EFFECT OF SOME HERBICIDES (ATRAZINE AND NICOSULFURON) ON MICROBIAL BIOMASS NITROGEN AND PHOSPHOR IN SOIL

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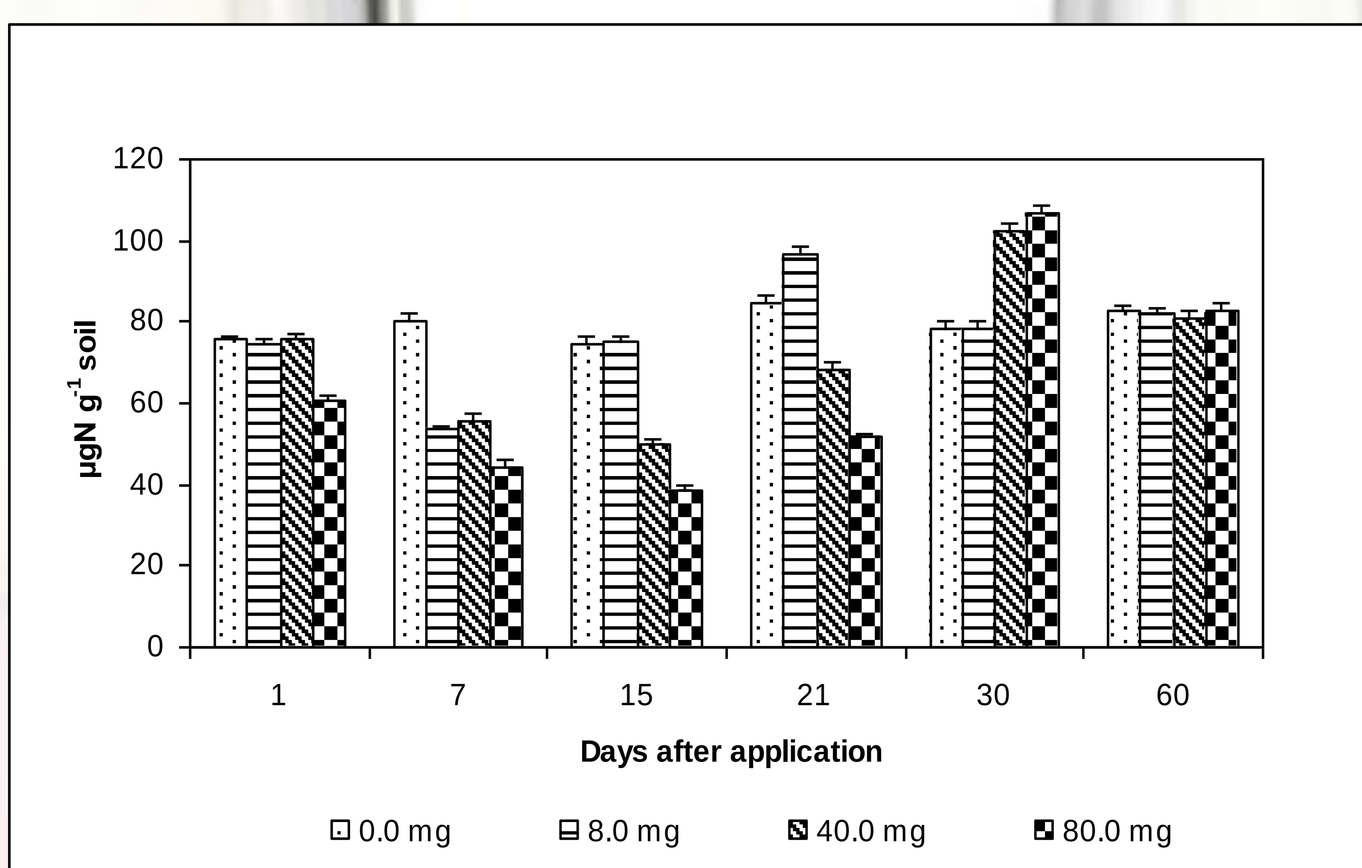
INTRODUCTION

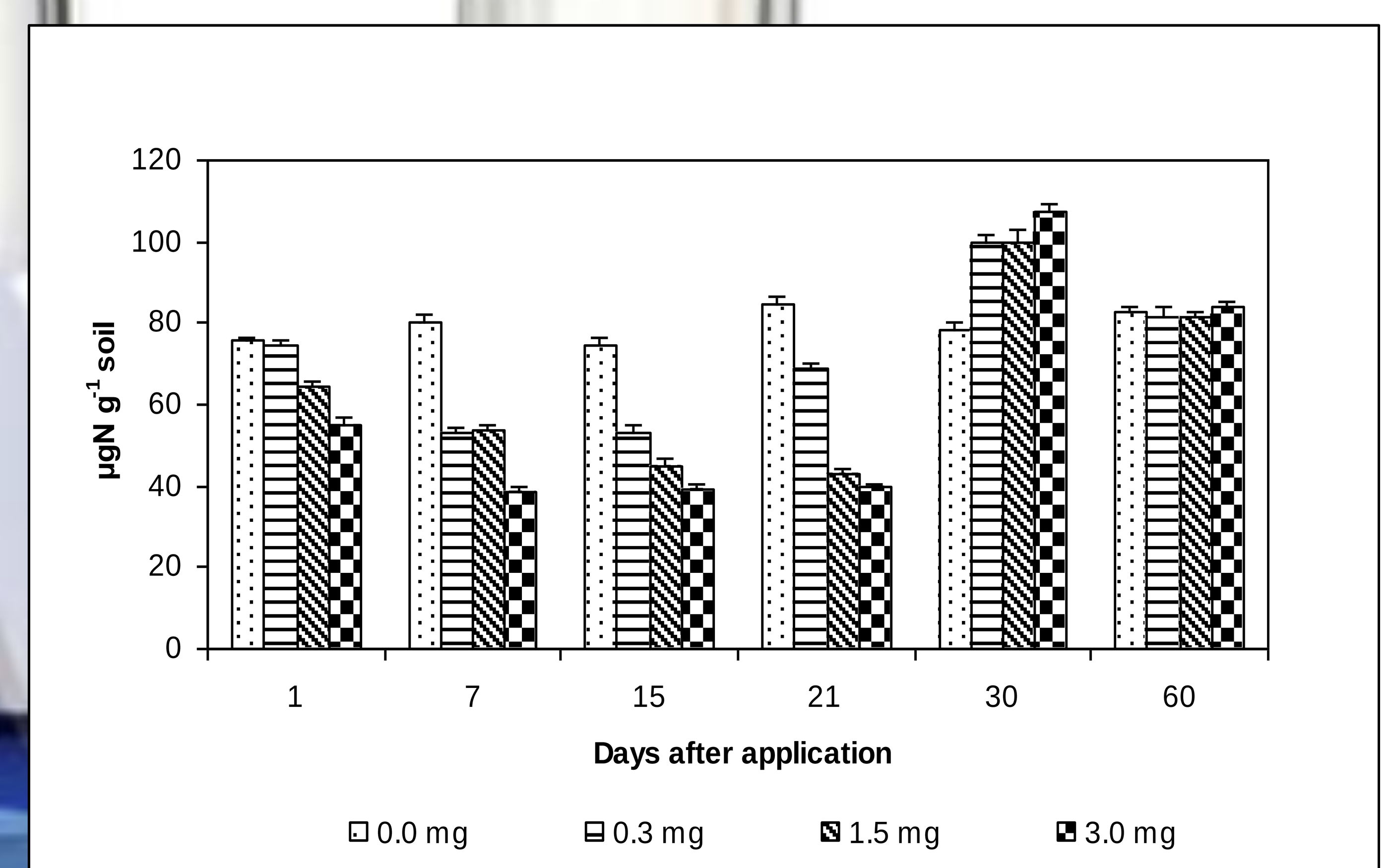
The actual interest in the effects of herbicides on soil microbial biomass is driven by the awareness of the importance of soil microorganisms in controlling carbon, nitrogen, phosphor and sulfur flows in soil decomposition, mineralization and immobilization processes. Exposure to some xenobiotic compounds may force the soil microbial biomass to direct a large part of its energy budget maintenance into reducing mineralization activity. Such a situation could have long-lasting negative effects on soil fertility. Atrazine belongs to a group of herbicides that are moderately persistent and moderately mobile in soil and its half-life varies between several days and several months. The influence of s-triazines on soil microorganisms has been intensively investigated. Several studies have demonstrated that atrzine may influence the population dynamic of certain microbial groups. Sulfonylureas are class of herbicides characterized by high biochemical activity at low application rate. Nicosulfuron, a member of this class, is a common agricultural herbicide used to control most annual and perennial grasses and several broad-leaved weeds in maize. Sulfonylurea herbicides can affect ecosystems, although their acute and chronic toxicity to animals are considered to be very low.

The purpose of the present study was to examine how the herbicides atrazine and nicosulfuron at normal field concentration, five times and ten times higher concentrations affect the soil microbial biomass nitrogen and phosphor.

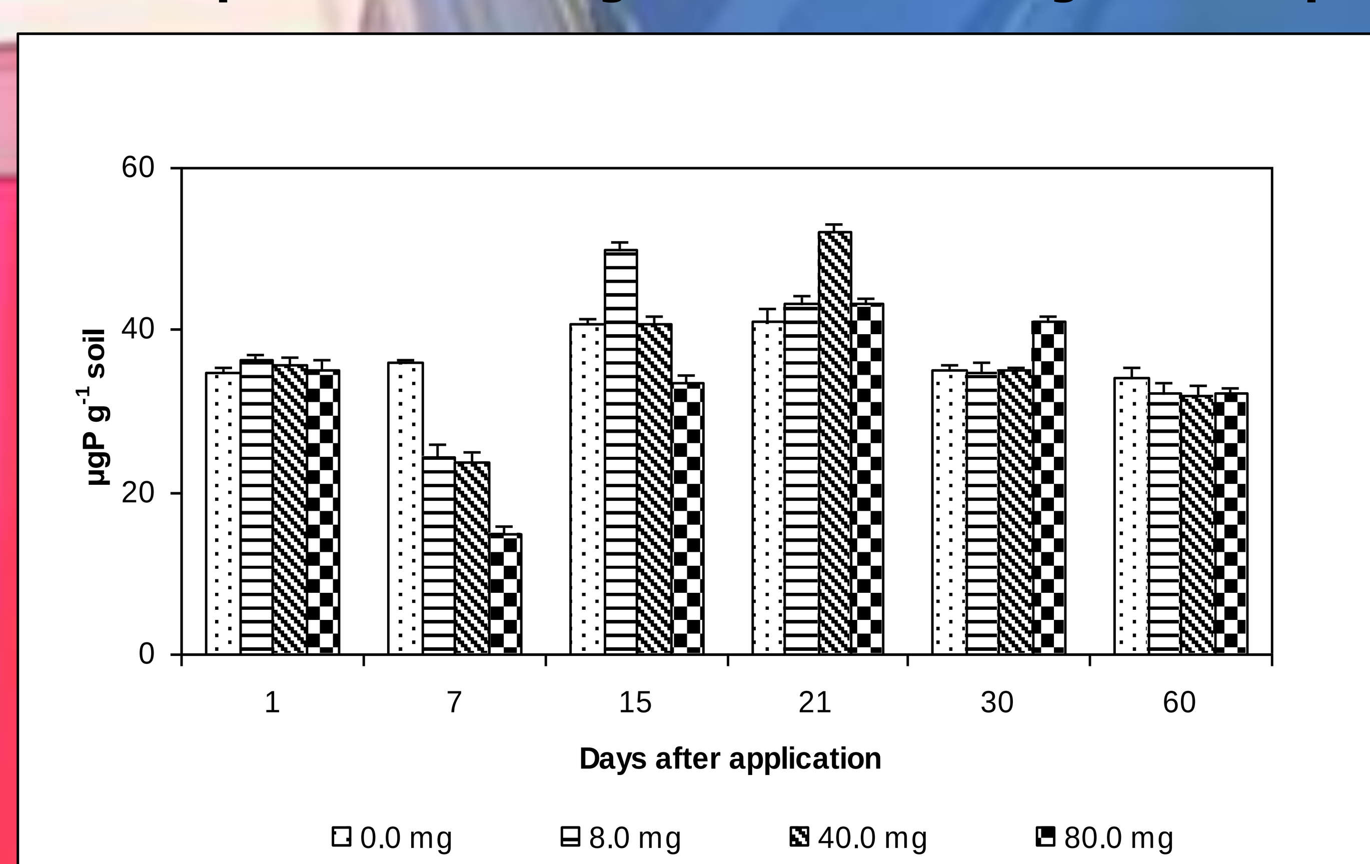
MATERIALS AND METHODS

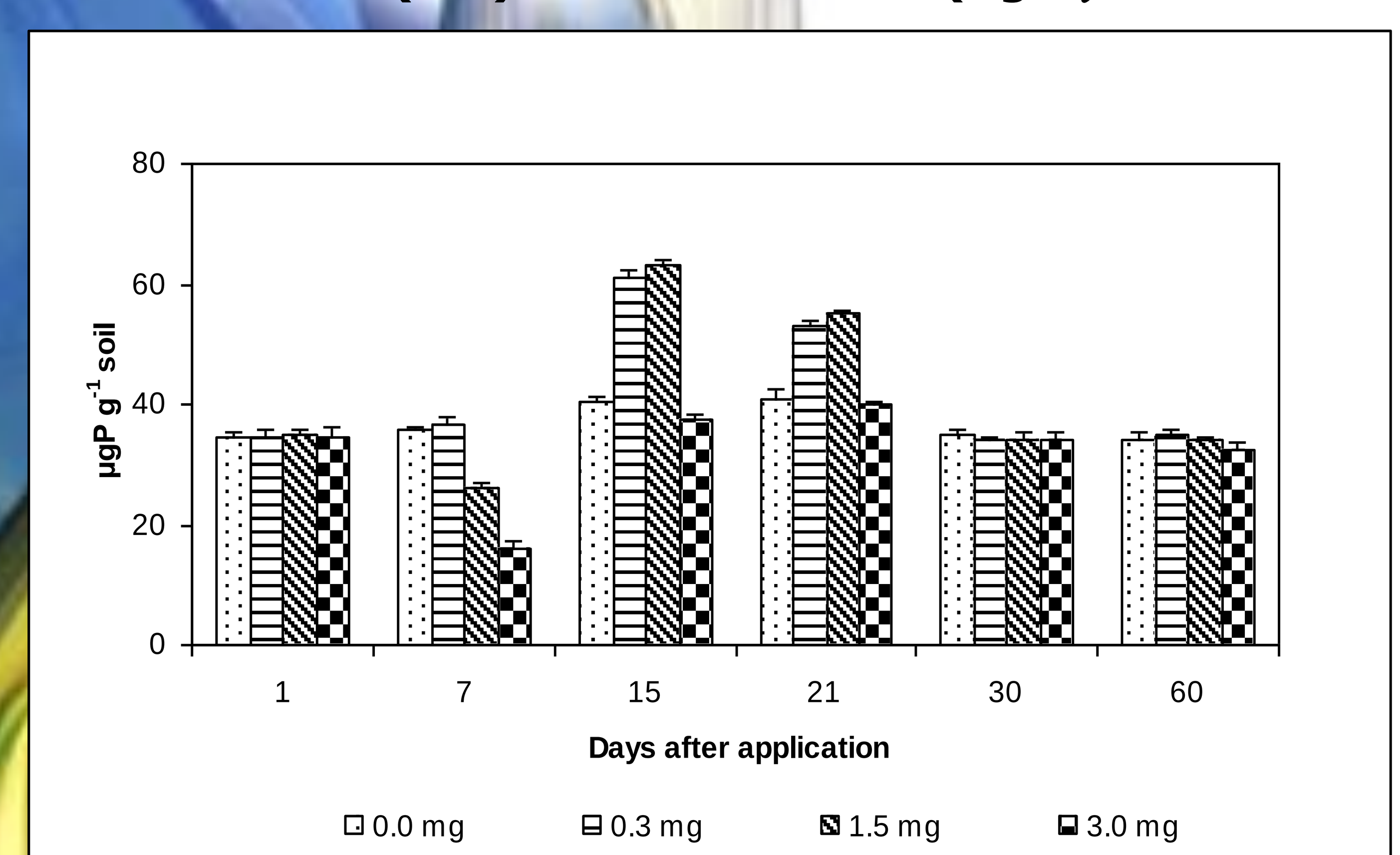
Atrazine tested in the experiment was a technical grade product of Agan Chemical Manufacturers, Ashdod, Israel, and nicosulfuron was a technical grade product of BASF Company, Germany. The rates of application for the herbicide atrazine were: 8.0, 40.0 and 80.0 mg/kg soil and for herbicide nicosulfuron: 0.3, 1.5 and 3.0 mg/kg soil. The lowest concentrations tested were label rate (8.0 mg/kg for atrazine and 0.3 mg/kg for nicosulfuron), and the other two doses were five and ten times higher than recommended dose. Trails were conducted in laboratory conditions in chernozem soil (pH 7.10, organic matter 3.32 %, sand 21 %, silt 49 %, clay 30 %) taken at Zemun Polje, Belgrade. The trial soil had never been treated with pesticides before. Soil microbial biomass nitrogen were estimated by chloroform-fumigation extraction and soil microbial biomass phosphor were estimated by Brooks`s method. Samples were collected for analysis 1, 7, 14, 21, 30 and 60 days after herbicide application (DAHA). Statistical data processing was done using the PC Anova software.





Graph 1. Microbiological biomass nitrogen in the presence of atrazine (left) and nicosulfuron (right)





Graph 2. Microbiological biomass phosphor in the presence of atrazine (left) and nicosulfuron (right)

RESULTS AND DISCUSSION

The effects of atrazine and nicosulfuron on microbial biomass nitrogen and phosphor are shown in Graphs 1 and 2. Acquired datas indicated that the effect of atrazine and nicosulfuron on soil microbial biomass N and P depended on their application rate and duration of activity, and the effect was either stimulating or inhibiting. The results of experiment with atrazine show a decreased microbial biomass N 7 to 21 DAHA. Significant increase in biomass N was recorded under higher concentrations 40.0 and 80.0 mg at 30 DAHA. At the end of the experiment no effects were observed. The results show a decreased microbial biomass N for all nicosulfuron concentrations 1 to 21 DAHA. Increase in N biomass N was recorded for all concentration at 30 DAHA.

The highest biomass P was found under 40.0 mg (21 DAHA), and the lowest was under 80.0 mg atrazine (7 DAHA). Reduced biomass P under all concentrations atrazine was recorded only seven days after application. Increase in biomass P was recorded under concentration 8.0 (15 DAHA), 40.0 (21 DAHA) and 80.0 mg (30 DAHA). These effects were transitory, because all the variables tested showed a tendency to the controls values. Under ours experimental conditions changes in the biomass P content varies throughout the experiment and the changes were depended on nicosulfuron rates of application and exposure time.Reduced biomass P was recorded under concentrations 1.5 (7 DAHA) and 3.0 mg (7 DAHA). Increase in biomass P was recorded for concentrations 0.3 and 1.5 mg at 15 and 21 DAHA.

We should note in conclusion that the investigated rates of atrazine and nicosulfuron were either recommended or multiplied doses, while the changes observed were temporary in character and intensity, which suggests that there is no real risk of causing a disruption of the existing balance of soil biochemical processes.

ACKNOWLEDGEMENTS

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