Copyright ©

Kieler Meeresforsch., Sonderh. 5, 429 – 430. Kiel 1981

Enzymatic decomposition of particulate organic matter by meiofauna*

A. Faubel[1] and L.-A. Meyer-Reil[2]

[1] Zoologisches Institut der Universität Hamburg, Hamburg, Germany

[2] Institut für Meereskunde an der Universität Kiel, Kiel, Germany

The most common biological polymers produced in the sea are proteins, lipids, and polysaccharides (mainly cellulose and chitin). These organics are degraded, therefore they do not accumulate in the marine environment. Meiofauna organisms are greatly dependent on the availability of particulate organic matter in sediments. Except for very few species, the digestion and enzymatic degradation rates in annelids, turbellarians and related groups have been poorly investigated. The aim of this study was to determine short-term variations in the enzymatic activity of meiofauna organisms.

The investigations are based on measurements of the enzymatic activity of α–amylase, β–D–glucosidase and proteolytic enzymes. The enzymes were extracted from organisms applying different homogenization techniques. Highest activity of α–amylase in *Lumbricillus lineatus* was obtained after grinding the tissue with a glass rod. Homogenization by Ultra-Turrax, and sonication resulted in lower activity rates. Even after homogenization of the tissue, most of the activity remains bound to particles which can be demonstrated by the drastic decrease of enzymatic activity after filtration of the homogenized tissue. Therefore, all homogenization procedures were performed by grinding the organisms using a glass rod.

Enzymatic activities were determined using enzymes derived from oligochaetes (*Lumbricillus lineatus*) and turbellarians (Proseriata). By plotting incubation time versus relative activity (changes in absorbance at the appropriate wave length), straight lines were obtained for the activity of α–amylase, β–D–glucosidase and proteolytic enzymes. Relative activity rates were determined from the slope of the activity curves calculated by linear regression, which may be converted into units of enzyme equivalents per g of organisms per h by means of standard curves, prepared with commercially available enzyme preparations. Appropriate experiments were performed to investigate the influence of salinity and temperature on enzyme activities. α–amylase of *Lumbricillus lineatus* shows optimum activity in the salinity range of brackish water (8 – 24 $^0/_{00}$). This reflects the salinity of the original habitat of this species. However, α–amylase of Proseriata (Turbellaria) shows optimum activity in the salinity range of proper seawater (32 $^0/_{00}$). The main distribution area of the Proseriata studied are eulittoral beaches of the North Sea. Within the temperature range studied, optimal activity of α–amylase in *Lumbricillus lineatus* and Proseriata was observed at 37° C. However, both organisms differed in their enzymatic activity pattern.

* This program was supported by the German Research Council (Sonderforschungsbereich 95 der Deutschen Forschungsgemeinschaft), Publication No. 287.

There are some indications that the degradation cycle of organic polymers is governed by short-term variations or even rhythms, which may be demonstrated for meiofauna, macrofauna and microorganisms. In a field experiment in the Kiel Bight (''Hausgarten'' June 1980), Oligochaeta (*Lumbricillus lineatus*, *Grania postclitellochaeta*, *Marionina* sp.) and Nemertini (*Cephalothrix* sp.) were investigated for their activity of digestion over a diurnal cycle. The results reveal that the decomposition of carbohydrates (α—amylase activity) in Oligochaetes and *Cephalothrix* sp. follow a diurnal cycle showing maximum activity during morning and noon.