

Comparison of Major Infestations between Conventional Tea Growing and Organic Tea Growing at Sulloc Tea Plantation in Jeju Island

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Key words: *Tetranychus kanzawai*, *Empoasca onukii*, *Scirotothrips dorsalis*, *Homona magnanima*, *Caloptilia theivora*

Abstract

The occurrence of major pest infestation was compared between conventional tea plantation and organic tea plantation at Sulloc tea garden in Dosun-dong, Seogwipo-si, Jeju-do from 2002 to 2009. *Tetranychus kanzawai* was observed a lot in the second year, but it waned from late June. There was not much difference between conventional farming and organic farming in terms of pest density. *Empoasca onukii* was infested in the second year of organic farming compared with conventional farming, which highlighted the fact that second year of organic farming requires a special care. *Scirotothrips dorsalis* was highly dense in the second and third year of conventional farming, but its occurrence was lowered when the farming technique was shifted to organic farming. The number of *Homona magnanima* peaked 4 times each year. In 2008, the first year of organic farming, saw high occurrence of 771.2 per trap per year. In 2009, the second year, the population per trap dropped to 80, showing a great variance depending on year. The occurrence of *Caloptilia theivora* peaked 5 times annually. In 2008, the first year of organic farming, an average of 2,779 pests per trap was found, and in the following year, 4,143 pests were observed. It showed that density rose in organic growing period.

Introduction

Located at Dosun-dong, Seogwipo-si, on Jeju Island, Korea, the Sulloc Tea Plantation was founded in 1982, and began to grow tea shrubs using organic techniques from 2008. This research study compared the density of major insects during conventional tea growing period (2002-2007) and organic tea growing period (2008-2009) to use it for efficient management of tea garden.

Materials and methods

The study was carried out at Sulloc tea garden in Dosun-dong, Seogwipo-si, Jeju-do, Korea. *Tetranychus kanzawai* and *Empoasca onukii* have been fed with organic farming materials, whose major ingredient is *Sophora flavescens*, twice a year. The study was conducted once a week. 5 blocks in the garden were selected for study and mean value of each block was recorded. To look for *Tetranychus kanzawai*, researchers plucked off 50 leaves from the bottom of tea plant and counted the

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number of pest infestation on the leaves. To research *Empoasca onukii* and *Scirotothrips dorsalis*, researchers put sticky board (18x20cm) below tea shrub and counted the number of pests fallen on the sticky board after beating the surface of tea leaves 5 times. Sex pheromone trap was also installed in each block to study *Homona magnanima* and *Caloptilia theivora*.

Results and discussion

Tea red spider mites were found most in the first and the second year of the tea growing season, and consequently their density were reduced after late June. Meanwhile, the third and the fourth year saw less density of pests. After tea growing technique was shifted to organic growing, the occurrence rate of tea red spider mite was similar in the first year, and it spiked in the second year.

Tab. 1: Comparison of average percentage of tea leaves (Mean±SD) infested with *T. kanzawai* among years in different tea growing seasons

Spray program	Year	Tea growing season		
		1st	2nd	3rd, 4th
Conventional	2002	0.07±0.04b	1.25±0.43bc	0.03±0.02c
	2003	10.76±2.30b	5.64±1.65bc	0.12±0.08c
	2004	43.33±7.20a	6.64±0.81b	1.95±0.13a
	2006	0.07±0.03b	0.31±0.06c	0.06±0.04c
	2007	0.89±0.29b	1.62±0.51bc	0.09±0.03c
Organic	2008	2.36±0.56b	2.56±0.96bc	0.48±0.11b
	2009	2.27±0.39b	14.71±2.77a	0.88±0.03c

* Means followed by same letters in a column are not significantly different by Tukey's studentized range test ($P=0.05$).

Tea green leafhopper (*Empoasca onukii* Matsuda): From late April, pest density rose, peaked in mid-June and mid-July and lasted until November. Pest density appeared to be adjusted naturally in the second year into organic tea growing period. That was due to a rising number of spiders, which are natural enemies of Tea green leafhopper, according to Kosugi (1999), Ohtaishi (1986) and Nakamura (1992).

Tab. 2: Comparison of mean number per beat tray (18×20 cm, Mean±SD) of *E. onukii* among years in different tea growing season

Spray program	Year	Tea growing season				Total
		1 st	2nd	3rd, 4 th	Post-harvest	
Conventional	2002	8.8±2.13a*	35.4±6.96c	71.4±8.61b	2.6±0.68b	118.2±14.21bc
	2003	2.4±0.87b	13.2±3.56c	16.4±3.53c	0.8±0.37b	32.8±6.90e
	2004	1.2±0.58b	35.0±1.84c	172.4±17.01a	43.2±6.18a	251.8±22.82a
	2006	2.6±0.93b	22.4±2.98c	21.2±2.52	1.8±0.97b	48.0±4.00de
	2007	3.2±0.97b	11.8±1.02c	30.4±5.32c	1.0±0.45b	46.4±5.27de
Organic	2008	2.6±0.93b	77.4±12.55b	13.2±1.83c	0.6±0.24b	93.8±14.00cd
	2009	4.6±1.12ab	118.6±11.92a	31.6±8.76c	13.2±4.31b	168.0±16.60b

* Means followed by same letters in a column are not significantly different by Tukey's studentized range test ($P=0.05$).

Yellow tea thrips (*Scirotothrips dorsalis* Hood): Yellow tea thrips were observed from late April to late October. Their count increased in the second year and the third year

of growing season. However, the density was leveled off when growing technique was shifted to organic type from conventional type. According to Kotomari (1982), it was driven by the rise of Phytoseiidae.

Tab. 3: Comparison of mean number per beat tray (18×20 cm, Mean±SD) of *S. dorsalis* among years in different tea growing season

Spray program	Year	Tea growing season				Total
		1 st	2 nd	3 rd , 4 th	Post-harvest	
Conventional	2002	1.0±0.32c [*]	62.0±17.21b	187.4±29.19b	17.8±3.61b	268.2±36.09b
	2003	18.6±5.37bc	298.4±65.01a	778.2±179.56a	32.2±1.74a	1127.2±228.77a
	2004	2.6±1.08c	51.4±11.05b	162.8±19.18b	33.0±1.14a	249.8±22.57b
	2006	58.2±11.07a	165.2±21.22b	166.6±8.30b	23.6±0.98ab	413.6±26.63b
	2007	49.0±11.55ab	65.2±16.67b	155.2±41.59b	20.0±5.30ab	289.4±71.94b
Organic	2008	27.4±11.10abc	46.0±7.03b	96.2±17.57b	24.8±4.63ab	194.4±24.16b
	2009	5.2±1.24c	41.0±4.01b	72.0±12.88b	14.0±1.52b	132.2±17.51b

^{*} Means followed by same letters in a column are not significantly different by Tukey's studentized range test ($P=0.05$).

Oriental tea tortrix (*Homona magnanima* Diakonoff): The year of 2008, the first year of growing organic tea, saw highest level of pest infestation. But it fell down in 2009. Ishijima(2009) found that density of imago dropped sharply in non-pesticide field. That was attributable to *Trichogramma* spp., *Apanteles* sp., and *Bracon* sp.. The surveyed tea garden was believed to be the same case, in which growing number of natural enemy led to fewer population of imago.

Tab. 4: Comparison of mean number of *H. magnanima* catches (Mean±SD) in sex pheromone traps among years in different tea growing season

Spray program	Year	Tea growing season				Total
		1 st	2 nd	3 rd , 4 th	Post-harvest	
Conventional	2004	24.8±3.40b [*]	30.2±5.19b	87.2±2.92c	11.4±1.75a	153.6±11.04b
	2006	377.8±81.76a	129.4±11.50b	74.4±5.34c	4.4±1.03ab	586.0±87.54a
	2007	203.4±57.64ab	76.8±19.00b	332.8±31.04a	3.0±0.84b	616.0±49.08a
Organic	2008	138.0±3.33b	461.0±110.94a	167.6±25.20b	4.6±2.87ab	771.2±124.21a
	2009	16.0±5.89b	10.0±8.30b	48.8±4.73c	5.2±2.03ab	80.0±17.27b

^{*} Means followed by same letters in a column are not significantly different by Tukey's studentized range test ($P=0.05$).

Tea leaf roller (*Ceroplastes pseudoceriferus* Green): Its population peaks five times per year and its density varies greatly each year. The occurrence spiked after switching to organic farming. Tea shrubs were pruned to prevent spread of disease, and it created new leaves, serving as breeding ground for *Caloptilia theivora*.

Tab. 5: Comparison of mean number of *C. theivora* catches (Mean±SD) in sex pheromone traps among years in different tea growing season

Spray program	Year	Tea growing season				Total
		1st	2nd	3rd, 4th	Post-harvest	
Conventional	2004	28.6±73.70b*	35.4±9.85cd	213.8±13.53c	47.2±5.26b	325.0±22.05d
	2006	45.0±9.15b	296.0±42.85bc	139.6±7.28c	28.4±4.88b	509.0±58.36cd
	2007	12.0±2.97b	82.4±9.76cd	1611.0±244.52b	81.0±18.17b	1786.4±256.73bc
Organic	2008	118.6±23.30ab	646.6±99.19a	1704±447.76b	113.0±31.76b	2579.2±467.85b
	2009	208.0±78.46a,	350.2±35.75b	2845±309.03a	749.2±105.60a	4142.8±444.59

* Means followed by same letters in a column are not significantly different by Tukey's studentized range test ($P=0.05$).

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