

Status of White Fly, (*Bemisia tabaci* Gennadius) in Vindya Plateau

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ABSTRACT

The white fly *Bemisia tabaci* (Genn.) (Hemiptera: Aleyrodidae) is a polyphagous insect pest and infested/harbored on many crops/ trees/ fruits/ vegetables and cause economic damage. The studies were conducted during 2014, 2015 and 2016 using one hundred and twenty three new plant species belonging to twenty four families including forty three crops, sixteen fruits plants, twenty one vegetables, eight flowers, eleven weeds, eighteen trees, two spices and one each from ornamental, aromatic, medicinal and creeper at the College of Agriculture, Ganj Basoda (MP). The research revealed that maximum (35%) host plants were damaged from crops followed by vegetables (17.1%), tree (14.6%) fruit plant (13%), weeds (7.3%), flower (6.5%), and rest of the plant categories *i.e.* Spices, ornamental, aromatic plants, medicinal and creeper were the least preferred by white fly for infestation and multiplication. Maximum (34) host plants were found damaged in fabaceae family followed by cucurbitaceae (14), Malvaceae (8), Solanaceae (8), Moraceae and Euphorbeaceae (6) and Asteraceae and Brassicaceae (5). The rest of the families were found least preferred. The higher per cent of damaged crops was observed in the Fabaceae family (27.6%) followed by cucurbitaceae (11.4%), Poaceae (8.1%), Malvaceae and Solanaceae (6.5%), Asteraceae and Moraceae (4.9%). Infestation was found less than five percentage in rest of the families. The average maximum population intensity *i.e.* 39 individual/leaf was observed in Malvaceae family followed by Solanaceae (35.7 individual/leaf), Amaranthaceae (28.5 individual / leaf), Solanaceae (35.7 individual/leaf), Caricaceae (28.4 individual/leaf), Cucurbitaceae (23.4 individual/leaf) and Bracicaceae (21.4 individual/leaf), Compositae (19 individual/leaf), Chenopodiaceae (14.5 individual/leaf), Euphorbiaceae (12.1 individual/leaf), Lamiaceae (11.4 individual/leaf) and Poaceae (10.5 individual/leaf). The rest of families noted less than ten individual per leaf.

Highlights

- The incidence of whitefly was maximum in the fabaceae family followed by Cucurbitaceae, Malvaceae, Solanaceae Euphorbiaceae Moraceae, Asteraceae and Bracicaceae for feeding, shelter and oviposition purpose

Keywords: Status, host plant, whitefly, population level,

The white fly *Bemisia tabaci* (Genn.) is a polyphagous insect pest and infested/ harbored on many crops/ trees/ fruits/ vegetables etc. It is originated from Asia (Singh *et al.* 1990). *Bemisia spp.*, being possibly of the Indian origin (Fishpool and Burban 1994), was described under numerous names before its morphological variability was recognized. It is also distributed throughout the northern, central and the western region of the Indian subcontinent and is a

very serious to American cotton particularly in the dry areas. Apart from cotton, it also feeds on various other plants such as cabbage, cauliflower, mustard, toria, melon, potato, brinjal, okara and some other weeds (Atwal and Dhaliwal 2009 and Choudhary and Garg 2002).

The nymphs are yellow - white scales 0.3-0.6 mm long which suck the cell sap, are sluggish creatures,

clustered together on the under surface of the leaves and their pale-yellow bodies make them stand out against the green background (Fig. 2). In the winged stage, they are 1.0-1.5mm long and their yellowish bodies are slightly dusted with a white waxy power. They have two pairs of pure white wings and have prominent long hind wings (Fig. 3). The eggs are pear shaped with a pedicel spike at the base, and is approximately 0.2 mm long (Fig. 1). The puparium is flat, irregular oval shape and 0.7 mm long.



Fig. 1: Eggs of White fly



Fig. 2: Nymph stage of whitefly



Fig. 3: Adult stage of White flies



Fig. 4: Symptom of Whitefly damage on crop

On a smooth leaf the puparium lacks enlarged dorsal setae, but if the leaf is hairy, two to eight long dorsal setae are present and the adult is about 1 mm long. The male is slightly smaller than the female. The body and both the pair of wings are covered with a powdery, waxy secretion, white to slightly yellowish in colour (Atwal and Dhaliwal 2009 and Gupta *et al.* 2005).

Although it is a major insect pest of cotton, soybean, tomato, chilli, brinjal, green gram, black gram and other crops, (Singh *et al.* 1990; Choudhary and Garg 2002; Gupta *et al.* 2005 and Atwal and Dhaliwal 2009) it may be getting the status as the major/key insect pest in field crops / vegetables/ ornamentals/forestry/ medicinal plants in the near future due to the intensive cropping system/ closer plantation, higher dosages of fertilizers, low level of organic manure in soil and change in the weather conditions (Fig. 4). Thus, keeping this view in mind investigation was undertaken to check the status of host plant and the population level to help in the framing of suitable management practices such as preventive / curative measures of host plant at the right time to curb easy multiplication / infestation level of the white fly.

MATERIALS AND METHODS

The status of the host plants of white fly, *Bemisia tabaci* was noted from Vidisha district of Madhya Pradesh and population of this insect was observed during 2014, 2015 and 2016. On the basis of the population of nymphs/adults, the host plants were categorized (Table 1). The Ganj Basoda is 23° 51' N 78°10'E and 410 Meter above the mean sea level. The soil type of this study area is shallow medium black (pH normal). The annual maximum and

minimum temperatures are 31.82°C and 18.96°C respectively with annual rainfall 1051 mm. The regular observations were taken at fortnight interval on various categories of the host plant (e.g. trees, field crops, fruits, vegetables, weeds, flowers, ornamental, spices, creeper and aromatic /medicinal plants etc.). During the study, the whole plant was examined and the population of nymphs and adults were counted and the population per leaf was presented.

Table 1: Whitefly population scoring level

| Sl. No. | Incidence levels | Scale | Population density / leaf |
|---------|------------------|-------|---------------------------|
| 1. | Very low | I | 0-10 |
| 2. | Low | II | 10-20 |
| 3. | Moderate | III | 20-30 |
| 4. | Severe | IV | 30-40 |
| 5. | Very severe | V | >40 |

RESULTS AND DISCUSSION

One hundred and twenty three new host plants were categorized into five categories. Out of one hundred and twenty-three, maximum fifty seven host plants belong to very low infestation category.

The minimum number of host plant *i.e.* six new host plants belong to severe incidence category and eighteen host plant comes under very severe incidence category (Table 2 and Fig. 5). It represents twenty four families together with forty three crops, sixteen fruits plants, twenty one vegetables, eight flowers, eleven weeds, eighteen trees, two spices and one each from ornamental, aromatic, medicinal and creeper (Table 2 and Fig. 6).

The Maximum thirty five percent host plants were found to be damaged from crops followed by vegetables (17.1%), tree (14.6%) fruit plant (13%), weeds (7.3%), flower (6.5%), and rest of the plant categories *i.e.* Spices, ornamental, aromatic plants, medicinal and creeper were least preferred by white fly for infestation and multiplication (Table 2 and Fig. 6).

The maximum thirty four host plants were found to be damaged in the fabaceae family followed by cucurbitaceae (14), Malvaceae (8), Solanaceae (8), Moraceae and Euphorbeaceae (6) and Asteraceae and Brassicaceae (5). The rest of the families were found least preferred (Table 2 and Fig. 7). Utmost per cent of damage was observed in the Fabaceae family (27.6%) followed by cucurbitaceae (11.4%),

Table 2: Host plants status of White fly, *Bemisia tabaci*

| Sl. No. | Common name | Botanical name | Family | Type of host plant | Level of incidence | Population level |
|---------|------------------|---|----------------|--------------------|--------------------|------------------|
| 1 | Green amaranthus | <i>Amaranthus viridis</i> L. | Amaranthaceae | vegetable | III | 27.12 |
| 2 | Spin amaranthus | <i>Amaranthus spinosis</i> L. | Amaranthaceae | vegetable | III | 29.89 |
| 3 | Carrot | <i>Dacus carota</i> | Apiaceae | Vegetable | I | 5.20 |
| 4 | Coriander | <i>Coriandrum sativum</i> L. | Apiaceae | Spice | I | 7.78 |
| 5 | Safflower | <i>Carthamus tinctorius</i> | Asteraceae | Crop | II | 15.42 |
| 6 | Niger | <i>Gazotia abyssinica</i> L.f.Cass | Asteraceae | Crop | I | 6.89 |
| 7 | Sunflower | <i>Helianthus anus</i> | Asteraceae | Crop | III | 24.23 |
| 8 | Marigold | <i>Tagetes</i> spp | Asteraceae | Flower | III | 27.48 |
| 9 | Chrysanthemum | <i>Chrysanthemum morifolium</i> Ramat | Asteraceae | Flower | IV | 39.47 |
| 10 | Mustard | <i>Brassica compestris</i> | Brassicaceae | Crop | II | 12.46 |
| 11 | Toria | <i>Brassica rapa</i> | Brassicaceae | Crop | II | 17.48 |
| 12 | Chandrashoor | <i>Lepidium sativum</i> | Brassicaceae | Medicinal | I | 4.69 |
| 13 | Cauliflower | <i>Brassica oleracea</i> var. botrutis | Brassicaceae | Vegetable | IV | 38.79 |
| 14 | Cabbage | <i>Brassica oleracea</i> var. capitata | Brassicaceae | Vegetable | IV | 33.39 |
| 15 | Papaya | <i>Carica Papaya</i> L. | Caricaceae | Fruit | III | 28.43 |
| 16 | Bathua | <i>Chenopodium album</i> | Chenopodiaceae | Weed | I | 7.49 |
| 17 | Spinach | <i>Spinacia oleracea</i> | Chenopodiaceae | Vegetable | III | 21.47 |
| 18 | Ragoon creeper | <i>Combretum indicum</i> (L.) DeFilipps | Combretaceae | Creeper | I | 4.17 |

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|----|-------------------------|---|---------------|------------|-----|-------|
| 19 | Sunflower | <i>Helianthus annuus</i> L. | Compositae | Crop | II | 18.15 |
| 20 | Safflower | <i>Carthamus tinctorius</i> L. | Compositae | Crop | II | 19.87 |
| 21 | Bottle gourd | <i>Lagenaria siceria</i> | Cucurbitaceae | Vegetable | III | 26.78 |
| 22 | Ridged gourd | <i>Luffa acutangula</i> Mill | Cucurbitaceae | Vegetable | III | 29.14 |
| 23 | Sponge gourd | <i>Luffa aegyptiaca</i> Mill. | Cucurbitaceae | Vegetable | III | 27.19 |
| 24 | Bitter gourd | <i>Momordica charantia</i> L. | Cucurbitaceae | Vegetable | II | 16.74 |
| 25 | Pointed gourd | <i>Trisanthus dioica</i> Roxb. | Cucurbitaceae | Vegetable | III | 24.12 |
| 26 | Snake gourd | <i>Trichosanthes cucumerina</i> L. | Cucurbitaceae | Vegetable | III | 23.99 |
| 27 | Water melon | <i>Citrullus lantus</i> var. <i>lantus</i> (Thrub.) Matsum & Nakai | Cucurbitaceae | Vegetable | III | 21.86 |
| 28 | Musk melon | <i>Cucumis melo</i> L. | Cucurbitaceae | Vegetable | III | 29.14 |
| 29 | Cucumber | <i>Cucumis sativus</i> L. | Cucurbitaceae | Vegetable | III | 27.87 |
| 30 | Ivy gourd (Kundru) | <i>Coccinia grandis</i> (L.) Viogt | Cucurbitaceae | Vegetable | II | 19.14 |
| 31 | Summer Squash | <i>Cucurbita pepo</i> L. | Cucurbitaceae | Vegetable | III | 22.67 |
| 32 | Round gourd | <i>Praecitrullus fistulosus</i> (Stocks) Panglo | Cucurbitaceae | Vegetable | III | 26.41 |
| 33 | Winter squash | <i>Cucurbita maxima</i> | Cucurbitaceae | Vegetable | III | 23.91 |
| 34 | Spiny gourd (Kakoda) | <i>Momordica dioica</i> Rob. ex Wild | Cucurbitaceae | Vegetable | I | 8.19 |
| 35 | Castor | <i>Ricinus communis</i> L. | Euphorbeaceae | Crop | II | 16.87 |
| 36 | Croton plant | <i>Croton</i> spp. | Euphorbiaceae | Ornamental | II | 15.49 |
| 37 | Aonla | <i>Emblica officinalis</i> Geartn. | Euphorbeaceae | Fruit | III | 26.79 |
| 38 | Asthma plant | <i>Euphorbia hirta</i> L. | Euphorbiaceae | Weed | I | 4.67 |
| 39 | Large dudhi | <i>Euphorbia macrophylla</i> Lam. | Euphorbiaceae | Weed | I | 6.47 |
| 40 | Hazar dana | <i>Phyllanthus</i> spp. | Euphorbiaceae | Weed | I | 2.12 |
| 41 | Sisoo | <i>Dalbergia sisoo</i> Roxb. | Fabaceae | Tree | II | 11.56 |
| 42 | Shisham | <i>Dalbergia latifolia</i> | Fabaceae | Tree | I | 6.45 |
| 43 | Golden shower tree | <i>Cassia fistula</i> L. | Fabaceae | Tree | II | 16.42 |
| 44 | Charota | <i>Cassia tora</i> (L.) Roxb. | Fabaceae | Weed | I | 2.30 |
| 45 | YellowSanji | <i>Melilotus indica</i> | Fabaceae | Weed | I | 2.60 |
| 46 | White sanji | <i>Melilotus alba</i> | Fabaceae | Weed | I | 3.90 |
| 47 | Black siris | <i>Albizia lebeck</i> (L.) Benth. | Fabaceae | Tree | II | 11.23 |
| 48 | White siris | <i>Albizia procera</i> (L.) Benth. | Fabaceae | Tree | II | 12.46 |
| 49 | Green gram | <i>Vigna radiata</i> L. Wilczek | Fabaceae | Crop | V | 79.12 |
| 50 | Black gram | <i>Vigna mungo</i> L. Hepper | Fabaceae | Crop | V | 74.56 |
| 51 | French bean | <i>Phaseolus vulgaris</i> | Fabaceae | Crop | V | 57.13 |
| 52 | Soybean | <i>Glycine max</i> L. Merrill | Fabaceae | Crop | V | 41.29 |
| 53 | Pigeon pea | <i>Cajanus cajan</i> L. Millsp | Fabaceae | Crop | V | 43.85 |
| 54 | Cow pea | (<i>Vigna unguiculata</i> (L.) Walp | Fabaceae | Crop | V | 51.96 |
| 55 | Faba bean | <i>Vicia faba</i> | Fabaceae | Crop | IV | 36.89 |
| 56 | Fenugreek | <i>Trigonella foenum-graecum</i> | Fabaceae | Spice | V | 46.29 |
| 57 | Garden Pea | <i>Pisum sativum</i> L. | Fabaceae | Crop | V | 65.18 |
| 58 | Field pea | <i>Pisum ravenis</i> L. | Fabaceae | Crop | V | 59.46 |
| 59 | Grass pea | <i>Lathyrus sativus</i> L. | Fabaceae | Crop | II | 13.19 |
| 60 | Lucerne | <i>Medicago sativa</i> | Fabaceae | Crop | II | 12.45 |
| 61 | Sunhemp | <i>Crotalaria juncia</i> | Fabaceae | Crop | II | 11.67 |
| 62 | Groundnut | <i>Arachis hypogaea</i> | Fabaceae | Crop | IV | 37.13 |
| 63 | Indian bean | <i>Dolichus lablab</i> L. | Fabaceae | Vegetable | III | 26.19 |
| 64 | Gulmohar | <i>Delonix regia</i> (Boj.) | Fabaceae | Flower | II | 14.16 |



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|-----|------------------------|---|-------------|-----------|----|-------|
| 65 | Daincha | <i>Sesbania bispinosa</i> (Jacq.) W. Wight | Fabaceae | Crop | II | 15.95 |
| 66 | Subabul | <i>Leucaena leucocephala</i> (Lam.) | Fabaceae | Tree | II | 12.87 |
| 67 | Desi Babul | <i>Acacia nilotica</i> (L.) | Fabaceae | Tree | I | 5.11 |
| 68 | White babul | <i>Acacia leucophola</i> L. | Fabaceae | Tree | I | 3.10 |
| 69 | Babul | <i>Cassia ceima</i> L. | Fabaceae | Tree | I | 6.70 |
| 70 | Pongram | <i>Pongamia pinnata</i> (L.) | Fabaceae | Tree | I | 2.19 |
| 71 | Palas | <i>Butea monosperma</i> (Lam.) Taub | Fabaceae | Tree | I | 1.31 |
| 72 | Temrandus | <i>Tamrindus indica</i> L. | Fabaceae | Fruit | I | 1.87 |
| 73 | Exotic babul | <i>Prosopis juliflora</i> (SW.) DC. | Fabaceae | Tree | I | 2.01 |
| 74 | Babul | <i>Cassia ceima</i> L. | Fabaceae | Tree | I | 4.61 |
| 75 | Teak | <i>Tectona grandis</i> L.f. | Lamiaceae | Tree | I | 8.90 |
| 76 | Khamer | <i>Gmelina arborea</i> Roxb. | Lamiaceae | Tree | I | 8.99 |
| 77 | Basil | <i>Ocimum tenuiflorum</i> | Lamiaceae | Aromatic | I | 1.15 |
| | | | | | | 2.05 |
| 78 | Linseed | <i>Linum usitatissimum</i> L. | Linaceae | Crop | I | 8.79 |
| 79 | Indian Cotton | <i>Gossypium arboreum</i> L. | Malvaceae | Crop | V | 41.23 |
| 80 | American Cotton | <i>Gossypium hirsutum</i> L. | Malvaceae | Crop | V | 69.13 |
| 81 | Levant cotton | <i>Gossypium herbaceum</i> L. | Malvaceae | Crop | V | 65.87 |
| 82 | Egyptian | <i>Gossypium barbadense</i> L. | Malvaceae | Crop | V | 59.47 |
| 83 | Ladies finger | <i>Abolmeschus esculantus</i> L. | Malvaceae | Vegetable | V | 57.46 |
| 84 | Chinarose | <i>Hibiscus rosasinensis</i> L. | Malvaceae | Flower | I | 2.11 |
| 85 | Hollyhock | <i>Alcea</i> spp. | Malvaceae | Flower | I | 3.69 |
| 86 | Semal | <i>Bombax ceiba</i> L. | Malvaceae | Tree | I | 1.29 |
| 87 | Mulbary | <i>Morus alba</i> L. | Moraceae | Fruit | I | 5.46 |
| 88 | Jackfruit | <i>Artocarpus heterophyllus</i> Lam. | Moraceae | Fruit | I | 4.83 |
| 89 | Banyan tree | <i>Ficus benghalensis</i> L. | Moraceae | Tree | I | 1.02 |
| 90 | Pipal | <i>Ficus religiosa</i> L. | Moraceae | Tree | I | 2.06 |
| 91 | Fig | <i>Ficus carica</i> L. | Moraceae | Fruit | I | 5.32 |
| 92 | Goolar | <i>Ficus racemosa</i> L. | Moraceae | Fruit | I | 1.62 |
| 93 | Jasmine | <i>Jasminum officinale</i> L. | Oleaceae | Flower | I | 2.14 |
| 94 | Guava | <i>Psidium guajava</i> L. | Myrtaceae | Fruit | I | 6.78 |
| 95 | Jamun | <i>Syzygium cumini</i> (L.) Skeels. | Myrtaceae | Fruit | I | 8.99 |
| 96 | Sesame | <i>Sesamum indicum</i> L. | Pedaliaceae | Crop | I | 8.56 |
| 97 | Paddy | <i>Oryza sativa</i> L. | Poaceae | Crop | I | 9.86 |
| 98 | Sorghum | <i>Sorghum bicolor</i> L. Moench | Poaceae | Crop | II | 18.37 |
| 99 | Maize | <i>Zea mays</i> L. | Poaceae | Crop | II | 19.49 |
| 100 | Pearl millet | <i>Pennisetum typhoides</i> L. | Poaceae | Crop | II | 17.63 |
| 101 | Sugarcane | <i>Saccharum officinarum</i> | Poaceae | Crop | I | 9.45 |
| 102 | Baryard Millet | <i>Echinochloa crusgalli</i> | Poaceae | Crop | I | 8.76 |
| 103 | Kodo | <i>Paspalum scrobiculatum</i> L. | Poaceae | Crop | I | 9.41 |
| 104 | Little Millet (Kutaki) | <i>Panicum sumatrense</i> L. | Poaceae | Crop | I | 7.69 |
| 105 | Wheat | <i>Triticum</i> spp. | Poaceae | Crop | I | 2.78 |
| 106 | Barley | <i>Hordeum vulgare</i> L. | Poaceae | Crop | I | 1.47 |
| 107 | Pomegranate | <i>Punica granatum</i> L. | Punicaceae | Fruit | I | 6.78 |
| 108 | Ber | <i>Zizyphus mauritiana</i> Lam. | Rhamnaceae | Fruit | I | 2.44 |
| 109 | Wild ber | <i>Zizyphus jujuba</i> Mill. | Rhamnaceae | Fruit | I | 1.66 |
| 110 | Kaitha | <i>Limonia acidissima</i> L. | Rosaceae | Fruit | I | 1.78 |

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|-----|---------------------------|------------------------------------|-------------|--------|----|-------|
| 111 | Rose | <i>Rosa indica</i> L. | Rosaceae | Flower | II | 18.57 |
| 112 | Sweet orange | <i>Citrus sinensis</i> (L.) | Rutaceae | Fruit | I | 9.74 |
| 113 | Lime | <i>Citrus aurantifolia</i> Swingle | Rutaceae | Fruit | I | 8.43 |
| 114 | Stone apple | <i>Agels marmelos</i> (L.) Correa | Rutaceae | Fruit | I | 1.96 |
| 115 | Night blooming jasmine | <i>Cestrum nocturnum</i> L. | Solanaceae | Flower | I | 2.83 |
| 116 | Black night shade (Makoy) | <i>Solanum nigrum</i> L. | Solanaceae | Weed | I | 1.67 |
| 117 | Tomato | <i>Lycopersicum esculantum</i> | Solanaceae | Crop | V | 71.26 |
| 118 | Potato | <i>Solenum tuberosum</i> | Solanaceae | Crop | IV | 38.48 |
| 119 | Chilli | <i>Capsicum annum</i> | Solanaceae | Crop | V | 55.67 |
| 120 | Chilli | <i>Capsicum frutiscence</i> | Solanaceae | Crop | V | 61.29 |
| 121 | Brinjal | <i>Solenum melongena</i> | Solanaceae | Crop | V | 42.97 |
| 122 | Bhatkatai | <i>Solenum vergianum</i> | Solanaceae | Weed | I | 1.13 |
| 123 | Big-sage | <i>Lantana camara</i> L. | Verbenaceae | Weed | I | 1.47 |

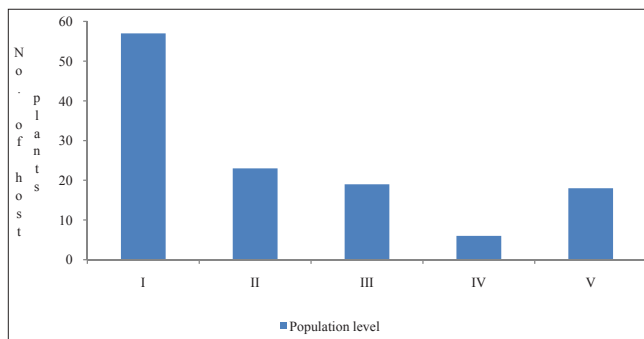


Fig. 5: Population level of white fly

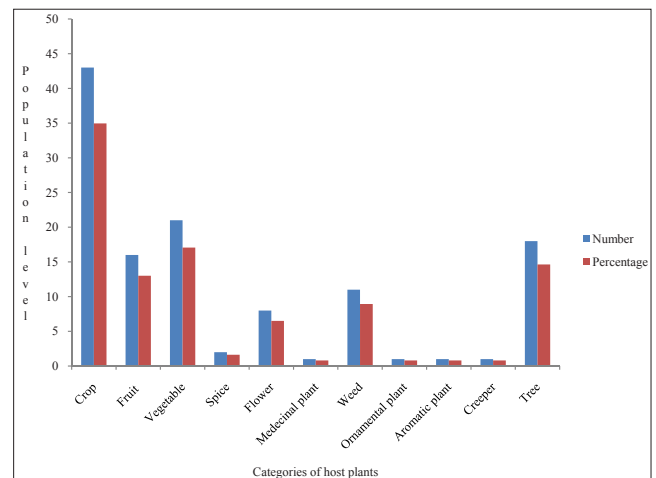


Fig. 6: Number and percentage of Host plant categories damage by white fly

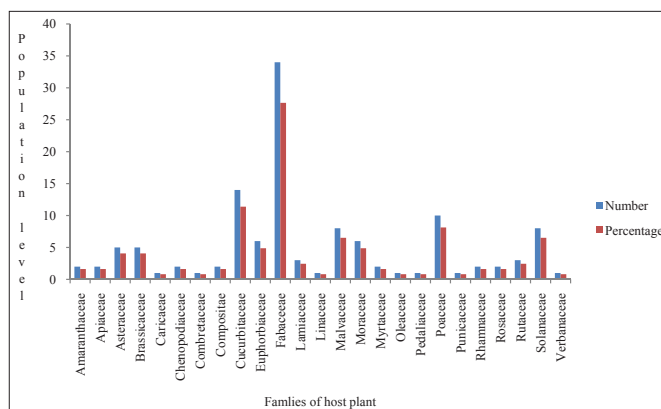


Fig. 7: Number and percentage of host plant family damaged by white fly

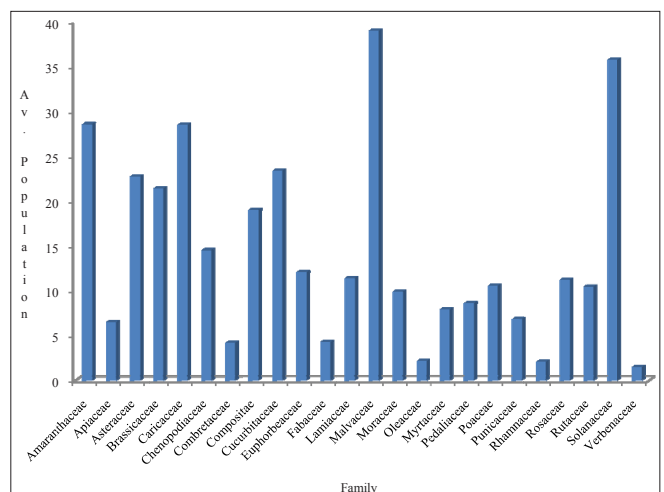


Fig. 8: Familywise average population density of white fly

Poaceae (8.1%), Malvaceae and Solanaceae (6.5%), Asteraceae and Moraceae (4.9%). Infestation was found less than five percentage in rest of the families (Table 2 and Fig. 7).

The average maximum population intensity *i.e.* 39 individual/leaf was observed in the Malvaceae family followed by Solanaceae (35.7 individual/leaf), Amaranthaceae (28.5 individual / leaf), Caricaceae (28.4 individual/leaf), Cucurbitaceae (23.4 individual/leaf) and Brasicaceae (21.4 individual/leaf), Compositae (19 individual/leaf), Chenopodiaceae (14.5 individual/leaf), Euphorbiaceae (12.1 individual/leaf), Lamiaceae (11.4 individual/leaf) and Poaceae (10.5 individual/leaf). The rest of the families were noted less than ten individual per leaf (Table 2 and Fig. 8).

The result reported by Pimple and Summanwar (1983) are accordance with the present observation and he had found pest infesting about 323 host plants representing 63 families. Singh *et al.* (1990) and Garg (2014) have advocated that the white fly is a major insect pest of soybean in Madhya Pradesh and it agrees with the present finding. Borad *et al.* (2002) have reported that white fly infest the brinjal crops and are considered as the major pest, this again supports the present result. Gupta *et al.* (2005) have noticed that it is a major pest of Malvaceous, Solanaceous, Fabaceous vegetables and Cole crops, this results strongly supports the present observations. The present findings are in line with the result reported by Dharavath *et al.* (2017) and they have found that the white fly is a major insect pest of brinjal. Garg and Patel (2017) have observed that it is a key pest of black gram in Vindya Plateau of Madhya Pradesh and it is of conformity with the present result.

CONCLUSION

It can be concluded from the present findings that the incidence of whitefly was maximum in the fabaceae family followed by Cucurbitaceae, Malvaceae, Solanaceae Euphorbicaeae Moraceae, Asteraceae and Bracicaceae for feeding, shelter and oviposition purpose.

REFERENCES

- Atwal, A.S. and Dhaliwal, G.S. 2009. Agricultural pests of south Asia and their management. Kalyani Publishers, Ludhiana.
- Board, P.K., Patel, H.M., Chavda, A.J. and Patel, J.R. 2002. Bio-efficacy of endosulfan and cypermethrin mixture against insect pest of brinjal. *Indian Journal of Agricultural Research*, **72**(1): 685-688.
- Chodhary, R.K. and Garg, V.K. 2002. Succession of pest complex and their natural enemies on cotton (*Gossypium spp.*) in Madhya Pradesh. *Journal of Cotton Research and Development*, **17**(2): 180-185.
- Fishpool, L.D.C. and Burban, C. 1994. *Bemisia tabaci*: The white fly vector of African cassava mosaic geminivirus. *Tropical Science*, **34**(1): 55-72.
- Garg, V.K. and Patel, Y. 2017. White fly: A Serious threat to black gram, *Vigna mungo* L. Hepper in Madhya Pradesh and their eco-friendly management practices. *Betvanchal*, COAGnaji Basoda, pp. 73.
- Garg, V.K. 2014. Adoption of insecticides used pattern in Soybean. *Indian Journal of Tropical Biodiversity*, **22**(2): 202-204.
- Gupta, H.C.L., Ameta, O.P. and Chechani, V.K. 2005. Management of insect pests of horticultural crops. Agro-tech Publishing Co., Udiapur.
- Pimple, T.D. and Summanwar, A.S. 1983. Food plants preference of the whitefly, *Bemisia tabaci* Genn. A potent vector of some plant viruses. *Pestology*, **7**(9): 5-9.
- Singh, O.P., Verma, S.N. and Nema, K.K. 1990. Insect pests of soybean in India. International Book Distributors, Dehra Dun, India.

