

Assessment of Life Cycle Terminology of Non-Mulberry Silk Insect

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Abstract

This review highlights several aspects considered while phrasing the life cycle of non-mulberry silk insect. It may improve the description style of the developmental history of the non-mulberry silk insect in scientific literature.

Keywords: life stage, terminology variation, non-mulberry silk insect

Introduction

The life cycle of non-mulberry silk insect is broadly divided into four stages i.e. egg, larva, pupa and imago. However, the larval stage is again divided into five subdivisions that are known as stadia or instars. Serious confusions have been noticed on the usage of the terminologies such as STAGE, STADIUM and INSTAR while describing the life cycle of the non-mulberry silk insect. Sometimes difficulties arise while using these terminologies either etymologically or biologically. Various authors in general have defined these terminologies.

Richards and Davies [1] defined instar as the successive post embryonic developmental stage of an insect which is formed by the moulting of the cuticle. Hinton [2-4] and Jenkin and Hinton [5] pointed out that the instar and the stadium should be counted once at the moment of apolysis. In their opinion, the short exuvial phase that only extends from apolysis to ecdysis constitutes the pharate or hidden instar and after ecdysis, true instar is formed. Wigglesworth [6] argued that where pharate phase is very short, the older Linnean definition of instar starting with ecdysis may still

retain some convenience. Jones [7] pointed out that instar is the individual form of an insect formed either by dorsal closure or by apolysis and it is very difficult to determine the moment. In this view, the instar is usually hidden or obscure. It is better to avoid the term with reference to different stages in the life cycle of an insect. If it is used at all, then it can also be used in the larval, nymphal, pupal and imaginal manifestation. He further clarified that the duration of a given stadium can be counted either from the moment of eclosion or ecdysis or from pupation. In order to avoid confusions between stage, stadium, and instar in the life cycle of an insect in general and in the non-mulberry silk insect in particular the following clarifications are suggested.

Stage

It should be used in a broader sense which involves major morphological characters, such as the principal divisions in the life cycle of the non-mulberry silk insects (i.e. egg, nymph, larva, pupa and adult etc.). For example, the life history of tasar silk insect has been divided into four principal stages.

Stadium

It should be used for the period between the two successive moults. For first stadium, it is between the hatching and the first moulting and for the fifth stadium; it is between the fourth moulting and pupation. For example, during first stadium the tasar non-mulberry silk insect takes about 0.25g of Asan leaf. The larval period of the tasar

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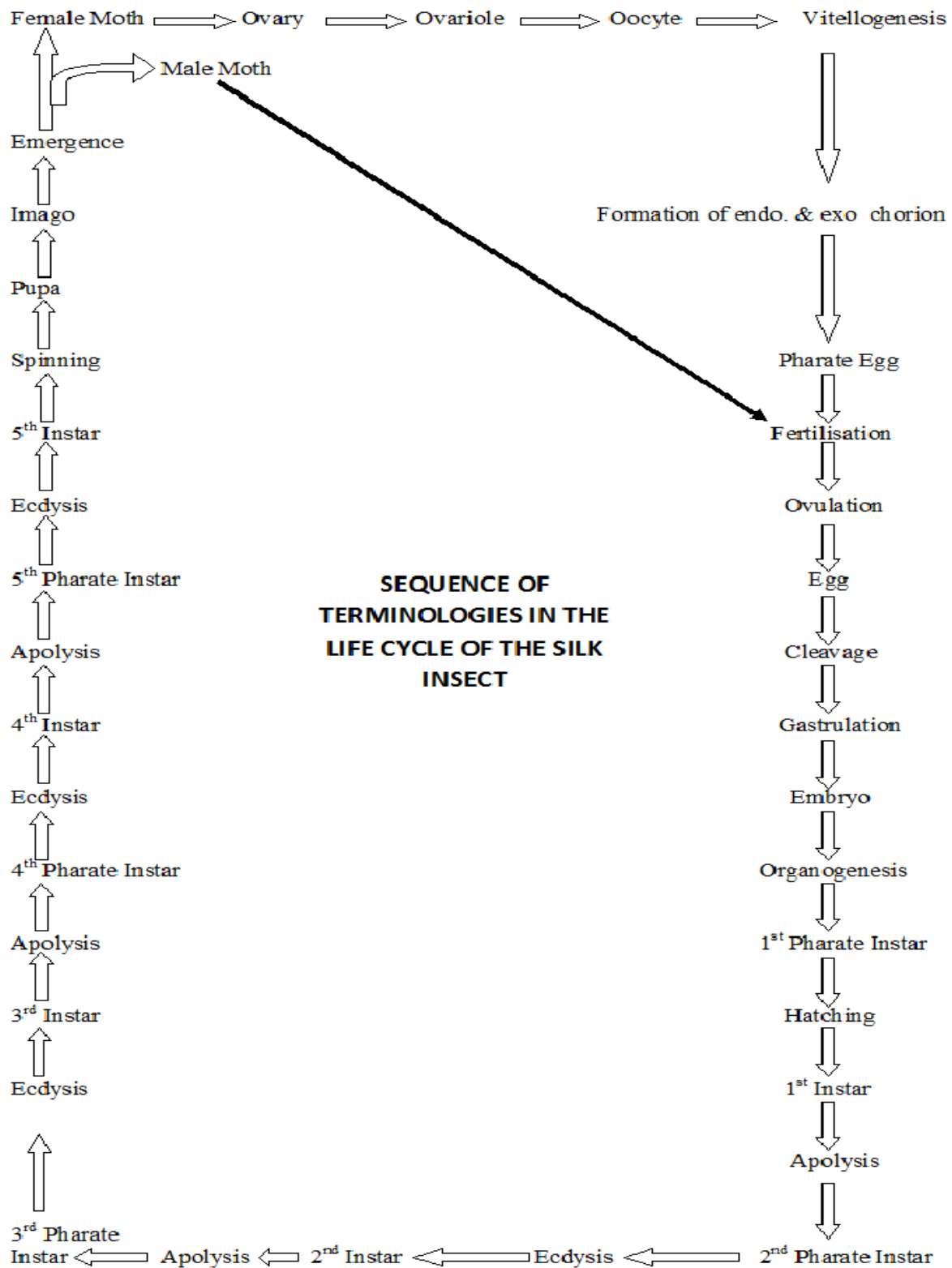


Figure 1: Different terminologies used in the life cycle of the silk insect

non-mulberry silk insects is divided into five stadia.

Moulting

Moulting includes apolysis and ecdysis. Apolysis means the process by which epidermis is retracted from the old cuticle prior to the secretion of a new one and ecdysis is the shedding of the old cuticle with formation of a new one. Moulting is related to the shedding and formation of the cuticle which is an integral part of the non-mulberry silk insect.

Hatching

Hatching is not equivalent to moulting. It is the shedding of the egg shell which is secreted by the follicle cells of the ovariole and is not an integral part of the non-mulberry silk insect. Moreover, moulting involves digestion and dissolution of the old endo-cuticle whereas hatching does not require any dissolution of the chorion.

Pharate Instar and Instar

The stage between apolysis and ecdysis is the pharate instar and between ecdysis to ecdysis is the true instar. But for first pharate instar, it is from dorsal closure to hatching and for 1st instar it is from hatching to moulting.

General Comments

Thus, similar to other insects, the life cycle of non-mulberry silk insect includes four major stages such as egg stage, larval stage, pupal stage and imaginal stage. The larval stage is again sub-divided into five stadia and the larva itself is sub-divided into five instars. Keeping the above classification in view, the developmental history in the non-mulberry silk insect can be described in a prescribed manner.

The differentiation of oocyte is from the germarium which develops as previtellogenic oocyte within the ovariole of an ovary. Vitellogenic oocyte is formed as a result of accumulation of yolk through vitellogenesis and at the end of which an endochorion is formed around the vitellogenic egg. After formation of the exochorion, the vitellogenic egg becomes the mature pharate egg. As soon as the

mature pharate egg is deposited by the female moth, it immediately enters the egg stage since the age of the egg is counted from the moment of oviposition.

From fertilization point of view, the egg stage can further be sub-divided into prezygotic and zygotic period. After the formation of zygote, the pre-embryonic period starts that extends up to the formation of germ layers. The embryonic period within the egg stage extends from the formation of germ layers up to the dorsal closure. The embryo within the egg stage and at the dorsal closure is actually the first pharate instar that remains within the egg stage for a specific or variable period and undergoes complex changes before hatching.

Then each succeeding pharate instar is formed within the preceding instar at the moment of apolysis. Thus, it can be safely said that except first, each pharate instar resides under the skin of the preceding instar as a pharate individual for a specific or variable time which after ecdysis reaches in the succeeding instar. Hence, the terminology stage, stadium and instar should be used in the above manner in order to overcome the ambiguity in scientific literatures on sericulture.

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