1) indicated that the treatment of imidaclorpid @ 0.28 ml/l recorded the highest mortality (99.89%), while dimethoate @ 1 ml/l (99.83% mortality), cartap hydrochloride @ 1 g/l (99.73% mortality) and *V. lecanii* @ 2.0 g/l + imidaclorpid @ 0.14 ml/l (98.78% mortality) were the next effective treatments against jassid.

Bhargava and Bhatnagar (2001) reported that imidacloprid 600 FS at 9 ml/kg seeds and 70 WP at 10 g/kg seeds were effective against jassid (*A. biguttula biguttula*). *B. bassiana* and *V. lecanii* at higher dose (5g /l) caused 83.59 and 80.84 per cent mortality, respectively of *A. biguttula biguttula* on brinjal. Thus, the present findings are in close agreement with the results of the earlier workers.

From the present study, it can be concluded that *V. lecanii* @ 2.0 g/l + imidaclorpid @ 0.14 ml/l was found to be as effective as the chemical insecticides at full dose and it can be used for the bio-intensive management of jassid in okra ecosystem.

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Record of Natural Enemy Complex of Spiralling Whitefly *Aleurodicus disperses* Russell (Homoptera : Aleyrodidae) infesting Mulberry in Tamil Nadu

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Spiralling whitefly *Aleurodicus disperses* Russell (Homoptera : Aleyrodidae) a polyphagous exotic pest was recorded in India, infesting around 19 species of plants in Kerala and Tamil Nadu region (David & Regu, 1995). Its sudden outbreak in cassava (Palanisamy et.al., 1995) and in guava (Mani & Krishnamoorthy, 1996) as well as ascendancy of its spread on mulberry causing economic loss in south India was reported by several workers (Douressamy *et.al.,* 1997, Geetha Bali *et.al.,* 2001 and Raja Gopal Reddy *et.al.,* 2001).

In order to explore the natural enemies associated with *A. disperses,* a number of field surveys were carried out for four years (2003-2006) at

Table 1. Details of natural enemies of spiraling whitefly, *Aleurodicus disperses* Russell (Homoptera: Aleyrodidae) recorded in mulberry of Tamil Nadu (2003-2006).

Sl. No.	Natural Enemies	Taxonomic position	Population Nos./Plant	Season of abundance	Stage of the host attacked	Other hosts Infesting Mulberry
1.	**Predators** *Menochilus sexmaculatus*	Coleoptera Coccinellidae	5.53	All	Eggs, Nymphs & Pupae	Mealy bug Thrips
2.	*Cryptolaemus montrouzieri*	"	0.86	Summer Winter	"	"
3.	*Coccinella septumpunctata*	"	6.10	All	"	"
4.	*Axinoscymnus* Puttarudriahi	"	16.56	Winter	"	—
5.	*Mallada astur* Chrysopidae Parasitoids	Neuroptera:	0.70 Winter	Summer	"	Thrips
6.	*Encarsia* sp. Aphelinidae	Hymenoptera :	2.66*	Winter	Nymphs & Pupae	—
		CD (0.05) CV%	0.99 12.41			

*% of parasitisation

monthly intervals in three traditional sericulture belts of Tamil Nadu (South India) in Salem, Erode and Dharmapuri districts.

The survey revealed four species of predators belonging to the family coccinellidae and one species of neuropteran predator, feeding on the eggs and nymphal stages and parasitisation by *Encarsia* sp. (Hymenoptera : Aphelinidae) in nymphal stage was recorded. The population of *Axinoscymnus puttarudriahi, Coccinella septumpunctata* and *Menochilus sexmaculatus* were abundant whereas *Cryptolaemus montrouzieri* and the Green lacewing *Mallada astur* showed least establishment (Table 1).

The population build-up of *A. puttarudriahi* was directly proportional to the intensity of whitefly incidence. The studies revealed that the predator *A. puttarudriahi* and the parasitoid *Encarsia* sp. were promising as biological control agents against spiraling whitefly. Fortuitous introduction of these natural enemies on spiraling whitefly in Lakshadweep Island and their natural efficacy was reported by Ramani (2000). Mass multiplication techniques of these natural enemies have to be studied to launch a bio-control package.

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Effectiveness of Mycoinsecticides against *Amrasca biguttula biguttula* (Ishida)

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Okra, *Abelmoschus esculentus* (L.) Moench is one of the important vegetable crops in Junagadh attacked by the cotton jassid, *Amrasca biguttula biguttula* (Ishida). The effectiveness of mycoinsecticides against

different developmental stages of okra jassid is meager and hence, the present investigation was carried out in laboratory at Junagadh (Gujarat, West India)

A laboratory experiment was carried out to determine the effectiveness of mycoinsecticides against nymphs (first, second and third instars) and adults of *A. biguttula biguttula.* For this purpose laboratory-reared first, second and third instar nymphs and adults jassids were kept separately in Petri dishes. They were starved for 24 hours before bioassaying. Instar-wise, four replications were made and 10 insects were kept in each replication. The solution of each treatment *(Beauveria bassiana* @ 5 g/l and *Verticillium lecanii* @ 4 g/l) was sprayed using a baby sprayer on an okra leaf containing the test insect. The sprayed leaves were allowed to dry under ceiling fan for 5 minutes and they were kept in Petri dishes. The fresh food was changed on next day of spray, and insects were reared to record the mortality. Mortality counts were recorded at 3, 5 and 7 days after treatment. Data on nymphal and adult mortality were converted into correct per cent mortality.

Data on instar-wise nymphal mortality due to *V. lecanii* and *B. bassiana* (Table 1) revealed that on third and fifth day after feeding, significantly higher mortality was recorded in the first and second instar nymphs as compared to third instar and adults of *A. biguttula biguttula.* The mortality in the first and second instar nymphs were as high as 99.00 and 97.13 per cent and 99.88 and 98.91 on third and fifth day, respectively after feeding on *V. lecanii* while, *B. bassiana* recorded 95.68 and 90.19 per cent and 98.72 and 92.17 per cent mortality, respectively in the respective days.

Data (Table 1) also revealed that there was a consistent decrease in mortality from first to third instars and adults in both the biopesticides. The total mortality among different stages ranged from 90.19 to 100.00 per cent in *V. lecanii* @ 4g/litre and 88.30 to 99.24 per cent in *B. bassiana* @ 5g/litre on seventh day after feeding. The highest mortality was recorded in the first instar nymphs (100.00%), followed by second (99.57%), third (96.52%) and adults (90.19%) in *V. lecanii* @ 4g/litre. Similar trend was also observed in case of *B. bassiana* @ 5g/litre but efficacy was slightly lower as compared to *V. lecanii* @ 4g/litre. Thus, the result clearly indicated that the first instar nymphs proved to the most susceptible to *V. lecanii* and *B. bassiana*, followed by second instar nymphs. The third instar nymphs and adults were found less susceptible. The results also indicated that the *B. bassiana* was at par in effectiveness as compared to *V. lecanii* in all life stages of insect.

From the overall result it is concluded that, the bioinsecticides, *V. lecanii* @ 4 g/l and *B. bassiana* @ 5 g/l were significantly superior against the first instar, followed by second instar nymphs of jassid. The third instar