

RELATIVE DURABILITY OF BLACK LOCUST AND SHIPMAST LOCUST WHEN SUBJECTED TO FOUR WOOD DECAY FUNGI

By E. RICHARD TOOLE

Duke School of Forestry

The wood of shipmast locust long has been considered more durable in actual service than that of the common black locust. The results of certain laboratory tests have been interpreted to indicate a similar relationship. The laboratory data now have been subjected to an analysis of variance. This analysis shows that of the four fungi studied the difference in durability between common black locust wood and shipmast locust wood is significant only in the case of *Poria incrassata* and in the case of *Fomes rimosus*.

IN a recent issue of the JOURNAL¹ an interesting laboratory experiment on the relative durability of different varieties of black locust subjected to certain wood decay fungi was reported. Although certain differences in the amount of decay are plainly evident, yet, a complete interpretation of the data presented was not made.

In order to obtain an estimate of the importance of these differences the data (summarized in Table 1) have been subjected to analyses of variance.² Table 2 shows the results.

The experiment was so designed that tests of the significance of differences between the effect of different fungi within each variety should be based upon mean square "between cultures of the same fungus".³ This follows from the fact that a "culture" is a single fungus only. Tests of the relative durability of the two varieties subjected to the same fungus, however, should be based upon mean square "between blocks of the same culture", since blocks of both varieties were introduced into each culture. On the other hand, regardless of the experimental design, the variances of the two varieties

are analyzed separately because the mean squares which supply the black locust experimental errors are very much greater than those of shipmast locust. Consequently they are not pooled into a single analysis.

The comparisons of the mean squares "between fungi" with those for "between cultures of the same fungus" in the case of both varieties of locust show that the probability that the difference in the mean square due to chance alone is less than one in one hundred ($P < .01$). In other words there are definite differences in activity among the fungi within the same variety, above and beyond differences due to experimental error.

Differences between the observed sums according to fungus for black locust which exceed 3.833 grams and 5.281 grams are significant of real effects at the 5 per cent and 1 per cent levels, respectively. These numerical values are arrived at by multiplying the standard error of the difference between 2 sums of 5 culture observations by the t (see Snedecor⁴) value appropriate to 16 degrees of freedom at those levels of significance. On this basis the difference between *Polyporus*

¹Hirt, R. R. A progress report on laboratory tests of the relative durability of different varieties of black locust subjected to certain wood decay fungi. Jour. For. 36: 53-55, 1938.

²Fisher, R. A. Statistical methods for research workers. Oliver and Boyd, London, 1936.

³Terms in quotations refer to terms used in Table 2.

⁴Snedecor, G. W. Calculation and interpretation of analysis of variance and covariance. Collegiate Press, Ames, Iowa, 1934.

TABLE 1¹

LOSS OF WEIGHT IN GRAMS IN COMPARATIVE TESTS
ON HEARTWOOD BLOCKS OF COMMON BLACK
LOCUST AND OF SHIPMAST LOCUST SUB-
JECTED TO DECAY BY FOUR DIFFER-
ENT FUNGI FOR A PERIOD OF
FIVE MONTHS²

Fungus	Culture ² number	Black locust	Shipmast locust
<i>Polyporus robiniophilus</i>	1	.210	.00
		.605	.00
	2	.638	.00
		.150	.00
	3	.539	.00
		.035	.00
	4	.262	.15
		.790	.00
	5	.505	.00
		.630	.00
	Sum	4.364	.15
<i>Fomes igniarius</i>	1	.279	.00
		.119	.00
	2	.116	.04
		.070	.04
	3	.620	.00
		.095	.00
	4	.140	.00
		.260	.00
	5	.440	.00
		.220	.00
	Sum	2.359	.08
<i>Poria incrassata</i>	1	4.790	.230
		2.356	.350
	2	4.410	.560
		4.420	.235
	3	4.326	.165
		1.860	.178
	4	2.785	.110
		4.240	.350
	5	4.080	.098
		2.658	.340
	Sum	35.925	2.616
<i>Fomes rimosus</i>	1	1.140	.00
		.817	.00
	2	1.709	.03
		.639	.03
	3	.470	.00
		1.040	.00
	4	.214	.03
		1.960	.00
	5	1.130	.01
		.040	.00
	Sum	9.159	.10

¹These data were taken from Table 1, p. 54, Jan. 1938 issue Jour. For.

²Each culture contains four blocks, 2 of each variety.

robiniophilus (Murr.) Lloyd and *Fomes rimosus* (Berk.) Cooke is significant at the 5 per cent level; the differences between *Poria incrassata* (Berk. and Curt.) Burt. and the other three fungi are significant at the 1 per cent level; and the difference between *Fomes rimosus* and *Fomes igniarius* (L.) Gill. is significant at the 5 per cent level. Similarly in the case of shipmast locust, differences which exceed .643 grams and .885 grams are significant at the 5 and 1 per cent levels respectively. Then it is seen from Table 1 that the difference between *Poria incrassata* and the other three fungi are significant at the 1 per cent level, while the differences among the other fungi are not sufficient to be termed significant.

The comparison of the "between blocks in the same culture" mean squares for each of the two varieties of locust demonstrates that the differences between the amount of decay between the two varieties are significant at the 1 per cent level. Differences between the observed sums between the two varieties for each fungus which exceed 4.901 grams and 6.557 grams are significant at the 5 per cent and 1 per cent levels, respectively. These values are obtained by multiplying the standard error of the difference between 2 sums of 5 culture observations by the *t* value appropriate to 40 degrees of freedom at those levels of significance. The differences in amount of decay between both *P. incrassata* and *F. rimosus* on the two varieties of locust are significant at the 1 per cent level while those differences between both *P. robiniophilus* and *F. igniarius* on the two varieties of locust are not significant at either the 5 per cent or 1 per cent levels.

Considering an absence of decay or the control, to be an absolute zero, it cannot be shown whether the probability that the departure from zero caused by decay is due to chance in an amount $<$ or $>$.05.

From these data it is shown that of the four fungi studied, the difference in durability between black locust wood and shipmast locust wood is significant only in the case of *P. incrassata* and *F. rimosus*, since the probability that these differences are due to chance is less than one

in one hundred. It cannot be shown from this experiment that the differences between *P. robinophilus* and *F. igniarius* on the two varieties of locust are significant, since the probability that these differences are due to chance is greater than five in one hundred.

TABLE 2
ANALYSIS OF VARIANCE FOR LOSS OF WEIGHT MEASUREMENTS FOR EACH VARIETY

Source of variation	Degrees of freedom	Sum of squares	Mean square	F ¹	p ²
<i>Black locust</i>					
Between fungi	3	72.811097	24.270366	147.673	< .01
Between cultures of same fungus.....	16	2.629627	.164352		
Total between cultures	19	75.440724	3.970564		
Between blocks of same culture.....	20	11.632100	.581605	89.533	< .01
Total	39	87.072824			
<i>Shipmast locust</i>					
Between fungi	3	.471263	.157088	34.299	< .01
Between cultures of same fungus.....	16	.073273	.004580		
Total between cultures	19	.544536	.028660		
Between blocks of same culture.....	20	.129929	.006496		
Total	39	.674465			

¹F = Comparison of ratio of larger Mean square to the smaller. Example: $\frac{.581605}{.006496} = 89.533$.

²P = Probability that this ratio is greater than (>) or less than (<) one out of a hundred chances obtained by comparing the F value obtained with corresponding values in G. W. Snedecor's table of F.



Approximately 65,000 miles of roads and nearly 130,000 miles of trails on the 157 National Forests were maintained in 1937 by the U. S. Forest Service. The total road mileage maintained included 1,793 miles of forest highways and 63,564 miles of truck trails.

Construction was completed on 3,747 miles of National Forest roads and on 1,403 miles of horse and foot trails. The road construction included 265 miles of forest highways and 3,482 miles of truck trails.