SUMMARY

1. Seven soil samples, when screened for cellulolytic fungi yielded 34 species. Deuteromycetes dominated mycoflora both in cultivated soils and in soils from hot water spring environs. Aspergilli gave maximum counts. However, some specificity was evident in that Aspergillus nidulans was dominant in sorghum fields, Aspergillus niger in groundnut fields, Aspergillus parasiticus in paddy fields and Aspergillus fumigatus in all the samples from hot water springs.

2. The fungi isolated could be grouped into three distinct groups in terms of linear growth. Rhizopus oryzae and Trichoderma lignorum were always fast growers, Aspergillus niger, Fusarium solani were moderate growers and species of Curvularia, Phoma nebulosa, and Chaetomium globosum were slow growers. Pythium, generally a fast grower, grew slowly in groundnut fields and in hot water spring soil samples. Samples from hot water springs yielded fungi which grew moderately or slowly. This variation reflected influence of the habitat, high temperature and substrate made available (cellulose).
3. Eighteen test fungi were used to test their polysaccharase producing capacity. The test polysaccharides included - starch, oil, chitin, protein and cellulose. Rate of growth on appropriate substrate reflects capacity to secrete required enzyme. All the fungi synthesized necessary enzymes and could use polysaccharides. Capacity to use polysaccharides however, differed with individual fungus. *Rhizopus oryzae* and *Trichoderma lignorum* gave fast growth on all polysaccharides. This capacity probably accounts for their ubiquity in soils worldwide. Growth on starch and extracellular amylase secretion were not related.

4. *Aspergillus terreus* var aureus yielded high endoglucanase and effected 91% viscosity loss of carboxymethylcellulose. Moderate to high exoglucanase activity was evident and standing cultures were favourable. Release of reducing sugars from filter paper and CMC was appreciable.

5. *Aspergillus terreus* var aureus used saw dust as a sole source of carbon. High endoglucanase activity was evident both in still and shake cultures. Saw dust, thus can be used
as a substrate for endoglucanase production. Rice straw served as an excellant source for endoglucanase synthesis. The culture conditions (standing or shake) had little effect on enzyme production. Exoglucanase activity was moderate in shake and still cultures. Release of sugars from filter paper and CMC was low.

6. *Aspergillus terreus* used wheat straw as a substrate and yielded high endo- and exo glucanase on the third day. Release of reducing sugars from CMC and filter paper reached its peak when enzyme was obtained on the third day. Groundnut hulls supported high endoglucanase synthesis by *Aspergillus terreus* var aureus. Exoglucanase activity was however low.

7. With cotton straw still and shake cultures of *Aspergillus terreus* var aureus gave high endoglucanase activity. There was no correlation between endo and exo glucanase activity.

8. *Aspergillus terreus* var aureus yielded appreciable endoglucanase and high exoglucanase when growth media were based on combination of agricultural waste (Bagasse) and industrial waste (MAFOO waste). The fungus also used saw dust in combination with MAFOO effluents and
gave appreciable endoglucanase and high exoglucanase activity.

9. Of the two agrowastes—wheat straw and cotton straw—used in combination with MAFCO wastes, the later was a better supporter of endoglucanase activity. Exoglucanase activity was high with wheat straw as a carbon source.

10. Low endoglucanase activity and medium exoglucanase activity were evident on rice straw—MAFCO waste based medium. *Trichoderma lignorum* exhibited low endoglucanase activity using CMC-peptone medium on the first day and there was a sudden increase on the second day. *Trichoderma* is a fast grower and during the first 24 hours it grew fast with little accumulation of exo—as well as endo—glucanase. With abundant vegetative growth and consequent secretion of enzymes there was high viscosity loss and medium to high exoglucanase. Growth and enzyme production were directly related here.

11. *Trichoderma lignorum* exhibited moderate exoglucanase activity using rice straw as well as wheat straw. With wheat straw in submerged cultures activity was reduced
considerably. Exoglucanase activity was low against filter paper as a substrate.

12. Submerged conditions were favourable for endo glucanase production in groundnut hulls. With cotton straw as carbon source, high endoglucanase activity was evident.

13. *Mennoniella echinulata* used all the test substrates (agricultural wastes) efficiently and yielded moderate to high Endo- and Exo-glucanase activity. Release of reducing sugars from filter paper or CMC as well as viscosity loss of CMC revealed no definite relation with cultivation conditions - emerged or submerged.

14. *Trichoderma lignorum* and *A. terreus* var. aureus both yielded appreciable endoglucanase activity using saw dust as a sole carbon source in solid substrate fermentation. With *Aspergillus terreus*, exoglucanase activity was quite high in solid substrate fermentation.

15. Groundnut hulls were a better substrate than saw dust for both production of endoglucanase and for release of sugars in solid state fermentation. The difference is probably due to variation in chemical composition and easily hydrolysable nature of groundnut hulls.
16. As natural environments always involve mixed substrate - mixed culture system, Ramie cellulose (mixed substrate lignin, cellulose and hemi cellulose) and mixed cultures of Aspergillus were used to elucidate this aspect. The results indicated that efficient hydrolysis and sugar release were effected by this system. Aspergillus terreus gave high endoglucanase activity individually and its activity was reduced in association with Aspergillus versicolor. It revealed that the combination of partners was major factor governing bioconversion.

17. The cellulase - system of Aspergillus terreus var aureus was susceptible to catabolite repression. Glucose fed through diffusion capsules reduced endoglucanase synthesis.

Attempts to induce catabolite repression resistant mutants through UV treatment were successful. The mutants M-30 and M-60 yielded high endo glucanase activity even in presence of glucose fed through diffusion capsules.

18. The investigations thus have revealed that search of novel habitats leads to fruitful results.
34 cellulolytic fungi could be isolated selectively from fields and hot water springs.

Many of them exhibited capacity to degrade major natural polysaccharides. *Aspergillus terreus* var aureus, *Trichoderma lignorum* and *Memnoniella echinulata* were efficient cellulase synthesizers and could be successfully used in conversion of major agrowaste/industrial wastes in this region.