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Field disease potential of tomato cultivation in West Bengal

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Survey of disease potential of hybrid and deshi (indigenous) cultivars of tomatoes were conducted in Coochbehar, Jalpaiguri, Nadia and Murshidabad districts of West Bengal. Results showed heavy disease incidence on hybrid as compared to deshi cultivars. Predominant diseases of hybrid cultivars were bacterial wilt caused by *Ralstonia solanacearum*, leaf curl by virus, blight caused by *Phytophthora* and *Alternaria*. The field disease incidence of hybrid cultivars were severe in North Bengal acidic sandy soils than in nearly neutral loam soil of Nadia and Murshidabad districts. The deshi cultivars showed little or no infection due to the above pathogens.

Bacterial wilt was the most serious disease in North Bengal districts. Crop loss in fields ranged from 70-100% resulting in complete loss of economic stability of the local farmers.

In the absence of resistant cultivars, disease management by soil amendments was attempted. Significant decrease in wilt occurence was observed following treatment of soil with urea, fly-ash and active bleaching powder singly or in combination.

Key words : Diseases of hybrid tomato, bacterial wilt, leaf curl, management of wilt, soil amendment

INTRODUCTION

Hybrid tomatoes are of widespread cultivation in different districts like Nadia, Mushidabad, Jalpaiguri and Coochbehar of West Bengal. Hybrid tomatoes grown in Haldibari and adjacent areas of Coochbehar and Jalpaiguri districts possess excellent post harvest keeping quality of the fruits. Firm texture, seedless nature, big size (150-200 g/ fruit) and delayed ripening make the North Bengal tomatoes one of the highly demanded tomatoes for table purpose. The fruits are of high demand at markets of Delhi, Haryana, Punjab, Assam, Jammu and Kashmir in India and are also exported to neighbouring countries like Nepal, Bhutan and Bangladesh and to several Middle East countries.

Apparently, there is a blooming economy. But diseases are major constraints causing loss in yield and deprivation to the farmers. A survey therefore was made to ascertain the field and post harvest diseases of hybrid and indigenous tomatoes grown in Nadia, Murshidabad, Jalpaiguri and Coochbehar districts of West Bengal.

MATERIALS AND METHODS

Farmers fields were surveyed at 20-30 days interval after sowing of the seeds or after transplantation of seedlings. The percentage of incidence of a particular disease was surveyed in the field by counting the total number of plants showing the symptoms in randomly selected blocks. Data of at least 5 blocks were considered for determining the mean percentage incidence of the disease.

The diseased plants or tissue samples and the soils from the fields were brought to the laboratory as quickly as possible. The bacterial pathogen were identified following Bergey's Mannual and the fungal pathogens were identified following Ellis (1971), Both (1971) and Barnett (1972). Koch's postulate study was done under greenhouse conditions.

Certain soil amendment was tested for management of bacterial wilt disease of susceptible cultivars under the greenhouse conditions. Seedlings were grown in plastic pots and some were kept as control without inoculation, another set was inoculated but received no soil amendment treatment. A third set of plants were grown in soil supplemented with urea, fly-ash or bleaching powder singly or in combination and then inoculated.

RESULTS AND DISCUSSION

The survey results of field and post-harvest diseases of hybrid and indigenous (deshi) cultivars of tomato in different districts of West Bengal are presented in Table 1. The results indicate that both field and post-harvest diseases were of more incidence on hybrid cultivars than on deshi varieties in North Bengal districts. It was of interest that in the plains of middle Bengal the farmers mostly cultivate deshi varieties like *Patharkuchi, Parul* and other local cultivars which were quite resistant to the field diseases commonly occuring on hybrid cultivars. Moreover, the hybrid cultivars shared more diverse diseases in the North Bengal area as compared to those grown in Kalyani, Madanpur, Bethuadahari of Nadia district.

Table 1 : Survey of field and post-harvest diseases of hybrid and indigenous (deshi) varieties of tomato

Location	Diseases Recorded
Haldibari & adjacent areas (All cultivars hybrid type) (Coochbehar and Jalpaiguri)	1. Seedling blight in nursery bed *Pythium* sp. 2. Wilt or Jheema Fungal – *Fusarium oxysporum* f sp. *lycopersici* Bacterial – *Ralstonia solanacearum* 3. Blight or Dhasa White – *Alternaria* sp. Black – *Phytophthora* sp. 4. Leaf curl or Tulsi by virus 5. Leaf spot. *A. alternata* *A. longispora* *Stemphylium vesicarium* 6. Nematodes. *Melodogyne incognita* 7. Post harvest fruit disease Black spot – *Phytophthora* sp. Many insect transmitted diseases.
Kalyani–Madanpur–Bethuadahari–Krishnanagar (Nadia) Murshidabad Hybrid tomatoes	1. Wilt Bacterial – *Ralstomia solanacearum* 2. Leaf curl or Kokra by virus 3. Leaf blight. *Phytophthora* sp. 4. Post harvest fruit diseases Buckeyee rot. *Phytophthora nicotianae* and *Stemphylium* sp. Soft rot-*Erwinia aroidae*
Deshi cultivar	1. Seedling blight – *Pythium* sp. 2. Fungal wilt.

It was also apparent from the survey data that the predominant diseases of hybrid cultivars are bacterial wilt of tomato (*Ralstonia solonacearum* race 1), leaf curl (Leaf curl virus) and leaf blights (White Dhasa by *Alternaria* sp. and Black Dhasa by *Phytophthora infestans*). *Fusarium* or *Verticilium* wilts were of low incidence as compared to bacterial wilt. In North Bengal fields especially in Haldibari and Jalpaiguri area the most dominant and destructive disease is bacterial wilt or Jheema. The disease was previously wrongly identified as Die-back of tomato. The disease may occur in the nursery bed on young plants, or on mature plants, at the flowering even up to fruiting stages. Healthy plants show incipient wilting of one or more branches or leaves of the plant. Within two days symptoms will be spreading to the other branches and by 3 to 4 days the whole plant will be completely wilted and die. Wilted plants yield on isolation *Ralstonia solanacearum* mostly. Koch's postulate studies with *R. solanacearum* were positive. Tomato rhizosphere soil sample from Haldibari area yielded 10^4-10^7 cfu of *R. solanacearum* per g of soil. Apparently, the pathogen population is quite high in the soil and the inoculum density is increasing every year due to continuous cultivation of tomato followed by chilli or egg plant which are also highly susceptible hosts of the wilt pathogen. Disease incidence data of wilted tomato are shown in Table 2 .

Identification of the tomato isolates as *Ralstonia solanacearun* Race 1 has been previously reported from our laboratory (Samaddar *et al.*, 1998).

Wilt management by soil amendements

Previously it has been shown that amendment of soil with urea, fly-ash and active bleaching powder when used singly or in combination, the population of the pathogen in soil was significantly reduced after 3 weeks of incubation (Samaddar *et al.*, 1998). Effects of single or multiple amendment of soil with urea, fly-ash or bleaching powder and corresponding inoculum potential and wilt incidence under greenhouse conditions were tested and the results are shown in Table 3. Urea, fly-ash and bleaching powder when applied singly caused significant reduction of wilt at relatively higher doses (0.2% to 0.5% w/u). But when applied in combination at a doses of 0.2% each the reduction of wilt incidence was highly significant.

Table 2 : Survey of incidence of wilt and leaf curl of tomato in different fields of West Bengal

Location	Percentage diseases incidence			
	Wilt	Curl	Blight	Total
North Bengal				
Haldibari	65	5	nil	70
Basrajwalla	50	5	nil	55
Santinagar	35	10	nil	45
Kasibari	22	36	nil	58
Belakoba	38	nil	nil	38
Middle Bengal				
Majdia	35	5	nil	40
Saguna	32	nil	nil	32
Bethuadahari	41	15	nil	56
Krishnanagar	22	—	nil	32
Murshidabad	39	15	nil	54
Gangnapur	33	5	nil	38

Suppliments along with urea which is normally used as a nitrogen source can significantly reduce the wilt incidence. Results of the field trials of these amendments in various agroclimatic zones will be presented in a separate report.

The results suggest that the management of the bacterial wilt by cultural practices is a distinct possibility. Soil amendment with fly-ash and bleaching powder as low cost supplements along with urea which is normally used as a nitrogen source can significantly reduce the wilt incidence. Results of the field trials of these amendments in various agroclimatic zones will be presented in a separate report.

Table 3 : Effects of soil amendments on wilt incidence of suseptible cultivar under greenhouse condition

Treatments	Percentage wilt incidence
Non inoculated control	0
Inoculated control	97
Inoculated + Urea (%)	
0.05	70
0.1	39
0.2	28
0.5	5
Inoculated + Fly-ash (%)	
0.05	64
0.1	45
0.2	24
0.5	10
Inoculated + Bleaching Powder (%)	
0.0015	50
0.0020	35
Inoculated + (Urea + Fly-ash + Bleaching Powder) (0.02 + 0.02 + 0.002%)	15

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