Summary

(1) A review of literature has been presented in connection with biochemical changes following chemical treatment and serological relationship between host and parasite.

(2) Materials used in this investigation and experimental procedures have been described in detail.

(3) Pathogenicity test of *Sclerotium rolfsii* on different soybean varieties (e.g. PK-262, Bragg, NRC-7, J-80, Pusa-16 and Macs-58) was done. Among the six soybean varieties, Macs-58 was found to be highly susceptible which was selected for induction of resistance.

(4) Accumulation of glyceollin from six soybean varieties were detected after 24 and 48h of inoculation with *S. rolfsii.* Higher accumulation of glyceollin was noticed after 48h of inoculation. PK-262 and Bragg contained more glyceollin (377-392 μg/g fresh wt. tissue) than Macs-58 (189 μg/g fresh wt. tissue).

(5) A series of experiments have been performed using twelve chemicals belonging to three separate groups, viz. metal salts (cupric chloride, ferric chloride, lithium sulphate, manganese sulphate, sodium molybdate, magnesium sulphate, zinc chloride and barium sulphate); growth regulators (IAA, 2,4-D, and 2,4,5-T) and biological compound (chitosan) in order to induce resistance in soybean plants (highly susceptible variety – Macs58). Among the tested chemicals cupric chloride and ferric chloride were found to be highly effective in reducing disease intensity.

(6) Fungitoxicity assay using selected metal salts, growth regulators and chitosan, on sclerotial germination of *S.rolfsii* were done.

(7) Biochemical changes associated with induction of disease resistance in soybean plants by non-conventional chemicals with special reference to phenol content, enzyme activities such as peroxidase, polyphenol oxidase, pectolytic enzymes, phenylalanine ammonia lyase as well as calcium and magnesium levels were determined.

(8) Maximum and minimum increase in phenol level (total phenol and orthodihydroxy phenol) was recorded in cupric chloride and sodium molybdate treated plants respectively.

(9) Polyphenol oxidase and peroxidase activities were higher in treated inoculated plants than untreated inoculated plants. However, pectolytic enzyme activity in treated inoculated plants was significantly less than untreated inoculated plants. Ca^{++} and Mg^{++}content were also related to pectolytic enzyme activity. Reduction of pectolytic enzyme reduced its activity in rotting tissue, was linked with greater accumulation of Ca^{++} and Mg^{++}.

(10) The plants treated with cupric chloride, the most effective treatment, elicited maximum increase in PAL activity following inoculation with *S.rolfsii.*

(11) Accumulation of glyceollin in susceptible soybean variety – Macs-58 before and after alteration of disease reaction by cupric chloride and ferric chloride were detected. Both the chemicals induced glyceollin synthesis in uninoculated soybean plants. $CuCl_2$ and $FeCl_3$ induced high level of glyceollin (485 and 332 µg/g fresh wt. tissue respectively) after challenge inoculation with the pathogen (*S.rolfsii*) in comparison to the untreated inoculated plants.

(12) Mycelial protein of *S. rolfsii* and different parts of inoculated soybean plants were estimated and analysed by SDS-PAGE. Old culture of mycelia contained more protein than the young. Leaves contain more protein than roots. Soluble proteins prepared from collar region of soybean plants (Macs-58) inoculated with *S.rolfsii* exhibited 2-3 additional bands, in comparison to their healthy control.

(13) Polyclonal antisera were raised against antigen preparations from mycelia of *S. rolfsii* and soybean roots (Macs-58).

(14) In agar gel double diffusion tests antiserum of *S. rolfsii* and Macs-58 reacted with antigens of different isolates of *S. rolfsii* and soybean varieties. Strong precipitin reaction occurs between pathogen antigen and host antisera as well as host antigen and pathogen antisera.

(15) Antigenic comparison among six soybean varieties and six isolates of the pathogen and two non pathogens using anti- *S.rolfsii* antiserum were done following conventional set up for immunoelectrophoresis. Susceptible soybean varieties shared the common antigens with the different isolates tested.

(16) Optimum conditions for ELISA reactions with anti-*S.rolfsii* were determined. An antiserum dilution 1:125 and an enzyme (alkaline phosphatase) dilution of 1: 10,000 were optimum. Antigen upto a concentration of 10μg/ml were detected in homologous reaction by ELISA.

(17) Detection of pathogen (*S. rolfsii*) in artificially inoculated soybean root tissues using DAC-ELISA formats, were developed.

(18) Cellular location of cross reactive antigens(CRA) shared by host(*Glycine max*) and parasite (*S.rolfsii*) using fluorescein isothiocyanate (FITC) was determined. Cellular location of CRA in mycelia and sclerotia of *S.rolfsii* were also studied. Major CRA was concentrated on the epidermal and cortical tissues of soybean roots and young hyphal tips of the pathogen.

(19) Alteration in antigenic patterns after chemical induction of resistance by cupric chloride in susceptible soybean plants were detected using immunodiffusion and immunoelectrophoretic tests. These observed antigenic changes owing to $CuCl_2$ treatment have some significance in the resistance of soybean to *S.rolfsii.*

(20) Implication of the results have been discussed.