Interpretation of Microclimate Data in Relation to Basidiospore Release by Fomes annosus

Robert A. Schmidt and Francis A. Wood

Assistant Professor of Forest Pathology, School of Forestry, University of Florida, Gainesville, Florida 32601; and Professor of Plant Pathology, Department of Plant Pathology, The Pennsylvania State University, University Park 16802, respectively.

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ABSTRACT

Atmospheric moisture and wind velocity measured 2 ft above sporophores of *Fomes annosus* were significantly correlated with numbers of basidiospores trapped immediately beneath the sporophore. However, similar climatic data taken at the level of the sporophore, i.e., much nearer to the site of interaction, showed no such relationship with the number of spores trapped.

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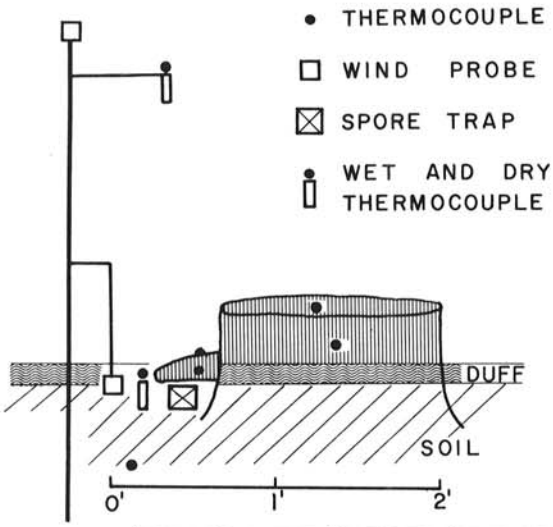
Fomes annosus (Fr.) Karst., a wood-inhabiting Hymenomycete which causes a butt and root decay of living trees, commonly produces basidiocarps at the base of pine stumps. Because of their proximity to the soil surface and the possibility of being sheltered by pine litter, these sporophores occupy a habitat in which climatic conditions, i.e., temperature and atmospheric moisture regimes, vary considerably from those external to it. Also, variation among sporophore habitats is not uncommon (3).

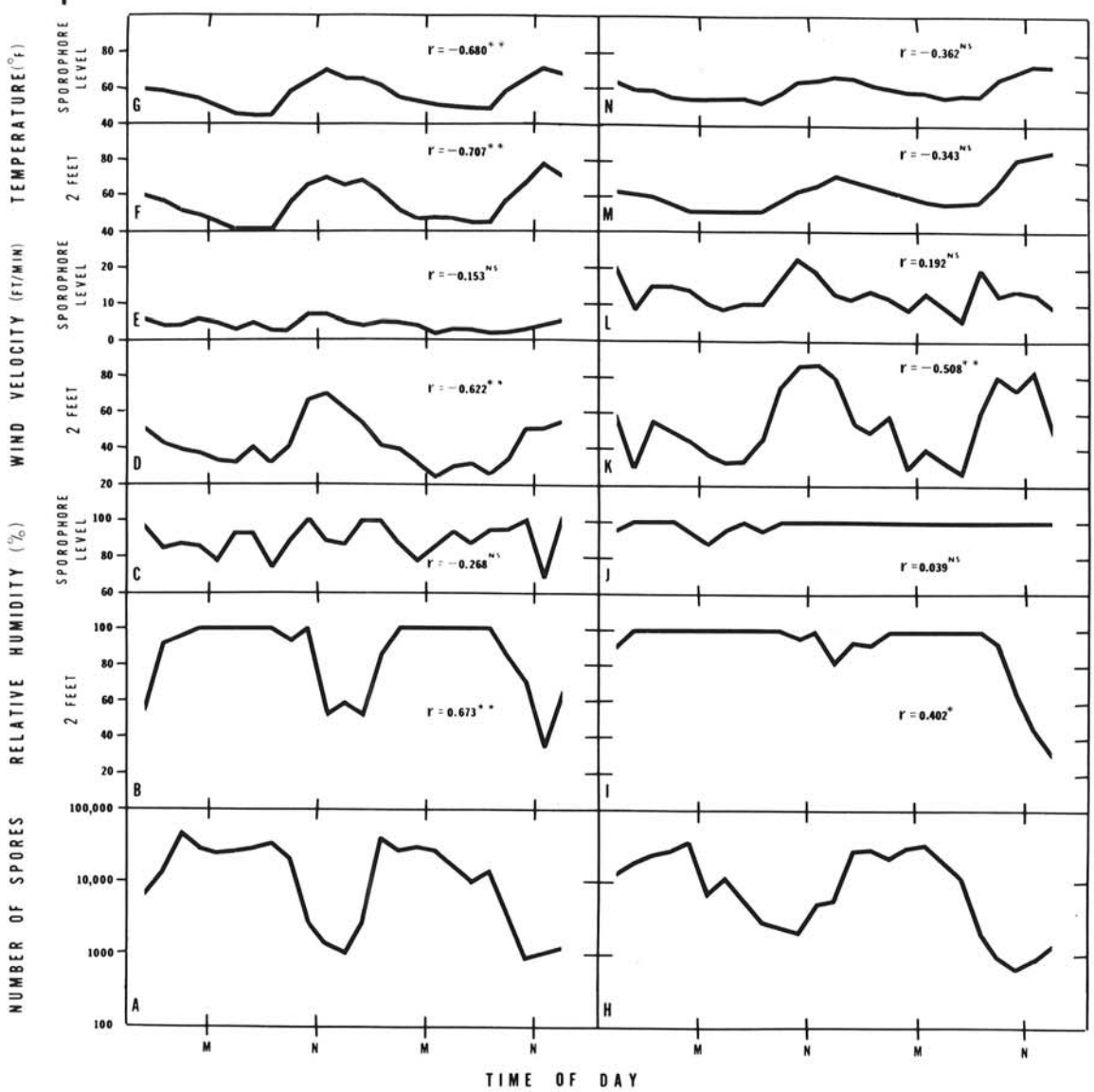
The data presented here were taken in a red pine (*Pinus resinosa* Ait.) plantation in Pennsylvania from a study designed to characterize the relationship of temperature and atmospheric moisture to basidiospore release by *F. annosus*. These data demonstrate how misinterpretations can arise from the use of climatic data obtained a short distance from the site of the pathogen-environment interaction; in this instance, data from outside the habitat of the sporophore.

Figure 1 shows the locations of temperature, atmospheric moisture, and wind velocity probes



relative to the spore trap and sporophore habitat. Temperature and relative humidity were measured and recorded with copper-constantan thermocouples and a multipoint potentiometer at two locations: (i) within the sporophore habitat (sporophore level), and (ii) 2 ft above the sporophore (2-ft level). Data from sporophore and stump thermocouples shown in Fig. 1 are not presented in this paper. Wind velocity was measured and recorded with nondirectional hot wire anemometers and a strip chart recorder at the same two locations (2). The catching surface of the spore trap (4) was positioned ca. 1 cm beneath the pore

Fig. 1. Diagram of the locations of temperature, atmospheric moisture, and wind velocity probes in relation to the spore trap and sporophore habitat.



surface of an active sporophore, and discrete, sequential 2-hr spore deposits were obtained.

Data taken from one stump on 14-16 and 21-23 August, presented in Fig. 2, were chosen because the sporophore on this stump released large numbers of spores in a typical diurnal pattern (1). Linear correlation coefficients (r) were calculated for the numbers of spores trapped and each climatic variable at both levels.

Although the ultimate relationship of climatic factors to basidiospore release by *F. annosus* is still under investigation, and will not be discussed here, several important conclusions are evident. Most significant is the existence of a statistically significant linear correlation between numbers of spores and climatic variables at the 2-ft level and the lack of a similar correlation among these variables at the site of interaction; i.e., at the sporophore. Specifically, relative humidity and wind velocity at the 2-ft level were linearly related to spore catches in a positive and negative fashion, respectively, but no such correlation existed for these variables at the sporophore. These relationships were evident during both sampling periods.

If the 2-ft measurements of the independent variables had alone been available, the conclusions that spore catches were directly related to per cent relative humidity and inversely related to wind velocity would have been logical. However, in the habitat of the fungus where the interaction between spore release and the climatic factor occurs, no such relationship could be detected. Therefore, insofar as a cause and effect relationship is concerned, the statistically significant r values between spore numbers and climatic variables at the 2-ft level are apparently meaningless.

Regarding the effects of temperature on spore release, a statistically significant inverse relation existed on 14-16 August. This could not be substantiated on 21-23 August, although the data look comparable. This fact and that of obtaining a statistically significant r value for the 2-ft relative humidity and spore catch on 21-23 August are indications that linear correlation analyses are not optimum for data of this sort.

In summary, it is apparent that climatic data taken at a distance of 2 ft above the sporophore of *F. annosus* are not reliable in determining the role of environmental factors in spore release. However, it is not uncommon to find in the literature the relationship between pathogen activity; e.g., spore release, and climatic factors interpreted from data measured at distances from the site of interaction greater than the 2 ft reported here. Depending upon the habitat of the organism and the nature of the dependent variable, these interpretations may be subject to considerable error.

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Fig. 2. The relationship between the number of basidiospores of *Fomes annosus* deposited on a trap beneath one sporophore, and the microclimatic data from the vicinity of the sporophore; A-G = 14-16 August, H-N = 21-23 August. Spore numbers are an estimate from a sample of the trapping surface exposed for 2 hr and wind velocity is the average of measurements at 15-min intervals over a 2-hr period; both are plotted at the midpoint of the 2 hr period: M = midnight; N = noon. The linear correlation coefficient (r) is represented as NS = nonsignificant; * = significant at 5%; and ** = significant at 1%.