Chapter-I

INTRODUCTION
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Plants are the source of a large number of vegetables which are consumed as leaves, fruits, flowers and underground parts. Although not much of calorific value, vegetables are important sources of essential minerals, vitamins and dietary fibre needed for human system. Due to roughage in sufficient amount, vegetables are important from digestion point of view. All vegetables have low protein and fat contents but also supply a fair amount of carbohydrate, vitamin A, C, E, and minerals like P, Ca, Fe, Mg, K etc. and provide colour, flavour and aroma to the consumers diet.

With the rapidly increasing Indian population and yield saturation of several important crops, the major challange ahead is to grow more food for providing nutritional security to human being. The importance of vegetables in human diet needs no over-emphasis. The Indian Council of Medical Research recommended that the vegetable requirement in India is 280 gm/day/person. But the per capita availability of vegetables in India is much lower i.e. just 120gm/day/person (Agro Economic Research, 2004). Since independence, India has emerged as the second largest producer of vegetables in the world.

After China (237 million tonnes) in the world (500 million tonnes), India ranks next producing about 71 million tonnes of vegetables grown in area of 6.2 million hectares and contributing nearly 14% of the total
world vegetable production (Anonymous, 1997). Other major producers are Japan (14 million tonnes), the Republic of Korea (11 million tonnes) and Iran (10 million tonnes). The rest of Asia and Pasific produce only around 36 million tonnes. High percentage of growth rate during the period 1987-1997 was recorded by Fiji (8.9%), China (8.0%), New Zealand (6.9%), Loas (6.0%), Malaysia (5.6%), Nepal (5.0%), Pakistan (4.7%), Indonesia (4.3%), Vietnam (3.9%), Maldives (3.6%), Iran (3.4%) and Cook Islands (3.2%). Other countries in the region had a growth of less than 3% while Mongolia, Japan, Tonga, DPR Korea and Combodia have recorded negative growth values during this period. The annual growth rate of vegetable production in India is around 2.6%.

Tomato, a native of Peru and Ecuador, is the world’s most popular and widely cultivated fruit vegetable. The tomato (*Lycopersicon esculentum* Mill.) belongs to the family **Solanaceae**. It is one of the most important vegetables in the world. It ranks second to all other vegetables except the potato in popularity and value. It is grown universally in home gardens, greenhouses and as a field crop for shipment and canning (Anonymous, 1981).

The area under this crop in the world is 2.602 million hectares with an annual production of about 60.132 million tonnes. In India, tomato is grown on an area of 0.82 million hectares with an annual production of about 8.02 million tonnes (Anonymous, 1985). In U.P. tomato is cultivated under 4.0 thousand hectares with 24.5 thousand million tonnes production (Horticulture production in India at a glance, 1999-2000).

The area under tomato cultivation is increasing on account of its
nutritive quality and greater commercial demand. Uttar Pradesh stand as the first largest producer having production of 13873 thousand tonnes followed by Bihar, Orissa, Karnataka and West Bengal showing production of 12885, 870, 5705 and 5391 thousand tonnes respectively (Kallo and Singh, 2001). The vegetables constitute an important component of our diet and are vital sources of several nutrients such as carbohydrates, vitamins and minerals.

Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular and widely grown vegetables in the world ranking second in importance to potato in many countries. The fruits are eaten raw or cooked. Large quantities of tomato are used to produce soup, juice, ketchup, puree, paste and powder. Tomato is popular also because it supplies vitamin C and adds variety of colours and flavours to the foods. Green tomatoes are also used for pickles and preserves. It has many other uses as tomato seed contains 24 per cent oil and is extracted from the pulp and residues in canning industry.

Brinjal (*Solanum melongena* L.) is an important solanaceous vegetable crop grown at commercial scale in Faizabad region of U.P. Brinjal, commonly called “Egg Plant”, an important vegetable crop belongs to family Solanaceae, cultivated in Faizabad regions since ancient times. It is widely grown in the tropical, subtropical and warm regions of the world.

The major Brinjal producing countries are China, Egypt, Indonesia, Turke, Japan, Italy, Iraq, Seria and Spain. Area under cultivation of the crop is about 0.64m hectare with production of 6.40 m tonnes and
Plate 1: Post-emergence damping-off of tomato plants in nursery bed

Plate 2: Healthy Tomato Crop showing vegetative growth
productivity of 13.9 tonnes/hec. in India. Although statistics states that about 1.5 per cent of total cultivated area in the country is under vegetable crop.

In India, Brinjal is extensively cultivated in Punjab, Mumbai, Bihar, U.P., Madras and Hyderabad. This vegetable is most vital in respect of gross income as well as nutritional status of the people. The bitter taste of Brinjal is due to glyco-alkaloid. Among the various causes of low productivity, diseases are the most important ones. This crop suffers from a number of devastating diseases caused by fungi, bacteria, viruses and nematodes. The major diseases are damping-off caused by Pythium spp. Alternaria blight caused by Alternaria melongenae, Phomopsis blight caused by Phomopsis vexans (Sacc and Syd) Harter, Sclerotinia blight caused by Sclerotinia sclerotiorum (Linn.) de Barry, Collar rot caused by Sclerotium rolfsii, bacterial wilt caused by Rolstonia solancearum, little leaf of brinjal caused by Phytoplasma.

Tomato crop suffers from a number of fungal, bacterial and viral diseases (Anonymous, 1990). Recently, over 200 diseases have been reported to affect the tomato plant. The common fungal diseases of tomatoes are leaf mould (Cladosporium fulvum), leaf spots (Septoria spp., Phyllosticta hortarum, Synchytrium melonginiae, Verticillium dahaliae), powdery mildew (Leveillula taurica), stem rot (Sclerotinia sclerotigrum and S. minor), Verticillium wilt (Verticillium dahaliae and V. albo-atrum), Fusarium wilt (Fusarium oxysporum f. sp. lycopersici), early blight (Alternaria solani and Alternaria alternata), late blight (Phytophthora infestans) and damping-off (Pythium spp., Phytophthora
spp., *Rhizoctonia* spp. and *Fusarium* spp.).

Vegetables viz; tomato and brinjal, the nursery crops suffer from damping-off disease of seedlings. This disease was first studied by Hesse (1874) in Germany. Seed and seedlings of these vegetables are completely destroyed or they die soon after transplantation to seed beds or fields. The symptoms of damping-off appear at two stages pre-emergence stage and post-emergence stage. In former, seeds generally fail to germinate, become soft and mushy, then turn brown, shrink and finally degenerate. However, later, the pathogen attacks the young tissue that become discoloured and water soaked and finally collapse.

Damping-off disease of tomato and brinjal is most serious damaging problem and have posed challange to the farmers for its successful cultivation in nursery phase. With this approach to work out the aspects of eco-friendly management of damping-off disease caused by *Pythium aphanidermatum*, the present investigation has been proposed with the following objectives and proper plan of work.

1. Detailed survey of proposed investigtion area regarding the occurrence and severity of damping-off disease and collection of infected seedlings.

2. Identification of the causal pathogen and its pathogenicity test in laboratory.

3. Effect of sowing date on incidence and severity of the disease.

4. Evaluation on efficacy of soil solarization (SS) technique or slow soil pasteurization in controlling this disease.
5. Investigation on effect of antagonistic fungi and bacteria against the pathogen (*Trichoderma* spp., *Gliocladium*, *Bacillus subtilis* and *Pseudomonas fluorescens*).

6. Role of organic amendment in soil with reference to control of damping-off disease.

7. Screening of vegetable cultivars taken into consideration against the disease.

8. Analysis on influence of leaf extracts of selected wild plant species on damping-off disease.

9. Integrated management of damping-off through chemicals and bioagents.

10. Suggestions and recommendation to the farmers cultivating these vegetables.
Plate 3: Damping-off infected brinjal seedling

Plate 4: Healthy vegetation of brinjal crop