

Behavioral study of crawler (first stage larva) of *Abgrallaspis azadirachti* (Ojha) (Homoptera: Coccoidea: Diaspididae)

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Abstract

The behavioral characteristics of the scale insect crawler (First stage larva) of *Abgrallaspis azadirachti* have been examined by the authors. *Abgrallaspis azadirachti* is a member of the class Insecta, order Homoptera, group Coccoidea, family Diaspididae, and subfamily Aspidiotinae. Armoured scales are the most successful group of plant parasite insects and the most destructive, infamous, cost effective, horticulture or agricultural pests. All members of this family are generally referred to by this name. It is a significant *Azadirachta indica* pest. The tropics, subtropics, and warmer regions of temperate zones are home to cosmopolitan armoured scales. Armoured scale insects use mobile first instar nymphs known as crawlers to disperse and colonize new places. The main dissemination stage of *Azadirachta indica*'s life cycle is the wonderful crawler. For the majority of armoured scales, the free – living crawler is arguably the most vulnerable stage of development. *Abgrallaspis* has a yellow – green crawler look. It is greatly impacted by elements such as crawler sex, substrate type, temperature, and humidity. There is strong evidence that diaspidid crawlers can only travel very small distances and very difficult across bare soil or sand. Within the same species, male and female crawlers frequently exhibit distinct behavioral tendencies. *Abgrallaspis azadirachti* crawlers have long, fine caudal setae and a broad, flat body shape. Phototactic and geotropic reactions have been found to exhibit behavioral differences between the sexes.

Keywords: Crawler (first stage larva), behavioral features, temperature, humidity, phototactic and geotropism etc

Introduction

Abgrallaspis azadirachti is a member of the class Insecta, order Homoptera, group Coccoidea, family Diaspididae, and sub family Aspidiotinae. This family of insects is frequently referred to as armoured scales. Hard bodied, armoured scale insects use their piercing and sucking mouth parts to feed on plant material. The eggs are deposited in a single mass beneath the female's waxy cover or in the waxy ovisac. Crawlers are small, mobile early instars. It began spreading to other parts of the plant and settled there to feed on the plant's tissues. After they have settled, first instar crawlers often stay motionless. Soon after hatching, the first instar crawler's emergency from under the mother's shell and start looking for a spot to call home. This was the sole active dispersal phase for female armoured scales. Howell (1977) [7] reported the first instar and discovered that males may typically be distinguished from females by the presence of an 8-shaped duct on the skull. Although it can also be lacking in males, the duct is invariably absent in females (Howell and Tippins, 1977) [7]. The earliest sexual dimorphism in the first instar may happen two to three days after crawler settles in. In the life cycle of all Coccoidea, the principal dispersal phase is the unfed first instar or crawler. The most susceptible stage of most armoured scales developmental cycles may be the free -living crawler.

Materials and methods

The armoured scale *Abgrallaspis azadirachti*'s behavior was investigated in the Zoology Department of Raja Balwant Singh College in Agra.

Experiment 1: This technique searched and marked the sample to characterize the infection of the plant portion caused by the armoured scale *Abgrallaspis azadirachti*. The upper surface of the leaves and twigs is more severely

contaminated than it was previously, but no crawlers moved from the heavily infested area throughout the period of a week.

Experiment 2: The plant portion was marked similarly to the first experiment, but the infested areas were divided using the bagging technique, covered with polythene bags that had been darkened, and set on glass. The infested area was more infested than the clean area, which was nearly in complete darkness. Over a month, the higher half had gotten severely infested, but no scale had moved to the clean part.

Experiment 3: Only the upper (infested) leaves were lighted, despite the fact that two leaves that resembled those previously employed were positioned so that they were in close proximity to one another. The upper (infested) portion of the leaves was where the adult female scale insect travelled. It was later revealed that a total of twelve crawlers had appeared during this time and moved to different locations to settle. Three crawlers had landed on the upper portion of the leaves within the polythene bags, four were dispersed across the surface of the lower leaves, and five had gathered at the spot where two leaves met. According to these findings, crawlers primarily settle near points of contact.

Results and discussion

Move a considerable distance to another location from beneath the mother. Crawlers' transverse a few distance before settling. The amount of time that passed between crawler birth and their appearance beneath the female scale varied and was influenced by the surrounding environment. While some crawlers started to migrate, others that stayed under the female for an extended amount of time frequently perished without settling. According to Jones, the time it

took for crawlers to emerge from under the female scale insect in California ranged from 30 minutes to almost two days, depending on the surrounding environmental factors. Avoiding direct sunlight may cause the body to react to heat instead of light. The primary inference from the aforementioned experiment is that *Abgrallaspis azadirachti* crawlers exhibit either a positive or negative phototropism reaction to light. Therefore, they cannot exhibit a complete lack of differentiation to light conditions, regardless of whether they are settling. According to the results of the aforementioned experiment, crawlers travel upward from the contaminated portion of the plant to clean area, demonstrating negative geotropism, as opposed to migrating downward for settling. The majority of the females moved to the opposite side and the males to the same side whether the pads were horizontal or vertical to the soil and the infestation source was positioned on either face of the pad. This suggests that female crawlers are more active than males and are unaffected by phototropism and geotropism. Singh and Ojha (2005) [11] also described the observations on the behavior of crawler (First stage larva) of *Aonidiella orientalis* (Newsted) (Homoptera: Coccoidea: Diaspididae)

on the leaves, fruits and twigs of *Dalbergia sisso* along with dispersal of the crawler. According to Hulley (1962) [9], *Lepidosaphes beckii* (Newman) crawlers exhibited a noticeable phototaxis but no gravity reaction. 65% of the crawlers settled with their heads up, 20% with their heads down, and 15% with their heads horizontal to the ground out of 40 first – instar scales.

The crawler's sex, substrate type, temperature, and humidity all have a significant impact on how long it wanders. According to Greathead (1972) [4] and Huffaker *et al.*, crawlers are mostly at risk from temperature extremes, low humidity, rain, and an absence of adequate settling sites. Whether a crawler migrates over a smooth rough surface depends on the substrate's characteristics. Three main elements influence crawler dispersal and settling behavior, natural behavior patterns that start wandering and settling, the availability of suitable settling locations, and ambient environmental parameters as wind, speed, temperature, humidity, and illumination. Wind is a dispersal and mortality agent. A few crawlers may finally be placed on suitable hosts that they otherwise could not colonize, even though the wind may dislodge a large number of them.



Fig 1: showing the crawlers of armoured scale *Abgrallaspis azadirachti* on the upper surface of leaves of *Azadirachta indica*.

Summary

The behavior of *Abgrallaspis azadirachti* crawlers (first stage larva) was dependent on how quickly and how far they settled before departing from their mother. Before resting on

the same plant or a nearby plant, crawlers typically wandered erratically for a few hours or even minutes, and less than twenty-four hours. It would appear to be fair to say that if a crawler has fused from below the female scale, it

may be carried away until it settles. There is virtually little risk of being swept off the leaves where it emerged if the crawlers are settled more quickly. They exhibit either a phototropism that is positive or negative. Positively, the area with more light was more infested than the one with less light. Additionally, they exhibit negative geotropism as opposed to positive geotropism. Crawlers spent one to two hours wandering. Settling behavior has previously described as well. Numerous studies have shown that crawlers travel faster to dusty leaves than to clean ones. There is no clear correlation between the number of crawlers and the rate of settling. The behavior of crawlers to travel, settle, and infest the non-infested parts of leaves and twigs was also greatly influenced by temperature and humidity.

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