INFLUENCE OF SOIL ARTHROPODS ON NUTRIENT CYCLING IN NO-TILLAGE AGROECOSYSTEMS

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Although arthropods are often the most abundant animals inhabiting agricultural habitats, the' importance in the functioning of system processes, such as mineral cycling and energetics, remair unexamined. Crop plants absorb nutrients primarily in their inorganic form, thus the decompos' tion and mineralization processes have a direct influence on plant growth and nutrition. Althouŗ decomposition and mineralization processes are accomplished predominantly by microflora, t activities of soil fauna have important indirect influence over these fundamental ecosystem p cesses (Reichle 1977, Swift et al. 1979, Seastedt & Crossley 1984). This paper speculates on t' occurrence of a similar functional role for soil arthropods in no-tillage agroecosystems, i.e regulation of the decomposition and nutrient release from surface crop residue.

Research on natural, less intensively managed terrestrial ecosystems, such as forests a grasslands, indicates that soil- and surface-dwelling microarthropods, especially Collembola oribatid mites, often exhibit control over decomposition rates, nutrient release (Edwards et al 1970, Seastedt & Crossley 1980, Douce & Crossley 1982, Anderson et al. 1983), and in some cases nutrient pathways (Persson 1983, Anderson & Ineson 1984). Our objective is to present argumen' illustrating how soil arthropod feeding activities may influence microbial composition and coloniz tion, and therefore decomposition of crop residue and nutrient cycling in no-tillage agroecosysten

Natural and Agricultural Ecosystems

According to Odum's (1983) definition and conceptualization, all ecosystems have three bas parts: an input environment, an internal system with its attendent structure, and an outp environment (Fig. 1). In addition, all ecosystems are defined by six components and opera through six processes (Table 1). These components and processes are the internal parts and activit' of an ecosystem. The two ecosystems processes we will focus on are nutrient cycling and cont mechanisms.

In general, when we compare agricultural ecosystems with natural ecosystems, we find that th former contain fewer species of organisms and have less connectivity (i.e., reduced interactions less overall complexity). However, to maintain high productivity agroecosystems also requi greater material and energy inputs resulting in larger outputs than natural ecosystems (Fig. 2). If w attempt to place agricultural ecosystems along a continuum ranging from natural to urban/indust systems, agroecosystems occupy a median position (Odum 1984) (Fig. 3). The location of particular agroecosystem along such a gradient depends upon the amount of energy and mater moving through the system (i.e., the nutrient throughput) and the amount or degree of intern biotic regulation. One can think of these two processes as moving in opposite directions along th gradient (Fig. 3). As a general rule, the more energy and materials per unit area that are "pump through" the system, the less opportunity for maintaining internal biotic regulation, so critical