Introduction

Active immunization has achieved remarkable success as a method for disease control in men and animals, but little use has been made of this method in the management of plant diseases. Because of the basic similarities in the biochemical processes that support life, one is tempted to think that primary defence mechanism may have evolved along similar lines in animals and plants and that active immunization may also occur in plants. Major strategies for disease control are based on the assumption that susceptibility is due to a lack of resistance gene and the disease in a susceptible variety can be controlled either by incorporating resistance gene in it or by treating it with chemicals, that inhibit the development of pathogen. Since suitable resistance varieties are not always available, we have become over-dependent on the use of toxic plant protectant chemicals for plant disease control. The ever increasing use of such toxic chemicals and often their injudicious applications has its attendent hazards and often poses environmental problems, as many of them may disturb the fine ecological balance that exists in nature. We have now become acutely conscious of the pollution hazards and in that context, search for safer alternative approaches to plant disease control has become very urgent.

Disease resistance and susceptibility in plants do not represent any absolute values. Even a susceptible host variety shows resistance to its pathogen at certain growth stages and under certain cropping conditions or stress situations and rarely perishes. This would suggest that even a susceptible variety has a potentially by effective defence mechamism and that by manupulating cropping conditions or by creating stress, it may be possible to elicit the expression of such latent defence potential during host parasite interactions. This constitutes the very basis of induced resistance in plants as a possible disease control measure. Since the first report of induction of resistance in plants against their fungal pathogens by prior inoculation with their less virulent forms, the emphasis had been mostly on biological induction of resistance. Only lately, any serious attention has been focused on the possibility of chemical induction of resistance in plant host. Considerable evidence has now accumulated to show that prior inoculation of susceptible plant host with an avirulent form of pathogen, cultivar of non–pathogenic races of pathogen, other pathogens of both homologous and heterologous nature or non–pathogen or even prior application of the heat killed or sonicated suspension of the pathogen or the metabolic or constitutive components of both pathogen and non-pathogen, can provide it significant levels of protection from the subsequent attack of the virulent form of pathogen (Goodman, 1967, 1980 ; Kuc, 1982, 1984 ; Matta – 1971, 1980 ; Purkayastha, 1994 ; Mukhopaddhya , 1997 ; Sequeira, 1983 ; Sinha, 1990). Plants so protected develop only limited number of lesions and often show limitations of lesion size. In some cases, such induced or acquired resistance is systemic in nature and persists effectively over fairly long periods. Even though effective field level protection has been achieved by this method against many diseases of tobacco, bean, cucumber and melons, various logistical problems relating to the large scale production of the inducer biotic agent and its application to the crop under field conditions make this approach both cumbersome and uneconomic and heavily limit its utility as a measure for plant disease control particularly in the Indian agricultural perspective. In that context, the possibility of disease control through chemical induction of resistance assures much greater significance.

Information is now available that treatment with diverse groups of nonconventional chemicals , mostly phytoalexin inducers with little or no direct toxicity can reduce symptom expression in many crop diseases significantly and restrict resultant damage within tolarable limits (van Andel, 1966 ; Wain and Carter, 1972; Chakraborty and Purkayastha, 1987; Lazarovits, 1988 ; Sinha, 1989; Purkayastha, 1994 ; Mohr and Cahill, 2001). It has been demonstrated that prior treatment with many chemicals in the nature of metal salts, amino acids, plant growth regulators and miscellaneous organic compounds are effective in inducing high level of resistance in susceptible rice plant against brown spot (Sinha and Hait, 1982) and blast diseases (Sinha and Sengupta, 1986), in soybean against charcoal rot (Purkayastha and Chakraborty, 1989), in chick pea against fusarium wilt (Chowdhury and Sinha, 1996), in peanut against *Sclerotium* infection (Chowdhury and Sinha, 1997) and in rice against *Rhizoctonia solani* (Bhattacharyya and Roy, 2000) . These and other studies established that many such compounds can provide crop plants with effective systemic protection from their pathogens and that such effect often persists over fairly long periods. In most of these cases no direct toxic action of these chemicals on the pathogens can be envisaged, rather these seem to act as "Sensitizer" and activate host defense through a conditioning of its tissue.

Soybean [*Glycine max* (L) Merrill] is one of the major pulse crops (Plate-1) under Indian conditions, particularly important as a source of protein for both human and animal consumption and also a rich source of cooking oil with heavy use in vanaspati industry. It is also used in the manufacture of paints, varnishes, water proof goods, glycerine, rubber substitues, fire works and explosive (Kale, 1985). Soybean is also recognised by medical science for its high content of lecithin which is essential for building up the nervous system .

Sclerotium blight , southern blight or southern stem rot of soybean incited by *Sclerotium rolfsii* Sacc. (=*Corticium rolfsii* Curzi.) , a soil borne pathogen of very aggressive nature causes considerable damage to soybean (Punja,1985). During the first month of plant development or during late reproductive stages symptom usually appears as white , cottony , fan like mycelium which grows over the stem surface on seedlings and mature plant . Infected seedlings or older plants often are killed . The fungus produces an abundance of globular , tan to reddish brown or dark brown sclerotia about the size of mustard seeds . The sclerotia are associated with the mycelium on the surface of the plant. This disease is very difficult to control by conventional chemicals and no soybean variety resistant to *Sclerotium rolfsii* is yet available. Considering the undoubted importance of soybean in Indian agriculture , it was felt worthwhile to explore the possibilities of control of the above disease by the use of non conventional phytoalexin inducer chemicals.

Basic objectives of the present investigation were (a) to achieve effective control of *Sclerotium* infection by developing high level and durable resistance in susceptible soybean plants by wet seed treatment with a select group of non-conventional chemicals , at their optimum concentration and for optimum duration, (b) to investigate the nature of biochemical changes that may be associated with induction of resistance in soybean plants, (c) to detect cross-reactive antigens shared between *S.rolfsii* and soybean varieties and their cellular location and (d) to determine the serological changes after induction of disease resistance.

Before going into the details of the present work, a brief review in conformity with this study has been presented in the following pages.

Plate 1: Soybean [*Glycine max* (L.) Merrill] plants (variety – Macs58) grown in the Experimental field (inset picture- soybean pods)