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Uptake of N and P by Various Crops through the Growing Season

Introduction

The response of crops to fertilizer treatment is sometimes measured by determining the uptake of fertilizer nutrients by the plants at certain stages of growth. However, uptake of nutrients and yields are not always closely correlated. This study was carried out to observe the pattern of dry matter accumulation, and the uptake of N and P by several crops during a growing season, and to observe the relationship between nutrient uptake and dry matter yields of several sampling dates.

Materials and Methods

Plant samples were obtained from field plots of wheat, barley, rapeseed, peas and flax on several dates during the growing season of 1975. The plots were part of a randomized, replicated experiment designed to study the effects of phosphate placement methods on response of the various crops to phosphate fertilizer. The control (0 P_2O_5) and 45 Kg P_2O_5/ha treatments were selected for this study. At each sampling date plants from two or three 18-inch portions of row per plot on two replicates were cut at ground level and dried at 75 degrees C for yield and N and P determinations. Dry matter yields and N and P uptake were converted to kg/ha.

Results and Discussion

Dry matter yields of wheat and barley (figures 1a and 2a) increased progressively during the sampling period with only a slight decrease in rate during the 59 to 69 day interval. However, the total content of both N and P in the fertilized wheat plots decreased during this interval, with the P content (yield) showing the sharpest decline. In barley, the decrease in N and P yield occurred earlier than in the wheat. This period coincided with a period of low rainfall and increased uptake of N and P, but had very little effect on dry matter accumulation.

In rapeseed (figure 3) and peas (figure 4) the decrease in N and P content (yield) was associated with a decrease in dry matter yield. As with wheat and barley, the sharpest decrease occurred for phosphorus. In peas the smallest changes in yield and N and P content were observed in the treatment where

phosphate was banded below - to the side of the seed. In flax (figures 5 and 6) the uptake of N and P was very closely related to dry matter yield, suggesting that factors affecting N and P uptake influenced dry matter accumulation. Highest dry matter yield and N and P uptake resulted from banding phosphate below the seed.

It is apparent from the data shown that nutrient uptake and yields of dry matter are not always closely related. The data also show that dry matter yields as well as N and P content (uptake) actually decreased at some sampling dates. Although care was taken to ensure that all leaves were collected and no material lost, it is possible that some of the leaves may have dried and dropped off the plants between sampling dates. This would account for actual losses of dry matter and nutrients. It is also probable that some N, and perhaps P, could have been lost through leaching from the plants, through pollen drop in later stages, or by translocation back to the roots. It is also possible that some variation in plant population in rows may account for part of the variability.

The data point to the difficulties of obtaining completely accurate results from such a study.

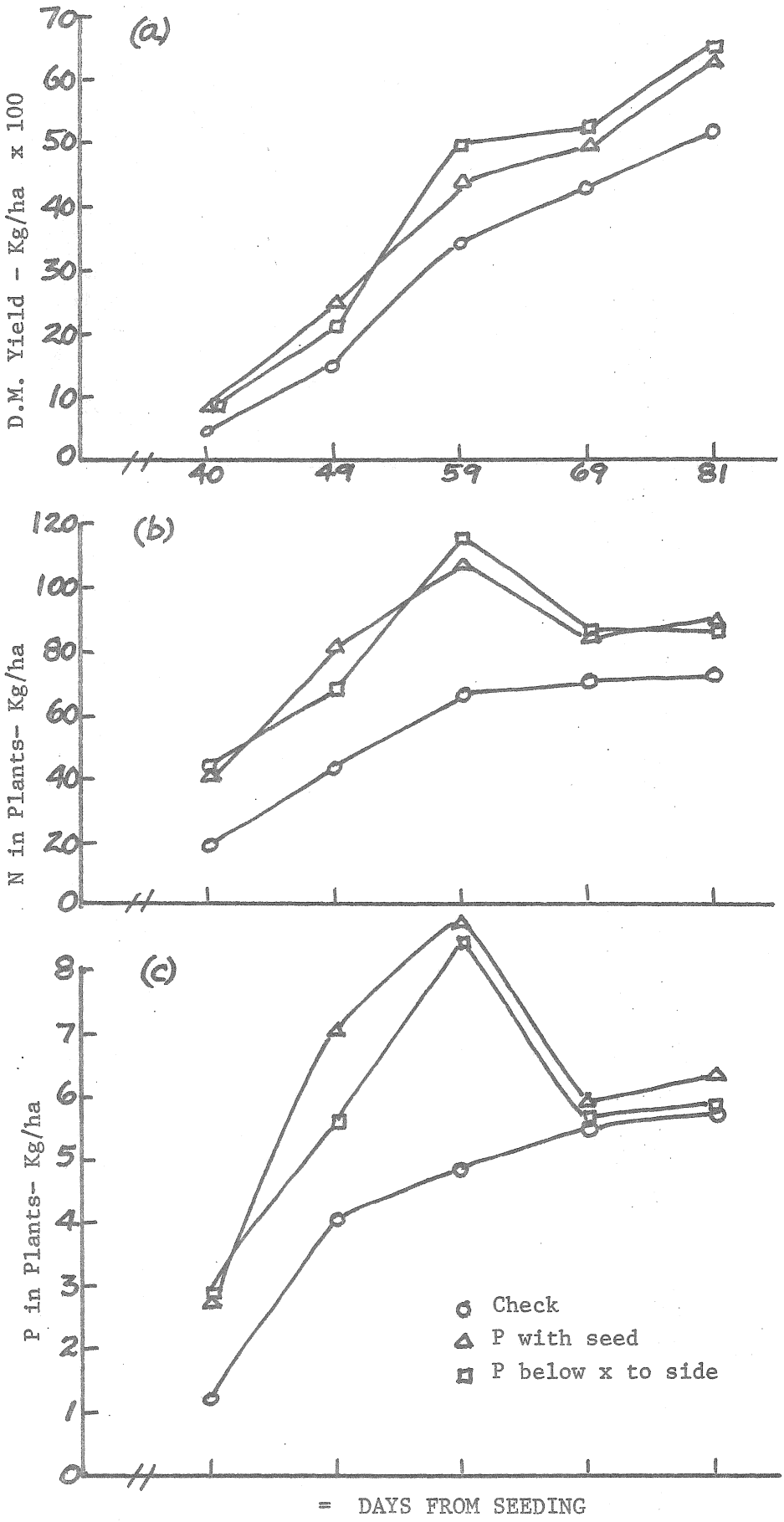

Figure 1. Effect of phosphate fertilizer (45 kg P_2O_5/ha) on dry matter yield, and uptake of N and P by Neepawa wheat during the growing season on Scott loam.

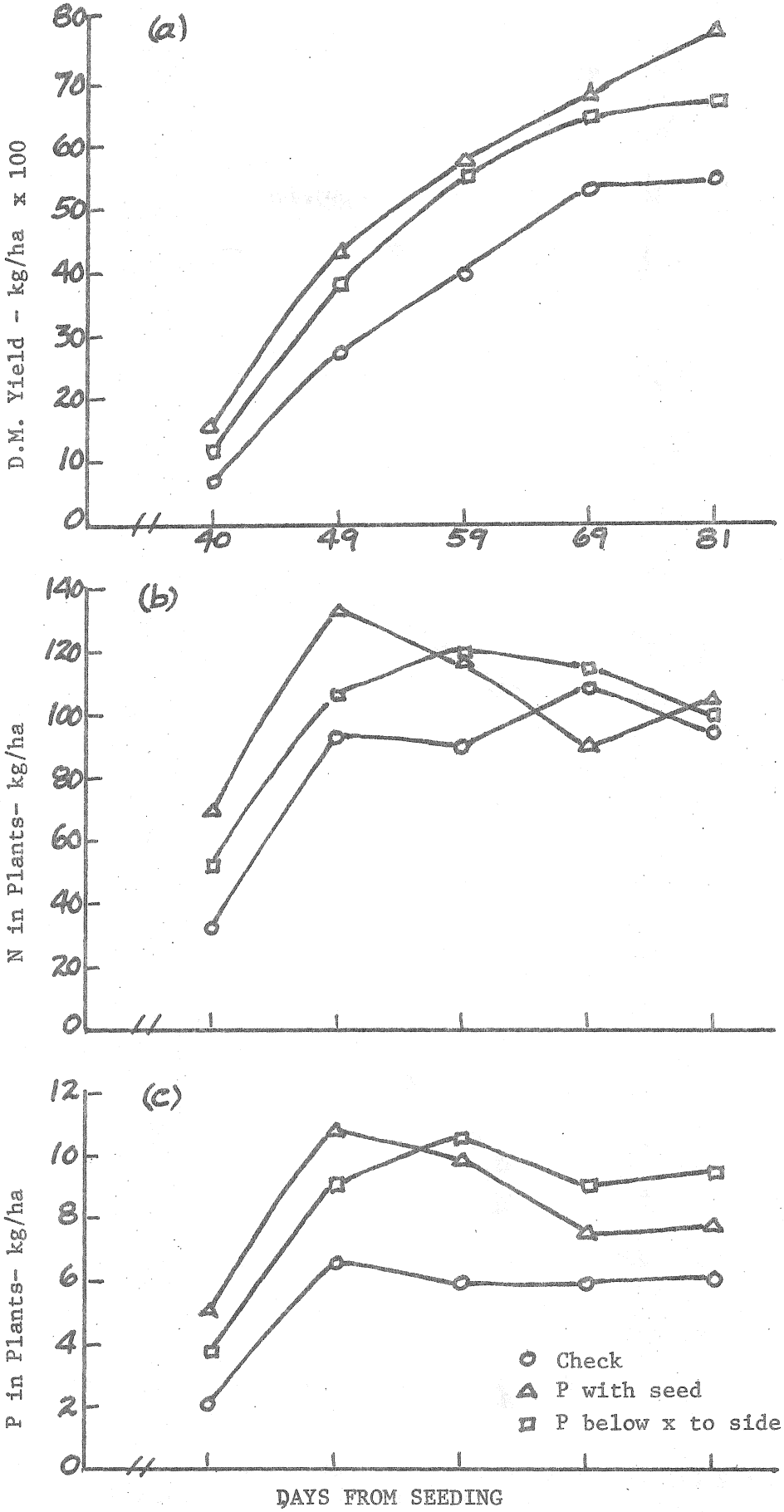

Figure 2. Effect of phosphate fertilizer (45 kg P_2O_5/ha) on dry matter yield, and uptake of N and P by Bonanza barley during the growing season on Scott loam.

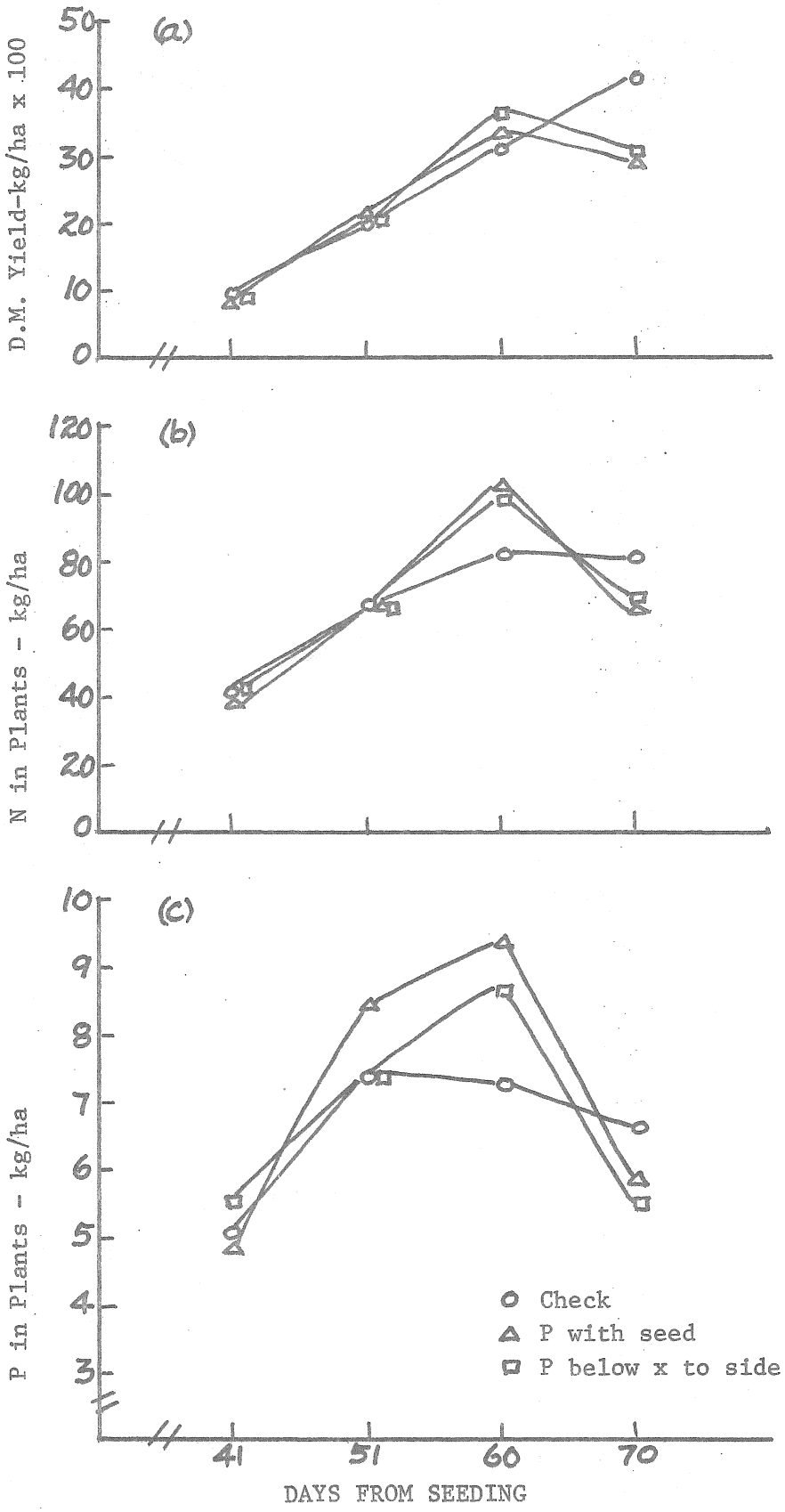

Figure 3. Effect of phosphate fertilizer (45 kg P_2O_5/ha) on dry matter yield, and uptake of N and P by Torch rapeseed during the growing season on Scott loam.

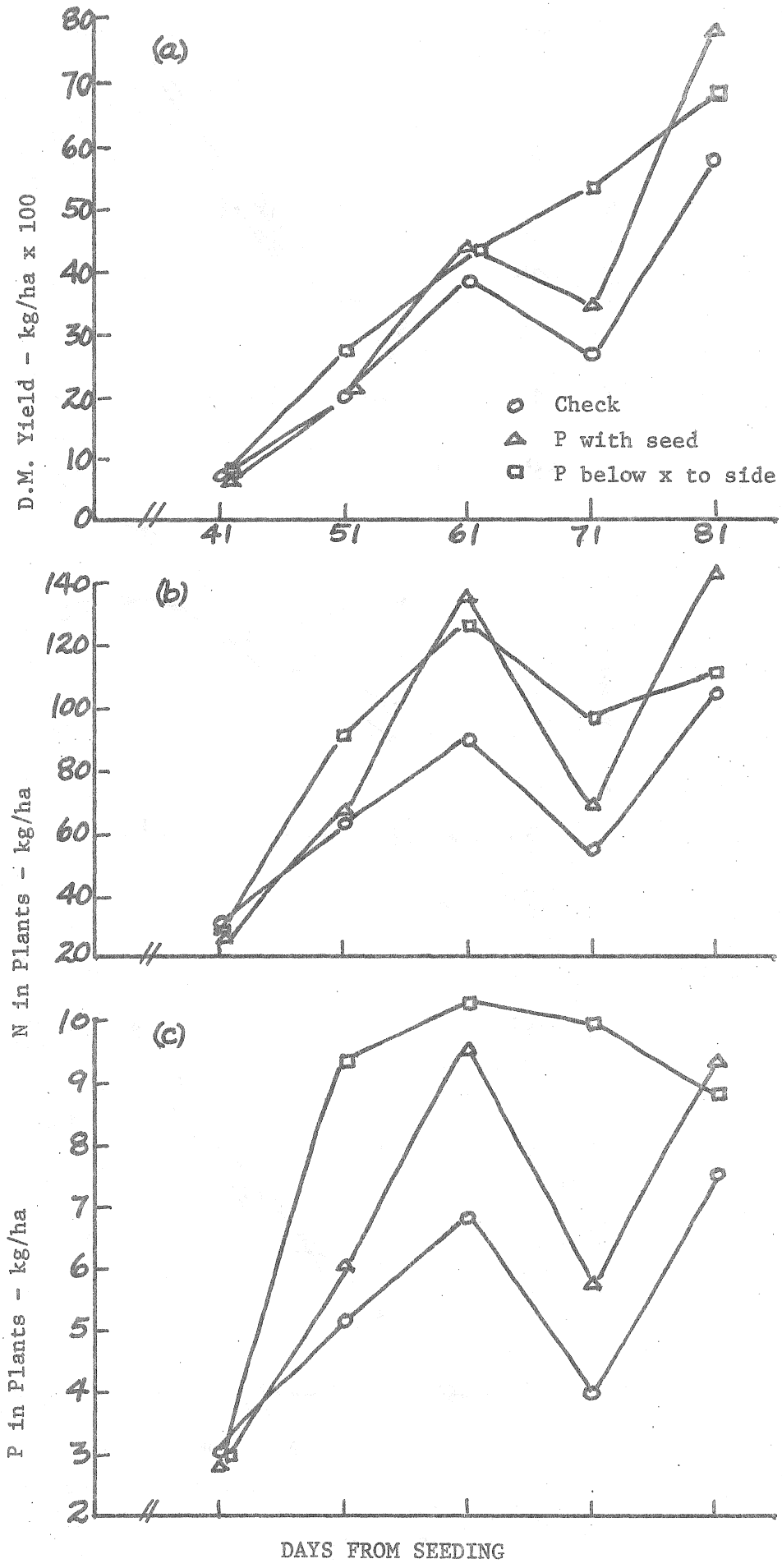

Figure 4. Effect of phosphate fertilizer (45 kg P_2O_5/ha) on dry matter yield, and uptake of N and P by Trapper peas during the growing season on Scott loam.

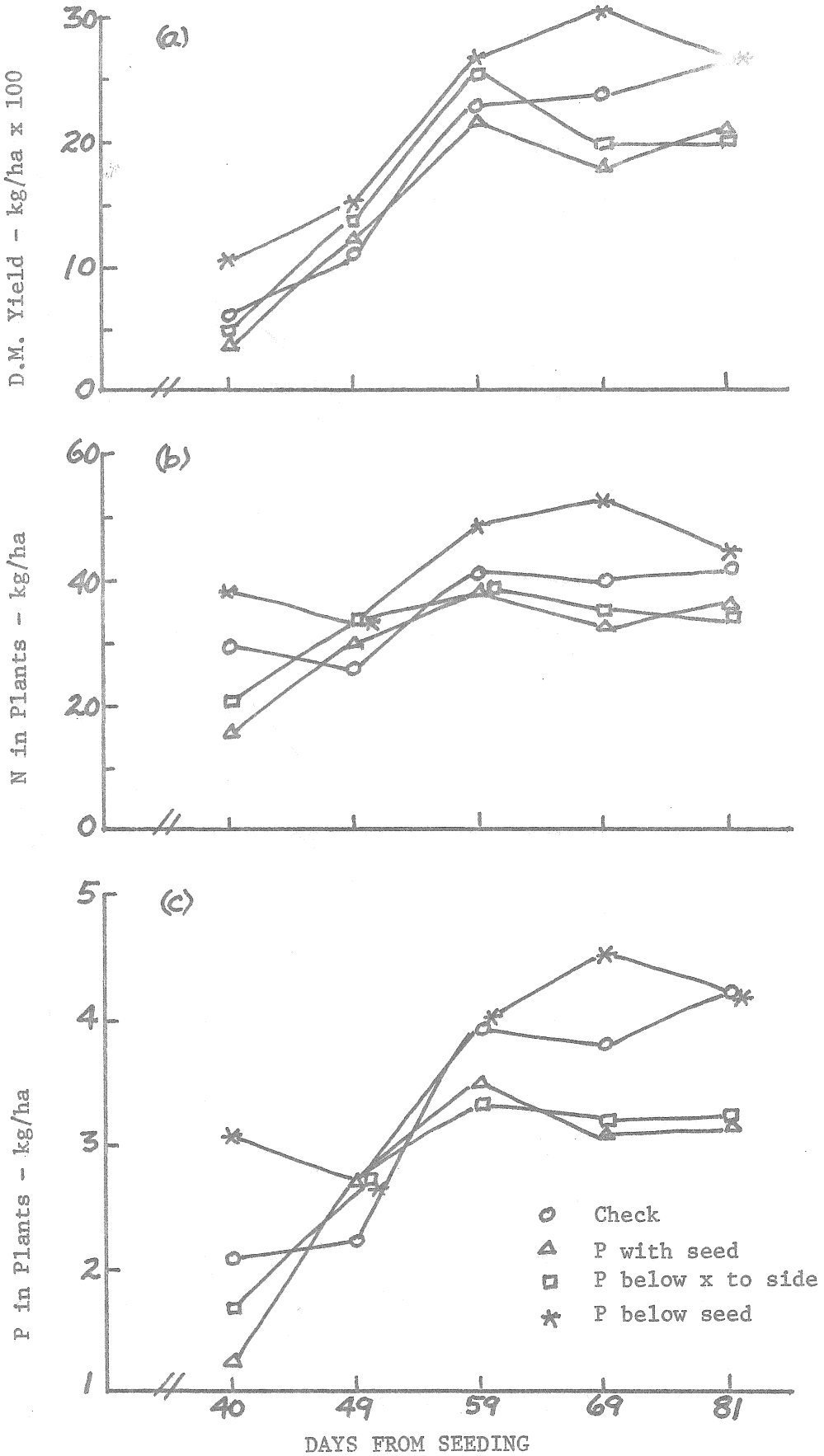

Figure 5. Effect of phosphate fertilizer (45 kg P_2O_5/ha) on dry matter yield, and uptake of N and P by Noralta flax during the growing season on Scott loam.

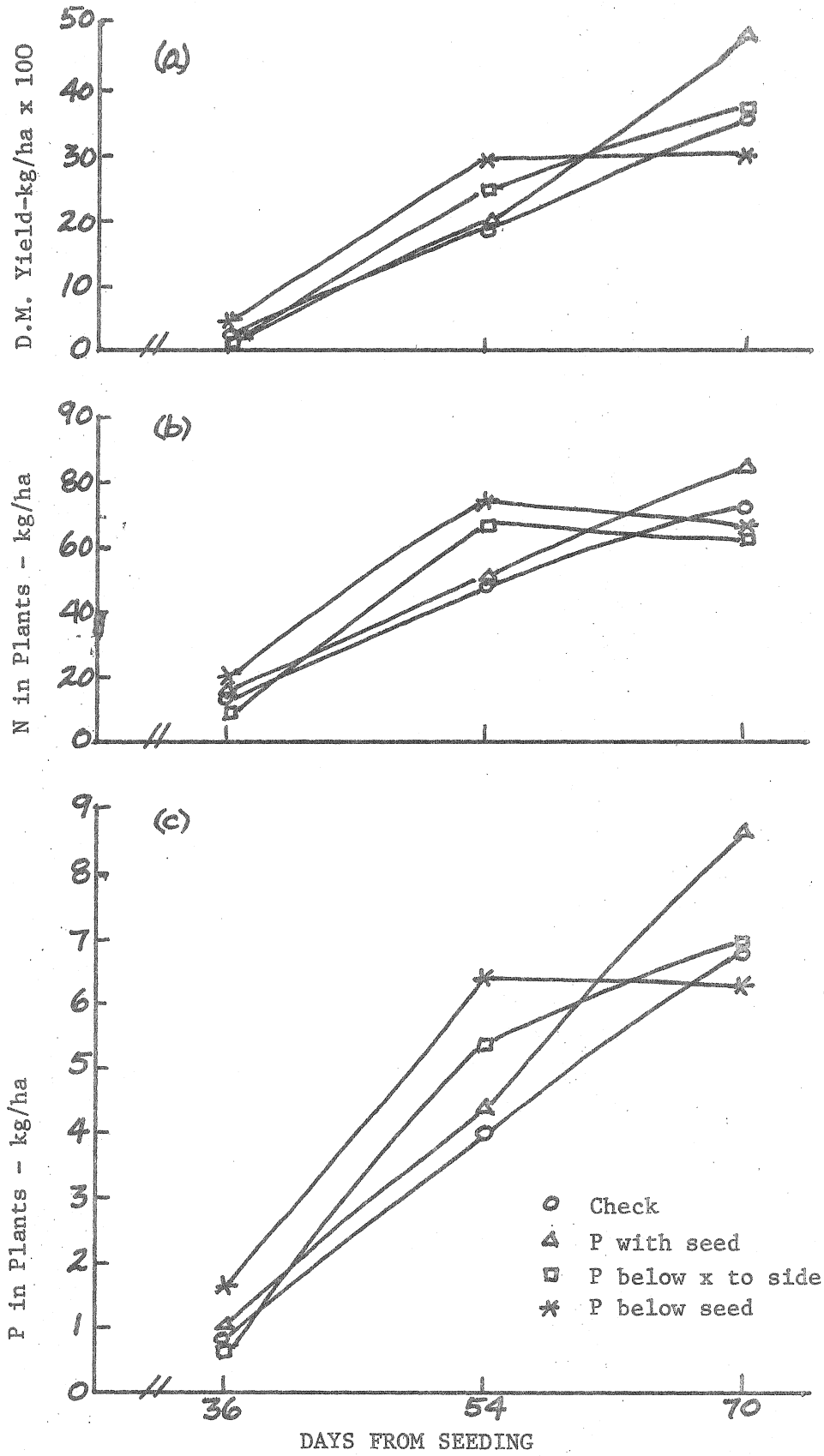

Figure 6. Effect of phosphate fertilizer on dry matter yield, and uptake of N and P by Noralta flax during the growing season on Waseca loam.