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ECOLOGICAL AND BIOLOGICAL STUDY OF *Vespula. Germanica*

Batool A. Karso[1] Salih M. Ali Bas[2]
[1,2]Dept. of Plant Protection, Colle. of Agricultural Engineering Sciences, University of Duhok. Iraq
Email: batool.karso@uod.ac

ABSTRACT

Vespula germanica (German wasp) is considered a dangerous pest that attacks bees and orchards, and its sting harmful to humans , found in much of the Northern Hemisphere, Khalaf was recorded in Iraq in 1958, it was limited to registration within the Iraqi insects fauna only, and no any biological or environmental studies in Iraq. Therefore, study aimed for understanding of some aspects of the insect. During three years, 2018-2019- and 2020, field survey in different fields in Duhok, Iraqi Kurdistan, collected 27 nests to investigate several colony characteristics. Our study showed the size of mature nests is correlated to number of individuals produced. observed that the German hornet builds its nests in different places as on trees and shrubs, on roofs of houses , buildings, animal pens, poultry fields, and near water sources. Queen begins to appear at beginning of May, workers at beginning of July, as for the males and virgins, they appeared in October. And all members cast die in winter except newly fertilized queens remain, who hibernate to next season. Showed the activity of workers increases with the progression of the hours of the day and that their highest activity is during the hour (9-11) in the morning, at rate 100 wasps/hour. seasonal activity starts from May to November, and highest activity recording during July, August, and September. The highest average of sealed brood area 3.11inch during July , highest average number of hexagonal eyes 91 eyes/nest in October.

***Keywords*:** yellow wasps or German wasps , European wasp, ecological study, biological study, brood area, *vespula germanica*

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INTRODUCTION

The yellow wasp or German wasp or European wasp *Vespula germanica* (Fabricius) (Hymenoptera: Vespidae) is an invasive eusocial vespid it has invaded New Zealand, Australia, South Africa, North America, Canada, Chile, and Argentina (Beggs et al., 2011). And khalaf recorded it in Iraq in,1958 (Khalaf, 1958) and Augul,(,2017). It is considered a pest that has significant negative impacts on horticulture, apiculture, tourism, and outdoor social activities, as well as animal health and biodiversity.(Bashford ,2001). Wasps have been shown to negatively affect natural ecosystems, economic and human recreational activities. For instance, the painful sting may interfere with human outdoor activities and affect residential areas where wasps are attracted to food and refuse (Akre and MacDonald, (1986),and Beggs *et al*.,(2011)).
Vespula germanica spends the overwintering period as mated queens in human goods, and they are the only reproductively active females and, as are responsible for the spread

of the population and the establishment of new colonies (Spradbery, 1973). Flight activity of queens outside the nest is limited in time, but contributes to the increase in population spatial redistribution, although accidental transport of overwintering queens is a well-known factor of geographical spread. In temperate regions, flight by queens occurs twice a year: in early autumn, when new queens leave the parental nest to mate and find shelter to overwinter, and in spring, when new colonies are initiated by them. Here, this study aimed to investigate the comparative seasonality, an abundance of *vespula* wasp colonies in region field's .and to determine the nest site preferences of German wasps in Duhok. Examine aspects of colony dynamics, nest size, brood size, and nest building efficiencies, to determine how they affect queen production. Finally, studied the Ecological behavior of *V. germanica* under environmental conditions, which that a major urban pest in the invaded range understanding their behavior and may help us to improve the development of local and regional management strategies. To control this pest, by focusing the effect of climate factors on the decrease of the local abundance of individuals, and slow the spread of this species. German wasp is an increasing problem in Iraq / Kurdistan region additional that no studied and information about this pest.

MATERIAL AND METHODS

For the first time this study was done in Iraq specially Kurdistan region, we conducted a survey of Akre district - Duhok Governorate Kurdistan Region-Iraq during three years 2018, 2019 and 2020 respectively under field condition. Started in July to November for each year, before starting the research, intensive observation on yellow wasp's appearance and building nest during end of spring. Each year, in this experiment three new nest of combs was selected in the same location branch of tree and under house wall. Observed weekly, and the climatic information was taken from Akre region - Meteorological Station near the site of experiment.The specimens of the *V. germineca* was deposited by Iraq Natural History Research Center and Museum University of Baghdad.

Biological study:

1- Nest collection:

Yellow wasp nests were collected complete with queens, workers and broods from the fields in which they are located after sunset to ensure the presence of most individual of the colony with nest. For the purpose of followed and carried out biological and environmental experiments on the nests. The method of checking the nest was by attaching a paper cone around the nest while blocking the mouth of the cone to ensure that no individuals left. The nest was anesthetized by injecting carbon dioxide (CO2) into the cone for half a minute to facilitate the process of counting individuals.

2-Effect of weather condition on brood area production of yellow wasps:

The area brood production was estimated weekly after obtaining their measured areas for three years respectively, by used standard small frame special foundation grade by silk into squares of 1 inch, As for the average number of brood area in nest, wire was used, including a square with one inch, and placed on the nest, number of brood area inside the square was calculated for all colony ,queen, worker and male of yellow wasp.

3- Calculated the number of the hexagonal eyes:

The number of the hexagonal eyes was studied in above nests, where the hexagonal eyes were taken from each nest for all individuals, queen, worker and male to measuring number of the hexagonal eyes, the average number of hexagonal eyes in each nest, wire was used, a square with a side length of one inch, and placed on the nest, and the number of hexagonal eyes inside the square was calculated for all nests under study and for each of the queen, the worker, and the male.

4-Ecological study:-

The Ecological study was done for three years 2018 - 2019 - 2020, in the Akre at Duhok State, the climate is Akre, which is characterized by dry winter, and hot, humid summer. By choosing deferent three nests yearly in nature.

Observation of appearance and hidden of Germany wasps: -

The appearance and hidden difference from year to year according to climate conditions. The date of the first appearance of the yellow wasps (the mother queens, then the workers, then the male and, subsequently the virgin queens) was confirmed, as was the date of the hidden by observing individuals in the environment and their presence in the nests. during two time periods 9 – 11 morning and 4 – 6 afternoon.

Determine the population density of the yellow hornet during the season of activity:

Calculate the population density of the yellow hornet during the season of activity: The percentage number of yellow wasp was calculated weekly on the nest during three different years in 2018, 2019 and 2020. which calculated the nest individuals through the nests selected from nature, and this process was carried out afternoon to ensure that all individual back to the nest (the population density was calculated for one nest weekly). This study was repeated monthly from the appearance of the yellow wasp until its disappearance. The frequency of nests of *V. germineca* was estimated by a monthly census in three nesting sites. Each nest found was coded, mapped, and afterwards fixed near the nest. In the initial phase of this investigation the old nests (commonly scars) were marked with a nail close to the nests to record probable reactivations yearly.

All new nests recorded after each census were considered new foundations and "active nests" were those with adults (males or females). In this species, the adults lack diapause in all periods of the year.

The seasonal variations of the stages of development of the immature presents in the nests, as well as of the flight of the wasps were registered through daily observations and periodic excavations of the nests.

Daily activity of the yellow wasp:

The daily activity times was determining when the yellow hornet is active by as the number of wasps released and returning to the nests were calculated by two times per day at tow hour for each period (9 – 11 morning and 4 – 6 evening) for one day (Monday) per a week from July to November. temperatures and humidity obtained from meteorological akre.

Seasonal activity of the yellow wasps:

The seasonal activity of the yellow wasps was determined during the season, by calculating the number of wasps throughout the hours of the early day until evening for each month separately of July until November with three readings per month, in the begin - mid, and at the end to determine the months is most active depending on the strength of the monthly wasp active.

Statistical anlysis: The results were analyzed statistically using (R.C.B.D.) and Duncans test below 0.05 probability to tested the significant between means depending on (SAS). (Antar, 2010).

RESULTS AND DISCUSSION

1- The appearance and hidden of individual of the yellow wasps: -

The results showed that the variation in climatic conditions (temperature and relative humidity) during the three years (2018-2019 and 2020), has an effect on the timing of coming out. The fertilized females (queens) began to appear at the beginning of May and June in the Akre area fields, the village of Al-Alaye. Where it recorded the first appearance during three years in 2018, 2019, and 2020 according to average temperature was 34.5°C,31.4°C, and 36.1°C, and relative humidity was 15%, 16.5%, and 11.5% respectively. While it was started to hidden during three years 2018, 2019, and 2020 in mid and end November respectively under the average temperature 13.1°C, 13.8°C, and 17.1°C and R.H. 76%, 25% and 48% respectively.

The results showed that the Germany wasp *Vespulagermanica* were found attacking vegetables, Orchards, and honeybees *Apismellifera* during July to November (2018-2019 and 2020), the *V. germanica* started to appear in small numbers. Where the queens began to build their nests in the first week of June when the queen built nests with many hexagonal eyes and laid eggs in them. As for the workers, their first appearance was at the beginning of July and the workers continued to appear until the end of the season in November for each year, while the first appearance of the males in the nests was at the beginning of the first week of the month of September. Its appearance was accompanied by the appearance of the queens, the new virgins, and the workers, males, and queens disappeared. Newborn in the fourth week of October when temperatures decrease. There were no reported cases of any individual of the yellow wasps during the months of December, January, and February. This is in agreement with (Hussein *et al*., 1986), who was found that the reason for the emergence of individuals of the yellow wasps in some months of the year and its disappearance in other months may be due to its effect on temperature. The reason for the prolonged appearance of workers in the environment (from May to the end of November) may be due to their being the main element responsible for caring and feeding the brood, and because they are responsible for everything the colony needs. As for the reason for the production of males at the end of the season, it may be that the males have a basic function, which is to pollinate the virgins, so their appearance coincides with the appearance of the queens, virgins, of young age. With an increase in temp and photoperiod the hidden queen became active and starting nest building with increased temp and availability of food, the population of German wasp also increased reaching its maximum at end of July in the late summer the

colony reaches maximum size and then the population wasp started to decrease with the decrease in temp at November..

2-Population density of yellow wasps:

The results of the study during the three years 2018, 2019 and 2020; the variation of population density of yellow wasp the area undergo a seasonal variation of the ecosystem. The most important environmental factors are temp and RH and during the winter the workers and males die while the queen undergoes hibernation. In the first year of the experiment (2018), observed that there is a difference in the population of Germany wasp of a worker, males and the number of virginal queens from one cell to another as in (Table1). According to the size of the nest, larger nest size, contain a greater number of yellow wasp. The significant differences at the beginning form the nest and until the beginning of the exit of an individual from the brooding phase at the beginning of July, as the average population density of yellow wasp remains increased until the end of September reached 100 individuals, at temperature and R.H. 30.4°C and R.H.16.5%. During October and November yellow wasps begin to disappear and decrease their population density in the nest's reached 7 individuals, at temperature 16.2 °C and R.H. 51.3%., because of the effect of weather conditions.. The second year of the experiment (2019) in the same table (1) shows that the highest average population density of yellow wasp during September for nests was 94 individuals at temperature 29.3°C and R.H. 16.5% while the lowest average during November, for the same nests, reached 25.5 individuals at temperature 17°C and R.H. 33.1%. Finely the third year of the experiment (2020), observed that the highest average in august was 24.8 individuals at temperature 35°C and R.H. 13.8% while the lowest average in November was (3) individuals at temperature 21.6 °C and relative humidity 33.8%. as in (table1) These results agreed (Mulham *et. al*, 1991) who showed that the passage rate of foraging workers entering or leaving nests can be used to calculate the total number of workers in the nest.

3-Total sealed brood area production of yellow wasps:

The results showed that the yellow wasp *Vespulagermenica* L. in the first year of study (2018), started to appear in large sealed brood area production during the fourth week of July and gradually decreased the four week of October according to reach the highest mean during the four week of July was (3.11 inches) under temperature (33.8°C) and R.H. (15.9%) (table 2). observed during the first week of October the sealed brood area of wasps decreased gradually until the fourth week of October. The monthly lowest mean total brood area of the wasps recorded in August (2.5 inches) under an average temperature (34.1°C) and R.H.(16%) followed by (1.5 inches) in September at temperature(30.4°C) and R.H. (16.5%) and (0.24 inch) in October at an temperature (24.9°C) and R.H. (33.9 %) (Table 2). While in the second year of study (2019), Shows that the highest mean brood area of the Germany wasps in the four week of July was 2.59 inch under average temperature 33.1°C and R.H. 13.6% whereas the lowest mean of brood area wasp in three weeks of October was 0.90 inch with average temperature 27.6°C and R.H. 18.3%. Finely the third year of study (2020), The results of this experiment showed that the mean total sealed brood area of yellow wasp for a different

month the German wasp started to appear in small brood area production during July reached zero then gradually increased the four week of august according to the highest mean brood area was 2.15 inch with temperature 35 °C and R.H. 13.8% followed by the lowest mean of brood area (0 inches) in July with temperature 35.5°Cand RH 13.3% as in (table2).This results with an agreement (Matsuura and Yamane,1990; Archer,2008) who conducted the nests that contained combs reaching the maximum size, the differences between the cell and individual number could be by the high number of yet unused cells due to high production rate at the moment of the collection or brood being taken out of their cells and abundant outside the nests of the emergence of reproductive adult.

4- The number of hexagonal eyes of the yellow wasps.

The study conducted on Germany wasp's colony revealed that the hexagonal eyes of workers are smallest than the hexagonal-eyes of males and queens as in (Table 3) during three years (2018, 2019, and 2020). The study of the first year (2018), from Table (3) and the environmental observations, it was found that the colony started with 39 eyes at the beginning of the activity season on July 39 hexagonal eyes at average temperature 33.8°C and RH 15.9., and the number of hexagonal was increased to reach the highest number (peak) 91 hexagonal eyes in October at temperature 24.9°C, and R.H. 33.9% and the nest would be the largest size, after which the workers stopped building other hexagonal eyes.

While the study of the second year (2019), estimated that the colony nest started with 23.3 eyes at the beginning of the activity season in July at an average temperature of 33.1°C and RH 13.6%., and the number of hexagonal was increased to reach the highest number (peak) 82 hexagonal eyes in October at temperature 25.8°C, and R.H. 25.6%. Finely the study of the third year (2020), showed the colony nest started with 19 hexagonal eyes at the beginning of the activity season in July at an average temperature of 35.5°C and RH 13.3%., and the number of hexagonal was increased to reach the highest number (peak) 77 hexagonal eyes in October at temperature 27.3°C and R.H. 19.4%, This indicates that the number of hexagonal eyes varied depend on month and year according to weather condition as temp., Humidity, wind, and quantity of food. also, through observation and followed the workers when building the hexagonal eyes at the beginning of the construction, the eyes shape is circular and as the construction progresses, it becomes hexagonal in shape, and this is in agreement with Karsia and Zsoltpezes, (1999) as it was shown that the hexagonal eyes were built in a circular way at its beginning and then became hexagonal in shape end of construction. The difference in the measurements and the size of the hexagonal eyes may be due to the type of brood in which;2h they are raised since the hexagonal eyes for males are larger than the hexagonal eyes of queens and workers. And the size of the nest reaches its maximum size at the end of the season (the end of summer), after which the workers stop building the hexagonal eyes, and this is consistently agreed with Richards (1978)**.** He explained that the maximum size of the nest usually occurs in late summer or early autumn.

5- Daily activity of yellow wasps:-

Study the daily activity (foraging activity) of yellow wasps during three years (2018, 2019, and 2020) as in (Fig 1,2,3). The best time to start looking for yellow hornets and their exit from their nests begins at sunrise at seven in the morning, It was observed that there was a variation in the rate of daily activity according to the time of taking the readings in the morning and evening affected by climate condition like temperature and relative humidity, where the total rate morning and evening for study years reached (61.94, 43.38) – (51.34, 38.22) and (37.96, 31.02) respectively.

Where in the first year of the experiment (2018), the maximum rate during the hours between 9-11 morning was 113.8 wasps in July at temperature 33.8 ° C and 15.9% relative humidity, while the maximum mean during hours 4-6 Afternoon was 81.3 wasps. (Fig1). The second year of the experiment (2019) had a maximum rate during the hour between 9-11 am (90.8) wasps in July at temperature 33.1 ° C and R.H. 13.6% while the maximum mean during the afternoon was (73.5) Wasps. (Fig 2)

In the third year of the experiment (2020), the maximum rate during the morning was (73.3) wasps in July at temperature 35.5°C and R.H. 13.3 %, while during the afternoon was 62.5 wasps.(Fig3) The numbers of wasps striking and emerging from the nests increased to wasps during the hour between 9-11 am and the increase continued in a more significant and significant way during the morning, as the number of released from them during the hour between 9-11 in the morning reached wasps. Then its activity began to decrease in the afternoon. No large numbers were recorded after six o'clock, and only some wasps were recorded after that hour. Through these results, we can see the factor temperature may be affecting on the density of individuals searching for food. In addition to other factors, such as the amount of brood in the colony, with the advancement of the daylight hours and the daily activity of the yellow wasp.

As foraging numbers increased with the advancement of daylight hours and the rise in temperatures, and vice versa, it decreased with lower temperatures, and perhaps the reason for that to his activity in searching for food and water sources to feed the brood inside the hexagonal eye, in addition to his physiological activity, which increases with increasing temperatures, as well as that the yellow wasp is an insect that does not store its food in the hexagonal eyes as in honey bees, so it seeks to get what it needs From food during daylight hours and gathering materials to build and expand their nests, this is consistent with agreed Reeve and Gamboa (1983) reported. He showed that yellow wasps spend more than half of the daytime hours searching for food and looking for materials to build nests. By following his daily activity, he found that there are environmental factors that affect the rate of this activity, including wind speed and dust storms, as it was noticed that workers refrain from going out or go out in small numbers when the wind speed is high or when there are dust storms where their activity is less and they remain inside the nests. With agreed Santos and Presley(2010) that the greater foraging activity of hours between 9-12 AM. In general, the high temp, high light intensity, low humidity, and low wind speed are favor foraging activity conditions (Lima and prezoto,2003; Ribeiro- Junior *et al.*, 2006).

Table (1): Effect of weather condition on density population of yellow wasps during 2018, 2019 and 2020.

Year	2018				2019				2020			
Month / week	No. of Individual	Mean \ month	Temp\ Month	R.H. \ month	No. of Individual	Mean \ month	Temp\ Month	R.H. \ month	No. of Individual	Mean \ month	Temp\ Month	R.H. \ month
Jul.1st week	29	50 e	33.8	15.9	23	42 g	33.1	13.6	0	0	35.5	13.3
Jul.2nd week	50				41				0			
Jul.3rd week	54				49				0			
Jul.4th week	68				55				0			
Aug.1st week	60	82 c	34.1	16	69	74.7d	36.1	13.1	15	24.8 h	35	13.8
Aug2nd week	80				70				30			
Aug.3rd week	87				77				32			
Aug.4th week	100				83				22			
Sep.1st week	110	100 a	30.4	16.5	95	99.5 ab	29.3	16.5	28	15.8hi	34.1	11.4
Sep.2nd week	95				98				14			
Sep.3rd week	115				100				12			
Sep.4th week	80				105				9			
Oct.1st week	20	39 fg	25	33.9	113	66de	25.8	25.6	8	6.3hij	27.3	19.4
Oct.2nd week	40				64				7			
Oct.3rd week	70				51				5			
Oct.4th week	25				37				5			
Nov.1st week	16	7hij	16.2	51.3	30	25.5gh	17	33.1	4	3j	21.6	33.8
Nov2nd week	7				20				3			
Nov.3rd week	3				15				2			
Nov.4th week	1				0				1			

*Values sharing the same letter within the ,same columns and rows are not differ according to the Duncan Multiple Range Test (0.05)

Table (2): effect of weather condition on sealed brood area production (with) temp and relative humidity during three years (2018-2019-2020).

Year	2018				2019				2020			
Month / week	Av. Brood area	Mean (inch)	Av. Temp	R.H.	Av. Brood area	Mean (inch)	Av. Temp.	R.H.	Av. Brood area	Mean (inch)	Av. Temp	R.H
			Per Month				Per Month				Per Month	
Jul.1st week	2.26	3.11a	33.8	15.9	1.30	2.59ab	33.1	13.6	0	0f	35.5	13.3
Jul.2nd week	3.14				3.05				0			
Jul.3rd week	3.83				3.44				0			
Jul.4th week	3.21				3.11				0			
Aug.1st week	2.47	2.5 ab	34.1	16	1.47	2.04b	36	16.6	0	2.15b	35	13.8
Aug.2nd week	2.63				2.12				2.73			
Aug.3rd week	2.27				1.47				1.52			
Aug.4th week	2.68				2.22				2.22			
Sep.1st week	1.67	1.5bc	30.4	16.5	1.13	1.49 c	29.3	16.5	2.36	1.70bc	34.1	11.4
Sep.2nd week	1.43				1.11				1.18			
Sep.3rd week	1.57				1.52				1.37			
Sep.4th week	1.39				2.03				1.91			
Oct.1st week	0.19	0.24e	24.9	33.9	2.03	0.90cde	27.6	18.3	1.04	1.27cd	27.3	19.4
Oct.2nd week	0.43				0.5				1.41			
Oct.3rd week	0.25				0.19				1.22			
Oct.4th week	0.1				0				1.41			

*Values sharing the same letter within the same columns and rows are not differ according to the Duncan Multiple Range Test (0.05)

Table (3): The number hexagonal eyes of yellow wasps during three years 2018-2019- 2020.

Year	2018				2019				2020			
Month / week	Hexago-nal eyes	Average / Month	Temp	R.H.	Hexago-nal eyes	Average /Month	Temp	R.H	Hexago-nal eyes	Average /Month	Temp	R.H.
Jul.1st week	25	39 de	33.8	15.9	18	23.3e	33.1 ;6	13.6	13	19 e	35.5	13.3
Jul.2nd week	35				22				16			
Jul.3rd week	45				23				20			
Jul.4th week	51				30				27			
Aug.1st week	55	63.5 cd	34.1	16	40	53.8cd	36.1	13.1	35	47.5 d	35	13.8
Aug2nd week	57				48				42			
Aug.3rd week	65				59				52			
Aug.4th week	77				68				61			
Sep.1st week	80	85.5ab	30.4	16.5	70	76.3 bc	29.3	16.5	67	72 c	34.1	11.4
Sep.2nd week	83				74				70			
Sep.3rd week	88				79				74			
Sep.4th week	91				82				77			
Oct.1st week	91	91 a	24.9	33.9	82	82 b	25.8	25.6	77	77bc	27.3	19.4
Oct.2nd week	91				82				77			
Oct.3rd week	91				82				77			
Oct.4th week	91				82				77			
Nov.1st week	91	91a	16.2	51.3	82	82 b	17	33.1	77	77 bc	21.6	33.8
Nov2nd week	91				82				77			
Nov.3rd week	91				82				77			
Nov.4th week	91				82				77			

***** Values sharing the same letter within the same columns and rows are not differ according to the Duncan Multiple Range Test (0.05)

6- Seasonal activity of yellow wasps:-

Through the study of the seasonal activity of the yellow wasps for three different years (2018, 2019, and 2020).it was found that its seasonal activity and spread in the environment began during April and May, as the average number of wasps recorded during this month was low individuals and these numbers represented queens only, The queen laying eggs and not leaving the nest, and thus the nest activity begins to increase the number of individuals inside the nest, where the nest activity is represented by the number of free laborers. The number of wasps started to increase gradually during July and August with the increase in temperatures and decrease relative humidity as in (fig4). In the first year of research (2018), from the estimated seasonal activity it was calculated that there high average of the yellow wasps reached 111.66 - 87.33 individuals, respectively during July and August at average temperature 33.93 - 34.26 °C and RH 16 - 15.83 % while the number of active individual decrease to reached 11.3 individual in November at temperature 16.1°C and RH 50.16%. In the second year of research (2019), the high average of active wasps during July 92.66 individuals at the temperature 33.1°C and RH 13.6% while the low average of wasps was (7) individuals at temperature 16.2°C and RH 38.1 %. Finally, in the third year (2020), the high average of the yellow wasps was 61.66 individuals during July at an average temperature of 35.3°C, 35.3°C and RH 13.3%, 12.6 %, while the low average number of wasp was 1.33 individuals during November at temperature 22.4°C and RH. 26.5%. Generally, Individuals numbers began to increase rapidly and significantly during July and August while decreasing gradually during October and November due to the opposite relationship between temperature and relative humidity. During these months, July, August, and September, the highest foraging activity of Germany wasps was recorded, and its activity was clear and visible,(fig 4), and this activity had a great and clear effect on fruits, including grapes, and that the increase in activity during these months came as a result of workers leaving their emerge of brood and increasing the number of nests. And it continued to decline until the number reached 2 or 1 wasps during November a few individuals registered a plane representing only the queens. It is evident from the results of the study that the activity of the yellow wasps began in April and ended in November, and that its highest activity was in July, August, and September. This result is in agreement with Mallis (1982) who showed that the peak du ration of the nest activity ranges between 6-7 months.

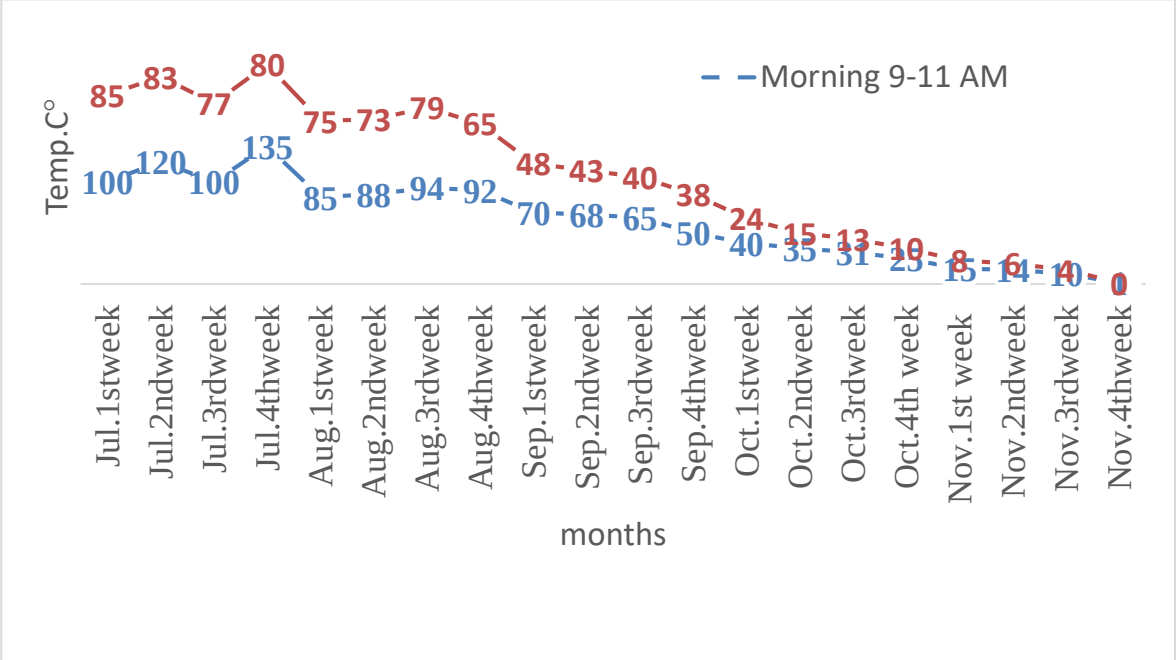

Figure (1): Daily activity of Germany wasps 2018.

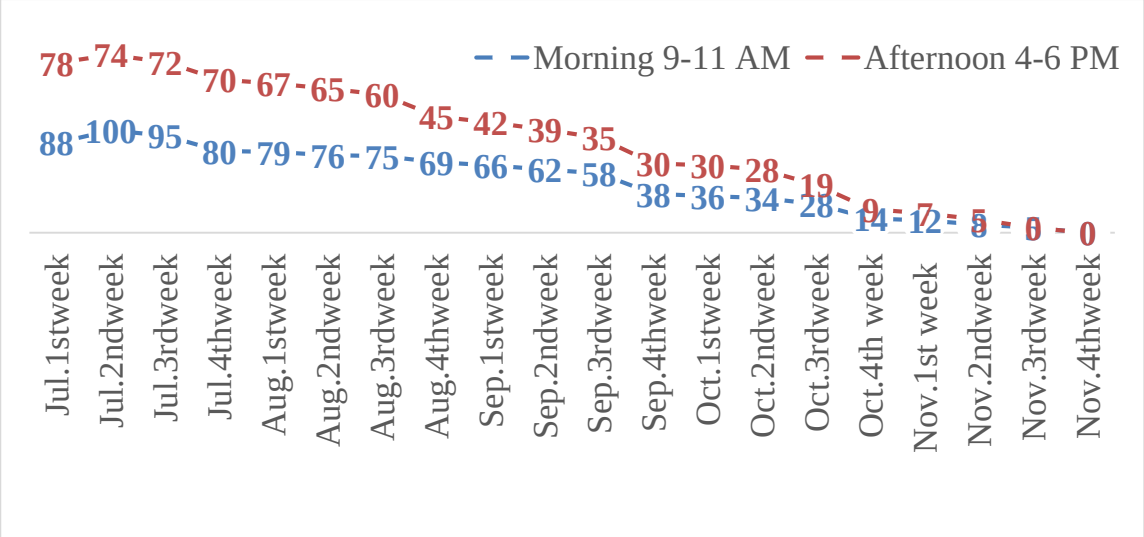

Figure (2):Daily activity of Germany wasps 2019.

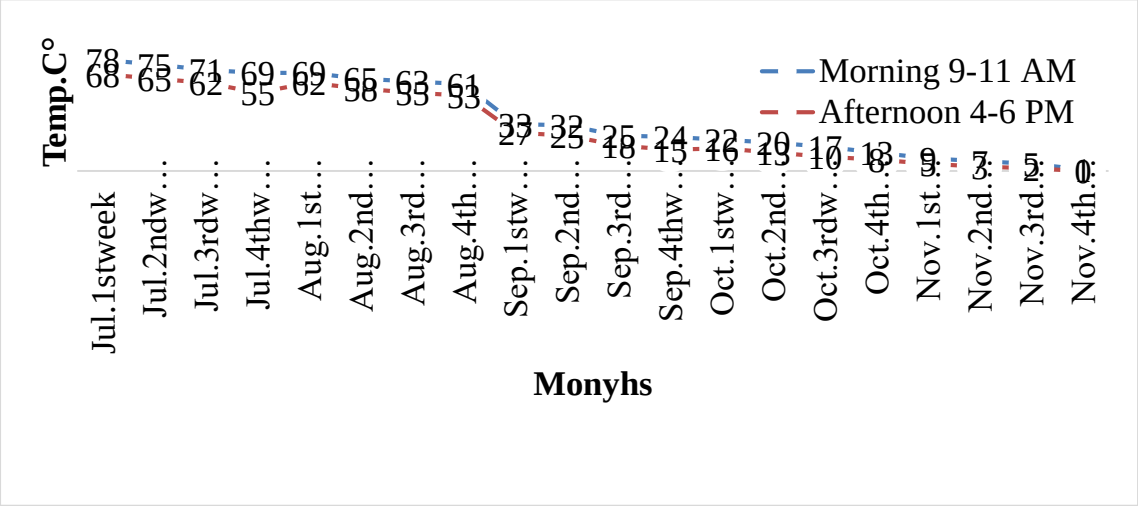

Figure (3): Daily activity of Germany wasps 2020

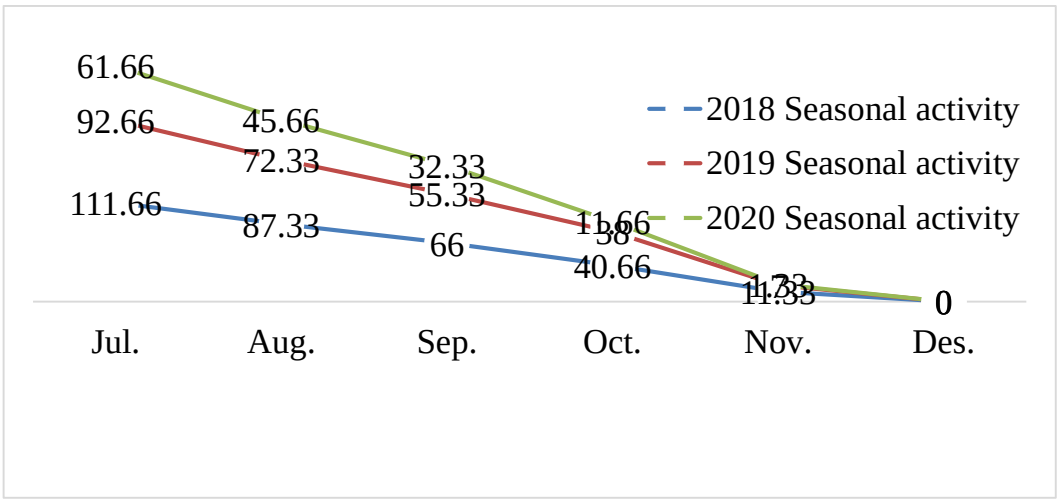

Figure (4) :Seasonal activity of Germany wasps during years (2018- 2019- 2020).

دراسة بيئية وبيولوجية للزنبور الأصفر *Vespula germanica*

بتول عبدالله كرسو[1] صالح محمد علي باس[2]
قسم وقاية النبات / كلية علوم الهندسة الزراعية/جامعة دهوك[1و2]
Email: batool.karso@uod.ac

الخلاصة

Vespulagermanica هو الزنبور الألماني (الزنبور الأوربي او الزنبور الأصفر) يعتبر افه خطرة تهاجم النحل والبساتين ولسعته تضر بالإنسان .ينتشر في النصف الشمالي للكرة الأرضية وموطنه اوربا وقد سجله خلف

في العراق لأول مرة 1958 وهو من الحشرات التي لم تنل القسط الوافي من الدراسة حيث اقتصر على تسجيله فقط ضمن الفونا الحشرية بالعراق ولا توجد أي دراسات حياتية او بيئية عليه في العراق. ولهذا تم اقتراح هذه الدراسة لغرض الإلمام الكامل ببعض جوانب الحشرة. ومن خلال المسح البيئي لمدة ثلاث سنوات لوحظ أن الزنبور الأصفر يبني أعشاشه في أماكن مختلفة من البيئة فهو يبني على الأشجار والشجيرات وعلى سقوف البيوت والأبنية وفي حظائر الحيوانات وحقول الدواجن وقرب مصادر المياه. وأن الملكة تبدأ بالظهور في بداية شهر مايس والشغالات في أوائل شهر تموز أما الذكور والملكات العذارى فتظهر في شهر تشرين الأول . وأن جميع أفراد الطائفة تموت شتاءا وتبقى الملكات الحديثة الملقحة والتي تسبت إلى الموسم القادم. وأتضح من خلال الدراسة بأن للحشرة أربعة مراحل البيضة –اليرقة العذراء والبالغة. وظهر أيضا بأن نشاط الشغالات يزداد بتقدم ساعات النهار وأن أعلى نشاط لها هي خلال الساعة (9– 11) ظهرا وبمعدل 100زنبور/ساعة. وأن النشاط الموسمي له يبدأ من شهر ايار وينتهي بشهر تشرين الثاني وسجل أعلى نشاط له خلال الأشهر تموز وآب وأيلول.وان اعلي معدل مساحة الحضنه 3.11 انج فى شهر تموز بينما اعلى معدل عدد العيون السداسية 91 عيون/عشة في الاشهر تشرين الاول وتشرين الثاني.

الكلمات المفتاحية: الزنبور الألماني, الزنبور الأوربي , دراسة بيئية, دراسة بايولوجية , .*vespula germanica*

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