STRAWBERRY CULTIVAR SOIL FUMIGATION, SPIDER MITE INTERRELATIONSHIP.

Douglas Walsh, Frank Zalom, Douglas Shaw, and Norman Welch
University of California, Davis

Soil fumigation with methyl bromide/ chloropicrin on strawberries promotes vigorous plant growth. A recurring observation in our studies is that vigorous strawberry plants are more tolerant of Tetranvchus urticae Koch (Acari: Tetranychidae) feeding the are non-vigorous strawberry plants.

In 1993 we conducted an experiment to test the effect of soil fumigation on strawberry plant susceptibility to T. urticae infestation and feeding. Two short day cultivars ('Chandler' and 'Cuesta') and 2 day-neutral cultivars ('Selva' and 'Sunset') were harvested from a high-elevation nursery near Macdoel, CA on 13 Oct. and transplanted into a paired block experimental design, with soil fumigation/ non-fumigation as the main plot and acaricide application/ untreated control as the sub-plot. The short-day cultivars were given 1 week, and the day-neutral cultivars were given 4 weeks supplemental vernalization at 33'F prior to transplant in Watsonville, CA.

Soil fumigation was applied commercially (flat field) at a rate of 375 lbs/acre, 57% methyl bromide/ 43% chloropicrin. Injection depth was 10" and nozzles were spaced at 12". Upon application of the fumigant the plots were tarped for 1 week with 1mm high-barrier plastic.

Acaricide applications consisted of monthly application of .04 lb ai/acre avermectin blb plus 0.125 lb ai/acre hexythiozox from February through July. Results (Table 1) differ between the cultivars in acaricide effect, but in all cultivars except Selva nonfumigation causes the greatest yield loss (Table 2B). However, we observed that percent yield loss to T. urticae feeding was about equal within both the fumigated and nonfumigated main plot (Table 2A).

Trends in leaf biochemistry (Table 1) were most distinct in Spring, with catechol-based foliar phenolics as well as leaf proteins being higher in the nonfumigated treatments. In our experience these trends tend to represent stressed and/or non-vigorous plants.

Accumulated mite days (Table 1) were higher in the fumigated plots than in the nonfumigated plots in all cultivars except for Sunset. (Mite densities in Sunset were extremely low for all treatments.) However, plants grown in nonfumigated soil became infested with T. urticae earlier and also reached peak population densities at an earlier date then the plants grown in fumigated soil. We believe that this is because plants grown in fumigated soils were more vigorous and therefore capable of sustaining higher T. urticae densities.

Table 1: Effects of Soil Fumigation and Acaricide Treatment on Four Commercial Strawberry Cultivars.

Cultivar: Chandler

		Fruit Yield±SD	Mite Days±SD Thru 6/2	Leaf Protein 4/1	Foliar Phenolics 4/1
Fumigated	Sprayed	1307± 27	-	12467	11994
Fumigated	Control	1000±242*	470454800	12047	8970
Nonfumigated	Sprayed	514± 73**	-	25142**	22671-k
Nonfumigated	Control	383± 23**	2253±1020	26975**	19657*
F=		22.502	1.632	18.42	13.468
p<		0.0058	0.3163	0.0083	0.0148

Cultivar: Selva

		Fruit Yield±SD	Mite Days±SD Thru 6/2	Leaf Protein 4/1	Foliar Phenolics 4 / 1
Fumigated	Sprayed	896±101		9350	14179
Fumigated	Control	696±346	3692±3094	11404	13281
Nonfumigated	Sprayed	707± 11		28977**	20441*
Nonfumigated	Control	572± 82	855± 133	28380**	18750
F=		1.035	2.499	216.214	17.419
p<		0.4671	0.1986	0.0001	0.0093

Cultivar: Cuesta

		Fruit Yield±SD	Mite Days±SD Thru 6/2	Leaf Protein 4/1	Foliar Phenolics 4/1
Fumigated	Sprayed	1423± 70		10885	12497
Fumigated	Control	812±159*	9236±2228**	12880	13384
Non	Treated	544± 15**		26904**	22695**
Non	Control	325± 1**	2765±1388*	28809**	19410**
F=		57.24	20.605	715.131	16.254
p<		0.001	0.0068	0.0001	0.0105

Cultivar: Sunset

		Fruit Yield±SD	Mite Days±SD Thru 6/2	Leaf Protein 4/1	Foliar Phenolics 4/1
Fumigated	Sprayed	1330± 9		8463	9559
Fumigated	Control	1230±64	740±368	11214	12449
Nonfumigated	Sprayed	446±52**		25809**	20392*
Nonfumigated	Control	401±30**	802±101	26928**	20906*
F=		253.938	3.839	84.583	28.032
p<		0.0001	0.113	0.0004	0.0038

*/Significant at 95%, **/ at 99% by Scheffe's F-test

Table 12. Fumigation and acaricide application effects on fruit yield (grams per plant), T. urticae density, leaf proteins and catechol based foliar phenolics (nanomoles per gram wet leaf weight) on 4 commercial strawberry cultivars.

Table 2A: Percent yield reduction as a result of mite feeding within the main fumigation/nonfumigated treatment.

	Chandler	Cuesta	Selva	Sunset
Fumigated	23.527	42.993	22.278	7.516
Nonfumigated	25.462	35.262	19.024	10.190

Table 2B: Percent Yield reduction between the subplot acaricide treatment/ untreated control grow-n in nonfumigated soil (ie. fumigation effect).

	Chandler	Cuesta	Selva	Sunset
Sprayed	60.635	62.056	21.050	61.749
Control	61.630	56.561	17.744	67.412