ON THE RATES OF ORGANIC WEIGHT LOSS, ORGANIC CONTENT, AND CARBON TO NITROGEN RATIO IN THE DECOMPOSITION OF THE LEAVES OF SIX MACROPHYTE SPECIES IN A LAKE RECEIVING A THERMAL EFFLUENT

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The effects of a thermal effluent from the Big Brown Steam Electric Station, located on Fairfield Lake, North Central Texas, on the rates of decomposition, organic content, and the changes in the carbon to nitrogen (C:N) ratios of the decomposing leaves of the aquatic macrophytes, Potamogeton nodosus, Nymphaea odorata, Sagittaria platyphylla, Typha latifolia, Scirpus californicus, and the oak, Quercus stellata were studied using the litter bag method. Decomposition was studied at two sites, one in an area affected by thermal effluents and one unaffected by thermal effluents, over summer and winter sampling periods extending from June, 1980 to October, 1980, and January, 1981 to August, 1981. This allowed the study of the decomposition of the leaves of these six plant species in four different thermal regimes.

The decomposition rates of the leaves of these six plant species generally increased as temperature increased from 13^{O}C to 36^{O}. There were no significant differences found among the decomposition rates of the six plant species tested in the two intermediate thermal regimes (mean temperature range = 27.3^{O}-33.6^{C}). Such data indicates that the optimal thermal conditions for decomposition in Fairfield Lake may lie between 27.3^{O}C and 33.6^{O}C. In contrast, the decomposition rates of all six plant species studied appeared to be inhibited during the summer at the thermally influenced site (mean temperature = 39.3^{O}C, range = 30^{O}C-42^{O}C). Associated with the inhibition of decomposition was the presence of a blue-green algal bloom and an absence of detritivorous animals.

The initial C:N ratios of the leaves of these six plant species ranged from 16.7:1 to 112.71:1. C:N ratio declined with decomposition, the final C:N ratios of the decomposed leaves generally ranging from 4.5:1 to 16:1. The observed decline in the C:N ratios of decomposing leaves to below 17:1 is related to the development of microbial communities. This decline in C:N ratio increases their nutritional value to second trophic level detritivores as most animals have been shown to require a diet with a minimal protein content of 16.5% by dry weight which corresponds to a C:N ratio of 17:1 or below.

There was apparently little influence of the initial C:N ratios of the leaves of the six plants studied on the rate at which C:N ratio declined nor was there an apparent influence of the initial C:N ratio values on the final C:N ratio attained during the decomposition of the

leaves of the six plant species used in this study. In addition, between 13^{O}C and 36^{O}C, there were no significant inter- or intraspecific differences in the rate at which the C:N ratios of the decomposing leaves of all six plant species declined, indicating that there was apparently little influence of temperature on the rate of C:N ratio decline or the ultimate C:N ratio achieved. These data suggest that the physical structure of decomposing plant material may be more important to developing microbial communities than its initial nutritional quality and that detrital microbial communities may consist of different temperature-adapted species under different thermal regimes.

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