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Only in recent years has there been any extensive investigation of fungi capable of attacking and utilizing cellulose materials. During this period many genera have been shown to be active cellulose destroyers. *Chaetomium*, which has been studied rather extensively, is a genus with fifty or more species, about one-half of which are known to be relatively high in cellulolytic activity.

One of the most extensive studies in this genus has been that of Greathouse and Ames (3). They tested sixteen species, three of which were new, using various sources of nitrogen. They found that the sixteen species fall into seven groups based upon their ability to utilize the cotton fabric in the presence of different nitrogen sources. *Chaetomium globosum* caused the greatest deterioration to the fabric of any of the species tested, although *C. caprinum*, *C. cancroideum*, *C. dolichotrichum* and *C. funicolum* were nearly as active. In general agreement with the above workers, Thom, Humfield and Holman (5) had previously found that *Chaetomium globosum* was superior to the seven species they tested on fabric. In a much less complete study of this genus White, Darby, Stechert and Sanderson (6) found that *Chaetomium indicum* and *C. funicolum* were equally as active as *Chaetomium globosum* in destroying cellulose.

Since a number of strains of *Chaetomium globosum* were available for study, it seemed of interest to compare their activity with other species, several of which had not been tested previously.

MATERIALS AND METHODS

Twelve ounce grey cotton duck was used as testing material in this investigation. The cotton strips used were cut lengthwise (excluding the selvedge) one and one-fourth inches wide and five and one-half inches long. Each strip was ravelled to three-quarters of an inch before using.

The nutrient solution used for the tests was made up according to the following formula:

NH_4NO_3	3.0 gm
KH_2PO_4	1.0 gm
$MgSO_4$	0.5 gm
KCl	0.25 gm
H_2O	1 liter

The pH of the medium after autoclaving was approximately 5.5.

At the present time there are several practical methods which may be used in testing the relative activity of cellulolytic fungi. In this study the plate method was employed since it had shown favorable results in other tests. To clarify this technique the general procedure followed will be mentioned briefly. The cotton strips were first moistened in carbon water or the nutrient solution and then squeezed between the fingers to remove the excess liquid. The strips were wrapped individually around glass plates approximately three and one-half inches square and one-quarter of an inch in thickness. These in turn were placed in separate petri dishes and sterilized at 120°C and 15 pounds pressure for 30 minutes. On completion of this process sterile nutrient solution was poured into the petri dishes. The amount of nutrient solution was varied in each group of organisms tested, with the specific quantity designated in Tables II and III. This variation was used to show the possible effect of such variation on the growth rate.

The fabric strips were inoculated with the organisms listed in Table I, and the petri dishes inserted in sterilizing cans. The latter step was found necessary in order to prevent excessive evaporation of the nutrient solution during the period of incubation. In both groups the organisms were incubated at a temperature of 37°C and a relative humidity of 75% for a period of one week.

The plates were removed at the end of this time and steamed at 100°C to kill the organisms. The strips were rinsed to remove the fungus mat and then dried at room temperature for several days. The strips were broken on a Scott Tensile Strength Machine with a 300 pound capacity, and the decline in tensile strength of the cloth was used as a measure of the cellulolytic activity of the organisms.

Results

It was found that there was considerable variation in the activity of the organisms tested. The figures in Table II show that approximately one-half of the organisms caused considerable loss in tensile strength of the fabric. This would seem to indicate that these organisms prefer high temperature and humidity for optimum growth. The remaining species and strains, with the possible exception of a few, are capable of attacking and utilizing cellulose if the environmental conditions are rigidly controlled. Since *Chaetomium globosum* is known to be more active at lower temperatures (30°C and a relatives humidity of 85%), the same factors may greatly influence the activity of other species which were only moderately active. However, since a large number of the organisms

Table I

List of the organisms with their source and locations indicated.

Species	Isolate Number	Source and Location of Isolate	Identified by:
atrobrunneum	J-1041	Molded mattress cover, Guadacanal, 1945	L. M. Ames
aureum	6403	G. W. Martin, on *Eriophorum*, Mud Lake, Michigan. June, 1948.	J. W. Grove
causiaeformis	J-1334	Source unknown	L. M. Ames
cochliodes	6401	G. W. Martin, on *Eriophorum*, Mud Lake, Michigan, June, 1948.	J. W. Groves
cristatum		L. M. Ames, paper carton, Ft. Belvoir, Virginia	L. M. Ames
cupreum		G. W. Martin, cotton material, Guadalcanal, 1945.	L. M. Ames
dolichocephalum	6356	G. W. Martin, absorbent cotton, Iowa City, Iowa, 1947	J. W. Groves
gangligerum		L. M. Ames, wood samples, Ft. Belvoir, Virginia	L. M. Ames
globosum	6378	G. W. Martin, leaves, Panama Canal. August, 1945.	J. W. Groves
globosum	6379	G. W. Martin, same as above.	J. W. Groves
globosum	6381	G. W. Martin, litter, Douglas Lake, Michigan. June, 1948.	W. M. Farrow
globosum	6405	G. W. Martin, Goodrich Rubber Scrap.	J. W. Groves
globosum	256	G. W. Martin, wood, Oahu, Hawaii.	W. M. Farrow
indicum	J-782	Tent Fly, New Guinea, 1945.	J. W. Groves
murorum	6259	G. W. Martin, wood, Mt. Shasta, Calif., Sept., 1941.	J. W. Groves
succineum	6260	G. W. Martin, wood, Chiriqui, Panama, July, 1935.	L. M. Ames
turgidopilosum	J-730	G. W. Martin, storage tent, New Guinea. 1945.	L. M. Ames
velutinum	J-359	Japanese tent, New Guinea. 1945.	L. M. Ames
	6533	G. W. Martin, deer dung, Douglas Lake, Michigan. June, 1948.	Unidentified

were isolated from the tropics, it seemed desirable to test them under similar environmental conditions.

The conditions under which the organisms in Table III were grown appear somewhat more favorable for optimum growth than those in Table II. Since the temperature and humidity were the same in both groups, the amount of nutrient solution and the wetting agent used must be the factors considered in the results. The

Table II

The chart gives the results of the strains and species in terms of percentage of decomposition of the fabric. Carbon water was used as a wetting agent. All organisms were grown in 20cc of nutrient solution.

Species	Tensile Strength in lbs.			3-strip aver. in lbs.	Per Cent of decomposition
atrobrunneum	0	0	0	0	100
velutinum	2	5	6	4	95
indicum	8	8	14	9	88
gangligerum	32	30	30	31	60
murorum	24	28	37	33	57
succineum	33	39	40	37	52
aureum	37	48	50	45	42
globosum 6379	46	46	50	47	39
globosum 6405	48	49	49	49	36
globosum 6378	49	49	50	49	36
causiaeformis	40	47	65	50	35
cupreum	44	51	55	50	35
cristatum	49	54		51	34
globosum 256	43	48	65	52	32
6533	45	60		53	30
turgidopilosum	59	60	63	61	21
globosum 6381	56	61	73	63	18
cochliodes	75	76	76	76	0

The control strips broke at 75, 77, and 78 lbs. with an average of 77. The latter was used as an index of 100%.

results indicate that 15cc of nutrient solution per plate might be somewhat better for optimum growth than the 20cc amount employed in Table II. The use of the standard nutrient solution as a wetting agent appears to be more favorable to growth than the carbon water.

When observing the position each organism occupied in the two tables, it was found that there was little change in the majority, but *C. cochliodes*, *C. cristatum*, *C.* 6381, and *C.* globosum 6405 fluctuated markedly in their activity. An increase or decrease is apparent with several other organisms, but the margin is not as pronounced. This variation in growth rates indicates more convincingly that additional nutrients play a significant role in increasing or decreasing the activity of cellulolytic fungi.

Conclusions

In comparing the activity of *Chaetomium globosum* strains with those of other species, there appears to be a distinct correlation between the growth rate and the temperature and humidity. *Chaetom-*

Table III

The chart gives the results of the strains and species in terms of percentage of decomposition of the fabric. The standard nutrient solution was used as a wetting agent. All organisms were grown in 15cc of the same solution.

Species	Tensile strength in lbs.			3-strip aver. in lbs.	Per Cent of decomposition
atrobrunneum	0	0	0	0	100
indicum	0	0	0	0	100
velutinum	0	0	0	0	100
murorum	21	24	25	23	66
dolichocephalum	25	25		25	63
gangligerum	18	30	32	27	60
causiaeformis	27	27	32	29	57
succineum	30	30	38	33	50
globosum 6379	25	26	42	38	46
globosum 6378	33	42	42	39	43
aureum	42	45	46	44	34
globosum 6381	44	44	46	45	33
globosum 256	43	45	47	45	33
cupreum	42	47	58	49	27
cochliodes	49	54	Contam.	52	22
turgidopilosum	50	52	55	52	22
6533	48	52	61	54	19
cristatum	47	57	61	55	18
globosum 6405	54	58		56	16

The control strips broke at 65, 67, and 70 lbs. with an average of 67. The latter was used as an index of 100%.

ium atrobrunneum, *C. indicum*, and *C. velutinum*, all isolated from the tropics, proved to be more active than any of the *C. globosum* strains. Other tests have shown the latter to favor lower temperatures and humidity than those used in this experiment. At lower temperatures it is possible that *C. globosum* might be more active than the species named. This assumption is based on other tests in which the standard strain was as active as the above organisms but at a much lower temperature and humidity. The evidence is inconclusive as to which species is superior in testing fabric deterioration. It would be necessary to experiment with a wide range of temperatures and humidity to determine the most suitable organism.

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