iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** IX **Month of publication:** September 2018

DOI:

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue IX, Sep 2018- Available at www.ijraset.com

Plant Virus: A Brief Review

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Abstract: Plant viruses cause severe diseases leading to heavy crop damage. The study of plant viruses has led the overall understanding of viruses in many aspects but still it's difficult to irradiate virus completely throughout the plant. The modern era of science and technology requires a better understanding about virus pathophysiology .The purpose of this cameo information is to provide an overview of the microscopic world of plant viruses as well as the common manifestations of plant virus diseases and major approaches to managing these diseases.
Keywords: Plant, Virus, Diseases

I. INTRODUCTION

Plant viruses are known to cause considerable losses in crop yield, quality of plants and plant products around the world. Viruses are infectious pathogens that are too small to be seen with a light microscope, but despite their small size they can cause destruction. All viruses are obligate parasites that depend on the cellular machinery of their hosts to reproduce. Viruses are not active outside of their hosts, and this has led some people to suggest that they are not alive. All types of living organisms including animals, plants, fungi, and bacteria are hosts for viruses, but most viruses infect only one type of host. Viruses cause many important plant diseases and are responsible for losses in crop yield and quality in all parts of the world [1]. Indian Ayurveda described certain viral resemblance specific symptoms like yellowing of leaves in Vrikshayurveda [2, 3]. Taking India into consideration, the earliest recorded viral disease are root wilt of coconut [4], spike disease of sandal [5], small cardamom disease [6], yellow leaf disease of areca nut [7], cotton stenosis [8], tristeza disease of citrus [9] , mosaic disease of sugarcane [10] and yellow vein mosaic disease of okra[11,3]. Viruses have great potential for inducing several economically important crop diseases as the fungal and bacterial plant pathogens, in spite of their extremely small size and elementary structure [12, 13]. They can infect whole plants, seeds and vegetatively propagated plant materials causing immense quantitative and qualitative losses.
This short review includes the important aspects on the plant virus ecology in modern era and concludes by understating the rapid preventive measures to manage the plant viruses.

A. Basic Biology

Like all other viruses, plant viruses are obligate intracellular parasites that do not have the molecular machinery to replicate without a host. Unlike all other living organisms, viruses are non-cellular. The simplest viruses are composed of a small piece of nucleic acid surrounded by a protein coat. As is the case with other organisms, viruses carry genetic information in their nucleic acid which typically specifies three or more proteins. Viruses are obligate parasites that cannot be cultivated using any growth media suitable for bacterial, fungal, plant or animal cell types [1].

B. Mode of Transmission

Seeds are important in the spread of a few viruses of legumes, wild cucumber, tomatoes, and curly top virus of beet sugar. The vegetative parts, the infected plants such as the tubers, bulbs, roots, offshoots, buds and scions which are used for propagation, will contain the virus present in the parent. Transmission by mechanical things like wind, agricultural implements play quite an important part. Handling plants at planting time and in cultural operation will also help in the spread of viruses such as sugar beet. Soil viruses transmitted through the soil. Some plant and animal viruses are spread and complete particles introduced into host cells by arthropod vectors. Among the arthropods most important agents of spread of virus diseases are the insects. The insect vectors which play a major role in the dissemination of plant viruses are the aphids, leafhoppers, flea beetles, scale insects, thirps and white flies. The virus may remain active in the body of the vector for many days. Some soil inhabiting viruses have nematode vectors which play important role in virus transmission.

C. Mode of Action

Plant viruses need vectors for transmission. Since plant viruses are obligate, bio trophic parasites, their life cycles start by penetration of the virion into the cell. Plant viruses are unable to penetrate the plant cuticle and cell wall. Virion enters the cytoplasm of the cell passively through wounds caused by mechanical damage to the cuticle and cell wall. The next phase of virus

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Volume 6 Issue IX, Sep 2018- Available at www.ijraset.com

infection is the partial or complete removal of the coat protein shell of the virion in the cytoplasm. Next the cell mediates expression of the viral genome by providing a transcription apparatus for DNA viruses and a translation apparatus for all viruses. The DNA viruses must be transported to the nucleus for transcription in order to gain access to the cell proteins required for the production of messenger RNA from viral DNA. Translation of viral RNA in the cytoplasm produces viral proteins that are required for completion of the virus life cycle. [1].

Fig.1 Leaf Curly Virus on Chilli

Fig.2 TMV on Tomato

Fig.3 Yellow Vein Mosaic of Okra

Fig.4 Papaya Mosaic

D. Management of Plant Virus Diseases

Virus identification is a mandatory first step in the management of a disease caused by a virus. The subsequent strategy for management will depend on the means by which a particular virus enters a crop, how the virus is transmitted between plants within a crop, and how the virus survives when the crop is not being grown [14, 15, 1].

Simple suggestions preventive measures to manage the plant viruses at farmer level.

1) Selection of seed should be done from credible sources ensuring virus free tags. This may include cuttings, bulls, rhizomes, tubers and seeds.
2) Crop rotation to avoid the availability of same host.
3) Eradicate the diseased plant from the field which will eliminate the inoculum from the field.
4) Insect vectors are the active transmitters of the viruses from weeds and other plant sources. These must be efficiently managed though eradication of weeds which harbour them and via sowing of trap crops.
5) Selection of virus tolerant verities can be very effective. E.g. Parbhani Kranti against yellow vein mosaic of the okra.
6) Hot water treatment can be effective against some viruses
7) Proper training and awareness about virus among farmers.

II. CONCLUSION AND FUTURE PERSPECTIVE

Indian agriculture is the backbone of a rural livelihood and national economy. Crop disease is the routine problem in farm but virus infection is the major challenge and big phobia in front of farmers. Virus diseases are critical in cash crops for farmers and they can even quickly roll back the economy of any region if they hit to their epidemics. So their timely management acquires huge importance. Because these pathogens depend on the normal cellular machinery of their plant host for reproduction, it is difficult to eliminate them without damaging the host plant. Therefore, most management strategies for diseases caused by plant viruses and viroids are directed at preventing infection of the plant. Another challenge in plant antivirus manufacturing is of non-specific mode of action. Such molecules can create residue of some unnecessary chemicals that will persist within plant. To overcome this hurdle, plant (herbal) extracted phytoconstituents may be the safer remedies against virus. Further research is necessary to irradiate virus problem completely.

III. ACKNOWLEDGEMENT

The work was supported by Western Bio Organics Agricultural Company, Sangli Maharashtra, India. This review paper is a part of research project “Z-7 Plus Natural Antivirus Product and its significance”. The authors are thankful to farmer friends and Western Bio Organics team.

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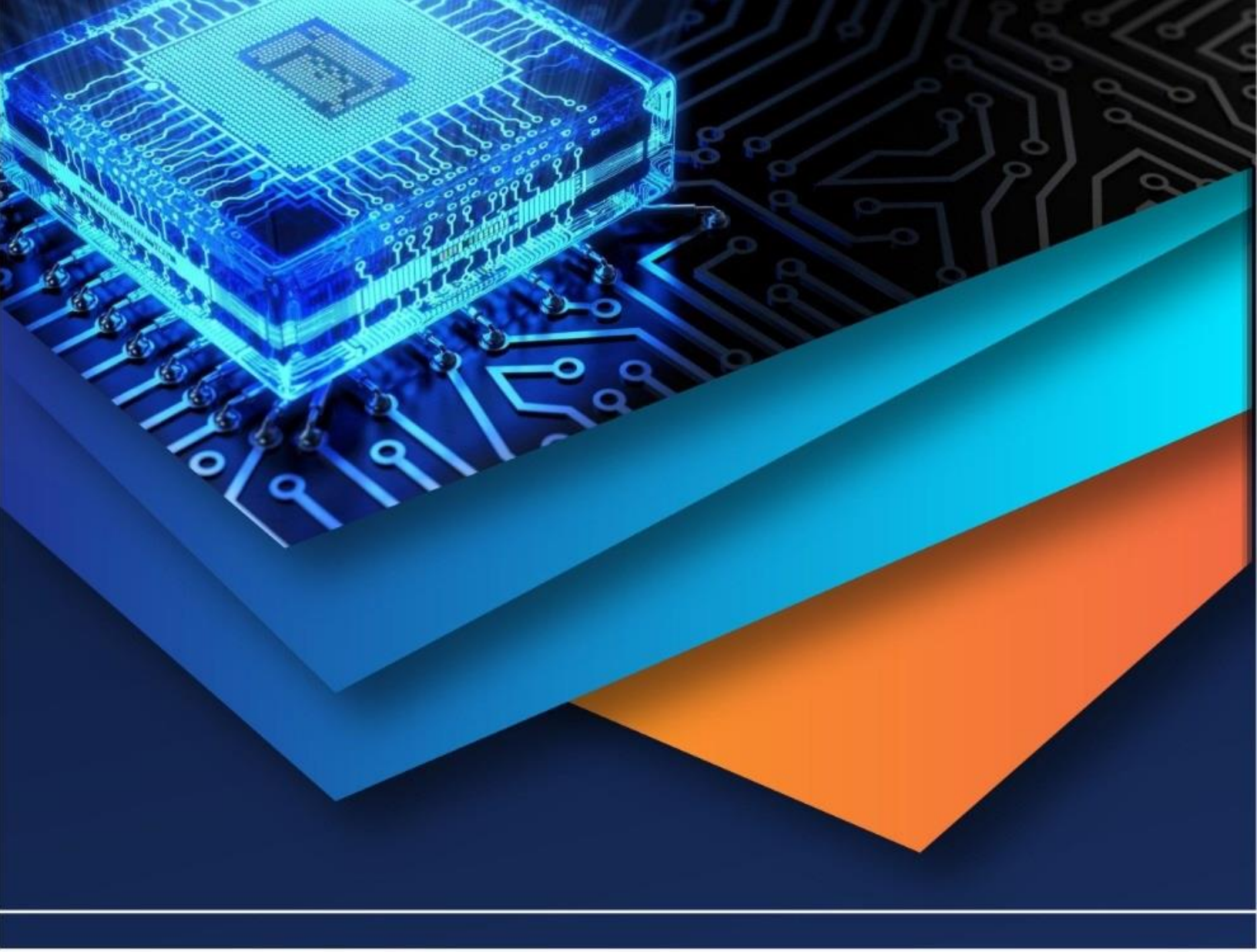

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