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OBSERVATIONS ON THE PREDATION BY THE CRAB SPIDER *THOMISUS ONUSTUS*

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ABSTRACT

Crab spider of the genus *Thomisus* Walckenaer (Araneae: Thomisidae), the *T. onustus* is a potent predator able to hunt prey larger than its own size. This study reports on a predatory event involving this spider, mimicking the *Cajanus cajan* flower for effective predation of pollinator bee *Apis dorsata*. The study focuses on the predation mechanism utilized by the spider making use of the plant architecture. The observations reveal that in a papilionaceous yellow coloured corolla of *C. cajan*, the same-coloured *T. onustus* is able to colour camouflage and can accommodate itself in a concealed position beneath the standard petal thus predating the prey by deceiving.

Key words: *Cajanus cajan*, cavae, keel petal, *Thomisus onustus*, crab spider, predation, *Apis dorsata*, camouflage, mimicry, prey, deceiving, corolla

Biotic interactions in the natural ecosystem range from symbiosis to parasitic associations where the organism has adapted itself for millions of years driving the energy chain of the ecosystem. Adaptations for predation have been successfully used by predators for capturing their prey in natural ecosystems. One of the most effective predations where the predator is unnoticed by the prey, thereby assuring that the prey would get trapped is mimicry and camouflage. During the course of time and various mechanisms for predation, a type of biotic interaction gets evolved for capturing the prey. Such an interaction is where the colouring seems to be a compromise between being conspicuous to conspecific or in other terms being poorly visible to predators or prey. Camouflage or mimicry is not only effective for escaping from their predators but also for deceiving the prey as they go unnoticed by the latter thereby easily trapping them. Thus, the predators ensure finding a prey while using flower as a platform for their feeding activities. Spiders are diverse groups of invertebrates and as per the World Spider Catalog > 47000 species and over 4000 genera are known. The crab spiders belonging to the genus *Thomisus* are known to have a mutualistic association with the plants. The spider resides in the flower and prevents or deters the harmful florivores or herbivorous insects. In turn, the plants are known to attract these spiders by emitting floral volatiles such as β-ocimene upon attack by herbivores (Knauer et al., 2018). Interestingly the spider uses the floral physical colour and structure as platform for carrying out its predatory activities. The crab spider also feeds on the pollen and nectar of the flower during the lean phase of pollinators and thus can survive for an extensive period (Vogelei and Greissl, 1989). In addition to it, when the female crab spiders mimic different flower species, they are simultaneously cryptic in the colour-vision systems of both bird predators and hymenopteran preys (Thery and Casas, 2002). The present paper is a report of crab spider *T. onustus* utilizing the flowers of *Cajanus cajan* for its predation.

MATERIALS AND METHODS

Field observations were carried out in *C. cajan* agricultural plots at the Indira Gandhi National Tribal University Amarkantak, Madhya Pradesh during the February 2022 (flowering stage of *C. cajan*) during the day when the pollinators visited the flowers. The predatory behaviour of the crab spider *T. onustus* was observed and the same was documented with photographs.

RESULTS AND DISCUSSION

A typical papilionaceous flower has a vexillum (standard) petal which encloses the alae (wings) and the carina (keel) petals (Fig. 1A). Since the colour of the flower and that of the crab spider *T. onustus* is

yellow, latter was able to disguise itself with the flower colour (Fig. 1B-D). Thus, the prey is unable to notice the spider due to cryptic colouration. Similar pattern has been observed in case of the Australian crab spider *Thomisus spectabilis* (Heiling et al., 2005). Moreover, the architectural pattern of the papilionaceous corolla also has a distinct advantage for the crab spider, which perhaps enhances its efficiency of predation as the spider is able to fit into the inner cavity of the standard petal (Fig. 1B-D), thus concealing itself from the visiting pollinator and even protects itself from its predators. Thus, in a papilionaceous corolla, the spider has a dual advantage, one being the colour camouflage and the second being the spiders gets into a concealed position beneath the standard petal. It seems that the spider is able to use the cavae present on the wing petals of *C. cajan* to get a firm grip (Fig. 1D). For creating enough space for the visiting pollinator, such as the honey bee, *Apis dorsata,* the spider pushes the standard petal to create an orifice (Fig. 1B-C). The honey bee visits the flower little realizing the consequences of entering the flower. It has been observed that the spider adopts sit-and-wait approach for its prey so that the spider will get its food since the pollinators are sure to visit the flowers for collection of the nectar as a reward for carrying out pollination. Even a single pollinator visiting the flower is enough for the spider to trap its prey. As soon as the bee forces its entry into the flower through the orifice, the spider ambushes it by using the raptorial forelegs preventing its escape, and ultimately leading to death (Fig. 1D). Subsequently, the spider feeds on the bee. A dipteran is also recorded on the prey *Apis* sp. (Fig 1-D). This is the first report of the crab spider *T. onustus* using *Cajanus cajan* flower as an effective site for predation.

There are reports of *T. onustus* predating many insects using flowers of many plants such as *Erigeron annuus* (L.) Pers., *Bellis perennis* L., *Glebionis segetum* (L.) Fourr., *Malva sylvestris* L., *Chrysanthemum frutescens* (L.) Sch.Bip., *Eryngium* L. sp., *Erica tetralix* L., *Biscutella laevigata* L., etc. (Llandres et al., 2012; Knauer et al., 2018; Rodríguez-Gironés and Jiménez,

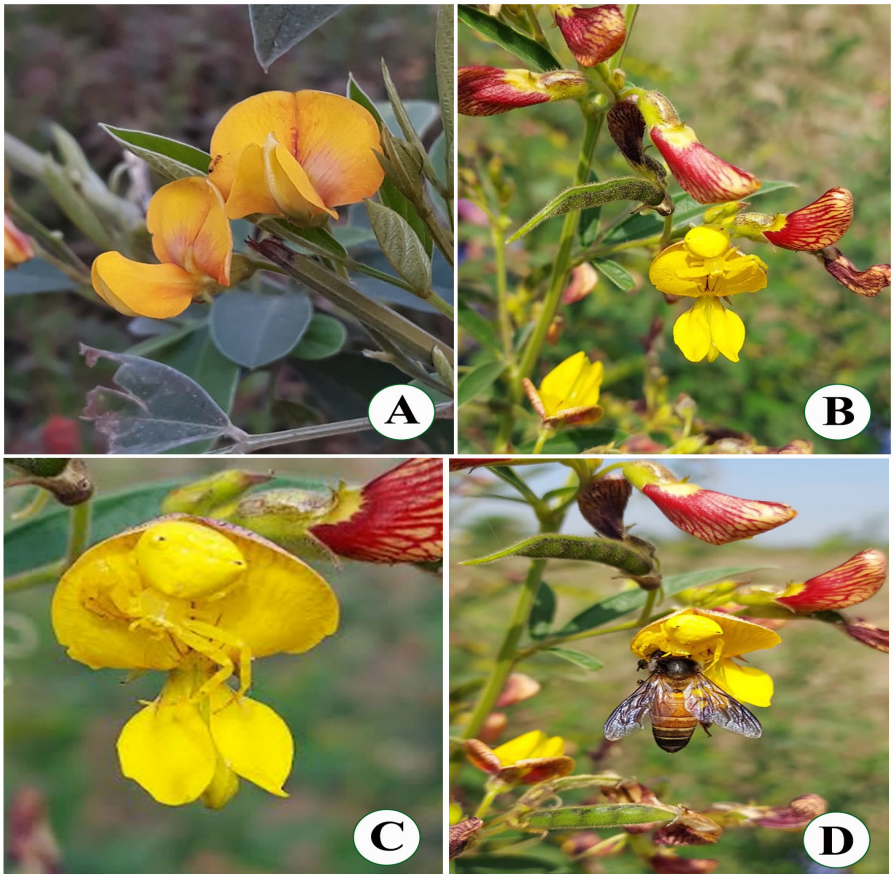

Fig. 1. *Thomisus onustus* mimicking the flower of *C. cajan* for its predation; A. A typical papilionaceous corolla; B. *T. onustus* mimicking the corolla; C. *T. onustus* positioning itself under the vexillum of *C. cajan*. D. *T. onustus* ambushing the bee *Apis* sp. using the raptorial forelegs

2019;). Similar patterns of crab spiders belonging to the genus *Phrynarachne* deceiving its prey have been recorded (Yu et al., 2021). On the other hand, in case of *Epicadus heterogaster* it has been observed that the spider attracts pollinators regardless of flower thus representing an evolutionary pathway (Vieira et al,, 2017). However, in flowers where the papilionaceous corolla is absent, the chances of spider getting spotted increases, hence the pollinator becomes cautious and avoids visiting such flowers (Antiqueira and Romero, 2016); and due to which a reduction in the bee visits has been observed (Knauer et al., 2018). Papilionaceous flowers such as the one in *C. cajan* serves dual advantage for the crab spider for predating the pollinators. Not only the colour of the spider is the same with the flower colour but the crab spider also conceals itself in the inner cavity of the standard petal thereby getting conspecific from its predators as well as preys. The spider is able to utilize the cavae present on the keel petal to get a firm grip on the flower. The spider pushes the standard petal to create an orifice for the visiting bee. Thus, the present observations indicate that crab-spiders' colour mimicry works successfully on the visual systems of both predator and prey.

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