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Investigation on Effect of *Populus alba* Stands Distance on Density of Pests and Their Natural Enemies Population under Poplar/Alfalfa Agroforestry System

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Abstract: This study was carried out in order to distinguish the effect of agroforestry system (combination of agriculture and forestry) on pests and natural enemy's population in poplar research station. Wood is one of the first substances that naturally was used for a long period of time. Forage is an important production of natural resources too. Some factors such as proper lands deficit, lack of economy, pest and disease attacks and faced production of these materials with serious challenges. Agroforestry is a method for decrease of the mentioned problems. The stands of poplar had have planted by complete randomized design with 4 treatments (stand distance) of poplar/alfalfa include 3×4, 3×6.7, 3×8, 3×10 m and 2 control treatments, alfalfa and poplar. The results showed that *Chaitophorus populeti* had the highest density in poplar and 3×10 m treatments. *Monosteira unicostata* is another insect pest that had most density in 3×10 m treatment. And alfalfa had high density of *Chrysoperla carnea*. The density of *Coccinella septempunctata*, were almost equal in all treatments.

Key words: Agriculture, forestry, insect, *Medicago sativa*, poplar, tree density

INTRODUCTION

Wood is one of the basic materials that has been naturally and abundantly available to mankind. Nowadays the global demand of wood, paper and other wood industries has been increased. In Iran like other countries the importance of forests has been taken in to consideration more than before (Heidari, 2003), but our country is classified as countries that have poor forest areas. So, poplar plantation has been considered for years as an alternative wood source instead of forest trees. Thirty percent of the total reported poplar planted area was established in agroforestry systems, which also accounted for 40% of the global poplar wood production (Ball *et al*., 2007). Alfalfa is as a valuable forage for livestocks. Todays lack of talented areas, pests and diseases and low economical advantage has caused serious challenges to supply wood and adequate forage (Mirzaie, 2001). Agroforestry (intercropping of agronomic plants and trees) (Nair, 1993) is a method that can overcomes most of the afore mentioned problems (Heidari, 2003). There have been few studies of insect pests in agroforestry systems, although insect pests of crops that are components of agroforestry systems have been studied. Scanty information is available about the insects associated with the multipurpose trees and shrubs that are gaining greater economic importance as components of agroforestry systems. This project carried out to study the effect of distance and planting system on insect's density in various planting distances and also the effect of alfalfa planting on pests and natural enemies in poplar/alfalfa agroforestry system (Rathore, 1999).

MATERIALS AND METHODS

This research carried out in West Azarbaijan in Iran. The stands of poplar (*Populus alba*) were planted by complete randomized design with 4 treatments (stand distance) of *P. alba*/ *Medicago sativa* include 3×4, 3×6.7, 3×8, 3×10 m and 2 treatments of alfalfa and poplar.

Sampling of insects: The sampling was done from first June to December in 2005, 2006 and 2007.

Sampling of lady birds and lace wings: This sampling was done in fixed intervals. In each plot four branches of definite number of trees were selected in four directions, sampling was done via observing and shaking branches in a net and the number of insects was recorded.

Sampling of sucker pests (poplar aphid and lace bug): Four branches were selected in four directions from definite number of trees in each plot and insects were counted on five leaves of each branch. Also the insects on alfalfa were sampled by netting. Collecting of lady birds and lace wings was done either by netting alfalfa or

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gathering on poplar trees. Natural enemies were also examined along with counting insects. Natural enemies of pests were collected with pests and examined.

Data analysis: The Data was analyzed with MSTATC software.

RESULTS

The most important pests and natural enemies that had high density and played significant role in this system were *Chaitophorus populeti* (Panzer) (Hom: Aphididae), *Monosteira unicostata* (Muls and Rey) (Het: Tingidae), *Chrysoperla carnea* (Neu: Chrysopidae) and *Coccinella septempunctata* L. (Col: Coccinellida).

Chaitophorus populeti is one of important pests of poplar trees (Haghighian and Sadeghi, 2003). According to data analysis its clear that, aphids density is different in several years and it had the highest density in 2005 and 2006, in comparison with 2007. Researches shows that the effect of temperature is remarkable. So that, high temperature decreases aphids growth and density (Blackman and Eastop, 1984). It's likely, low density of aphids in 2007 is due to high average temperature during sampling.

The results of statistical analysis showed that in poplar and 3×10 m treatments aphid population is more than other treatments (Table 1). Of course this result is different from other findings. Because aphid density in monoculture systems is less than its density in polyculture and agroforestry systems (Naeem *et al*., 1997; Parajulee and Slosser, 1999) ascribed their findings to microclimatic (such as humidity; temperature) factors.

Density of *Acyrthosiphon pisum*, *Periphyllus testudinaceus* and walnut aphids in agroforestry system were less than aphid's density in monoculture (Peng *et al*., 1993; Naeem *et al*., 1997). The reason that the results of this project differ from other findings, derives from existence of abundant weeds in poplar treatments. Maybe the existence of weeds like alfalfa in mixed culture treatments caused temperature and humidity equilibrium, and improve the condition for aphid's activity.

About lac bugs it was identified that population density of this insect is different, on cultivation distances and 3×10 m treatments had the highest density of it (Table 1). Population dynamics showed that density of this insect has positive relation with temperature. When the weather gets warmer so the number of lace bugs will increase.

According to researches of this project, lace wing's population is high in alfalfa treatment (Table 1). It seems that alfalfa grows well in monoculture and high population

Table 1: Means comparison of insects in agroforestry system

	Treatments					
Insects	Poplar	3×4 m	3×6.7 m	3×8 m	3×10 m	Alfalfa
Chaitophorus populeti	2.53^{a}	2.31^{b}	2.18^{b}	2.29^{b}	2.55^{a}	-
Monosteira unicostata	2.17^{b}	2.16^{b}	2.16^{b}	2.06^{b}	2.56^{a}	-
Chrysoperla carnea	1.77^{b}	1.69^{bc}	1.66^{bc}	1.54^{c}	1.73^{b}	2.12^{a}

*Means followed by same letter(s) are non-significantly different from each other

of pests (specially alfalfa aphids) has caused lace wing to accumulate in this system. Pfammatter and Vuignier (1998) pointed out that in spring and summer, existence of predators such as larva completely depends on pests density rather than cultivation system. In other similar researches in agroforestry system, 3×4 m treatment collected lace wing by netting alfalfa had the lowest and collected via shaking poplar branches had the highest average. At the same time, Wyss's (1995) findings showed that increasing of plants variation will lead to high frequently of chrysopids.

In the case of ladybirds (*Coccinella septempunctata*) no significant difference was seen in various cultivation distances, this shows that cultural method didn't have effect on ladybird's population (Gold *et al*., 1989). So, it is conclude that there's no relation between the natural enemies activities and the type of cultivation system, other studies confirm this subject. Diversification of agricultural ecosystems caused high abundance of food resources or equal distribution of food, then ladybirds could be more efficient and abundant. In a similar research that was done by Heidari (2003), abundance and fauna of ladybirds in alfalfa's monoculture was more than its abundance in Agroforestry systems.

Of course, studies concerned with *Coleomegilla maculate* (Andow and Risch, 1985; Risch *et al*., 1983), *Coccinella septempunctata* (Helenius, 1990), approved this result. Changing of lady birds population rate showed that the highest density of these predators is almost simultaneous with high density of aphid population and this result proves the point that the more number of prey, the more number of predators.

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