. Originally from the Sahel and domesticated across a wide area of Sub-Saharan Africa, cowpea is very adaptable and diverse. One might question whether the high diversity in black-eyed pea makes it a more sustainable long term legume for African and American agriculture than soybean mono-cropping or even common bean which are supported by lower levels of diversity than cowpeas. Certainly, the study of aphid and weevil resistance and susceptibility in cowpea has important implications on the co-evolution of these insects with this legume and with other related legumes through comparative genomics and transcriptomics.

Dr. Matthew W. Blair is a Plant Breeder and Research Associate Professor at Tennessee State University (TSU) in Nashville, Tennessee where he conducts breeding and genetics projects on legumes and dicotyledonous C4 crop plants such as cultivated amaranth. TSU is an 1890s land grant university, one of the Historically Black Colleges and Universities (HBCU) in the United States, that is critical to agriculture in the southeastern USA with plant science research and farmer training/extension.