**Demonstrating New Technologies for Improved Corn Rootworm Management**

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**Abstract:**
An on-farm demonstration was initiated at the Cornell Musgrave Farm, Aurora, to present, compare, and evaluate new and emerging corn rootworm (CRW) management strategies. In this first phase of a three year project, ca. a 0.7 acre field site (Cornell Musgrave Farm, Field "X", Aurora, NY) was late planted to pumpkins and field corn to attract egg laying by corn rootworm beetles (*Diabrotica* species) providing a suitable site for establishing the CRW control comparison demonstration in 2001. Year 1 objectives have been completed and a summary of activities is presented.

**Introduction and Justification:**
Over the past decade, the western corn rootworm (CRW) has become established as the predominant insect pest of field corn in New York. The more economically damaging capacity of western CRW, compared to the ubiquitous northern CRW species, has increased grower awareness and concern of potential risks of CRW. Corn grown for silage is at particular risk from rootworm injury (Davis 1994).

Current options for managing CRW include crop rotation or use of a soil insecticide at planting. Crop rotation is the most effective tactic to avoid CRW losses. This option, however, is not always possible given a farm's annual cropping or livestock feeding needs, constraints on land resources or other factors. CRW active soil insecticides, the second management option, are relatively expensive, toxic to handle and may not always provide adequate control.

Western CRW is responsible for dramatic increases in overall soil insecticide use. A 1985 pesticide survey reported that 13.8% of NY's corn acreage received a soil insecticide (Specker et al 1986). By contrast, a 1994 NYS PIAP survey found that 70.3% of corn for grain acres and 17.3% of corn for silage acres were routinely treated with an insecticide. Presumably a significant proportion of these insecticide applications were for CRW management (Partridge et al 1995).

Several advancements in CRW management are currently in development and expected to be commercially available in the near future. In 1999, transgenic hybrids resistant to CRW were tested on a national level. The companies developing these hybrids anticipate commercial release by the year 2001 to 2002. Given the economic importance of CRW, it is anticipated that grower interest in these hybrids will be high. Some analyst's project that market penetration by these new releases will quickly exceed the 20 - 25% national corn acreage market share currently occupied by transgenic Bt-corn hybrids. Some estimates range as high as 75%. Bt hybrids for European corn borer control first became commercially available in 1996.

In addition to transgenic hybrids, two companies are testing insecticide seed treatments for controlling CRW. Gustafson, Inc. (Dallas, TX), Inc. has a CRW active seed treatment (Prescribe) under development and Syngenta, Inc. (Greensboro, NC) has recently announced that a corn seed treatment for CRW using Force insecticide will be marketed on Northrup-King corn varieties in year 2001. These treatments offer the potential benefits of efficacy, combined with a user-

friendly CRW insecticide delivery method and an environmentally sensitive low a.i. rate per acre. Properly deployed, these novel tactics offer much promise to enhancing our CRW management options.

This demonstration will present, evaluate, and document comparisons of these new CRW management options. Timing of the demonstration would coincide with the expected commercial release of new CRW-hybrids and seed treatments (2002 – 2003). The demonstration would be established at the Cornell Musgrave Farm (Aurora, NY). Results from this demonstration will be featured at annual farm field day event(s) and shared with a larger clientele audience through CCE outreach efforts and educational materials such as Cornell Guidelines for Integrated Crop Management. This project compliments other related studies designed to develop and test CRW insecticide-resistance management strategies (Cox and Shields, Shields and Calvin, and others).

**Objectives:**

1) To introduce, highlight, evaluate and document effectiveness of new CRW management technologies and techniques.
2) To enhance timely development and outreach of CCE CRW management information and provide a forum for discussion of the benefits and concerns associated with the use of these new technologies, including efficacy, and resistance management.

**Procedure:**

**Year 1 (2000).**

Promote CRW infestation in a selected study area of the Aurora research farm. A trap-crop mixture of cucurbits and field corn will be planted in mid-June 2000 to attract late-season CRW infestation and encourage egg laying in the study location. The area planted will be large enough to establish plots during the 2001 growing season, ca. 0.7 acres. Standard agronomic practices, site preparation, fertility, seeding rates, herbicide use, etc. will be utilized.

Rootworm beetles can readily move between fields and may cause damage in locations other than where they emerged. Late maturing corn fields can attract large numbers of corn rootworm beetles since neighboring more-mature corn may have stopped producing pollen, the beetles preferred food. Corn rootworm beetles are also naturally attracted to cucurbitacin produced in blossoms of members of the squash family.

A corn rootworm trap crop plot was planted on 20 June 2000 with a Kinze 2-row corn planter. Planting was delayed approximately 30 days after adjacent corn fields to provide a late food source for corn rootworm beetles. Rows of field corn only were alternated with rows of a mixture of field corn and pumpkins. Approximately 16,000 corn seeds per acre (mix of 3 locally adapted Pioneer brand, 100 day hybrids) and ca. 1.5 lbs. of pumpkin seeds per acre (Harris Seed Co., variety “Spookie”, 110 day) were planted at a depth of 1.5 inch and a row spacing of 30 inches. Seeds received a planter box treatment of Germate Plus (Gustafson, Inc.) seed protectant just prior to planting. Fertilizer (265 lb./acre of 10-10-10 N:P:K) was banded at planting. A pre-emergence application of the herbicide Dual 8E (metolachlor, 2 pt. / acre, Novartis, Inc. Greensboro, NC) was applied on 22 June. Plots were sidedressed with 100 lb. of nitan per acre July 1, 2000.

Field corn was grown using standard agronomic practices appropriate for central NY.

A good stand of corn and pumpkins was established which attracted large numbers of corn rootworm beetles. Observations August 9, 2000, during the time of corn and pumpkin flowering, estimated 10 – 15 corn rootworm beetles per pumpkin blossom and 1 - 3 beetles per pollenating corn plant. Pumpkins had an extended period of flowering that continued from early August through mid September. Farm neighbors appear to be reliable indirect sources of pumpkin yield monitoring information. Pumpkin set was evidentially good as inferred by the preponderance of "Spookie"-sized pumpkins on neighborhood front porches in the vicinity of the field plot in late September and October.

This demonstration project is on going and will continue in 2001 and 2002.

**Proposed Activities Year 2 and 3 (2001 and 2002).**
Demonstration plots will be established in May 2001 and again in 2002 in the 2000 field site, pending continued funding. CRW control strategies proposed are: a transgenic CRW resistant hybrid; a non-CRW resistant isoline receiving one of the following: no CRW insecticide, a standard CRW soil insecticide, or a CRW active seed-treatment (ST) insecticide at the rate recommended for seed corn maggot (low) or corn rootworm (high) (Gaucho or Prescribe respectively, Gustafson, Inc., Dallas, TX); and an appropriate non-transgenic hybrid pre-coated with a CRW insecticide. Demonstrations will be established at the Cornell Musgrave Farm and featured at farm field days. Information generated by this study will be shared with additional clientele through CCE extension outreach efforts and publications.