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WEATHER FACTORS AFFECTING THE ABUNDANCE OF MOSQUITOES AND HOUSEFLIES IN CAIRO INTERNATIONAL AIRPORT

Walaa M. M. Abdel-Khalek[1]; Said M. A. Dahroug[2]; Alaa El-Dien Bayoumi[2] and Youssef E. Y. Abdallah[2]

1) General Administration of Environment, Cairo International Airport
2) Plant Protection Dept., Fac. Agric., Ain Shams Univ.

ABSTRACT

This study was conducted with the aim of monitoring mosquitoes and houseflies in Cairo International Airport and evaluating the effect of three weather factors: the maximum temperature, the minimum temperature and the percentage of relative humidity on the population activity of these pests. Mosquito populations were detected and monitored through placing sticky traps in four infested areas as one sticky trap for each station. The housefly adults were detected and monitored through placing bait traps in five areas as one bait trap for each station. Monitoring for the two pests extended from January 2019 to December 2020. Obtained results indicated that mosquito adults were more abundant in Skylight Bathrooms and Air Conditioning Stations followed by the Area between Halls 1&2 and finally the Power Station. The housefly adults were most abundant in the Airside Hall no. 3, Terminal Building no. 1 and Gate 27, Terminal Building no. 1 followed by Area between Budling no. 2 and Budling no 3, Area between Halls 1 & 2, Terminal Building no.1 and the seasonal Hall related to Terminal Building no. 3 were the least areas to harbor housefly adults. This trend was obtained during the two years of study.

Both maximum and minimum temperatures had negative effects on the population density of mosquito adults but the effect of minimum temperature was insignificant, while relative humidity had insignificant positive effect.

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For the housefly adults, both maximum and minimum temperatures had insignificant negative effect on the population density but the effect of relative humidity was positive and significant. This study suggests to take into confederation the effect of Carbone dioxide (CO2) and degree of shade on the insect population in future studies of these pests.
Keywords: weather factors, population dynamics, Culex pipiens, Musca domestica, Cairo International Airport.

INTRODUCTION

Culex pipiens L. (Culicidae:Diptera) is a cosmopolitan mosquito species distributed worldwide, except for Australia and Antarctica (Mattingly *et al.* 1951, Barr 1957, Belkin 1962, Tanaka *et a*l. 1979, Dahl 1988, Lee *et al*. 1989, Farajollahi *et al*. 2011). Cx. pipiens show large adaptability to changeable environmental conditions, and it colonizes road drains and sewer drains both in urban and suburban areas and seminatural environments, such as irrigation canals, hunting swamps, rice fields, and sewage lagoons (Carrieri *et al*. 2014). Many studies have focused on the effect of weather parameters on different aspects of mosquito bio-ecology (Shone *et al*. 2006, Reisen *et al*. 2008).

The housefly, Musca domestica L. (Culicidae:Diptera) is a species of worldwide distribution (Smith, 1986; Ferreira and Lacerda, 1993) and of medical and veterinary importance since it is a mechanical vector of several diseases (Harwood and James, 1979; Smith, 1986, Levine and Levine, 1991).

The successful persistence of M. domestica in different regions of the world can be explained by at least two important factors, i.e., a short life cycle and a high growth rate (Rutz and Axtell 1980; Krafsur *et al*. 1985, Axtell and Arends, 1990). The growth rate is generally influenced by environmental factors (Chapman and Goulson, 2000). Temperature is an important environmental factor for M. domestica population growth, particularly in equatorial and tropical zones, where there is a high density of the species (Levine and Levine, 1991).

The main objective of this work is following up the distribution of these two dangerous pests in Cairo International Airport as influenced by three weather factors: the maximum temperature, the minimum temperature and the percentage of relative humidity for two years.

MATERIAL AND METHODS

Survey and monitoring procedures of the mosquitoes and houseflies were carried out through distributing various traps in different locations in and around Cairo International Airport (Fig. 1). Traps of mosquitoes were located near the sewers, humid tunnels and humid areas which are involved within the infrastructure. Traps of houseflies were located near the garbage collection places. In each area one trap was placed.

Monitoring procedure was applied to locate, identify and rank the severity of pest infestations, also to estimate the changes in its distribution and abundance. Information about daily maximum temperature, minimum temperatures and relative humidity were obtained from the General Authority of Meteorology.

Fig.(1): The two general layouts (A and B) for Cairo International Airport show the different locations of the used traps as monitoring stations for the studied insect pests.

Mosquito populations were detected and monitored through placing sticky traps in four infested areas (Air Conditioning Stations 1 & 2 'Terminal Building #1', Power Station 'Terminal Building #1', Area between Halls 1 & 2 'Terminal Building #1' and Skylight Bathrooms 'Terminal Building #3'. The yellow sticky traps (10 x 20 cm) used as monitoring stations were placed on walls near the stagnant water and sewers as one sticky trap for each station. The sticky traps were changed weekly and counts of adult mosquitos were recorded.

The housefly adults were detected and monitored through placing bait traps consists mainly of an attractive material in the investigated five areas Airside Hall 3 'Terminal Building #1, Seasonal Hall 'Terminal # 3 accessory', Area between Halls 1 & 2 'Terminal Building #1, Area between Terminal Building #2 and Terminal # 3 and Gate 27 'Terminal Building #1. The bait traps used were hanged near the rubbish dumps, which are considered a suitable place for housefly accumulation as one bait trap for each station. Flies caught in the traps were removed weekly and counts were recorded.

Weather data were obtained daily from January 2019 to December 2020 at 2 meters height. Data were obtained from the Climatic Change Information Center (CCIC), Agricultural Research Center, Ministry of Agriculture and Land Reclamation according to the location of Latitude 30.0 - Longitude 31.4 in which Cairo International Airport is located.

RESULTS AND DISCUSSION

1) **Population dynamics of mosquito adults in Cairo International Airport:** Data in Table (1) show the fluctuations of mosquito adult population in 2019. These data indicate that mosquito adults were more abundant in the air conditioning stations (ACS) 1&2 in terminal building no.1 (9330 adults) followed by area between halls (AbH) 1&2 in terminal building no. 1 (4498 adults) then the power station area (1936) and finally skylight bathrooms (1004) with no statistically significant differences between the last two areas.

In all areas, the population of mosquito adults increased gradually towards the end of the year with two peaks of existence in ACS and AbH areas. These peaks occurred in July and December (The larger numbers were in December). These peaks reached 1027 and 1580 adults in ACS area & 553 and 945 adults in the AbH area.

In the other two areas only one peak of abundance was noticed; the first one was 250 adults in the beginning of the year (February) in the power station and the other was 243 adults in December in skylight bathrooms.

In the second year (2020), the population of mosquito adults was significantly higher than the previous year (Fig. 2). The ACS location had the greatest population (22191 adults), followed by the AbH area (5512 adults), followed by the power station and skylight bathrooms with 3044 and 2786 adults, respectively (F = 43.7).

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The population of mosquito adults in the whole surveyed areas had three typical peaks of abundance occurred in March, June and September 2020 with an exceptional peak in December in the ACS area. These peaks reached 2802, 2138, 2216 and 1973 adults in the ACS area. They were 425, 273 and 272 adults in the power station. Peaks were 1289, 273 and 289 in the AbH area and 356, 264 and 249 adults in the skylight bathrooms.

These data are in harmony with those found by Drago *et al.* (2017) found that *Aedes albopictus* and *Cx. pipiens* are commonly distributed in Italy and represent the main species found in catch basins. YaZhen *et al.* (2017) who investigated the population dynamics of *Cx pipiens* in Sichuan Province, China. They mentioned that mosquitoes were captured in different environments. The peak density of *Cx. pipiens* was concentrated in June-August. JiSong *et al.* (2018) in China reported that mosquito population differed significantly from one month to another during the period of investigation (2011-2016). Jun *et al.* (2018) in China found that the period from April to November, was the main period for mosquito activity. Bahk *et al.* (2020) performed a descriptive and prospective monitoring for *Cx. pipiens*. They found that the main period of activity was from March to November.

Table(1): The changes in the population density of mosquito adults in different areas of Cairo International Airport during 2019.

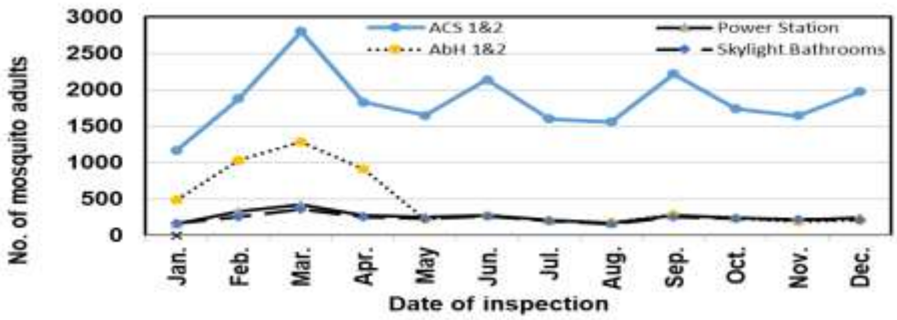
Area	Density of mosquito during months of the year												Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
ACS 1&2	39	74	304	794	658	668	1027	893	738	1265	1290	1580	9330
Power Station	122	250	132	189	126	138	158	134	128	163	170	226	1936
AbH 1&2	114	138	137	170	136	143	553	417	412	633	700	945	4498
Skylight Bathrooms	58	47	64	73	64	47	77	64	62	81	124	243	1004

ACS = Air Conditioning Stations 1 & 2 (Terminal Building #1)

Power Station (Terminal Building #1)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

Skylight Bathrooms (Terminal Building #3)



ACS = Air Conditioning Stations 1 & 2 (Terminal Building #1)

Power Station (Terminal Building #1)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

Skylight Bathrooms (Terminal Building #3)

Fig(2): The changes in the population density of mosquito adults in different areas of Cairo International Airport during 2020.

2) Population dynamics of housefly adults in Cairo International Airport: The population of housefly adults was highly fluctuated in 2019 in all investigated areas (Table 2). The population of adult houseflies began with relatively high numbers because it continued from the previous year except in the AbTB 2&3 The population of housefly adults had two peaks of abundance in all areas mostly in April and July. In AH3TB no. 1 area, the peaks occurred in April (222 adults) and September (290 adults); while in Gate 27, these peaks occurred in April (180 adults) and in July (208 adults) with no significant differences between both areas. The timing of the two peaks was quite different for AbH 1&2 and AbTB 2&3 areas since the two peaks occurred in the beginning of the year (193 adults) and in July (128 adults) in the first area and in April and October in the second area with no significant differences between both. The seasonal Hall no. 3 had the lowest population of housefly adults with the first peak (78 adults) occurred in July, while the second and higher peak occurred in the last month of the year (227 adults). The population of housefly adults was surprisingly increasing towards the end of year. In the year 2020, the population of housefly adults increased significantly in all localities compared to that of 2019 with no significant differences between all areas.

In the year 2020, the population of housefly adults increased significantly in all localities compared to that of 2019 with no significant differences between all areas. Surprisingly, the housefly adults had three peaks of occurrence in all areas in March, June, and September. This increased number of peaks may be due to the great increase in numbers of flies. The largest numbers of flies were in March, followed by September then the lowest numbers were in June peaks. This maybe coincided with high temperature prevailed during that month (Fig. 3).

These results are in accordance with those found by Kavran *et al.* (2019) who reported that the best methods for monitoring houseflies were glued cardboard or yellow sticky cards and that the more sensitive methods i.e., spot cards and sticky fly strips, should be used for lower abundance of the fly population

Table(2): The changes in the population density of housefly adults in different areas of Cairo International Airport during 2019.

Area	Density of mosquito during months of the year												Total
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
AH3TB #1	190	149	189	222	185	195	213	153	290	230	174	188	2378
Seasonal Hall #3	101	42	46	53	52	51	78	65	77	140	163	227	1095
AbH 1&2	193	96	67	93	77	78	128	105	130	157	128	193	1445
AbTB 2 &3	97	96	85	114	98	99	126	101	220	240	212	235	1723
Gate 27	186	117	123	180	155	155	208	169	168	182	172	219	2034

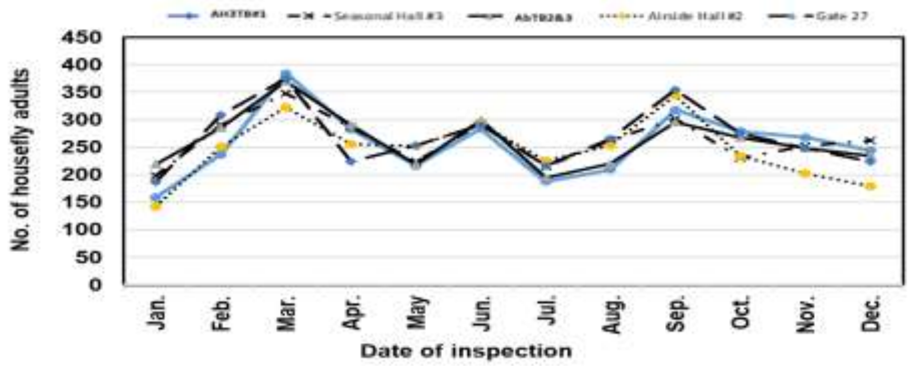
AH3TB#1 = Airside Hall 3Terminal Building #1

Seasonal Hall (Terminal # 3 accessory)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

AbTB2&3 = Area between (Terminal Building #2 and Terminal Building #3)

Gate 27 (Terminal Building #1)



AH3TB#1 = Airside Hall 3Terminal Building #1

Seasonal Hall (Terminal # 3 accessory)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

AbTB2&3 = Area between (Terminal Building #2 and Terminal Building #3)

Gate 27 (Terminal Building #1)

Fig (3): The changes in the population density of housefly adults in different areas of Cairo International Airport during 2020.

3) Effect of three main weather factors on the changes in the population density of Culex pipiens in the different areas in Cairo International Airport: The statistical analysis (Table 3) showed both maximum and minimum temperatures had negative effects on the population density of adult mosquitoes in 2019 in Skylight Bathrooms but the effect of minimum temperature was insignificant. The effect of relative humidity was positive and highly significant. The three tested weather factors were responsible for 25.7% of the variance in the population density in this area. In the Area between Halls 1&2, Both maximum and minimum temperatures had insignificant effects on the population density of adult mosquitoes, while R.H.% had positive effect. The three tested weather factors were responsible for only 3.68 % of the variance in the population density in this area. For the Power Station in terminal building 1, all the three factors had insignificant effect on the population density of adult mosquitoes. The effects of maximum and minimum temperatures were positive but the effect of relative humidity was negative. The three tested weather factors were responsible for less than 1% of the variance in the population density. For the Air Conditioning Stations 1&2, Both maximum and minimum temperatures had positive and significant effects on the population density of adult mosquitoes in this area. On the other hand, relative humidity had insignificant positive effect. The three tested weather factors were responsible, as a group, for 42.8% of the variance in the population density in this area.

Obtained data of statistical analysis (Table 4) indicated that both maximum and minimum temperatures had negative effects on the population density of adult mosquitoes in 2020 in the Skylight Bathrooms area. The effect of R.H.% was positive but insignificant. The three tested weather factors were responsible for 18.4% of the variance in the population density in this area. In the Area between Halls 1&2, all the three factors had highly significant effects on the population density of adult mosquitoes. Both maximum and minimum temperatures had negative effects and relative humidity had a positive effect. The three tested weather factors were responsible, as a group, for 56.4% of the variance in the population density. For the Power Station in terminal building 1, maximum temperature had insignificant effect but minimum temperature had significant effect on the population density of adult mosquitoes. The effect of relative humidity was positive.

Table (3): Statistical analysis and regression among mean numbers of Culex pipiens population density and three weather factors at four different areas at Cairo Airport during 2019.

Area	Tested variables	Simple correlation		Regression values				E.V. %	"F"
		"r"	Prob.	"b"	s.e	"t"	Prob.		
Skylight Bathrooms	Min. temp.	-0.207	0.137	----	1.419	-0.160	0.874	**25.7**	**5.6***
	Max. temp.	-0.289	0.036	0.355	1.289	0.275	0.784		
	R. H. %	0.500	0.000	0.670	0.288	2.327	0.024		
AbH 1&2	Min. temp.	0.240	0.084	----	6.97	1.142	1.990	**3.68**	**9.5****
	Max. temp.	0.105	0.453	----	6.33	-0.996	-1.195		
	R. H. %	0.328	0.017	2.37	1.415	0.403	1.679		
Power Station tb1	Min. temp.	0.077	0.582	----	5.428	-0.081	0.936	**0.7**	**0.12**
	Max. temp.	0.073	0.602	----	4.928	0.190	0.850		
	R. H. %	-0.018	0.896	----	1.101	0.265	0.792		
ACS 1&2	Min. temp.	0.484	0.000	15.67	10.979	1.428	0.160	**42.8**	**12.2****
	Max. temp.	0.376	0.005	3.09	9.968	-.0310	0.758		
	R. H. %	0.111	0.427	----	2.228	2.023	0.049		

ACS = Air Conditioning Stations 1 & 2 (Terminal Building #1)

Power Station (Terminal Building #1)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

Skylight Bathrooms (Terminal Building #3)

R. H.= relative humidity

Table (4): Statistical analysis and regression among mean numbers of Culex pipiens population density and three weather factors at four different areas at Cairo Airport during 2020.

Area	Tested variables	Simple correlation		Regression values				E.V. %	"F"
		"r"	Prob.	"b"	s.e	"t"	Prob.		
Skylight Bathrooms	Min. temp.	-0.295	0.032	-2.509	0.871	-2.88	0.066	18.4	3.7
	Max. temp.	-0.213	0.126	----	0.569	2.341	0.023		
	R. H. %	0.063	0.653	----	0.120	-0.809	0.422		
AbH 1&2	Min. temp.	-0.634	0.000	-29.729	5.305	-5.604	0.000	56.4	21.1**
	Max. temp.	-0.514	0.000	14.625	3.467	4.221	0.000		
	R. H. %	0.345	0.012	0.240	0.730	0.329	0.744		
Power Station tb1	Min. temp.	-0.317	0.021	-4.348	1.128	-3.853	0.000	26.6	5.9*
	Max. temp.	-0.209	0.134	----	0.737	3.291	0.002		
	R. H. %	0.090	0.523	----	0155	-0.774	0.442		
ACS 1&2	Min. temp.	-0.035	0.803	----	5.984	-2.738	0.009	13.6	2.6
	Max. temp.	0.053	0.706	----	3.911	2.707	0.009		
	R. H. %	-0.051	0.718	----	0.824	-0.800	0.428		

ACS = Air Conditioning Stations 1 & 2 (Terminal Building #1)

Power Station (Terminal Building #1)

AbH = Area between Halls 1 & 2 (Terminal Building #1)

Skylight Bathrooms (Terminal Building #3)

R. H.= relative humidity

The three tested weather factors were responsible, as a group, for 26.6% of the variance in the population density. For the Air Conditioning Stations 1&2, all 3 factors had insignificant effects on the population density of adult mosquitoes in this area. The three tested weather factors were responsible for 13.6% of the variance in the population density in this area.

These results are in harmony with those obtained by many authors. Ruybal *et al.* (2006) found that temperature had strong and consistent non-linear effects on all four life history traits of mosquitoes. Chuang *et al.* (2012) reported that temperatures (>30°C) had negative effects on the longevity and survival rates of mosquitoes at minimum air temperatures; there was a positive effect on the abundance of adult *Cx. pipiens* during May and June. However, during July and August, maximum temperature had a negative influence on the abundance of adult *Cx. pipiens*. On the other hand, Lebl *et al.* (2013) reported a negative correlation between adult mosquito abundance and humidity. Carrieri *et al.* (2014) found that mosquito population was mostly affected by the R.H.% registered from March to July, particularly in May. Helbing (2015) reported that *Cx. pipiens* tended to be positively related to climatic factors. Abouzied (2017) observed that in winter–spring (20.46±1.88°C and 51.68±3.63% RH), the preadult survival rate for *Cx. pipiens* was 80.65%, which was higher than the 50.00% observed in the summer–autumn (30.19 ± 0.678°C and 52.68 ± 8.04% RH). Hassan *et al.* (2017) in the western coast of Saudi Arabia reported that regression analysis indicated that abundance of *Cx. pipiens* was negatively related to temperature and positively related to R.H.%. Amusan and Ogbogu (2020) found that temperature, rainfall and humidity are considered essential in the duration of mosquito development and longevity. This study suggests to take into confederation the effect of Carbone dioxide (CO_2) and degree of shade on the *Cx. Pipiens* population in future studies of this pest.

4) Effect of three main weather factors on the changes in the population density of Musca domestica in the different areas in Cairo International Airport: The statistical analysis (Table 5) showed both maximum and minimum temperatures had positive effect on the population density of adult flies in 2019 in the Airside Hall 3 Terminal Building #1 area. Maximum temperature had an insignificant effect but minimum temperature had significant effect. The relative humidity had insignificant negative effect also. The three tested weather factors were responsible for 10.8% of the variance in the population density in this area. For the Seasonal Hall area, both maximum and minimum temperatures had negative insignificant effects on the population density of adult flies. The three tested weather factors were responsible, as a group, for 63.8% of the variance in the population density in this area. In the Area between Halls 1&2, both maximum and minimum temperatures had negative effects on the population density of adult flies. The maximum temperature had significant effect but the minimum temperature had insignificant effect. For relative humidity, the correlation coefficient was 0.546 (which was highly significant) and the regression coefficient was 0.329. The three tested weather factors were responsible, as a group, for 59.5% of the variance in the population density in this area. For the Area between Terminal building # 2& Terminal building # 3, both maximum and minimum temperatures had positive and insignificant effects on the population density of adult flies. On the other hand, relative humidity had significant positive effect. The three tested weather factors were responsible, as a group, for 44.2% of the variance in the population density in this area. In the area of Gate 27, all the three factors had positive effects on the population density of adult flies. The three tested weather factors were responsible, as a group, for 47.4% of the variance in the population density in this area.

Obtained data of statistical analysis of all tested weather factors (Table 6) had insignificant effect on the population density of adult flies in 2020 in the Airside Hall 3 Terminal Building # 1 area. Both maximum and minimum temperatures had positive effect but the relative humidity had negative effect. The three tested weather factors were responsible, as a group, for only 0.9% of the variance in the population density in this area. For the Seasonal Hall area, all the three factors also had insignificant effects on the population density of adult flies. Maximum temperature and relative humidity had positive effects but minimum temperature had negative effect. The three tested weather factors were responsible, as a group, for only 5.9% of the variance in the population density in this area. In the Area between Halls 1&2, the three factors also had insignificant effect on the population density of adult flies. The three tested weather factors were responsible for 8.7% of the variance in the population density in this area. For the Area between Terminal building # 2& Terminal building # 3, Data indicates that this area is the only area that the

Table (5): Statistical analysis and regression among mean numbers of Musca domestica population density and three weather factors at five different areas at Cairo Airport during 2019.

Area	Tested variables	Simple correlation		Regression values				E.V. %	"F"
		"r"	Prob.	"b"	s.e	"t"	Prob.		
AH3TB#1	Min. temp.	0.291	0.034	0.555	1.654	0.335	0.739	10.8	1.99
	Max. temp.	0.254	0.067	----	1.502	0.124	0.901		
	R. H. %	-0.027	0.848	----	0.336	0.739	0.464		
Seasonal Hall #3	Min. temp.	-0.090	0.521	----	1.346	1.285	0.205	63.8	11.2**
	Max. temp.	-0.226	0.104	----	1.222	-0.858	0.395		
	R. H. %	0.575	0.000	0.675	0.273	2.471	0.17		
AbH 1&2	Min. temp.	-0.149	0.288	----	1.068	1.679	0.100	59.5	8.9**
	Max. temp.	-0.278	0.044	-1.382	0.970	-1.425	0.161		
	R. H. %	0.546	0.000	0.329	0.217	1.517	0.136		
AbTB2&3	Min. temp.	0.219	0.116	----	1.558	1.810	0.076	44.2	12.9**
	Max. temp.	0.074	0.599	----	1.415	-0.915	0.365		
	R. H. %	0.406	0.003	0.790	0.316	2.499	0.016		
Gate 27	Min. temp.	0.291	0.035	1.449	0.971	1.493	0.142	47.4	4.8*
	Max. temp.	0.195	0.161	----	0.881	-0.852	0.398		
	R. H. %	0.147	0.294	----	0.197	0.894	0.376		

AH3TB#1 = Airside Hall 3Terminal Building #1

Seasonal Hall #3 = (Terminal # 3 accessory)

AbH1&2 = Area between Halls 1 & 2 (Terminal Building #1)

AbTB2&3 = Area between (Terminal Building #2 and Terminal Building #3)

Gate 27 (Terminal Building #1)

R. H.= relative humidity

Table (6): Statistical analysis and regression among mean numbers of Musca domestica population density and three weather factors at five different areas at Cairo Airport during 2020.

Area	Tested variables	Simple correlation		Regression values				E.V. %	"F"
		"r"	Prob.	"b"	s.e	"t"	Prob.		
AH3TB#1	Min. temp.	0.054	0.701	----	1.117	-0.442	0.660	0.9	0.153
	Max. temp.	0.072	0.608	----	0.730	0.560	0.578		
	R. H. %	-0.019	0.891	----	0.154	-0.010	0.992		
Seasonal Hall #3	Min. temp.	-0.049	0.728	----	0.842	-1.718	0.092	5.9	1.026
	Max. temp.	0.012	0.934	----	0.550	1.713	0.093		
	R. H. %	0.038	0.786	----	0.116	-0.022	0.983		
AbH 1&2	Min. temp.	-0.212	0.128	----	0.877	-1.812	0.076	8.7	1.548
	Max. temp.	-0.155	0.268	----	0.573	1.494	0.142		
	R. H. %	0.097	0.488	----	0.121	-0.117	0.907		
AbTB2&3	Min. temp.	0.415	0.002	-1.588	0.895	-1.776	0.082	31.4	7.473
	Max. temp.	0.469	0.000	1.447	0.585	2.475	0.017		
	R. H. %	-0.398	0.003	-0.272	0.123	-2.206	0.032		
Gate 27	Min. temp.	0.106	0.451	----	1.030	-0.364	0.718	3.2	0.544
	Max. temp.	0.115	0.411	----	0.673	0.450	0.655		
	R. H. %	-0.164	0.140	----	0.142	-0.964	0.340		

AH3TB#1 = Airside Hall 3Terminal Building #1

Seasonal Hall #3 = (Terminal # 3 accessory)

AbH1&2 = Area between Halls 1 & 2 (Terminal Building #1)

AbTB2&3 = Area between (Terminal Building #2 and Terminal Building #3)

Gate 27 (Terminal Building #1)

R. H.= relative humidity

effect of some weather factors was obvious since both maximum and minimum temperatures had positive and significant effects on the population density of adult flies. On the other hand, relative humidity had significant negative effect. The three tested weather factors were responsible, as a group, for 31.4% of the variance in the population density in this area. In the area of

Gate 27, all the three tested weather factors had insignificant effects on the population density of adult flies. The three tested weather factors were responsible for only 3.2% of the variance in the population density in this area.

These data are closely related to those obtained by Dakshinamurty (1948) who mentioned that *M. domestica* chooses the lower humidity on each of the humidity gradients, 20–40, 40–60, 60–80 and 80–100, at 25°C. It chooses 30°C in temperature gradients of 20–30°C and 30–40°C at constant humidity. Results of Jing *et al.* (2013) in China indicated that along with the increase of temperature from 15°C to 35°C, the developmental duration of larvae became shorter. Schou *et al.* (2013) in Denmark, measured the locomotor activity of *M. domestica* males and females. They found that locomotor activity during daytime increased with temperature at all tested densities until reaching 30°C and then decreased. Zahn and Gerry (2020) in Southern California found that house fly flight activity was positively correlated with temperatures up to 42°C and negatively correlated with humidity in a laboratory study. This study suggests to take into confederation the effect of Carbone dioxide (CO_2) and degree of shade on the *Musca domestica* population in future studies of this pest.

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تأثير العوامل الجوية على تواجد البعوض والذباب المنزلى فى مطار القاهرة الدولى

ولاء محمد محمد عبد الخالق[١]– سيد محمد عبد اللطيف دحروج [٢]– علاء الدين بيومى[٢]
يوسف عز الدين يوسف عبد الله [٢]

١) الإدارة العامة للبيئة، شركة ميناء القاهرة الجوى٢) قسم وقاية النبات، كلية الزراعة، جامعة عين شمس.

المستخلص

أجريت هذه الدراسة بغرض رصد التغيرات في تعداد الحشرات الكاملة للبعوض والذباب المنزلي الموجودة في مطار القاهرة الدولي ودرجة تأثرها بالتغيرات في ثلاث عوامل جوية هي درجة الحرارة العظمى ودرجة الحرارة الصغرى والنسبة المئوية للرطوبة الجوية. وقد تم إستخدام المصائد اللاصقة الصفراء لرصد الحشرات الكاملة للبعوض *Culex pipiens* في أربع مناطق بمعدل مصيدة لكل منطقة، بينما إستخدمت مصائد الطعوم في اصطياد حشرات الذباب المنزلي *Musca domestica* في خمس مناطق بمعدل مصيدة لكل منطقة ، وقد إستمرت فترة الدراسة لمدة عامين من يناير ٢٠١٩ حتى ديسمبر ٢٠٢٠. أشارت النتائج المتحصل عليها إلى أن حشرات البعوض كانت أكثر تواجداً في منطقة مناور الحمامات ومحطات تكييف الهواء يليها المنطقة الموجودة بين الصالتين ١ ، ٢ وأخيراً محطة الكهرباء الخاصة بمبنى الركاب ١، بينما كانت حشرات الذباب المنزلي أكثر تواجداً في صالة ٣ التابعة لمبنى رقم ١ من جهة المهبط ، يليه بوابة رقم ٢٧ التابعة لمبنى الركاب رقم ١ من جهة المهبط، ، ثم المنطقة الواقعة بين مبنى الركاب ٢ ومبنى الركاب ٣، ثم المنطقة الواقعة بين صالتى

السفر والوصول التابعتين لمبنى الركاب ١ وأخيراً الصالة الموسمية التابعة لمبنى الركاب ٣ هي أقل مكان وجدت فيه حشرات الذباب. وقد إستمر هذا الشكل من التغيرات طوال مدة عامي الدراسة. كان لكل من درجة الحرارة العظمى والصغرى تأثيراً سلبياً على تعداد ونشاط الحشرات الكاملة للبعوض ولكن نجد أن تأثير درجة الحرارة الصغرى غير معنوياً ، بينما كان للرطوبة الجوية تأثيراً موجباً ولكنه غير معنوياً. بالنسبة للذباب المنزلي فقد كان لكل من درجتى الحرارة العظمى والصغرى تأثيراً سلبياً على التعداد ولكنه غير معنوي بينما كان تأثير الرطوبة النسبية معنوياً وموجباً أيضاً. تقترح هذه الدراسة أن يؤخذ في الإعتبار تأثير ثنائي أكسيد الكربون ($CO2$) ودرجة الظل على تعداد الحشرات في الدراسات المستقبلية لهذه الآفات.

الكلمات الرئيسية: العوامل الجوية، تعداد الحشرات ، *Culex pipiens*، *domestica* Musca، مطار القاهرة الدولى.