

Combining Soil Solarization with Conventional Chemical Fumigants and Anaerobic Soil Disinfestation (ASD) in Florida Strawberry Production



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Introduction

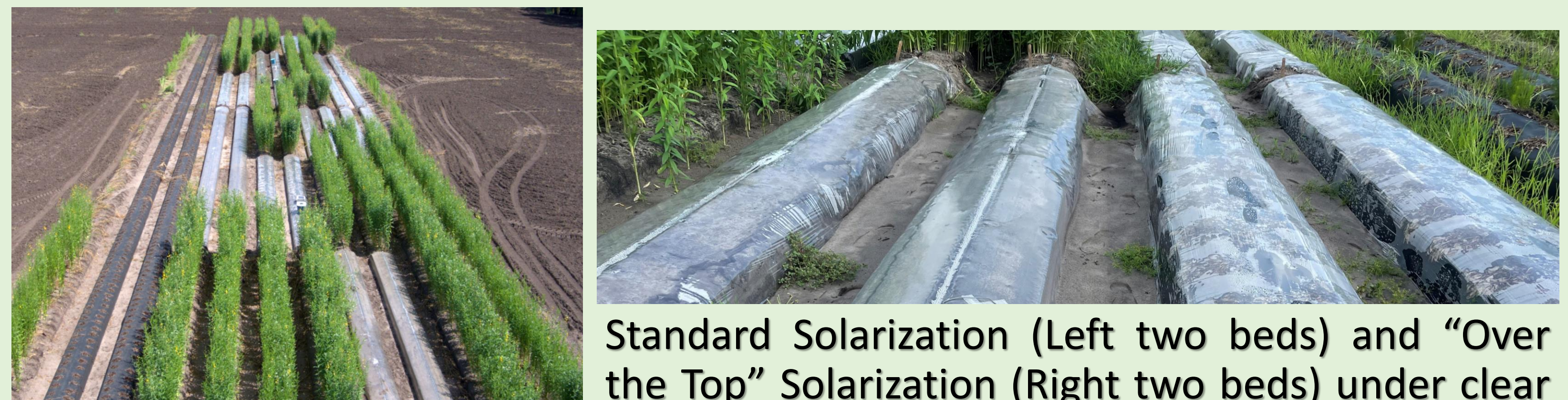
Management of soil borne pests on commercial Florida strawberry farms has long been a challenge to growers. In recent years, this has been particularly difficult with regulatory pressures on the use of remaining chemical soil fumigants and the costs associated with their use. Also, while still in its infancy, organic strawberry production in Florida has been established by several shippers to try to meet the demand for this strawberry market segment. To provide growers with alternative non-fumigant soil pest management techniques, this project builds on previous work from these and other researchers with an on-site demonstration of Soil Solarization and Anaerobic Soil Disinfestation for the 2023 grower outreach by our collaborative groups.

Methodology

Planting beds were inoculated with soil borne diseases, Sting and Root Knot nematodes, and common weed seeds prior to treatment. Four replications of six treatments (Table 1) were randomly placed into planting beds previously farmed (2021) in strawberries. Each plot comprises two planted beds (4 plant lines), 40 ft in length (8 ft x 40 ft plots, 320 ft²), in a randomized complete block (RCB) experimental layout. Following summer Solarization and ASD plots, beds were reworked in September, standard fumigation applied to comparison plots, and all plots planted and grown conventionally to maturity on October 15, 2022. Data collection for pest control and yields have begun. AOV with LSD Means comparison, $\alpha=0.05$.

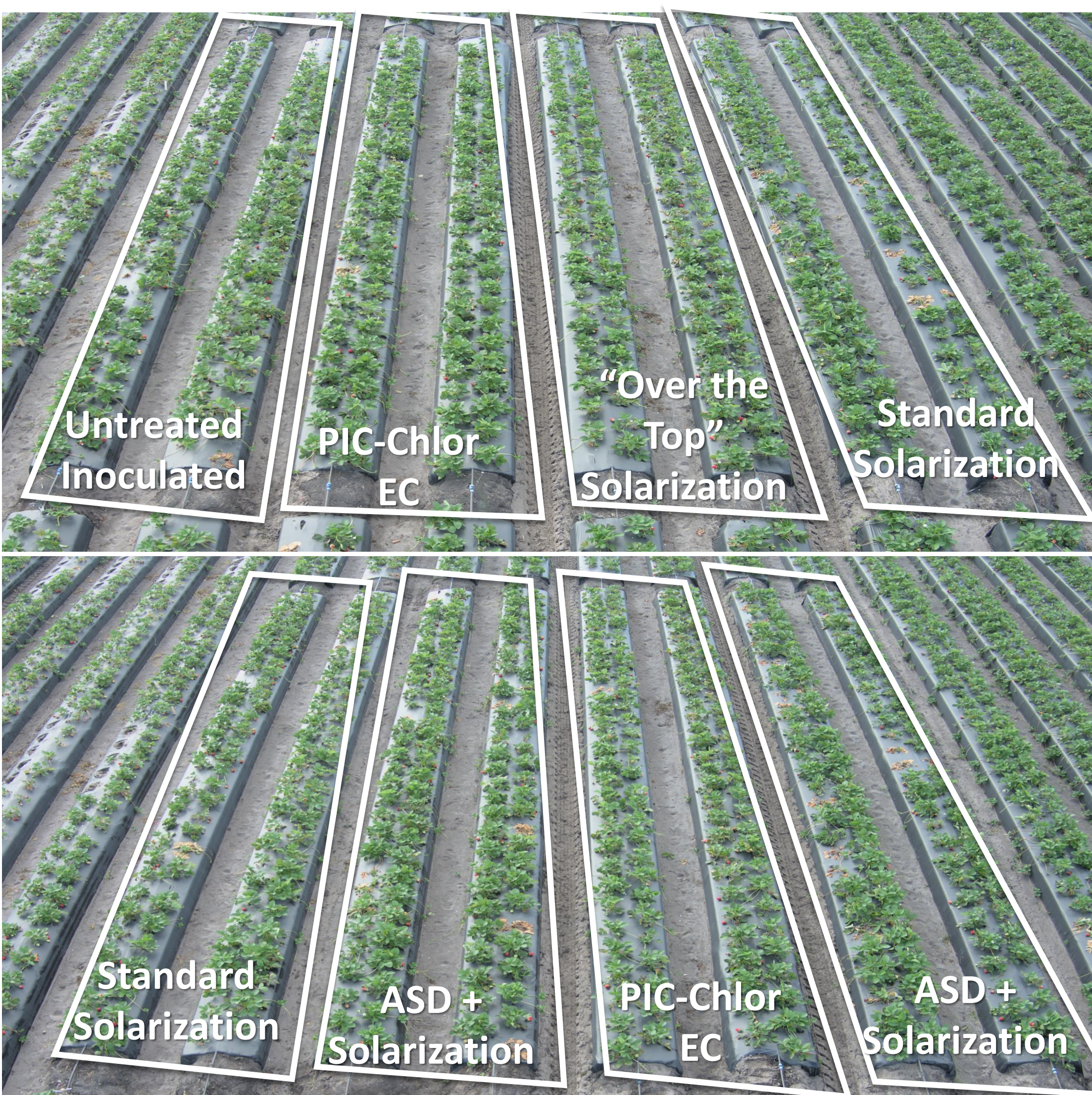


Summer 2021 - Trial initiation. ASD components; chicken manure and molasses applied under both black and clear plastic mulch.



July 2022 trial overview.

Mid-Season drone overview plot comparison



Untreated (inoculated and non-inoculated) had Sun Hemp cover crop and black plastic in fall

Standard Solarization had summer transparent plastic mulch

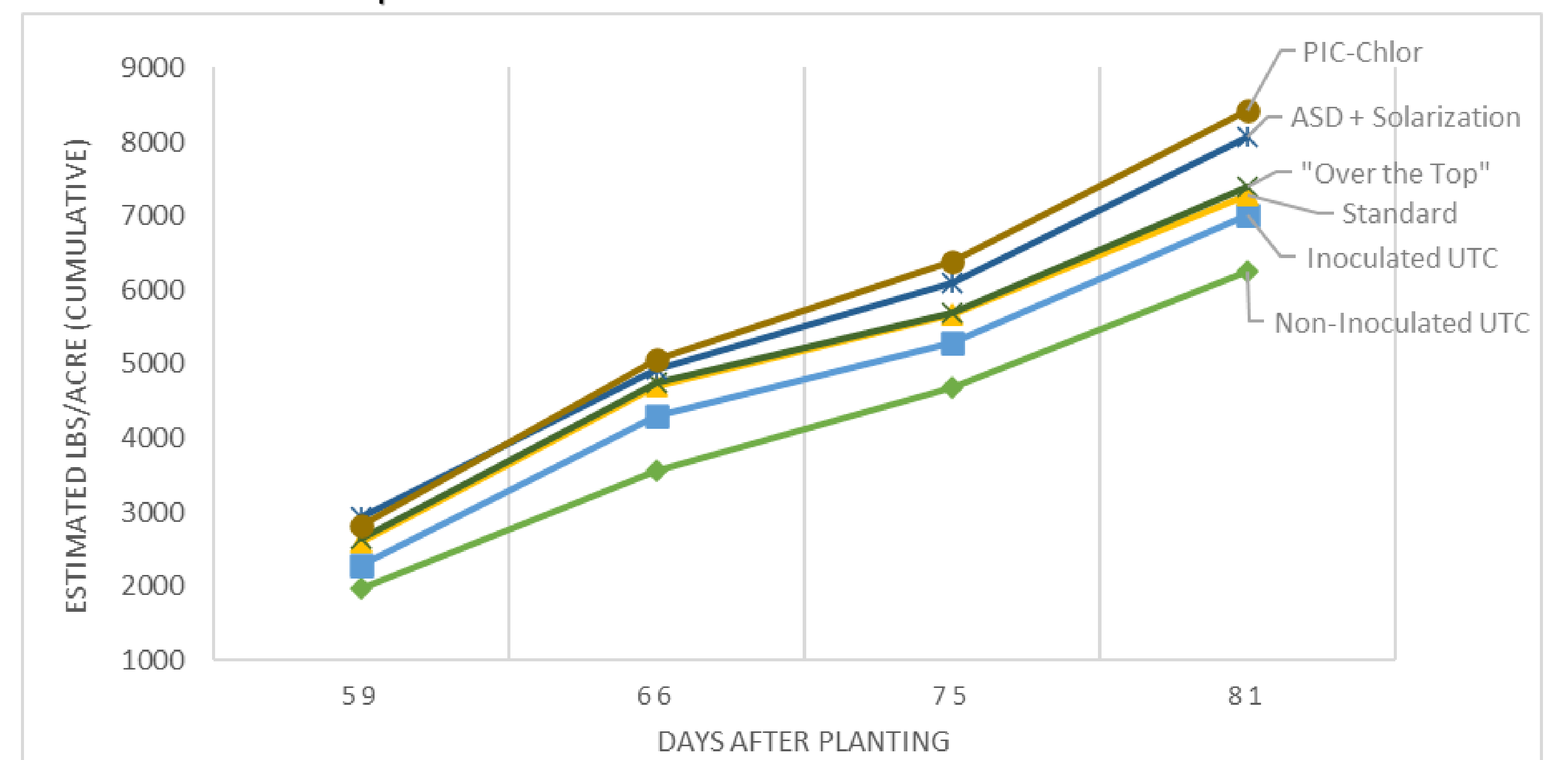
"Over the Top" solarization was solarization with previous season plants and plastic in place

ASD + Solarization plots received chicken litter and molasses prior to solarization

PIC-Chlor EC standard fumigation prior to tarping and planting

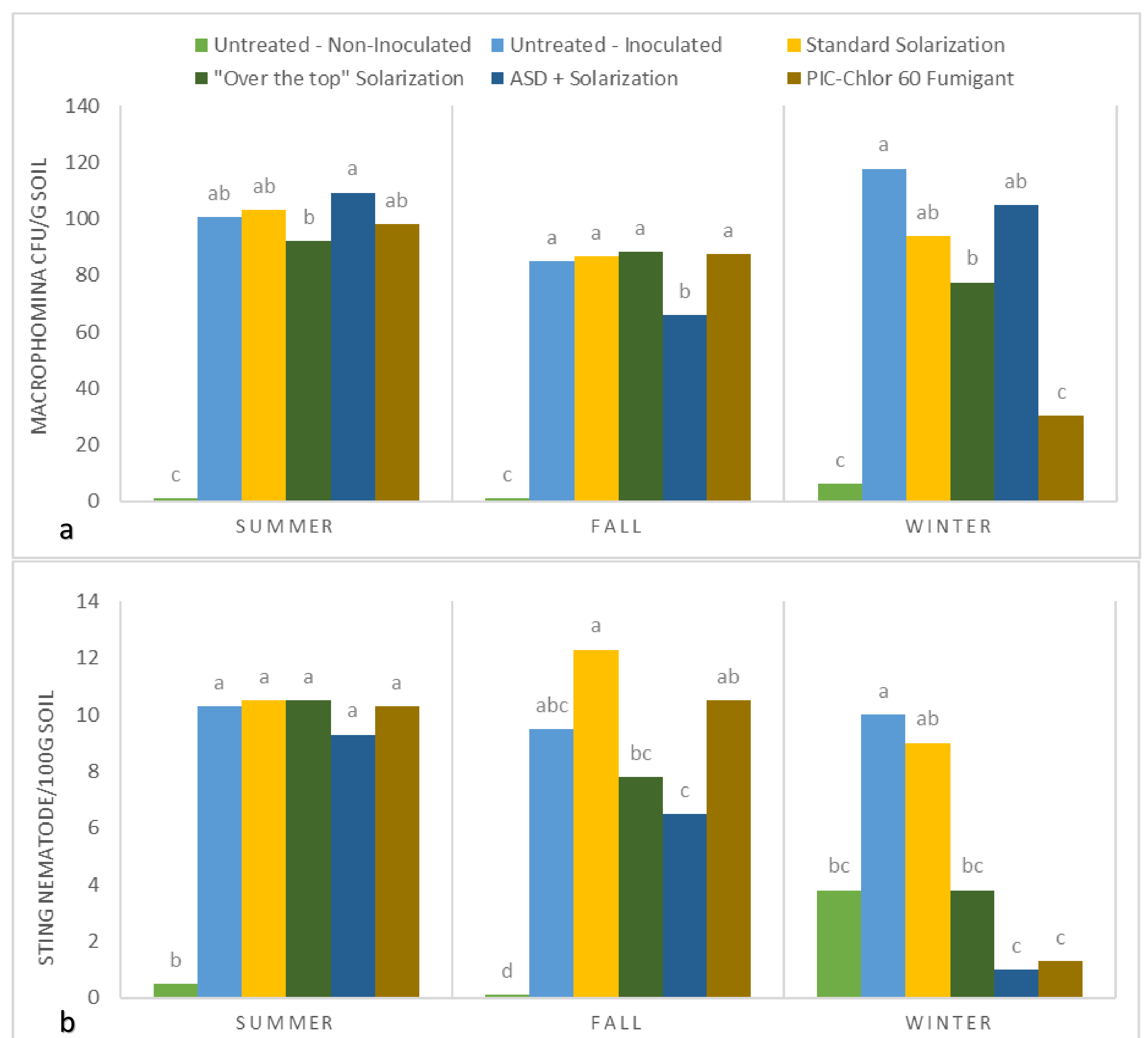
Yields to Date

Figure 1. Cumulative yield weights for marketable berries harvested four times this season. ASD and "Over the Top" solarization significantly increased yields relative to standard solarization-treatment plots.



Disease and Nematode Control

Figure 2. Macrophomina soil disease (a) and Sting nematode (b) control from samples collected before and after planting. "Over the Top" Solarization significantly reduced Macrophomina better than the other solarization treatments. Sting nematode control for ASD and "Over the Top" solarization was on par with fumigation.



Disease and Nematode Control

Table 1. Crop responses as of January 4, 2023 (81 days after planting). Vigor, height, and width measured from ten plants per plot; stand count per 40 row-ft, and cumulative flats/acre from four harvest. LSD Means test, $\alpha=0.05$.



Treatment	Vigor (0-100%)	Stand/40 row-ft	Height (cm)	Width (cm)	Flats/Acre
Untreated - Non-Inoculated	72.9% b	120 a	17.7 b	30.4 b	780 d
Untreated - Inoculated	73.4% b	120 a	18.2 b	30.3 b	878 cd
Standard Solarization	80.1% ab	118 a	19.6 ab	33.6 a	911 bc
"Over the Top" Solarization	83.0% ab	121 a	19.1 b	32.1 ab	925 bc
ASD + Solarization	85.9% a	112 a	21.7 a	33.6 a	1008 ab
PIC-Chlor 60 Fumigant	87.9% a	123 a	21.4 a	34.3 a	1053 a

Table 2. Average control relative to the untreated inoculated check for three soil samples collected June 1, September 15, and January 4. Average pressure over time (SAUDPC) was tabulated in ARM, with LSD means separation and $\alpha=0.01$. Sting nematode (*Belonolaimus longicaudatus*) counts taken from 100g soil and Macrophomina CFU counts taken from cultures of 1g soil, replicated four times.

Treatment	Pest Control	
	Sting Nematode	Macrophomina
Untreated - Non-Inoculated	100% a	98% a
Untreated - Inoculated	0% d	0% d
Standard Solarization	4% cd	7% cd
"Over the top" Solarization	27% b	12% c
ASD + Solarization	40% b	11% c
PIC-Chlor 60 Fumigant	23% bc	22% b

