EFFECT OF JUVENILE HORMONE ANALogue AND PRECOcENE ON THE GROWTH AND METAMORPHOSIS OF HOUSE FLY MUSCA DOMESTICA

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ABSTRACT

Larval instar duration of the house fly Musca domestica is influenced by the application of GHA and precocine. Topical use of ug / ul of JHA KD 183 prolonge Juvenile period compared to the control. On the contrary, application of ug / ul of precocine decreased it. Application of both substances has no effect. The emergence inhibitors were also influenced by such treatments. It reached 52. 39% by the use of JHA, (-14.28%) by the use of precocine.

INTRODUCTION

Two hormones control development and metamorphosis in M. domestica, these are the moulting (ecdysis) and Juvenile hormone. Corpora allata is the source of JH. Shortly after emergence brain hormone stimulate CA to release JH which acts on ovary and fat bodies. The ovary then produce 20-hydroxy ecdysone which activates the fat body to produce the female protine vitellogenine which is added to yolk to complete the egg maturation (Hagedorn et al 1977, Aqui et al 1985; Alsharock 1989).

In insects, JHAs are growth regulators. They either prevent moulting (ecdysis) or inhibit their embryonic development (Slamea et al 1974). There are several types of JHA vary in their activities and effects on insects resistance, for example the activity of JH S31183 on the house fly M. domestica was significantly high than that of metheprene (Kawada 1987). The stage of insects which treated by JHA was involved in the variation of JH activity (Radwan et al 1984; Hatakoshi et al 1987).

Precocene, anti juvenile hormone, has a great role in growth and reproduction, they reduce the egg production in the emerged adults and cause reduction in the duration of last nymphal life of stinke bug (Mukhopadhyay et al 1988).

The efficiency of the chemicals depends on their quality and quantity. for example application of 2ug of JHA was sufficient to stimulate egg development in M. domestica, while 5ug of (20 - hydroxy ecdysone) has no effect (Adams & Filibi 1985).

The aim of the present study is to investigate the effect of these two substances and point out which of them is more active than the other on growth and development of the house
flies and to determine which stage of the life cycle is more affected by low concentration of JHA to reveal the suitable application of these substances which can be used as a control tool of reproduction through the life cycle.

MATERIALS AND METHODS

1 - Rearing : The adults were collected by sweepnet, transferred to cages (130 x 100 x 90 cm) made of wood and wire screen.

Moist bread and sugar was used as a feeding source for larvae, another jars containing water with powdered milk and sugar was used for adults feeding. Female adults were placed with mature males for mating. After oviposition, batches of eggs were transferred to new cages frequently to obtain known age larvae.

2 - Solutions used : 1 Ug of JHA KD 138 (Fig 1) was dissolved in 1 UI of acetone (1:1 part).

1 Ug of standard precocene 11 was dissolved in 1 UI of acetone. This concentration was chosen according to previous studies.

3 - Experimental : Two experiments were carried out

Exp. I

1 U 1 of JHA, 1 U1 of precocene 11 were applied topically separately each on 25 2nd instar larvae.

1 U1 of precocene was applied topically on 25 2nd instar larvae and followed by JHA application after 24 hrs.

1 U 1 of acetone was applied topically on 25 2nd instar larvae as control. Application of solution was carried out on 1-day old of 2nd instar larvae.

Exp. II : This experiment was planned as exp I but on 3rd instar larvae.

The percent of adults emergence inhibitors was calculated from the following formula:

\[ EI \% = 100 - \frac{T}{C} \times 100 \]

where \( T \) = emergence in treatments, and \( C \) = emergence of isolated individuals in untreated (Mulla & Darvazeh, 1979).

4 - Statistical : Statistical analysis of the data was conducted by using complete Randomize Design (C.R.D) and Duncans multiple range test (Steel and Torrie 1980).
RESULTS AND DISCUSSION

The results of the 1st exp. showed that the treatment of the 2nd instar larvae with JHA prolonged their stadium till day 8, compared with control where all larvae ecdysed to 3rd instar on day 6 table (I), fig. (II).

In contrast, precocene 11 shortened the stadium (table 1). Here moulting started after 1st day of treatment and the ecdysis of all 2nd instar larvae to 3rd instar were completed after 4 day of treatment.

In group (III), again precocene 11 induced the moulting on the 1st day, while JHA prolonged it when applied after 24 hrs. of precocene treatment.

Statistical analysis of exp. I data showed highly significant differences between precocene II and JHA effects on the stadium of the treated larvae. The prolongation of group III larvae duration in compared with control is due to the effect of JHA, since JHA has a great ability to penterates the integument and to reach its target organ. This agrees with the results of (Herzog & Monroe, 1972). The shortness of the stadium of group III larvae may be due to the counter-effect of precocene II on the corpora allata (C-A) and its interference with JH biosynthesis or disruption of brain regulation of (C-A), so the precocene depress the JH titer (Bowers et al., 1976; Hagedorn et al., 1977; Aqui et al., 1985).

With the continuous of life cycle, the 3rd instar larvae, pupa & adults, which emerged from the treated larvae, were affected too in the same way but their is an important point that the adults which emerged from group II & III was inactive, more of them have no ability to fly and died after short time, this reveles to conclude that these adults (males or females) have no ability to mating and producing anew generation, so they may be sterile. The application of precocene II induced abnormality and sterilization to Spodoptera mauritica (Santha & Nair 1988).

For adults, emergence started on day II with JHA treatment, day 6 with precocene and day 8 when both substances applied.

The emergence inhibitor percente (EI %) was increased with JHA treatment and decreased with precocene II treatment.

This shown as follows:

1 - Emergence inhibitor of Group I (JHA) = 100 - 10 / 21 x 100 = 52.39 %
2 - Emergence inhibitor of Group II (precocene) = 100 - 24 / 21 x 100 = 0.14.28 %
3 - Emergence inhibitor of Group III (precocene + JHA) = 100 - 16 / 21 x 100 = 24.19 %

This agrees with the results of (Adams & Filib, 1988).

In exp. II (table II, fig II), similar effects of the two substances was seen. Pupation was delayed to day 5 in group I, day 2 in group II and day 3 in group III compared to the normal life cycle (Mohammed et al. 1980).

Experimental and statistical analysis of both experiments data lead to conclude that is:

1 - The effective role of JHA on metamorphosis is highly then that of precocene.
2 - The doses of JHA and precocene which was applied are sufficient to used as a good tool for the houseflies control.
3 - The JHA are more active when applied on the late instar larvae.
ACKNOWLEDGMENT

My sincer thanks to prof. ( Dr. ) Z. M. Alsharook, Dean of Education College, Mosul Univ. for providing chemicals and working facilities.

LITERATURE CITED


### Table 1: Influence of hormones on the stadium (days) of 2nd instar larvae *M. domestica*.

<table>
<thead>
<tr>
<th>Insect instar</th>
<th>Type of treatment</th>
<th>Precocene</th>
<th>Precocene+JHA</th>
<th>Acetone</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd-3rd instar</td>
<td>Juvenile hormone (JHA)</td>
<td>8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>c*</td>
<td>d</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>2nd instar-pupa</td>
<td>13</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>2nd-adult</td>
<td>19</td>
<td>12</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

### Table 2: Influence of hormones on the Stadium (days) 3rd instar larvae *M. domestica*.

<table>
<thead>
<tr>
<th>Insect instar</th>
<th>Type of treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd-pupa</td>
<td>JHA Precocene Precocene+JHA Acetone</td>
</tr>
<tr>
<td></td>
<td>12 8 11 10</td>
</tr>
<tr>
<td></td>
<td>c* e c d</td>
</tr>
<tr>
<td>3rd-adult</td>
<td>16 12 14 13</td>
</tr>
<tr>
<td></td>
<td>a c b a</td>
</tr>
</tbody>
</table>

*similar letters reveal that there is no significant difference at 0.05 level according to Duncans test.*

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تأثير مشابه هرمون الخداثة والبريكوسين على نمو وتحول حشرة Precocene II

الذبابة المنزلية

Musca domestica

عبد النبي جويدة عبد
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الخلاصة

تأثر فترة تحول الاطوار البرقية المختلفة لحشرة الذبابة المنزلية باستعمال مشابه HORMON الخداثة والبريكوسين. وقد تبين أن الاستعمال السطحي لـ 50 من مشابه هرمـون التحول فرصة للتحول البرقية. وقد تبين أن الاستعمال السطحي لـ 10 من البريكوسين يعمل على تسريع فترة التحول، في حين أن استعمال المادتين معاً ليس له تأثير واضح على فترة التحول والنشوء. مقارنة ببعض المتقاربة.

كما تبين أن عملية تحليل أعداد البالغات تتأثر فيما الأخرى فتصدر إلى 39% في حالة استعمال مشابه هرمون الخداثة و ( - 22% - 14%) في حالة استعمال البريكوسين.
Fig. II Effect of hormones on adult emergence of the house flies.