Effect of Rose Bengal on *Hylemyia antiqa* (*Meigen*) (Diptera :Anthomyiidae)

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Abstract: Rose Bengal as photosensitizers material used as insecticide after the addition of a specific hydrocarbon to control different stages of the onion fly *Hylemyia antiqu*a (egg , larval, pupal and adult) with different doses (o.o1270 , 0.00145 , 0.00127, 0.000029 µg /L) ,with different light expose time. Most of these treatments eradicate the target pest. pupae stages of *H. antiqua* could be sensitive to photosensitizer because it can be controlled during only 15 sec. then eggs instar that could be controlled during 30 sec . but adult instar could be controlled with 60 sec. from light exposure to direct sun light and later 4^{th} instar larvae which needed to, at lest 15 min. to be controlled with the same concentration from used photosensitizer. This is to prove that photosynthtizers can play an active role in pest control. [Journal of American Science 2010;6(8):27-30]. (ISSN: 1545-1003).

Keywords: Rose Bengal; photosensitizer; hydrocarbon; onion; fly *Hylemyia*

1. Introduction

Development of new pesticides that are efficacious, environmentally safe, and being to non target to organisms continues to be a priority for the agriculture chemistry community in order to protect and increase our food and fiber production. Over the past few decades, new and better toxic strategies have been applied to this problem. The rise and fall of the organochlorine insecticides due to long-term environmental concerns, and their replacement by the organophosphate and carbamate insecticides. The latter insecticides are under pressure at present as being too toxic to non target species. The observation of the development and the eventual difficulties of synthetic pyrethriods may, due to insect resistance . .Also, fungi in the genus *Cercospora* produce cercosporin, a potent singlet oxygen (102)-generating photosensitize that plays a critical role in the ability of these fungi to parasitize plants, mice ,bacteria and many fungi are sensitive to *cercosporin* , *Cercospora* species are resistant to its toxicity. The cellular resistance of these fungi to Cercosporin has been correlated with fungal cell surface reducing ability and ability to maintain Cercosporin in a chemically reduced state (Daub *et al*. 2000) . But for Integrated pest management (I.P.M) programmes often look for more specific ways to control pests. Biological control agents, such as the bacterium *Becillts thuringiensis* and the fungus, *Beauveria bassiana*, can control insects with minimal disturbance to the environment because of their host specify and short half – lives. Often these agents alone cannot prevent yield loss or are too expensive. Their for looking at combination of these agents and photoactive dyes like Rose Bengal, fluorescein , eosin y (Martin *et al* . 1998).

Also, the encyrtid parasitoid, *c. peregrinus* has been used as a biological control agent against the mealy bags P. citri and P. ficus. With help of photoactive dyes can examine the behavior and host selection (Joyce *et al*. 2001). For medical filed, photosynthtizer plays a critical role in epidemiological characteristics of diseases (Oliveira, 2000). Later, photosynthtizer as a method to describe the effect of synthetic pyrethroid insecticides which used in protection of fruits and vegetables as well as public hygiene(Tyrkiel *et al*. 2001). As an effect of the substitution position of the suger moieties, the photosynthtizer bearing suger moieties at the meta-position of PH group showed remarkably high activity compared with para – substituted ones, and the difference could not be explained by the opticald. Confocal laser scanning microscopy revealed that meta- substituted photosynthtizers are not readily deactivated from the excited state in cellular microenvironment, this may explain their potent photocytoxicity. The phosphorescence quantum such as uranine, eosion yellowish, erythrosine B and rose Bengal or photosynthtizers was usually used as insecticides. The photodynamic action has been shown to function by one of two mechanisms Heitz and Downum (1995). In type one mechanism the dye absorbs a photon of light rises the first to singlet exited state and then drops to the exited tripled stat. The energy of the photon is then added to the target substrate molecule, making an activated form substrate. The activated molecule then adds to ground state oxygen or their oxygen radicals and becomes oxidized in the process, in type two mechanisms the dye again absorbs a photon of light as the first step in the process. The dye rises first to the exited singlet state and then to the excited triplet state. The excited dye molecule then gives the energy to ground state oxygen thereby rising the oxygen to the exited singlet state. Finally, the excited oxygen adds to the target substrate and oxidizes it. But there are an other new ideas like, photosensitization via dye coordination a new strategy to synthesize metal nitrosyls that release NO under visible light (Harrop 2006).

Addition of hydrocarbon to Rose Bengal (Patent R. no. 1788/ 2009) is very important , that without this addition these material can not control the pest with this efficiency.

The aim of this work to define the effect of Rose Bengal as insecticide environmental friendly compound.

2. Material and Methods

Chemical preparation: Rose Bengal fluorescent stain powder was mixed with 6 mg/dl ion hydrocarbon patent R. No. 1788/2009; dissolved in water to prepare concentrations of 0.01270, 0.00145, 0,ooo127 and 0.000029 µg/L.

Insect culture : Hylemyia antiqua was reared in the laboratory of Plant Protection institute, Ministry of Agriculture, Cairo, Egypt.

Design of experiment:

Each concentration of Rose Bengal was topically applicated on each stage of insect instar by micropipette at volume of 1 µl/insect instar in groups of 10and15 replicate insects. Each group of selected treated insects exposed to direct light sun for period selected as it mentioned ,then keep it in room light. The death recorded after 24 hours after the application.

The period was selected for eggs were 30 and 60 sec.. As for larva 4th instars and pupa were 1.5, 15, 20 min and 15, 150sec. respectively. The adult form the selected time of exposure was 60 and 120 sec.

Therefore the insects were classified into 4 groups according to the concentration of Rose Bengal to reach as follow:

Group 1 at concentration was 0.01270 µg/l

Group2 at concentration was 0.00145 µ g/l

Group 3 at concentration was 0.00 0127 µg/l

Group 4 at concentration was 0.000029 µ g/l

3. Results

From table (1), LC50 for egg s stage of *H.antiqua* was 0.0 0 0 446 with slop 0.219 ± 0.006 at 3 0 seconds exposure time to direct sun light, but it was 0.0 0 0 0 84 with slop 0.516 ± 0.007 at 60 seconds that indicate the photosensitizer can control eggs stage of *H.antiqua*, but in the other hand, it was 315.022 at LC90 in 30 seconds a s time of exposure to direct sun light . But also, it was 0.0253

In 60 seconds exposure to direct sun light. However, Rose Bengal can not only control eggs stage of *H.antiqua* but also integrate this target which time of exposure to direct sun light play an active role with Rose Bengal concentration with the additional material.

But for 4^{th} instar larvae of *H.antiqua* ,the LC50 was 0.000347 with slop 0.316 ± 0.006 at 15 min. as time of exposure to direct sun light , but it was 0. 00003 with slop 0.547 ± 0.008 at 20 min. as time of exposure to direct sun light. But 4^{th} instarlarvae of *H.antiqua* LC90 was 3.892 at 15 min. exposure to direct sun light. In the other hand at 20 min. time exposure to direct sun light, LC90 was 0.0676. It notes that this stage take time for light exposure more than eggs stage.

For Pupae stage LC50 of *H. antiqua* was 0. 0 0 0177815 with slop 0.3843 ± 0.0654 at 15 sec. time exposure to direct sun light. But it was 0.0 0 0 0142837 with slop 0.4805 ± 0.0007 at 150 sec. time exposure to direct sun light.

For LC90, it was for the same stage o.3 8 4 with at 15 sec. time exposure to direct sun light . But, it was 0.0 0 6 6 3 741 with at 15 0 sec. time exposure to direct sun light.

For Adult stage of *H.antiqua* , the LC50 was 0.0 0 0 2 6 with slop 0.070 ± 0.0003 at 60 sec. of exposure to direct sun light. But it was 0.0 0 0 2 9 with slop1.088 ± 0.0054 at 12 0 sec. exposure to direct sun light. For LC90 to adult stage of *H.antiqua*, it was 0.0166 with slop 1.0 8 8 when it exposed 60 sec. to direct sun light, but it was 0.0 0 3 when exposed 120 second to direct sun light.

4. Discussion

From all results, time of exposure to direct sun light play an active role in controlling all stages of *H.antiqua* in order to complete photosensitizer reaction . Increasing time exposure to direct sun light decrease the used photosensitizer concentration and vice verse. However eggs stage as stable stage, it can be controlled with few seconds of light exposure to direct sun light with low concentration of photosensitize but 4^{th} instar larvae of *H.antiqua* takes time of exposure to direct sun light, up to 20 minutes , with the same concentration of photosensitizer. Again to 15, 150 seconds of time exposure to direct sun light with the same concentration of photosensitizer pupae stages can be controlled may be due to it is powerless stage. Also at adult stage, exposed to 60,120 sec. that can control this instar similar to the previous one . However from all treatments, pupae stages of *H. antiqua* could be sensitive to photosensitizer because it can be controlled during only 15 sec. then eggs instar that could be controlled during 30 sec . but adult instar couled be controlled with 6 0 sec. from light exposure to direct sun light and later 4th instar larvae which needed to, at lest 15 min. to be controlled with the same concentration from used photosensitizer.

Table (1): Effect of Rose Bengal on *Hylemyia antique* stages

Time			**Eggs**
	LC_{50} and confidence limits	**Slope ± SE**	**LC_{90} and confidence limits**
30 Sec.	**0.000446** **(0.000087 – 0.0020)**	**0.219 ± 0.006**	**315.022** **(2.2943 – 107583)**
60 Sec.	**0.000084** **(0.000036 – 0.000157)**	**0.516 ± 0.007**	**0.0253** **(0.00892 – 0.1387)**
	Fourth instar larvae		
15 min.	**0.000347** **(0.000119 – 0.000888)**	**0.316 ± 0.006**	**3.892** **(0.2707 – 1601.33)**
20 min.	**0.00030** **(0.000169 – 0.00053)**	**0.547 ± 0.008**	**0.0676** **(0.0224 – 0.3862)**
	Pupae		
15 Sec	**0.000177815** **0.00038094) (0.00006586 -**	**± 0.0654 0.3843**	**0.384** **(0.06249954 - 12.88246017)**
150 Sec.	**0.0000142837** **(0.00000301-0.00003591)**	**0.4805 ± 0.0007**	**0.00663741** **(0.00253953- 0.0342026)**
	Adults		
60 Sec.	**0.00026** **(0.000158 – 0.000395)**	**0.070 ± 0.0003**	**0.0166** **(0.000275 –**
120 Sec.	**0.00029**	**1.088 ± 0.0054**	**0.003**

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