6–1 GENERAL INTRODUCTION

The oxidoreductases (EC 1) comprise the largest enzyme group and consist of enzymes that catalyze reactions in which one substrate is oxidized (the donor) while another is reduced (the acceptor) (Dixon and Webb, 1979). In common with all redox reactions, the reaction mechanism involves electron transfer, expressed in a simplistic representation as:

\[ A^- + B \rightarrow A + B^- \]  \[1\]

However, the observed reaction usually involves the transfer of two hydrogen atoms from the donor to the acceptor (dehydrogenation) and, consequently, most of the enzymes are called dehydrogenases. The entire dehydrogenase-catalyzed reaction system is an enzyme donor–acceptor complex, located inside the cell, and does not involve ions or electrons reacting in solution (Dixon and Webb, 1979). Where molecular oxygen (O\(_2\)) is the acceptor, the O\(_2\) is reduced to water and the enzymes are termed oxidases. Here again, the reaction mechanism is not straightforward, and may involve the transfer of one or two H atoms (or one or two electrons) to the O\(_2\). For one particular oxidase enzyme, laccase, which catalyzes a one-electron transfer, it appears that the enzyme may operate like a battery, storing electrons from individual oxidation reactions to reduce molecular oxygen, intermediates of which remain bound to the enzyme complex (Thurston, 1994). One or both atoms from O\(_2\) can also be incorporated into the substrate being oxidized and the enzymes that catalyze these transformations all fall into EC 1.13. and 1.14. and are termed oxygenases. There are many other oxidoreductase acceptors, including hydrogen peroxide (H\(_2\)O\(_2\)), which acts as both donor and acceptor for the enzyme catalase, and as acceptor for peroxidases.

We propose the use of an assay for fluorescein diacetate (FDA) hydrolysis as an alternative indicator of overall enzymatic activity in soil. FDA hydrolysis is mediated by a number of different enzymes, including lipases, proteases, and