

MODE OF HUNTING AND FUNCTIONAL RESPONSE OF THE  
SPIDER *MARPISSA TIGRINA* TIKADER  
(SALTICIDAE : ARACHNIDA) TO  
THE DENSITY OF ITS PREY, *DIAPHORINA CITRI*

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The mode of hunting in *Marpissa tigrina* Tikader is typical of a carnivore predator. Both the sense of sight and touch are involved in the perception of the prey. After locating the prey, the spider creeps cautiously towards the prey so as not to disturb it, finding the prey in its jumping range, pounces upon it. The spider is capable of capturing 3-4 citrus psylla, *Diaphorina citri* one after another and feeds on them all at a time.

*M. tigrina* shows a functional response to increasing density of its prey (citrus psylla) which is a serious pest of citrus. The number of prey consumed daily by an individual spider increased with the increase in prey density up to 40. With the further increase in prey density, the rate of predation decreased progressively at a reduced rate. The results reveal that the spider is a highly beneficial predator of citrus psylla.

(Key words: *Marpissa tigrina*, hunting, functional response, *Diaphorina citri*)

## INTRODUCTION

Spiders are well known for their predatory activity on insect pests and other arthropods. However, there is little information on predator-prey relationships which represents an important component of field population ecology. There is also a great interest in the problem of how predator population affects the population of their prey. For assessing the performance of a predator, the first step is to learn as to how it performs as an individual particularly the way it searches its prey, perceives the prey and accepts or refuses given prey individuals (HUFFAKER *et al.*, 1971). The knowledge of functional response of individual is, therefore, essential for a clear understanding and approach to modelling predator-prey interactions. The functional responses of predators were studied in detail by HOLLING (1959 a, b, 1961, 1966).

During the course of investigations of spider fauna of citrus orchards at the Punjab Agricultural University, it has been observed that *Marpissa tigrina* Tikader has great potential for preying on citrus psylla, *Diaphorina citri*, a serious pest of citrus. Hithertofore, this spider has also been reported to be a voracious feeder of fulgorid pest of grapevine i.e., *Amarasca biguttula biguttula* (SADANA & KAUR, 1980). It was, therefore, considered worthwhile to study the mode of hunting and to assess the functional response of this spider to the density of its prey, citrus psylla.

## MATERIALS AND METHODS

The adult females of *M. tigrina* were reared individually in the laboratory cages. The latter consisted of a lantern chimney placed over a petridish paved with moist soil and then filter paper and covered by a

piece of muslin cloth tied with the help of a rubber band. The spiders were starved for 24 hours before the start of experiments and then provided with different number of nymphs of citrus psylla i.e., 10, 20, 30, 40, 50, 60 and 70 in ten replicates. A few leaves of citrus were also introduced in the laboratory cage which served as food for the prey. The number of nymphs consumed by each spider was recorded after 24 hours of starting the experiment. Observations were also recorded on the searching method used, mode of perception of prey and attack by *M. tigrina*.

## RESULTS AND DISCUSSION

### *Perception of prey and hunting:*

*M. tigrina* searches its prey with its keen eye sight besides depending upon contact stimulus. It creeps about, stops every

now and then, raises its head and gazes around its neighbourhood. As it receives stimulation due to the movement of its prey, it starts approaching the prey with caution so that its own movements are imperceptible to the prey. Such smooth and creeping movements are often accompanied by fluttering of palpi. At times, when the prey approaches from behind and touches the body or legs of the spider, it turns quickly to face the prey. When the prey comes within the jumping range which is almost double the length of its body, it suddenly leaps upon the prey with an unerring aim. The jumping distance in salticids varies greatly (SNETSINGER, 1955; BRISTOWE, 1958). Just before jumping, the front legs are extended forward for seizing the prey. A similar attacking posture is reported in the Thomisid spider, *Philodromus rufus* (HAYNES & SISOJEVIK, 1966).

TABLE 1. Influence of prey, *Diaphorina citri* density on the number of prey consumed by the predator, *Marpissa tigrina*.

Treatment Group	Number preyed upon						
	10	20	30	40	50	60	70
1	10	14	15	18	15	14	13
2	10	16	15	19	16	17	14
3	10	12	17	15	14	15	14
4	10	15	18	18	16	16	15
5	10	17	15	15	15	17	16
6	10	18	14	13	18	14	13
7	10	15	16	15	17	15	15
8	10	13	18	17	19	17	16
9	10	12	19	18	17	14	13
10	10	18	15	19	16	13	14
Mean	10.0	15.0	16.2	16.7	16.3	15.2	14.3
Average %	100	75	54	41.7	32.6	25.3	20.4

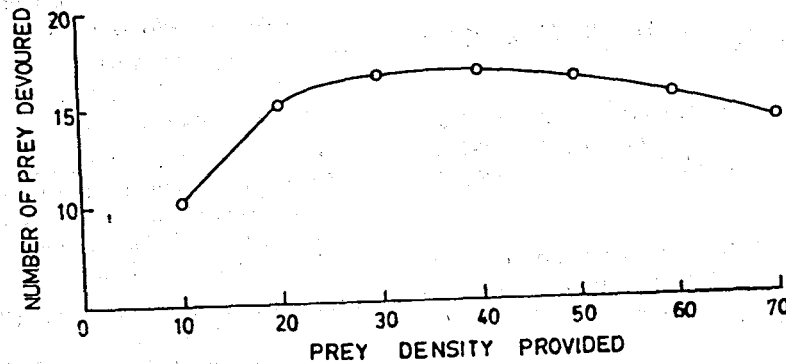


Fig. 1. Functional response of *Marpissa tigrina* in relation to prey, *Diaphorina citri* density.

*Mode of feeding:*

The manipulation of prey during feeding is done through palpi. The Prey is crushed with chelicerae to squeeze out body juices on which the spider feeds. It discards the hard parts of prey which are rolled into a ball like structure by the manipulation of palpi. Partial digestion of the prey before ingestion takes place in preoral cavity. The latter has endites on either side containing maxillary glands. HAYNES & SISOJVIC (1966) also reported partial digestion before ingestion in *P. rufus*.

*Functional response to prey density:*

The results of the experiments on functional response of *M. tigrina* to the prey (citrus psylla) density are presented in Table 1 and Fig. 1. It is evident that the number of prey consumed daily increased with increase in prey density upto 40. With further increases in prey density, the predation decreased progressively at a reduced rate. This indicates declining functional response of *M. tigrina* at higher prey densities. The functional response curve of *M. tigrina* to prey density (Fig. 1) is closely similar to the curve described by HAYNES & SISOJVIC (1966) for functional response

of the spider *Philodromus rufus* Welck. (Fam. Thomisidae) to the density of *Drosophila*. An S-shaped or sigmoid curve is characteristic of the functional response of various predators (HOLLING, 1961; HUFFAKER *et al.*, 1971).

The declining trend in functional response of *M. tigrina* may be due to the disturbance caused by the prey to the predator because of overcrowding at the higher densities and also due to the limit on extent of feeding. Though the functional response of *M. tigrina* shows a declining trend after a certain rise to plateau, this does not mean that the predatory spider is unable to regulate population of its prey in a realistic population-interaction situation. In the field, there is not one predatory spider which is working at high densities of prey. *M. tigrina* is, therefore, a useful predatory spider which can be exploited to economic advantage for the control of citrus psylla.

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