Introduction
The occupational lung disease has been a challenge over the past few decades. Various suspended particulate matters of industrial environment are the main cause of respiratory ailments. The prominent respiratory diseases are asthma, bronchitis and other form of lung allergic reactions. It is believed that the agro-based products like hay, grain, rice bran, wheat straw etc. harbours various kinds of allergens which are harmful to the farming population (Dutkiewicz et al., 1989; Zedja and Dosman, 1993).

Thermophilic actinomycetes (TAs) are ubiquitous in nature and are found almost in every decomposing organic matter where temperature reaches above 45°C. Agricultural farming and agro-based industries deal with mouldy materials such as bagasse, straw, cotton, stored damp hay and stored moist grain. The self-heating of these substrates caused by microbial growth and their activity raises the temperature at which TAs can grow. The TAs play an important role in the establishment of hypersensitivity pneumonitis among farmers (Lacey and Dutkiewicz 1994; Salvaggio, 1997, Prior et al., 1996; Von Ehrensten et al., 2000). The most common species of TAs causing hypersensitivity pneumonitis (HP) includes the species belonging to genera Faenia, Saccharomonospora and several other species of Thermoactinomyces (Lacey and Dutkiewicz, 1994; Khan et al., 1995; Moreno et al., 1997). These organisms have been isolated from various working and living environment of patients (Kurup et al., 1976). Inhalation of numerous spores of these organisms will sensitize the individuals and, on prolonged inhalation of heavily contaminated air, may result in HP (do Pico, 1992; Fink, 1992). Hypersensitivity pneumonitis is an immunologic interstitial lung disease which may be incapacitating if not diagnosed early and controlled by avoidance of antigens. The commonly recognized
diseases includes farmer's lung, bagassosis, mushroom worker's lung and ventilation pneumonitis and are caused by inhalation of thermophilic actinomycetes and various fungi or other organic dust.

These HP diseases are an immunological induced inflammation of the lung parenchyma. The respiratory systems may be acute, consisting of chills, fever, sweating, headache and nausea that begin 2 to 9 hours after re-exposure, peak typically between 6 and 24 hours and lasts from hours to days. The sub-acute form may appear gradually over several days to weeks and is marked by cough and dyspnoea which may lead to severe dyspnoea leading to urgent hospitalization. The chronic form has an insidious onset over a period of months, with increasing cough and exertional dyspnoea, fatigue and weightloss (Richerson et al., 1989). Symptoms, signs and other manifestation of HP disappear within days, weeks or months in most patients if the causative agent is no longer inhaled (Fink, 1984). There is widespread exposure to these antigens, but the number of individuals who develop the disease is relatively low. It has been estimated that between 5 and 15% of an exposed population will develop HP (Fink, 1992). This observation strongly suggests that host factors are important in the expression of chemical disease.

Farmer's lung disease is a form of HP caused by inhalation exposure to aerosolized dust of "moldy hay" containing thermophilic actinomycetes (Pepys, 1969). The exposure may be short or long-term (Short-term exposure usually results in acute clinical episode, whereas lung-term low-dose exposure usually results in a more insidious disease frequently progressing to extensive irreversible lung damage). The diagnosis depends on the demonstration of an association between exposure to moldy forage
and the clinical symptoms. This association is most frequently made by demonstrating antibodies to one or more of the thermophilic actinomycetes (Bamdad, 1980). Farmer's lung is reported to be consequence of a type III hypersensitivity reactions in combination with type IV allergy. The formation of immune complexes seems to be the initiating mechanism of this disease. These immune complexes activates the complement cascade, resulting in a release of vasocative amine (histamine, 5-hydroxytryptamine) which leads to a higher permeability of blood vessels. Additionally, accumulated lymphocytes activate macrophages, which in this disease fail to phagocytose the immune complexes, resulting in epithelial granulomas and interstitial inflammation (Gemot et al., 1997).

Diagnosis of HP includes appearance of clinical symptoms and the antibodies production in the serum of exposed subject, that match the concept of an immune complex mediated reaction in the bronchioles and mainly in alveolar wall tissue. Antibodies can be detected by several methods such as immunodiffusion, counter-immunoelectrophoresis, Immunoblotting and Enzyme-linked immunosorbant assay (ELISA).

Double immunodiffusion method has been used for the detection of precipitating antibodies in the serum samples against the antigen of TAs. The DID however, can detect the precipitating antibodies only if present in higher quantity. The cessation of exposure to bio-allergens results in reduction in the amount of antibodies, and therefore, DID may give negative results. Although the patients may still have features of HP and re-exposure can elicit the full clinical picture. Many investigators have detected precipitin against S. rectivirgula in the patient's sera of HP, having an elevated concentration of IgG antibodies.
(Cornelia et al., 1996; Kumar et al., 1993) as compared to unexposed control subjects. The specific class of Immunoglobulin can not be detected by precipitating antibodies in DID. ELISA has been therefore, employed to detect specific IgG antibodies against TAs in the exposed farm and agro-mill workers. The results of ELISA have been correlated with DID and clinical diagnosis of HP (Bour et al., 1992). Studies on HP caused by thermophilic actinomycetes are of particular interest in northern India, which is predominantly an agricultural area with the bulk of its population exposed to a variety of agro-based products. This necessitates the identification of local common allergens of TAs group for proper diagnosis of the disease in local population of the area. The present investigation was therefore, undertaken with the following specific objectives:

1) To undertake the survey of different agricultural products and aerial environment for the prevalence of thermophilic actinomycetes in agro-industries and agricultural farms in the state of Uttar Pradesh, India.

2) To undertake morphological, biochemical and serological characterization of these clinically important thermophilic actinomycetes.

3) To develop probes for the detection of antibodies against thermophilic actinomycetes associated with hypersensitivity pneumonitis among the local farmers and agro-industrial workers.