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Study of the effect of type, trend and some environmental factors on poplar bugs *Monosteira buccata* Horv. (Tingidae: Heteroptera) in Nineveh governorate

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Abstract
This study was conducted on the poplar bug that infects different plant families, especially the trees of the willow family, including the trees included in our study, which are the black poplar (P. nigra), the Euphrates poplar (P. euphratica), the willow (Salix sp.) during the study year for the period between 5/15/2021 until 9/15/2021, The study included the sensitivity of two types of poplar trees and willow trees to the infestation of poplar bugs. The presence of the insect nymphs was observed on the study trees from mid-May to mid-September of the study season. It was found from the study that the highest average number of nymphs was in black poplar and reached 19.55 nymphs/leaf in mid-July at a temperature of 42°C and a relative humidity of 28%. While the lowest average number of nymphs in Euphrates poplar was 0 nymph/leaf at the end of August at a temperature of 45°C and relative humidity of 26%. Since the nymphs prefer the warmer interface compared to the less warm interfaces, the average number of nymphs in the black poplar, Euphrates poplar and willow and for the eastern side is 14.498 nymphs/leaf, 5.271 nymphs/leaf, and 3.453 nymphs/leaf, respectively and to the north, 4,640 nymphs/leaf, 2.249 nymphs / leaf, 1.822 nymphs / leaf, respectively.

Keywords: environmental, *Monosteira buccata Horv*., heteroptera

Introduction
The human need for forests and their products has increased, especially with the development of human and civil civilization due to the many benefits provided by forests from the productive and protective benefits to the environment and tourism, and this is clearly evident in the countries rich in them. It was a basic source of human livelihood in ancient times because it provided him with protection, food and housing (Abdullah and Al-Kinani, 1985) [1]. The world's systems have tended to develop and multiply these wealth, and attention is focused on fast-growing species with short cutting cycles (Zsuffa *et al*., 1993) [12]. Especially since natural forests have become unable to meet the increasing requirements in light of the huge population explosion in the world. The genus Populus is one of the genera of the Salicaceae family. Gogh trees are used as ornamental plants and stabilize the soil on the banks of rivers and streams, and their leaves are invested as animal feed, in addition to extracting medicinal substances and drugs from the bark of their trees (Shams El-Din, 1990) [9] (Browicz, 1977) [10]. Scientific studies and research have proven the economic importance of poplar wood, and due to its importance, forests were established in Nineveh and Dohuk governorates (Raeder_Roitzsch, 1969). Then its cultivation spread to other governorates in northern and central Iraq (Ramadan, 1990). Poplar trees are infected with many insects that cause them a lot of damage, represented in the death of trees, the deterioration of annual growth, the distortion of their integrity, and the reduction of the commercial value of their wood (Kulman, 1998) [11]. Reducing its economic importance as it grows in tourist areas (Hana and Amin, 1983) (Swailem and Maarouf, 1981) [8]. In addition, the weakness of trees makes them sensitive to other insect groups such as bark beetles, bark borers and wood. The types of trees differ in the pattern of infestation with poplar bugs in the northern and central regions of Iraq and cause damage to trees by depleting their juices and weakening them to the point where they are more vulnerable to infection with highly dangerous pests. This insect, which follows the suckers group, infects all types of poplar, in addition to the family trees of apple, almond and sunflowers (Al-Mallah, Nabil and Mustafa, 2018) [5].

Materials and methods
This study was carried out in the Nineveh Forest located on the eastern side of the Tigris River at latitude (39.19°) north and longitude (43.09°) east during the year 2020-2021, which included species of black aspen, Euphrates, and homogeneous willow trees. In ages and sizes As for the laboratory study that was carried out in the laboratories of the Forestry Department and the Central Laboratory of the College of Agriculture and Forestry in the years 2020-2021, to conduct this study, random samples were taken every 15 days from five trees randomly selected for each species, with the beginning of the emergence of the insect until its disappearance With five leaves for each direction (west, east, north, south), the sample size for one type becomes twenty leaves for each direction and 100 sheets for each type. The papers for each direction and for each of the three species were placed in a polyethylene bag and brought to the laboratory to calculate the number of eggs and the number of nymphs, To determine the effect of the type and trend on the population density of the insect phases and to determine the seasonal activity of its spread and phases on the studied species, the simple correlation values were calculated for the relationship between population fluctuation of the phases of the insect and the average relative humidity and temperatures obtained from the

weather station in Mosul, and the regression equation for the relationship between Population density of the insect phases for each of the studied species and each of the average relative humidity and known temperatures in the study area to find an equation for predicting the seasonal activity of the insect and showing the proportion of the effect of each of the factors of relative humidity and temperature on the population density of the insect phases. The statistical analysis program l.s.d was used at a probability level of 5% to determine the difference between the average temperature, relative humidity and the average number of nymphs.

Results and discussion

The interaction between type, direction and date in the average number of nymphs of the poplar bugs during the study period using l.s.d analysis and at the probability level (5%) that the studied tree species, the date of collection of samples and the eastern direction of the trees had a significant effect on the population density of the poplar bug nymphs, After conducting the statistical analysis, it was noted that there were significant differences in the average numbers of nymphs/leaf on the leaves of the studied trees, where the highest average number of nymphs/leaf in the black poplar was 29.32 nymph/leaf for the eastern direction and for the western direction 21.16 nymph/leaf in the middle of July, While the highest level of the average number of nymphs in the Euphrates poplar, towards the east, was 10.04 nymphs/paper and to the west, with an average of 7.94 nymphs/sheet in mid-July. As a result of the statistical analysis, it was noted that the black poplar outperformed the Euphrates and willow poplars in the general average of the numbers of nymphs and for the eastern and western direction, as it reached The average number of nymphs in black poplar for the east direction was 14.49 nymph / leaf and for the direction of the west 7.03 nymph / leaf, while the Euphrates type and for the east direction the year average reached 5.27 nymph / leaf and for the direction of the west 3.12 nymph / leaf and for the willow type the general average for the east side was 3.45 nymph / leaf To the west, 2.25 nymphs / paper, Which is consistent with what was mentioned by (Al-Sharif, 2020) [4] and (Al-Jubouri, 2013) [2], which showed that the plant host of the insect, the direction and the date of sampling had a significant effect on the number of nymphs on the tree fronts.

Table 1: Effect of the interaction between species, date of sampling and trend on average numbers of nymphs

Willow				Euphrates Poplar				black poplar				Sampling date
the West	the South	North	the East	the West	the South	North	the East	the West	the South	North	the East	
1.8	2.28	2.08	2.84	3.32	3.92	2.44	6.72	7.88	8.48	5.6	17.36	5/15
1.76	1.68	1.4	3.64	3.76	5.6	3.24	8.88	4.76	3.56	2.76	7.36	5/30
3.48	3.04	2.72	5.84	2.24	3.6	1.72	5.44	6.28	6.76	4.64	18.36	6/15
5.12	4.72	4.28	6.4	6.24	6.72	4.76	9.28	9.72	13.56	7.6	20.88	6/30
5.72	5.4	4.72	9.36	7.92	7.28	5.96	10.04	21.16	15.32	12.4	29.32	7/15
2.4	1.68	1.2	3	0.6	0.36	0.36	0.64	8.04	6.92	5.08	22.84	7/30
0	0	0	0	4	4.24	1.76	6.44	4.16	5.08	2.32	7.72	15/8
0	0	0	0	0	0	0	0	1.28	1.52	0.97	4	30/8
0	0	0	0	0	0	0	0	0	0.76	0.96	2.64	9/15
20.28	18.8	16.4	31,079	28.08	31.72	20.24	47.44	63.28	61.96	42.33	130.48	the total
2.25	2.08	1.8	3.45	3.12	3.52	2.24	5.27	7.03	6.88	4.70	14.49	overall average
1.144												l.s.d

The results of Table (2) when using the l.s.d test and at a probability level of 5% showed that there are differences in the average numbers of nymphs on the studied tree species and through the dates in which the samples were collected. The statistical analysis showed that the trends and collection dates had a significant effect on the numbers of nymphs of the poplar bug. And that the highest average number of nymphs was in the east direction, with an average of 16,240 nymphs/sheet in the date of collection (15/7) and the lowest average number of nymphs for the same direction was 0.880 nymphs/sheet in the collection date (15/9), From these results, we note that the nymphs prefer the eastern direction over the northern direction, where the general average of nymphs in the eastern direction was 7.740 nymphs / paper, and the general average of nymphs in the northern direction was 2.903 nymphs / paper. These results are consistent with what he mentioned (Al-Sharif, 2020) [4]. The oak leaf biter prefers the eastern direction, which was explained by (Al-Jubouri, 2013) [2]. The poplar leaf-bitter prefers the eastern and southern sides of trees, and it is the warmest side for the larvae, and it was shown (Al-Shabi, 2009) [3]. The insects of *Anisoplia leucaspis* L. prefer the warm side of the tree. This indicates that insects usually prefer areas that are warm and exposed to sunlight and are more compatible with their vital activity.

Table 2: The effect of the interaction between the date of collection of samples and the trend on the average numbers of nymphs of the poplar bug

Average relative humidity (%)	average temperature (C)	Average number of nymphs/sheet directione				Sampling date
		the West	the South	North	the East	
28	38	4.333	4.893	3.373	8.973	15/5
10	37	3.427	3,613	2.467	6.627	30/5
20	42	4	4,467	3.027	9,880	15/6
23	45	7.587	8.520	5.947	12.187	30/6
28	42	11,040	9.147	7.293	16.240	15/7

27	42	3,680	2.987	2.213	8827	30/7
27	39	2,720	3.107	1,360	4.720	15/8
26	45	0.427	0.507	0.133	1.333	30/8
20	37	0	0.253	0.320	0.880	15/9
209	368	37,214	37,494	26.133	69,667	the total
23022	40.889	4.134	4.166	2,903	7.740	overall average
0.660						l.s.d

The results of Table (3) indicate the interaction between the type and the trend and their effect on the average numbers of nymphs of the poplar bug using the l.s.d test at the probability level of 5%, The results indicated the superiority of black poplar to the east over willow and Euphrates poplar in the average number of nymphs, reaching 14.498 nymphs/leaf, followed by Euphrates poplar, with an average number of nymphs 5.271 nymphs/leaf, then willow, with an average number of nymphs 3.453 nymphs/leaf, As for the effect of the trend on the average number of nymphs, the results indicated that the east direction was superior, with an average of 7.740 nymphs/sheet, compared to the rest of the trends.

Table 3: Effect of the interaction between type and trend on the average numbers of nymphs of the poplar bug

type effect	Average number of nymphs/sheet				Species
	directione				
	the West	the South	North	the East	
8,263	7.031	6.884	8,263	14.498	black poplar
3,541	3.12	3.524	3,541	5.271	Euphrates Poplar
2.404	2,253	2.089	2.404	3,453	willow
	4.134	4.165	2,903	7.740	direction effect
0.381					L.s.d

Table (4) shows that the nymphs of the poplar bugs are present on the leaves of the black and Euphrates poplar trees since the beginning of the spring season and with the beginning of sample collection and using the L.S.D test at a probability level of 5%, The results showed that there were differences in the average numbers of nymphs on the studied tree species, From the results of the statistical analysis, it was found that the dates of collecting samples and species had a significant effect on the number of nymphs. It also showed that the highest average number of nymphs in the black poplar was 19.55 nymphs / leaf in the middle of July (15/7) with an average temperature of 42 °C and a relative humidity of 28%, while The lowest average for nymphs and for the same species was 1.09 nymphs/leaf in the middle of September (15/9), with an average temperature of 37 degrees Celsius and a relative humidity of 20%. As for Euphrates poplar, the highest average number of nymphs reached 7.61 nymphs / leaf in the middle of July (15/7) with an average temperature of 42 and a relative humidity of 28%, and the lowest average number of nymphs was 0 nymphs / leaf at the end of August and the middle of September, As for willow, the highest average number of nymphs reached 6.3 nymphs/leaf in mid-July, with an average temperature of 42°C and a relative humidity of 23%, and the lowest average number of nymphs was 0 nymphs/leaf in the middle of August and the following readings, with an average temperature of 39°C and a relative humidity of 27, The data indicated that the type of black poplar in the general average number of nymphs was 8.263 nymphs / leaf, followed by Euphrates poplar 3.451 nymphs / leaf.

Table 4: The effect of the interaction between the species and the date of sampling on the average numbers of nymphs of the poplar bug of the studied tree species.

Average relative humidity*(%)*	Average Temperature ((C	Average number of nymphs/sheet			Sampling date
		willow	Euphrates Poplar	black poplar	
28	38	2.25	4.1	9.83	15/5
10	37	2.12	5.37	4.61	30/5
20	42	3.77	3.25	9.01	15/6
23	45	5.13	6.94	12.94	30/6
28	42	6.3	7.61	19.55	15/7
27	43	2.07	4.11	10.72	30/7
27	39	0	0.49	4.82	15/8
26	45	0	0	1.8	30/8
20	37	0	0	1.09	15/9
209	368	21.64	31.87	74.37	the total
3.22	40.889	2.40	3,451	8,263	overall average
0.572					l.s.d

As for the correlation values and the coefficient of determination between the numbers of nymphs and the average temperature and relative humidity and between the area and the percentage of damage resulting from feeding the nymphs, Table (5) shows that there is a significant correlation between the average temperatures and each of the average area and damage percentage in black poplar, which amounted to 0.427 and 0.344 respectively, While the

correlation was significant for black poplar between the mean humidity, area and percentage of damage 0.189 and 0.045, respectively. As for the Euphrates poplar, there is a significant correlation between the average temperature and the area of damage and the percentage of damage 0.301 and 0.291, while the correlation between the average relative humidity and the area of damage and its percentage amounted to 0.456 and 0.450. As for willow, the value of the significant correlation between the average temperature and the area of damage was 0.477 and 0.477, and the correlation between the average relative and the area of damage was 0.495 and 0.493, respectively.

Table 5: Correlation values and coefficient of determination of the relationship between average temperatures and relative humidity in the area of damage and its percentage in the leaves of the studied species infested with poplar bug

	Correlation and coefficient of determination of damage percentage (%)		Correlation and coefficient of determination of damage area (cm2)	The Worker	Species
R2	R	R2	R		
11.83	0.344*	18.23	0.427*	temperature	black poplar
0.2	0.045*	3.57	0.189*	relative humidity	
8.4	0.291*	9.1	0.301*	temperature	Euphrates Poplar
20.25	0.450*	20.8	0.456*	relative humidity	
22.75	0.477*	22.75	0.477*	temperature	willow
24.30	0.493*	24.5	0.495*	relative humidity	

*The correlation is significant at the 1% probability level.

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