Summary

In this study I investigated how decoration-building of *Argiope aetheroides* is proximately controlled. Since decoration silk is produced from the aciniform glands and these glands’ secretion is also used in prey-wrapping, I tested if manipulating the amount of silk in the aciniform glands would lead to changes in the building of decorations. When the aciniform glands of *A. aetheroides* were supplemented by giving spiders ample prey and silk was not depleted, a significant increase in total area and number of arms of decorations was found. When the aciniform glands were intensively depleted by repeatedly removing the wrapped prey from webs, the size of decorations in subsequent webs was significantly reduced. Spiders building webs with small or no decorations were still able to produce plenty of silk to wrap prey. Therefore, the presence of undecorated webs seemed to result from the silk reserve, which the spiders may invest on decoration-building, being depleted, rather than the aciniform glands being completely emptied. Based on the results, I propose that there is a threshold point in the aciniform glands, and the amount of silk reserve in the glands relative to that threshold determines the size of decorations.

Introduction

After constructing a regular web, many orb-weaving spiders incorporate extra structures called decorations or stabilimenta on their webs (Nentwig & Heimer, 1987). Investigators have reported several types of decorations made

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1) E-mail address: spider@mail.thu.edu.tw

2) Special thanks are given to Thomas Leuteritz, who kindly helped translate Peters (1993), based upon which this study was developed. This work is partially supported by a National Science Council, Taiwan, R. O. C. grant to I.M. Tso (NSC-91-2311-B-029-006).

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of various material such as silk, egg sacs, prey remain and detritus from at least 12 genera of orb-weaving spiders (Eberhard, 1973; 1990; Levi, 1983; Nentwig & Heimer, 1987). Among various types of decorations the functions of those composed entirely of silk were the focus of most studies. Traditionally the functions of silk decorations had been proposed to be stabilizing the web, adjusting web tension, serving as a moulting platform, aiding in thermoregulation, defending against predators and attracting visually-oriented insects (reviewed in Herberstein et al., 2000a). Among them, the predator defense and prey attraction hypotheses have received the most attention. Many studies demonstrated that decorated webs built by various species of *Argiope* (Craig & Bernard, 1990; Tso, 1996; 1998a; Herberstein, 2000; Bruce et al., 2001; Craig et al., 2001), *Cyclosa* (Tso, 1998b) and *Octonoba* (Watanabe, 1999) caught significantly more prey than undecorated ones. Such results are usually attributed to the web decoration’s colour signals being similar to those of the food resources, and thus attractive to insects (Craig & Bernard, 1990; Craig, 1991, 1994; Zschokke, 2002). However, some researchers did not find decorated webs built by *Argiope* spiders to catch more prey than undecorated ones (Blackledge & Wenzel, 1999). These authors suggested that web decorations were included to function as warning signals to prevent webs from being destroyed by birds or as defense devices against parasitoid predators (Blackledge, 1998a; Blackledge & Wenzel, 1999, 2000, 2001). After evaluating many empirical studies, Starks (2002) suggested that the prey attraction and predator defense hypotheses were not mutually exclusive and web decoration might have multiple functions.

Although the functions of decorations built by *Argiope* spiders are well studied, it remains unclear how their building is proximately controlled. Individual *Argiope* spiders do not always decorate their webs, and the number and size of silk bands on webs varies considerably on a daily basis (Seah & Li, 2002). If the presence of web decorations really benefits the spiders as proposed by various hypotheses, then why do the spiders not always incorporate such structures on their webs? To determine how decorating behaviour is involved in the ecology of *Argiope* spiders, an understanding of how the inconsistent pattern is proximately generated is essential. In the past two decades, researchers have tried to provide answers on different levels. Craig (1994) found the inconsistent pattern to be able to prevent hymenopteran prey from learning to associate the decorations with danger and then concluded that inconsistent building of decorations (in both