#11015 Oxamyl

Georgia Commodity Commission for Vegetables
Research Fund

Cowpea Curculio Management in Southern Pea and Snap Beans – 2012 Report

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Introduction

Cowpea curculio (see photo on right), *Chalcodermus aeneus* (Boheman), is the key pest of southern peas or cowpea, *Vigna unguiculata* (L.), in Georgia and elsewhere in the Southeast. Southern pea acreage in Georgia was 5,632 acres in 2011 and valued at $8.7 million in Farm gate value. It can also be occasionally found on snap beans which was grown on 9,336 acres in 2011 and valued at $18.3 million. The inability to consistently control this weevil is one of the reasons for the limits to cowpea acreage since there is a near zero tolerance for infested peas in frozen pack processing. Its impact on snap beans is less clear, i.e., it does not appear that curculios cause significant damage to this crop. A new trapping method (Riley's Modified Tedders-left photo)was evaluated as a detection tool for this pest. Traps werefurther used to assess curculio populations throughout the winter. Evaluations of insecticide sprays were also made beginning at flowering in both cowpea and snap beans in 2012 using standard pyrethroids and unlabeled materials. The traditional use of a more tolerant cultivar (e.g. Cream Eight) tested as a split plot in the southern pea insecticide efficacy test.

Field Evaluation and Survey Method

A block of peas with split plots of Pinkeye Purple Hull (susceptible peas)andCream Eight(slightly more tolerant peas) for evaluating insecticides against cowpea curculio was planted on June 14, 2012. We made9 applications of insecticide with a one overhead and two drop TX18 hollow cone nozzles @60 gal/acre spray volume to insure maximum efficacy of each product evaluated. Peas were harvested out of 10 ft of row and we assessed "stung" hulls, peas, and curculio grubs per harvested plot. In addition to the efficacy study, we pursued special exemption registration of Vydate (oxamyl) insecticide for cowpea curculio control, but it was turned down in IR-4 due to issues with an EPA oxamyl review.

For the survey, traps were placed in the experimental plots to monitor cowpea curculio movement into the test plots. Also, traps were placed year-round and checked weekly at 5 fieldsites to assess cowpea curculio population dynamics. We shared this data with extension as an early warning of cowpea curculio movement. A poster was produced for curculio management in Georgia and presented at the SERFV Meeting -Educational Session in January, 2013.

Results

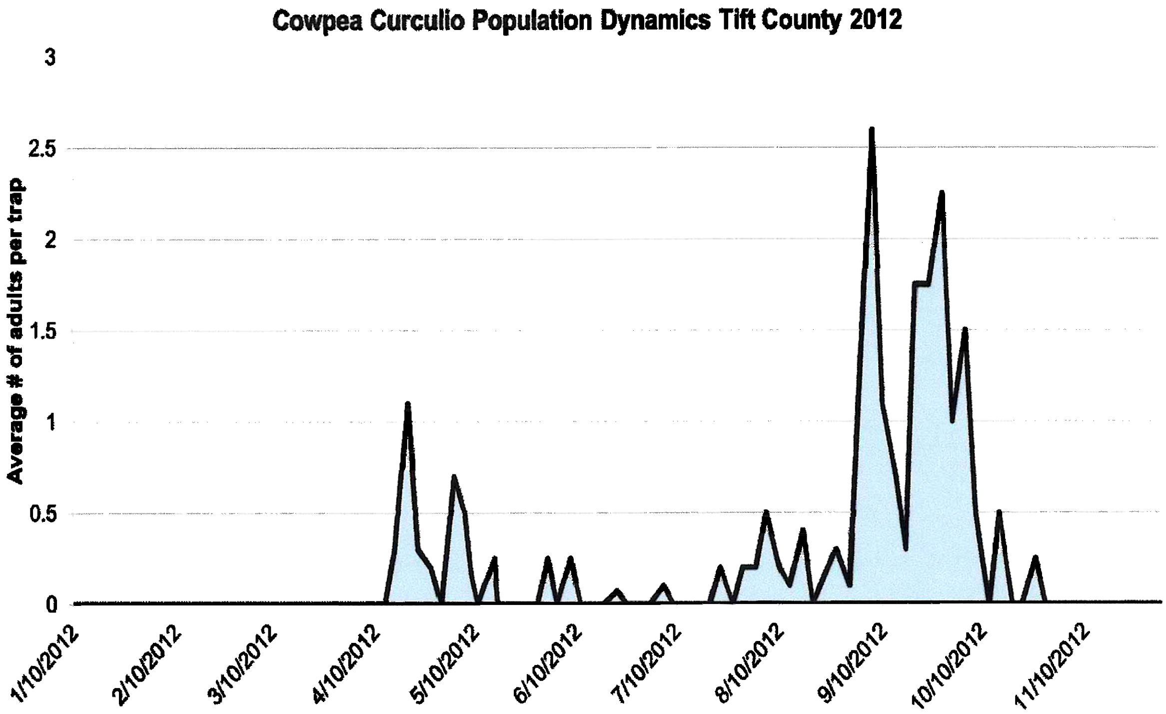


Figure 1. Cowpea curculio captured by week across all locations in Tift County in 2012.

The new traps provided a clear picture of the overall movement of cowpea curculio adults in the Tift County landscape. This included an early detection of cowpea curculios, as early as April 16th(Figure 1).We know from previous studies that, during the winter, adult curculio can be found on narrow-leaved vetch, purple cudweed, heartwing sorrel, cutleaf eveningprimrose,and moss verbena. We found curculios in traps near honey suckle hedges in the winter of 2013.Adults have been reported overwintering in clumps of broomsedge, purple cudweed,heartwing sorrel, moss verbena, and sicklepod (Sudbrink et al. 1998). It also has been reported that cowpea curculios can reproduce on snapbean pods before southern pea plants bloom so nearby plantings of snap bean is presumed to exacerbate the problem. However, in our side-by-side plantings of snap beans and cowpeas at the Lang Farm in 2012, it was clear that the curculio preferred cowpeas over snap beans (Table 2). Late in the summer, the curculio has been reported onsicklepod, *Cassia obtusifolia*, and the beans of*Strophostyles*spp. plants. However in our study, the large peaks we detected in September and October appear to be associated with fall harvests of southern peas.Thus, we believe that the management of cowpea curculio is going to be largely dependent on the management of the cowpea crop which seems to drive most of the population dynamics of this pest. Since curculios overwinter as adults and only 2-5% of the adults survive the winter (Arant 1938), the peak of adults in October largely determines the level of curculios that will carry over and be present at the location the following spring. This can be enhanced by the presence of alternate feeding host plants like broomsedge (Sudbrink et al. 1998) that may increase the percent survival of adults over the winter. A management tactic that might be considered in the future is controlling the fall generation, possibly soil treatments to target pupae, to reduce the winter carryover of adult curculios.

Table 1. The level of control of cowpea curculio in southern peasachieved at the Lang Farm, Coastal Plain Experiment Station, Tifton, GA, 2012. The last six treatments (in bold) provided a significant reduction in cowpea curculio damage and increased yield compared to the untreated check in each pea variety, but only the Baythroid and Voliam Xpress (also known as Besiege) treatments are labeled on cowpeas.

Treatment	Both	Pinkeye Purple Hull		Cream Eight	
	Total bushels per acre	Total clean pea weight /10ft	Total stung pea weight/10ft	Total clean pea weight/10ft	Total stung pea weight/10ft
Untreated check	129 cde*	239.6 f	23.0 b	159.5 f	34.1ab
HGW86 SC 13.5 floz/a drench	137 bcde	282.9def	31.4 a	166.1 f	34.9 a
Vydate 2L 4pt/a foliar	105 e	302.5cdef	1.3 c	229.8ef	6.2 cd
HGW86 SC 13.5 floz/a drench + Vydate 2L 4 pt/a foliar	113 de	354.9abcdef	0.9 c	196.3 f	9.9 cd
Mustang Max 0.8EC 4 floz/a	139 bcde	261.7ef	3.6 c	308.7cdef	20.3bc
Mustang Max 0.8EC 4 floz/a + PBO 4 floz/a	142 bcd	316.8bcdef	4.5 c	289.1def	34.8 a
HGW86 SC 13.5 floz/a drench + Mustang Max 0.8EC 4 floz/a	**157 abc**	**366.1abcde**	**2.1 c**	**372.5bcde**	**16.4 cd**
Vydate 2L 4 pt/a + Mustang Max 0.8EC 4 floz/a	**143 bcd**	**298.9cdef**	**0.5 c**	**458.0abc**	**12.1 cd**
Baythroid XL 2.1 floz/a + PBO 4 floz/a	**168 ab**	**456.2 a**	**4.6 c**	**416.5abcd**	**16.0 cd**
Voliam Xpress 9.0 floz/a	**179 a**	**437.5ab**	**5.1 c**	**436.3abcd**	**17.3 c**
Voliam Flexi 7oz/a +Mustang Max 0.8EC 4 floz/a	**172 ab**	**386.0abcd**	**1.4 c**	**503.3ab**	**9.6 cd**
Regent 4SC 3 floz/a	**167 ab**	**412.1abc**	**0.8 c**	**577.7 a**	**3.0 d**

*Means within columns followed by a same letter are not significantly different (LSD, $P<0.05$)

What was notable from the cowpea test (Table 1) planted on June 14 was that effective control of curculios increased marketable yields by as much as 39%. Cream Eight was no more tolerant of curculio damage than Pink Eye Purple Hull. The curculio infestation was already present when peas were planted, based on trap counts (Fig. 1). Thus, the only curative action that could be taken was an effective insecticide. Unfortunately, there were few effective options for control in peas; all involvedpyrethroid insecticides. Regent will likely not be labeled in peas.

Table 2. The level of control of snap bean pests and total cowpea curculio counts compared to the adjacent cowpea test with the same test design planted one month later.

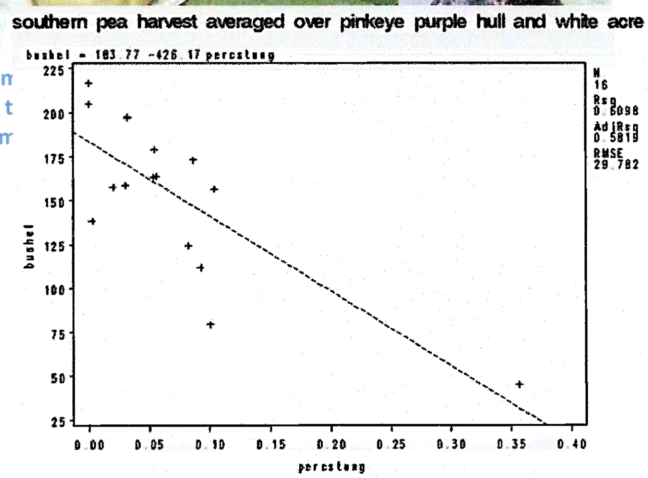
Treatment	Snap Bean Damage and Yield			Curculios on each crop	
	Damaged pods	Clean pods	Clean weight	Snap beans	Cowpeas
Untreated check	17 a	321 a	3.22 a	0.00 a	1.25 bc
HGW86 SC 13.5 floz/a drench	22 a	249 a	2.45 a	0.00 a	5.00 a
Vydate 2L 4pt/a foliar	16 a	298 a	2.96 a	0.00 a	1.25 bc
HGW86 SC 13.5 floz/a drench + Vydate 2L 4 pt/a foliar	21 a	402 a	4.31 a	0.00 a	0.50 bc
Mustang Max 0.8EC 4 floz/a	9 a	359 a	3.48 a	0.00 a	1.75 bc
Mustang Max 0.8EC 4 floz/a + PBO 4 floz/a	25 a	365 a	4.10 a	0.00 a	2.50 b
HGW86 SC 13.5 floz/a drench + Mustang Max 0.8EC 4 floz/a	16 a	305 a	3.54 a	0.00 a	0.50 bc
Vydate 2L 4 pt/a + Mustang Max 0.8EC 4 floz/a	7 a	338 a	3.27 a	0.00 a	0.00 c
Baythroid XL 2.1 floz/a + PBO 4 floz/a	14 a	328 a	3.05 a	0.00 a	0.75 bc
Voliam Xpress 9.0 floz/a	14 a	266 a	2.46 a	0.00 a	2.00 bc
Voliam Flexi 7oz/a +Mustang Max 0.8EC 4 floz/a	13 a	263 a	2.53 a	0.00 a	2.25 bc
Regent 4SC 3 floz/a	9 a	313 a	3.01 a	0.25 a	0.75 bc

*Means within columns followed by a same letter are not significantly different (LSD, P<0.05)

The snap bean trial, which was planted on May 17th one month prior to the cowpea trial and in the adjacent field block, did not experience significant yield loss to any insect pest (Table 2). In fact, the level of cowpea curculio in snap beans was surprisingly low compared to the numbers seen on the foliage in the adjacent cowpea crop (compare last two columns in Table 2). The other interesting observation was that the numbers of adult curculios found with beat cloth and visual inspection of the plant (Table 2) did not correlate well with the damage inflicted by the curculios (Table 1). The only useful observation from the numbers of adults on the foliage was that there seemed to be some kind of attraction to HGW86 drenched cowpea seedlings (Table 2).

Figure 2. Dam
underneath t
the adult fem

The damage caused by cowpea curculio occurs inside of the pea pod until the grub exits the pod by eating an exit hole and dropping to the ground to pupate in the soil (Figure 2). Since eggs placed into the pod are sealed up by the adult female and egg hatch occurs internally, the grubs are protected from contact insecticide sprays to the surface of the pod. Thus, insecticide sprays mainly target the adult curculio, hopefully before she has had a chance to lay eggs into the pods.



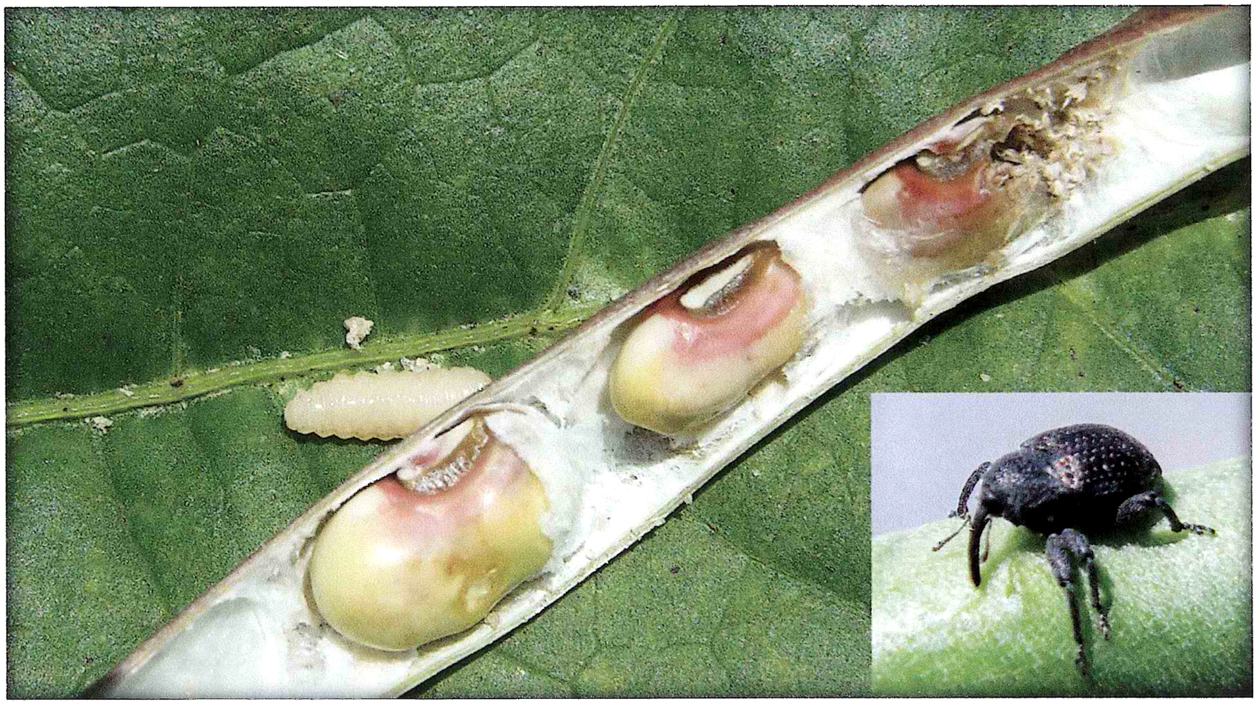
The relationship of the percentage of cowpea curculio "stung" peas to bushels of yield has never been documented in the literature. The preliminary data from 2012 comparing untreated and Voliam Xpress treated plots revealed a significant negative regression with an R-squared of 0.6, 10% stung peas = 42.6 bushels lost (graph to the right). Thus, even a relatively small amount of percent stung peas means that bushels of yield have been lost due to cowpea curculio. A high level, 50% stung peas, resulted in virtually no harvestable peas (75% yield loss) in this test. Another way to say this is that cowpea curculio populations at a location that result in 50% stung peas means that this location is unfit for cowpea fruit production.

Based on our results, we have a serious problem with cowpea curculio management in cowpeas in Georgia. The only effective labeled insecticides are either pyrethroids or pyrethroids combined with other products. Thus, the selection for pyrethroid resistance is at a maximum level in the region. For two years, we have been trying to get oxamyl (Vydate) considered for labeled in cowpeas through the IR-4 program with no success. We have not been able to identify any other insecticide MOA with significant efficacy against this pest except fipronil (Regent) which will never be labeled in cowpeas. If high levels of pyrethroid resistance become widespread in the Southeast, we will have no chemical option for this cowpea production limiting insect pest. In that case, our only two options will be to either stop growing cowpeas entirely or find a regionally effective non-chemical control method for this pest, a much more difficult research proposition.

(One page summary for GFVGA article)

Cowpea Curculio Management

by David Riley, UGA Vegetable Entomologist



Cowpea curculio (see black adult, white grub, and damaged peas in photo) is the key pest of southern peas (cowpea)in Georgia and elsewhere in the Southeast. Southern pea acreage in Georgia was 5,632 acres in 2011 and valued at $8.7 million in Farm gate value. As little as 10% "stung" (oviposited) peas is associated with 25% direct yield loss and reduced quality through product contamination. There are two major problems with insecticide sprays which is the main tactic for the control of this pest. One is that continued use of a single mode of action seems to result in long term resistance to that class of insecticide. That is the likely reason why products that were used in the 1960's are no longer effective against this pest.Pyrethroid insecticides are the only labeled products for the control of this pest and these seem to have been losing efficacy in recent years. The second problem is that most growing stages of this insect are protected from foliar contact sprays. That is, the egg is deposited inside the developing pod and the grubs develop inside the mature pod (photo), both protected by the pod from contact sprays. Once they complete their development, grubs exit the pod and pupate in the soil. Thus, the only stage that is effectively targeted by foliar insecticides is the adult. The adults have been traditionally difficult to scout well enough for early detection. A new trap designed at the UGA Vegetable Entomology Research Lab at Tifton has improved early detection of adults, but we still need effective insecticides to treat at first flower or at first adult movement into the field. Our long term research will focus on how to reduce overwintering populations, possibly develop new host plant resistance options, and, of course, find new effective insecticide options.