



## ELEVATED CO<sub>2</sub> REARED BROWN PLANT HOPPER AS PREY ON FEEDING POTENTIAL OF WOLF SPIDER *PARDOSA PSEUDOANNULATA*

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### ABSTRACT

Laboratory studies were conducted to find out the influence of elevated CO<sub>2</sub> (570±25 ppm) on the feeding potential of wolf spider *Pardosa pseudoannulata* (Boesenberg and Strand), an important predator of rice brown planthopper (BPH), *Nilaparvata lugens* (Stal.) during 2013 and 2014. The spiders were allowed to feed on the BPH nymphs that were reared under elevated CO<sub>2</sub> (570±25 ppm) and ambient CO<sub>2</sub> (400±25 ppm) conditions. Results indicated that predation by wolf spider did not differ from that of ambient CO<sub>2</sub>.

**Key words:** Elevated CO<sub>2</sub>, *Nilaparvata lugens*, nymphs, density, wolf spider *Pardosa pseudoannulata*, predation

Climate change, a current global concern is the change in climate over time, either due to natural phenomenon or because of anthropogenic activity and exerts multitude of threats to many species in various forms. The pre-industrial levels of CO<sub>2</sub> in atmosphere rose from 285 ppm to the current level of 397 ppm, which is further predicted to rise to 570 ppm by the end of 2050 (IPCC, 2007). The CO<sub>2</sub> would thus affect insects indirectly through host plants by influencing the host physiology. Increased atmospheric CO<sub>2</sub> levels have an indirect influence on natural enemy fitness through changes brought in plants and their herbivores.

The plants grown under elevated CO<sub>2</sub> had high C: N ratios in tissues, which results in slower growth and developmental rates of insects and thereby increasing in the length of life stages and rendering them vulnerable to attack of natural enemies (Coviella and Trumble, 1999). Herbivores may be physically weakened while feeding on poor hosts under elevated CO<sub>2</sub> conditions, and might thus considerably fail to defend themselves against predators and parasitoids. Enriched CO<sub>2</sub> may alter enemy-avoidance behavior as some aphids showed reduced responses to alarm pheromones under elevated CO<sub>2</sub>, potentially making them more susceptible to enemy attack (Awmack *et al.*, 1997). Such effects would increase the susceptibility of herbivores to natural enemies, reducing herbivore population size under elevated CO<sub>2</sub> conditions (Coll and Hughes, 2008). Most climate change studies are carried out on plant and insect pests; subsequently several studies have to be conducted to obtain an

apparent view of the effects of elevated CO<sub>2</sub> on natural enemy populations. In this context, there is need to assess the impact of rising atmospheric CO<sub>2</sub> on wolf spider, *Pardosa pseudoannulata* (Boesenberg and Strand), an important predator of rice brown planthopper, and hence the present study.

### MATERIALS AND METHODS

Wolf spider, *P. pseudoannulata* adults were collected using an aspirator from the unsprayed experimental rice plot. Immediately after the collection, spiders were confined individually in 45 x 30 cm glass chamber and starved for 24 hr. As the wolf spiders prefer comparatively lower temperature and shady areas to survive, these were collected and reared at the controlled laboratory conditions (25±2°C and 70 ± 5% RH). Later, both ambient and elevated CO<sub>2</sub> reared rice brown planthopper (BPH), *Nilaparvata lugens* nymphs were provided as prey in different proportions (1:10, 1:20, 1:30, 1:40 and 1:50) to the spider in five replicates each. Observations on the number of BPH consumed by the spiders were recorded for 10 consecutive days (Munyuli *et al.*, 2007). Dead BPH that had not been eaten by the spiders were also counted. The data were subjected to square root transformation and statistically analyzed with CRD using SAS Software, Version 9.3 (SAS, 1990).

### RESULTS AND DISCUSSION

The predation by wolf spider, *P. pseudoannulata* did not differ between the elevated and ambient CO<sub>2</sub>