Chapter-I

INTRODUCTION

Soil borne plant pathogens constitute the first bio-hostile element of the soil ecosystem that plants encounter before emergence and also at various stages of growth and development. After the success of "green revolution" in terms of stability in food grain production, nutritional aspects of the human diet is the potential area that needs exploitation. Without vegetables, the nutritional requirements, taste, flavour and fancy of human dietary system will remain incomplete. It is important to support and strengthen unpredictable and fragile food grain production. Vegetable cultivation must be encouraged to supplement food grain production. As per statistics, availability, production, productivity and consumption of vegetables and fruits at national level is too low **(Chadha, 2000).**

Most horticultural corps are raised in nurseries and then transplanted. Due to seed rots and seedling death, above 50 per cent plant populations are lost. This affects further production. Thus, the health of nurseries is of immense significance for profitable and sustainable production of horticultural crops. through the production of healthy seedlings. Ironically none of the disease control methods available presently, could bring the level of soil sanitation above critical threshold, where it could reduce seed and seedling diseases **(Chaube and Singh, 1991)**. The routine sanitation approaches, crop rotation and soil disinfestation with fumigants and other pesticides, have become restricted because of their incompatibility with sustainable agriculture. For example-methyl bromide, the most widely used soil fumigant, which is a potent ozone depletor, is liberated in the environment, mainly from its agricultural use **(Ristaino and Thomas, 1997)** and poses a threat to harmonious ecosystems and environment. Crop rotations have now become untenable because of intensification of agriculture. The claim of some control with chemical and bioagent seed-treatments do exist in literature and the cultural practices such as raised beds, restricted plant densities, manipulated irrigation systems etc. have served only limited purpose and never got universal practical acceptance. An alternative claimed as an innovative approach is 'soil solarization' **(Chet, 1987)**. It is very simple and cheap technique, which requires no special scientific know-how. Solarization is just to capture the solar radiations/energy to heat up the soil. The moist soil is covered airtight with polyethylene mulches/sheeting during the period of intense solar radiations for a period of 15 days to few months **(Katan** *et al.*, **1976; Stapleton** *et al.*, **1982).**

Solarization is effective in subtropical areas where solar radiation is sufficiently intensive to create sublethal soil temperatures **(Blok** *et al.*, **2000; Katan, 1987**). Under suitable climatic conditions, solarization can control a wide spectrum of soil borne pests including fungi, bacteria, weeds, nematodes and insects **(Gamliel and Stapleton, 1993a).**

The technique and process involved, suggests that physico chemical and biological changes do occur during and after solarization, which contribute to the biocidal effect **(Chen and Katan, 1980; Stapleton** *et al.,* **1985, 1991; Ristaino** *et al.*, **1996).** Thus, soil solarization is a passive but complex phenomenon, comprised of physical, chemical and biological components. Besides direct hydrothermal inactivation and enhanced antagonism, it often results in improved plant growth response **(Chen and Katan, 1980; Gamliel and Katan, 1991; Stapleton and DeVay, 1984; Stapleton** *et al.,* **1985).** Increased concentrations of certain mineral nutrients have directly been correlated to increased plant growth response in solarized soils **(Gamliel and Katan, 1991; Stapleton** *et al.,* **1991).** Since physics, chemistry and biology- the three major soil components are involved, it is required to be investigated thoroughly, in different agroclimatic and agroecological regions to define and propagate its utility. It is more so important to study, as all the three partners of the "disease triangle" are affected producing positive effects. Soil nutrients are more available; pathogens, pests, weeds and nematodes are suppressed; disease-pest index is reduced; antagonists increased and PGPR are stimulated. Thus, a complex process occurs as a result of processes, which occur during and after solarization. It is in this context, effect of soil solarization on health of nurseries of some vegetable crops was studied through field trials, glass-house experiments and *in-vitro* studies with the following objectives:

1. Effect of solarization on major physical factors such as temperature, moisture, pH, etc.

2. Impact on pre and post-emergence damping-off.

3. Impact on plant growth i.e. plant growth response (PGR).

4. Effect on population of antagonists, PGPR, pathogens and weeds.

5. Integration of solarization with fungicides, organic amendments and bioagents.

6. Analysis and interpretation of results to elucidate mechanisms contributing to soil suppressivity.