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THE FIVE "F" OF WHITEFLY'S MASTERY OVER THE CONCERN OF PLANT PROTECTORS

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ABSTRACT

Whitefly (Bemisia tabaci), a polyphagous Hemipteran phloem feeder has a wide host range starting from numerous vegetable, fruits, ornamental plants even the weeds. Multiple dimensions of damage generate significant losses in a variety of economically important crops, and controlling them has become a difficult problem for growers. In this article we will discuss about the white fly related factors to identify the answer of its mastery on the concern of the horticulturist, entomologist even the pathologist.

Key words:- Whitefly, polyphagous, host range, damage

INTRODUCTION

Sap sucking insects are a major source of concern for both growers and researchers. Bemisia tabaci (Gennadius) (Hemiptera: Aleyrodidae) is one of them, and it has emerged as a severe limiting factor in the production of a wide range of agricultural products all over the world. Even after the progress of research, availability of multiple management practices , development of new varieties still this noxious insects are ruling the field of total crop loss due to all sucking insect complex. Not a single factor is responsible for this aggressive mode of damage by this insect. So, here in this article we tried to summarize and put five important factor under one ink which are acting as the leading reasons of pathogens leadership in the sector of yield losses.

Fact 1: Nature of damage

B.tabaci shows multidirectional way of its damage which also varies with the host species. After study all the symptoms or pattern of damage mainly four ways can be come out.They are-

i) Sap sucking by B. tabaci nymphs and adults from the plant tissue damage the photosynthetic units and turned the leaves and other plant tissue into yellow, dry and weak one even encourage the leaves fall off which unitedly results in stunted growth, yield loss and loss in vigour.

ii) Both the nymphs and adults together at the time of infection , excrete honeydew that act as substratum for black sooty mold growth which indirectly hamper the yield by reducing the photosynthesis activity (Horowitz et al,2020).This honeydew attract ant and some other insect also that helps in the insect dispersal too.

iii) B.tabaci counted as a super spreader and super carrier among all others insect vectors by spreading and carrying more than 100 important plant viruses from unhealthy plant to healthy one. Among them some are worthy of serious concern for their ability of causing diseases having high severity like Tomato yellow leaf curl virus (TYLCV), Tobacco mosaic virus (TMV), Tomato chlorosis virus (ToCV), Bean golden mosaic virus (BGMV) etc.(CABI,2020)

iv) Other than the diseases cause and physical damage; white flies are capable enough to produce no of physiological disorder in plant due to continuous feeding and destroying host tissues. Some of them are silvering of squash, Uneven ripening of tomato etc. (Mccollum,2004)

Fact 2:-Host range

The second factor which is a serious strength for this ferocious insect is the wide range of host. It has covered almost every family of agricultural crop that results in the better survival of the pathogen, easy continuation of life cycle and less stress for food availability. So, the pathogen abundance always remain high. Li et al,2011 made an extensive effort to mention about all the available hosts that are susceptible to this insect attack and this information really made us more concerned.

Fact 3:-Genetic evolution and biotypes

The evolution and biology of whitefly consists of incomplete metamorphosis with an exceptional pre-pupal stage that provides protection against abiotic and biotic stresses (Abd-Rabou, 2001). Until 1986, the primary pest species of whitefly was the greenhouse whitefly, Trialeurodes vaporariorum, but later Bemisia tabaci (Gennadius) was found attacking an variety of ornamental plants in Florida greenhouses (Burban et al., 1992). Among the biotypes, B and Q are considered to be most important. Feeding by the B-biotype whitefly (also known as Bemisia argentifolii or common name, "silverleaf whitefly") causes different physiological changes in the summer squash plant, while, resistance to the insect growth regulator

SL.No.	Host family	Name of the hosts
1	Malvaceae	Abelmoschus moschatus (Musk mallow), Abutilon theophrasti (velvet leaf),
2	Euphorbiaceae	Acalypha australis,A. wilkesiana,
3	Aceraceae	Acer buergerianum (Trident maple), A.Palmatum(Japanese maple),
4.	Araceae	Alocasia macrorrhizos(giant taro),
5.	Amaranthaceae	Alternanthera philoxeroides(Alligator weed), Amaranthus retroflexus(Red root pigweed),Amaranthus spinosus(Spiny amaranth), Amaranthus tricolor(edible amaranth), Amaranthus viridis (Slender amaranth
6	Apiacea	Apium graveolens var duice(celery),
7	Liliaceae	Asparagus officinalis(Asperagus), A.setaceus(Asparagus fern)
8	Basellsceae	Baselia alba(Malabar spinach)
9.	Cucurbitaceae	Benincasa hispidia(Wax gourd),Trichosenthes cucumerina (Snake gourd)
10	Brassicaceae	Brassica juncea, B. oleracea var. alboglabra (Chineese kale), B.botrytis(Cabbage), B. oleracea(Cauliflower)
11.	Rhamnaceae	Ziziphus jujube (Ber)
12	Vitiaceae	Vitis vinifera (Grape vine)
13	Fabaceae	Vigna radiate(Mung bean),V.angularis (Adzuki bean),Vicia faba(Faba bean), Trifolium repens(white clover),
14	Asteraceae	Tagetes erecta (Marie gold), T.patula (French marie gold)

pyriproxyfen (Distance), strikingly reduced susceptibility to the IGR buprofezin (Talus), and reduced susceptibility to the neonicotinoids insecticides imidacloprid (Marathon or Merit), acetamiprid (TriStar), and thimethoxam have been reported in Q-Biotype infesting cotton and other ornamental crops (Flagship). Furthermore, Bird (1957) proposed the race concept and recognized Jatropha race was (host-restricted'; Low fecundity) and the Sida race (polyphagous; moderate to high fecundity). Furthermore, esterase patterns revealed genetic polymorphism between local 'A type' and invasive and invasive 'B' type in Cucurbita spp (protein polymorphism) (Brown et al., 1995).

Fact 4:-Insecticide resistance:-

The threat regarding the B .tabaci is increasing with the increasing resistance of the insect against different group of insecticides. We here drew a timeline based table which reflects that the resistance against different insecticide grown by B.tabaci is increasing with the passing time and this trend can be seen across the globe even island like Srilnka.

Sl.No	Name of The Insecticides	Place of Research	Reference
1	Bifenthrin, α-cypermethrin, pirimiphos-methyl, endosulfan and imidacloprid	Crete	Roditakis et al,2005
2	Pyrethroids (deltamethrin and bifenthrin), organophosphates (dimethoate and chlorpyrifos) and neonicotinoids (acetamiprid and thiamethoxam), pymetrozine and to endosulfan	West africa	Houndété et al,2010
3	Moderate to high resistance to neonicotinoids and moderate resistance to carbosalfan	Srilanka	Marasinghe et al,2016
4	cypermethrin, deltamethrin, monocrotophos and imidacloprid.	India	Naveen et al,2017

Fact 5:- Threat to plant defense

B. tabaci has the ability to weaken the host's defences, making it vulnerable to other pathogens and insects. BtFer1 is a salivary protein produced by B. tabaci that reduces H2O2-generated oxidative signals during feeding on tomato plants. (Qi et al, 2019).Yang et al,2017 made an experiment on the interaction between LAC1, a secretory protein and Plant defence. LAC1 released into the salivary channel and also the midgut of B.tabaci and enters into the plant tissue at the time of feeding and detoxify phenolic compound that responsible for plant defence. Moreover, B. tabaci is capable of slice up the sulfate group from the glucosinolates. Glucosinolates are known as plant secondary defense metabolites that generally worked in plant system activating through the help of myrosinases. So the cleaving off the sulfate group turned into desulfoglucosinolates of the glucosinolate molecule and then as a consequence of the inability by the activation by myrosinases and finally weaken the plant defence mechanism.(Malka et al,2016)

CONCLUSION

In this short article we have tried to put all the information regarding the B.tabaci abundance across the globe and its emerging threats based on different factors which can utilized for the researchers, students and academician for the betterment of management practices by identifying new ways in this regard.

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