Morning Glory Seed Survival:

Morning glory seeds in the ASD treated houses had decomposed or decayed, with no viable seeds present after treatment. Morning glory seeds in the non-ASD treated areas also showed some decomposition, however 60% remained firm and the endosperm appeared viable. After removal of the cover in December there was some germinating grasses which indicates the treatment may not be effective for all plants. It is possible that the germinating grass seed was on top of the soil surface and thus not affected by the ASD process. In both houses, the entire growing area was covered with black or white on black plastic mulch which prevent d weed growth after planting, so season long weed control could not be evaluated.

Fusarium Crown Rot:

Although the treatment seemed successful for reducing *Sclerotinia sclerotiorum*, House 1 reported that the crop planted in the spring was not thriving. Some plants were wilting during the daytime and fruit production was limited. Samples from wilting plants were submitted to the UMD Plant Diagnostic lab and confirmed for the presence of Fusarium Crown Rot. We obtained soil samples from the high tunnels and conducted a small bioassay to determine how much Fusarium inoculum remained. We found no difference (P=0.8580) between the treated and untreated sections of the high tunnels. It should be noted that our sample was taken several months after the treatment was completed, and the fungus may have reinvaded treated areas. In addition, we could not differentiate between pathogenic or saprophytic Fusarium species. However, our results may indicate that our treatment was less successful in reducing Fusarium than Sclerotinia.

Example of wilting plant infected with Fusarium Crown Wilt from House 1.

In House 2, plants thrived. However we have no way to compare the efficacy of the ASD treatment versus the efficacy of resistant rootstock on grafted plants. Overall yields from House 2 were outstanding and exceeded yields from the non-treated ASD house with grafted plants by 30%. The adjacent non-treated house planted to non-grafted susceptible plants performed poorly with losses of approximately 75% due to Fusarium Crown rot. and Root Knot nematode. The author's recommend the use of grafted plants with resistant a rootstock in combination with the ASD treatment if Fusarium Crown rot or Root Knot nematode are present. Follow-up studies are being conducted during the 2019-2020 season comparing the ASD treatment, mustard seed meal treatment and combination of grafted versus non-grafted plants.

Sources of Spider Diversity in Agroecosystems: Where do the Creepiest Predators in Your Croplands Like to Live?

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As the Halloween season settles upon us, most of our attention shifts to focus on upcoming harvests, pumpkin patches and the beautiful fall foliage. However, this time of year means something very different for a certain arthropod natural enemy in your croplands. For the rest of the fall season, spiders will be reproducing and searching for spots to hide their egg sacs for the winter. Of all the natural enemies you can think of, spiders may not seem like the best candidate to suppress agricultural pests, but their contribution to the ecosystem services utilized in your croplands is not to be underestimated. Spiders are the most abundant natural enemy that occur in most agroecosystems and are estimated to globally consume around 3 trillion prey items in croplands each year. Habitat structure is thought to be one of the most important factors for spider habitation, as different spider families have unique feeding strategies that are adapted to specific habitat niches (Figure 1). Previous studies have shown that spider assemblages in more structurally diverse habitats are higher in spider abundance and diversity than less diverse habitats. Perhaps there is already an area on your farm that spiders take refuge during the year.

Figure 1: A jumping spider pouncing off a leaf and a long-jawed orb weaver weaving its web. The jumping spider uses ambushes to surprise potential prey, while the long-jawed orb weaver creates a web and waits for prey to become entangled if they stray too close. Both spiders are common in drainage ditches and croplands.

Agricultural drainage ditches are common structures on farms along Maryland's eastern shore that are created for hydrological control in arable landscapes. Drainage ditches are generally not planted and are less disturbed than the croplands that they border or intersect, and thus could be an attractive habitat for various spiders throughout the growing season (Figure 2).

Figure 2: An agricultural drainage ditch intersecting a freshly planted soybean field. Spiders tend to migrate to uncropped areas on farms when fields are disturbed.

Drainage ditches possess greater plant diversity compared to monoculture stands planted in croplands, which has previously been shown to allow for more diverse spider community assemblage in both natural and agricultural settings So, the plant diversity in drainage ditches has led us to believe that ditches may influence the spider communities of neighboring croplands.

In order to better understand the spider communities of drainage ditches and their neighboring croplands, I conducted a preliminary experiment in a drainage ditch neighboring an organic soybean field during summer 2018. I defined 4 habitats within or near the drainage ditch that I believed could possess unique spider communities: inside the ditch, at the edge of the ditch, 10m into the soybean field from the ditch edge, and 20m into the soybean field from the ditch edge. Spiders were collected from these 4 habitats at select stages of soybean growth via foliar sweep and pitfall trap sampling. The soybean growth stages we sampled during were: after seeding, vegetative stage 3 (V3), reproductive stage 5 (R5), and just prior to soybean harvest. All spiders collected in 2018 were identified to genus.

One of the trends observed from our preliminary experiment was that drainage ditches appeared to possess greater spider diversity and abundance than nearby croplands throughout the summer (Figure 3).

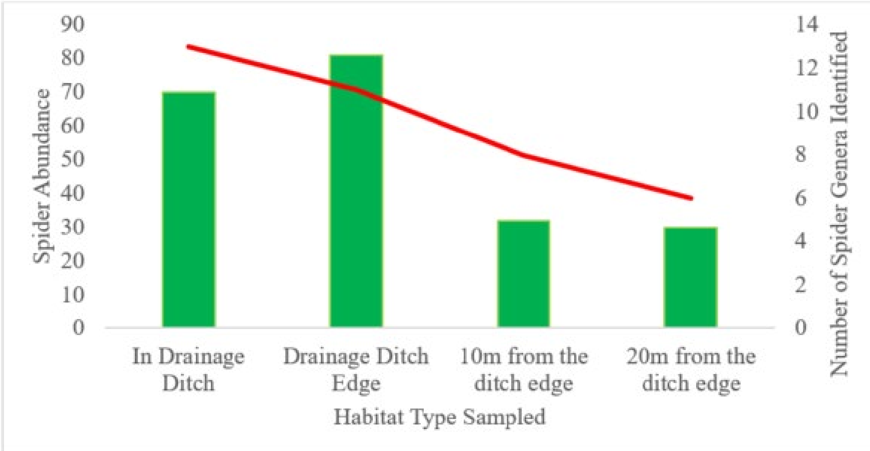

Figure 3: Number of spider genera identified (red line) and spider abundance (columns) collected via foliar sweep and pitfall sampling at various distances starting in a drainage ditch and ending in an organic soybean field.

Both spider diversity and abundance were highest in habitats possessing drainage ditch foliage (in ditch and ditch edge habitats) as opposed to the monoculture soybean stands in the neighboring field. This data suggests that the further away from a drainage ditch a sampling site is, the fewer and less diverse the observed spider community is. This has implications for pest suppression in croplands, as less natural enemies like spiders imply reduced pest suppression for the crops planted in said field.

Another trend observed from our preliminary data was that spider diversity in and around drainage ditches increases as the soybean growing season progresses (Figure 4).

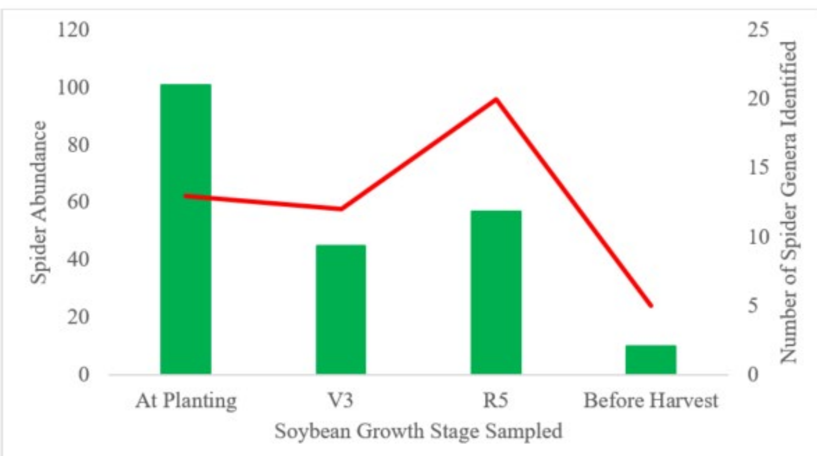

Figure 4: Number of spider genera (red line) and spider abundance (columns) collected via foliar sweep and pitfall sampling during select soybean growth stages in an organic soybean field and its nearby drainage ditch.

I observed that spider diversity increased as the soybean growth season progressed, yet spider abundance declined. The decrease in spider abundance as the summer progressed may be attributed to the soybean field that was sampled being terminated and reseeded after the first growth stage sampling. Similar field disturbances, such as harvests, have previously been associated with decreases in spider abundance in croplands through. Preliminary results from a larger scale experiment of the same experimental design we performed during summer 2019 supports my suspicions on this matter, as spider abundance within 3 drainage ditches and their neighboring soybean fields steadily increased as the summer progressed.

From this preliminary experiment, I can conclude that drainage ditches harbor more diverse spider communities than neighboring croplands. The increase of spider diversity in croplands neighboring drainage ditches may be community spillover from the more diverse spider communities in drainage ditches, but data from the 2018 preliminary study I performed cannot assert this in confidence. The results of the current larger 2019 drainage ditch spider study will better document the nature of the drainage ditch-cropland spider populations and how it changes as the soybean growing season progresses.