Opinion

Soybean vein necrosis virus

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Soybean (*Glycine max*) is the one of the most important crop grown in US used for vegetative oil and animal feed. Soybean has been found to be infected with several viral diseases like soybean chlorotic mottle, soybean crinkle leaf, soybean dwarf, soybean mosaic etc. Soybean Vein Necrosis virus (SVNV) is a recently discovered disease of Soybean plant. It belongs to family Bunyaviridae and genus Tospovirus. It was first discovered in Tennessee in 2008 and has been found in soybean production areas of Wisconsin, Iowa, Arkansas, Tennessee and other southern states of US.[1] The disease first starts as intravenal chlorosis in the leaves. The chlorotic lesions range from 6 to 12mm but can be larger .In affected plants; the veins may appear clear, yellow, or dark brown (Crop protection Network). Much of the discoloration is noticeable underside of the soybean leaves. In susceptible varieties it spreads throughout the leaf ultimately leading to necrosis of leaf. Whereas in resistant varieties the lesion are limited or the disease progress slowly. Most of the varieties of soybean are found to express moderate resistance to the disease. In severe infestation leaf fall has also been found. The necrosis of leaf can be a serious problem towards growth and yield of soybean plants and any epidemic conditions can lead to prodigious loss of production.

SVNV belongs to Genus Tospovirus which includes diseases transmitted through thrips. The soybean thrip (*Neohydatothrips variabilis*) has been identified as the vector of SVNV.[1] The infected soybean plants or alternative host are fed by the thrips larva. Several weed host has been found to be an alternative host for SVNV.[1] Under favorable conditions the feeding continues throughout the growing season and the thrips are infected with the SVNV virus. The infected thrips attack the healthy soybean plant in vegetative or early reproductive stage. This way the SVNV life cycle continues. In a recent study done by Stacy Keough et al.,[2] a positive interaction was found between host plant SVNV and vector. This indicates that SVNV infected *N. variabilis* females produced more offspring compared to non-infected females leading to wide spread of disease. SVNV is systematically transmitted. It can be transmitted from infected seed to growing seedlings systematically at the rate of 6%.[3]

SVNV is a relatively new disease and nothing much has been known about its prevalence .It may have been present from ages and unnoticed or transmission from other countries could have led to its emergence. Not much of research regarding the epidemiology, resistance and management of disease has been conducted so far for SVNV (Daren Mueller). This novice identification can be confusing to some of the other diseases like brown spot, bacterial blight, cercospora leaf blight, Downy mildew and sudden death syndrome, so a correct understanding of disease is necessary (Crop protection Network). Multiple trials in different growing conditions using different varieties of soybean can only lead to an accurate epidemiology of the disease. Any disease needs certain growing conditions like temperature, ph, humidity, moisture, and light for its survival. So study regarding these aspects for disease growth and survival is a very necessary step towards finding a better solution to the disease. As virus borne diseases present enormous variations in epidemiology and pathogenesis, a single management tactics isn't sufficient to control the diseases. Viruses reproduce fast and diseases have property to spread quickly. So care must be taken as early as during preparation of field. Proper cultural techniques with virus free growing conditions need to be maintained. One of the most effective techniques is development of resistance towards SVNV in varieties of soybean plants. Some varieties are susceptible and some resistant to SVNV. The resistance found in plant can be due to physical appearances or genetic factors. Genetic manipulation technique has helped us to create desired genetic sequence in plants. The identification of resistance gene in several varieties followed by proper recombination and breeding techniques to develop a resistant plant can be a better way to mitigate the disease. The local varieties are the reservoir of dominant alleles that can suppress any genetic changes made by virus to the plant. The virus mainly invades by breaking the immune system of the plant, making it vulnerable to several other diseases as well. So scientific trials focusing towards identification of resistance factors in the plant and its incorporation in the commercially grown soybean plant seems promising.

One of the better approaches of studying the disease can be made through the study of virus gene function in association to necrosis caused by the disease. A study done by Bomin Kim et al.,[4] in Turnip Mosaic virus, the necrosis symptom was the result of hypersensitive reaction in plant towards the virus as a defensive approach to fight against disease, eventually leading to cell death (necrosis). The necrotic response was associated with the production of H_2O_2, accumulation of salicylic acid (SA), emission of ethylene, and expression of defense-related genes. So congruent research in SVNV regarding the physiology of necrosis, the expression of viral genes in the plant cells and response of the soybean towards the disease is necessary.[5,6] To sum up, SVNV is a neophyte to the world and not much damage has been recorded till date. This is the appropriate time to conduct all the research regarding the disease so that we can halt the epidemic condition in near future. Study of its epidemiology, viral genes expression, management, development of resistance and varietal trial are promising research that should be carried out.

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Conflict of interest

The author declares no conflict of interest.

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