Phytoplasma in Nurseries : an Imminent Threat to Floriculture

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Indian floriculture industry has grown widely and has established its shoots and roots across the continents through import and exports. The rapid increase in the nursery industry along with the real estate boom has augmented the import of exotic plant and variants from across the globe. The introduction of plants brings along the inhabitants of the hosts as well and if the introduced location is favourable, they flourishes in the new place quickly and will start conquering the other flora. Even though unconsciously, such imports has introduced and established many weeds and pathogens in our country in the past like Parthenium, Eichornia, Michania, Lantana, Salvinia etc and many pests and diseases like Banana bunchy top, African cassava mosaic disease and a long list of introduced insect pests. Phytoplasma cannot be an exception. Some of the morphological manifestations of phytoplasma infections are favourable to the ornamental value of the plants and the rapid propagation of such infected planting material is already occurring. This practice is posing a major threat to our country's biosecurity and th going to affect the global floriculture trade in futur countries are becoming more conscious ab biosecurity issues.

What are phytoplasmas?

Phytoplasma is an economically important pl pathogen both in agricultural and nursery industri Phytoplasmas formally called mycoplasma-l organisms (MLOs), are plant pathogenic bacteria the class Mollicutes, lack rigid cell walls, surrounc by single membrane and are pleomorphic with a s of 80-800nm. They are called as MLO's due to th resemblance to mycoplasmas, the human pathoge and their sensitivity to tetracycline derivatives. Mc than four decades after their discovery they still rema as one of the poorly characterized pathogens as th are difficult to culture in vitro unlike mycoplasmas other bacteria.

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What are phytoplasmas?

Phytoplasma is an economically important plant pathogen both in agricultural and nursery industries. Phytoplasmas formally called mycoplasma-like organisms (MLOs), are plant pathogenic bacteria in the class Mollicutes, lack rigid cell walls, surrounded by single membrane and are pleomorphic with a size of 80-800nm. They are called as MLO's due to their resemblance to mycoplasmas, the human pathogens and their sensitivity to tetracycline derivatives. More than four decades after their discovery they still remain as one of the poorly characterized pathogens as they are difficult to culture in vitro unlike mycoplasmas or other bacteria.

Petunia yellows

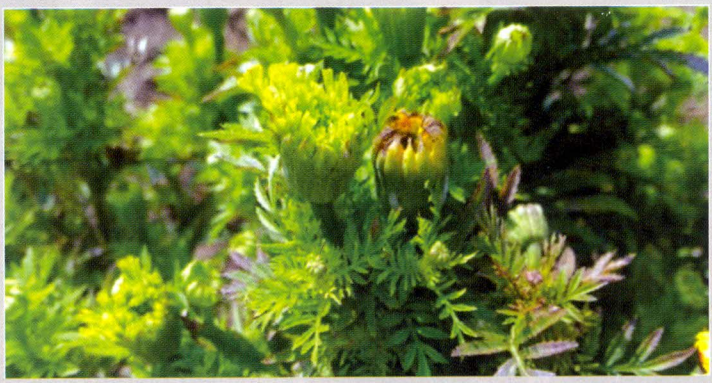
Ixora yellows

Murraya little leaf

Figure 2: Phytoplasma symptoms in marigold raised from cuttings in farmer's field

flowering stage as phyllody and virescence where petals turn green and leafy structures arises instead of flowers. In case of marigold, plants raised through cuttings exhibit incidence of phytoplasma up to 50 to 60 percent in farmer's field even in the absence of vectors, where symptoms are expressed towards flowering. In nurseries the plant looks healthy and when it reaches the flowering stage the symptoms are expressed and cause loss to the farmer. To avoid such circumstances, the nursery should take care of getting the propagation material from phytoplasma free mother stocks. The mother plants from where cuttings, scions, suckers, seeds etc collected must be certified phytoplasma free and has to be maintained under insect free condition to ensure the lack of further infection.

Introduction of plants from other countries and continents enables the introduction of phytoplasmas to Indian nurseries as they are molecular pathogens inhabiting phloem and difficult to detect. If such introduced phytoplasma finds a susceptible host endemic to our country the infection can lead to epidemics and loss of our native plants or food crops.



Flower malformation and Little leaf in phytoplasma infected marigold

Thus proper care and procedures for import has to be followed to avoid such accidental introductions.

How to contain the phytoplasma threats?

The prevalence of a new pathogen in our country can be a trade barrier for the export of that planting material to another country. Countries like Australia, New

Zealand, Canada, Europe and USA have already developed a system to screen those threats to ensure their country's biosecurity. The Plant Quarantine Order 2003 and its amendments in India also regulate and restrict imports of phytoplasma infected plants and planting materials and other flower products imported from other countries. Even though a system is in place, some of accidental escapes occur in India which is evident from symptom expressions of phytoplasma infections in wide variety of plants.

Towards ensuring quality planting material, National Hroticulture Board has taken an initiative by developing guidelines for recognizing horticultural nurseries with a slogan 'Our Quality Planting Material is our Property. We care' where nurseries are ranked from satisfactory to excellent by evaluating source of parent material, propagation in disease free condition by adoption of technically prescribed method, adoption of good nursery management practices, reliable record keeping and training of staff etc. If the evaluation is strictly followed and every nursery tries to achieve the excellent ranking the issues related to the disease spread will be automatically resolved. Awareness among the first hand users or stakeholders involved in import, inspection, propagation, cultivation, export and certification regarding the phytobiosecurity threats posed by phytoplasma is a must to secure the floral wealth of our country from exotic strains of phytoplasma and other pathogens. India is blessed with wide range of agroclimatic conditions making it favourable for the establishment and spread of phytoplasma. In order to minimise the further spread and establishment of phytoplasma in our cropping system due to free flow of planting materials from one location to another, there is a need to strengthen the domestic quarantine.

The most important hurdle in phytoplasma diseases is that once occurred they are very difficult to manage. Elimination of phytoplasma from infected plant is nearly impossible. It can be removed only to some extent. Thus the best way to control the disease is prevention, use of disease free planting material, clean cultivation through removal of weeds and alternate hosts and management of insect pest. The treatment of tetracycline derivatives of antibiotics was found to reduce the load of phytoplasma in infected phloem tissue, but the symptoms revert back after some duration. "Prevention is better than cure" is the word of the day for containing phytoplasma diseases.

Management options

Cultural Management :

- Use of clean propagation material
- Use of resistant cultivars
- Use of insect proof net in nursery
- Mulching for avoiding weed growth and repelling leafhoppers
- Installing yellow sticky traps @ 4 traps per 100 sq. mt. for trapping leafhoppers in the field
- Good agricultural practices like rouging infected plants, weed control, habitat management to enhance natural enemy activity
- Rouging and burning of alternate hosts and weed hosts (Parthenium, Brinjal etc.)
- Rouging and burning of cuscuta infected plants to check spread of phytoplasma infestation
- Cuscuta must be destroyed before it produces seeds

Chemical management

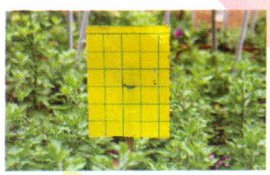
- Application of Kaoline as a particle film will repel leafhopper from landing on treated plant
- Spray with dimethoate 30 EC @ 2.0 – 2.5 ml/l. or imidacloprid 17.8 SL @ 0.25 – 0.5 ml/l. for managing leafhoppers
- Spray antibiotics like Oxy-tetracycline @ 400mg/l.

Growth promoters

- Use of plant growth regulators like auxins to recover the symptoms

New Interventions

- Use of plant immunity activators like Benzothiadiazol, Acibenzolar methyl etc.



Yellow sticky trap