

FLOOD AFFECTED MANGO ORCHARD MANAGEMENT

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HISTORY OF FLOODS IN PAKISTAN

Since its creation, Pakistan has faced severe floods in 1950, 1956, 1957, 1973, 1976, 1978, 1988, 1992, 2010 and now in 2013 record floods peak discharges. Floods of various magnitudes occurred between 1922 and 2013. These floods affected the basins of the rivers in Punjab and Sindh. In Khyber Pakhtunkhwa (KPK), Baluchistan, FATA, G-B, AJK and some areas of Punjab also, damages are caused mainly due to flash floods in secondary and tertiary rivers including from hill torrents.

FLOOD AFFECTED MANGO ORCHARD MANAGEMENT IN PUNJAB 2013

Mango is a national fruit of Pakistan and mango tree is the symbol of love in the world. Mango is cultivated more than 100 countries of the world and in Pakistan, it is cultivated on area of 420000 acres and earn 24 million dollars annually from the export of mango fruit. Mango is the tropical fruit tree and in Punjab cover an area of about 281000 acres of land especially Khanewal, Multan, Muzaffargarh, Lodhran, Vehari, Bahawalpur and Rahim Yar Khan District. These are main districts of mango orchard and producing very high quality (delicious taste-wise, aroma-wise) and quantity of mango products which is liked in all over the world. In August 2013, the heavy flood affected the major areas of mango orchard like Multan, Khanewal, Muzaffargarh and Rahim Yar Khan. Minor losses occur in Sher Shah area Multan and Taleeri, Khan garh areas in Muzaffargarh.

Mango is considered to be a moderately flood tolerant plant. The flood affected the small plants and also big mango trees. Most of the orchard in flood affected areas are not healthy and also have been affected by different mango diseases like dieback, gomosis. Anthracnose, root rot and sudden death of mango trees etc which spread very quickly in the flood condition due to favorable condition of humidity and temperature.

FLOOD TOLERANT MECHANISMS OF MANGO PLANTS

The ability of mango trees to survive prolonged flooded conditions appears to depend on, the development of hyper trophic (swollen) stem lenticels immediately above the water line. The initial stages of lenticels hyper trophy are characterized by the development of intercellular spaces in the phloem tissue and production of additional phloem tissue by increased phellogen activity. Later stages of hyper trophy are characterized by the development of intercellular spaces in the phellem tissue and cortex. Layer in mango trees that died within few days as a result of flood water there was no lenticels hyper trophy, however stem lenticels hypertrophied within 4 to 10 d on mango trees that survived flooding. Hypertrophied lenticels

with petroleum jelly or silicone resulted in trees dying within 3 d of flooding .Hypertrophic lenticels in mango trees probably enhance O₂ diffusion to the roots and also evidence that hypertrophic lenticels serve as excretory sites to eliminate potentially toxic compounds such as ethanol, acetaldehyde and ethylene with results from anaerobic metabolism in the roots observed that flooded mango with little oxygen (1-2% O₂) in the floodwater exuded significantly more ethylene from the lenticels . The relationship between mango genotypes and the ability to form hypertrophied lenticels under flooded conditions. Hypertrophic lenticels can also develop on stems of very young mango trees subjected to flooded conditions. Therefore, development of hypertrophied stem lenticels may be useful as a screening and selection tool for flood-tolerant mango cultivars. Many mango cultivars are mono embryonic, producing one zygotic embryo and therefore do not come “true to seed” .Therefore, once Flood-tolerant, monoembryonic mango trees that form lenticels are identified they must be clonally propagated.

ADVERSE AFFECTS OF FLOOD ON DIFFERENT SOILS

Flood alters the oxidation reduction status of the soil, reducing the redox potential due to chemical changes and various byproducts of soil microbes. Flood decrease the pH of alkaline soils and bound nutrient elements such as iron, magnesium & manganese to become more soluble. Flood increase the absorption of magnesium and iron in mango plants.

PHYSIOLOGICAL RESPONSE OF FLOOD ON MANGO PLANTS

Flood declines the net Co assimilation, stomata conductance and transpiration which can occur within 2 to 3 d after roots are submerged and higher root respiration rates that limited the availability of carbon based assimilates required for growth. Adventitious roots have developed above the water line in a mango trees when flooded for longer period. These roots may facilitate the absorption and translocation of O₂ (oxygen) to submerged roots and their development is common morphological response of mango plants to anoxia (Deficiency of oxygen).

ADVERSE AFFECTS OF FLOOD ON VEGETATIVE GROWTH

Vegetative growth of mango trees declines under flooded conditions for more than two to three days. Flood more than 14 days also significantly reduced root dry weight, resulting in an increased shoot to root ratio. If the flooding period is prolonged, lack of oxygen in the soil results in a reduction of root and shoots growth, wilting, decreased nutrient up take and eventual death.

ADVERSE AFFECTS OF FLOOD ON ROOTS OF MANGO PLANTS

Root rot causes severe damage under flooded conditions. Phytophthora root rot reduces the stomatal conductance and photosynthesis, transpiration may be decreased hydraulic conductivity.

ADVERSE AFFECTS OF FLOOD ON MECHANISM OF EXCHANGE OF GASES

Flood carries silt and closed the pore spaces (macro & micro pore spaces). The mechanism of exchange of gases (CO₂ & O₂) collapsed and decline the root and shoot growth.

TREATMENT OF FLOOD AFFECTED MANGO ORCHARD

- Drained out the flood water from mango orchard within a 6-days otherwise oxygen availability to the roots will become insufficient and attack of root rot will take place plants will die within 10-20 days. Orchard owner should try to apply tractor pumps to pull out the standing water from the orchard areas.
- Harvesting of mango fruits should be completed within a week time duration during flood condition and re-instate the health of mango plant.
- Clean the mango stems after flood water and apply (one Kg. lime, one Kg. copper sulfate and 10-12 liter of water) Bordeaux paste upto 4' high to protect the stem from diseases.
- Remove all dry branches, diseased fruits and collect material and burn it or bury into the soil.
- Spray the orchards with copper oxichloride 250 gm or thiofinate Mehtyle 250 gm or mataloxyxis+manko zaib 250 gm in 100 liters of water after two time in 15 days interval.
- Apply 2x1 ft. rings around the stems of mango trees and 1x1 ft around the small mango trees.
- Undershed areas of mango trees should be plough up (shallow depth) or made shallow hoeing with spade to avoid the root damage of trees
- Apply 2 Kg ammonium nitrate/plant and 80-100 Kgs FYM/tree. It absorb the moisture.
- Apply 10 Kg. lime per tree to protect the soil from fungal diseases spores and release the excess moisture from the soil.
- Apply one Kg. copper sulfate in the root zone of trees to protect the root system from diseases.
- After flood inspect the mango trees individually and if gummosis condition observed then clean the stem/branches with knife without damaging the skin and apply potassium permagnate (5 gm. In 100 liter of water) on the damaged area and repeat this action after 10-12 days interval up to recovery.
- Stop the irrigation up to 2-3 months followed by dormancy stage.
- When soil comes in watter condition, plough the field with (rootavator/deep plough) 2 inches deep in soils so that mechanism of exchange of gases and root development can take place. Subject to the condition that there is no reported incidence of sudden death in the orchards.

- Collect the fallen fruits and burry into the soil and burn it otherwise fallen fruits are source of reproduction of fruit flies and dissemination of disease like anthracnose, sudden death, wilting).
- Sudden death is the common diseases of mango trees observed after flood. The organisms inter damage root, stem and lead to death of the tree. If flood water stands for a prolong period then rotting of start and ultimately sudden death of tree occur. Drain-out the flood water and paste of bordex mixture on damage areas.

REFERENCES

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