pH AND DECAY STUDIES ON WOOD-INHABITING ORGANISMS [1]

C. Madhosingh [2]

Introduction

Birch and poplar fence posts treated with a chemical mixture [3] succumbed to rot by various fungi after eight years in field tests. One of the principal wood-rotting organisms isolated from the decayed posts was Coprinus micaceus Fr. , usually in association with the saprophytic Fusarium oxysporum Schlecht. em. Snyd. & Hansen. Other wood-rotting organisms isolated from fence posts were Lenzites saeparia (Wulf. ex Fr.) Fr. and Polyporus adustus Willd. ex Fr. The experiments described below were designed to study, the growth of these organisms at various hydrogen-ion concentrations and also the decay of birch blocks by C. micaceus

Materials and Methods

pH Studies - The pH of the 2 per cent malt agar medium was adjusted by using a citric acid- phosphate buffer system, Growth experiments were conducted in 9-cm Petri plates which were inoculated centrally. Cultures were incubated at 70% R. H. and 80°F. Radial growth was recorded periodically.

Decay studies were carried out in jars 8. 5 cm in diam. and 10 cm deep, containing 300 gm of sterilized soil with a moisture content of 40 per cent. Yellow birch sapwood blocks (3/4" cubes) were weighed, numbered and treated with various concentrations of the preservative mixture [3] in solution in the apparatus illustrated in Figure 1.

The blocks were placed 2mm apart in a container and were held down by a heavy piece of glass directly under a thistle funnel in a desiccator. The lip of the desiccator lid was smeared with a thin film of vacuum grease and slid tightly on the bowl. The outlet was closed and suction applied. The flask acted as a trap with outlets to the vacuum source and the mercury manometer, The blocks were subjected to 10 cm mercury pressure for 30 minutes in order to remove intercellular air before the impregnating solution was introduced

---

1. This study was conducted by the author partly while employed at the Ottawa Laboratory, Forest Products Research Branch, Canada Dept. of Forestry and partly in the Department of Botany, University of Western Ontario, being part of a thesis submitted in partial fulfillement of the requirements for the Ph. D. degree.
2. Present address: Plant Research Institute, Canada Dept. of Agriculture, Ottawa, Ont.
3. Sodium fluoride, 34%; potassium dichromate, 34%; sodiurn arsenate, 25%; 2,4- dinitrophenol, 7%.

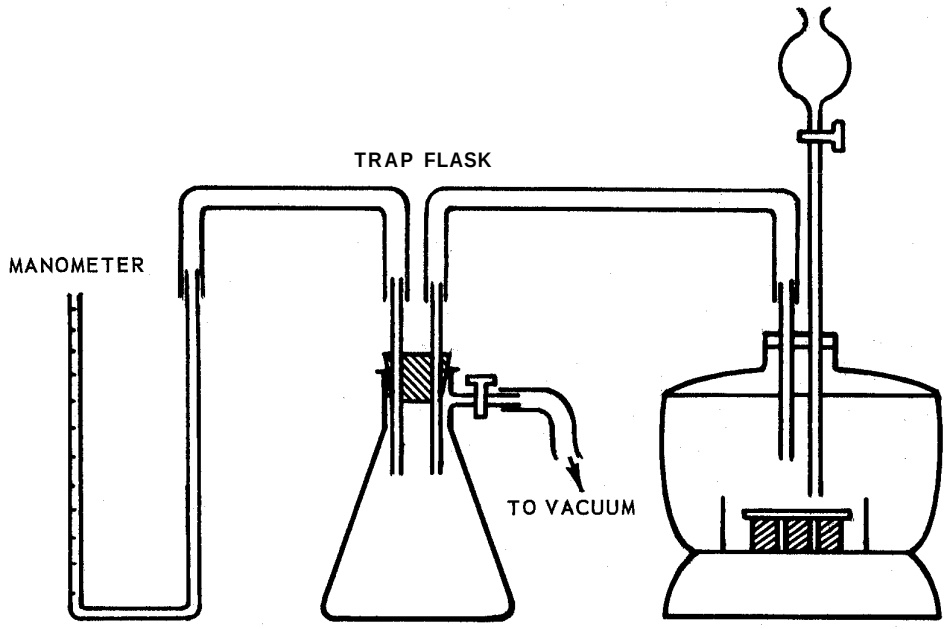

FIGURE 1. IMPREGNATION APPARATUS

through the thistle funnel. When the blocks were completely covered by the solution, the system was returned to normal atmospheric pressure and the blocks allowed to stand in the solution for another 30 minutes. The blocks were then wiped dry and weighed. The difference in weight between the air-dry blocks and the blocks after treatment represents the weight of solution in the blocks. From this, knowing the concentration of the preservative in the solution, the amount of preservative in the blocks was calculated.

Twelve blocks were used in each treatment, four in each of three jars. Two of the blocks were buried about 1 cm apart just under the soil surface. An inoculum, prepared by placing a strip of yellow birch (22 x 55 x 4 mm) in a plate with C. micaceus for 2 weeks, was placed over the two buried blocks. The two other blocks, which were treated similarly, were placed on the inoculum. The blocks were arranged so that the wood fibres ran vertically. The cultures were incubated at 80°F and 70% R. H. for a period of three months. The blocks were then cleaned with a brush and weighed again. Decay was estimated on the basis of weight losses.

Results and Discussion

pH Studies - A comparative study of the growth of the organisms at various hydrogen-ion concentrations is illustrated in Figure 2. These results show that P. adustus grew more rapidly than the other wood-rotting organisms but that its growth was definitely limited to the acid substrate. C. micaceus tolerated the higher pH, even growing at pH 9.5, whereas L. saeparia ceased growth at pH 7.5. Generally the wood-rotting organisms grew better at the lower hydrogen ion concentrations than on the alkaline substrates, By contrast, the wood saprophyte F. oxysporum grew well on all the substrates, and even better on the alkaline substrate. This probably accounts to some extent for its being widespread in nature.

Table 1 Weight losses in yellow birch, inoculated with C. micaceus and incubated at 80°F and 70% relative humidity for a period of three months

% Preservative in Treatment	% Preservative Retained in Blocks (average of 4 blocks)	Block Wt. before experiment (Av. of 2 blocks (gm.)	Block Wt. after experiment (Av, of 2 blocks (gm.)	Loss in Weight (gm.)	Loss % (Weight before Experiment)
		Surface Blocks			
.01	.0045	4.17	3.05	1.12	26.86
.05	.0233	4.18	3.48	.70	16.74
.10	.0412	4.35	3.67	.68	15.63
.15	.0520	4.37	3.62	.75	17.16
.20	.0570	3.19	3.60	.59	14.08
.25	.0861	4.28	3.42	.86	20.09
0.30	.109	4.35	3.75	.60	13.79
0.0		4.25	3.72	.53	12.47
		Burried Blocks			
.01	.0045	4.23	2.58	1.65	39.00
.05	.0233	4.23	1.93	2.30	54.37
.10	.0412	4.26	1.75	2.51	58.92
.15	.0520	4.25	1.70	2.55	60.00
.20	.0570	4.21	1.55	2.66	63.18
.25	.0861	4.16	2.96	1.20	28.84
.30	.109	4.32	2.30	2.02	46.76
0.0		4.23	2.83	2.40	56.74

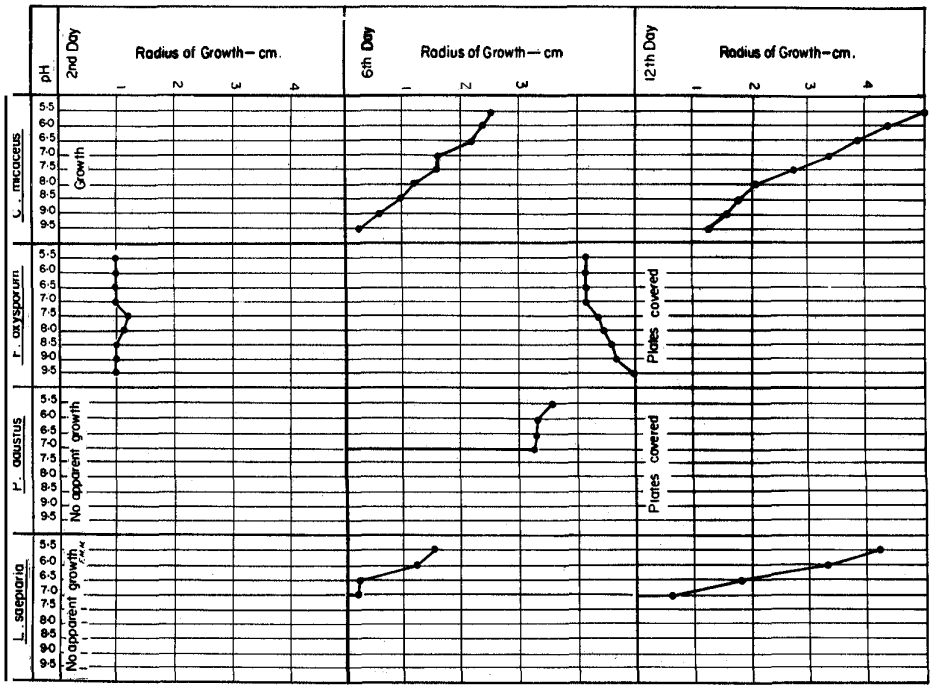

FIGURE 4. A COMPARATIVE STUDY OF THE EFFECT OF HYDROGEN ION CONCENTRATION ON THE GROWTH OF *C. MICACEUS, F. OXYSPORUM, P. ADUSTUS* AND *L. SAEPIARIA*.

Decay Studies, The results of the decay caused by Corpinus micaceus are shown in the Table 1. It will be seen in column 2 of the table that there was an increase in retention of the preservative in the blocks with increasing concentration of preservative in the treatments. The differences between the treatments, however, were not great enough to alter the growth of the decay organism so as to produce significant differences in percentage weight losses. There was, however, a distinct difference in decay between the buried and surface blocks. The buried blocks had a weight loss of over 30 per cent above that of the surface blocks. This was expected because of the more moist environment which facilitated the growth of the wood-rotting fungus.

PLANT RESEARCH INSTITUTE,
CANADA DEPARTMENT OF AGRICULTURE,
OTTAWA, ONT.