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Diagnosis of Wilt Disease in Guava

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Guava is a plant that produces tasty fruits three times a year. However, its production is decreasing because of a wilt disease. This disease is mainly caused by a root-knot nematode and a fungus called *Fusarium* which damage the plant's roots. To solve this problem, scientists are working on creating new guava varieties that can resist this disease. They are doing this by crossbreeding regular guava with a wild type called *Psidium cattleianum*, which is naturally resistant to both the nematode and the fungus. After introducing the disease artificially in experiments, researchers found that *Psidium cattleianum* is indeed resistant. Using its pollen, they created 1,000 new guava plants, and after testing them, 35 were found to be resistant to wilt disease.

Introduction

Guava (*Psidium guajava*) is also called the "poor man's apple." This fruit is rich in nutrients and is easily available in every part of the country. It is also known by other names, such as Bihi in North India, Latam in Maithili, Jamphal in Gujarati and Sibekai in Kannada etc. Guava is one of the most famous and nutritious fruits of India. In terms of production in the country, it ranks fifth after mango, banana, papaya and citrus fruits. So far, the production of guava has been very good, the main reason for which is the sweetness and quality of its fruits. Its fruits are nutritious as well as medicinal properties. All environments are favorable for the production of guava, whether it is strong sunlight or severe cold. It can also be grown in all types of soil, whether it is fertile or saline. However, it is a difficult to grow it in areas with high salinity, but some wild species (*Psidium cattleyanum*) have been found capable of producing fruits even with high salinity.

Popular Variety of Guava in Uttar pradesh

Many varieties of guava have been developed in India, such as Arka Purna, Arka Rashmi, Apple Color, Lalit, Arka Kiran, Sweta, Dhawal, Lalima etc. The most popular among these is Allahabad Safeda, which is produced on a large scale in Uttar Pradesh.

Symptoms of the disease

At the beginning of the wilt disease, the leaves of the plants start appearing light yellow and as the severity increases, the leaves wilt. There is also a loss of turgidity and epinasty. Some branches become bare and start drying and the emergence of new leaves or flowers also stops. After the onset of these symptoms, the plant wilts and dries up completely. The roots will also be seen rotting in the basal region and the bark starts separating easily from the stem. Light brown discoloration is also seen in the vascular tissues.

Casual organism

In the year 1935, some guava orchards in Bakkarpur area near Allahabad city of Uttar Pradesh suddenly started wilting and dying and their production and productivity started falling suddenly. After this incident, scientists of the whole country started researching and trying to find out the cause of this wilting disease. Then after a research it was found that its main reason is the combined attack of *Fusarium oxysporum* pv. Psidii and root knot nematode *Meloidogyne incognita*. The outbreak of this disease increases gradually and spreads quickly from one plant to another. This disease has now spread to every part of the country on a large scale. Most of the farmers use chemicals on a large scale to prevent it. Due to this, the health of the guava plant and the health of the soil deteriorate. The sweetness of its fruits also gradually decreases.

Management

To control this disease, Central Institute for Subtropical Horticulture, Lucknow developed a fungal strain *'Aspergillus Niger*-17'. This can control the disease to a great extent but it is not a permanent solution as the pathogen can develop resistance against it very quickly. Due to this, the problem of wilting can increase even more and no chemical or treatment will effect in its control. For its effective prevention, scientists of Indian Horticultural Research Institute, Bangalore, in their research, artificially tested many wild species like *Psidium cattleyanum*, *P. molle*, *P*. guineense, *P. chinensis*, *P. friedrichsthalianum* and many varieties. In which *Psidium cattleyanum* proved to be immune to wilt and root-knot nematode disease and *P. friedrichsthalianum* proved to be disease resistant.

Inter-species hybridization

To develop new varieties, till now researchers from different countries have done inter-species hybridization and developed offsprings. Due to this, no offsprings have been developed disease resistant till now. But for future farming, it is very important to develop disease free offsprings. For this, scientists have developed many disease resistant offsprings by hybridizing with disease resistant wild species (*Psidium cattleyanum*). It has sweetness, taste and beauty in fruits like *Psidium guajava* and amazing ability like wild species to fight biological disorders in plants. Finally, to save guava from this dreadful disease like wilt and have succeeded in developing disease resistant varieties with the help of wild species. After doing inter-species hybridization several times for permanent solution of this disease, such progenies were developed which are resistant to diseases like wilt. But there was a very serious problem in this, when flowers bloom in *Psidium guajava*, flowers do not bloom in wild species. For this, the researchers developed a wonderful method and stored the pollen grains of disease resistant wild species in liquid nitrogen at very low temperature and when flowers bloomed in *Psidium guajava*, pollination was done with the help of these pollens and the process of formation of flowers to fruits was done. With the development of the above disease resistant progenies, plants and soil will not have to bear the use of chemicals for guava production for a long time. Along with this, it will also increase the income of farmers and health of people.

Cryopreservation of pollen and fertility testing

To store the pollens of disease resistant species, first their flowers were closed with the help of butter paper a day before opening and the pollens were collected the next morning. After this, they were packed in a capsule and covered with aluminium foil and slowly stored in liquid nitrogen. Their fertility was also tested by pollinating female flowers of guava plants with these cryopreserved pollens and observing in vitro deposition of pollens in the lab, which successfully proved the fertility of both types of pollens (fresh and cryopreserved). Actually the percentage of pollen germination in wild species (3.27% in *P. cattleyanum*) was very low, therefore a suitable sucrose media (5% sucrose + 100 ppm boric acid) was also developed. Later, with the help of the developed media, the fertility of cryopreserved pollens was also tested by observing in vitro germination of pollens for a full 6 months at an interval of one month. Pollination was also carried out with the help of 6-month-old pollens stored in liquid nitrogen. As a result, 1000 progenies were developed.