
Oviposition by *Chilo partellus* (SWINHOE) in Relation to Its Mating, Diurnal Cycle and Certain Non-Plant Surfaces

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In *Chilo partellus* (SWINHOE), maximum mating takes place during the first night after emergence, declining markedly during the successive nights. Mating commences after midnight, reaches a peak between 5 a.m. and 7 a.m. and then declines. Oviposition is maximum during the first night after mating and declines on successive nights. The most suitable period for oviposition is between 4 p.m. and midnight. Among the non-plant surfaces tested for oviposition, glass is most suitable polythene sheet and wax paper coming next, followed by filter paper. Muslin and nylon net are unsuitable for the purpose.

INTRODUCTION

The ovipositional response of the stem-borer *Chilo partellus* (SWINHOE) to different susceptible and resistant maize genotypes has been compared by a number of workers (DURBEY and SARUP, 1982; AMPOFO, in press; KUMAR and SAXENA, in press). According to DURBEY and SARUP (1982), the susceptible and resistant maize genotypes examined do not differ from one another in eliciting oviposition by the moths in the fields. On the other hand, AMPOFO (in press) and KUMAR and SAXENA (in press) report differences in egg-laying by the insect on susceptible and resistant genotypes. On the basis of this information, we have undertaken a study on the role of chemical and mechanical plant characters in determining oviposition by *C. partellus* on susceptible and resistant maize genotypes. In order to determine the role of chemical characters of plants, it is necessary to have a non-plant material, treated with the test chemicals which will serve as a mechanical substrate for oviposition by the insect. For comparison of the insect's ovipositional responses to different plants or substrates, it is important to reduce to the minimum the variability in responses due to the insects' internal condition. This paper reports on observations on the ovipositional responses of *C. partellus* in relation to its age, mating, time of day and its response to different mechanical surfaces.

MATERIALS AND METHODS

Freshly emerged unmated male and females, reared on an artificial diet (OCHIENG et al., in press), were kept singly in a plastic vial (7 × 7 cm) until required for tests. For each experiment, 10–30 insects were used and the data were processed by the usual statistical procedures (SNEDECOR and COCHRAN, 1970).

Five pairs of males and females were brought together for mating, at different time-intervals after their emergence, in a rectangular perspex chamber (28 × 17 × 17
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The percentages of the pairs mating during each successive time-interval were recorded. This indicated the optimum age for maximum mating. Mated females were then kept singly in a similar perspex chamber and provided with water on wet towel paper in petri-dishes. The number of eggs laid by each female, during every successive 24-hr period, were recorded until the moth died. On the basis of the total number of eggs laid by a female during its life time, the percentages of eggs laid on different days following mating were calculated. This indicated the post-mating period for maximum oviposition.

In order to study the relationship between the time of the day and oviposition, freshly mated females were confined singly in the rectangular perspex chamber for 24 hr, starting at 8:00 a.m. On the basis of the total number of eggs laid by each female during the 24-hr observation period, the percentage of those laid during each successive 4-hr periods was calculated.

Oviposition behaviour by *C. partellus* on non-plant surfaces was studied by testing the following substrates: glass, polythene sheet, wax paper, parafilm membrane, Whatman filter paper No. 1, 2, and 541, muslin cloth, nylon net (6 meshes/cm and 12 meshes/cm), and wire net (6 meshes/cm). Tests were conducted in a circular glass chamber (15 mm high; 100 mm dia.) with a flat glass plate along its bottom and a removable top formed by an inverted petri-dish. The tests were conducted under 2-choice as well as no-choice situations. In the 2-choice situation, the non-plant surface under test was placed flat across the chamber's bottom, occupying one half of its area, leaving the other half of the glass sheet free. Females, introduced singly into each chamber, were able to remain in contact with one or the other test surface throughout the 24 hr-observation period. On the basis of the total number of eggs laid on both the surfaces within the chamber, percentage of those laid on each was calculated. In the no-choice situation, the test surface occupied the chamber's bottom, sides, as well as top. One single female was kept in each chamber. On the basis of tests on 30–50 females, arranged in replicates of 10, the percentage of those laying eggs on the test surface was calculated.

**RESULTS**

Oviposition in relation to mating time

When freshly emerged unmated males and females were brought together, the percentage of pairs mating was maximum (83±S.E. 3) during the first night after emergence, declined to 7±3 on the second day, and to 3±3 on the third day. The insect started mating mostly after midnight, the percentages of pairs mating increasing from 3±3 between 1:00 a.m. and 3:00 a.m., to 23±3 between 3:00 a.m. and 5:00 a.m. and finally to a maximum of 67±3 between 5:00 a.m. and 7:00 a.m.

Oviposition was maximum during the first night after mating, the percentage of eggs laid being 58±7%. It declined to 26±5%, 4±1%, 5±3%, 2±2% and 1±1% on successive nights after mating. Oviposition occurred between 4:00 p.m. and 8:00 a.m., the percentages of eggs laid being 44±10 between 4:00 p.m. and 8:00 p.m., 37±11 between 8:00 p.m. and midnight, 15±15 between midnight and 4:00 a.m. 4±3% between 4 a.m. and 8 a.m. No eggs were laid between 8:00 a.m. and 4:00 p.m.

In order to lessen the variability in egg-laying caused by internal conditions of insects themselves, their ovipositional responses to different surfaces were compared by
Table 1. Ovipositional response by \textit{Chilo partellus} on different surfaces, each presented as a choice against glass.

<table>
<thead>
<tr>
<th>Test material</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>Polythene sheet</td>
<td>48±7*</td>
</tr>
<tr>
<td>Glass</td>
<td>Wax paper</td>
<td>75±11*</td>
</tr>
<tr>
<td>Glass</td>
<td>Parafilm M\textregistered R</td>
<td>73±7*</td>
</tr>
<tr>
<td>Glass</td>
<td>Whatman No. 1</td>
<td>76±7*</td>
</tr>
<tr>
<td>Glass</td>
<td>Whatman No. 2</td>
<td>80±6</td>
</tr>
<tr>
<td>Glass</td>
<td>Whatman No. 541</td>
<td>97±3</td>
</tr>
<tr>
<td>Glass</td>
<td>Muslin No. 3</td>
<td>100±0*</td>
</tr>
<tr>
<td>Glass</td>
<td>Nylon net (12 meshes/cm)</td>
<td>94±6*</td>
</tr>
<tr>
<td>Glass</td>
<td>Nylon net (6 meshes/cm)</td>
<td>100±0*</td>
</tr>
<tr>
<td>Glass</td>
<td>Wire net</td>
<td>100±0*</td>
</tr>
</tbody>
</table>

* Data based on means of 10 females.
* Significant different from each other at \( P=0.05 \).
* Not significantly different from B at \( P=0.05 \).

bringing the two sexes together for mating during the first night after emergence and testing their ovipositional responses during subsequent nights.

Ovipositional responses to different surfaces

When a glass surface was presented to the moths as a choice against different surfaces, the ovipositional responses varied according to the nature of the surface (Table 1). Polythene sheet elicited almost as much egg-laying as glass surface. However, with wax paper or parafilm membrane, the percentage of eggs laid on the glass was about 3 times that on any of the two surfaces. With Whatman filter paper No. 1, 2 or 541 the percentage of eggs laid on the glass was about 3 times that on Nos. 1 and 2 and about 30 times that on No. 541 (Table 1). With a choice of muslin cloth, nylon net (6 meshes/cm, 12 meshes/cm) or wire net (6 meshes/cm) as a choice against glass, about 99–100% eggs were laid on the latter.

In the no-choice situation, on the other hand, the percentage of females laying eggs on glass, wax paper and nylon net (6 meshes/cm) was 100 each, and that on muslin was 90. The number of eggs laid on these surfaces was 167±37 on glass, 108±21 on wax paper, 81±50 on nylon net and 62±15 on muslin cloth.

DISCUSSION

The observations presented above show that the number of eggs laid by female \textit{C. partellus} varies with the time-intervals after mating which, in turn, varies with the age of the moths. Hence, comparison of the insect's oviposition on different plants or other substrates using adult females of uncontrolled age, mating time and post-mating
period would not reflect differences due to characteristics of the test substrates or the insects' internal condition. In order, therefore, to avoid such differences in egg-laying it is desirable to use the females mated during the first night after emergence and tested for oviposition during the subsequent night when maximum number of eggs are likely to be laid.

Observations from the present work also show that the mechanical character of a surface is important in determining oviposition by *Chilo partellus*. Of the 3 Whatman filter papers used, No. 541 was most coarse, No. 1 finest and No. 2 in between. The fact that moths laid much more eggs on No. 1 and 2 than that on No. 541 suggests that rough surfaces are less suitable for oviposition than smooth surfaces. This view is further supported by the fact that oviposition on muslin cloth which has a rough surface was much less than on glass, polythene sheet, parafilm and wax paper, which have smooth surfaces. Thus, *Chilo partellus* differs from certain other moths e.g. *Heliothis armigera* (Saxena and Rembold, 1985) which lay eggs on filter paper, muslin or nylon net.

In view of the above observations, glass would seem to be the most suitable substrate on which to apply various chemicals to test their influence on *Chilo partellus* oviposition behaviour. Polythene sheet or wax paper come next, provided these substrates are themselves not affected by the chemicals.

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REFERENCES


