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Control on Plant Virus Disease

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Abstract:

Throughout the world, plant viruses and its diseases are one of the important limitations for food production. From 100 years ago, studies about the plant viruses and virus diseases given much attention to their control. According to IXth International Committee on Taxonomy of Viruses (ICTV) classification of 2012, "there are 91 genera 1005 virus and viroid species infecting plants which are classified largely based on differences in host reaction, serology, genome sequence identity and phylogenic analysis of the virus". Controlling of plant has been difficult to achieve because lack of any effective means of curing virus-infected plants. Chemotherapy, thermotherapy and meristem-tip culture can be successful but still it cannot be used at large scale. Subsequently, the main aim is prevent or delay virus infection or to improve its effects. According to objectives, used to achieve including phytosanitation (involving quarantine measures, crop hygiene, use of virus-free planting material and eradication), changes in cropping practices, and use of pesticides to control vectors, mild strain protection and the deployment of resistant or tolerant varieties. In this review paper, we will discuss about the controlling of plant viral diseases through some techniques such as Control measures, Host Plant Resistance, Chemical Method, Phytosanitation etc.

Keywords: *Plant Virus Disease, Phytosanitation, Cropping, Pesticides Chemotherapy, Thermotherapy, Meristem-tip*

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Introduction

Plants are infected naturally by different viruses worldwide and number of viruses continually developed. Higher plants provide the habitat for a wide range of pathogens, of which viruses are some of the most widespread. Plant affect different crop species including that contain the great importance in agriculture. Sometimes effects of viruses are not harmful but their crop growth and yield usually decreases and may cause serious losses. It have long been recognized and provided the inducement studies of viruses of crop plants. It main aim controls the developed effective viruses which could be used on large scale to increase crop productivity and make effective use of the land, labour and other resources under utilisation.

This paper considers the limitation to adoption and the scope for developing and utilizing integrated control measures.

Control Measures: Eliminated some viruses from infected plants without killing or removing but by heat or meristem-tip therapy or by the use of chemicals. By using these method, developed virus-free plants of vegetatively-propagated crops for further propagation and release to growers. Therapy cannot be used on large scale and lack of any possible means of curing infected plants is an important limitation of control. Subsequently, other methods have been accepted. These are to:

- Prevent plants from becoming infected.
- Delay infection to such a late stage of crop growth that yields are not seriously impaired.
- Decrease the effects of infection.

Phytosanitation: According to this term, various approaches are applied that control achieved by decreasing the number of foci of infection from which further virus spread can occur. It contain five main ways for doing this that is as follows:

- Quarantine measures to avoid introducing viruses and their vectors to areas free of them
- Sanitation including the removal of all surviving plants, debris and self-sown 'volunteer' seedlings of previous crops.
- Removal from within and around crops of any weed or wild plants known to be alternative hosts.
- Use of virus-free stocks of seed or vegetative propagules for all new plantings.
- Removal ('roguing') of diseased plants from within plantings, especially those found during the early most vulnerable stages of crop growth.

Quarantine: Information available on the geographical distribution of viruses and their organism is inadequate because of lack of facilities and trained personnel to demeanor surveys and virus identifications. Viruses and vectors are restricted to certain regions which is apparent but in some areas, it shows absence.

It contains obvious advantages in adopting quarantine and measures to maintain the current situation and to avoid introducing virus and vectors areas where they are established and cause problem. There are also particular problems in controlling the movement across land borders and by natural disasters, insecurity and civil unrest, difficulties are associated with the disruptions. Quarantine controls are of limited value that are suggested by these problems because pests and pathogens will eventually become established in all areas where agro-ecological conditions are suitable.

For virus detection, importance maintaining and improving quarantine procedures and need to develop new techniques to overcome currently intractable problems.

Crop Sanitation: It creates the problem that is by growth of 'self-sown' seedling 'volunteers' of crops such as cereals, rice and groundnut. This facilitates the survival and perennation of viruses and their vectors, and can provide a 'green bridge' between successive growing seasons.

It contain advantages that are gained by approving agriculture practices which decrease the amount of crop debris and obstruct survival. According to Sudan Gezira Irrigation Scheme, it was appreciated at an early stage in studies on cotton leafcurl disease. Special implements were devised to facilitate the removal and destruction of the cotton stumps remaining after harvest that would otherwise survive and regenerate to become foci of infection in subsequent plantings. In this Sanitation, measures are accepting to avoid the carryover of inoculum in sugarcane, tobacco and other commercial crops and it contain the law to help the removal of all crops residues before new planting begins.

Removal of weed or wild hosts: Many viruses have weed or wild hosts that act as foci of infection from which there is spread into or within crops. Remove the sources of virus infection or vector hosts by standard phytosanitary control measure that are not part of crop so as to minimize the initial virus infection source and

number of vectors. For example, patches of the perennial grass weed is the symptoms of maize dwarf mosaic disease and Sorghum halepense that occur commonly within and around crop stands. It contain advantages that to be gained are also apparent from experience with Cacao swollen shoot virus in the Western Region of Ghana, where many outbreaks in cocoa are associated with under-storey forest tree Cola chlamydantha.

Virus-free Propagules: For all new plantings, use of virus-free propagules that is a basic approach to control which is beneficial for several reasons:

- Virus-free material establishes more readily and is more productive than infected.
- If virus-free material is adopted there are no initial foci of infection within crops from the outset, during the early most vulnerable stages of crop growth. This delays and curtails the period over which any subsequent spread can occur.
- Plants not infected until a late stage of crop growth are affected less severely than those infected early.
- Infected propagules are particularly dangerous sources of inoculum because they tend to be distributed randomly within crops. This facilitates virus spread from infected to neighboring healthy plants, whether this is by contact or by vectors.

Much attention has been given in technologically to advance countries by these reasons that producing the virus-free stocks of seed and tubers, cuttings or other propagules of crops that are propagated vegetatively. There are no major problem for obtaining stocks that are free from infection by careful selection or by using some form of therapy. To maintain and designate the health status of stock by using the official inspection and certification procedures.

Roguing: Removal of symptomatic plants, known as roguing, is a phytosanitary control measure that is widely used to remove sources of virus infection from within crops. Roguing is widely applicable and used to control infected diseases of diverse crops in both tropical and temperature regions. The approaches is most effective against viruses that is not spread quickly in any considerable amount. It is popular with farmers, who are seldom prepared to allocate the time and effort required to inspect crops with thoroughness and required frequency to identify and remove diseases plants When symptoms are conspicuous and when the symptomatic plants are removed early, before vectors have visited them in case of effective of roguing and when vector number are low and when a virus is being transmitted persistently by insect vector in case of non-effective.

Host Plant Resistance: Crop species contain a feature that is some degree of genetic diversity and it is used by agriculturalists and horticulturalists to increase crop productivity and remove the most damaging effects of pest and pathogens. By selecting and adopting genotypes, it is achieved that yield satisfactorily and avoid or withstand biotic and abiotic limitations.

Host plant resistance is virus diseases which is helpful to distinguish between 'positive' and 'negative' selection. *Negative selection* is recognized as being several diseased and they do not grow or yield satisfactorily due to which particularly vulnerable crop genotypes are discarded by farmers or researchers. *Positive selection* is recognized by to identify particularly resistant genotypes when heterogeneous populations are exposed to infection. Positive selection is requires substantial scientific input and expertise, while negative selection is practiced within even the most primitive cropping systems. Both selection has been used widely and intentionally or unintentionally host plant resistance that play a big contribution to control the virus diseases by decreasing incidence.

There are widely used in agriculture and horticulture and could make a greater contribution to control the diseases but for several constraints:

- Effective resistance breeding programmes are developed by considerable research as these must also take explanation of other biotic and abiotic constraints and requirements of farmers, consumers and processors. For a sufficiently long period, necessary funds, personnel and resources are not always available.
- There have been occurrences of resistant varieties being released without adequate on-farm testing to ensure that the varieties are suitable for adoption and that they meet the often severe requirements of farmers and consumers.
- In case of resistant varieties are developed, they may not available because of the lack of an effective seed multiplication and distribution system, and farmers are unaware of benefits that are gained from adoption.
- The resistance may be associated with undesirable traits as resistant varieties may lack some of the desirable attributes of the susceptible varieties being grown.

- The need to adopt resistant varieties is not necessarily compelling, especially if the disease occurs occasionally and attracts less attention than other factors decreasing yield.
- Resistance may be overcome due to the emergence or increased prevalence of virus strains that damage previously unaffected varieties. Moreover, varieties that are resistant in some areas may be susceptible in others. Thus, it may be difficult to develop and exploit broad-based resistance that is also durable.

Chemical Control: To decrease the spread of legume viruses vectored by insects that is the application of insecticides. It is frequently ineffective because success with it depends on factors such as mode of action of pesticide and mechanism of transmission of virus. Insecticides should always be applied carefully as they become ineffective when vectors develop resistance to them and overuse results in unwanted side effects with environmental and economic consequences, such as buildup of toxic residues, loss of beneficial natural enemies of vectors, and unanticipated growth of other pests or pathogens. By using chemical control of vectors, success in decreasing virus that is greater with persistently than with non-persistently transmitted viruses.

Non-persistent Viruses: Most common types of insecticides are infected at controlling non-persistently aphid-borne viruses. It is the newer generation of synthetic pyrethroids because of their rapid knockdown and greater antifeedant activity. This newer generation viruses contain applications that did not control the virus sufficiently well to provide reproducible yield increases.

Persistently Viruses: Success was obtained with chemical control of luteoviruses, such as BLRV and related viruses, in cool-season grain legumes. In growing season, treatment could prove useful in areas where infection with FBNYV is likely to occur because chemicals are used in low temperature (100-200g/ha) that is more acceptable environmentally than many of the older generation of systemic insecticides normally applied as foliar sprays. However, due to the environmental impact, chemical control should still only be considered when other control approaches are insufficient to achieve economic yields in infected crops.

Review of Literature

Thresh (2003), improved technology would only be attained by developing more effective methods of controlling pests or pathogens diseases. Crucial challenge for researchers, extensionists and farmers to developed the effective and sustainable methods to control the plant viral disease and also not harmful effects on human health and environment.

Jones (2006), concluded that challenge to achieving satisfactory yield and quality of produce to virus epidemics in cultivated plant. An increasingly sophisticated and diverse range of host resistance, cultural (phytosanitary and agronomic), chemical, biological and legislative control measures are becoming available to meet this challenge. There is an increasing knowledge base and sophistication technology to control the plant virus diseases. In this review paper, control measure also need to be ecologically and socially sustainable, robust, affordable and compatible with standard agriculture practices.

Bosch, Jeger and Giligan (2006), dictated that from the previous crop as planting material, transmission of virus through the use of infected cuttings and transmission through an herbivorous insect vector map onto vertical and horizontal disease transmission modes. The effect of transmission mode on virulence which is depend on mechanisms responsible for transmission in combination with the trade-offs operating in system under consideration.

Loebenstein and Katis (2014), to control the virus disease in legume crops is through Integrated Plant Disease Management (IDM) that is, by crop management or ecosystem management. In this review paper applying the chemical methods to controlled the virus-infected crop.

Islam (2017), stated that knowledge and perceptive criticize the farmer's literacy about the plant diseases, their symptoms recognition and proper management practices. The farmers are not confused with virus diseases but they are pile up to their loss through wrong usage of pesticides. The long lasting solution against these diseases can only be through incorporation of host plant resistance due to the lack of knowledge of farmers about virus diseases. More than hundreds of research institutes, laboratories and universities about the plant virus diseases are failed and in generating the virus resistance crop verities against most of the plant viruses. Only few success stories relating to virus resistance cultivars but 0.1% is un-justifying.

Conclusion

In this review paper, many approaches are applied due to which controlling plant virus diseases and it also contain little doubt that many of the diseases now causing serious losses and diseases could be controlled

through the application of existing knowledge in tropics areas. There are also likely to be important contributions from new technologies and approaches to control the viral diseases by biotechnologists. This information is utilized by researchers and extensionists in developing and stimulating suitable large scale control measures that are not effective but appropriate for use by farmers. Avoiding the harmful effects on human health or environment by using control measures and should complement and be fully compatible with those being used against pests and pathogens. If these studies should be done on large scale and over a sufficiently long period to provide a reliable indication is cost-effectiveness of the control measures. Improved methods of virus control plays an important role in enhancing productivity and utilized the experience gained already in developed countries and introducing the new biotechnologies.

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