

Cultivating Papaya Successfully in PRSV – Prone Areas

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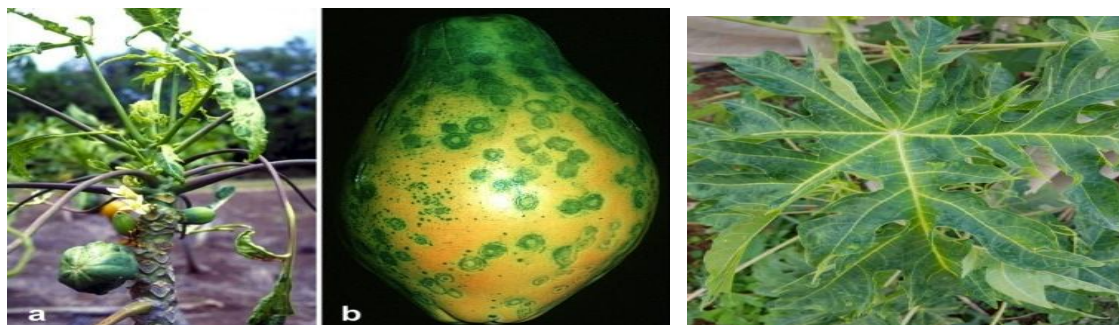
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Introduction

The papaya ring spot virus (PRSV) is posing a serious threat to papaya cultivators, sometime infecting even up to 100% of its plantation. In the absence of any known papaya germplasm resistant to PRSV, breeding PRSV resistant / tolerant cultivars does not seem to be a reality in the near future. Some progress has been made on molecular genetic level to identify genes for PRSV resistance and transfer them to commercial cultivars, but a major breakthrough is still awaited. Under these circumstances, integrated management of papaya cultivation is the best way to save cultivars from the impending gloom caused by the deadly virus.

Papaya, an important fruit crop of India, is being grown in 39,300 hectares, producing 1.5 million tonnes of fruits per year. In India, papaya occupies sixth position in fruit production. Although total area under papaya plantation is increasing, its cultivation is adversely affected by a number of diseases, especially papaya ring spot virus (PRSV). The PRSV stunts the plant growth and reduces the size of fruits drastically. Symptoms appear on foliage, fruits and main stems. Infected plants initially show chlorosis in youngest leaves which are soon followed by vein clearing, rugosity and a prominent green mottling of the laminae. Affected leaves show a tendency to roll upward along the margins and become lighter green than the healthy ones.

The fruits from infected plants are small, deformed and unmarketable. An enormous amount of yield losses is caused due to PRSV. There is no known source of papaya germplasm resistant to PRSV, neither it can be prevented / controlled by manipulating one or the other cultural operations. Therefore, integrated management gave higher production (33.74 tonnes / ha) compared with the conventional management (17 tonnes /ha). There are two transgenic papaya varieties developed resistant to PRSV i.e., Rainbow and Sun Up.



Integrated Management

1. Cross – protecting

A mild strain of papaya ring spot virus-P is used for cross – protection. Three inoculants are given for successful cross – protection. First inoculation is given at 3 leaves stage. Leaf extract from especially maintained mildly infected plants are applied to seedlings using mechanical (rub method) or powder spray method. Second and third inoculations are given at 15 days intervals. The seedlings are transplanted in the field 20 days after third inoculation.

Such cross – protected plants show tolerance to PRSV under field condition. Under glasshouse conditions at Pune, about two-thirds cross-protected plants showed mild symptoms even when infected with the challenge inoculation (the severe strain). There is a need of refinement of the technology and standardization of cultivation practices for cross-protected plants before releasing them commercially.

Delaying onset of infection

The age of plants at the time of first infection of PRSV is crucial to determine the extent of damages. Therefore, following strategies are adopted to delay the inevitable transmission of PRSV infection through the aphid vectors.

1. Creating physical barrier

This can be achieved by planting a few rows of another plants around papaya plantation to create a physical barrier. The border row plants are effective in controlling/delaying onset of PRSV infection by stopping (minimizing) aphid vectors from entering the papaya field.

2. Adjusting of planting

The spread of PRSV through aphid vectors can also be avoided by adjusting the date of planting to break population of aphid vectors. One should know seasonal variation in

aphid-vector population to avoid the period of their high population. The period of minimum vectors population should be used to transplant papaya seedlings in the field.

3. Controlling aphid vectors

The spread of PRSV via aphid vectors can be minimized by keeping their population low by preventive sprays of insecticides. The insecticides become more effective when mixed with neem oil. Dimethoate (1.5ml / litre) mixed with 1% neem oil is effective in controlling the population of vectors and incidence of PRSV. The preventive sprays should be repeated at 15 days interval during the period of high vectors population.

4. Keeping plants healthy

The disease incidence can be delayed or avoided by keeping the plants healthy by:

i. Proving adequate moisture and nutrition

The papaya plants cannot withstand water stagnation but they grow best under constant adequate soil moisture regime. This can be achieved effectively by using drip irrigation system. Papaya plants can be kept healthy by providing adequate nutrition. However, optimum requirement of papaya plants based on a balanced mixture of nutrients both from organic and inorganic sources can be around 10 kg farmyard manure , 2 kg neem cake, 200 g each of nitrogen, phosphorus and potassium in 6 split doses (once in 2 months), 0.5% zinc ($ZnSO_4$) and 0.1% boron. Zn and B are applied through foliar sprays. First spray is made at first flowering (3-5 weeks). Second spray is made 4 weeks after the first flowering.

ii. Protection against other diseases, insects and pests

The papaya plantation should be protected against other major diseases, insects and pests to maintain good plant health. Major diseases are damping off of seedlings, foot and stem rot/wilt, phytophthora blight, anthracnose, black spot of papaya, Cercospora leaf spot, powdery mildew, fruit rot and nematodes.

iii. Other cultural operation

To keep papaya plants healthy, timely completion of other cultural operations like weeding, cleaning tree basins, and other relevant operations are also required.