

## EFFECTS OF LANDSCAPE FABRICS ON PEST CONTROL IN A RAISED-BED TROUGH SYSTEM FOR STRAWBERRY PRODUCTION WITHOUT FUMIGATION

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Pre-plant soil fumigation with methyl bromide and other alternative fumigant chemicals used for the control of soilborne pathogens and nematodes is highly restricted in California. Therefore, there is an increasing interest to find alternative methods to avoid or reduce the use of fumigants. Non-chemical approaches include resistant/tolerant cultivars, long crop rotation cycles and biofumigation. However, the selection of cultivars is difficult due to multiple pathogens that may be encountered in the soil, and biofumigation alone requires specific soil conditions to provide high efficacy. Therefore, other non-chemical strategies that can be used regardless the types or species of pathogens or pests are desired.

Landscape fabrics are geotextiles that have been used to control weeds. For example, fabrics such as Dewitt Weed Barrier<sup>TM</sup> can reduce the emergence of yellow nutsedge (*Cyperus esculentus*), pigweed (*Amaranthus* sp.), bermudagrass (*Cynodon dactylon*) and johnsongrass (*Sorghum halepense*). Besides weed control, commercially available spun polyester/polyolefin landscape fabrics, such as Weed-X<sup>TM</sup>, can also serve as a physical barrier to reduce root weevil (*Diaprepes abbreviatus*) infestation preventing downward penetration. However, little is known about whether the fabrics can be used to control plant parasitic nematode and soilborne pathogen infections for strawberries. The objectives of this study were to 1) determine the performance of landscape fabrics for the control of nematodes and soilborne pathogens, and 2) evaluate the strawberry yield using different landscape fabrics.

Four different commercially available landscape fabrics were used: Pro-Shield<sup>TM</sup> (Dalen Products Inc., Knoxville, TN), Weed Barrier<sup>TM</sup> Pro (DeWitt Co., Sikeston, MO), Pro-5 Weed Barrier<sup>TM</sup> (DeWitt Co., Sikeston, MO), and Weed-X<sup>TM</sup> (Dalen Products Inc., Knoxville, TN). The experiments were carried out with cultures of root knot-nematodes (*Meloidogyne incognita*), *Phytophthora cactorum*, and *Verticillium dahliae*.

Greenhouse experiment: Soil in pots was infested with root-knot nematodes (5000 freshly hatched J2 root-knot nematodes) and both soilborne pathogens (50 g of soil containing 10890 *P. cactorum* cfu/g soil and 485 *V. dahliae* cfu/g soil). Over the infested soil, one of the four different fabrics was placed. Above the fabric, 1000 cm<sup>3</sup> of soilless substrate (60% peat; 40% perlite) was added. A strawberry plant cv. Camarosa was planted per pot. The planted pots were randomly distributed, watered three times and harvested ten weeks after planting. The number of roots that penetrated the landscape fabrics was determined. Roots and substrate were inspected for nematodes and pathogens, and strawberry petioles were analyzed for *V. dahliae*.

Field trial: In 2010 a field trial was conducted at the Monterey bay Academy located near Watsonville, California. Soil beds were constructed with a specially built bed shaper/press and covered with plastic mulch. Nine beds were randomly assigned to one of three different

landscape fabrics (Pro-Shield™, Weed-Barrier™ Pro Pro-5 or Weed Barrier™) and filled with peat-perlite substrate. Strawberry transplants (cv. Albion) were planted in each bed at 20.3 cm spacing, and irrigation was performed through drip tapes. Each bed was lengthwise divided in three equal sections and one section was infected with nematodes, other with soilborne pathogens and the third section remained untreated. The infections were performed under the landscape fabrics. After 18 weeks of nematode and pathogen inoculation, the number of roots that penetrated the fabrics was determined. Simultaneously, nematode and pathogen infection was evaluated in roots and substrate.

In general, all fabrics exhibited strong capacity to contain the roots inside the raised-bed substrate trough system. In the greenhouse experiment, Pro-5 Weed Barrier™ and Weed-X™ were more effective for root retention than Pro-Shield™ and Weed Barrier™ Pro fabrics. In the field trial, Pro-5 Weed Barrier™ also showed the lowest root penetration, but it was not significantly different than the other two fabrics evaluated.

All fabrics tested performed satisfactorily against root-knot nematodes. In the greenhouse experiment, all fabrics prevented nematode penetration in strawberry roots. Weed-Barrier™ Pro, Pro-5 Weed Barrier™ and Weed-X™ consistently prevented nematode movement into soilless substrate whereas nematodes were only found once in the Pro-Shield™ fabric treatment. In the field, root-knot nematodes were found in the peat-perlite substrate in all three landscape fabrics tested. However, even though there were nematodes in the soilless substrate, the root infection was significantly less than the untreated control without fabrics. Specifically, the landscape fabrics reduced gall and egg mass formation up to 89 and 81%, respectively, compared to the control without fabrics.

In the greenhouse experiment no *P. cactorum* infection was found in strawberry roots and very little incidence in the soilless substrate. In the field trial slight *P. cactorum* infection was found in roots and substrate as well as in soil below the fabrics. There was a *V. dahliae* infection found in one petiole sample of the greenhouse experiment where Weed-X™ was used. However, no *V. dahliae* incidence was found in roots or substrate in the greenhouse experiment in any other fabrics tested. In the field trial, no *V. dahliae* was found in roots, substrate, or soil below any of the fabrics.

All three landscape fabrics used in the field trial provided similar marketable yield harvested over time. Similarly, there was no significant difference among fabrics in the 21 week cumulative marketable yield, cumulative non-marketable yield, or cumulative total yield.

This investigation demonstrated the potential of landscape fabrics to reduce the infection of nematodes and soilborne pathogens for strawberry fruit production. The landscape fabric trough system could be an alternative to manage soilborne pests and pathogens in areas where pre-plant soil fumigation is restricted and multiple pests and pathogens are present. This fumigant-free approach is a step forward for reducing the dependency on methyl bromide and other pre-plant fumigants for strawberry fruit production in California. Future research is needed to evaluate the cost, durability, and eventual disposal of the fabrics after field use.