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Phosphorus status of diverse soils in Finland as influenced by long-term P fertilisation 2. Changes of soil test P relation to P balance with references to incorporation depth of residual and freshly applied P

Keywords Acetate extractable P, Olsen P, sampling depth, total P, water extractable P,

Abstract

Fertilising with phosphorus (P) ensures continuous supply of an essential growth factor as necessary for productive and sustainable agriculture. The amounts of P required to attain and maintain an adequate P status in the soil were investigated in field experiments on sites in Finland on soils containing large amounts of residual fertiliser P. The effects of five rates (0, 15, 30, 45 and 60 kg ha⁻¹) of annual P application were measured in the soil by chemical methods after 9 to 15 experimental years, and the changes in soil test P (STP) were compared with P balances. Stratification of P in ley soil by broadcast application of fertilisers was assessed at five sites. Mean changes of STP in the whole topsoil caused by P fertilisation expressed as per cent of the balance difference were 3.5% (0.0214 mg dm⁻³)/(kg ha⁻¹) in the acid ammonium acetate test (P_{Ac}), 4.7% (0.0214 mg dm⁻³)/(kg ha⁻¹) in water extraction (P_w) and 9.7% (0.058 mg dm⁻³)/(kg ha⁻¹) in sodium bicarbonate extraction (modified Olsen P). Initially high P_{Ac} values tended to slowly decrease at zero P balance, which did not change without some particular reason, such as soil acidification or mixing of the topsoil with some of the less fertile soil. A thin layer of the uppermost soil was quickly enriched by broadcast application of P fertiliser.

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