1. Introduction
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Whiteflies and its biotypes are poly-phagous pests of great significance in agriculture worldwide (Kontsedalov et al., 2008; Watson et al., 1992), having a long history of destabilizing agricultural and horticultural production. It belongs to family Aleyrodidae from the suborder Homoptera of order Hemiptera having 1,556 extant species in 161 genera (Martin & Mound, 2007). The suborder Homoptera has also been considered as a separate order (Matthews et al., 2010). Whiteflies are associated with 160 host plant species from 42 families of 113 plant genera of field and fruit crops, ornamentals and forest trees including weeds (Brown and Bird, 1992). It occurs at all the stages of the crop growth and responsible for direct and indirect yield losses (Selvaraj and Ramesh 2012). Its small size belies its ability to move relatively large distances, placing many hosts within communities at risk of infestation. The ability to disperse is made worse by its extensive movement through commerce of transplant, floricultural, or other greenhouse plants. Besides small size, rapid reproductive potential is another characteristic feature that limits options for control. The damage potential of this pest as a direct plant stressor, virus vector and quality reducer (e.g., by contamination with excreta) is substantial. These attributes, among others, render this species a shared pest within agricultural communities. As a result, there have been intensive investigations on the biology, behavior and control of this group and the viruses they vector.

Adults hardly exceed 1.0 mm in length, are of snow-white in color attributed to the secretion of wax on its body and wings (Plate 1). Adult as well as immature stages inhabit and gradually feed on the lower surface of leaves, reducing plant vigor by depletion of plant sap. Draining out enough sap to obtain scarce amino acids, lead to the production of great quantities of honey dew (Khan et al., 2011). This honey dew becomes a substrate for sooty mould that reduces the photosynthetic capacity of the foliage.

Adults of *Bemisia tabaci* (Gennadius) (Plate 7) are important as vectors of many virus diseases than as direct pests. Under severe infestation of yellow mosaic virus in black gram, the harvest was resulted with blank yield in particular (Gupta and Pathak, 2009). An excessive use of pesticides has failed to control the whitefly (Roditakis et al., 2005) and led to serious problems of resistance (Prabhakar et al., 1992). This escalation of problems has prompted many researchers to become involved in management studies of
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whiteflies, the viruses they are capable of transmitting. Many of the tactics used to control \textit{B. tabaci} have been reviewed by Bellotti and Arias, 2001; Faria and Wraight, 2001; Gerling \textit{et al.}, 2001; Hilje \textit{et al.}, 2001; Morales, 2001; Naranjo, 2001; Palumbo \textit{et al.}, 2001).

The chemical control is considered to be the most promising tool to combat whitefly menace but the long term sustenance is still a challenge (Horowitz and Ishaaya, 1996). Palumbo \textit{et al.}, (2001) advocated that the repeated applications of chemicals have resulted in the development of resistance in whitefly. Many molecules have been introduced in the market for the use. Among the conventional insecticides, synergized pyrethroids have been found the most efficacious to control \textit{B. tabaci} (Horowitz and Ishaaya, 1996; Ellsworth and Watson, 1996; Prabhaker \textit{et al.}, 1998). Such spray mixtures involve combining high rates of pyrethroid insecticides with moderate rates of compounds from a different chemical class such as organophosphates, carbamates, formamidines and cyclodienes. Either compound used alone provides little protection against \textit{B. tabaci}. The increased toxicity results from the inhibition of insecticide resistance mechanisms (Dittrich \textit{et al.}, 1990; Denholm \textit{et al.}, 1998).

Some new chemistry insecticides such as insect growth regulators and other molecules are getting more attention as a good substitute (Ali \textit{et al.}, 2005). Pyriproxyfen and buprofofen are the most prominent members of insect growth regulators group (Palumbo \textit{et al.}, 2001); however buprofofen has been regarded as the first selective IGR. Both the compounds are effective against the immature stage of whitefly by inhibiting the incorporation of N-acetyl-glucosamine into chitin and interfering with cuticle formation (Kanno \textit{et al.}, 1981) resulting into failure of ecdysis. On the other hand pyriproxyfen exhibits disruption of normal juvenile hormonal balance (Dhadialla \textit{et al.}, 1998) resulting into suppression of embryogenesis, metamorphosis and adult formation (Ascher and Eliyahu, 1988; Ishaaya and Horowitz, 1992, 1995). It is not effective against adult stage. Pyriproxyfen is reported to affect all immature stages, while buprofofen affects particularly first and second instar stage (Beevi and Balasubramanian, 1991).

The whitefly population under natural environment moves through an apparent influence of a multiple man made or naturally occurring abiotic as well as biotic factors.
Understanding of the timing, spatial distribution and magnitude of mortality factors is central to the study of population dynamics. Such information on biological attributes and population dynamics of whiteflies is an important key for its successful management through predicting pest outbreaks that build upon, existing mortality forces (Naranjo and Elsworth, 2005). Also an adequate knowledge on ecological aspects of concerned pest and of factors i.e. host plants, climatic conditions etc, responsible for change in status of key pest (Southwood, 1978; Bonato et al., 2007) and host plant selection by herbivore arthropod is a major argument in ecology which provides base lines for developing any pest control strategy (Khan et al., 2011).

The studies on bio-assay of insecticides in laboratory as well as field, determination of population dynamics, the population count, collection and handling of insects are first step to determine effective pest management strategy. The small size of whiteflies and attraction towards yellow color and orientation behavior toward light (positive photo-taxis) has however made the counting a hectic and troublesome task. Many scientists have tried and are still working on various ecological and management aspects viz., natural population fluctuation, dynamics and bio-assay of different pesticide molecules for this specific pest. The adults are active fast fliers, get away with a slight disturbance and this may be one of the reasons that the capture and handling method of adult whiteflies have not been properly addressed (Gupta and Pathak, 2009).

The population dynamics study is not sufficient to ascribe causality, but requires a detailed approach. In last few decades, a number of studies have been conducted to describe the host suitability of whiteflies on various host plants (Carabali et al., 2010; Naranjo et al., 2010; Kakimoto et al., 2007; Bayhan et al., 2006; Samih, 2005). Life table studies were also initiated to examine whitefly mortality dynamics. Interacting sources of mortality were considered as weather (dislodgement by severe winds, dust or rain), predation (usually by coccinellid beetles), parasitoids, physiological in viability (in eggs and nymphs), and insecticides (Ellsworth et al., 1998; Naranjo et al., 1998; Naranjo and Ellsworth, 1999; Naranjo, 2001).

Natural enemies are self regulating and once they are established further investments in control are not necessary. Among the natural enemies, indigenous
predators play an important role in delaying pest density increases but their contribution has often been undervalued. *Bemisia tabaci* predators include beetles (Coleoptera: Coccinellidae), true bugs (Miridae: Anthocoridae), lacewings (Neuroptera: Chrysopidae), mites (Phytoseiidae) and spiders (Araneae). Sengonca et al., (2004) reported that, coccinellids were specialist predator of whiteflies. The value of coccinellids in biological control of insect pest is enhanced by the predaceous habit of both adults and grubs, which contribute to the destruction of pest at a greater density.

Considering above facts, the experiments were designed with following specific objectives-

- Development of monitoring and capturing device for adult whitefly, *Bemisia tabaci* Gennadius
Plate 1: Damage caused by whitefly (A & D – Blackish appearance due to development of sooty mould on honeydew secretion; B & C – Yellow vein mosaic on okra)