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Popular Article

Weeds as Potential Reservoir for Pathogens

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Abstract

Weeds are very well known for their competitive nature in respect to crops whether it is for food, light, space, etc. These are also very well known for their survival and also to act as an alternative host for pathogens in their surviving times. When crops are absent, these weeds become an integral part of the life cycles for the pathogens. Hence, becomes necessary to manage the weeds from the field. If not timely done then these may cause huge damages.

Introduction

Weeds are major problem not only from the agronomical point of view but also from the pathological point of view. They are defined as the unwanted plants which grow with our main crops. Weeds compete with the crops for light, water, nutrients, space, etc. Losses caused by weeds (33%) are more than as in case of pathogens (26%), insects (20%), storage pests (7%), rodents (6%) and others (8%). They grow with the crops and acts as an alternative host for most of the pathogens (bacteria, fungus, viruses, nematodes, some insects, etc.). These pathogens use weeds as alternate hosts for their survival. In unfavorable conditions, they provide shelter to these organisms which may pose heavy economic losses when the main crop is grown. Most of the pathogens due to their virulence nature are able to cause diseases and may infect more than one species of crop. Pathogens can survive well using their surviving structures or on the plant debris or may prefer any alternate host for their survival. For example, filamentous fungi which belong to the genera *Fusarium* and *Alternaria* is cosmopolitan in nature and can thrive well in any climatic condition.

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Relationship between host and pathogen

Basically 3 components, i.e., host, pathogen and environment is considered but a 4th factor which also plays a very important role in the development of disease has been added into it 'time'. Diseases in plants are usually caused by bacteria, fungi, viruses, mollicutes, etc. These pathogens involve a number of processes viz., infection, colonization, reproduction and then finally it spreads all over. When managed these pathogens are able to mutate and then forming other races which results in the increase in their genetic diversity. Phytopathogens are not host specific at all. They infects a large number of plants whether from same family (collateral hosts) or from the other family (alternate hosts). Weeds can survive throughout the year unlike our crops hence forms a great reservoir for pathogens to live/harbor. As a result, when seeds of weeds are disseminated then the pathogens are also dispersed through the seeds.

Some important points to be remembered due to which weeds may be regarded as reservoir for pathogens

1. Weeds can act directly or indirectly as vectors for plant pathogens.
2. Weeds may also serve as reservoirs for pathogens and also to their vectors.
 - a. Serve for overwintering in absence of crops as endophytic in nature, especially for non-mobile pathogens.
 - b. Serve for mobile pathogens on external surface.
3. Some weeds may act as obligate alternate hosts for pathogen, where the necessity of the weed is compulsory for completion of the life cycle such as in *Puccinia*.
4. Through transgenic crops the genes of resistance could be shifted into the weed species.

Reasons for unnoticed diseases in weeds

1. They eliminate the sensitive hosts by naturally.
2. Resistance or tolerance for a pathogen is obtained by the long-term selection.
3. Makeup of the weed species is somewhat heterogeneous in a field which results in low plant to plant contact within same susceptible species.
4. High genetic makeover of the weed species.

Critical Examples of plant families which acts as Alternate Hosts

Not all the plant families are reservoir of the plant pathogens but some of them may act as the reservoir for pathogens. Some of the examples of such are given below;

1. **Amaranthaceae:** This family contains members like spinach, quinoa, beets, etc. It also have some weeds like Palmer amaranth (*Amaranthus palmeri*) and lambsquarters (*Chenopodium album*), these gives shelter to *Tobacco Rattle Virus* which may cause chlorotic symptoms and viral disease on beet and sugar beet, potato and tobacco.



2. Fabaceae: this family contains all types of peas, beans and pulses. It also has numerous varieties of weeds into it. *Pueraria montana var. lobata* a notorious weeds species which is able to harbour pathogen of soybean rust, i.e., *Phakopsora pachyrhizi* and *P. meibomiaae*. Other weeds which harbour this pathogen are *Desmodium tortuosum* and *Trifolium spp.*

3. Brassicaceae: collectively members of this family is known as mustards or crucifers which includes members like cauliflower, broccoli, radish, etc. Weed of this family named as wild radish (*Raphanus raphanistrum*) acts as reservoir for *Beet Yellow Virus* which may cause viral disease in many legume crops.

4. Solanaceae: contains crops like potato, tomato, pepper, etc. It is often regarded as the nightshade family. Weeds in this group such as Jimsonweed (*Datura stramonium*) can be infected with *Tomato mosaic virus and Potato virus X*, which on later stages infects the tomato and potato respectively.

5. Poaceae: contains all the members of the grass family. Crops included in it are corn, sugarcane, millets, etc. Sweet corn can be infected by *Maize Dwarf Virus* which is harboured in Johnsongrass (*Sorghum halapense*).

Not only viral diseases but there are lot of fungal and bacterial diseases which may be reserved in the weeds for the overwintering in the absence of weeds. Some of them are,

- *Anagallis arvensis L., Avena Fatua L., Brassica napus L., Chenopodium album L., Convolvulus arvensis L., Echinochloa crus-gali (L.) P. Beauv., Hordeum vulgare spring L. (vol.), Medicago lupulina L., Plantago major L., Raphanus raphanistrum L., Solanum tuberosum L., Triticum aestivum L., Veronica arvensis L.,* etc. have been found to harbour different *Fusarium spp.* like *F. avenaceum, F. culmorum, F. equiseti, F. graminearum, F. oxysporum, F. poae, F. redolens, F. sporotrichioides, F. tricinctum* and *Fusarium* species.
- In a study done by Ocimati *et. al.* it was found that weeds such as *Canna spp., millet, sorghum* and wild sorghum caused the wilt disease caused by *Xanthomonas compestris pv. musacearum* in banana.
- According to Phillips A. J. L., while studying 4 weeds namely *Amaranthus deflexus, Bidens formosum L., Bidens pilosa L. and Tagetes minuta L.* concluded that all of them were infected and were acting as alternative host for *Sclerotinia sclerotiorum* which causes severe losses in sunflower, soybean, other beans, etc.



Conclusion

It is very necessary to perform essential agronomic practices in order to eliminate and manage the weeds from the field so as to save the crops from the further infections caused by the different types of pathogens. The practices may be in the form of Integrated Weed Management or Integrated Disease Management.

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