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The First Hours in the Life of a *Busseola Fusca* (Lepidoptera: Noctuidae) Larva

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Introduction

The stem borer *Busseola fusca* (Fuller) (Lepidoptera: Noctuidae) is an important pest of maize and sorghum in East and Southern Africa [1]. *Busseola fusca* is oligophagous with a host range consisting of a few grass species. However, under field conditions, by far the most recoveries are made from maize and sorghum, and few only from wild grasses [2-6]. *Busseola fusca* neonate larvae have a specific mode of dispersal. After hatching under the leaf sheath, they ascend to the whorl, where they either feed on the leaves or disperse to other plants *via* 'ballooning-off'. Ballooning on silk threads is known to be an important behaviour of the first instar larvae in Lepidoptera, making it possible for them to be transported by wind from one plant to another [7-9]. We hypothesize that, apart from ballooning off, neonate larvae migrate between plants by crawling actively. This dispersal mode will, however, depend on how long newly hatched larvae can survive without feeding. In this context, we have estimated here the maximum time period that the neonates can survive without feeding as well as the time after hatching which they commence feeding, when food availability is not limited.

Materials and Methods

The eggs of *B. fusca* used in this study were obtained from insects reared on a meridic diet according to the methods developed by Onyango & Ochieng'-Odero [10] at the International Centre of Insect Physiology and Ecology (*icipe*), Nairobi, Kenya. To rejuvenate the colonies, feral individuals collected from maize fields in western Kenya were added thrice a year.

Sets of 40-60 eggs were kept at 25.3 ± 0.9°C, 68.6 ± 12.8 % RH (means ± SE) and L12:D12 in a room under a reversed photoperiod, with the scotophase lasting from 7:00 to 19:00, herewith referred to as night, and another room under normal conditions with the photophase lasting from 7:00 to 19:00. During the reversed photoperiod, the observations were made using a red 80 W fluorescent tube as light source. First, time to egg hatching was evaluated. This was followed by evaluation of the time period that each neonate larvae kept without food could survive, and time to the first feeding when food availability was not limited. For the latter, the neonates were kept in a Petri dish with artificial diet. Congo red at 1 g/L was added to the artificial diet enabling determining when the larvae started feeding on the diet.

Results and Discussion

The eggs took 7.1 ± 0.03 days to hatch (mean ± SE, n=91). This is in accordance with results reported by Kaufmann [7] for this stem borer species. The neonates lived for 48.8 ± 7.5 h (mean ± SE, n=25) when they were kept without food.

In the presence of food, the time to first feeding was 4.0 ± 0.4 hours (mean ± SE, n=51) for larvae that had hatched during the night, and 3.8 ± 0.4 hours (mean ± SE, n=40) for those that hatched during daytime, indicating that the time of hatching did not affect time to first feeding.

These results indicate that the neonates live long enough without food to actively disperse to neighbouring plants *via* crawling [7,8,11,12]. *Busseola fusca* neonates possess sensitive sensory organs on their antennae that enable them to detect plant volatiles from their host plants and to orient towards them [13, personal observations].

Location of a suitable feeding site is a critical part of the life of immature insects, particularly neonates [9]. These authors reported that most neonates of the Lepidoptera have a pre-feeding movement phase during which long distance dispersal is achieved by ballooning. As already reported by Kaufmann [7], larval migration of *B. fusca* occurs immediately after hatching. *Busseola fusca* females lay eggs in batches of an average of 92 eggs per plant. Thus, the high numbers of plants infested with larvae in a field are the result of larval (incl. neonates) dispersal from the `mother` plant rather than number of the plants infested with eggs [7]. This was also shown for *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae) by van Hamburg [11] and Chapman et al. [14]. For example, in South Africa 100% of the sorghum plants in a field became infested although eggs were laid on only 18% of plants [11]. Apart the larval dispersal achieved by means of ballooning [9], crawling might be an important way of dispersal for neonate Lepidoptera. The larvae that balloon off cannot determine where they land and landing may take place on a non-suitable host plant or on the ground, while larvae that disperse *via* crawling can target a suitable plant. In some cases, the moths lay their eggs predominantly in the soil, such as *Phthorimaea operculella* (Lepidoptera: Gelechiidae) [15] or, under an intercropping situation, the female moths such as *C. partellus* can lay their eggs on non-hosts [16], requiring the neonates to locate the host *via* crawling. The fact that neonates do not feed right after hatching and can live a considerable time without food, as shown in *B. fusca* in this study, allows them to migrate between plants by crawling actively. Van Den Berg and Van Rensburg [17] indicated, by measuring plant damages in the field, that *B. fusca* larvae are able to migrate between 5-7 plants in three weeks. However, direct observations under field conditions will contribute to demonstrate the active dispersal activity of *B. fusca*.

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