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DIFFERENCES IN COMPOSITION AND DYNAMICS OF SPIDER COMMUNITIES IN ORGANIC, POLLUTION-FREE, AND COMMON TEA GARDENS

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ABSTRACT

From 2002 to 2003, once every 1-2 weeks, a systematic survey was carried out on the 25-year-old organic tea gardens, pollution-free tea gardens with poor vegetation, and common tea gardens in the 25-year-old organic tea gardens in the Magu Mountains in southern Anhui. There were 6224 individuals of common tea garden spiders, belonging to 14 species of 8 families; 7430 individuals of pollution-free tea garden spiders, belonging to 16 species of 8 families; 8005 individuals of organic tea garden spiders, belonging to 29 species of 12 families. In the three types of tea gardens, the number of species and individuals of spiders was more from March to May and October to November, and the number of species and individuals was less in July and December. The common tea garden in this study has less vegetation. The tea garden management is slightly extensive. Chemical pesticides are indiscriminately applied. And the number of spider species and individuals is the least. Although the vegetation around the pollution-free tea garden is less, the management is meticulous. According to the control indicators, the number of spider species and individuals is more than that of ordinary tea gardens. Organic tea garden plants are relatively prosperous without pesticides, and the number of spider species and individuals is the largest. The tea garden environment and management measures have a great influence on the composition of the spider community.

KEYWORDS

organic tea garden, pollution-free tea garden, common tea garden, spider; biodiversity

1. INTRODUCTION

The tea garden has a stable environment, and spiders are an important type of left-behind natural enemy. They have strong predation on the adults, nymphs and young larvae of *Ectropis obliqua hypulina*. There have been many descriptions of spider species in Chinese tea areas [1]. It has also been reported that the number of individuals in spider groups rises and falls [2,3]. However, little research has been done on the influence of the tea garden environment and tea garden operations on spider communities. China has a long history of growing tea, and the diversity of tea garden habitats and farming has a significant impact on the composition of insect communities [4,5]. Since the late 1990s, my country has vigorously developed organic tea and pollution-free tea. Chemical pesticides are banned in organic tea gardens [6], and the management is meticulous. Pollution-free tea gardens restrict the use of pesticides and focus on fertilization and pest control. Common tea gardens still use traditional management methods, which are slightly extensive. The effect of such a management model on spider communities over the long term is unclear. If the similarities and differences in the composition and dynamics of spider communities in these three types of tea gardens are explored, it will have important reference significance for better utilization of spider resources and classification and management of three types of tea garden diseases and insect pests.

2. RESEARCH METHODS

2.1 Three Types of Tea Garden Habitats

One organic tea garden, one pollution-free tea garden, and one ordinary tea garden in the Magu Mountains of southern Anhui were selected. The three types of tea gardens were separated by 5km, and no pesticides were applied during the spring tea period. The area was all larger than 6.67×104 m². The tea trees were 25 years old, with a tree height of 85-95 cm, a plant spacing of 35 cm, and a row spacing of 1.5 m. Chemicals are banned in organic tea gardens. Tea leaves are picked by hand during spring, summer, and autumn. A small amount of organic fertilizer is applied in September. The tea garden is located in the mountains and forests. In the pollution-free tea garden, spring tea and autumn tea are picked by hand, and summer tea is picked with a tea picking machine. Tea trees are pruned every 2 years after summer tea is picked. The land is cultivated after spring tea and autumn. Spring tea is fertilized with urea and fertilized again before summer tea. From September to October, organic fertilizer is applied as base fertilizer. The situation of insects is monitored and pesticides are applied to control insects according to the control indicators. During summer and autumn tea time (from June to November), pyrethroid pesticides, a small amount of dimethoate, phoxim and other organophosphorus pesticides, and imidacloprid are mainly applied to control leafhoppers, inchworms, whiteflies, and weevil pests. The application times are 7 - 8 times, and the concentration is 1500 - 2500 times. In the common tea gardens, spring tea is picked by hand, summer tea is picked by a tea-picking machine, and some autumn

Table 1: Difference among species richness and individual abundance of spiders from three types of tea gardens.

Order	Family	Organic		Non-Pollution		Common	
		Richness	Abundance	Richness	Abundance	Richness	Abundance
Arancida	Linyphiidae	7	6068	4	6438	4	5467
	Salticidae	2	386	2	150	1	132
	Oxyopidae	2	483	2	183	2	164
	Sparassidae	1	1	0	0	0	0
	Araneidae	2	64	2	110	1	89
	Pisauridae	1	2	0	0	0	0
	Philodromidae	2	48	0	0	0	0
	Thomisidae	3	329	2	199	2	157
	Agelenidae	2	300	1	44	1	41
	Tetragnathidae	2	224	2	286	2	159
	Lycosidae	4	59	1	20	1	15
Clubionidae	1	41	0	0	0	0	

tea is picked by hand. In some years the pruning is after summer tea and the plowing is after autumn. Sometimes plowing is also done after spring tea. In some years, second fertilizer is applied before spring tea and basal fertilizer is applied in autumn, without paying attention to the investigation of insect infestation. During the summer and autumn tea periods (June to November), insecticides are applied irregularly to treat insects. The times of spraying are 10 to 15 times, and the dosage and types of pesticides are similar to those of pollution-free tea gardens. There is a lack of trees around the pollution-free tea garden and common tea garden.

2.2 Survey and Analytical Methods

From July 2002 to July 2003, the species and number of spiders in the tea garden were investigated every 1 to 2 weeks. Each time, 15 quadrats were checked by the parallel hopping method, and each quadrat was divided into 1m tea branches. The tea branches were vigorously tapped and accepted by plastic film. Then, the spiders in 15 quadrats were investigated on the surface of the tea garden by parallel hopping method, and each quadrat was 1m 2. The families and species of spiders were identified and the number of individuals were counted [7].

3. RESULTS

3.1 Similarities and Differences in Spider Community Composition in Three Types of Tea Gardens

6224 spiders were found in common tea gardens, belonging to 14 species of 8 families. In the pollution-free tea garden, 7430 spiders were found, belonging to 16 species of 8 families. In the organic tea garden, 8005 spiders were found, belonging to 29 species of 12 families. The main dominant species are *Coleosoma octomaculatum*, *Hylyp hantes graminicola*, *Singa hamata*, *A gelena laby rinthica*, *Oxy op es sertatus*, *Saddle crab spider Xy sticus ep hipp iatus*, *Misumenop s tricusp idatus*, *white-spotted hunter Evarcha albaria* and *black fly tiger Plex ipp us pa y kulli*. Microscopic spiders have a larger number of individuals. From common tea gardens, and pollution-free tea gardens to organic tea gardens, the number of species and individuals of spiders tends to increase, and the number of species and individuals of organic tea gardens is much more significant (Table 1).

2.2 Similarities and Differences in the Dynamics of Spider Species and Individual Numbers in Three Types of Tea Gardens

The similarity between the three types of tea garden spider species and population changes is that the number of spider species and individuals is higher from March to May in spring and from October to November from mid-autumn to late autumn. The weather is hot in July and the weather is relatively cold in December. the number of spider species and individuals is small. The difference is that the number of species and individuals of spiders in organic tea gardens is higher (Figure 1, Figure 2).

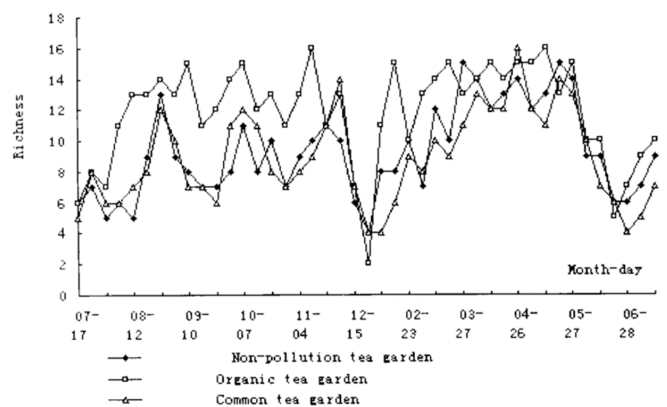


Figure 1: Comparison of spider richness dynamic from three types of tea garden.

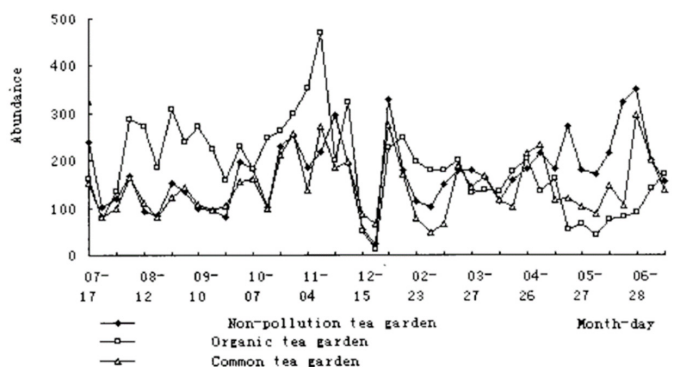


Figure 2: Comparison of spider abundance dynamic from three types of tea gardens.

3. DISCUSSIONS

The tea trees of these three types of tea gardens are of the same age, but the tea garden environment and agronomic measures are quite different so the composition and dynamics of the spider community are significantly different. The organic tea garden is located on the mountainside, and the top and bottom of the mountain are densely forested. The organic tea garden is surrounded by dense trees, such as pine and cyperus, with rich plant phases, more species, and more individuals of spiders. Common tea gardens have poor flora, extensive management, and minimal spiders. Although the pollution-free tea garden is relatively poor in flora, it has less application of pesticides, better management, and a slightly higher number of spiders. In addition

to having a good natural environment in tea gardens, proper agricultural measures such as nymph control and cultivation can also help protect spiders. In recent years, some tea farms have planted shade trees and street trees when developing new tea gardens and intercropped suitable economic forests reasonably. The practice of spreading grass in the tea gardens in winter and keeping weeds around the tea gardens can increase the heterogeneity of the environment and provide shelter for spiders, increasing the diversity of spiders.

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