Seed Corn Maggot, Stand Losses and the Need for Insecticide Seed Treatments

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Seed corn maggot, *Delia platura,* (SCM) is the primary NY pest attacking large-seeded crops during germination. These crops include corn, soybean and edible beans. One of the difficulties in managing this pest is the unpredictability of the infestations, the lack of an insecticide rescue option and the lack of flexibility to compensate for crop stand losses.

SCM adult flies, looking similar to small house flies, are attracted to fields with high organic matter within the plant zone, and lay their eggs close to germinating crop seeds. The newly hatched larvae attack and feed on the germinating seeds and young emerging plants. In NY, the frequent use of animal manures and cover crops known as green manure crops increases the attractiveness of the fields to SCM. The short and cool NY growing season encourages growers to plant their crops as early as possible to be able to harvest profitable yields. This early planting of seeds into cold soils results in slow and delayed emergence which increases the window of vulnerability to SCM damage. In these situations, stand losses can exceed 50% due to the attractiveness of the organic matter, resulting in a high level of eggs being laid around the germinating seeds.

Under NY growing conditions, measurable yield losses in corn start to occur between 10-20% stand losses. The magnitude of the yield loss is dependent on the corn variety, degree-day maturity requirements and the subsequent growing conditions which influence the ability of the undamaged plants to compensate for the damaged plants. Due to the short growing season in NY, the decision to replant the field is seldom an option due to the additional expense of replanting (ca. $130/ac) and the yield reductions associated with shorter season corn variety required to be planted for maturity to be completed before killing temperatures in the fall. Typically, if the surviving corn stand has less than a 40% stand loss, the resulting yield loss is less costly than the combined cost of replanting and yield decline associated with late planting.

2021 Field Study in Aurora, NY

A study was initiated to examine the impact of SCM and the necessity of insecticide seed treatments on corn grown under continuous corn culture with minimal organic matter and corn following a green manure cover crop with high organic matter.

Experimental design:

The continuous corn site had been planted to corn for 7 years prior to the 2021 growing season. Previous corn crops had been harvested as grain and soil tillage was restricted to spring chisel plowing. Crop residue was minimal and planting in 2021 was achieved using a 4-row no-till planter. The cover crop site was planted to red clover in 2020 and the clover crop was retained as a green manure crop. Prior to planting the cover crop site to corn, the clover was mowed, liquid dairy manure was applied to the surface and the soil was chisel plowed to prepare the seed bed for planting. Planting in 2021 utilized a 4-row no-till planter. Each area was planted on a weekly basis yielding 6 different sequential planting dates. Each row of the 4-row planter contained a different treatment and the plots for each planting date were comprised of a single planter pass in the continuous corn and two planter passes in the cover

crop site. The following treatments were planted as single rows within each planter pass. 1) conventional corn (non-Bt-RW) with no seed applied insecticide, 2) conventional corn (non-Bt-RW) with seed applied insecticide, 3) Bt-RW corn with no seed applied insecticide and 4) Bt-RW corn with seed applied insecticide. Each planting date was replicated four times at each location. Data collected included stand counts after the plants were V3-4 growth stage and excavation of the missing plants to document the reason for the missing plant.

Results:

Continuous corn site:

At the continuous corn site, the experimental design allowed 24 planting pairs (corn type x presence/absence of seed applied insecticide) for comparison and analysis. Fourteen of the 24 planting pairs (58%) suffered stand losses in the untreated seed row from seed corn maggot ranging from 2% to 66% stand loss. If the 10% stand loss/yield loss threshold is used, then nine of the 24 planting pairs (38%) indicated economic yield losses in the non-seed applied insecticide treatments. If 14% stand loss/yield loss threshold is used, then eight of the 24 pairs (33%) indicated economic yield losses in the non-seed applied insecticide treatments. If the 20% stand loss threshold is used, then six of 24 (25%) planting pairs indicate economic losses in the non-seed applied insecticide treatments. Four of the planting pairs had greater than 40% stand losses in the non-seed applied insecticide treatments.

Corn following cover crop site:

In the corn following cover crop site, the experimental design allowed 24 planting pairs (corn type x presence/absence of seed applied insecticide) for comparison and analysis. Sixteen of the 24 planting pairs (66%) suffered stand losses in the untreated seed row from seed corn maggot ranging from 2% to 62% stand loss. If the 10% stand loss/yield loss threshold is used, then 13 of the 24 planting pairs (54%) indicated economic yield losses in the non-seed applied insecticide treatments. If 14% stand loss/yield loss threshold is used, then nine of the 24 pairs (38%) indicated economic yield losses in the non-seed applied insecticide treatments. If the 20% stand loss threshold is used, then seven of 24 (29%) planting pairs indicate economic losses in the non-seed applied insecticide treatments. Five of the planting pairs had greater than 40% stand losses in the non-seed applied insecticide treatments.

Discussion:

The following values were estimated for 2021 from three different regions of NY. These values were estimated by regional experts.

Region	Silage value (in field)	Representative Yield	Value/ac
NNY:	$40/ton	17 tons/ac	$680
CNY	$38/ton	20 tons/ac	$760
WNY:	$47/ton	20 tons/ac	$940

In all three regions, a one-ton silage loss per acre in yield equals eight-times the cost of the insecticide seed treatment. A one-ton reduction in silage is approximately 5% loss in yield which equals a $40 loss per acre. If we use the estimate that 1%-5% yield losses began at a 10% stand loss ($8-$40 in

lost silage), then it is economically beneficial for the farmer to utilize an insecticide seed treatment costing $5 per acre to prevent the loss.

Continuous Corn:

Research data collected in controlled studies during 2021 at the Cornell Musgrave Farm located in Aurora, NY shows that in continuous corn production, seed corn maggot economically damaged 38% of the non-insecticide seed treated plots ranging from 10% to 66% stand losses. If we estimate a 10% stand loss equals a 1-5% yield loss, then the value loss to the farmer is $8-$40/acre.

The cost to the farmer to protect his yield loss with insecticide seed treatment is $5/acre and therefore it is economically viable to spend $5 per acre to protect yield losses ranging from $8 to $400 per acre on 38% of a farm's acreage. If we estimate a 20% stand loss results in a greater than 5% yield loss, then 25% of the fields will suffer losses greater than $40 per acre. These losses would be economically devastating to a farmer, where the farm loses yield on 38% of their acreage ranging from $40/ac to $400/ac. Since predicting which fields will be attacked by seed corn maggot prior to planting is difficult and imprecise, the prevention of yield losses ranging from $40-$400/ac on 25% of the acreage easily compensates and is economically justified for the cost of the insecticide seed treatment for all acres.

Corn following a Cover Crop:

Research data collected in controlled studies during 2021 at the Cornell Musgrave Farm located in Aurora, NY shows that in corn production following a cover crop, seed corn maggot economically damaged 54% of the non-insecticide seed treated plots ranging from 11% to 62% stand losses.

If we estimate a 10% stand loss equals a 1-5% yield loss, then the value loss to the farmer is $8-$40/acre. The cost to the farmer to protect his yield loss with insecticide seed treatment is $5/acre and therefore it is economically viable to spend $5 per acre to protect yield losses ranging from $8 to $400 per acre on 54% of a farm's acreage. If we estimate a 20% stand loss results in a greater than 5% yield loss, then 33% of the fields will suffer losses greater than $40 per acre. These losses would be economically devastating to a farmer, where the farm loses yield on 54% of their acreage ranging from $40/ac to $400/ac. Since predicting which fields will be attacked by seed corn maggot prior to planting is difficult and imprecise, the prevention of yield losses ranging from $40-$400/ac on 33% of the acreage easily compensates and is economically justified for the $5 per acre cost of the insecticide seed treatment for all acres.

Conclusions:

This 2021 research data indicates the level of potential economic losses by NY corn farmers if seed applied insecticide is not available for use. In NY, replanting after stand losses from SCM is not a viable economic option in most situations due to the short NY growing season. The farmer is required to suffer yield losses due to reduced stand because replanting is seldom a viable economic option.

These data documents the increased risk of economic stand losses from SCM when the farmer plants corn after a cover crop/green manure crop, which is utilized in soil building and nutrient retention over the winter months. These data also indicate why the attempts to have farmers adopt cover crops in the 1990's, were not successful due to SCM related stand losses in the corn crop planted following the

cover crop. Adoption of cover crops to build soil health and nutrient retention was not successful until corn seed was treated with a seed-applied insecticide to prevent stand losses in cropping situations where SCM pressure was increased. Given that conservation practices such as reduced tillage and planting cover crops to reduce erosion and runoff are not only encouraged but also incentivized in NY State, it is important to understand that in the absence of these seed protectants, farmers may revert to planting fewer cover crops to avoid losses to SCM.

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