33 Nitrogen—Inorganic Forms

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33-1 GENERAL INTRODUCTION

This chapter is an updated revision of the comprehensive treatment on inorganic forms of nitrogen by Bremner (1965). Where possible, duplicative material has not been included in the interests of economy of space. Some duplication is unavoidable, particularly with respect to steam distillation methods for determination of NH₄⁺, NO₃⁻, and NO₂⁻, the colorimetric method for determination of NO₃⁻, and the method for determination of nonexchangeable NH₄⁺, since these proved methods have changed little if any over the past 15 years. The microdiffusion method has been extensively revised, and the titanous sulfate steam distillation and the phenoldisulfonic acid colorimetric methods for NO₃⁻ have been omitted. Colorimetric and specific ion electrode methods for NH₄⁺ and NO₃⁻ have been added.

The inorganic combined N in soils is predominantly NH₄⁺ and NO₃⁻; with the exception of neutral to alkaline soils receiving NH₄⁺ or NH₄⁺-producing fertilizers, NO₂⁻ is seldom present in detectable amounts, and usually its determination is unwarranted. Several other inorganic forms of N, including hydroxylamine, hyponitrous acid, and imido-nitric acid (nitramide), have been postulated as intermediates in microbial transformations of N, but these compounds have not been detected in soils (Bremner, 1965).

The fact that inorganic N may represent more than a small fraction (<2%) of the total N in soils has been established only within the past 30 years following studies showing that soil contains significant amounts of fixed (nonexchangeable) NH₄⁺ (e.g., Rodrigues, 1954; Dhariwal & Stevenson, 1958; Stevenson & Dhariwal, 1969; Bremner & Harada, 1959; Bremner, 1959; Walsh & Murdock, 1960; Schachtschabel, 1960, 1961; Young, 1962). Subsequently, fixed NH₄⁺ has been defined as the NH₄⁺ in

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