

Effect of deep application of non-fumigant nematicides on *Meloidogyne incognita* in a tomato plasticulture system

Chinaza Nnamdi¹ and Abolfazl Hajihassani². ¹ Department of Plant Pathology, University of Georgia, Tifton, GA, USA; ² Department of Entomology and Nematology, University of Florida, Davie, FL, USA.

Time zone = Eastern Standard Time

Background

- The use of plastic mulch in vegetable cultivation is relatively common in Southeastern USA because of its many benefits^{1,2}.
- Root-knot nematode (RKN; *Meloidogyne incognita*) is detrimental to vegetable crops and cause significant yield loss. To control RKN in the plasticulture system, growers fumigate or apply non-fumigant nematicides^{1,2}.
- Non-fumigant nematicides are usually applied by chemigation via drip tapes placed at a depth of 2.5-7.6 cm below the surface (Fig. 1) of the soil when laying the plastic mulch³.
- Nematicide application at a depth of 2.5-7.6 cm may only affect RKN populations associated with the roots systems. This is due to the fact that the effect of nematicides is restricted to a few weeks after planting⁴.
- RKN populations at lower depth may move upward and infect plants later in growing season⁵.

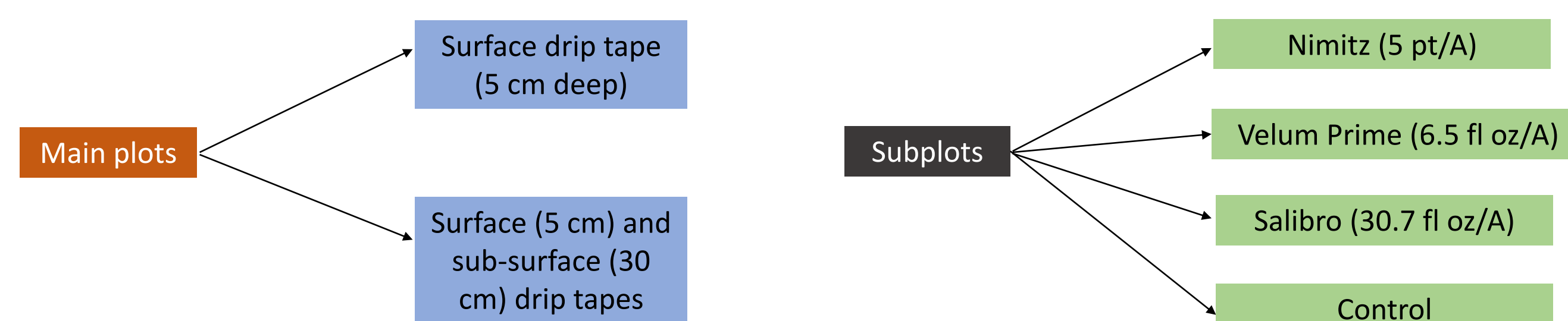


Objective

Evaluate the effect of three non-fumigant nematicides (fluensulfone, fluazaindolizine, and fluopyram) applied by different drip tape techniques [surface and sub-surface drip tapes (SSDT) vs only surface drip tape (SDT)] on RKN control and impact on tomato growth and yield.

Materials and Methods

- The experiment was done in spring 2019 and 2020 using tomato (cv. Red Bounty; RKN-resistant). The experiment was repeated in 2 different field sites in the summer of 2021 using an RKN-susceptible tomato cv. Roadster.
- Experimental design was a split-plot randomized complete block design.



Data Collection:

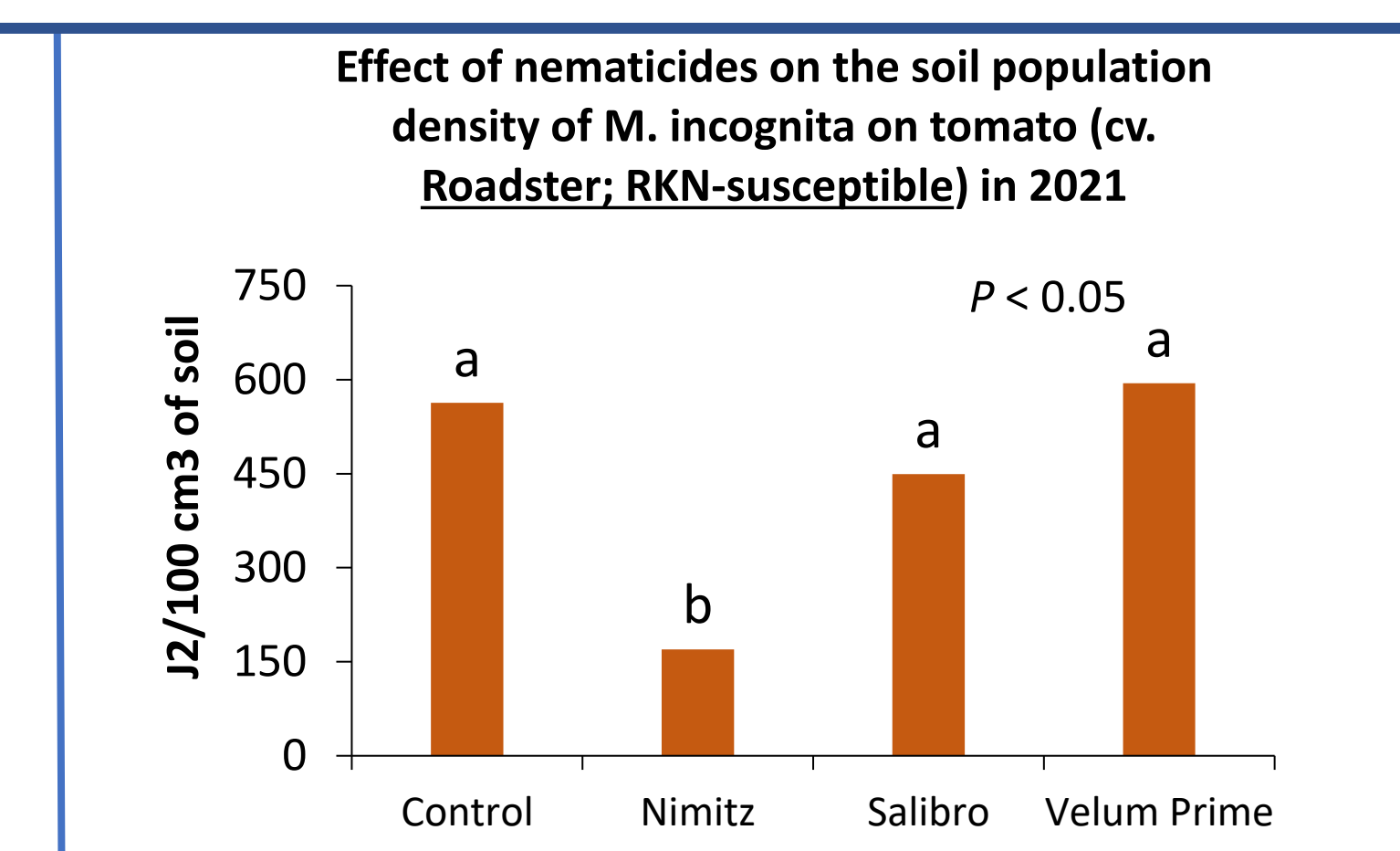
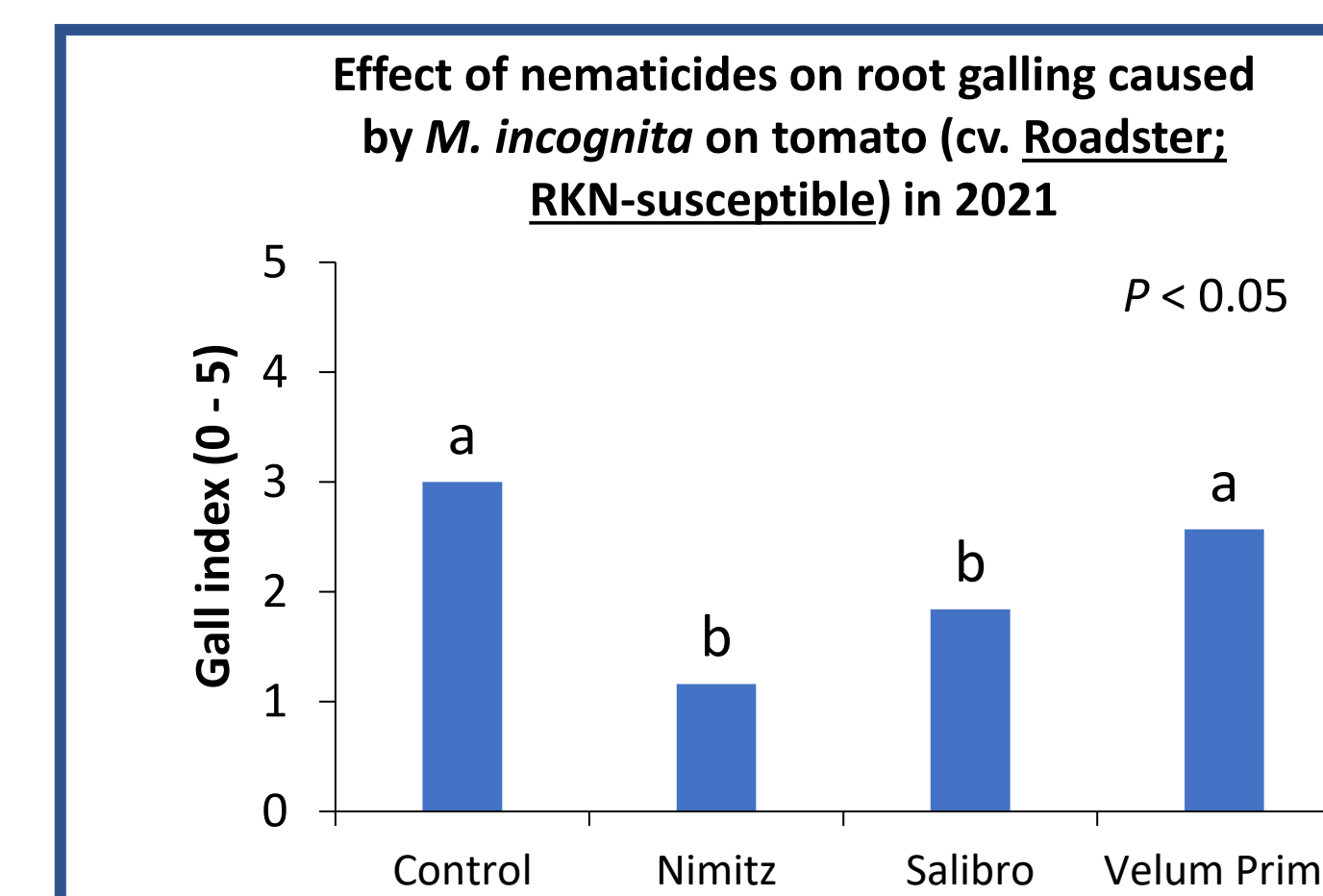
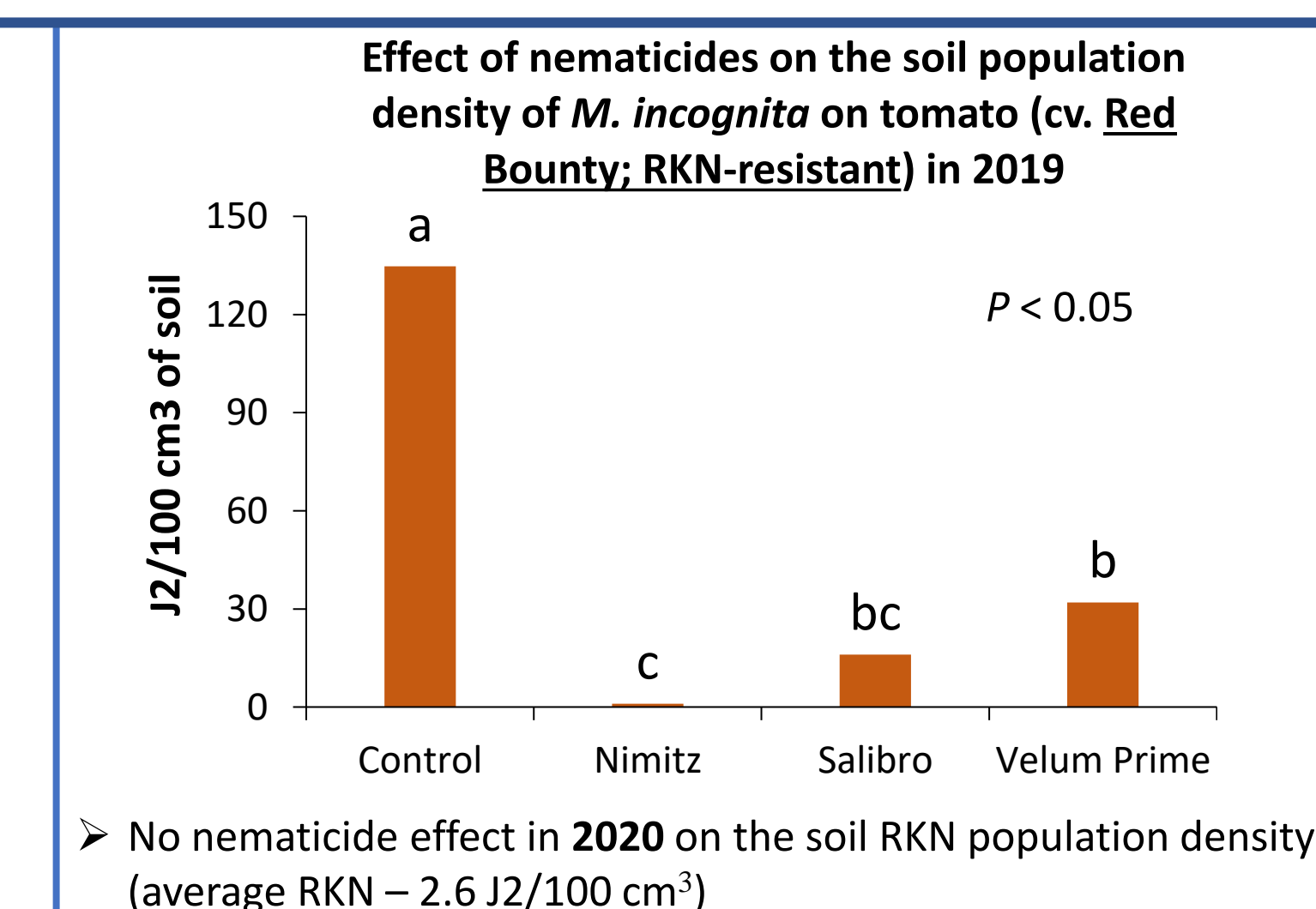
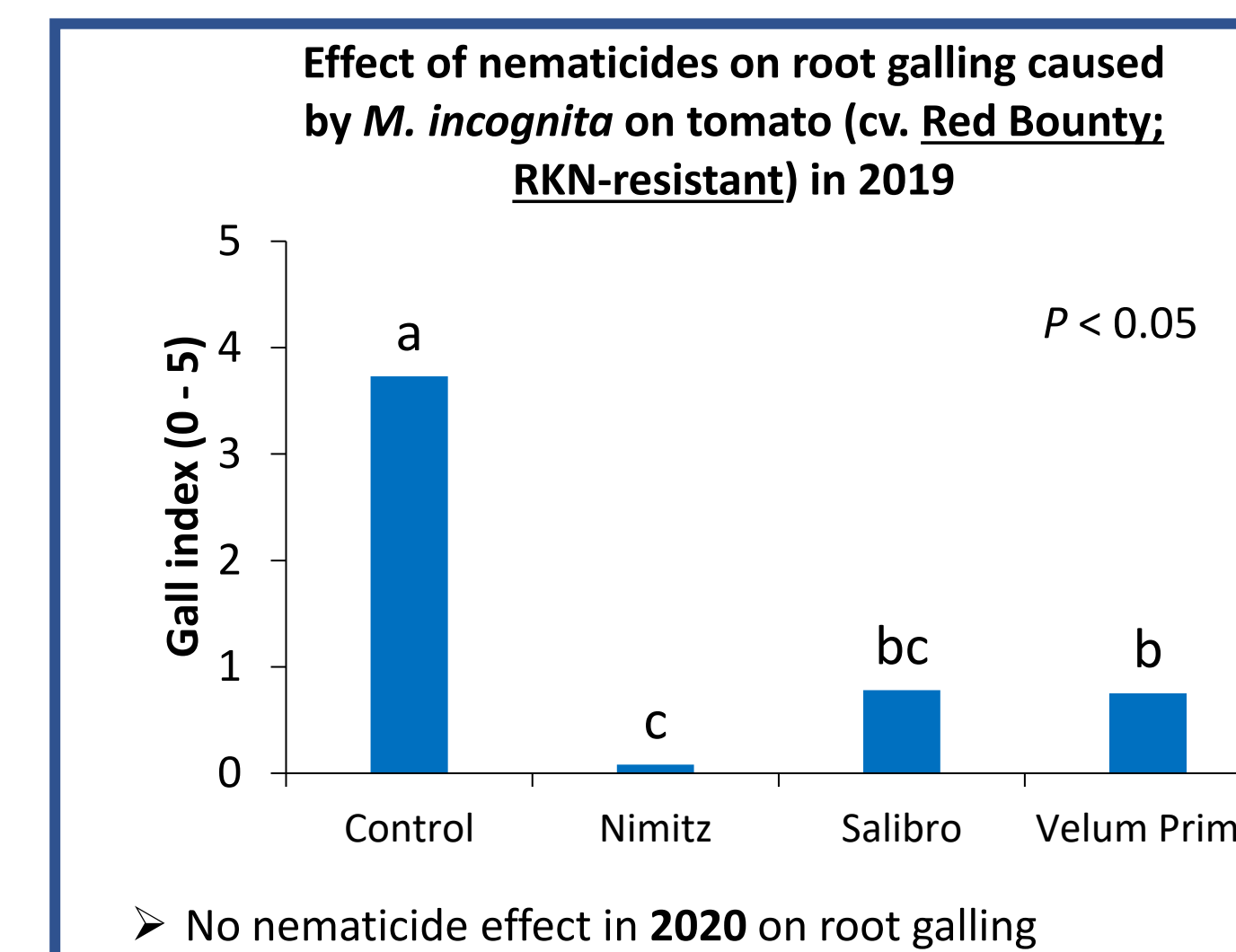
- Vigor rating of the plants was measured with the aid of a handheld crop sensor using a scale of 0-1 at 28 and 56 days after transplanting.
- Roots of the plants were collected at midseason and end of the season for root gall evaluation using a gall index of 0-5 with 0 being no galls seen on roots and 5 being >75% of the root system galled.
- Soil samples were also collected at midseason and end of the season to determine the population of RKN.
- Fruits were harvested at the end of the season to assess the yield.
- Data were subjected to analysis of variance using PROC GLIMMIX (SAS® 9.4), and means were separated by Tukey's adjustment for multiple comparisons test ($P < 0.05$).



Fig. 1. The surface and sub-surface drip tapes used to inject nematicides into the soil.

Results

- Drip tapes × Nematicides:** No significant effect on crop vigor, fruit yield, root gall index, and root-knot nematode population density for both cultivars.
- Drip tapes:** No significant effect on crop vigor, fruit yield, root gall index and root-knot nematode population density for both cultivars.
- Nematicides:** No effect on yield for both cultivars.



Conclusions

- This study shows that the placement depth of the drip tape plays no role in RKN management in a single crop plasticulture system. This technique however might be effective in multi-cropping plasticulture systems and requires further investigation.
- This study also shows that for a single crop plasticulture system, a grower should not be concerned about RKN that exist deep in the soil profile and only focus on providing sufficient control for RKN that exist within the top profile of the soil.

References

- Morris, et al. 2015. Efficacy of fluensulfone in a tomato-cucumber double cropping system. *J. Nematol.* 47 (4), 310–315.
- Hajihassani, A. 2018. Chemical nematicides for control of plant-parasitic nematodes in Georgia vegetable crops. Tifton, GA: UGA Cooperative Extension Bulletin 1502.
- Lamont, et al. 2016. Drip Irrigation for Vegetable Production. University Park, PA: Penn State Cooperative Extension.
- Colyer, et al.. 1997. Influence of nematicide application on the severity of the root-knot nematode-Fusarium wilt disease complex in cotton. *Plant Dis.* 81:66-70.
- Noling, J. W. 2016. Nematode Management in Tomatoes, Peppers, and Eggplant. Gainesville, FL: University of Florida IFAS Extension.

Acknowledgements

The authors wish to thank the previous members of the University of Georgia vegetable nematology team and Eric Goodwin for technical assistance; and Josiah Marquez and Xuelin Luo for advice on statistical analysis. We also thank Georgia Fruit and Vegetable Growers Association for financial support.