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Reddish colouration in a Green spider: evolutionary origin and subsequent adaptation

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The Green lynx spider, *Peucetia viridans*, is normally coloured a uniform green. An individual heavily suffused with reddish pigment was collected from a reddish flower. Origin of the ability to match the colour of a non-native flower is discussed in relation to a recent study on spider colouration.

Many species of spiders have been reputed to possess the ability to reversibly change their colour. In a crab spider, *Misumena vatia* (Clerck), this ability has been clearly demonstrated (Packard, 1905). Normal colour of *M. vatia* is white due to guanin crystals present in intestinal diverticular cells which can be seen through the transparent epidermis (Millot, 1926). White spiders placed on a yellow flower or paper become yellow (time required varies from one to 20 days); yellow spiders placed on a white flower or paper become white again in five or six days (Gabritshevsky, 1927). Yellow pigmentation is exhibited when a carotenoid-containing fluid is transported from the intestine to the epidermis (Weigel, 1941). Thus, the entire spider body is involved in this slow but dramatic colour change. *M. vatia* and a few related crab spiders are the only spiders which are reportedly known to reversibly change the colour of the entire body (Gertsch, 1949; Hinton, 1976). Kaston (1965), however, discussed two references (Bristowe, 1958; Uyemura, 1957) which reported almost instantaneous colour changes from white or green to brown.

The spider family Oxyopidae contains hunting spiders which are specialized for living on plants (Cloudsley-Thompson, 1968). Their long legs enable them to travel easily and rapidly over vegetation. Lynx spiders of the genus *Oxyopes* normally blend with the background of their habitat substrate (Brady, 1975). The *O. tridens* group, which are mostly black and white, blend well with the drab habitats in which they occur; the *O. acleistus* group blend well with their green background colours (Brady, 1975).

Peucetia viridans (Hentz), commonly known as the Green lynx spider (green princess of Duncan, 1949), is a striking green in colour although small bright red spots may occur on the body and legs (Brady, 1964). Various observers report the occurrence of reddish markings on *P. viridans* but these remarks generally refer to small spots (Duncan, 1949). Reddish pigmentation observed by previous workers has not been of sufficient areal extent to alter the main colour appearance of the spider.

On 30 September 1970 an individual of *P. viridans* was collected on corona vine, *Antigonon leptopus* Hook. & Arn. (Polygonaceae), in a garden in Austin, Travis County, Texas, U.S.A. This spider exhibited extensive pink-maroon colouration on each tibia (less so on tibia IV) and on the dorsum of the abdomen (associated with white spots). The general appearance of this individual was decidedly pink. The spider blended quite well

with the background colour presented by the bright pink flowers of *A. leptopus*. The spider was placed in a plastic box with a spray of *A. leptopus* flowers. After a week to 10 days both flowers and spider had begun to lose their colour. Tibial colouration was completely lost while abdominal pink colouration had begun to concentrate in somewhat smaller areas. The general effect was a decidedly less pink spider.

Although the colour match of the spider with the flower was excellent, this colour matching could not have been due to direct natural selection as a result of association with this plant in Texas because *A. leptopus* is introduced from Mexico. Populations of *P. viridans* in Mexico could have evolved the ability to match colour with this plant. Such an occurrence would seem unlikely as no tendency for this spider to associate with any particular plant has been previously observed (see remarks by Gertsch, 1949: 213). No such association appears to exist between *P. viridans* and *A. leptopus* in central Texas today. Selection as a result of resting on native pink-flowered shrubs is possible although few such shrubs exist.

Most plant backgrounds in which *P. viridans* occurs are various shades of green. In such sites the spider is well-camouflaged. On yellowish flowers this species is a dilute green in apparent efforts to match background colour. Gertsch (1949) reported that, in California, *P. viridans* found on wild buckwheat, *Eriogonum fasciculatum* (a plant with dull green foliage and yellowish flowers), are "yellow or even brown in color".

The pinkish colour exhibited by this spider was undoubtedly in response to the pink colour of *A. leptopus*. A recent paper by Hinton (1976) provides a possible evolutionary origin of the reddish colouration of *P. viridans*. Red patches of colour appear on the sides of the abdomen of the crab spider *M. vatia*. As these spots are ultra-violet absorbing, they are invisible to insects. Hinton (1976) hypothesized that these spots functioned as warning colouration for birds and other vertebrates. The Green lynx spider, *P. viridans*, guards its eggs ". . . with great vigor, and when a pencil was poked at the egg case, she left an impression of her fangs in the soft graphite end" (Brady, 1964). This habit of vigorously defending an egg case, coupled with the extremely painful bite (fortunately this knowledge has been acquired by personal communication rather than personal observation) of this species, suggests that the pinkish colouration of *P. viridans* evolved as a contrasting colour to the basic green colour of this spider. Such a colour contrast in connection with a reinforcing painful bite could effectively deter vertebrate predators.

That at least several spiders including *P. viridans* have the ability to match their background colouration has been established earlier in this communication. *P. viridans* is a basically green spider with pinkish markings which may function to deter vertebrate predators from devouring its egg case as it guards its progeny. The ability to utilize this pinkish colouration to match background colouration to avoid detection by either potential predators or prey as the spider rests on a pink flower has occurred because of the preadaptive possession of this colouration.

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