

## Impact of Rain Induced Natural Calamity on Spices Crops in Kerala

### CROP ADVISORIES

#### **Black pepper**

In majority of black pepper areas, soil moisture remained excessive for prolonged periods due to incessant rains, leading to damage of primary and feeder roots causing yellowing of plants that are in bearing stage. The incidence of *Phytophthora* foot rot (both aerial and root infections) was widely prevalent. Spike shedding due to *Colletotrichum* was also observed in vines weakened by the prolonged monsoon under misty conditions in high altitude regions. After rains with water table receding a higher degree of the yellowing is expressed as the roots cannot support the nutrient supply for standing crop. The problem was much severe in unmanaged gardens where no plant protection measures are followed. Heavy water flow due to incessant rains has caused severe top soil loss, exposing roots and thereby causing yellowing.

#### *Recommendations*

- Provide adequate drainage to reduce water stagnation.
- Removal and destruction of dead vines along with root system from the garden to reduce the build-up of *Phytophthora* inoculum
- Prune the branches of standards/ support trees to avoid excess humidity and for better penetration of sunlight.
- Apply enough organic mulch to prevent further soil erosion in the coming rainy season which on decomposition will add to the organic matter content of the soil.
- Immediate soil testing and need based fertilizer schedule based on site specific nutrient management (SSNM) for fertility restoration.
- Apply lime / dolomite (500 g per standard) for building the soil structure and fertility of bases
- Apply FYM 5-10 kg/vine fortified with *Trichoderma*/PGPR, two weeks after application of lime.
- Replant with high quality planting materials of released varieties collected from accredited nurseries preferably raised in fumigated or solarized soil.
- Replant Glyricidia / Silver Oak wherever the support trees are damaged.
- Spray one-two rounds of foliar sprays of soluble NPK (19 all) + IISR black pepper micronutrient mixture (@ 1 kg each dissolved in 200 L water) to boost the health of the plant and for new root regeneration.
- Apply 5-10 kg FYM or 3-5 kg of compost enriched with biofertilizers/ PGPRs/ *Trichoderma* at the base of the vine and cover with soil to build up the soil organic matter content
- Apply biocontrol agent *Pochonia chlamydosporia* @ 50 g/ vine or *P. chlamydosporia* multiplied in cow dung or neem cake (10:1) @ 1-2 kg/vine in areas where vines are severely infested with root knot nematodes

- Drench all vines at a radius of 45-50 cm with copper oxychloride (0.2%) @ 5-10 litres/vine and give a foliar spray with Bordeaux mixture (1.0%). Drenching and spraying need to be repeated at monthly intervals.
- Wherever incidence of *Phytophthora* foot rot was observed, vines need to be drenched with metalaxyl mancozeb (0.125%) / potassium phosphonate (0.3%) @ 5-10 litres/vine. A foliar spray with metalaxyl mancozeb (0.125%)/ potassium phosphonate (0.3%) may also be given. After one month, a second application of spray and drench can be repeated.
- Manage anthracnose/ spike shedding by prophylactic spraying of Bordeaux mixture (1.0%) or carbendazim + mancozeb (0.1%)
- Spray quinalphos (0.05%) at monthly intervals for managing sucking pest infestation

### **Cardamom**

Cardamom, being cultivated in high ranges, is highly prone to winds and shade tree falls which has accounted for wide damage to the crop in the harvesting stage. The plants are vulnerable to fungal diseases and the scenario was much worse this year as control measures are ineffective because of heavy rains. Rhizome rot due to *Pythium* spp., capsule rot due to *Phytophthora* spp. and stem lodging due to *Fusarium* spp. are rampant, especially in Idukki.

#### *Recommendations*

- Phytosanitation by removal of disease affected and damaged plants
- Improve the drainage by providing drainage channels and through proper terracing.
- Thick shade may be regulated by gentle lopping of tree branches shade to reduce incidence of *Azhukal* and rot diseases in cardamom.
- Establishing shelter belts with wind breaks with deep rooted crops in the boundary to prevent soil erosion.
- Remove broken or fallen branches of shade trees in cardamom plantations.
- Get the soil analysed and the need based fertilizer schedule based on site specific nutrient management (SSNM) for fertility restoration.
- One- two foliar sprays of soluble NPK (19 all) + IISR cardamom micronutrient mixture (@ 1 kg each dissolved in 200 L water) will help in boosting the health of the plant till new root regeneration.
- Prophylactic sprays with Bordeaux mixture (1.0%) and subsequent sprays may be repeated at monthly intervals. Drenching plant basin with copper oxychloride (0.2%) also reduces the soil inoculum and further spread of diseases
- Provide mulching, particularly in the exposed areas.
- Apply organic manures such as neem cake @ 250-1000 g depending on the clump size reduces nematode infestation.

- Apply 3-5 kg of FYM/ compost enriched with biocontrol agents like *Pseudomonas fluorescens* / *Trichoderma harzianum* / *Lecanicillium psalliotae* around the base of the plant to build up the soil organic matter content
- Drench and spray potassium phosphonate (0.3%) or metalaxyl-mancozeb (0.125%) in areas affected with rhizome rot / *Azhukal*.
- Alternatively, in rot affected areas, fungicides fosetyl-aluminium (0.2%) or potassium phosphonate (0.3%) can be sprayed @ 500-750 ml/plant and drench the basins with metalaxyl –mancozeb (0.125 %) / copper oxy chloride (0.25%)/ copper hydroxide (0.2%).
- Wherever leaf blight incidence is observed, spray combination product of carbendazim and mancozeb (0.1%) or carbendazim (0.2%) @ 500-750 mL/plant and repeat the sprays at 30 days' interval depending on the severity and extent of disease spread.

### ***Ginger & Turmeric***

Damage to ginger and turmeric was minimal as they are not being cultivated extensively in Kerala. However, the incessant rains and high soil moisture conditions have led to high incidence of soft rot due to *Pythium* at many places. Ginger was damaged irrecoverably wherever there was inundation. Water logging can spread incidence of bacterial wilt at an alarming speed. Many farmers had to harvest the crop early to minimize their loss.

### ***Recommendations***

- Improve the drainage through inter cultivation operation and cover the exposed rhizomes with soil.
- Apply 7-10 t of mulch (green or dried leaves) to prevent further soil erosion in the coming rainy season
- Get the soil analysed and apply the split dose of NPK and other essential nutrients that are leached and found low in the soil
- Apply one- two foliar sprays of soluble NPK (19 all) + IISR ginger/ turmeric micronutrient mixture (@ 1 kg each dissolved in 200 L water) to boost the health of the plant and to improve productivity.
- Soil application of biocontrol agents like *Trichoderma*, PGPR or *Pseudomonas* multiplied in suitable carrier media such as coir pith compost, well rotten cow dung or quality neem cake may be done at regular intervals to keep the rhizome rot disease under check.
- Supplementation of oil cakes like neem cake (2 t/ha), composted coir pith (5 t/ha) and suitable microbial cultures of *Azospirillum* and phosphate solubilizing bacteria will improve the fertility and yield. Application of PGPR strain of *Bacillus amyloliquefaciens* is also recommended for growth promotion and disease control.
- To check the nematode population, apply neem cake along with the bioagent *Pochonia chlamydosporia*.

- Once rot disease is located in the field, remove affected clumps and drench the affected and surrounding beds with mancozeb (0.3%) or metalaxyl mancozeb (0.125%) or copper oxychloride (0.2%) to check the spread of the disease
- To manage foliar diseases, spray Bordeaux mixture (1%) or mancozeb (0.2%) or carbendazim (0.2%), with the appearance of disease symptoms.
- Bacterial wilt affected ginger plants may be removed carefully without spilling the soil around and the affected area and drench surrounding areas with copper oxychloride 0.2%. Care should be taken to dispose the removed plants far from the cultivated area or destroy by burning.
- An integrated strategy involving pruning and destroying freshly infested pseudostems at fortnightly intervals and spraying malathion (0.1%) need to be adopted wherever shoot borer infestation is observed in ginger.
- Wherever the crop is totally lost, short duration tuber crops, seasonal vegetables and fodder crops can be grown.

### **Nutmeg/clove**

The rainfall and flood have caused a trail of destruction in nutmeg gardens. Sudden drying of nutmeg trees was noticed in flood affected areas of Thrissur and Ernakulam districts. It is suspected that the anaerobic conditions due to heavy silting has caused this. Excessive humidity has led to higher incidence of leaf shedding due to foliar fungal pathogens. Dieback, immature fruit shedding and thread blight are prevalent in areas where there were continuous rains and prolonged waterlogging. A large scale incidence of shot hole borers is noticed in nutmeg, clove and other trees of Kozhikode and a few other districts for the first time. Preliminary studies have indicated that the pest belongs to *Xylosandrus* species. Samples were collected and sent to NBAIR, Bengaluru for confirming the identity.

### *Recommendations*

- If possible, wash down the adhering mud on leaves with a powerful water spray, gently rake the basin to break the clogged clay/mud and to facilitate aeration
- If there is flood deposit of silt/ clay, it is beneficial to some extent as it adds to the nutrient content. Raking the surface hard pan and mixing with the soil by inter cultivation operations will increase soil aeration and root regeneration.
- Improve drainage in the fields and sprinkle lime in the basin @ 250-500g/plant
- Add ameliorants like Dolomite + Gypsum (500 g each per tree) at the basin and mix it up with the top soil.
- Immediate soil testing and need based fertilizer schedule based on site specific nutrient management (SSNM) recommendations for fertility restoration.
- Apply 25 kg FYM or compost enriched with biofertilizers/ PGPRs/ Trichoderma at the tree base of the vine and cover with soil to build up the soil organic matter content
- One- two foliar sprays of soluble NPK (19 all) + micronutrient mixture (@ 1 kg each dissolved in 200 L water) will help in boosting the health of the trees

- Wherever die back/ thread blight is observed infected branches and leaves need to be cut and removed and sprayed with Bordeaux mixture (1%)
- If abnormal leaf fall /fruit rot/ fruit drop /severe leaf spot is noticed, spray Bordeaux mixture (1%) on leaves and fruits.
- Foliar spray of *Pseudomonas* at the rate of 20 g per litre of water prevent the spread of diseases
- Wherever borers are noticed, maintain the vigour of the trees by providing adequate drainage. Strict field sanitation should be maintained in the garden by collecting and burning the deadwood and debris. Spray and drench with imidacloprid (1 ml / litre) after removing all dead and infested branches.

## General

- Advisories on soil conservation measures including contour terracing, soak pits etc. in the vulnerable areas and promoting planting crops like pineapple, vetiver etc. for soil binding and preventing further soil erosion in rehabilitating areas
- As the top fertile soils in the affected plots have been lost in floods, on site soil testing campaign may be done and advisories may be issued for soil fertility restoration
- Where the flood deposits of silt/ clay have happened, it is beneficial to some extent as it adds to the nutrient content (secondary and micronutrient) in the location. Raking the surface hard pan and mixing with the soil by inter cultivation operations will increase soil aeration and water movement into and out of the soil and help in plant health rejuvenation.
- Soil reclamation using amendments like lime, green leaf manures, bio-fertilizers, coir pith, composts etc. need to be backed up to restore the soil organic matter content.
- Apply lime or dolomite at the rate of 500 to 1000 kg per acre in such areas and incorporate well into the silt deposition which aids in soil flocculation and improvement of aggregate stability and thereby soil structure.
- The crop/ organic wastes may be applied in the crop basins, apply lime, mix and cover with soil so that it gets degraded and can also be mixed with the soil before planting next season crop.
- For immediate relief, to support the standing crops (like black pepper, cardamom, nutmeg etc.) supplemental foliar application with soluble NPK and micronutrients is imperative.
- Fertilizer schedule needs to be revised as per the altered soil fertility status and site specific nutrient management for different spices based on the soil test need to be adopted.
- Wherever heavy incidence of pests/diseases is noticed, it is advisable to apply recommended pesticides to suppress the pest/pathogen load.
- Conducting trainings and demonstrations to farmers in affected/ vulnerable areas on soil fertility restoration awareness.