



# RELATIONSHIP BETWEEN ANTS *PHEIDOLE MEGACEPHALA* (HYMENOPTERA: FORMICIDAE) AND SOME DEAD ANIMALS TISSUE

Dalal Tareq Al-Ameri<sup>1\*</sup>, Abbas K. Hamza<sup>2</sup> and Ali Sabah Alhasan<sup>1</sup>

<sup>1</sup>Department of Horticulture, College of Agriculture, University of Al-Qadisiyah, Iraq.

<sup>2</sup>Department of Animal Production, College of Education, University of Al-Qadisiyah, Iraq.

## Abstract

An ants *Pheidole megacephala* is a highly invasive insect, although the degree of invasiveness differs geographically. Collection of *Pheidole megacephala* (Hymenoptera: Formicidae) was obtained and their behavior towards decomposed animal tissues was investigated. This study focused on three parameters: Use of animal grazing chickens, cow liver, chicken gizzard, and sardine. After calculating the number of ants that colonized on each of the mentioned bait, chickens attracted the largest number of ants followed by the tissue of chicken gizzard. The other side of the study was done by place the carcass of hens in a cage for three days. By observing the behavior of the attracted ants, large numbers of ants (371) were found to transport the fly eggs in the body out. The other (78) fed on the body's discharge, while another bitten the body and another died on the body. Thirdly, three bodies of chickens were placed closed to the ant's nests and three others were placed away from them. Decomposition speed in both cases was calculated and temperature and humidity were recorded. Showing that the rate of decomposition of the carcass in the presence of ants was slower than none. This is due to the effectiveness of ants that hinder the effectiveness of other insect larvae feeding on this carcass. Ants feed on eggs and other insect larvae, especially dipteran insects. This led to reduces the consumption rate of the carcass by those infected insects (Necrophagous species). This due to misleading the calculation of the real death time of a body by criminal investigators.

**Key words:** Ants, Pheidole, Formicidae, ants forensic entomology

## Introduction

*Pheidole megacephala* is the most invasive widespread organism on our planet. Ants form 50% of the total eukaryotic organisms present on Earth, Grimaldi, and Engel (2005).

Ants are present in all deferent hepatitis and terrestrial environments in large numbers except the poles. It has existed for 140 million years of evolutionary history. About 1300 species of ants are recognized worldwide. It forms 30% of the biological mass of some regions, Moreau and Bell (2013). The reason for the success spread because of their social organization, their ability to change or modify theirs regain of living according to circumstances, maximum utilization of the available resources, and to their ability to defend themselves and carry things that are more than ten times their weight, Field *et al.*, (2007); Muneer Al-Baldawy (2019). The ants go through a complete metamorphosis (egg, larva, pupa and adult). This cycle lasts for approximately two months and the

colony of ants includes workers (sterile female) and one queen, usually. There may also winged female and male late in the summer and winter. In Iraq, most of the ants belong to the Formicidae family, which has about 300 species belonging to 20 subfamilies, including 12 thousand species distributed throughout the world, Agosti, and Johnso (2005). Some types of ants are beneficial to the environment as they act as natural predators for many harmful insects and parasites. They are also useful for soil fumigation, parasitic exchange with some plants and animals and recycling some organic matters. It is used as direct food for humans in some areas and can be used with some compounds for the pharmaceutical industry and some medical and biological preparations, Reddy and Yang (2011). Ants play a great role in the spread of plant seeds and pollination of plants and in biological control, Bolton (2014); Luma Alabadi (2018). However, some ants are harmful and annoying to human beings and their furniture and animals and may cause damage to some facilities such as roads and buildings, Remon and Donoso (2015); Khaeim Hussein (2013). This widespread of ants

\***Author for correspondence** : E-mail : dalal.tareq@qu.edu.iq

in all or most environments and in large numbers make it play a role in some criminal issues. Although it is not considered as an insect of forensic importance directly as the species of blowflies, its large spread gave the possibility to benefit from the vast amount of information and useful evidence through the patterns of presence and geographical and environmental distribution, which contribute to the solution of many cases of judicial ambiguity as the importance comes second after flies and beetles, Hall and Huntington (2010); Byrd and Castner (2010). The ants colonize dead animal carcasses and tissues and perform certain activities. It may affect other forensic evidence such as estimating the time of death, which is misleading to the investigators. On the other hand, ants may lead to the place of death. Ants can indicate where the body is, depending on the geographical and environmental distribution. Ants may be an accidental visitor to the body or animal tissue, *i.e.* their presence was purely coincidental, Catts and Goff (1992).

**Material and Methods**

**Ant preference for different types of animal tissue:**

Four types of animal tissue were developed: cow liver, chicken gizzards, sardines fish and chickens in order to identify the type of animal tissue preferred or attractive to larger numbers of ants. Three replicates for each tissue were used. (75)g of each tissue was placed in a flat plastic container and placed in cages of 50 cm diameters allowing insects to pass through and not allowing cats and other predators or scavengers to enter. These cages were placed in the garden of a house near many ant nests at 9:00 am on August 1<sup>st</sup> 2016 and left for three days. During which the relative temperature and humidity were recorded and the number of ants presents and attracted or fed on each tissue within the first six hours of the beginning of each day were counted. Visual observations of ants' behavior and activity were recorded. The number of ants that bite animal tissue or prey on eggs and larvae of other insects or that carried other insect eggs were counted and recorded. This in addition to calculating the number of dead ants insects on various animal tissues after adjusting the ratio according to Abbot equation, Abbot (1925); Wafaa Alawsy (2018).

**Chickens carcass decomposition rates compression**

Three dead chickens (three replicates) were placed close to ants nest in the cages in a house garden in a neighborhood in Diwaniyah city-Iraq. others three carcass chicken placed in an ant-free area (in the backyard of a residential house) under the same

environmental conditions during July 2016. Temperature and relative humidity were recorded with monitoring and recording the duration of each stage of decomposition of the carcasses of birds (fresh, bloating, decomposition, skeletal). The duration to reach the skeletal stage is the period form of the death until reaching the skeletal stage, while observing the behavior of ants, table 4.

**Results and Discussion**

**Ants preference for different types of animal tissues:**

Results present that the most common types of animal tissue preferred by ants are chicken compared with the rest of the tested tissues. The average number of ants that were attracted to this tissue was (4.6) ants during the first hour of the first day. This rate gradually increased to (43) ants after 6 hours and then reached

**Table 1:** The rate number of attracted ants to different baits on the First day.

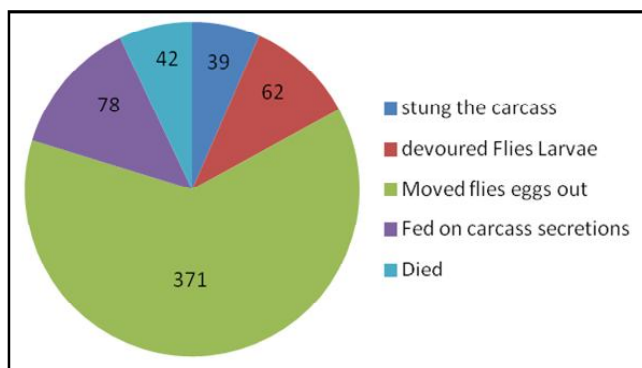
The Baits					
LSD	Chicken	Cow liver	Gizzards	Sardines	hours
1.03	0.43±4.66	0.21±3.00	0.11±3.33	0.43±2.33	1
1.03	0.21±11.00	0.32±5.33	0.21±8.33	0.71±5.33	2
1.03	0.43±20.33	0.33±8.00	0.54±14.00	0.83±7.66	3
1.03	0.43±29.00	0.12±12.66	0.32±21.66	0.61±11.33	4
1.03	0.19±35.00	0.54±14.66	0.44±28.00	0.34±14.66	5
1.03	0.31±43.33	0.56±16.66	0.32±33.33	0.21±17.66	6
	1.20	1.20	1.20	1.20	LSD

**Table 2:** The rate number of attracted ants to different baits on the Second day.

The Baits					
LSD	Chicken	Cow liver	Gizzards	Sardines	hours
1.21	0.21±40.66	0.22±10.33	0.89±33.00	0.23±4.66	1
1.21	0.43±45.33	0.49±14.33	0.84±39.00	0.43±11.00	2
1.21	0.45±50.33	0.14±15.00	0.76±41.00	0.19±20.33	3
1.21	0.32±55.66	0.32±15.67	0.98±44.00	0.32±29.00	4
1.21	0.29±58.00	0.31±16.00	1.11±46.66	1.30±35.00	5
1.21	0.48±61.00	0.98±17.33	0.29±48.00	1.21±43.33	6
	1.48	1.48	1.48	1.48	LSD

**Table 3:** The rate number of attracted ants to different baits on the Third day.

The Baits					
LSD	Chicken	Cow liver	Gizzards	Sardines	hours
LSD	Chicken	Beet liver	Gizzards	Sardines	hours
1.74	0.32±66.00	0.39±24.33	0.29±55.00	0.21±23.33	1
1.74	1.93±75.00	0.57±23.66	0.43±61.33	1.21±25.00	2
1.74	1.31±86.33	0.43±25.00	0.66±69.33	1.93±29.00	3
1.74	1.21±98.00	0.52±26.00	0.98±77.00	0.98±30.66	4
1.74	1.93±110.66	0.43±26.33	1.34±86.33	0.32±32.33	5
1.74	1.43±121.66	0.32±27.00	0.42±93.33	0.43±33.33	6
	2.12	2.12	2.12	2.12	LSD



**Fig. 1:** Behavior and number of ants that visited and colonized carcass chicken.

(61) and (121.6) ants during the second and third day respectively, tables (1, 2 and 3). This tissue was mostly preferred followed by gizzards tissue that attracted (3.3) ants during the first hour of the experiment and then increased with the time to reach (33, 48 and 93) ants after the sixth hour of the experiment for the first day and in the second and the third days, respectively. Cow liver tissue attracted a lower number of ants insects and sardines tissue attracted the lest ants number (2.3, 4.6 and 23) ants in the first day, the second and the third day, respectively during the first hour. It attracted (17.6, 43.3 and 33.3) ants after six hours of the first, the second and the third days, respectively. This due to the attraction of large numbers of ants to dead chickens to the need for the necessary proteins, carbohydrates, and fats, which consumes part of them to provide the necessary energy and store the surplus in the body until needed.

The results showed that there were significant differences between the number of ants drawn to the chickens and cow livers, gizzards and sardines during the same hour on the one hand and between the ants returned during hours for the same bait or animal tissue. Chicken tissue attracting ants followed by the tissue of gizzard significantly as compared to the rest of the baits. The death of some ants on the sardines and the death of

fewer on the chickens were observed. This death because that ants drowning in dissolved fat, which may fill and close the respiratory pores of the insect. Thus preventing the oxygen supply of the tissues and cells of the insect and the release of carbon dioxide. This explains the death of many ants insects, especially on tissue rich with fat.

**Behavior and activity of ants towards the carcass of chickens**

On average of temperature of (39.6)°C and relative humidity of (24.7)%, it was noted that the ants that visited the carcass of chickens carried out various activities and behaviors on those decomposing bodies that originally contain eggs and larvae of diptera flies. The most obvious behavior was that (371) ants carried the eggs of flies from the body to the outside, down to their underground tunnels nests, Fig. 1. The second behavior was that a group of ants fed on excretions of the corpse falling on the ground and near and under the carcass. While some ants looking for secretions resulting from the decomposition of the body and licking and feeding them (62) ants were also prey larvae flies that in the carcass, especially young devoured flies larvae. Three to five ants gathered around each larva to kill and moved them out into their nests. It should be noted that there are quite a few (42) ants died over the body for various reasons. (39) ants were seen and recorded trying stung the carcass. For the behavior of the ants that transferred the flies eggs and killed the fly larvae, this may cause confusion in the accounts of criminal investigators who depend on the numbers of eggs and the duration of development and numbers of flies larvae and others. This may affect the rate of carcass decomposition as the lack of numbers of flies larvae that consume the tissues leads to a decrease in the decomposition rate. Investigators must rely on the rapid development of larvae, size and speed of decomposition of the body, as well as the succession of insects on the body to obtain important information to solve the issue of attention to the presence of ants in the body, which works to change some of the calculations, were calculated without it.

**Table 4:** Required duration to reach the skeletal stage with the presence and absence of ants for chicken carcass

Temp rate (C°)	Relative humidity (%)	Skeletal rates (days)	Period of decomposition (days)	Decom-position Stage	Pres-ence of ants
44.5	23	7.3	1.33	Fresh	Absence
			1.7	Bloated	
			3.4	Decay	
			7.3	Skeletal	
45.5	21.6	8.5	1.4	Fresh	Present
			1.79	Bloated	
			4.33	Decay	
			8.5	Skeletal	

Ants that fed on the body secretions resulting from the decomposition of the body indicates that it was looking for any food containing proteins and sugars and fats. It also indicates that ants are not one of forensic insect, because in this case, it fed on the body’s secretions, not the body itself, and even fed on the body itself they consider if as food like any other food rich in proteins, fats, and sugar. It is considered as a secondary forensic importance insect. It believed that ants sunk in the dissolved fat so that some of them died on the body tissues.

## References

- Abbot, W.S. (1925). A method of computing the effectiveness of an insecticide. *J. Econ. Entomol.*, **18**: 265-267.
- Agosti, D. and N.F. Johnson (2005). Database. World Wide Web electronic publication. Available at: [antbase.org](http://antbase.org) (accessed 03 September 2012).
- Bolton, B. (2014). Ant Web: Bolton World Catalog. Available from: <http://www.antweb.org/descriptiondo?genus=parapatrechinaandrank=genusandproject=worldants>. (23.10.2014).
- Byrd, J.H. and J.L. Castner (2010). Forensic entomology: the utility of arthropods in legal investigations, 2nd and. CRC, Boca Raton.
- Catts, E.P. and M.L. Goff (1992). Forensic entomology in criminal investigations. *Annual Review of Entomol.*, **37**: 253-272.
- Fiel, H.C., W.E. Evans, Hartley, L.D. Hansen and J.H. Klotz (2007). A Survey of structural ant pests in the southwestern U.S.A. (Hymenoptera: Formicidae). *California Uni. Sociobiology*, **49(2)**:
- Garcia, F.H., P.G. Hawkes and G.D. Alpert (2014). Taxonomy of the ant genus *Proceratium* Roger (Hymenoptera, Formicidae) in the Afrotropical Region with a revision of the *P. Arnoldi* clade and description of four new species. *Zoo Keys J.*, **447**: 47-86.
- Grimaldi, D. and M.S. Engel (2005). *Evolution of the Insects*. Cambridge University Press: New York.
- Hall, R.D. and T.E. Huntington (2008). Medicocriminal entomology. In: Haskell NH *et al.*, (eds) *Entomology and death: A procedural guide*. Clemson, US: Joyce, sprint shop Sc. Pp 1-9.
- Khaeim, Hussein M. (2013). "Mass Selection with an Optical Sorter for Head Scab Resistance in Soft Red Winter Wheat". Theses and Dissertations—Plant and Soil Sciences, 32.
- Luma, A. Alabadi and M. Hussein Khaeim (2018). Utilization of Treated Wastewater in Irrigation and Growth of *Jatropha* Plant to Protect the Environment from Pollution and Combating Desertification. *Plant Archive Journal*. eISSN: 2581-6063 (online), ISSN: 0972-5210.
- Moreau, C.S. and C.D. Bell (2013). Testing the museum versus cradle tropical biological diversity hypothesis: phylogeny, diversification and ancestral biogeographic range evolution of the ants. *Evolution*, **67**: 2240-2257.
- Moreau, C.S., C.D. Bell, R. Vila, S.B. Archibald and N.E. Pierce (2006). Phylogeny of the ants: Diversification in the Age of Angiosperms. *Science*, **312**: 101-104.
- Moretti, T.D., D. Solis and W.A. Godoy (2013). Ants (Hymenoptera: Formicidae) collected with carrion-baited traps in Southeast Brazil. *Foreign. Sci. J.*, **6**: 1-5.
- Muneer Saeed M. Al-Baldawy, Ahed Abd Ali H. Matloob and Hussein M. Khaeim (2019). Antifungal Inhibitory activity of *Ophiomyces Vulgaris* L. and artemisia herba-alba powder and its constituent phytochemicals against *Aspergillus ochraceus* and *Fusarium graminearum* growth. e-ISSN: 2581-6063 (online), ISSN: 0972-5210. *Plant Archives*, **19(1)**: 2019 pp. 801-804.
- Ramon, G. and D.A. Donoso (2015). The role of ants (Hymenoptera: Formicidae) in forensic Entomology. Inst. Nacional de Investigación en Salud Pública, Iquique. *Uni. Tec.*, **14(36)**: 19-26.
- Reddy, N., H. Xu and Y. Yang (2011). Unique natural- protein hollow-nanofiber membranes produced by weaver ants for medical applications. *Biotechnology and Bioengineering*, **108**: 1726-1733.
- Silva, J.A., E. Pereira, O. Silva, C. Santos, J. Delabie and J. Rebelo (2015). Ants (Hymenoptera: Formicidae) associated with pig carcasses in an urban area. *J. Sociobiology*, **62(4)**: 527-532.
- Ulysséa, M.A. and C.R.F. Brandã (2013). Ant species (Hymenoptera, Formicidae) from the seasonally dry tropical forest of northeastern Brazil: a compilation from field surveys in Bahia and literature records. *Revista Brasileira de Entomologia*, **57(2)**: 217-224.
- Wafaa Sahib Alawsy, Hussein M. Khaeim (2018). Effect of Sewage Water Irrigation on Growth Performance, Biomass and Nutrient Accumulation in Maize and Barley. *International Journal of Agricultural and Statistics Sciences*, **14(2)**: (ISSN: 0973-1903).