

# PHYTOPHTHORA

## -A THREAT TO BLACK PEPPER-

### PRESENT STATUS AND FUTURE STRATEGIES OF DISEASE MANAGEMENT

Black Pepper (*Piper nigrum* L.) originated from the Western Ghats of India is an important spice crop commercially grown in India, Indonesia, Malaysia, Brazil, Sri Lanka, Madagascar, Thailand and in some parts of China. Known as "black gold" it is the major export earner among spice crops in India. It is grown as a pure crop or a mixed crop in coconut, arecanut gardens and also in coffee, cardamom and tea on commercial scale. *Phytophthora* foot rot remains as a main threat to this crop not only in India but also in other countries where this crop is grown. It has been estimated to cause an annual crop loss of 4.5-7.5 million dollars on a global scale. Though the disease was reported as early as in 1902 in India, research efforts on the understanding of the disease and management strategies are only recent developments.

#### About the disease

This is caused by soil-

borne fungal pathogen *Phytophthora capsici*. The fungus which remains dormant in the soil and in infected plant debris, starts multiplying with build up of soil moisture coinciding with the onset of south west monsoon. Climate with a temperature range of about 18-25°C, high humidity (>RH 90.1), intermittent showers to continuous rainfall and low sunshine hours during May-June to August September are the congenial conditions for the disease development. Incidentally, these are the conditions that trigger the new flesh emergence and abundant root regeneration of black pepper. The pepper vine is highly vulnerable to infection at this stage. All parts of the plant viz. the tender runner shoots, leaves, spikes, aerial branches and roots are prone to infection.

#### Foliar phase

Foliar infection starts on tender runner shoots spreading on the ground or on tender leaves at the

lower regions of the bush, with soil splashes. Small dark brown leaf spots with fast advancing margin enlarge up to one-three cm with a fimbriate margin, are characteristics of the disease. Intermittant showers will lead to disease spread from lower region of the bush to the upper parts of the bush in a ladder like fashion. Disease spread is through rain splashes. Aerial infection which includes rotting of green tender stem results in varying degrees of defoliation leading to reduced canopy. It is not fatal.

#### Soil phase

Root infection starts primarily on tender feeder roots and gradually spreads to thicker roots. From the main roots, the infection gradually reaches the foot or collar. Root infection ultimately culminates in foot rot. Infection reaching the foot or collar through runner shoots is also seen occasionally. Disease spread is through soil water and root contact. Foliar

*capsici*, *R. similis* and *M. incognita* in black pepper, besides boosting up the vigour of the rooted cuttings of black pepper. Soil application of biocontrol agents like *Trichoderma* spp. and *Gliocladium virens* raised in carrier media like coffee husk/neemcake/sorghum gram reduced *Phytophthora* infection. These agents are compatible with Ridomil but not with copper fungicides. The nursery mixture fortified with VAM propagules and other biocontrol agents would further boost the vigour of rooted cuttings and provide defence against soil-borne pathogens. Adequate time gap would be necessary for the application of these biocontrol agents from the time of application of copper fungicides, since copper is toxic to these agents. Soil application of the biocontrol agents would check build up of pathogen population.

#### Disease resistance

Large scale cultivation of Karimunda is discouraged and planting of a mixture of varieties like Narayakodi, Uthirankotta,

Balankotta and Kalluvally is recommended.

#### Future priorities

1. Evolving productive varieties with high degree of resistance to *P. capsici* and *R. similis* and *M. incognita* through conventional breeding programmes and also through biotechnological approaches
2. Standardisation of mixture of varieties that reduce the rate of disease spread
3. Standardising methods for early detection of the disease in order to take up appropriate disease control measures
4. Identification of locally available low cost organic residues/mulches/suppressive to *P. capsici* and plant parasitic nematodes
5. Identification of biocontrol agents compatible with agrochemicals and development of delivery systems
6. Standardisation of water management and population levels of pepper in mixed crop system like areca, coconut and coffee

that would ensure micro climatic conditions unconducive to disease development

7. Evolving nutrient levels/type of nutrients that would ensure optimum root regeneration and host defence.
8. Development of spraying equipment that can release spray droplets to a height of 15-20 minutes to suit pepper in coconut, areca and coffee mixed cropping system

Although research priorities identified are long range they are imperative for an effective disease management strategies. However, the adoption of an integrated disease management strategy involving cultural, biological and chemical methods on a community basis would be a sound and practical proposition in the existing circumstances.

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