IV. GENERAL DISCUSSION.
The climatic factors such as temperature, relative-humidity, rainfall, wind etc. is highly a determining factor for growth and development of any life. The cultivation and yield of a crop depend greatly on climatic factors. The cultivation of rice crop is season-bound process, and is indigenous to the humid area of tropical and sub-tropical regions. The indica variety of rice (Oryza sativa L.) are grown mainly in the tropical countries. Assam is located in the north-east part of India, and lies between 24° and 28° N latitude. The state Assam is situated in the monsoon sub-tropic zone and is characterised by having hot and wet summer and dry and cool winter. Of all the weather elements rainfall is the most important single factor that determines the extent, growth and production of the rice crop.

The seed-borne mycoflora of paddy stored in different storage condition shows the various activities in different aspects.

The seed mycoflora of paddy stored in ambient storage granary was isolated during the year 1992. The method employed were, nutrient culture plate and blotter technique, recommended by Muasket (1948) and ISTA (1976). The result (Tables - 4,5) reveal the detection of seed-borne fungi from outer seed coat (external seed-borne) and from inner parts (internal seed-borne). The internally seed-borne fungi detected in the present investigation were Alternaria
Alternaria (Fr.) Keissler; Aspergillus niger Van Teigh; Aspergillus flavus ex. Fres.; Curvularia lunata (Walker) Boedijn; Curvularia pallescens Boedinn; Drechslera oryzae Breda de Hann; Fusarium moniliforme Sheld; Helminthosporium oryzae Breda de Hann; Nigrospora oryzae; Penicillium purpurogenum Stoll; Rhizopus oryzae Went and Prinsen Greetings; Trichoconis padwickii and some unidentified forms. A number of internally seed-borne fungi like Alternaria alternata; Curvularia lunata; Drechslera oryzae; Helminthosporium oryzae; Nigrospora oryzae; Rhizopus oryzae and Trichoconis padwickii were detected with higher percentage in blotter method whereas the internally seed-bone fungi viz. Aspergillus niger; Aspergillus flavus; Curvularia pallescens; Fusarium moniliforme and Penicillium purpurogenum showed higher percentage in nutrient culture plate method. Similarly, variation of incidence of internally seed-borne fungi depending on ambient storage has also been observed. Some seed-borne fungi showed higher percentage of contribution in Tin granary and some in Thatch granary. This type of variation of seed-borne fungi depending on storage structure has also earlier been reported by Doijode (1988); Charajan and Tarar (1992). The seed-borne fungi were found to exist throughout the experimental period. The detection of seed-borne fungi in various sensitive parts of seeds has also been reported by Vidhyasekaran et al. (1970); Jayaweera et al. (1988). The existence of seed-borne fungi of paddy as found in the present investigation was also reported by Shetty and Shetty (1988); Singh et al. (1991); Vaid and Sarma (1992) and Sah
and Jain (1993). Both the types of seed-borne fungi systematically invade the seeds in ambient storage and destroy the most sensitive components of the seeds and result failure in germination and reduce the nutrient values.

The rural farmers of the state, select the seeds from ambient storage for raising the crop in the next planting season. As a result of which the seed-borne pathogen hiding internally in the seeds may cause severe damage to the seeds and the crop plant in different phases of its growth. Neergaard (1986) stated that the external factors of the environment exerts an influence on the host and pathogen and on the association of host and pathogen to establish the diseases.

The analysis of aeromycospores inside the atmosphere of ambient storage granary was studied. The results obtained in the experiment (Tables - 6, 7, 8 and 9, 10, 11) exhibited the association of a number of fungal spores and types. By the gravity slide method, total number of fungal aerospores recorded inside the atmosphere of tin granary were 718, 951 and 764 numbers in 1990, 1991 and 1992 respectively, and in thatch granary were 847, 1051 and 827 numbers of spores in 1990, 1991 and 1992 respectively. The above findings reveal the presence of higher number of aerospores in the atmosphere of thatch granary, in all the 3 years of study.

Similarly, a total of 2951, 3424 and 3349 colony was detected by nutrient culture plate method from tin granary
and 2946, 3326 and 3559 colony from thatch granary in the year 1990, 1991 and 1992 respectively. The above results reveal higher number of colony (3424) in tin granary in the year 1991 and less colony (2951 and 3349) in 1990 and 1992. The thatch granary recorded maximum (3559) in 1992 and less colony (2946 and 3326) in 1990 and 1991. By gravity slide method a total of 12 fungal spore types and some unidentified forms, and 28 fungal types (colony) with some unidentified forms were recorded in nutrient culture plate method. The results (Tables - 6, 7, 8 and 9, 10, 11) reveal a clear variation of fungal spore and colony in the ambient atmosphere of tin and thatch granary, in 3 years of study. Similar results of variation of aeromycospores in different storage structures had also earlier been reported by Prasad and Pathak (1987) and Rao (1992).

The abundance of spores and mycelium in the atmosphere of storage granary may also be due to initial contamination of grains in the crop field by different categories of saprophytic and parasitic fungi. Sometimes the grains in the field as well as in the threshing floor are destroyed by untimely rain and damp climate, which result in problem of drying the seeds. As a result of which the farmers of the state are compelled to preserve the semidried seeds with higher percentage of moisture content in thier storage structures or temporarily in heaps. The seeds stored under such circumstances with higher seed moisture content generally are proliferated by storage fungi in ambient condition, and they contaminate the entire grain lot in the
ambient storage. The deterioration of grains in ambient storage due to the infestation of a number of fungi is well known and the storage structure is one of the factors that influence the grains during storage (Hall, 1955). In the present study, the most frequently occurring fungal spores in both the storage structures were the *Alternaria* sp.; *Aspergillus* sp.; *Curvularia* sp.; *Fusarium* sp.; *Helminthosporium* sp. and *Penicillium* sp. with higher percentage contribution. Similar isolation of fungi from paddy stored in different storage structures has also been reported by Jayaweera et al. (1988); Rao (1992).

It is generally known that the crop may suffer a lot owing to infection caused by a number of fungal pathogens and saprophytes of soil and air. These pathogens and saprophytes may also be there in the selected seeds to be used in the next cropping season.

An investigation of fungal spores in the air over a paddy field was carried out during 1990, 1991 and 1992. The results of the experiment (Tables - 12, 13 and 14 and Figs. 20, 21 and 22) reveal clearly a noticeable fluctuations of aeromycospores in the atmosphere of paddy field. The variation of aeromycospores were observed in three different times (07 hrs., 12.0 hrs. and 19.00 hrs.) of the day. Monthly and yearly variations of aeromycospores in 3 years also reveal that the spores over the atmosphere of paddy field is variable. The results by the nutrient culture plate method revealed only a marginal drop in the year 1991. The number of
colonies estimated by this method were 2186, 2116 and 2413 in 1990, 1991 and 1992 respectively. The highest number of gunal colonies (1458 in 1992, 1344 in 1990 and 1283 in 1991) were recorded at 12.0 hours, and less at 07 hours (655 in 1992, 601 in 1990 and 541 in 1991) and least at 19.00 hours (300 in 1992, 291 in 1991 and 261 in 1990). The above findings are in accordance with that of Verma and Kamal (1982), Satpute et al. (1983). Wind and temperature have a profound effect on the dissimilation of air flora from one place to the other. This is because of the fact that the velocity of wind and the range of temperature are not constant, and are changing in all the moments of time. Owing to variation in wind current, the trapping of acerospora was dissimilar at different times of the day. According to Kumar (1984) this type of variation could be due to the wind velocity, which is blowing faster at noon hours and resulted much more aerospores in the atmosphere of crop field and less spores at 07 and 19.00 hours, owing to deposition of spores in the dew drops and moist surfaces of plant parts and in soil. When divided the years into 3 seasons i.e. winter, rainy and summer, the distribution of spores reveal seasonal variations (Table-15) recorded in nutrient culture plate method. The highest number of fungal colonies observed in culture plate method were 1017, 713 and 683 in the winter, rainy and summer season of 1992 respectively. The percentage contributions were 42.1, 29.5 and 28.5 respectively. The experimental results show that the summer season contributes least number of colonies over the atmosphere of paddy fields and it may be due to post harvesting period of paddy having no other crops at that
period. Similarly the rainy seasons of the years 1990, 1991 and 1992 accounted less spores in comparison to winter and that is due to washing down of atmospheric fungal spores along with suspended particles (Gregory, 1973; Bansal et al. 1988). Some of the species recorded in the 3 years of investigation are also related to different diseases of paddy crops and were Alternaria alternata (Fr.) Keissler; Claviceps oryzae Hoshioka; Ephelis oryzae Sydow; Helminthosporium oryzae Breda de Hann; Pyricularia oryzae Cav.; Rhizoctonia solani Kuhn.; Scelerotium oryzae Catt. etc. and some other species of pathogenic importance. Moreover, a number of saprophytic fungal spores and types recorded and were shown in the Tables - 12, 13 and 14.

The moisture content of paddy seeds, from both the ambient storage structures, were determined by following the oven drying method recommended by Agrawal (1986) and international rules for seed testing (1985). The perusal of the data (Tables - 16, 17 Figs. 23 and 24) reveals clearly the change of seed moisture with the progress of storage period in both the ambient structures. The seed moisture content in both the storage structures shows fluctuations in 12 months of analysis and safe storage months was observed May and June, having seed moisture (12.8 and 12.0) in tin granary and June having seed moisture (12.8) in thatch granary. The rest of the months exhibited higher percentage of seed moisture 15.2% in tin granary/15.4% in thatch granary. During storage period, the grains face seasonal fluctuations of temperature and relative-humidity also and
these factors have an impact on the moisture content of the grains in storage. According to Delouche et al. (1973) both ambient temperature and relative-humidity of tropics and sub-tropics are usually harmful for storage of seeds.

The data (Table - 16) on relative-humidity and temperature of the two ambient storage structures also reveal clearly fluctuations in 12 months of the year. The relative-humidity in both the storage structures recorded was above 95% from the months June to December and the rest of the months recorded above 90%. Similarly, the temperature recorded in both the storage structures was also changing in 12 months of the year. Comparatively high temperature was recorded in tin granary than that of the thatch granary. This result indicates the variation of temperature, and higher temperature in tin granary may be due to its roofing. The recorded minimum temperature of both the ambient storage structures also exhibited variation at night. Minimum temperature was observed as 12°C in November in tin granary and 14°C in December in thatch granary.

The extent of germination of seeds from the two ambient storage structures were studied by following the blotter method (Agrawal and Dadlani, 1987) and international rules for seed testing (Anonymous, 1985), for a period of 12 months. The data recorded (Tables - 16, 17 Figs. 23, 24) exhibited a gradual increase in germination (92% to 98.6 in tin granary and 93% to 99% in thatch granary) from the month of January to June in both the storage structures, but the
same decline (92.5% to 6% in tin granary and 94% to 7.5% in thatch granary) sharply from the month of July to December. The progressive increase in germination with the progress of time during the first half of the year may be attributed to physiological maturity of the seeds accompanied by temperature increase of the atmosphere and non-activity of the seed-borne fungi. On the other hand, the gradual decrease of germination percentage in later months of the year may be due to ageing and senescence of the seeds accompanied by activity of the associated seed-borne fungi leading to seed deterioration. The deterioration of seeds (loss in germinability) in ambient storage condition has also been reported by Hussain et al. (1988); Vyas et al. (1990) and Singh et al. (1991). According to Vijayalakshmi and Rao (1985) the drastic reduction in seed germination at higher humidity could be due to the invasion of embryo tissues by fungi like Aspergillus sp.; Alternaria alternata.

The deterioration of seeds in ambient storage does not mean only the loss of seed germinability, but a wide range of seed components also degrade in ambient conditions of seed storage. The present experiment was carried out to assess the losses of nutrients of seeds in ambient storage. It is clearly observed that with the increasing storage period (January to December) starch and protein of paddy showed gradual loss in both the tin and thatch granary (Table 18). The loss of starch at the end of 12 months (December) of analysis from the begining (January) were 26.6% in thatch granary, and 31.7% in tin granary. The losses of starch was
more in tin granary than in thatch granary. The protein content in tin granary showed a loss by 27.1%, and in thatch granary by 24.2%. The other seed components (total sugar, reducing sugar and non-reducing sugar) showed gradual increase from January to August, and drop gradually in subsequent months (September and December). Similar pattern of deterioration of seed nutrients in ambient storage has also been reported by Prasad and Kumar (1987), and in some other seeds reported by Rao and Reddy (1988); Rashmi and Mehrotra (1990); Kalpana and Rao (1991) and Phukan (1993). The seed deterioration in ambient storage could be due to the type, and material composition of storage structures, location of storage granary and the relative humidity and temperature prevailing inside and outside the storage granary. The above parameters has an impact on seed moisture content, which increase in support of the above factors, and result the growth and proliferation of a number of seed-borne fungi. These fungi in course of their action may bring about several undesirable changes by contaminating and degrading the seed constituents in storage and make the seeds unfit for human consumption or sowing by elaborating toxic metabolites. According to Agnihotri (1963); Steward (1967); Bilgrami et al. (1979) and Prasad et al. (1988) the storage fungi under favourable conditions liberate a number of specific enzymes for the degradation of seed constituents like starch, protein and sugar etc. to get their nutritious.

Although fungicides are used for protecting the seeds from fungal infestation, they are also found to have
some other beneficial activities, for example, enhancing the seed germination, growth etc. The effect of fungicides viz., Diathane M-45, Zebtane, Bavistin, Jkstein, Fytolane and Topsin-M on germination and seedlings growth of paddy stored in ambient conditions was studied. The experimental findings (Tables - 20, 21, 22 and 23 Figs. 30, 31, 32, 33, 34 and 35) reveal that the fungicide Diathane M-45 and Zebtane (both are manocozebe) exhibited better germination when treated the seeds with 200, 600 and 1000 ppm concentrations, except the fungicides 'Zebtane', which inhibit the germination at 1000 ppm. concentration, when compared with that of the control (DW). Both the fungicides on the other hand inhibited the growth of seedlings (root and shoot) when treated with the above concentrations. Bavistin and Jkstein (both are carbendazim) also exhibited similar increase in seed germination and inhibition of seedlings growth when compared with that of the control. When the effects of the above fungicides were compared it was observed that the performance of Diathane M-45 and Zebtane seems better than that of Bavistin and Jkstein in increasing the germination of paddy. On the other hand the inhibition of seedlings growth seems higher by the fungicide Bavistin and Jkstein when compared with Diathane M-45 and Zebtane. The 'Fytolane' treated paddy seeds with similar concentrations as above, exhibited increase in seed germination when compared with that of the control. The results showed a decreasing trend of seed germination with the increase in concentrations of the fungicide (Table-20). Similarly, decrease in seedlings growth was observed gradually with the increase concentrations of
the fungicide (Tables - 21, 22). Topsin-M (Thiophanate methyl) treated seeds exhibited increase in seed-germination only at 200 ppm concentration (81%) but at 600 and 1000 ppm showed drop (74.2, 69.2%) in seed germination when compared with that of the control (DW). The fungicide similarly showed inhibition in seedlings growth. All the fungicides, except 'Topsin-M', revealed clearly the increase in seed germination when treated the seeds with the concentrations as above. Similar increase in seed germination of paddy by the fungicide Diathane M-45 and Bavistin have also earlier been reported by various workers (Pasha et al., 1991; Singh and Kang, 1992 and Asalmol et al. 1992 and Solauke and Kore, 1993). In order to assess the degree of activity of different fungi, their metabolites were extracted and paddy seeds were treated with the metabolites to see their effect on seed germination and seedlings growth. The results (Tables - 25, 50) show the inhibition of seed germination of paddy when treated with metabolites of all the seed-borne fungi of different cultural ages (7, 14 and 21 days). Comparatively, the metabolites of 21 days of cultural ages exhibited marked inhibitory effect on seed germination. The boiled and unboiled metabolites of Aspergillus niger and Helminthosporium oryzae showed marked inhibitory effect on seed germination. Though both the metabolites of above seed-borne fungi inhibited the seed germination yet the boiled metabolites are found to inhibit maximum seed germination.

Similar inhibitory effect of above metabolites on root growth of paddy seedlings were recorded in the present
investigation with the exception that the metabolite of *Alternaria alternata*, increase the root length in all the cultural ages (7, 14 and 21 days). The boiled metabolites of *Curvularia lunata*, *Curvularia pallescens* and *Helminthosporium oryzae* of 21 days cultural ages inhibited completely the root growth of paddy seedlings. As a whole, the metabolites of all the test fungi show clearly a differential effect on root growth.

The effects of above metabolites of seed-borne fungi of paddy on shoot-growth were carried out. The results (Table 26) showed similar inhibitory effect of shoot growth. The boiled and unboiled metabolites of different cultural ages (7, 14 and 21 days) showed the inhibition of shoot growth. Comparatively boiled metabolites of all the cultural ages are found to be highly inhibitory. Differential inhibitory effects on shoot growth of paddy seedlings by the metabolites of all the test fungi are also revealed clearly in the present findings.

It has been noted that the metabolites of fungi contain a number of toxins. According to Bhowmik and Das (1985) the seedlings when grown in the close vicinity of the sown seeds of respective crops also produce secondary metabolites, which secret out of the fungal body and find natural way inside the germinating seeds along with imbination of water or by diffusion. These metabolites produce effect on the germinability of the seeds by either inhibiting or stimulating the process of germination. There
are several such reports of toxin contamination of cereals (Hesseltine, 1974; Agrawal et al., 1983). According to Tripathi (1974); Gangopadhyay and Chakravarty (1981); Bhowmik and Das (1985) the fungi like Aspergillus niger, Curvularia lunata, Fusarium moniliforme, Aspergillus flavus, Alternaria alternata and Penicillium sp. etc. produce toxin as secondary metabolites. They have also stated the inhibition of germination and root-shoot growth by the toxic substances secreted by the above fungi. Similar effect of metabolites, other than paddy has also been reported by Reddy et al. 1990; Kumar, 1990; Rahman 1991; Saha and Chakravarty, 1992.

The climatic components are the determining factors of growth and development of fungi and has an impact on the proliferation of seed-borne fungi. The experimental findings of the present work reveal clearly the influence of relative humidity and temperature on the growth of seed-borne fungi of paddy. The growth and sporulation of fungi are also influenced by physical environment like temperature. The experimental data (Table - 51) reveal the influence of varying degree of temperatures on the growth and sporulation of fungi. Most of the test fungi exhibited better growth and sporulation within the range of 28°C to 30°C temperatures. At 30°C the fungi Aspergillus niger, Aspergillus flavus and Penicillium purpurogenum showed better growth and sporulation. On the other hand the fungi Alternaria alternata, Curvularia lunata, Curvularia pallescens, Fusarium pallidoroseum and Helminthosporium oryzae showed better
growth and sporulation at 28°C. The results exhibited least growth and no sporulation at 18°C temperature; and at 35°C temperature all the test fungi showed less growth and sporulation in comparison to 30°C temperature. Similar variations in the requirement of temperature and relative-humidity in fungal growth has earlier been reported by Shukla (1975); Kore and Gurmi (1978); Roy and Kumar (1989); Patil and Pathak (1993)

The relative-humidity exerts a vital role of the growth and development of fungi. The present investigation (Table - 53) was undertaken to study the role of varying percentage of relative humidity in the growth and sporulation of certain seed-borne fungi. The R.H. (80.6, 90.7, 96.6 and 100%) exhibited linearly the growth and sporulation of test fungi (Table - 52, Fig. 51). Negligible growth and sporulation were observed within the range of 80.6 and 90.6% RH, and better growth and sporulation 96.6% RH and excellent growth and sporulation at 100% RH.

To control the seed-borne fungi in the present investigation, an attempt was made to study the effect of toxic substances present in the botanical sources growing abundently as weeds in the paddy fields. The weeds selected were Echhornia crassipes L.; Ludwigia odsendens L. and Polygonum orientalis L.

The results (Table - 55) reveals clearly the differential effect of whole plant extracts of Echhornia crassipes when treated the seed-borne fungi viz. Alternaria
Alternaria alternata, Aspergillus niger, Aspergillus flavus, Curvularia lunata, Curvularia pallescens, Fusarium pallescens, Helminthosporium oryzae, Penicillium purpurogenum of paddy were treated. The growth of Alternaria alternata, Curvularia pallescens and Helminthosporium oryzae was enhanced as compared to control, whereas the same extract inhibited the growth of Aspergillus niger, Aspergillus flavus, Curvularia lunata, Fusarium pallidoroseum and Penicillium purpurogenum.

Similarly, the leaf extract of Polygonum orientalis inhibited the growth of Alternaria alternata, Aspergillus niger, Aspergillus flavus, Curvularia lunata, Curvularia pallescens, Fusarium pallidoroseum and Helminthosporium oryzae, except Penicillium purpurogenum, where the growth of the fungus was recorded increase. The root extract of the same plant inhibited the growth of Curvularia lunata, Curvularia pallescens, and enhanced the growth of Alternaria alternata, Aspergillus niger, Aspergillus flavus, Fusarium pallidoroseum, Helminthosporium oryzae and Penicillium purpurogenum. The extracts of Polygonum orientalis exhibited in the experiment a differential activity in the growth of the above test fungi.

The leaf and root extracts of Ludwigia odsendens also exhibited, in the present experiment, both inhibitory and stimulatory effects, when treated the seed-borne fungi of paddy. The leaf extract, inhibited the growth of Aspergillus niger, Aspergillus flavus, Curvularia pallescens and stimulated the growth of Alternaria alternata, Curvularia
lunata, Fusarium pallidoroseum, Helminthosporium oryzae and Penicillium purpurogenum. The root extract on the other hand inhibited the growth of Alternaria laternata, Aspergillus niger, Aspergillus flavus, Curvularia lunata, Curvularia pallescens and similarly, stimulated the growth of Fusarium pallidoroseum, Helminthosporium oryzae and Penicillium purpurogenum.

Better inhibitory effect of above plant extract was exhibited by the leaf extracts of Polygenum orientalis in the present experiments, where the extracts inhibited the growth of seven fungal species out of eight. Similar effects of plant extracts in the control of paddy seed-borne fungi have also been reported by Natarajan and Lalithakumari (1987); Mishra and Tewari (1992); Rao and Ratnasudhakar (1992) and in other seed-borne fungi by Singh and Tripathi (1993); Shing et al. (1993) and Prasad and Kumar (1993).

It is known that most of the plant parts contain a number of chemical substances which are reported as antifungal, antibacterial, antiviral and insecticidal. The active principles which stimulate or inhibit the growth of fungal pathogen, may be a number of substances like phenol, and some related compounds, glycocids, lectones, ketone, terpenes, essential oil, certain alkaloids, steroid like substances and resin etc. (Thapliyal and Nene, 1967; Nath and Bordoloi, 1984; Arya, 1988; Tariq, 1991; Kishore and Dwivedi, 1992 and Sarvamangala et al. 1993).
The effects of seed leachates of paddy on spore germination of seed-borne fungi viz. *Alternaria alternata*, *Aspergillus niger*, *Aspergillus flavus*, *Curvularia lunata*, *Curvularia pallescens*, *Fusarium pallidioroseum*, *Helminthosporium oryzae* and *Penicillium purpurigenum* of paddy were studied. The results (Table - 62) reveal that the leachates of all the soaking hours (12, 24, 36 and 48 hours) resulted inhibition of spore germination of all the seed-borne fungi. The inhibitory effect of leachates on spore germination was found gradually more with the increasing ages (soaking hours) of leachates and the magnitude of inhibitory effects on spore germination showed variable depending on soaking hours and spore types of seed-borne fungi. This may be due to the fact that the leachates contain a number of chemical substances of organic and inorganic origin. According to Chaturvedi et al. (1974); Dhawali and Kodmelwar (1978); Kumar and Jalali (1985); Kalichelvan and Mahadevan (1988); Balkishan and Mehrotra (1988) the seed leachates show inhibitory effects on spore germination of certain fungi. The inhibitory and stimulatory behaviour of different seed leachates could be due to the presence of different sugars, amino-acids, organic acids, phenolic compounds, molic acids (Hafiz, 1952; Saxena and Gupta, 1982). The present findings are also in agreement with the above workers. To ascertain the possible cause of inhibition, the detection (estimation) of total phenol in the leachate of paddy was undertaken.

The percentage of total phenol content (Table 64,
Fig. 53) in the seed leachates reveals clearly a variation depending on soaking hours variable was also found in the two granaries. The tin granary shows a little more total phenol than the leachates obtained from the seeds of thatch granary. It may be due to variation in the incidence of seed mycoflora.

Kuc (1966) and Kraft (1973) stated that the phenolic compounds are responsible for the general resistance of plants to parasitic fungi. These water soluble compounds diffuse into the infection spot and prevent the spore germination of pathogen (Overeem, 1976). The phenolic compounds also exert inhibitory effect on the proteolytic and cellulytic enzymes of the pathogen (Mahadevan, 1965). Further investigation on the biochemical aspects will probably reveal the extent of activity of seed-borne fungi on the field of paddy.