

Study of the AL-Soluble Phosphorus Content in Incubation Experiments

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The transformation processes of different elements in the soil during the growing season are always in the centre of interest. It was found (THOMPSON & BLACK, 1947; VAN DIEST & BLACK, 1959) that in incubated soils organic phosphorus decreases with similar increase in extractable inorganic phosphorus. The mineralization of organic-P depends on the combined activities of the soil microorganisms and free enzymes.

Studies on the effect of temperature showed that mineralization of organic-P increases with increasing temperature, particularly above 30 °C (VAN DIEST & BLACK, 1959; EID et al., 1951). SPARROW et al. (1990) found that mineralizable-P appeared to be associated with readily mineralizable organic-C.

Summarizing the effect of soil moisture, DALAL (1977) stated that the reported results are confounded with the effect of aeration.

In our advisory and fertilizer recommendation practice for phosphorus application the AL-soluble P_2O_5 content of the upper 0-25 cm layer is the basis of calculation. In the framework of incubation studies with different Hungarian and Egyptian soils set up to follow the fate of nitrogen in a 5-factorial (soil moisture content, temperature, added nitrogen and two plant residues) experiment we have had the opportunity to analyze the AL-P status of the soil, too. The results of a calcareous sandy soil are shown in this presentation.

Materials and Methods

A half-year incubation experiment was carried out to investigate the effect of soil moisture content, temperature, added nitrogen and two different plant residues (maize and alfalfa) on the AL-soluble phosphorus dynamics of a calcareous sandy soil.

Soil samples were collected from a non-fertilizer field of the Experimental Station of RISSAC at Órbottyán. Some main soil properties are given by authors in another presentation in this issue (NÉMETH et al., 1993).

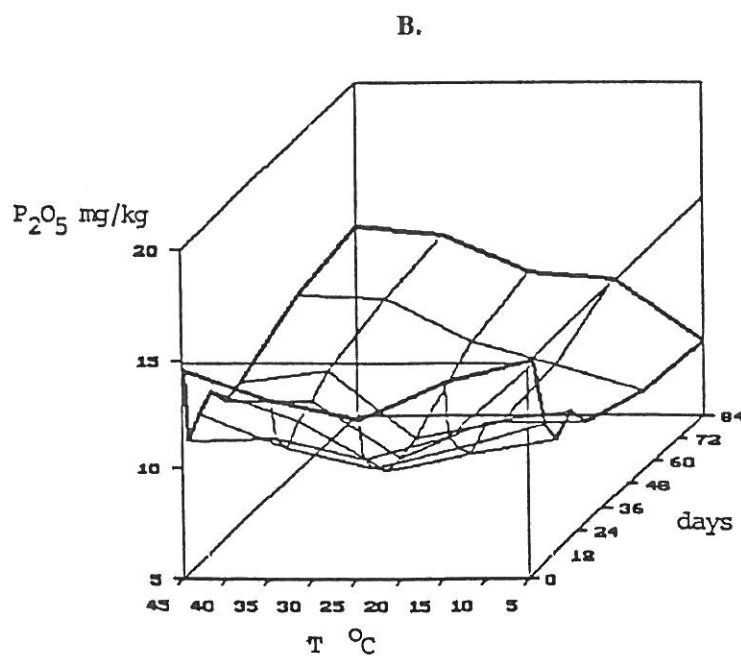
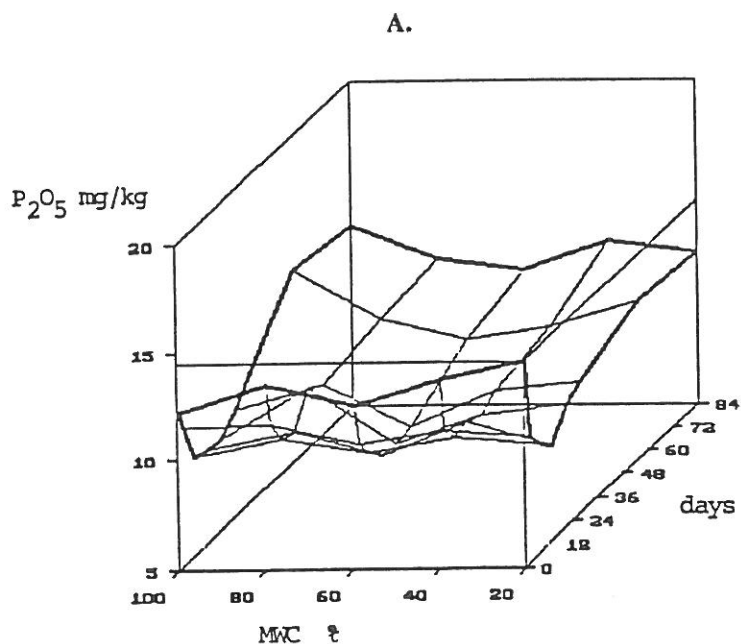


Fig. 1

Effect of soil moisture (A) and incubation temperature (B) on the AL-soluble P content of the calcareous sandy soil (Órbottyán)

By applying the SITOBİ programme it was easy to make an interactive design of multifactorial orthogonal experimental plans (NÉMETH et al., 1993).

The phosphorus (AL- P_2O_5) content of the soil was measured ten times during the first 84 days of the incubation. Sampling was carried out more frequently (five times) in the first two weeks - because on the basis of our earlier studies - it was found that the major changes were registered in that period.

Discussion

In this paper the effects of soil moisture content and incubation temperature are discussed, as an average of other treatments (Fig. 1A and B).

Fig. 1A illustrates the effect of soil moisture content on the AL-soluble (mg P_2O_5 /kg) content of this sandy soil. The original phosphorus content of this soil was very low (13-15 mg/kg). It can be seen that in the first 10 days a strong P immobilization process occurred in all soil moisture treatments. After this a long mobilization period started. At the end of the investigation (84th day) the phosphorus content reached the initial values. The 100% MWC had a slight positive effect on the amount of phosphorus. (In this treatment the P content was higher than in other treatments.) The results also show, that near the optimum range (60% of MWC) at the end of incubation the P content was lower than in the dry and wet environment.

The effect of the various incubation temperature treatments on the P content of the soil differed to a greater extent than that of soil moisture treatments (Fig. 1B). A strong P immobilization was observed during the first 10 days. Following this, on the next week, a low mobilization took place, and from the beginning of the third week a second immobilization process occurred. This slight P immobilization continued at 5 °C during the whole period of incubation, while around 45 °C increased mobilization was registered. As a result of the different incubation temperatures, the final P content of the samples varied between 5 and 15 mg P_2O_5 /kg.

Summary

In a half-year incubation experiment carried out on a calcareous sandy soil the dynamics of the AL-soluble P content was investigated.

The results showed that soil moisture treatments had a lesser effect on the AL-soluble P_2O_5 content of the soil than the different incubation temperature treatments. At 5 °C a significant P immobilization occurred, while at 45 °C a long mobilization process followed the first two-week immobilization.

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