

**DESIGN AND MANUFACTURE OF LIGHT TRAP TO
DETERMINE THE START OF THE ACTIVITY AND THE
ATTRACTION OF INSECT MEDITERRANEAN FRUIT
FLY(*CERATITIS CAPITATA*)**

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ABSTRACT

This research examines the design and manufacture of optical trap attractive adhesive-friendly environment in order to determine the activity and the emergence of some insects (such as Mediterranean Fruit fly *Ceratitis capitata*). The results the attraction of insects to the trap during the months of testing, a months (March ; April and May) 2009. Increasing numerical density of the insects tended to improve as the weather and increasing temperature. The results indicated that increase in the incidence in the month of May. It is clear from the study that the trap was effective in controlling and attract the insect, which can be considered an important element in the fight against this scourge. The best rule is attractive beer yeast with the water - and the height of the trap 100 cm - and the best highlight is the color white.

INTRODUCTION

Insect pests cause significant losses of vegetable ; fruit trees and ornamental plants. It is noted that most of these insect pests capable of conditioning their lives, under all circumstances, making it more difficult to control with many overlapping generations, the side effect of pesticide resistance in another dimension, and for the use of pesticides is costly and cause poisoning to humans, animals and plants and also pollutes the environment. The researchers tested a modern method of resistance based on the nature of life and behavior of insects to reduce the spread of insect pests in general, without use of pesticides. In view of the fruit fly spread of the Mediterranean basin have been caught by testing. In previous studies to account for pests and diseases in the region of Jabal Al-Akhdar in the emergence of fly Mediterranean Sea basin, which is considered the most serious pests of economic importance on many important plant families.

Several investigators in different countries have been used the light traps for many agricultural purposes. This kind of traps was used to survey specific order or family in Libya. Pests and contribute to the a etiology in causing significant economic losses allegedly agricultural production is estimated at 35-40% of the food world (**Oerke , 1994**) The cause of this scourge in some countries of the North Mediterranean basin significant economic losses in Italy amounted to 45 thousand dollars a year on fruit trees and estimated the cost of the control value of 160000 dollars per hectare per year (**Cirio, 1975**)

El-Ghariani (1992) found that, a normal light trap was used during this study for surveying insect species in El-Beida, Libya. The list, of captured insect species contain thirty nine species belonging to twenty for families under six orders. The obtained data revealed that twenty five species were completely identified including nine newly record species in Libya. **Hashim (2004)** indicated that the presence of Mediterranean Fruit fly *Ceratitis capitata* and the peach is a barrier to the export of most of the fruit produced in Egypt, according to the agricultural quarantine systems recognized internationally.

Hessein and Kraim (1975); Hessein (1978 and 1981) used these traps in surveying general orders insect species. **Poltawski and**

Schintlmester (1988) studied the Noctuidae fauna which caught by light trap in Rostov/Don (USSR). **Bader, et al. (1982)** used light trap to survey and classified eight species of Lasiocampidae and Lemoniidea in Egypt . Population studies of certain species was also carried out by means of light traps. **Kim et al. (1988)** monitored the annual occurrence of the pyralid chilo suppressalis M. In rice fields in 33 region of Korea Republic . **Matioli and Silva (1990)** studied the population dynamics of Alabama orgillacea (Hueb) on cotton in Minas Gerais, Brazil using two kinds of light traps furthermore. **Tong and Fang (1989)** stated that light traps were efficient in reducing and controlling many field population of various insect species.

The two most important sources of variation in light trap collections include nightly variation and variation resulting from trap placement (**Huffaker et al., 1943**). Nightly variation results in considerable differences in the numbers of mosquitoes captured from night to night due to environmental factors (temperatures relative humidity, lunar cycle) that influence mosquito behavior. Moonlight affects both the efficiency of the light trap and the behavior of the mosquitoes that are being sampled. The brightness of the moon affects the contrast of the trap's light source in relation to the background light that the insect is navigating in (**Barr et al., 1960**) which in turn affects the attractiveness of the trap to the mosquito. Although it is generally accepted that fewer mosquitoes are caught at full moon than with a new moon, some species' flight activity increases substantially on bright versus moonless nights.

Compounding the variability resulting from moonlight, the effects of temperature and humidity on mosquito activity and light trap collections are well documented. There are varying ranges of temperature and humidity at which individual species are most active. For example, *Aedes vexans* activity intensifies as the relative humidity increases to 70%. With higher relative humidity, this mosquito shows a decline in activity (**Service; 1976**). It is also generally accepted that

Aedes sollicitans activity decreases substantially when temperatures drop below 60°F. It follows that the amount of variability of humidity, temperature, and moonlight throughout the night will affect the numbers of mosquitoes collected in a trap from night to night.

Placement variations refers to the variability of light trap collection due to the location of the trap. The variability factors of location include proximity to a mosquito source, preferred activity and resting area degree of protection from wind and the proximity to artificial background light. Studies have shown that light trap collections can vary significantly with only a 2 to 3 meter change in location (**Barr *et al.*, 1963**). The actual distance that a mosquito becomes attracted to a light source is unknown but it is thought to be very short and probably varies by species (**Service, 1976**). The affect of background light on light traps is similar to that of moonlight in that it alters the contrast of the trap light as the attraction stimulus. Each of these factors shows that location of the light trap has considerable influence on trap data when comparing species composition, trap to trap collections, and year to year comparisons of individual traps.

Although no significant variation has been shown between trap color and species attractiveness, some variability has been suggested for *Culex tarsalis* (**Barr *et al.*, 1963**) and variation may exist for other species. **Mulhern (1942)** suggested that light traps be painted green to blend with their surroundings and most county mosquito control agencies have adopted that recommendation. More important to the exterior trap color is the color of the underside of the roof, which is most commonly painted white. Changing this color will affect light intensity emitted by the trap (**Barr *et al.*, 1960**) and increase variability in sampling. The aim of this study is to combine the manufacture of the trap more than one type of traps used (light and attractive) to limit the use of the insects that are active day and night in the same trap, which was piloted in the city of El-Beida - Jabal Al-

Akhdar - Libya. Used to trap and catch the rhythm of insects and depend on the behavior of certain insects: special moves, such as whether to walk or aviation and barriers impeding the development, attraction towards the preferred food, the color, the smell, to sound and light to be sexually attractive, and know when they arise and to identify periods of activity throughout the year.

MATERIALS AND METHODS

This study included two parts first part, laboratory experiment the model of the trap was designed in Agriculture engineering Department faculty of Agriculture, University of Omer Al-Mukhtar. Trap water Has also been tried and worked in the workshop before going down to the field in order to experimentally demonstrate the insects. Figures (1 and 2). Trap consists of the Fig as also to develop attractive article which is the dimensions of 30 × 40 cm with a bottle upside down and inside, the lighting system. Which is change the color of light through the opening of the bottle from the bottom of the basin and the basin is in a small pump function. The delivery of attractive article through a pipe and spilled soft over the bottle so as to give more attractive to insects, such as a method of work was the painting of the fountain basin of attraction of the color yellow home and abroad, and light green. With a trap to control the barrel up from 100 cm - 50 cm, which provides or reduces the high barrel and the pump is running and the system lighting by electricity connection cables.

The second (field experiment) in the part has been selected was farm-Haj . Yusuf El-Aweemy 6.5 km - city of El-Beida - Jabal Al-Akhdar – Libya. A light trap was placed. Hanging on apple tree.

Field experiments were carried out in the months (March ; April and May) to determine the trap where the activity and times of emergence of the fruit fly Mediterranean Sea without the use of any kind of pesticides with attractive article in the trap. The samples were collected twice a week. In the laboratory, the insects were separated into groups and preserved. The collected samples were identified by zoological department.

- 1-Base of the trap.
- 2. Pin to control the rise height of trap.
- 3. Model to develop a common wire.
- 4. Pump for the transport of material from the bottom of the fund attractive to top bottle
- 5. Fund Article attractive.
- 6. The lamp inside a bottle.
- 7. Bulb lamp.
- 8. Holder to install the hose pump.
- 9. A common electrode.

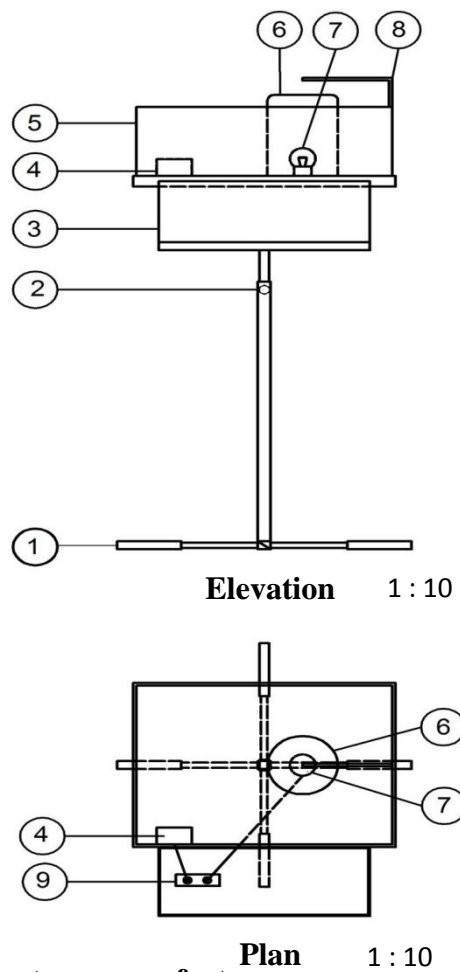


Figure (1): An Elevation and plan for trap manufacturer.



Figure (2) : A photograph of the trap.

The transactions of the experiment as follows:

To study the impact of the design of the trap. Study design has been caught using other type of optical traps, a trap El-Ghariani (a trap for comparison). The trap El-Ghariana has a funnel fixed below the bulb, with a wide mouth of 33 cm in diameter, and 33 cm , high. There are two rings on the side of the funnel to fix the trap. The used electrical light in this study was 20 watts ordinary clear lamp bulb.

Places the development of the trap

The influence of where to place the trap was studied in the middle of the garden party by using the hook and the revised rate of the trap every 100 meters from the apple orchard area of 4 hectares. Fisheries and distributed along the length of the edge of the garden.

The trap was examined twice a week for three months and recorded the numbers of insects catches.

Site on the hook for the tree :

The impact of the development of the trap was studied in four directions (north, east, south, west) for the apple trees. Select the partition where the tree on the way to the visually impaired, such as the four directions and each of the four directions and three repeaters. This experiment carried out during the month of April for a week. Large numbers of insects

Height trap:

The effect of trap height of was studied to attract insects and found the impact in terms of this influence depends on the increase because plants and insects found on the plant and put the hook on a multi-altitudes (60 ; 80 ; 100 and 120 cm) from the surface of the earth. The number of insects were recorded.

The type of material

Three types of attracting article were studied including (1-a methyl Eiginol) is a chemical has been tested to see how efficiency between them and other natural materials that have been used and are (2-Pear juice) (3-mixture of beer yeast with water) has been used with all types of lighting available to the ridges trap. Experiment designed by complete randomized block design for the three replicates of each treatment. This study carried out in May for a week. Large numbers of insects.

Color lighting:

This treatment was aimed to determine the color of which the insect has been attracting. The effect of lighting color using five types of lighting color of (red, green, yellow, white and blue) were used by means of electric lamps with capacity of about 20 watts. Readings were periodically harvested and counted and recorded periodically. Experiment designed by the design of the full three random sectors

Duplicates of each treatment. This study carried out in May for a week. Large numbers of insects.

The population density of the insects

The population density means the number of personnel in the unit area or unit volume and shows that the amount of the abundance of the total. The changes in population density of the insect and that during the months of the experiment. The phenomena observed in the area of climate research with the aim of linking them to changes in the intensity of the numbers of insects were observed for the insect population density in the study area by using the optical trap attracting manufacturer. Where, emptying the contents of the trap in the form of cans, plastic Fig (3) The samples were taken to laboratories, Faculty of Agriculture, where counting and recording the number of insects. Then the order and classification of insects and other outstanding. Different method to estimate the population density of the insect, according to a number of factors, including that of the same, including Balhacrp regarding the areas in which they occur.



Figure (3): Some of the samples taken by the hook manufacturer.

RESULTS AND DISCUSSIONS

The results of this study performed by the great importance of optical traps in the fight against the Mediterranean fly, which is one of the most important and most dangerous insect in the public areas in most countries of the Middle East has been obtained the following results. Of course, the activity of the insect and the number of generations and the intensity of the community are affected by many factors, notably the environmental conditions prevailing and service operations and control practice in the region and other factors.

1. The effect trap design:

Results showed that the highest attraction of insects caught in the trap on the manufacturer and the comparative difference in the moral level of the possibility of 5% (Table 1). This is because the trap is a trap made attractive for the night and day. Night light by day and by Article attractive. Therefore advised to rely on the predictable trap manufactured in the numbers of the insect to its efficiency and ease of manufacture.

Table (1) Effect of trap design on capture of insect Mediterranean Fruit fly.

Trap design	Replicate			Total	Insect average/trap/14days	Percentage of total catches (%)
	Rep. 1	Rep. 2	Rep.3			
Trap El-Ghariana	20	23	26	69	23 ^b	37.7
Design trap	39	40	35	114	38 ^a	62.3

Averages followed by the same letter in the same column are not significant different based on Duncans' multiple test at P= 0.05.

2. The effect of trap location.

Table 1 shows the number of insects to the trap catches on the border and the center of the garden during the period of seasonal activity of the fly Mediterranean Sea from the beginning of March until the last month of May. At the time of the test showed that there

was no significant difference) in the rate of catches to trap insects in both the central and border the garden. The percentage of the overall attraction of the trap center and the border was 48.1 and 51.9%, respectively.

Table(2) Effect of trap location on capture of insect Mediterranean Fruit fly.

Location	Total of insect catches	Average of weekly catches/ trap	Percentage of catches %
Orchard center	150	12.5	51.9
Orchard border	139	11.6	48.1

No significant differences between trap locations based on t test at $p=0.05$.

3. The effect of height trap bearer:

The findings set out in the Table (3) attracting the highest to date was in the trap is 120 cm high and had a number of insects are 49. But 100 cm high taken, then the 34 insect pest in the preparation of other less given the decline of the level of the earth's surface were the numbers of insects are 29 'from the 22 insect at high 80 and 60 cm, respectively.

Results showed that the highest attraction of the insect in the trap is 120 cm high, followed by the trap at a height of 100 cm and 80 cm high and 60 cm. There was no differences between the 100 and 80 cm. Results suggest that the higher the trap has proved a clear impact on the rate of insect attracting more high. Follows from the foregoing that the height 120 cm from the surface of the ground is the height appropriate for the trap to control the emergence and spread of this insect. Thus, the possibility of detection of low densities of the insect before it gets the level of economic damage.

Table(3) Effect of higher trap bearer on capture of insect Mediterranean Fruit fly.

Trap height (cm)	Replicate			Total	Insect average/trap/30 days	Percentage of total catches (%)
	Rep. 1	Rep. 2	Rep.3			
120 cm	51	48	48	147	49 ^a	36.6
100 cm	36	32	34	102	34 ^b	25.4
80 cm	26	28	33	87	29 ^b	21.6
60 cm	23	20	23	66	22 ^c	16.4

Averages followed by the same letter in the same column are not significant different based on Duncans' multiple test at P= 0.05.

4. The effect of the color of the lighting:

The results indicated that the better of the color of the insects attracted to the color is white, followed by yellow, then green, then blue and finally red (Table 4). Numbers were more in the use of white lights, and the number of insects, and 16 were the least when using the color blue, red, and the preparation of the insects had the 6 and 4 insect respectively. This study showed that the attraction of insects to the trap and the color was not caused by color alone, but a glimmer of light and the reflection of attractive colors is the same trap.

Table (4) Effect of the color of the lighting on capture of insect Mediterranean Fruit fly.

The color of the lighting)	Replicate			Total	Insect average/trap/7 days	Percentage of total catches (%)
	Rep. 1	Rep. 2	Rep.3			
White	17	13	18	48	16 ^a	31.4
Yellow	16	11	12	39	13 ^a	25.5
Green	10	15	11	36	12 ^a	23.5
Blue	5	5	8	18	6 ^c	11.8
Red	5	2	5	12	4 ^c	7.8

Averages followed by the same letter in the same column are not significant different based on Duncans' multiple test at P= 0.05.

5. The effect of attracting the type of material:

According to the use of certain substances attractive in the trap to improve the performance of the trap and increase the numbers of insect images. The results indicated that the presence of attracting third beer yeast with the water was the best in attracting insects followed by 54 Pear juice and then rule Almithail Aiginol . This underlines the importance of materials in addition to the attractive optical traps to increase their effectiveness in attracting large numbers of insect and elimination.

Table (5) Effect of attracting the type of material on catches insect Mediterranean Fruit fly.

The type of material	Replicate			Total	Insect average/trap/7 days	Percentage of total catches (%)
	Rep. 1	Rep. 2	Rep.3			
a methyl Eiginol	10	13	13	36	12 ^c	20.7
Pear juice	22	18	17	57	19 ^b	32.7
beer with water	29	23	29	81	27 ^a	46.6

Averages followed by the same letter in the same column are not significant different based on Duncans' multiple test at P= 0.05.

6. Effect of orientation on catches insect Mediterranean Fruit fly.

It is clear from Table (6) there is no moral difference at 5% level of probability between the numbers of insects to fish catches installed in different directions to a tree. The least attraction was in the southern direction with a clear preference for the direction of west. No attempt is being made for the diagnosis of the main factors that cause this phenomenon. The results showed that there was no significant difference between the numbers of insects catches to set traps in the different views of the tree. The observations indicated that damage to the tree, distributed almost equally in all directions. Which suggests that it is not necessary to select specific points on the tree at a fishery in the apple orchards.

Table (6) Effect of orientation on catches insect Mediterranean Fruit fly.

Orientation	Replicate			Total	Insect average/trap/7 days	Percentage of total catches (%)
	Rep. 1	Rep. 2	Rep.3			
North	14	11	14	39	13	24.5
South	12	12	12	36	12	22.7
West	13	15	17	45	15	28.3
East	15	13	11	39	13	24.5

No significant differences between trap locations based on t test at $p=0.05$.

CONCLUSION

The results showed the importance of using the optical trap attracts flies in the fight against the Mediterranean Sea and the reduction of damage to fruit trees and the need to use to determine the existence and whereabouts of the spread of infection and intensity of insect numbers in different times. According to this method of combating this insect through the collection of large numbers of them and eliminate them and prevent them from completing their life cycle, and the dissemination of infection, and the best is a combination of permanent full use of the insect trap, one of the most important methods of control used and the most to eliminate the scourge of serious and could be used to rationalize the use of insecticides against this scourge, and that this method does not conflict with other control methods, and even supported, is the important element in the success of any one of the other control methods.

1 - does not cause pollution of the environment, water or air, or human, animal or plant or the people who use them or the enemy vital in the environment.

2 - does not require application of high technologies, training or the presence of professionals on a permanent basis.

3 - do not conflict with other methods of control, but working to strengthen the effectiveness of a number of these modalities.

4 - their use does not cause the emergence of strains of insects resistant to pesticides or foramina.

5 - used throughout the year, which is useful in the fight against the insect, which at times does not allow the use of pesticides.

6 - enter the trap in the pest management program for this insect, they are working on:

- Locating the spread of the insect, and periods of activity.

- Assess the effectiveness of control operations carried out after the chemical.

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الملخص العربي

تصميم وتصنيع مصيدة ضوئية لتحديد بدء نشاط وجذب حشرة ذبابة البحر الأبيض المتوسط

نبيل الدسوقي منصور

قسم الهندسة الزراعية – كلية الزراعة بالبيضاء – جامعة عمر المختار - ليبيا

تشتهر منطقة الجبل الأخضر بزراعة أشجار الفاكهة والمحاصيل والخضروات وأشجار الغابات الطبيعية وهي بذلك تعد من أهم المناطق الزراعية والتي تتميز بأتساع حدودها الجغرافية واختلاف الطبيعة الجغرافية للمنطقة من سهول وهضاب ومناطق ساحلية وجبلية لذا تتباين الظروف البيئية. تم تصنيع واستخدام مصيدة ضوئية جاذبة لاصقة لجمع وحصر أكبر عدد من الآفات الحشرية التي قد تصيب المحاصيل والإسطبلات وتسبب خسائر فادحة في مردود أي مشروع تصيبيه . فلقد استغلّت ظاهرة انجذاب الكثير من الحشرات إلى مصادر الضوء ليلا في تصميم بعض الأجهزة لصيد هذه الحشرات . وصنعت هذه المصيدة من خوص من الحديد وهي عبارة عن صندوق أبعاده 30 x 40 سم وبارتفاع للصندوق 25 سم . والصندوق بداخله زجاجة محكمة القفل وبداخلها لمبة كهربائية 20 وات . كما تم وضع مضخة صغيرة داخل الصندوق لرفع المادة الجاذبة من الصندوق لتنساب على الزجاجة ثم تكمل الدائرة مرة أخرى.

و يدرس هذا البحث تصميم وتصنيع مصيدة ضوئية جاذبة لاصقة صديقة للبيئة وذلك لتحديد نشاط وظهور بعض الحشرات مثل (ذبابة ثمار البحر الأبيض المتوسط) وقد دلت النتائج بانجذاب عدد من الحشرات إلى المصيدة خلال أشهر تجريبها وهي أشهر (مارس – ابريل – مايو) عام 2009 حيث زادت الكثافة العددية للحشرات كلما اتجهنا إلى زيادة درجة الحرارة . كما وضح من النتائج زيادة نسبة الإصابة في شهر مايو . ويتضح من الدراسة بأن المصيدة كانت فعالة في مراقبة وجذب الحشرة مما يمكن اعتبارها عنصراً هاماً في مكافحة هذه الآفة . صممت التجربة بطريقة القطاعات العشوائية الكاملة وبثلاث مكررات.

وتشير النتائج أن عدد الحشرات الملتقطة يرجع لقرب الموقع المختار إلى المياه فالحشرات تكون قريبة من مصادر المياه وكان لموقع طرف البستان أكثر عدد من الحشرات حيث وصل إلى 150 حشرة في مدة شهر .

أوضحت النتائج أن اعلي جذب للحشرة كان في المصيدة ذو ارتفاع 120 سم وكانت عنده عدد الحشرات الملتقطة هي 49 حشرة في شهر . يليها المصيدة ذو ارتفاع 100 سم وكان عندها عدد الحشرات الملتقطة هي 34 حشرة في شهر . وكان أفضل لون انجذبت إليه الحشرات هو اللون الأبيض يليه اللون الأصفر ثم اللون الأخضر ثم اللون الأزرق وأخيراً اللون الأحمر .

وكان أفضل مادة جاذبة خميرة البيرة مع المياه كانت أفضل في جذب الحشرات فلقد جذبت حشرة في أسبوع ثم تلاها عصير الكمثري ثم مادة الميثايل ايجينول . توصي الدراسة باستخدام المصيدة المصممة لأنها:-

لا تسبب تلوث البيئة أو المياه أو الهواء أو الإنسان أو الحيوان أو النبات أو الأشخاص الذين يستعملونها أو الأعداء الحيوية الموجودة في البيئة.

لا يحتاج تطبيقها إلي تقنيات عالية أو تدريب أو وجود الفنيين بشكل دائم. تستخدم علي مدار السنة ، وهذا ما يفيد في مكافحة الحشرة في الأوقات التي لا يسمح فيها باستخدام المبيدات.

- تدخل المصيدة في برنامج مكافحة المتكاملة لهذه الحشرة ، فهي تعمل علي:
- تجميع أعداد كبيرة من الحشرة والتخلص منها ومنعها من التكاثر ونشر الإصابة.
- تحديد أماكن انتشار الحشرة ، وفترات نشاطها .
- تقييم فاعلية عمليات مكافحة الكيماوية بعد القيام بها.