RELATIVE GROWTH OF FUNGI AFTER FUMIGATION WITH METHYL BROMIDE

Methyl bromide concentration	6 lb./ 1,000 ft.^{3}	6 lb./ 1,000 ft.^{3}	12 lb./ 1,000 ft.^{3}	20 lb./ 1,000 ft.^{3}	Untreated control
Fumigation time	24 hr.	72 hr.	96 hr.	24 hr.	
Species :					
Aspergillus niger van Tiegh.	++	++	–	–	++
Basidiomycete No. X 28*	++	++	–	–	++
Ceratostomella picea Münch.	–	–	–	–	++
Lentinus lepideus Fr.	++	++	–	–	++
Lenzites trabea (Pers.) Fr.	++	–	–	+	++
Poria vaporaria (Pers. ex Fr.) Cooke	–	++	–	–	++
Trametes cinnabarina (Jacq.) Fr.	++	++	–	–	++
Trichoderma viride Pers. ex Fr.	++	++	–	++	++

Normal growth is denoted by ++ ; poor growth is denoted by + ; no growth is denoted by –.
* Unidentified Basidiomycete isolated from Klinkii pine (*Araucaria klinkii* Lauterb) imported from New Guinea.

infected timber, especially in large stocks or where heat treatment may be undesirable or impracticable. Since the discovery of Siricid wasp larvæ in imported timber during 1951, large-scale fumigation of timber with methyl bromide under plastic tarpaulins has been used extensively in Australia[2]. It should be emphasized that the process is one of sterilization rather than preservation. Further work on this project is not contemplated at present.

J. B. CARTWRIGHT
D. W. EDWARDS
M. J. MCMULLEN

Division of Wood Technology,
N.S.W. Forestry Commission,
Sydney, Australia.
June 12.

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Testing of Two Samples

VARIOUS methods, parametric and non-parametric, are used for examining the significance of the difference between two given samples. The most common of these is the parametric one, the *t*-test[1], which is based on the assumption that the samples are drawn from a normal population. There is Pitman's[2] *w*-test which has been built up by considering all the possible samples that can be drawn by pooling together the two samples. Besides these, Wald and Wolfowitz[3] have used the run theory for deciding the significance of the difference between two samples. This method has been extended for k samples by myself[4]. Recently, tests have been constructed by Wallis[5], Kruskall[6] and Rijkoort[7] by using rank numbers for each of the samples.

It will be seen that the first method does not give any consideration to the order of occurrence of the individuals in the sample. The second, third and fourth methods mentioned above are based on the assumption that the probability for the occurrence of any individual depends only on the two samples together and do not take into account the magnitude and the relationship between the order of the individuals in the two samples. The object of this note is to give some tests which take both the above factors into consideration.

Suppose there are two samples of size n, the individuals of which take the values $\theta_1, \theta_2, \ldots \theta_k$ with probabilities $p_1, p_2 \ldots p_k$. Let the individuals of the samples, taken in the order of occurrence, be as follows :

$$\left.\begin{array}{lll} \text{Sample I} & x_1, x_2, \ldots & x_n \\ \text{Sample II} & y_1, y_2, \ldots & y_n \end{array}\right\}$$

Consider the distributions of X and Y defined by

$$X = \sum_{r=1}^{k} | x_r - y_r | ,$$

$$Y = \Sigma | x_r - y_r | + \Sigma | x_{r+1} - y_r | + \Sigma | x_r - y_{r+1} |$$

The expectation and the variance of X and Y are as follows :

$$E(X) = n \sum_{r,s=1}^{k} | \theta_r - \theta_s | p_r p_s = n\varphi,$$

$$V(X) = n[\Sigma (\theta_r - \theta_s)^2 p_r p_s - \varphi^2] = nv,$$

$$E(Y) = (3n - 2)\varphi,$$

$$V(Y) = (3n - 2)v + 4(3n - 4)[2\Sigma(| \theta_r - \theta_s | |\theta_s - \theta_t | + | \theta_r - \theta_t | | \theta_t - \theta_s | + | \theta_t - \theta_r | | \theta_r - \theta_s |)p_r p_s p_t + \Sigma(\theta_r - \theta_s)^2 p_r p_s (p_r + p_s) - \varphi^2].$$

The third and the fourth cumulants and, in fact, the higher cumulants of both X and Y can all be shown to be linear in n, the number of observations in the sample, and therefore the distributions tend to the normal form as n increases.

The two distributions considered here, and also their extensions, can be used for deciding whether two samples of moderate sizes can be considered as belonging to the same population. This can be done by comparing the standardized deviates of X and Y for the given samples, assuming the p's to be that obtained by pooling them together.

It may also be noted that it may be possible to have an optimum test by considering the distribution of

$$\left.\begin{array}{l} \Sigma | x_r - y_r | + \Sigma | x_{r+1} - y_r | \ldots \Sigma | x_{r+s} - y_r | \\ + \Sigma | x_r - y_{r+1} | + \Sigma | x_r - y_{r+2} | \ldots \Sigma | x_r - y_{r+s} | \end{array}\right\}$$

in which s will have to be so determined that the standardized deviate is a maximum. Also, instead of taking the p's as determined by pooling together the two samples, we may estimate them for given s by maximizing the standardized deviate.

It is hoped to discuss all these points in detail in a communication to be published elsewhere.

P. V. KRISHNA IYER

Defence Science Organization,
New Delhi.
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