Summary and Conclusions
The clinically important thermophilic actinomycetes (TAs) were isolated from plant materials and soil samples collected from different agro-environment regions in Uttar Pradesh, India. The isolated TAs were characterized morphologically and biochemically as well. The TAs were also subjected to antibacterial drugs. The TAs isolates, based on differences in their properties were further characterized serologically. The respiratory allergies due to inhalation of these bioallergens were determined in personnel exposed to different agro-industrial environment.

Thermophilic actinomycetes were isolated from paddy grains, wheat and rice straw, rice husk, hay bagasse, cotton dust and soil samples etc. These samples were collected from agricultural fields, poultry farm, dairy farm, cotton mill and sugar mill located in Uttar Pradesh, India. Of the 467 samples, 70.2% yielded one or more species of TAs. The TAs isolated from different environment varied in their morphological and biochemical properties. The TAs were identified as: *Thermoactinomyces vulgaris*, *T. thalpophilus*, *T. sacchari*, *Saccharopolyspora rectivirgula*, *Thermomonospora fusca* and *Saccharomonospora viridis*. *Thermoactinomyces vulgaris* was the most widely prevalent species followed by *S. rectiviculga* and *T. thalpophilus*. *T.sacchari* was frequently isolated from bagasse samples. *T.fusca* and *S.viridis* counts was low as compared to other TAs isolates. All the selected TAs were found resistant to nalidixic acid and novobiocin. *T.fusca* and *S.viridis* showed resistance to ampicilin, whereas *T.fusca* was also resistant to kanamycin to which all other tested TAs isolates were sensitive.
Seasonal aerial counts of TAs in the agriculture farm of Kuarsi, Aligarh was determined by direct media Petriplate exposure. The higher colony counts plate$^{-1}$ was recorded during May (3.3) followed by June (2.1) which decreased during July and August. Again a sharp rise occurred during October, after which a gradual decrease was noted.

The aerial prevalence of TAs were recorded from dairy farm, poultry farm, cotton spinning mill and sugar mill located in Western Uttar Pradesh, India. Dairy farm, Jamalpur and Poultry Farm, Meerut, yielded high prevalence of S.viridis, T.vulgaris, T.thalpophilus, S. rectivirgula whereas T.sacchari was also recovered from fodder store in dairy farm. In poultry farm, S.viridis and T. vulgaris were more prevalent. The cotton spinning mill, Hardoi, revealed higher aerial counts of T.vulgaris and T.thalpophilus in the speed frame section and S.rectivirgula accounted more in blow room. Whereas, in Saatha sugar mill, Aligarh, T.sacchari and T.vulgaris were highly prevalent in crushing and bailing sections. Membrane filters were used to trap the spores of TAs at different agro-sites. The average cfuL$^{-1}$ of air inflow were recorded mostly from agricultural farm where T. vulgaris was highly prevalent (5.6 x 10$^3$ cfuL$^{-1}$). T.sacchari was 5.6 x 10$^3$ cfuL$^{-1}$ of air samples collected from sugarcane unloading area of Saatha sugar mill.

Double immunodiffusion (DID) test with cultural filtrate antigens of T.vulgaris, T.thalpophilus, T.sacchari and S.rectivirgula showed that all organisms reacted strongly with their homologous antisera raised in New Zealand white rabbits. However, number of precipitin bands varied from organism to organism. Much clear bands were obtained with culture filtrate after 70% ammonium sulfate
precipitation and gel filtration of antigens. The antigens prepared from different TAs and their homologous antisera when reacted with heterologous antigens revealed the antigenic diversity among these TAs.

Clinically important TAs prevalent aerially in cotton spinning mill, Hardoi and Saatha sugar mill, Aligarh, India were evaluated to find out their effect on the workers (n=115) exposed to these organisms. On the basis of the symptoms of hypersensitivity pneumonitis, subjects were divided into symptomatic and asymptomatic groups. The workers from both the mills above 35 years of age were less precipitin positive and lower number of precipitin positive cases were also noted in smokers and non-smokers. *S.rectivirgula* yielded more precipitin positive sera in both symptomatic and asymptomatic groups among cotton spinning mill workers, whereas, the ELISA positive cases were also more against *S.rectivirgula* followed by *T.thalpophilus* and *T.vulgaris*. Among sugar mill workers, higher number of precipitin positive sera of symptomatic and asymptomatic were ELISA positive against *T.sacchari* and *S.rectivirgula* as compared to their respective precipitin negative sera. In general, the mean absorbance ELISA values for IgG antibodies in the sera of precipitin positive symptomatic and asymptomatic were significantly (P<0.05) higher than their respective precipitin negative subjects sera or the unexposed healthy control.

The subjects with complaint of respiratory disorders were investigated at J.N. Medical College, Aligarh. Non-farmers (n=300) and farmers (n=129) were included in the study. 33% of non-farming subjects reported to have family history of respiratory allergies as
compared to farmers. Among farming populations, symptoms of farmers lung disease like wheeze, chill with fever, chest tightness were less frequently among full-time farming groups as compared to part-time farmers.

Double immunodiffusion (DID) test and Enzyme-linked immunosorbent assay was performed to determine precipitin reaction and IgG antibodies in the sera of subjects against antigen. Out TAs of the 85 sera samples collected from non-farming populations, only 11.8% reacted in DID and ELISA against TAs antigen, whereas the sera samples collected from farming group (n=147) which included both symptomatic and asymptomatic subjects, reacted strongly against these TAs in DID and ELISA.

In the present study, large proportions of ELISA positive subjects which were precipitin negative had sign and symptoms of hypersensitivity pneumonitis. It is concluded that the clinically important TAs existed in various agro-industrial samples which could be life threatening to the workers exposed to these bioallergens. The serological methods used like ELISA could be useful for serial prospective studies and probably also for early diagnosis of actinomycetal disease. As ELISA is simple, inexpensive, safe and readily available, it could help to determine the patterns of antibody activity in different classes and subclasses of immunoglobulin which may be of great importance for the better understanding of the immunopathology of actinomycetal infections. Our findings can help different agencies engaged in prevention and control of pollution and persons associated with occupational medicine.