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Influence of biochemical parameters of host plants on the biology of *Dialeurodes vulgaris* Singh (Aleyrodidae: Homoptera)

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Abstract. The influence of biochemical parameters of the host plants viz. *Jasminum multiflorum* Andr., *Jasminum sambac* Ait., *Jasminum grandiflorum* Linn., *Jasminum auriculatum* Vahl., *Jasminum pubescens* Willd. and *Jasminum flexile* Vahl. on the biology of *Dialeurodes vulgaris* was studied. The results indicate remarkable variation in the biochemical parameters of host plants which affected significantly the biology of the insect. The per cent survival and growth index have been considerably low in *Jasminum pubescens*, *Jasminum auriculatum* and *Jasminum grandiflorum* and the same trend has been noticed with regard to fecundity and longevity also. The most preferred hosts have been *Jasminum sambac* and *Jasminum multiflorum*. It is observed that high amount of phenol and excessive accumulation of sugars in host plants make them nonpreferred while high amount of amino acids makes the plants more preferred by *Dialeurodes vulgaris*.

Keywords. *Dialeurodes vulgaris*; jasmine; host preference.

1. Introduction

Several insects infest jasmine (*Jasminum sambac*) crop in south India (David 1958). Among them the jasmine whitefly *Dialeurodes vulgaris* Singh has been noticed to be endemic on the cultivars of jasmine in Tamil Nadu. There are 7 cultivars of jasmine belonging to 6 species of the genus *Jasminum* and all of them are infested by *D. vulgaris*. The present study reports on the quantitative levels of certain biochemical parameters of these cultivars and their influence on the biology of the whitefly on them.

2. Materials and methods

Seven cultivars of jasmine viz. Kundumalli (*J. multiflorum* Andr.), Maduramalli (*J. sambac* Ait.), Adukkumalli (*J. sambac* Ait.), Jathimalli (*J. grandiflorum* Linn.), Virijathi (*J. auriculatum* Vahl.), Kakkadamalli (*J. pubescens* Willd.) and Nithyamalli (*J. flexile* Vahl.) were raised in polythene bags with soils. Transparent plastic cages (8 × 6 cm) with screw cap at one end and the other end covered with muslin cloth were prepared. A part of the host plant was enclosed inside the cage. Whiteflies from the stock culture were collected using an aspirator and released into the cages for oviposition on the leaves. After 24 h the whiteflies and the cages were removed and observations recorded for incubation period, nymphal period, total developmental period, percentage survival, growth index, longevity of male and female and fecundity. There were 5 replications for each study.

Leaf samples of the host plants were simultaneously analysed for quantitative estimation of biochemical parameters. Leaf extracts were obtained using 80% ethanol. The reducing sugars were determined first. Subsequently the nonreducing sugars in the extract were hydrolysed to reducing sugars and the total sugars were

estimated by Nelson's (1944) method. By subtracting the reducing sugars from the total sugars, the nonreducing sugars were estimated and expressed as glucose equivalents. Free amino acids, protein and phenol were estimated following the methods, respectively of Moore and Steins (1948), Lowry *et al* (1951) and Bray and Thorpe (1954) (Outlined by Mahadevan and Sridhar 1982).

3. Results and discussion

The data presented in table 1 clearly indicate that the total developmental period have been considerably short whereas the per cent survival and growth index have been appreciably high in *J. sambac* and *J. multiflorum* followed by *J. flexile*, and the same trend has been noticed with regard to fecundity also. Hence the most preferred hosts have been *J. sambac* and *J. multiflorum* whereas *J. pubescens* proved to be the least preferred one.

3.1 *Influence of biochemical parameters of host plants on D. vulgaris*

The data on reducing sugar, non reducing sugar, total sugar, free amino acids, protein and phenol for the different species of *Jasminum* are given in table 2. The most unfavourable host *J. pubescens* (Kakkadamalli) contains the highest amount of phenol (21·238 mg/g) followed by *J. grandiflorum* (Jathimalli) which contains 9,000 mg/g. When phenol is sufficiently synthesised it combines with the sugars obtained as primary product of photosynthesis to form tannins. The tannins combine irreversibly with the available protein and form the indigestible complexes which result in the nutritional deficiency in the host plants which in turn affects the percentage of infestation and host preference (Raman and Ananthakrishnan 1986). On the contrary *J. auriculatum* (Virijathi) recorded lowest amount of phenol

Table 1. Influence of hosts on the developmental biology of *D. vulgaris*.

Host	Incubation period (days)	Nymphal period (days)	Total developmental period (days)	Survival (%)	Growth index	Longevity (days) Male	Longevity (days) Female	Fecundity
Kundumalli (*J. multiflorum*)	8·06	24·68	32·74	71·26	2·18	11·10	12·93	82·00
Maduramalli (*J. sambac*)	8·13	24·45	32·58	68·78	2·11	10·57	12·10	75·33
Adukkumalli (*J. sambac*)	8·26	24·53	32·79	72·17	2·20	9·77	11·47	71·67
Jathimalli (*J. grandiflorum*)	8·32	26·32	34·63	54·26	1·57	6·63	7·40	46·63
Virijathi (*J. auriculatum*)	8·62	27·00	35·63	47·91	1·36	6·26	6·57	36·00
Kakkadamalli (*J. pubescens*)	8·38	26·60	34·97	39·26	1·12	4·57	5·63	26·33
Nithyamalli (*J. flexile*)	8·84	24·40	33·24	63·83	1·91	9·83	10·13	68·67
CD ($P = 0·05$)	NS	1·46	1·15	5·71	0·20	1·48	1·45	10·07

Table 2. Biochemical parameters* of host plants of *D. vulgaris*.

Host	Reducing sugar	Non reducing sugar	Total sugar	Free amino acids	Protein	Phenol
Kundumalli (*J. multiflorum*)	32·565	23·495	55·727	2·512	22·248	4·694
Maduramalli (*J. sambac*)	33·689	25·869	58·557	2·776	19·748	6·492
Adukkumalli (*J. sambac*)	27·963	20·341	48·304	2·530	26·163	4·805
Jathimalli (*J. grandiflorum*)	22·141	10·315	32·456	2·319	22·443	9·000
Virijathi (*J. auriculatum*)	18·324	5·547	23·871	1·886	13·336	1·143
Kakkadamalli (*J. pubescens*)	48·383	7·721	56·103	2·093	23·808	21·238
Nithyamalli (*J. flexile*)	68·643	9·641	73·285	2·606	26·489	3·139
CD ($P = 0·05$)	5·616	11·110	10·724	0·148	3·063	0·678

*Values in mg/g (mean of 3 replications).

(1·143 mg/g) and its non preference may be due to the low nutritive contents viz. reducing sugar (18·324 mg/g), non reducing sugar (5·547 mg/g), total soluble sugar (23·871 mg/g), free amino acids (1·886 mg/g) and protein (13·336 mg/g). House (1969) stated that in general all the phytophagous insects have quite similar qualitative nutritional requirements but it is the quantitative factor that plays a more decisive role in insect host plant relationship. The total soluble sugar was found to be the highest (73·285 mg/g) in *J. flexile* (Nithyamalli) which is moderately preferred. The antibiosis or non preference of the host plants was correlated with the excessive accumulation of total sugars (Ananthakrishnan 1986). The favourable hosts viz. *J. sambac* (Adukkumalli/Maduramalli) and *J. multiflorum* (Kundumalli) contain moderate amount of sugars and protein and low amount of phenol when compared with *J. pubescens* (Kakkadamalli) and *J. grandiflorum* (Jathimalli). The amount of free amino acids was higher in preferred hosts being 2·512 mg/g in *J. multiflorum* (Kundumalli), 2·776 mg/g in *J. sambac* (Maduramalli) and 2·530 mg/g in *J. sambac* (Adukkumalli) which is in agreement with the findings of David and Paul (1973). However, *J. flexile* (Nithyamalli) recorded higher amount of amino acid and its non preference may be due to excessive accumulation of sugars (73·285 mg/g).

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