Effect of the Product of Radiational Removal of SO_2 and NO_X from Combustion Gases on the Population of *Globodera rostochiensis* Nematodes (Woll., Behrens 1975)

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Abstract

The studies were carried out in a greenhouse of the Agricultural University of Szczecin, during two growing seasons. The aim of this study was determine the effect of the product obtained from radiational SO_2 and NO_x removal from combustion gases on the populations of *Globodera rostochiensis* nematodes — one of the most common quarantine organisms. The analysis of the effect of the applied product on the population of nematodes demonstrated their varied character of response. In the combination with the product of radiational purification of combustion gases, also significantly lower population density (number of eggs and larvae in 1 g of soil) and lower fecundity of *Globodera rostochiensis* females were observed compared to the control combination. And in the second year of the experiment, the number of cysts in the combination with the product of SO_2 and NO_x removal from combustion gases was significantly lower compared to the control, and was less than half of the quantity of the previous year.

Keywords: interaction; nematodes; *Globodera rostochiensis*; product of radiational removal; *Lycopersicon*

INTRODUCTION

A serious ecological problem of the radiation method of SO_2 i NO_x removal from combustion gases has been posed by the utilization of its by-product. The studies on the possibility of utilization of the desulphurization and denitrification product in agriculture as a fertilizer have yielded very promising results. This could be one of the most pro-ecological projects in today's agriculture. The results of those studies are promising, in which a positive effect on the development of winter oilseed rape and summer wheat was found (MURKOWSKI & STANKOWSKI 1997; STANKOWSKI *et al.* 1998; MACIOROWSKI *et al.* 1999), as well as a stimulating influence on useful organisms – entomophilous nematodes (DZIĘGIELEWSKA 2000).

The aim of this study was determine the effect of the product obtained from radiational SO_2 and NO_x removal from combustion gases on the populations of *Globodera rostochiensis* nematodes – one of the most common quarantine organisms.

MATERIAL AND METHODS

The studies were carried out in a greenhouse of the Agricultural University of Szczecin, during two growing seasons, 2000 and 2001.

The pots (12 litres) where filled with garden soil, whose initial value of nematodes (Pi) was 10 cysts in 100 g. The plants were planted at the stage of two leaves. The by-product of radiational SO_2 and NO_x removal from combustion gases was brought into the ground at the dose 150 kg/ha per year.

The experiment was carried out in two repetitions, in the following four combinations:

1. Control – soil without the fertilizer or nematodes;
2. Fertilizer (product of radiational SO_2 and NO_x removal from combustion gases);
3. *Globodera rostochiensis*;
4. Fertilizer + *Globodera rostochiensis*.

On the completion of the growing season, the following were examined: density of cysts (Baerman's

method) (WILSKI 1967), density of larvae and eggs in 1 g of soil, and fecundity of females (BRZESKI *et al*. 1976).

RESULTS AND DISCUSSION

The analysis of the effect of the applied product on the population of nematodes demonstrated their varied character of response. In the first year of the studies, no significant influence was observed of the product of radiational SO_2 and NO_x removal from combustion gases on the number of *Globodera rostochiensis* cysts in the soil. However, in the second year of the experiment, the number of cysts in the combination with the product of SO_2 and NO_x removal from combustion gases was significantly lower compared to the control, and was less than half of the quantity of the previous year (Table 1).

Table 1. Effect of product of radiational SO_2 and NO_x removal from combustion gases on the number of *Globodera rostochiensis* cysts in soil

Combination	Number of cysts in 100 g of soil	
	2000	2001
Globodera rostochiensis	32.8 a	73.3 b
Globodera rostochiensis + Fertilizer*	36.3 a	29.3 a

*product of radiational SO_2 and NO_x removal from combustion gases

In the combination with the product of radiational purification of combustion gases, also significantly lower population density (number of eggs and larvae in 1 g of soil) and lower fecundity of *Globodera rostochiensis* females were observed compared to the control combination (Tables 2 and 3).

Table 2. Effect of product of radiational SO_2 and NO_x removal from combustion gases on density of *Globodera rostochiensis* in soil

Combination	Population density expressed as the number of eggs and larvae in 1 g of soil	
	2000	2001
Globodera rostochiensis	43.0 b	66.3 b
Globodera rostochiensis + Fertilizer*	24.3 a	13.3 a

*product of radiational SO_2 and NO_x removal from combustion gases

Table 3. Effect of product of radiational SO_2 and NO_x removal from combustion gases on cyst fecundity of *Globodera rostochiensis*

Combination	Female fecundity as the number of eggs and larvae in 1 cyst	
	2000	2001
Globodera rostochiensis	172.0 b	87.7 b
Globodera rostochiensis + Fertilizer*	79.5 a	48.7 a

*product of radiational SO_2 and NO_X removal from combustion gases

Previous studies (MAZURKIEWICZ-ZAPAŁOWICZ *et al*. 2000) demonstrated also that the product of radiational combustion gases purification is not indifferent in relation to other soil microorganisms. Namely, clear quantitative changes in soil nematodes were found, as well as the changes in density of particular trophic groups of nematodes, especially predatory ones, including their complete annihilation from the environment. In natural conditions, the influence of the examined preparation is neutralized by both biotic and abiotic factors. One may hope than that the tested product will find its practical application in agriculture, due to its evidently positive effect on plant growth (STANKOWSKI *et al*. 1998) and its restricting effect against *Globodera rostochiensis* nematodes – the plant parasites (KAUP 2000). However, the fact that the studied product in various manner modifies quantitatively and qualitatively the soil microfauna and microflora (DZIĘGIELEWSKA 2000; KAUP 2000; MAZURKIEWICZ-ZAPAŁOWICZ *et al*. 2000) the necessity arises to carry out complex studies that would allow determination of safe dosages, maintaining soil system homeostasis.

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