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Status of Sucking Insect Pests and Yellow Mosaic Disease Incidence in Major Greengram, (*Vigna radiata*) Growing Districts of Karnataka

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Abstract

Yellow Mosaic Disease (YMD) and sucking insect pests are the serious problem to greengram growing farmers in Karnataka. Information on the regional distribution of vectors involved and the disease transmitted is essential to manage the pests. In the present study, roving survey was undertaken during Kharif season of 2018 and 2019 in eight major greengram growing districts of Karnataka. The species of sucking pests observed on green gram are whitefly, Bemisia tabaci Asia-I group, aphids, Aphis craccivora and leafhopper, Empoasca kerri. There was a variation in pest incidence and also YMD incidence across the districts surveyed. The results indicated that whitefly population ranged from 1.08 to 4.23 per trifoliate leaf. The maximum numbers of whitefly population (4.23/trifoliate leaf) and YMD incidence (68.75%) was recorded in Belagavi district and the lowest number of whiteflies (1.08/trifoliate leaf) and YMD (10.32%) was observed Shivamogga district. The highest number of leafhoppers (5.32/trifoliate leaf) and aphids (57.62/ 5 cm twig) were observed in Chitradurga and Davanagere districts, respectively. High incidence of YMD is linked to high activity of sucking pests especially whiteflies which are reported vectors. Incidence was high in greengram was grown as sole crop than mixed crop. The variation in sucking insect pests and YMD incidence in greengram was discussed in this paper. The result may also help to develop the management strategies for the pests and diseases combined.

Keywords: Aphids, leafhoppers, disease incidence, roving survey, whiteflies, YMD

INTRODUCTION

Greengram, *Vigna radiata* (L.) Wilczek, generally known as mungbean or moong belongs to the family Fabaceae, is native to India or the Indo Burma region [11]. The crop is varieties of cropping pattern and provides a source a cereal based diet around the world [7]. In India, greengram is grown in an area of 42.42 lakh hectare and production of 20.23 lakh tonnes with productivity 477 kg/ha [4]. The major states of India where the cultivation is concentrated are Karnataka, Andhra Pradesh, Tamil Nadu Maharashtra, Odisha, Rajasthan, and Uttar Pradesh. It occupies an area of 396.7 thousand hectare with production and productivity of 135.26 thousand tones and 341 kg/ha, respectively [4].

Greengram is fast growing and covers the soil easily, and fix atmospheric nitrogen (30-40 kg N/ha) enhancing soil fertility. Due to smothering

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effect, it reduces the weed population and also helps in preventing soil erosion. After harvesting, it can be used as feed for cattles. In general, yield of green gram around the world is very low (384 kg/ha) and is not showing any increased trend. Major inducers for low yields are weeds, pests and diseases. The crop is attacked by varieties of insect pests, but sucking insect pests such as aphids, jassids and whitefly are of the major importance [5]. These sucking pests not only reduce the vigor of the plant by sucking the sap but also transmit the viral diseases [3] and affect photosynthesis as well [9].

Information on the composition of sucking pest species and YMD at various greengram growing districts of Karnataka is vital as a basis for determining the policy of integrated pest management. In addition, such information is used to determine the priorities for research into pest control technology greengram. The objectives of the survey reported in this paper were to determine the sucking insect pests and YMD status on greengram which helps in formulating suitable management practices.

MATERIALS AND METHODS

Roving survey was carried out during Kharif season of 2019-20 in different locations of eight districts (Shivamogga, Davanagere, Chikkamagaluru, Chitradurga, Haveri, Dharwad, Belgaum and Gadag) of Karnataka to estimate the incidence of YMD and sucking insects such as aphids, whiteflies and leafhoppers in greengram.

During survey, in each district, four taluks were selected and in each taluk five villages selected and in each village five fields were surveyed. The YMD incidence was recorded in one square meter area selected randomly at five locations in each field. Assessment of disease was done by counting total number of plants and symptomatic plants. The Per cent Disease Incidence (PDI) was calculated by using the following formula,

$$\text{Percent Disease Incidence (PDI)} = \frac{\text{Number of diseased plants}}{\text{Total number of plants examined}} \text{X } 100$$

Observation on the aphid population was made on 5 randomly selected plants in each location and the visual count was taken at top 5 cm twig of the plant. Observation of the whitefly and leafhoppers population was made by counting the number of adult whiteflies and leafhoppers per trifoliate leaf [2]. Later the whiteflies and leafhoppers were collected by using aspirator then stored in alcohol vials for species confirmation.

Species Confirmation

The insect pests observed during the survey were identified through molecular techniques and also by the taxonomic experts.

Whitefly: The phylogenetic analysis of *mt*COI gene from the whitefly was closely clustered with whitefly cryptic species belongs to the Asia-I group (ON385112).

Aphids: The sequence analysis revealed that nucleotide identity of aphid isolates *of mtCoI* gene sequences ranged from 91.8 to 100 per cent with *Aphis craccivora* (OP994083).

Leafhoppers: The leafhopper collected were transferred to 5 ml plastic vials containing 70 per cent ethyl alcohol and labelled. The specimens were identified by Dr. C. M. Kalleshwara swamy, C. M., Associate Professor, Department of Entomology, UAHS, Shivamogga, Karnataka. The leafhopper specimens were confirmed as *Empoasca kerri.*

YMD incidence: Virus infection in greengram samples was confirmed by PCR with begomovirus infection (OM106035).

RESULTS AND CONCLUSION

Whitefly, *B. Tabaci* Population

The average number of whiteflies in greengram growing areas of eight districts of Karnataka was ranged from 1.08 to 4.23 whiteflies per trifoliate leaf. Among the eight districts surveyed, more number

of whiteflies were recorded in the Belgaum district (4.23 per trifoliate leaf), Followed by Dharwad (3.94), Haveri (3.21), Chitradurga (3.06), Gadag (3.04), Chikkamagaluru (2.95), Davanagere (1.92) and the least number of whiteflies were recorded in the Shivamogga district (1.08) (Figure 1).

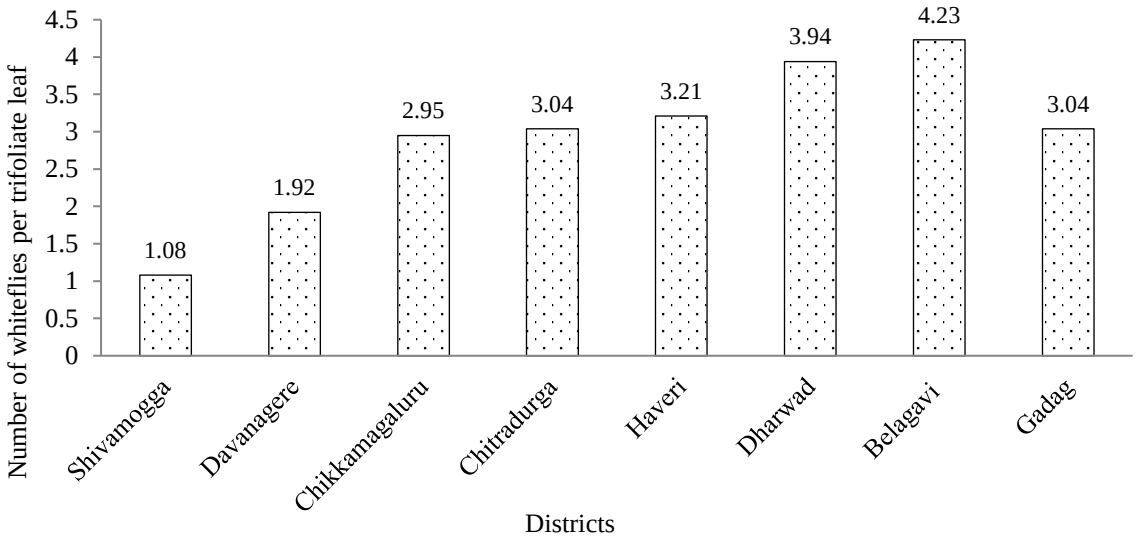

Figure 1. Incidence of whiteflies in different greengram growing districts of Karnataka.

Leafhoppers, *E. kerri*

The mean number of leafhoppers in greengram growing districts of Karnataka was ranged from 2.31 to 5.32 leafhoppers per trifoliate leaf. Among the eight districts surveyed, maximum number of leaf hoppers were recorded in the Chitradurga district (5.32 per trifoliate leaf), Followed by Gadag (4.88), Davanagere (4.53), Shivamogga (4.32), Haveri (4.21), Belagavi (3.35) and Dharwad (2.35) and the least number of leafhoppers were recorded in the Chikkamagaluru district (2.31) (Figure 2).

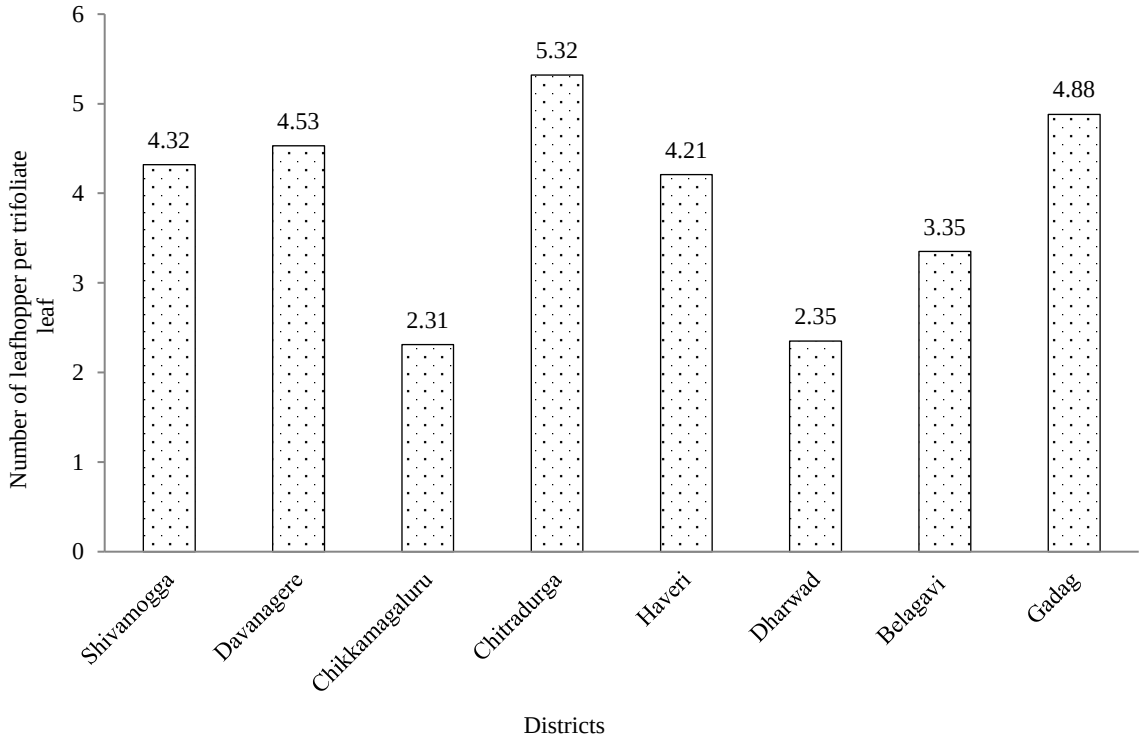

Figure 2. Incidence of leafhoppers in different greengram growing districts of Karnataka.

Aphids, *A. Craccivora*

The mean number of aphids in greengram growing districts of Karnataka was ranged from 57.62 to 29.54 per five cm twig. Among the eight districts surveyed, maximum number of aphids was recorded in the Davanagere (57.62/5 cm twig), followed by Chikkamagaluru (46.38), Shivamogga (45.23), Haveri (42.35), Chitradurga (36.95), Gadag (33.36), Dharwad (30.25) and the lowest number of aphids was recorded in the Belagavi (29.54) (Figure 3).

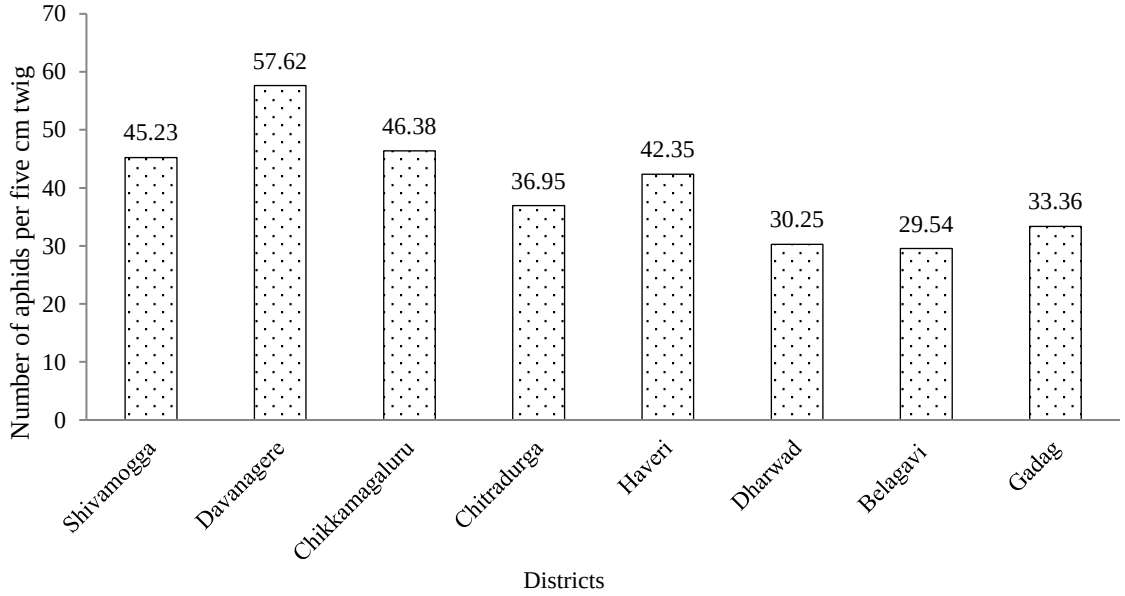

Figure 3. Incidence of aphids in different greengram growing districts of Karnataka.

YMD incidence

In greengram growing areas of eight districts surveyed, results indicated that the per cent disease incidence of YMD ranged from 10.32 to 68.75 per cent. The highest per cent disease incidence was recorded in the Belgavi district (68.75) followed by Dharwad (53.68), Haveri (26.93), Chitradurga (24.52), Chikkamagaluru (20.18), Gadag (16.77) Davanagere (15.69) and the least per cent disease incidence was recorded in the Shivamogga district (10.32) (Figure 4).

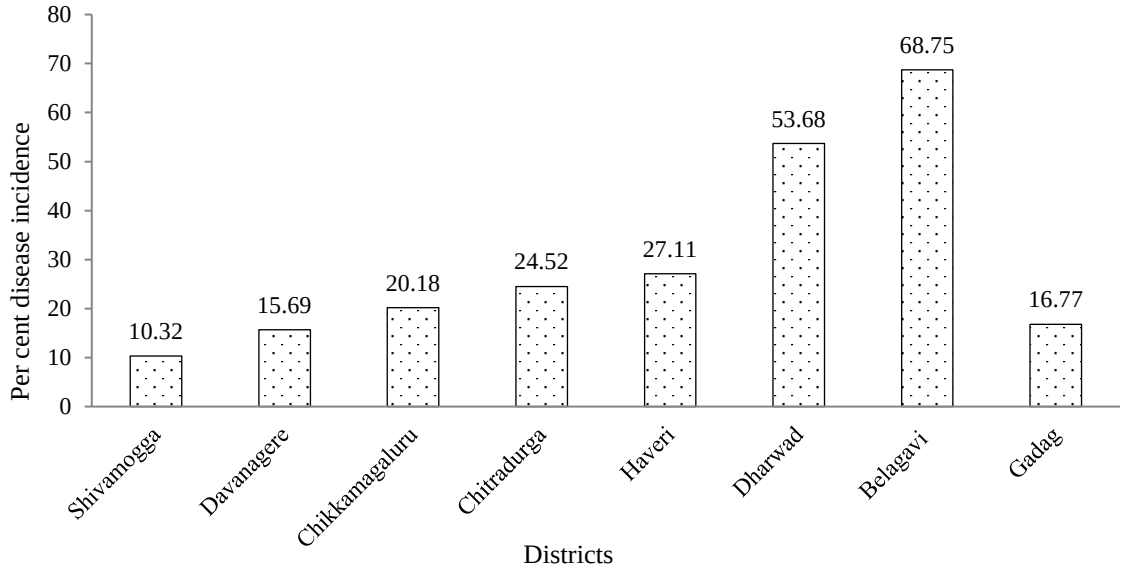

Figure 4. Incidence of YMD in different greengram growing districts of Karnataka.

Whitefly population was recorded more in Dharwad, Belgavi, Haveri and Gadag districts which may be due to the higher temperature and dry climate of these districts favours whitefly population multiplication. Semi-arid regions have favourable climatic conditions especially dry weather before and during the initial crop season congenial for whitefly perpetuation [8]. The whiteflies are polyphagous in nature, alternate host plants in the surrounding fields, weeds present in the field and bunds may also cause variation in the whitefly population. Cotton cultivation in Haveri, Belgavi, Gadag and Dharwad districts begins in February under irrigated conditions hence, whiteflies get their preferred host before greengram is sown. In Shivamogga, Davanagere, Chikkamagaluru and Chitradurga district farmers are mainly cultivating greengram as a inter crop or mixed crop in arecanut and coconut gardens, hence the whitefly population was less when compared to the potential growing districts of Karnataka. Previous reports also indicated that when main crop greengram is raised along with border crop or mixed crop, the whitefly population was reduced when compared to the sole crop [6] and Chilli [10].

Whiteflies act as a vector for the YMD in greengram. Hence, the maximum virus incidence was also recorded in Dharwad, Belgavi, Haveri and Gadag when compared to the other four districts surveyed. It indicates that whiteflies population increases the YMD also increases in greengram. These results are in accordance with the findings of [1].

The maximum aphids and leafhoppers population was recorded in Chitradurga and Davanagere districts. It may be due to mainly the crops grown during the Kharif season. In these districts cowpea and field bean was major pulse crops grown as a border or intercrop in all most all the crops. The aphids and leafhoppers prefer cowpea and field bean crops and eventually attack the greengram. Hence, the aphid and leafhoppers population was maximum in these two districts. However, the variation in population of sucking insect pests and YMD in greengram is due to sowing time of crop, variety and cultivation practices by the farmers may also the reason for fluctuation of number of sucking insect pests and YMD incidence in greengram.

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