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Effects of phosphate fertilizer on regrowth of *Medicago sativa* after defoliation

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Key words: phosphorus, buds, regrowth, alfalfa, starch

Introduction Regrowth after defoliation was related to carbohydrate reserves in resident tissue. Phosphorus advanced regrowth speed and forage yield of alfalfa. A field experiment was conducted to study the effects of phosphate fertilizer on the relationship between regrowth speed and carbohydrate reserves of alfalfa (*Medicago sativa*).

Materials and methods The trial was designed randomly with 4 treatments (0, 90, 180, 270 Kg P₂O₅/ha) and 3 replicates. The area of plot was 4 m×2 m. Each plot was seeded with 18g alfalfa (var. Sanditi) seeds in 30 cm row space on September 23, 2006. Alfalfa was cut with 5cm stubbles on May 3, 2007. Ten plants from each plot were dug on 0, 2, 5, 9, 13 d after defoliation. The number and dry weight of new buds and shoots, starch content in resident tissue were investigated.

Results and discussion

Regrowth performance

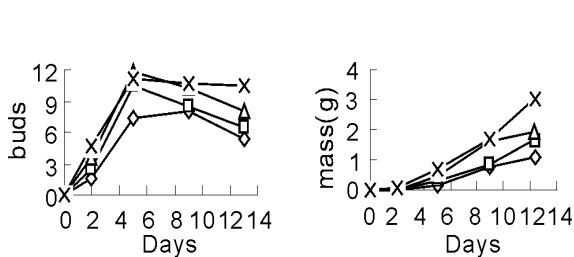


Figure 1 Effects of phosphorus on regrowth.

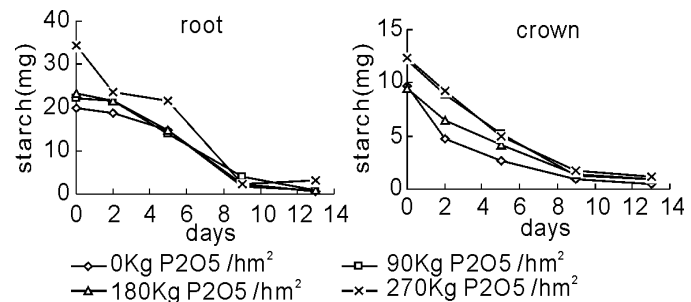


Figure 2 Starch reserves as influenced by phosphorus.

Buds per plant reached the peak on 5 days after defoliation in all treatments, and mass per plant rapidly increased after 5 days (Figure 1). Both of buds and mass per plant were increased as P application rate increased. The correlation of buds per plant on 5 days and mass per plant on 13 days after defoliation was significant ($R^2=0.36$). It suggested that buds in dormancy were promoted by the application of phosphorus, and then regrowth of alfalfa increased.

Starch reserves during regrowth Rapid decrease of starch reserves in root and crown occurred from 0 to 9 days after defoliation (Figure 2). Decreasing rate of starch was higher than that of water soluble carbohydrate. It showed that starch reserves in main root and crown of alfalfa played an important role during early term of regrowth. Starch loss in root during the first 5 days in plot applied phosphate fertilizer rate at 0, 90, 180, 270 Kg P₂O₅/ha was 5.1, 8.2, 8.4, 12.9mg/plant, respectively, and the regrowth weight / root starch loss was 33.7%, 36.5%, 55.8%, 52.6%, respectively. The results showed that more starch reserves were utilized and used more efficiently as phosphate application increased.

Conclusions Utilization of starch reserves in root and crown of alfalfa during early regrowth period was increased as P application rate increased. Phosphorus could promote the regrowth speed of alfalfa by enhancing the efficiency of root starch reserves for emergence of buds in dormancy after defoliation.

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