Ohio Vegetable & Small Fruit Research & Development Program

Final Report

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Project Title: Efficacy of anaerobic soil disinfestation (ASD) for control of soilborne diseases of strawberry transplants.

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Why was this project funded? This project was funded to determine if anaerobic soil disinfestation (ASD) could be used to reduce soilborne diseases in strawberry transplant production using locally sourced carbon products. Anaerobic soil disinfestation is a management practice that encourages anaerobic decomposition of carbon-based amendments, allowing for the accumulation of volatile compounds that kill pathogens. While ASD has proven efficacy in reducing soilborne diseases of tomato production fields its effectiveness in managing soilborne disease of strawberry Ohio is not known. Diseased strawberry transplants are the primary source of pathogen introduction into the field. Producing transplants locally could potentially lower transplant costs and reduce the risk of introducing soilborne pathogens into the production field. Anaerobic soil disinfestation is a promising tool that can be easily adopted by strawberry growers to produce disease-free transplants.

Project outline: Three carbon sources (grape pomace, apple pomace, and wheat middlings) were tested for the ability to create anaerobic disinfested soil. Grapes and apples were locally sourced, and pomace was prepared by pressing, drying and grinding the organic matter. The wheat midds were purchased from Central Farm and Garden in Wooster. Wooster silt loam soil was amended with one of the carbons and inoculated with *Colletotrichum acutatum* or *Neopestalotiopsis* sp. and saturated completely with 150 - 200 mL sterile water. One three-inch long IRIS tube was buried in the center of the soil in each bag to indicate anaerobic soil conditions at the conclusion of the incubation period. The bags were left for four weeks in a growth chamber at 25° C and planted with cv. Honeoye. Plants were grown in the greenhouse and fresh weight and the number of leaves per plant were recorded. Root disease incidence (number of plants with root lesions) and severity (0-100% of roots affected) were rated. The main crown of each plant was dissected, and the presence or absence of crown necrosis was recorded.

What was discovered: Carbon rich pomace is a waste product of apples used for cider and wine grapes that could potentially be used for ASD. Under greenhouse conditions grape pomace and wheat midds generated 2.3 time the level of anaerobic activity compared to apple pomace in Wooster silt loam. Although *Colletotrichum acutatum* or *Neopestalotiopsis* sp. were evaluated in this study, all but three of the plants including the controls in *Colletotrichum acutatum* studied died. Many of the plants in the *Neopestalotiopsis* sp. study also died, but there were enough surviving plants to conduct the disease assessments (Table 1). Mean fresh weight (g) of the plants ranged from 9.1 to 10.8 and the mean number

of leaves per plant ranged from 6.0 to 6.7. Plants did not produce fruit during this experiment. Rot severity was highest in the plants that did not receive a carbon treatment and lowest in the grape pomace treatment. Plants produced in the wheat midd ASD treatment had the least number of plants with crown necrosis.

Table 1. Efficacy of anaerobic soil disinfestation against *Neopestalotiopsis* sp.

Carbon source	**No. Plants**	**Mean Fresh weight per plant (g)**	**Mean No. leaves per plant**	**Mean root severity (%)**	**Plants with crown necrosis (%)**
Apple pomace	6	9.7	6.7	21.5	66.7
Grape pomace	2	10.8	6.5	10.0	50.0
Wheat midds	6	10.3	6.0	16.8	33.3
Control (no carbon source)	7	9.1	6.4	25.0	28.5

Take-home messages: While ASD has been adopted by many high tunnel vegetable producers in Ohio, evaluating ASD as a tool for disease management in strawberries has presented several challenges. Similar to producers, it has been challenging to obtain disease-free transplants to conduct reproducible research. Plants were sourced from two nurseries to try and reduce the probability of receiving diseased transplants. In this study we chose to conduct the research in the greenhouse to avoid introducing *Neopestalotiopsis* sp. into the research fields as we still know very little about how the pathogen overwinters or spreads in the field. However, using Wooster silt loam as the soil source made it challenging to keep the soil moist under greenhouse conditions, especially in July and August. Future studies should use a soilless substrate to amend the soil to support moisture retention. In addition, a drip irrigation system would allow for more reliable watering of the plants. Using growth chambers is another option to better monitor temperature and humidity.

Overall, this study provided data to support a Specialty Crop Research Block Grant proposal for 2025. ASD treatment did not adversely affect the fresh weight of strawberry plants or their leaf production, which are key criteria for continuing to evaluate ASD effectiveness in a crop. Grape pomace was determined to be a good carbon source for generating anaerobic soil conditions. Identifying local sources of carbon for ASD will help to reduce treatment costs and provide a value-added product to Ohio growers. Further investigating the effectiveness of grape pomace in reducing strawberry disease root severity is warranted if disease-free transplants can be sourced. My program is currently trying to propagate clean daughter plants from healthy plants so that they can be used in future research. Evaluating grape pomace for ASD in crops where ASD has been proven to be an effective disease management strategy (i.e., tomato) is recommended. In addition, repeating studies using apple pomace from other varieties is recommended as variety may play a role in the level of anaerobicity that is generated.