

INTRODUCTION

Asian Soybean Rust (ASR) was first found in South Carolina in November 2004. Although it was found in only a small number of counties it appeared to be rather widespread. It was found in Anderson County in the northwestern corner of South Carolina, in Horry County in the northeastern corner of South Carolina and in Barnwell County in the south central portion of the state. All of South Carolina is above the freeze line so the risk of ASR overwintering in South Carolina was minimal. However, the relatively close proximity of southern South Carolina to areas of Florida and possibly even Georgia where ASR might over winter placed South Carolina's soybean crop at a relatively high risk of exposure to ASR spore showers and subsequent disease development. Eleven official sentinel plots were established. These were concentrated in the southeastern corner of the state since it was closest to any ASR overwintering areas. Plots were also spread throughout the state in locations so that when a 30 mile radius was drawn around each site all of the major soybean growing areas were within these zones.

METHODS

Sentinel Plot Locations: Sentinel plots were established at the Edisto Research and Education Center in Barnwell County, the Pee Dee Research and Education Center in Florence County, and the Simpson Station in Anderson County. Sentinel plots were located in commercial soybean production fields in Calhoun, Clarendon, Colleton, Dorchester, Hampton, Horry, Kershaw, and Saluda Counties.

Sentinel Plot Design: Sentinel plots consisted of a maturity group V (Deltapine 5634 RR) and a maturity group VIII (AGS Prichard RR) cultivar each planted approximately 3 weeks prior to the normal planting date for the area and at the normal planting date for the area. Plots consisted of 8 to 12 rows that were a minimum of 50-feet long. Rows in most of the plots were on 38-inch centers although a few were on 30-inch centers and some were drilled. Plots were maintained using standard agronomic practices for the region. Herbicide regimes included the use of glyphosate materials. In many cases the early planting date was in April. Cool temperatures led to poor stands and poor plant growth in several of the sentinel plots. In many cases the later planted soybeans flowered within 7 to 10 days of the early planted soybeans.

Sentinel Plot Sampling: Sentinel plots were sampled approximately every other week in May and June. Beginning in July plots were sampled on a weekly basis. An extensive drought occurred beginning in late August and no rain fell on most of the state in September. By mid September many of the sentinel plots were near death. These were no longer sampled. The minimum sample consisted of 25 to 50 leaflets pulled from the early planted MG V cultivar collected by the on-site coordinator. The petioles were removed and the leaves placed in a Ziploc bag with the corner left open. These samples were either collected by a courier or mailed overnight to Dr. Mueller. Upon arrival samples were stored in a refrigerator until examination. 25+ leaves were examined under a dissecting scope at ca. 120 X magnification for each sample. If any structures resembling pustules were observed the structure was removed from the leaf, cut open, and the tissues examined under the microscope for the presence of uridiospores. If no pustules were observed in a sample the leaves were placed back into the Ziploc bag with the corner opened and left to incubate at room temperature for approximately 3 to 4 days. These samples were reexamined using the same procedure as the original examination.

Mobile Plot Sampling: Agents in several counties submitted samples on an almost weekly schedule. Ten samples were submitted almost weekly from commercial fields in Lee County. These were of great interest since this was the center of MG IV soybean production in the state and were some of the most physiologically advanced fields available. Sampling was done exactly as for the sentinel plots. Experimental plots of several legume cover crops and wildlife food crops were established in Colleton County. These crops were sampled biweekly until the plots were lost to the drought.

Monitoring Asian Soybean Rust in South Carolina

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Table 1. Chronological order of first rust finds on soybean by county in South Carolina (as of November 8) for 2005.

Month	County	Type of Plot	Soybean Acres in County
August	Hampton	Commercial field	9,700
September	Barnwell	Research Plot	6,200
	Calhoun	Commercial field & a Sentinel Plot	5,800
October	Aiken	Commercial field	5,700
	Allendale	Commercial field	12,500
	Anderson	Commercial field	2,500
	Bamberg	Commercial field	7,700
	Dillon	Commercial field	42,500
	Darlington	Commercial field	44,300
	Edgefield	Commercial field	2,300
	Georgetown	Commercial field	3,800
	Horry	Sentinel Plot	50,900
	Lexington	Commercial field	5,500
Newberry	Commercial field	3,500	
Oconee	Research Plot	250	
Orangeburg	Commercial field	31,400	
Pickens	Research plot	250	
Saluda	Monitoring plot	1,400	
November	Marlboro	Commercial field	28,300
State Total (2004)			540,000

RESULTS

EARLY DETECTIONS: ASR was first detected on August 15th in Hampton County in a commercial soybean field. One pustule was observed on one leaf out of 25 observed. This field was sprayed with a fungicide several days later and although the field was sampled several more times in the next 30 days no more ASR was detected. The second find was in an early planted research plot at the Edisto R.E.C. in Barnwell County on September 1st. ASR was much more common in this field. At the first observation 25% of leaves sampled had 5 to 30 pustules per leaf. One week later more than 50% of the leaves had 50 to 100 pustules per leaf. This field was used extensively to train county agents and industry personnel to identify rust in the field and under a dissecting scope. Groups of 2 or 3 individuals would spend 20 to 30 minutes collecting leaf samples then 1.5 hours looking at pustules and spores under the dissecting scope and microscope. The agents brought their dissecting scopes with them so that we could determine who did and did not have adequate equipment for identifying ASR. One of the agents found ASR in a commercial field in Calhoun County on September 6th after his training. The infestation was light, but continued to increase in severity and incidence until it was sprayed the following week. A second agent identified ASR in Horry County on October 4th. The Horry County find was of interest since it represented a jump of almost 50 miles north from the finds in Calhoun County and was of a relatively high incidence and severity. ASR was found in numerous fields in Horry County in the next several weeks. Like the original Horry County field, severity was much higher than would be found later in most of the October and November finds in other counties. This dissemination of ASR and increase in severity had apparently occurred during drought conditions.

OCTOBER/NOVEMBER DETECTIONS: Most of these finds were the result of directed searches in commercial fields by county agents. Some of these samples were sent to the Plant Problem Clinic on campus for diagnosis. Often the incidence and severity were low: 1 to 5 pustules on 5 to 10% of the leaves in a sample. In many of these fields ASR was not observed until after the sample had been incubated.

AREAS OF GREATEST SEVERITY: Barnwell, Calhoun, Orangeburg and Horry counties seemed to have the highest levels of ASR incidence and severity. In each county 10 or more fields were identified with rust at significant levels.

DISCUSSION

ASR was eventually found in most of the soybean producing counties in South Carolina albeit in many counties at very low levels. In all cases the plants were past flowering and pods had begun to develop (R3/R4). In many cases plants had already begun to drop leaves. Growers were alerted to detections through a Clemson University in-house electronic newsletter as soon as possible. Detections were also posted on the USDA web page. In August and early September when rust was detected in a zone growers were encouraged to make spray decisions based on crop physiological stage, relative proximity of rust to their field, and the weather forecast for the next 10 to 14 days. Spread of rust definitely seemed to be slowed by the September drought. No consideration of spraying was made during the drought period. When the drought was broken by widespread rainfall yields had already been reduced enough that it was no longer economical to spray fungicides. Growers and agents misidentified several common diseases such as Downy Mildew, Brown Spot, Frogeye Leaf Spot, and thrips damage for ASR. In-field, hands-on training for agents is needed to alleviate this area of confusion.

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