



ICAR-National Research Centre on Pomegranate, Solapur

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ADVISORY FOR POMEGRANATE WILT MANAGEMENT

Pomegranate wilt causes major economic losses if timely measures are not taken however, a drying plant does not always mean it is a wilt disease. Nutritional, deficiencies, toxicities or irrigation errors can also lead to yellowing or drying of plants, hence, before taking control measures you should find out the cause first through symptoms and then take appropriate management practices described below.

SYMPTOMS

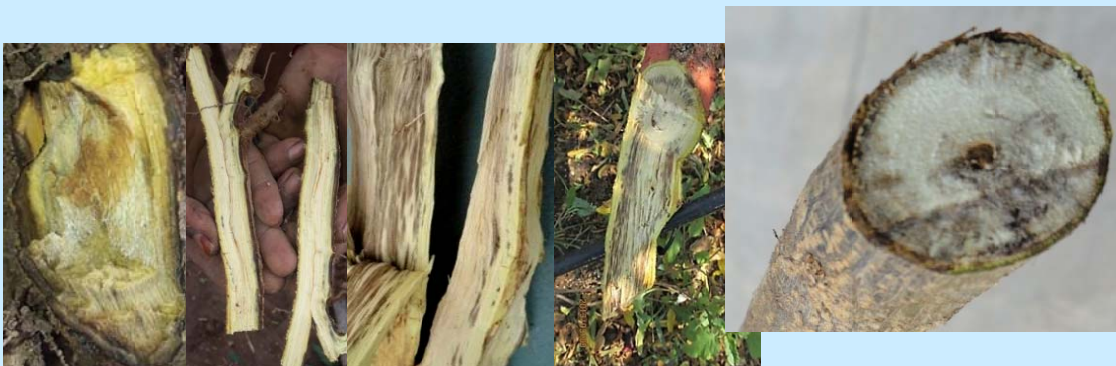
Observe the plants in the orchards showing yellowing/drooping/drying of leaves/nutrient deficiency type symptoms in some of the branches or entire plant. After ensuring that plants have not dried due to lack of irrigation water due to blocked drippers, observe the roots for external and internal symptoms to ascertain the cause of wilt, as in pomegranate several wilt agents are known. Split open the roots and lower portion of the stems to check internal symptoms. You can confirm the cause based on below based diagnostic symptoms. This is necessary to decide the correct management practice.

- Brown/grey/black discolouration of wood is caused by a fungus *Ceratocystis fimbriata*. In early stages inner root shows yellow wood with alcoholic smell. Plants dying one after the other over a period in a row or vicinity generally are due to *C.fimbriata*. In case the xylem/center pith is brown it is *Fusarium* sp. Though it is not a major cause of wilt in many pomegranate areas.
- Grey/black root rot, is due to species of *Sclerotium* or *Macrophomina* and generally seen where moisture is high around root zone.
- Collar rot/canker on stem at soil level spreads below and above soil level, can be due to *Phytophthora nicotianae* var. *nicotianae* or *Rhizoctonia* sp. It may also extend up to the root causing root rot. Root surface with white wash like fungal growth is *Rhizoctonia* sp. This is generally observed when beds are raised after plants grow and soil is heaped around the stem.
- Pin holes observed on inner wood/outer surface, are due to shot hole borer, that attack weak plants because of wilt or any other reason and are also attracted to metabolites produced by *Ceratocystis fimbriata*.
- Knots are observed on roots it is nematode infestation. Above ground plant shows nutrient deficiency type symptoms. Sometimes luxuriantly growing plants show reduced or no flowering for long periods (more than 1 year) then it is due to heavy root infestation with root knot nematode - *Meloidogyne incognita* (major parasitic species). It is the second major cause of wilt. Parasitic species of *Rotylenchulus*, *Aphelenchus* and *Helicotylenchus* are sometimes present on pomegranate .

The above symptoms may be present individually or 2 or more organisms may be present in association. If you do not find any of the above symptoms or are not sure of the cause, then samples should be sent/brought to the nearest laboratories of SAUs or ICAR institutes for confirmation.



Wilted plants due to *C. fimbriata*



Initially yellowing of wood with alcoholic smell, later Brown discolouration of vascular tissue and wood in root and stem to varying extent due to *C. fimbriata*

Symptoms Due to *Ceratocystisfimbriata*: Major Cause of Wilt



Nutrient deficiency (left above) and minute root knot (left below) symptoms in early stage of nematode infestation



Luxuriant green trees with no flowering for long period (right above) with its big size root knot symptoms (right below) in severe nematode infestation

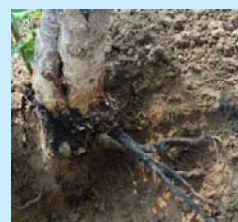
Symptoms Due to Root Knot Nematode: Second Major Cause of Wilt



Sclerotium



Rhizoctonia



Macrophina



Phytophthora

Root Rot and Collar Rot



Fusarium wilt



Pin/shot hole borer

Symptoms Due to Minor Wilt Pathogens

Survival and Spread

- Wilt fungus *C. fimbriata* survives for several (5-7) years in soil and infected plant debris. Nematode wilt though present in all types of soil, is more common in sandy soils with more aeration.
- Wilt pathogens spread through planting material, root graft in close spacing, soil and flood/run off/ irrigation water, insects like shot hole borer, intercultural operations / farm machinery and pruning tools.

Management

- i. The planting material (sapling as well as potting mixture in which it is planted) should be free from all wilt causing agents-the fungi, insects and nematodes; use solarized/sterilized soil for saplings. Plant on raised beds for better aeration to roots.
- ii. Solarize soil for 6 weeks in hottest months using 50-75 μ LLDPE (Linear low density polyethylene) sheet. Prepare the plot, irrigate it and cover it.



Soil Solarization Before Planting in Hottest Months



- iii. Apply promising bioformulations (*Aspergillusniger* AN27 @ 1kg/acre and Mycorrhiza [*Rhizophagusirregularis* Syn. *Glomusirregularis*]@ 1-5Kg/acre), *Trichodermaharzianum*, *Pseudomonas spp. etc.*, right from planting, every 6 months. These serve as best preventive measure for all types of wilt pathogens.
- iv. Grow green manure crops like dhaincha(*Sesbaniaaculeata*) and sunhemp(*Crotalaria juncea*) during rainy season and incorporate in soil before flowering.
- v. Apply boron depending on soil test value.
- vi. On observing first symptoms of wilt first ascertain the cause/s. If it is due to **fungal pathogens** *Ceratocystis*, *Fusarium*, etc. in the orchard treat soil with only one of the following most promising protocols:
 - a. 1st drenching Propiconazole25 EC@2ml/l+Chlorpyriphos20 EC@ 2ml. After 30 days of first application 2nd drenching with *Aspergillusniger* AN 27 (Kalisena) @ 5g/plant with 2Kg FYM/plant after 30 days of 2nd drenching 3rd drenching – Mycorrhiza [*Rhizophagusirregularis* Syn. *Glomusirregularis*] @ 25g/plant with 2Kg FYM/plant. OR
 - b. Three (3)drenchings at 20 days interval with propiconazole 25EC (2.0 ml/l) + chlorpyriphos 20EC (2.0 ml/l) use 5-10 l solution/plant. OR
 - c. 1st and 3rd drenching with fosetyl Al 80% WP @ 6g/plant, 2nd and 4th drenching with tebuconazole 25.9% w/w EC @3ml/plant. Make solution volume 10 l with water for each drenching.
 - d. Drenching with Metalaxyl8%+Mancozeb64%(2-2.5g/l) will be beneficial if *Phytophthora* is causing any loss.
- vii. To avoid residues in fruits drenching should be done immediately after harvest in rest period. Irrigate well the plants one day before treatment. After chemical drenching irrigation should be stopped for 2 days .
- viii. For controlling **shot hole borer** (*Xyleborus* spp.) which is associated with wilt disease, 10 liters preparation (paint) containing red soil (4kg) + Chlorpyriphos 20EC (20ml) + Copper oxychloride 50 WP (25 g) needs to be applied on stem surface from plant base up to 2 ft. from second year onwards. Pasting should be done once soon after harvest and once at defoliation, before crop regulation. Shot hole borer attacks weak plants, hence keep plant vigour through recommended nutrition and proper irrigation during as well as after crop period. Prune out affected branches and do no dump in or near orchard.
- ix. Wilt due to **root knot nematodes** can be managed with soil application of promising bioformulations along with FYM like *Paecilomyceslilacinus* @4-5Kg/acre, *Aspergillusniger* AN 27 @1Kg/acre, Mycorrhiza [*Rhizophagusirregularis* Syn. *Glomusirregularis*] @ 1-5 Kg/acre. Application should be done from beginning and repeated every 6 months. Drenching with azadirachtin (1%) @ 3ml/l can be done twice a year. Plant *Tagetes erecta* the African marigold varieties like 'PusaNarangiGainda' and 'PusaBasantiGainda' between plant to plant space. For effective results these should be grown for 5-6 months. A new non-fumigating promising nematicide (fluensulfone 480EC) against

root knot nematodes, has been tested. It can be applied @40g per plant below the drippers at crop initiation, however, is very costly for routine use. Applying well decomposed organic manures, vermicompost, green manuring with *Sesbania* (dhaincha) or sunhemp is beneficial, trap crops along with above mentioned promising bioformulations is best preventive management for nematodes.



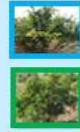
- x. Once disease is detected in the orchard, dig about 3-4 feet long trench between the wilted and healthy plant/s. The partially wilt affected plant/s showing initial symptoms should be treated with a suitable agrochemical and plants showing more than 25% dry branches or completely dead plants should be removed and burnt, they should not be kept dumped in the orchard as woodpile. While removing the wilted plants from the orchard, do not drag it out, protect the entire root zone with cover or treat the dead plant before uprooting with suitable disinfectant, so that you do not spread diseased soil to healthy plants in the orchard.
- xi. The soil in the pit from which dead plant has been removed, should be sterilized through soil solarization or with 5% formalin using about 10 l solution. It should be covered with polyethylene for 1 week. After 1 week remove polyethylene sheet and rake the soil daily up to 10-15 days, so as to allow escape of gas. Plant new sapling once there is no smell of formalin in soil. Person handling should use protective clothing, masks, eye cover while giving the treatments. Alternatively other effective disinfectants can be used.
- xii. Drenching should be done in the plant basin, made from main stem up to root zone area. Treatment should be taken up in the plant where wilt is in initial stage and at least 4-5 healthy plants on all the four sides around the infected plant/s.



Diagrammatic layout of wilt affected orchard for understanding soil treatment procedure



Formaldehyde treatment of soil from where partially wilted (above 25%) and completely wilted plants have been uprooted and safely disposed off



Soil drenching with fungicide of plants where fungal wilt initiated and healthy plants around affected plants

Soil Treatment of Wilt Affected Plot

- xiii. Pruning tools should be disinfected and cut ends painted with 10% Bordeaux paste, *Azadirachtaindica* (neem) oil may be added @50ml/l paint during rainy season. Pruning should be avoided during monsoons/rainy days. Affected plants within the buffer zone should be treated with a systemic fungicide; neighboring asymptomatic apparently healthy plants should also be treated with appropriate systemic fungicides. Plants with more than 25% canopy loss should preferably be uprooted and burnt.
