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NATIONAL PEANUT BOARD/SOUTHEAST PEANUT RESEARCH INITIATIVE
PROJECT EXTENSION REQUEST FOR WORK DONE UNDER RESEARCH AGREEMENT

Final Report

INSTITUTION: University of Georgia

PROJECT TITLE: Tropical Spiderwort Biology and Management

RES. AGR. NO.:
GACCP Control NO.:

PROJECT LEADER: Dr. Eric Prostko

EXPIRATION DATE: December 31, 2007

NPB CONTACT:
NPB Control NO.:

Final Report

A field trial was established at the L.E. Watson Farm in Berrien County to evaluate several treatments for the control of tropical spiderwort. Results of the field trial are as follows:

1) Tropical spiderwort ratings obtained 38 DAT indicated the following:

a) Treatments that included Intrro or Outlook provided the least effective control of tropical spiderwort (67-70% control).

b) There were no differences in tropical spiderwort control between Dual Magnum, Stalwart, or Parallel PCS treatments (82-87% control).

c) KIH-485 provided tropical spiderwort control equivalent to Dual Magnum. The 4.2 oz/A rate of KIH-485 was more effective than 2.09 oz/A or 2.79 oz/A (93% control vs. 82-83% control) and was also more effective than Stalwart or Parallel PCS.

USDA

United States Department of Agriculture

Research, Education and Economics
Agricultural Research Service

To: Georgia Peanut Commission
From: Dr. Theodore M. Webster
Subject: Update on ***Tropical Spiderwort Biology and Management*** Grant
Date: 12 December 2007

I am writing to provide to you a summary of the results from our work with tropical spiderwort (USDA-ARS Agreement Number 58-6602-7-108). My portion of the research grant titled *Tropical Spiderwort Biology and Management* submitted by Drs. Brecke, Ferrell, Prostko, and Webster was to evaluate the depth of emergence of tropical spiderwort (Bengal dayflower is the new approved common name of this species according to the Weed Science Society of America).

Two studies evaluated from what soil depths Bengal dayflower seeds were capable of germinating, emerging, and establishing. The first study was a field survey. We sampled 100 seedlings (cotyledon to 1-leaf) three times in 2006 (23 May, 21 June, and 11 August) and twice in 2007 (4 June and 17 July) in order to evaluate the emergence depth of seedlings under field conditions. Sites sampled had naturalized populations of Bengal dayflower (in excess of 1700 seedlings/m^2 emerged in this field in 2005), were irrigated, and were located in Grady County, GA, near Cairo. Soil cores were excavated with post-hole diggers and placed in pots for transport back to Tifton. Soil was rinsed from around the roots of the seedlings. The distance between the soil level and the seed coat (at the junction between root and stem differentiation) was measured for each seedling.

The majority of the emergence occurred in the top 1 cm in 2006. I categorized data in 1 cm increments, but emergence at 0.5 cm accounted for 25, 23, and 28% for 23 May, 21 June, and 11 August times, respectively (Figure 1). Average depth of emergence was 2.29, 2.02, and 1.65 cm on 23 May, 21 June, and 11 August, respectively. The maximum depth of emergence was 6 cm for 2 of the 3 dates and 6.5 cm for the other date. In 2007, the drought may have altered the depth of emergence from the shallower depth to deeper in the profile where moisture may have been higher. Average emergence depth was 2.69 cm, with a range of 0.5 to 9.0 cm. Only 4% of the emergence occurred at the 0.5 cm depth, with the majority of it occurring at 2 cm. The second excavation date in 2007 failed to provide any usable information, as the seedlings that we sampled were too old and the outer shell of the seed was no longer attached to the seedling, therefore depth of emergence could not be determined.

In the related greenhouse study, 25 Bengal dayflower seeds were buried at each of the following soil depths: 0, 1.27, 2.54, 5.08, 7.62, 10.16, 12.7, and 15.24 cm (0, 0.5, 1, 2, 3, 4, 5, and 6 inches). The study contained four replications. Seed mortality was evaluated, as opposed to emergence, due to the complex dormancy issues that we have previously experienced with Bengal dayflower seeds. In addition, the study was conducted over a 12 month period in order to overcome some of the dormancy issues. After 12 months, there was a linear relationship between seed mortality and depth of burial (R^2 = 0.74). Seed mortality was approximately 35% at the shallowest two depths (0 and 1.27 cm) and increased to 74% at 15.24

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cm (Figure 2). The deeper burial depths likely had greater fatal germination (i.e. successful germination events that do not emerge and establish due to their extreme depth in the soil profile). However, a small percentage of seedlings did establish at the maximum depth. We have observed emergence from at least 15.24 cm in the fields as well.

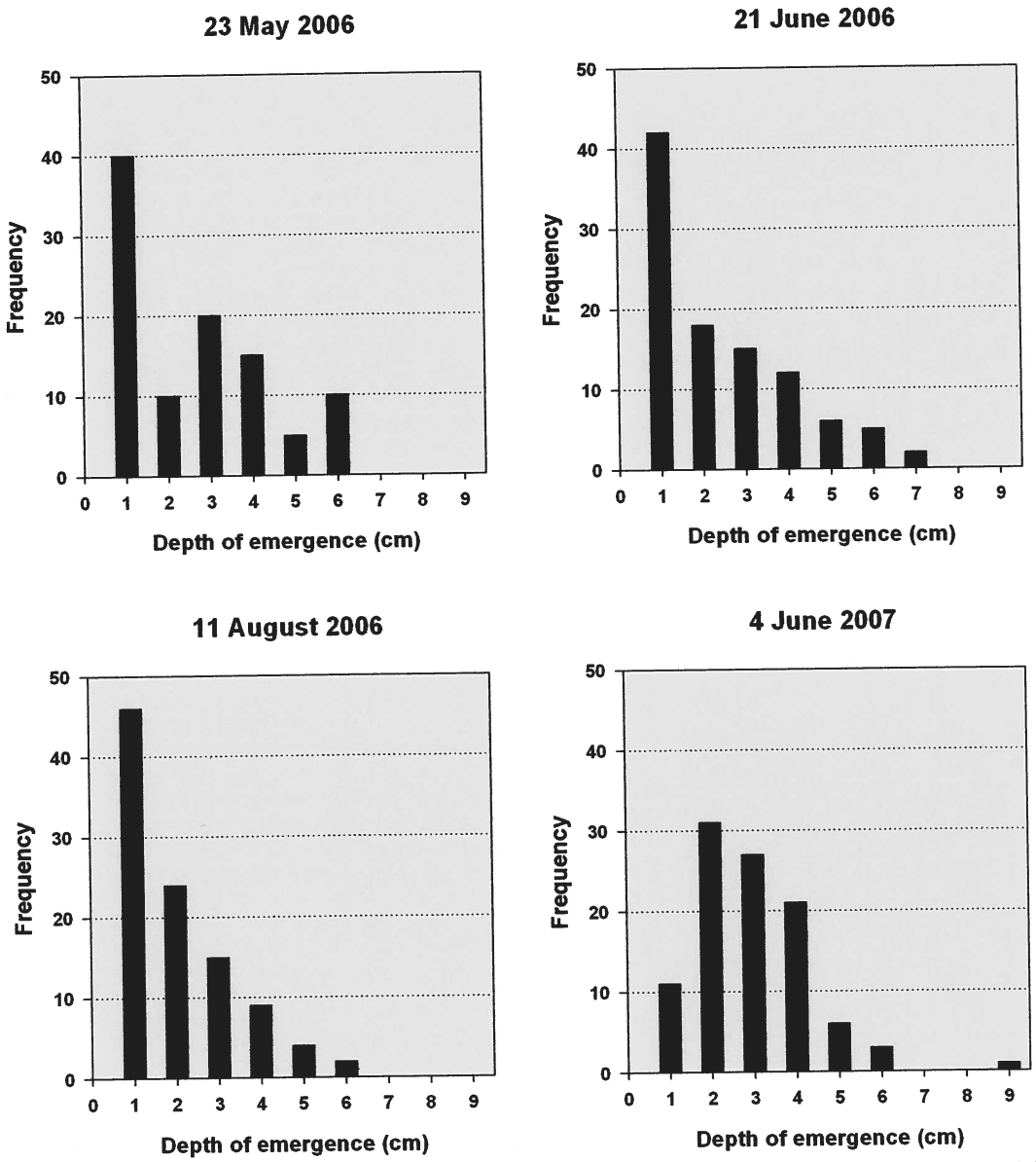

Figure 1. Frequency of soil depth from which Bengal dayflower emerged in naturalized field populations.

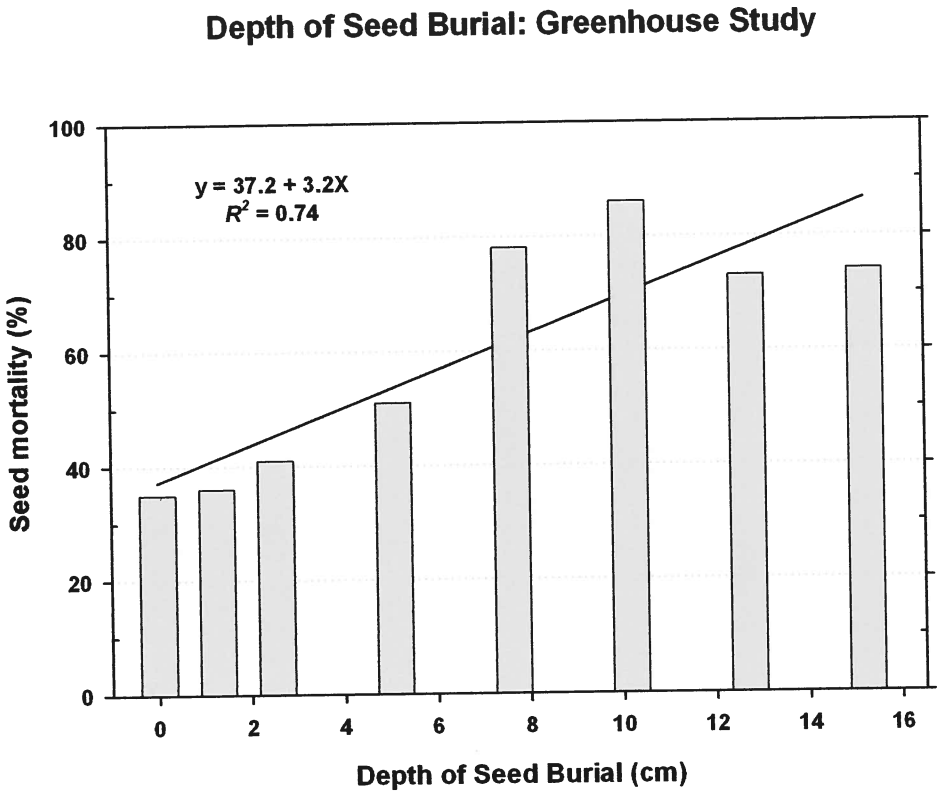

Figure 2. Results from a greenhouse study in which depth of emergence was evaluated at fixed intervals. Seed mortality increased with depth in a linear manner.

Conclusions: Results from the greenhouse study indicate that Bengal dayflower is capable of establishing from relatively deep positions (up to 6 inch or 15.24 cm depths) within the soil profile. However, the majority of the seedlings from the field study established from relatively shallow positions (average of 1.65 to 2.69 cm). These data may provide some explanation as to why deep turning (moldboard plow) has proven successful in minimizing Bengal dayflower populations in Florida studies. Future studies on seed longevity are critical in fully evaluating the potential of deep turning as a management strategy for Bengal dayflower. In addition, the means of dispersal of this seed into new areas needs to be determined. Preliminary evidence suggests that wildlife, especially doves, may be important in the spread of this species to new areas.