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Oospore variation in culture as applied to the taxonomy of *Chara*

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DAILY, FAY KENOYER (Butler University, Indianapolis, Indiana) *Oospore variation in culture as applied to the taxonomy of* **Chara**. Bull. Torrey Bot. Club **91**: 281–283. 1964. Results in a recent report on experimentally induced oospore variation in *Chara* are difficult to compare with the results of a systematic study cited. A discussion is submitted to indicate some problems involved and some information desired, hoping that this will be helpful in future work of this kind.

In a recent study, Griffin (1963) measured oospores from clonal cultures of six species of *Chara,* each grown under various cultural conditions. He found that oospores from the same genetic stock varied widely in length/width ratio. On this basis, it was recommended that a reevaluation of oospore shape and size, especially as they apply to the differentiation of infraspecific categories, be made. Several authors, including Daily (1953), were cited as using oospore measurements in the comlpete or partial differentiation of ''varieties'' or ''forms'' in *Chara.* Then, Griffin concluded that ''it has been shown that confidence placed in oospore shape and size as a character to be used at the infraspecific levels is probably unjustified.''

While discussing the established varieties of *Chara Braunii,* Daily (1953, p. 19) stated: ''If limited to a consideration of the last two characteristics and oospore length, Indiana plants are all referable to var. *Schweinitzii,* but the range of other characteristics is not encompassed by this category. Varietal names are, therefore, not considered in this species for the present.'' Obviously, the author was not confident that oospore length even when combined with other characteristics was significant at infraspecific levels in that species.

Let us consider, then, the results for *Chara zeylanica* Willd., for that is the only species of *Chara* in that paper (Daily, 1953, p. 40) in which a key is given for infraspecific categories. Oospore length, not width/length ratio, is included. It can be seen that there is overlapping between forms of *Chara zeylanica,* if oospore length alone is considered. This characteristic is significant only in combination with others.

The above examples do not designate confidence placed in oospore shape and size in differentiation of varieties and forms as implied by Griffin. Instead, oospore length in conjunction with other characteristics was insufficient to recognize these levels in one species of *Chara.* While in another, oospore length was significant only if taken in conjunction with other

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features. Furthermore, variations in oospore length are not sufficient to separate very many species of *Chara*, and when size range is better known, greater overlapping is expected.

Application of Griffin's results to differentiation of infraspecific categories cannot be made. For example, one form of *Chara zeylanica* (form not given) was cultured and the length/width ratio of its oospores can be compared with five other species of *Chara*, not against other forms of *Chara zeylanica*. It would seem desirable, then, to see if the oospores of the recognized forms of *Chara zeylanica* differ in size and shape in culture (and in other characteristics).

The conclusion by Griffin concerning oospore shape should be qualified, because length/width ratio as given in his paper is not a complete characterization of the shape of oospores. If they were completely described in this respect, some differences at the infraspecific level might be seen.

Likewise, his conclusion concerning variation in size of oospores should be modified. Length/width ratio of oospores as given in his paper cannot be compared directly with oospore length used for infraspecific differentiation in taxonomic work cited. Oospore length is an exact size based on one measurement, but length/width ratio is relative size based on two measurements of the oospore.

Taxonomists of the extant Characeae rarely give shape of the oospore when describing the species. If range in length and width are both given, it does not indicate, necessarily, that the shortest oospore is also the narrowest and that the longest one is also the broadest (although they may be). Length/width ratios could not be obtained safely from such figures in order to compare them with the length/width ratios given by Griffin.

In order to properly assess variation in the size of *Chara* oospores, their stage of development should be known. If both mature and immature oospores were measured by Griffin, their relative proportion would undoubtedly affect the results. Maturity of an oospore is usually indicated by giving the color of its outer colored membrane. The color is usually darker at maturity.

Griffin states, "It should be re-emphasized that only grosser factors were quantitized and this is not a definitive statement of cultural conditions." A flood of questions arise from this statement. Were cultural conditions such that monstrosities of morphological structure arose because of them? Would the range of morphological structure found in culture ever be found in nature? Were his cultures genetically constant throughout the culture period? If infraspecific genetic studies were made in the species of *Chara* cultured, how would the cultured plants compare with these?

It is hoped that further work in this field can be directly compared with the mass of information supplied by systematists, and that some answers to the above questions will be supplied.

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Radioecology and the study of environmental radiation

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MARTIN, W. E. (Lab. of Nuclear Medicine and Radiation Biology, Dept. of Biophysics, Univ. of Calif., Los Angeles) *Radioecology and the study of environmental radiation.* Bull. Torrey Bot. Club **91**: 283-323, 1964.—Among the major scientific problems of the Nuclear Age are those which deal with the collection of data and the development of concepts to be used in making realistic, quantitative evaluations of the biological hazards, if any, resulting from increased environmental radiation due to fallout. This paper presents a brief review of some of the ecological aspects of these problems. The major topics considered are: (a) the kinds and amounts of "natural" and "man-made" sources of ionizing radiation in the biosphere, (b) the formation and dispersal of fallout, including a comparison of local, tropospheric and stratospheric fallout patterns, (c) the redistribution of fallout materials by environmental processes, their accumulation by plants and animals, and their cycling in terrestrial food-chains, and (d) the evaluation of potential biological hazards arising from small increases in external and internal exposure of organisms to ionizing radiation.

Radioecology can be defined as the study of organisms and their external environments in relation to ionizing radiation. As a practical application of ecology to the study of fallout and reactor effluents, radioecology is primarily concerned with: (a) the influence of ionizing radiation on plant and animal populations and communities in their natural environments and (b) the influence of organisms and environmental processes on the distribution of radioactive materials in the biosphere.

Ionizing radiation has always been a part of the natural environments of living organisms. Speculations as to the possible influence of environ-

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