Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2020; 8(1): 131-135

Received: 01-11-2019
Accepted: 03-12-2019

Walaa Tawfik A
Plant Protection Research Institute, Agricultural Research Center, Dokki, Cairo, Egypt

Abdel-Salam AH
Economic Entomology Department, Faculty of Agriculture, Mansoura University, Mansoura, Egypt.

Hala El-Meuafy EM
Plant Protection Research Institute, Agricultural Research Center, Dokki, Cairo, Egypt

Ola Roshdy M
Plant Protection Research Institute, Agricultural Research Center, Dokki, Cairo, Egypt

Corresponding Author:
Ola Roshdy M
Plant Protection Research Institute, Agricultural Research Center, Dokki, Cairo, Egypt

Use of magnetize water to control some cowpea, (*Vigna unguiculata* L.) pests

Walaa Tawfik A, Abdel-Salam AH, Hala EM, El-Meuafy and Ola M Roshdy

Abstract
Semi field experiments were conducted to determine effect of different magnetized water concentrations on the population of cowpea pests, *Aphis cracivora* Koch, *Empoasca decipiens* Paoli and *Bemisia tabaci* Gennadius. Investigation and recording results were carried out 1, 3, 5 and 7 days after treatments. Results reported that there was a clear and significant effect for the magnetism to decrease and minimize *Aphis cracivora.* The total mortality was 32.47, 48.47 and 66.86% when treatment with magnetic seawater in concentrations 10, 20 and 40 milli-tesla. While, the total mortality for *Bemisia tabaci* was 14.99, 29.99 and 34.36%. Meanwhile, the efficacy of magnetized water had a strong repellant effect compared with its mortality percentages on *Empoasca decipiens*.

Keywords: Magnetized water, *Aphis cracivora*, *Empoasca decipiens*, *Bemisia tabaci*, cowpea

1. Introduction
Cowpea (*Vigna unguiculata* L.) is an annual legume that is adapted to warm conditions and sensitive to low temperatures. It is an important food legume and an essential component of cropping systems in the drier regions of the tropics covering parts of Asia and Oceania, the Middle East, Southern Europe, Africa, Southern USA and Central and South America [1]. Nigeria, Brazil, Niger and Burkina Faso [2] are among the major producers and account for over 70% of the world crop. The correct strategies of integrated pest management (IPM) have to include many practices, involving different kinds of pest control methods aiming to crop increase. In spite of all control efforts, pests annually destroy about 35% of all crops broad used worldwide [3]. The discovery of new safe and effective pesticides is one of the means of providing eco-friendly agricultural agents for modern crop protection [4]. The use of physical method for insect control in organic farms represents important measures in biosecurity system [5]. Magnetism and using the magnetic field seems to be promising physical method in insect control. Many workers stated the relationship between the power in magnet lines and behavior of some insects. The effects of magnetic fields on arthropods especially insects were studied on *Drosophila* size of wing [6, 7], aphid molting, development and fecundity [8, 9, 10].
Therefore, the current study aimed to detect the effect of magnetized water on *A. cracivora*, *E. decipiens* and *B. tabaci* mortality.

2. Materials and Methods
2.1 Insects
Infested cowpea leaves by *A. cracivora*, *E. decipiens* and *B. tabaci* were collected from the farm of Faculty of Agriculture, Mansoura University (Dakhlia, Egypt). The leaves were kept in jars at 27±2 ^{O}C and 65±5 percentage RH. The colony was maintained for two generations before the beginning of the tests. Then, newly born nymphs of *A. cracivora* and *E. decipiens* were placed, separately, on bean leaves in plastic Petri dishes (10 cm. in diameter). Each dish was covered with muslin for aeration and the bean leaves were put on the bottom of the dish [11]. Whenever leaves appeared discolored, they were replaced with fresh ones. After rearing pests in laboratory, they were put in cages contain plants and spraying these pests with different concentrations of magnetic water, these cages were covered.

2.2 Magnetized water
The magnetized seawater was prepared in physical department faculty of science, Mansoura University.

The magnetic flux in the middle center of bottles was measured with the tesla-meter. The magnetic field recorded 10, 20 and 40 milli-tesla (ml.t).

2.3 Statistical analysis
Fourteen individuals of the three piercing sucking pests for each replicate were applied to estimate the mortality line. The percentage of mortality was recorded after one, three, five and seven days and the data were corrected relatively to control mortality [12]. LC_{50} values were determined using probit analysis statistical method [13].

3. Results
The effect of magnetized seawater on the three piercing-sucking pests:

3.1 Aphis cracivora
Data in Table (1) demonstrated that, when the magnetic concentration was low the mortality rate of the *A. cracivora* was high. In addition, when the concentrations increased, the total mortality was increased. Total mortality was 32.47, 48.47 and 66.86% respectively when, treatment with magnetic seawater in concentrations 10, 20 and 40 (Ml.t) compared with treatment.

Table 1: Percentage mortality of *Aphis craccivora* treated with magnetized seawater in different concentrations.

Treatment	Conc. (Ml.t)	Percentage mortality of *A. craccivora*				Total Mortality %
Magnetic Seawater		One day	Three days	Five days	Seven days	
	10	5.6	18.12	6.25	2.5	32.47%
	20	10.62	22.5	11.25	4.37	48.47%
	40	15.62	28.12	18.12	5	66.86%

Figure (1) and Table (2) indicated that LC_{50} was 20.538 and LC_{90} was 151.28. The

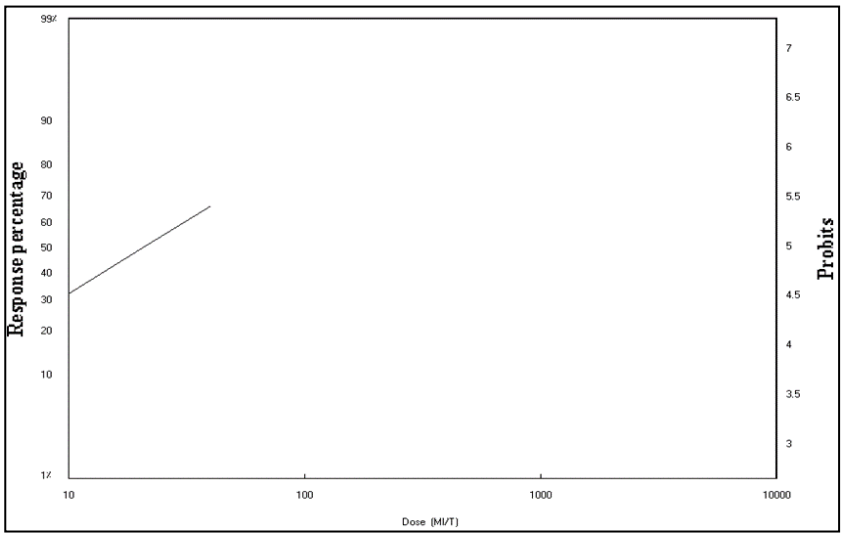

Fig 1: LC-P line for magnetized seawater treated with *Aphis craccivora*.

Table 2: Efficiency of magnetic seawater against *Aphis craccivora*

Treatment Conc.(mL.t)	Corrected Mortality%	LC_{50}	LC_{90}	Slope± S.D	R	P
10	32.47	20.538	151.28	1.4778±0.3	0.996	0.886
20	48.47					
40	66.86					
Asetamiprid 20%		39.8	199.2	1.8		

R: Regression P: Probability

3.2 Empoasca decipiens
Data listed in Table (3) showed the efficacy of three levels of seawater magnetization (10, 20 and 40 ml.t) on the mortality rate of *Empoasca decipiens*. The data indicated that when the concentrations increased, the total mortality increased it was 4.99, 8.11 and 12.49, respectively. While, the efficacy of magnetized water had a strong repellant effect compared with its mortality percentages on *E. decipiens*.

Table 3: Percentage mortality of *Empoasca decipiens* treated with magnetized water in different concentrations.

Treatment	Conc. (Ml.t)	Percentage mortality of *E. decipiens*				Total Mortality %
Magnetic Seawater		One day	Three days	Five days	Seven days	
	10	2.5	1.25	0.62	0.62	4.99%
	20	4.37	1.87	1.25	0.62	8.11%
	40	5.62	3.125	2.5	1.25	12.49%

However, Table (4) and Figure. (2) Demonstrated that LC_{50} was 1003.91 and LC_{90} was 36472.12, While, the probability was 0.9967. Moreover, compared with its insecticide Pirimiphose-Methyle LC_{50} was 521.1 and LC_{90} was 2192.9.

Table 4: Efficiency of magnetic water against *Empoasca decipiens*.

Treatment Conc.(mL.t)	Corrected Mortality%	LC_{50}	LC_{90}	Slope± S.D	R	P
10	4.99	1003.91	36472.12	0.821±0.435	1.00	0.996
20	8.11					
40	12.49					
Pirimiphose-Methyle 25%		521.1	2192.9	2.0		

R: Regression P: Probability

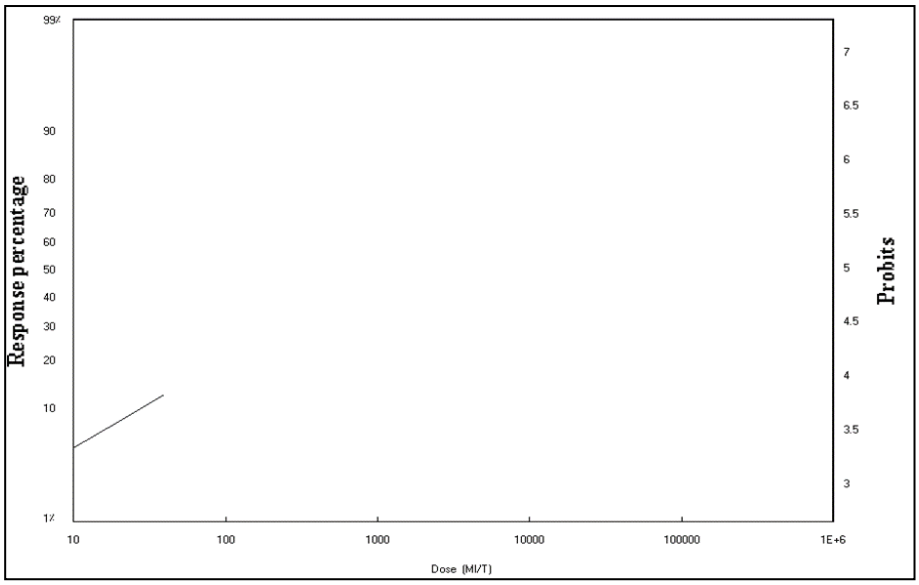

Fig 2: LC-P line for magnetized water treated with *Empoasca decipiens*

3.3 Bemisia tabaci

As clearly from the data in Table (5), the mortality rate was 14.99, 29.99 and 34.36% when *B. tabaci* treated with magnetized water in concentrations 10, 20 and 40 (Ml.t) compared with treatment. While, LC_{50} was 87.21 and LC_{90} was 1598.19 However, the probability was 0.9967 (Table 6 and Figure. 3) Meanwhile, Pirimiphose-Methyle LC_{50} was 521.1 and LC_{90} was2192.9.

Table 5: Percentage mortality of *Bemisia tabaci* treated with magnetized water in different concentrations.

Treatment	Conc. (Ml.t)	Percentage mortality of *Bemisia tabaci*				Total Mortality%
		One day	Three days	Five days	Seven days	
Magnetic Seawater	10	5	5.62	3.12	1.25	14.99%
	20	11.25	11.87	5.62	1.25	29.99%
	40	13.75	13.12	5.62	1.87	34.36%

Table 6: Efficiency of magnetic water against *Bemisia tabaci*.

Treatment Conc.(mL.t)	Corrected Mortality%	LC_{50}	LC_{90}	Slope ±S.D	R	P
10	14.99	87.21	15.98.19	1.01470.32	0.942	0.2355
20	29.99					
40	34.36					
Pirimiphose-Methyle 25%		521.1	2192.9	2.0		

R: Regression P: Probability

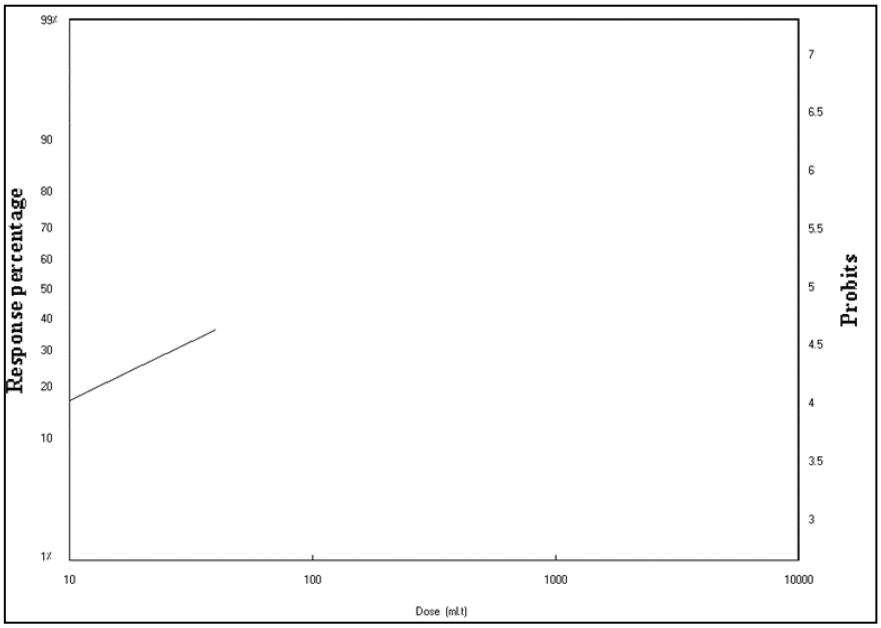

Fig 3: LC-P line for magnetized water treated with *Bemisia tabaci*

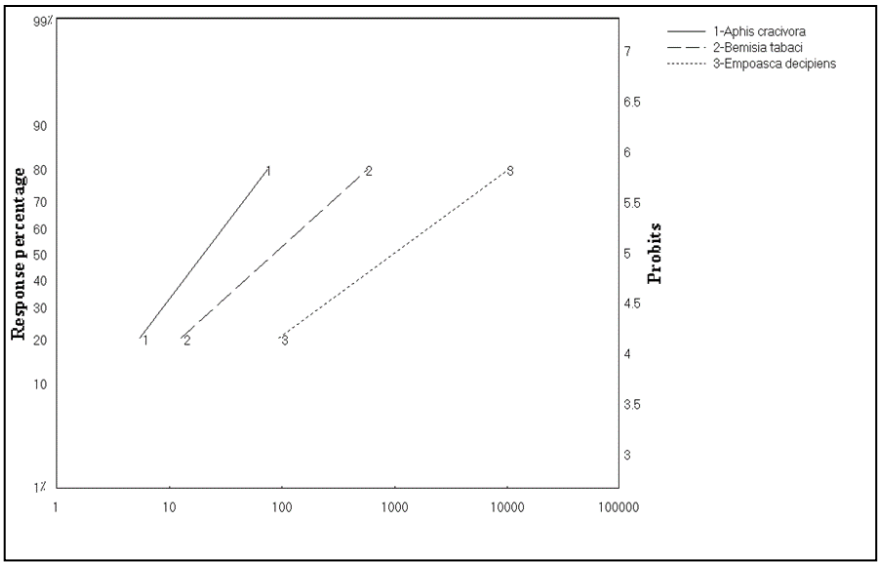

Fig 4: LC-P line for the effect of magnetized seawater on the three piercing- sucking pests.

From the data illustrated in Figure (4) it is really clearly that *A. craccivora* was the highest effect of magnetized water than the other piercing-sucking pests While, the efficacy of *E. decipiens* magnetized water had a strong repellant effect compared with its mortality percentages.

4. Discussion

Based on the results, magnetized water could provide a good alternative in controlling the three tested pests; *Aphis cracivora*, *Empoasca decipiens* and *Bemisia tabaci*. The data obtained revealed that *A. craccivora* was the highest effect of magnetized water than the other tested pests. In addition, it was observed that as the magnetized field concentration increases, the mortality increases.

Many authors used magnetic field on other insects such as Juan *et al.* (2012) [9] who mentioned that biological systems may react differently under the influence of different intensities of magnetic fields, that can change the development of aphid *sitobion avenae* (Homoptera: Aphididae) through effects on its metabolism and neuroendocrine system. Also Blank and Goodman, (1997) [14] mentioned that exposure to magnetic fields directly induced the transcription and biosynthesis of proteins, shortened the cell cycle, and accelerated cell division and development.

Hussein *et al*. (2015) [15] investigated the effect of magnetic field on the three insects; cotton leaf warm, *Spodoptera littoralis*, red palm weevil, *Rhynchophorus ferruginous* and the greater wax moth, *Galleria mellonella*. Results showed that each of body weight and growth rate as well as the physiological aspects was affected with the magnetic field. Rate of growth was negatively affected as it decreased in cotton leaf worm and red palm weevil.

Moreover, Tawfik *et al.* (2018) [16] evaluated the impact of using magnetized seawater MSW on the adult emergence of *E. zinckenella*. Results indicated that although the magnetic concentrations were low. The mortality rate of the *E. zinckenella* pupa was high and when the concentrations increased, the total mortality increased. Total mortality of pupal stage was 13.75%, 32.5% and 41.25% respectively. When, treatment with magnetic seawater in concentrations 10, 20 and 40 (Ml.t) compared with Check treatment

5. References

1. Singh BB, Ehlers JD, Sharmaand B, Freire Filho FR. Recent progress in cowpea Breeding. Challenges and Opportunities for Sustainable Cowpea Production. Proceedings of the World Conference III. Ibadan, Nigeria, 2002, 22-40.
2. FAO. (Food and Agricultural Organization of the United Nations). FAOSTAT Data, 2008.
3. Win TD. Pesticides. Au j. of Technol. 2010; 14(1):47-55.
4. Junjun O, Xiaokun Z, Lei W, Chuan X, Feng L, Long R *et al*. Synthesis and bioactivity study of 2-acylamino-substituted N-benzylbenzohydrazide derivatives. J. Agric. and Food chemistry. 2012; 60(44):10942-10951.
5. Cioban G, Tibru I, Morar Sala C, Nichita A. Establishing an effective program operation of a fly killer device in controlling of insect from organic farms, Lucrari Scientific- Universities de Stiinte Agricola a Banatului Timisoara, Medicine veterinara. 2013; 46(1):28-32.
6. Levengood WC, shinkle MP. Environmental factors influencing progeny yields in drosophila. Science. 1960; 132:34-35.
7. Biljana S, Marko A, lgor K, Iavna T, Zlatko P, Marina SR *et al*. Effect of a permanent magnetic field on wing size parameters in *Drosophila melanogaster*. Bio electromagnetics. 2001; 22:365-369.
8. Haline E, Kong HL, Schumeer H. Aphid molting under controlled electrical condition. Int. J Bio meteor. 1964; 7:265-275.
9. Juan He HH, Zhao HY, Monika W, Hu ZA, Shun HuX. Effect of static magnetic fields (SMF) on the viability and fecundity of aphid sit Obion avenae (Homoptera: Aphididae) under laboratory conditions. Arch. Biol. Sci., Belgrade. 2012; 64(2):693-702.
10. Giraldo DC, Molina J. In search of magneto sensitivity and ferromagnetic particles in *Rhodnius prolixus*: behavioral studies and vibrating sample magnetometer. J Insect Bhysiol. 2013; 59(3):345-350.
11. Mahdi K, Sahragard A. Comparative life table of *Aphis pomi* (Hemiptera: Aphididae) on two host plants *Maluspumila* L. and *Chaenomeles japonica* under laboratory conditions. J Crop Prot. 2012; 1(4):321-330.
12. Abbott WS. A method of computing the effectiveness of an insecticide J. Econ. Entomol. 1925; 18:265-267.
13. Finney DJ. Probit analysis. Cambridge univ, London, 1971, 333.
14. Blank M, Goodman R. Do electromagnetic fields interact

directly with DNA? Bio electromagnetics. 1997; 18:111-115
15. Hussein AM, Hatem AM, Abbas MK, Abdalla GE, Rady KE, Abdel-Samad SSM *et al*. Effect of Magnetic field on metabolism and enzyme activity in some harmful insects. Minufiya. J Agric. Res. 2015; 4(1):999-1009.
16. Tawfik WA, Aziz WZ, Shalaby MM. Effect of Magnetic water on adult emergence of *Etiella Zinckenella* (Treitschke) Pupa and Root-Knot Nematode (*Meliodogyne incognita*) Chit wood. J plant Prot. And path. Mansoura Univ. 2018; 9(11):751-754.