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PCR EVALUATION OF FOURTEEN BEAN GOLDEN MOSAIC VIRUS (BGMV) RESISTANT SNAP BEAN GERMPLASM LINE FOR THE PRESENCE OF THE VIRUS

R. T. McMillan, Jr., M. J. Davis, H. J. McLaughlin, and J. R. Stavely
Tropical Research and Education Center
University of Florida
Homestead, FL 33031
ARS, USDA, Molecular Plant Pathology Lab.
Beltsville, MD 20705-2350

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Abstract. **Since 1993 bean golden mosaic geminivirus (BGMV) has caused millions of dollars in losses to commercial snap bean (*Phaseolus vulgaris*) fields in south Florida. Late generation pole bean BGMV resistant lines, including those subsequently released, were planted in south Florida. The 14 lines being tested were planted each year starting in 1995 through the present in different growers fields with the susceptible 'McCaslan 42', randomly included among them. All fourteen advanced BGMV resistant pole bean lines were asymptomatic. All susceptible pole bean cultivar 'McCaslan 42' plants were symptomatic for BGMV based on PCR results. Thus, it appears that the early generation lines, with one possible exception, are resistant but not immune to BGMV.**

Introduction

Pole snap beans have been grown every winter in south Florida since 1900. The pole bean has had its share of troubles over the years, first by the devastating fungus *Sclerotinia sclerotiorum* which killed the vines and caused severe pod rot, and later by the high cost of labor necessary to grow and harvest the beans, which has cut the acreage from 7,000 acres to approximately 3,000 acres today (McMillan 1969; McMillan 1973; Anonymous 1990). Since 1993, bean golden mosaic geminivirus (BGMV) has caused millions of dollars in losses to commercial snap bean (*Phaseolus vulgaris*) fields in south Florida. Bean golden mosaic caused by the Bean golden mosaic virus occurs throughout most of the tropical and subtropical areas of the new world, including Florida, where beans are grown (Haber et al., 1991; McMillan et al., 1994; Blair et al., 1995: McMillan, 1996). With the appearance of BGMV and its white fly vector (*Bemisia argentifolii*), the pole bean growers were faced with the end of farming of the pole bean in south Florida.

Bean breeders had initiated a hunt for resistant genes in wild *Phaseolus* spp. since bean production in the same tropical areas of the world was already affected by BGMV. A bean geneticist in Puerto Rico, Dr. James Beaver, and others at the CIAT research center in Cali, Colombia had identified BGMV resistance genes. The resistant bean lines with these genes were sent to Agricultural Research Service Station at Beltsville, Maryland where Dr. Rennie Stavely incorporated them into the most favored pole bean, 'McCaslan 42'. The early crosses were planted in growers' fields near Homestead, Florida, and evaluated for resistance by Drs. Rennie Stavely and Robert T. McMillan, Jr. These pole bean lines showed no visible sign of BGMV disease.

The purpose of this research was to determine if the early generation lines were immune or symptomless carriers of the bean golden mosaic virus.

Materials and Methods

The 14 pole bean BGMV resistant lines homozygous for the *bgm*-1 BGMV recessive resistance gene and designated: (1) No. 4, 6-424, (2) No. 6, 6-438, (3) No. 9, 6-443, (4) No. 14, 6-448, (5) No. 22, 6-455, (6) No. 34, 5-2324, (7) No. 50, 5-2546, (8) No. 61, 5-2576, (9) No. 66, 5-2578, (10) No. 81, 5-2608, (11) No. 91, 5-2659, (12) No. 93, 5-2664, (13) No. 94, 5-2654, and (14) No. 96, 5-2666 were planted in 1997 in south Florida (Fig. 1). The lines were planted in a local pole bean grower field with the susceptible 'McCaslan 42', randomly included among them. All lines were asymptomatic at the time of tissue harvest. The 'McCaslan 42' controls were symptomatic for BGMV. A one-to two-gram sample of leaves was harvested from each of the lines and the controls and immediately placed on ice in a cooler. The leaf samples were transported to the laboratory where the DNA was extracted using a modified Dellaporta extraction (Dellaporta et al., 1983) preparation for PCR analysis.

Polymerase chain reaction (PCR) Oligonucleotide primers for geminiviruses were designed based on DNA sequence data for the virus and used to amplify a fragment of the viral genome containing part of the coat protein gene.

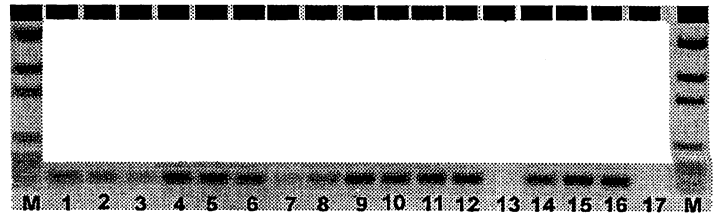

Figure 1. Polymerase chain reaction (PCR) analysis of the 14 pole bean lines. Fragments were amplified with primers specific to DNA geminivirus. Lanes M, Lamda EcoR I Hind III molecular weight markers DNA size standards; Lanes 1 through 14 are advanced generation pole bean lines; lane 13 did not amplify as did all of the other advanced pole bean lines; lane 15, symptomatic pole bean 'McCaslan 42' control; lane 16 was a positive control; and lane 17 was a negative water control.

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Results and Discussion

All fourteen advanced BGMV resistant pole bean lines sampled were asymptomatic. All of the susceptible pole bean cultivar 'McCaslan 42' control plants were symptomatic for BGMV. Thus, it appears that the early generation lines with the one possible exception, are resistant but not immune to BGMV (Fig. 1). BGMV was detected in all but one line (lane 13 Fig. 1) by PCR. A simple explanation for this one non-amplification might be that the plant sampled may have been an escape, but other unknown causes may have also produced these results.

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FIELD PERFORMANCE OF A NEW PEPPER WEEVIL PHEROMONE FORMULATION

HARRY BOTTENBERG
Glades Crop Care, Inc.
949 Turner Quay
Jupiter, FL 33458

BILL LINGREN
Trece, Inc.
P.O. Box 6278
Salinas, CA 93912

Abstract. **Pheromones have been a candidate for the monitoring and control of pepper weevils *(Anthonomus eugenii* Cano), a destructive pest of peppers in Florida. Concerns about the performance and cost of the standard pepper weevil pheromone based monitoring system have prompted recent developments in new pheromone formulations with increased longevity and attraction. We tested two new pepper weevil pheromone formulations in a commercial pepper farm in the 1998 spring crop in southern Florida. Various trap designs were also evaluated in a preliminary trial. One dual lure system (TRE8420 + 8462) showed superior longevity and sensitivity compared to the standard lure and unbaited control. The new lure system retains activity up to five weeks in the field and provides an economical means for monitoring and control of pepper weevils.**

Introduction

Pepper weevils cause damage to peppers *Capsicum* spp., by larval feeding in fruit leading to fruit drop or contamination of fruit with frass and weevils (Riley and King, 1994). Oviposition and feeding punctures on fruits and blooms by adults also reduce fruit quality while high populations of weevils can defoliate plants and prevent fruiting. Weevils are difficult to control once an infestation has become established in the field. Early detection of adults is essential so that a properly timed insecticide application can be made to prevent further population increase.

A variety of sampling methods have been developed. Visual inspection of plants provides the most consistent results, but is too time-consuming for use in commercial production settings (Riley et al., 1992). Likewise, yellow sticky traps can be used, but the intensity required makes this method too expensive as well (Riley and Schuster, 1994). Aggregation pheromones in combination with yellow sticky traps offer new perspectives in pepper weevil monitoring (Eller et al., 1994). The standard formulation developed by USDA and modified by Trece has been on the market since 1995. But high production costs and limited field longevity have limited its adoption as a monitoring system. Recent developments in new pheromone formulations and production methods at Trece have yielded several new candidates. The purpose of this study was to test these new formulations in the field for sensitivity and longevity of attraction and to correlate trap catch with weevil fruit damage. We also evaluated various trap designs compared to the yellow sticky trap.

Materials and Methods

Lure trials. Three lure systems were tested: standard lure, TRE 8420 + 8461 and TRE 8420 + 8462, and compared with an unbaited control treatment. Lures were prepared at Trece, Inc. (Salinas, Ca) and stored in a freezer before use. The stan-

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