CAUSES OF EARLY CITRUS DECLINE

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More than 500000 (Five lac acres are under Citrus in Pakistan. Although the area is increasing on yearly basis. The areas which were not formerly famous for Citrus growing are now rapidly planting Citrus varieties, yet the yield is not comparable with other Citrus Countries of the world, Moreover Citrus orchards are in declining states. Citrus is a long lived perennial evergreen tree. The economic life in some countries is about fifty years and in some cases in good situations live 100 years or more. In Pakistan the average age of Citrus tree is considered to be 25 years. After producing fruit for about 7-10 years. The orchard trees, in majority of cases starts declining. Citrus decline is attributed to a multiplicity of causes. This decline has been reported in some other countries as well. The symptoms comprise of retarded growth of trees, appearance of chlorotic leaves, sparse foliage, die back of twigs and sickly appearance of tree. In most cases the trees continue to linger on in a state of poor health for many years with a considerable reduction in yield.

In the early stages, the symptoms are restricted to a few limbs, but eventually the whole tree is affected. Trees show sparse foliage with mottling leaves, stunted growth and sickly appearance. Midrib and lateral veins of old, mature leaves turn yellow with interveinal area along the veins showing diffused yellowing leaves may turn yellow and are shed with the onset of autumn or summer and the die back of twigs starts. Dead shoots appear prominently after drying. The die back of weak shoots continues. There is excessive flowering, but the fruit set is either poor or the fruits are of small size. The yield could be bumper in the initial years of decline leading the trees to exhaustion thereby aggravating their susceptibility to decline. In the advanced stages of decline the yield drops down drastically owing to the reduced canopy. The quality of fruit is adversely affected. Apart from reduced size, the fruits have thick skin, undesirably firm, lacking in gloss with many skin blemishes, less juice although high in TSS content. The magnitude of decline increases with the age of plant and after 15-20 years affected plants become uneconomical to maintain.

A large number of factors responsible for the Citrus decline are soil pH, salt status, Soil structure, presence of hard pan, low organic matter, poor drainage, nutrient deficiencies, incompatible root stock attack of insects pests and diseases, faulty inter cropping, application of brackish irrigational water, adverse climatic conditions etc. etc. Prior to the discussion on the above mentioned factors we should analyze the natural factors of soil and climate in our Citrus growing areas.

Soil	Soil pH is more than 8.0
	Organic matter level ranges from 0.3 - 0.8 %
Climate	Extreme temperature during summer months i.e above 50°C

Causal factors responsible for declination

1-Soil Texture

Of the various factors responsible for the success or failure of a garden the condition of soil is most important. The soil texture plays an important role in proper root activity. The presence of calcium carbonate layer or clay affects the permeability and aeration of soil as well root growth and drainage. High contents of $CaCo_3$ in citrus soils decrease availability of iron, Zinc and manganese. The hard pan in the subsurface affects root activity and age of citrus orchards.

2-Soil Drainage

Poorly drained soil does not promote healthy Citrus growth as Citrus trees are sensitive to excess of soil moisture. The problem of poor drainage exists in many of the Citrus growing areas. Root development is arrested under the conditions of poor aeration. Moreover root rotting takes place which predisposes the plant to the attack of soil borne fungi particularly phytophthora leading to occurrence of root rot and collar rot which results in die- back of the shoots. The high soil moisture, poor drainage, aeration and permeability are associated with high clay contents of soil whereas light soils are not able to retain sufficient moisture. High water table in some areas also caused the declination of Citrus plants.

3-Soil pH

An ideal pH for Citrus is considered to be between 5.5 to 7.5. A high pH not only affects the availability of micro-nutrients, but a high sodium contents may have toxic affects in Citrus. The soil pH in our soils is more than 8.0 and in some cases it is about or above 9.0.

4-Soil salinity

Citrus trees are quite sensitive to excess of salts. The presence of excessive salts in our soils are also responsible for deterioration of Citrus orchards.

5-Soil Organic matter

The soil organic matter improved the texture, increase soil aeration and water holding capacity, has a moderating influence on soil temperature, protects the plant roots from extremes of heat and cold. It also have some hormones which are considered to be very useful for plant growth. It is believed that for proper Citrus production organic matter level in the soil should be from 2.0 to 2.5 percent, whereas our soils are quite deficient in organic matter. The present range is 0.3 to 0.8. %age.

6-Imbalanced Nutrition

The Citrus like other fruit plants, requires 17 elements for normal growth and production. Judicious application of these elements can only ensure sustained production of high quality fruit. Trees take considerable amounts of elements from the soil, replenshing of these elements is essential to maintain soil fertility for constant growth and productivity. If proper fertilizer practices are not adopted trees suffer a number of mal nutritional problems. This is more important when soil conditions are not much favorable for its cultivation. It is necessary to apply NPK at proper time in balanced quantity. In addition to that minor elements application through foliar spray is also recommend. In contrary to that our orchards are not receiving even major elements in time

and in required quantity. The result is that plants show declination symptoms at an early age.

7-Poor planting Material

For growing healthy Citrus trees, it is essential that an ideal rootstock for sustainable Citrus production & health should be used. Scion wood should be taken from known pedigree tree, possessing all production and quality attributes. Nursery business in our country is running without rules and regulations. Private nurserymen collect scion from the tree without care of diseases yield and fruit quality of mother plants, which result in poor planting material for Citrus industry. For growing healthy Citrus trees, it is essential to have a mandatory bud wood certification programme. Unless the orchards are planted with disease free nursery stock, the declination problem will remain there.

8-Faulty Intercropping

Citrus growers in our country grow Wheat Maize, Sorghum, Sugarcane, Rice, Cotton etc. These type of inter crops deplete the soil fertility, tend to shade the trees, interfere the growth and provide shelter to the pests. The crops sown are incompatible to the irrigational requirements. Intercrops has effect on disease and pest incidence which results in failure of Citrus trees.

9-Irrigation Practices

Sources of irrigation water and methods of irrigation are the main factors associated with Citrus decline. Inadequate amount of irrigation water or excessive watering is harm full for the health of the plant. Defective irrigation practices are followed by the grower which ultimately cause the death of the Citrus plants.

Unfit subsoil water use is the common practice in the Citrus growing areas especially in T.T. Singh and some parts of Sargodha region, due to which the whole orchard is destroyed with in a few years. Application of irrigation water is very necessary during the critical periods of summer and winter seasons but growers usually do not apply water during these seasons because of having unsuitable intercropping pattern due to which plants become under stress.

10-Weed Control

The insect pests, the weed roots also secrete toxins which adversely affect growth and fruit bearing.

Weed eradication either by the cultivation or by the use of herbicides is necessary for the health of Citrus orchard. Generally the growers give no attention towards the weed control of Citrus orchards and ultimately the health of the plant is deteriorated.

11-Insect Pests

Citrus trees are attacked by a number of insects such as Citrus psylla, leaf minor, mealy bugs, aphids, fruit fly, mites, scales, lemon caterpillar.

Citrus leaf minor is the most serious pest of Citrus especially under nursery conditions. The growth of the seedling plant is checked considerably. Due to leaf mines, leaf gets distorted and crumpled and plant does not remain attractive. The attack of leaf minor also encourages the incidence of Citrus canker.

Citrus psylla is another serious pest of young flushes that causes heavy flower drop affecting the fruit set extensively, the plant is also an active vector of the causal organism of greening disease.

Lemon butterfly is most destructive to Citrus seedlings as well as to new flush. They may cause complete defoliation and results in serious set back to plant growth.

Mealy bug causes heavy damage to nursery and grown up plants and also attacks the base of the fruit near the stock and resulting in heavy fruit drop. They also secrete honeydew on which black mould grows which interferes the photosynthesis.

An effective spraying programme is necessary in order to control these pests. But the growers usually do not give any attention towards the control of these pests due to which health of the plants is badly affected.

12-Diseases

Citrus is attacked by a number of fungal, bacterial and viral diseases. Disease problem in Citrus, if not attended adequately in time, May become a limiting factor for its successful and economical cultivation. These diseases require due attention for their effective management.

a) The important diseases caused by the fungi are

i- Gummosis, Root rot, foot rot and brown rot caused by

Phytophthora nicotianae and Phytophthora Citrophthora

ii-Wither tip Caused by colletotrichum gloeosporioides

iii-Fusarium root rot and dry rot. Caused by Fusarium Solani

iv-Pathological fruit drop caused by Botryodiplodia Theobromae, colletotrichum gloeosporioides and Alternaria Citri

b) Bacterial diseases

i-Citrus canker – caused by Xanthomonas campestris Pv. Citri

ii-Citrus Greening caused by Lilbrobacter asiaticum and Librobacter africanum.

The most destructive diseases among these all are gummosis and citrus cankers. The predisposing conditions for the gummosis are poor drainage, excessive irrigation, water logging, prolonged contact of water with tree trunk and susceptible root stock. Citrus canker is usually transferred from the infected nursery.

No orchard is free from diseases. The severity might be different at different localities. It is observed that in majority of orchards a few plants have died due to phytophthora root rot, Collar rot and Gummosis. The growers are least interested in controlling these serious diseases. In declination of Citrus orchards, diseases are also one of the major factors.

Suggestion for Improvement of Citrus Orchards

Citrus trees suffering from decline can be rejuvenated and brought back to normal conditions by adopting certain corrective measures. Some of the measures are mentioned here for guidance of Citrus growers.

- Select Citrus varieties suited to the agro-ecological environment and prevailing soil situations.
- Select root stock recommended for the areas by the experts.
- Always purchase the plants from the reliable nursery man maintaining certified mother trees for obtaining seed and bud wood.
- Irrigation water should be applied according to the requirement of the plants. Over and under irrigation water is not useful for the plants. Unfit sub-soil water should be avoided.

- Apply NPK fertilizer and other microelements in balanced amount.
- Pruning and training of the tree is very essential for economic production and well-bearing of Citrus orchards.
- Intercropping must be discouraged in the Citrus orchards. If necessary then the crops having compatible water requirement can be sown.
- Development of integrated pest management and disease management strategies including the use of natural enemies of insects and chemicals essential for the effective plant protection measures.

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