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An effective protocol to isolate and mechanically test silk fibers spun by *Osmia lignaria*

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Protocol status: Working

We use this collection and it's working

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Keywords: silk, isolation, solitary, bee, mechanical, testing, cocoon silk of domesticated silkworm, further examination of isolated silk, silk cocoons during the fifth instar larval stage, larvae between silk initiation, *osmia lignaria* silk, domesticated silkworm, isolated silk, enabling silk characterization, understanding of bee silk property, silk characterization as part, bee silk property, silk fiber, silk cocoon, silk from silk, cocoon silk, silk initiation, health in other silk, spun silk, other silk, solitary bees such as *osmia lignaria* say, silk, spinning larvae, collecting individual fiber, bee biology, hymenoptera, isolated fiber, bee species, individual fiber, various arthropod lineage, solitary bee, producing bee species, role in bee biology, cocoon formation, fiber, managed solitary pollinator, fifth instar larval stage, *osmia lignaria*, solitary pollinator, based fiber



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Spotlight Video

The video below is a supplement with extra context and tips, as part of the protocols.io Spotlight series, featuring conversations with protocol authors.

https://www.youtube.com/embed/eLScOMnxUkE?si=3u5YzaCDXnp9K_ye

Abstract

Silk, a remarkable protein-based fiber spun by various arthropod lineages, has been prized for millennia, with the cocoon silk of domesticated silkworms and spiders being the most utilized and extensively studied. There is limited information on how silk can be used to investigate biology, development, and health in other silk producing species, particularly for solitary bees such as *Osmia lignaria* Say (Hymenoptera: Megachilidae). *Osmia lignaria*, an increasingly managed solitary pollinator, produces silk cocoons during the fifth instar larval stage. We have developed a minimally invasive protocol to isolate and mechanically test *O. lignaria* silk fibers using a 3-D printed well plate system for rearing and two specific isolation techniques. Our protocol allows for collecting individual fibers directly from silk-spinning larvae between silk initiation and cocoon formation without preventing subsequent cocoon development, enabling silk characterization as part of larger rearing and developmental studies. For this study, isolated fibers were mounted on C-cards, facilitating diameter measurement using a microscope and mechanical testing with an MTS Synergie 100 tensile testing instrument. We successfully isolated and tested the mechanical properties of naturally spun silk from *O. lignaria*, with 20 fibers isolated and mechanically tested from seven larvae. Further examination of isolated silk can reveal physical, molecular, chemical, and morphological characteristics, advancing our understanding of bee silk properties and their role in bee biology, evolution, and nutritional status. This protocol provides a practical tool for researchers to isolate and study silk from silk-producing bee species.



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Protocol

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C-cards preparations

VERSION 1

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