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# STUDIES ON THE EFFECT OF ISOPROTURON ON SOIL MYCOFLORA

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Common annually used herbicide, isoproturon inhibited the total counts of soil fungi significantly. Two and four fold field doses showed a marked effect on the soil fungi after 30, 60 and 120 days of application. The total number of fungal species in soil decreased after application of the herbicide.

Key words : Isoproturon, herbicide, soil fungi.

The hazardous effects of several herbicides on soil microorganisms and their activities have been reported by many workers including Chandra *et al.* (1960), Gupta and Moonali (1970), Kaiser *et al.* (1970), Rodriguez-Kabana *et al.* (1977), Cerkanskas *et al.* (1982), Yu *et al.* (1988), Chakravarty and Chaterpaul (1990) and Wardle and Parkinson (1992). Isoproturon is a recent herbicide now used by farmers but its effect on soil fungi has not been studied so far.

## MATERIALS AND METHODS

Sandy loam soil of the college garden, having pH 7.8 and low level of organic matter (0.6%) was used for study. 2.5 kg of air dried soil was placed in cellophane bag after mixing the solution of herbicide thoroughly. The herbicide was applied in three doses viz., recommended field doses (1.0 kg/ha), 2 fold field dose (2.0 kg/ha) and 4 fold field dose (4.0 kg/ha). The water content of the soil was adjusted to 40% WHC level to permit good aeration. Treatments were set up in triplicates with one control, which was not amended with test herbicide. The cellophane bag was maintained in a aluminium pot. Pots were then incubated at 25±2°C for 120 days. Water content was adjusted at regular intervals. The soil was stirred by a glassrod to ensure even dispersion of water. After 5, 30, 60 and 120 days, soil samples were collected and assayed for their fungal population.

The dilution plate method was used for the estimation of soil fungi as described by Johnson *et al.* (1959). Modified Czapek's medium with glucose (10 g/litre) in place of sucrose was employed. Rose bengal was used as a bacteriostatic agent (Smith and Dawson, 1944). Five plates were used for each treatment and were incubated at 25±2°C.

## RESULTS AND DISCUSSION

The number of fungi at different doses of isoproturon after different periods are recorded in Table 1. The total counts of fungi with recommended field doses decreased significantly after 60 days. The decrease persisted up to 120 days. The two fold field dose caused a decrease after 60 and 120 days, while four fold field dose did so after 30, 60 and 120 days. The total number of fungal species also decreased with all three doses after 30, 60 and 120 days. Hill *et al.*, (1955) and Kaufman (1964) reported a depression in microbial population due to application of diuron and linuron. According to Abdel-Fattah *et al.*, (1982), fluometuron had no effect on total counts of fungi after 2 days but after 5 days it was highly depressive. In the present study, however, no effect on fungal population was recorded after 5 days. 2 and 4 fold field doses caused reduction in the fungal population only after 30 days. The decrease, however, persisted upto 120 days.

The total counts of *Aspergillus, Penicillium, Cladosporium* and *Curvularia* increased significantly with recommended field dose. However, 2 and 4 fold field doses caused a decrease in total counts of these fungi after 60 and 120 days. The total counts of *Fusarium* decreased significantly by 2 and 4 fold field doses after 30, 60 and 120 days of application. All the three doses caused a significant decrease in the population of *Rhizopus nigricans, Mucor heimalis, Chaetomium nigricolor, Monilia acremonium, Aspergillus candidus, A. luchuensis, A. ochraceous, Penicillium citrinum, Scopulariopsis brevicaulis, Myrothecium roridum* and *Epicoccum nigrum.* The recommended field dose increased the population of *Aspergillus flavus, A. niger, A. nidulans, Penicillium*

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Table 1: Counts (per gm. dry soil x10³) of common fungal species in soil after different treatments with various doses of Isoproturon

| Species | Periods of treatment | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 days | | | | | 30 days | | | | | 60 days | | | | | 120 days | | | | |
| | O | A | B | C | LSD 5% | O | A | B | C | LSD 5% | O | A | B | C | LSD 5% | O | A | B | C | LSD 5% |
| *Rhizopus nigricans* | 2 | - | - | - | 0.9 | 0 | 2* | - | - | 0.9 | 2 | - | - | - | 0.9 | 1 | - | 2 | 1 | 2.4 |
| *Mucor hiemalis* | - | - | - | 2 | 0.9 | 3 | 1* | - | - | 1.3 | - | - | - | - | - | 2 | 1 | - | - | 1.3 |
| *Cunninghamella echinulata* | - | 1* | - | - | 0.9 | 2 | 1 | 1 | 1 | 1.4 | - | - | - | - | - | - | - | - | - | - |
| *Chaetomium nigricolor* | 2 | - | - | - | 0.9 | 3 | - | - | - | 0.9 | - | - | - | - | - | - | - | - | - | - |
| *Monilia acremonium* | 3 | - | 1* | 2 | 1.3 | 4 | 2* | 1* | 2* | 0.9 | 1 | - | - | - | 0.9 | 2 | - | - | - | 0.9 |
| *Cephalosporium acremonium* | - | - | 1* | 1* | 0.9 | - | - | - | - | - | - | - | - | - | - | 2 | - | - | 1 | 1.6 |
| *Trichoderma lignorum* | 2 | 1 | - | - | 1.3 | - | - | - | - | - | 1 | - | 1 | 1 | 1.3 | 1 | - | - | 1 | 1.3 |
| Total Aspergillus count | 38 | 41 | 44 | 34 | 8.5 | 32 | 32 | 36 | 21* | 9.9 | 36 | 33 | 32 | 26* | 7.8 | 42 | 35 | 27* | 26* | 8.4 |
| *Aspergillus candidus* | 2 | 2 | - | 2 | 1.6 | 1 | - | - | - | 0.9 | 12 | 4* | 2* | 2* | 3.9 | 2 | - | - | - | 0.9 |
| *A. flavus* | 8 | 9 | 12 | 7 | 5.7 | 8 | 6 | 12* | 10 | 2.9 | 7 | 8 | 18* | 12 | 5.1 | 12 | 9 | - | - | 3.5 |
| *A. fumigatus* | 1 | 1 | 3 | 2 | 2.3 | - | - | - | - | - | - | - | - | - | - | 4 | 6* | 5 | 4 | 1.8 |
| *A. luchuensis* | - | - | - | - | - | - | - | - | - | - | 2 | 1 | - | - | 1.8 | 5 | 1* | - | 1* | 2.3 |
| *A. nidulans* | 12 | 18* | 15 | 6* | 3.7 | 6 | 7 | 8 | 4 | 4.1 | 2 | 7* | 3 | 4 | 2.3 | 2 | 7* | 8* | 6 | 2.6 |
| *A. niger* | 7 | 6 | 6 | 12* | 2.8 | 9 | 10 | 12 | 5* | 3.2 | 7 | 9 | 6 | 7 | 2.6 | 6 | 4 | 5 | 8 | 2.9 |
| *A. ochraceous* | 4 | 1* | 2* | - | 1.6 | 2 | - | - | - | 0.9 | 2 | - | - | - | 0.9 | - | - | - | - | - |
| *A.sulphureus* | 1 | 2 | 3 | 1 | 2.3 | 2 | 5* | 2 | 1 | 1.8 | 1 | 1 | 1 | - | 1.3 | 7 | 6 | 7 | 4 | 4.2 |
| *A. terreus* | 3 | 2 | 3 | 4 | 1.8 | 4 | 4 | 2 | 1* | 2.8 | 3 | 3 | 2 | 1 | 2.3 | 4 | 2 | 2 | 3 | 2.9 |
| Total Penicillium count | 5 | 8 | 10 | 9 | 2.3 | 6 | 15* | 15* | 10 | 5.8 | 10 | 3* | 3* | 1* | 1.3 | 8 | 2* | 1* | 3 | 5.1 |
| *Penicillium citrinum* | 2 | 2 | 2 | 1 | 1.6 | 4 | 3 | 1* | 2* | 1.8 | 8 | 2* | 1* | 1* | 1.6 | 3 | - | - | 2 | 2.6 |
| *P. frequentans* | 3 | 4 | 7* | 8* | 1.8 | 2 | 8* | 12* | 5 | 4.9 | - | - | 1* | - | 0.9 | - | - | - | - | - |
| *P. javanicum* | - | 2* | 1 | - | 1.3 | - | 3* | 1 | 1 | 1.6 | 2 | 1 | 1 | - | 1.3 | 2 | 2 | 1 | - | 2.1 |
| *P. notatum* | - | - | - | - | - | - | 1 | 1 | 2* | 1.4 | - | - | - | - | - | 3 | - | - | 1* | 1.3 |
| *Scopulariopsis brevicaulis* | 2 | - | - | - | 1.8 | - | - | - | - | - | 1 | - | - | - | 0.9 | 2 | - | - | - | 0.9 |
| *Paecilomyces fusisporus* | - | 2* | 1 | 2* | 1.3 | 1 | 2 | - | - | 1.3 | - | - | - | 1* | 0.9 | - | - | - | - | - |
| *Trichothecium roseum* | - | - | - | 1* | 0.9 | - | - | 1* | 1* | 0.9 | - | - | - | 1* | 0.9 | - | - | 2* | 4* | 1.8 |
| *Humicola nigrescens* | - | - | - | 1* | 0.9 | 1 | 2 | 1 | 1 | 1.5 | - | - | - | - | - | - | - | 1 | 3* | 1.3 |
| Total Cladosporium count | 6 | 7 | 4 | 3 | 3.8 | 6 | 9* | 6 | 1* | 2.8 | 17 | 24* | 9* | 5* | 4.6 | 6 | 8 | 3 | - | 3.7 |
| *Cladosporium epiphyllum* | - | 2 | - | 1 | 1.6 | 2 | 3 | 2 | - | 1.6 | 7 | 8 | 3* | 1* | 3.5 | 2 | 3 | 1 | - | 3.6 |
| *C. herbarum* | 6 | 5 | 4 | 2* | 2.3 | 4 | 6 | 4 | 1* | 2.3 | 10 | 15* | 6* | 4* | 2.1 | 4 | 5 | 2 | - | 2.3 |
| Total Curvularia Count | 4 | 4 | 3 | 6 | 2.6 | 5 | 4 | 6 | - | - | 3 | 2 | 2 | 4 | 2.8 | 5 | 12 | 21* | 12* | 6.9 |
| *Curvularia lunata* | 4 | 3 | 3 | 5 | 1.8 | 5 | 4 | 6 | 2 | 1.8 | 1 | 1 | 1 | 2 | 2.1 | 3 | 8* | 17* | 4 | 4.0 |
| *C. tetramera* | - | 1 | - | 1 | 1.4 | - | - | - | - | - | 2 | 1 | 1 | 2 | 1.3 | 2 | 4 | 4 | 8* | 3.6 |
| *Alternaria humicola* | 1 | 2 | 3* | 2 | 1.6 | 2 | 4* | 5* | 3 | 1.8 | 3 | 4 | 4 | 5 | 2.8 | 3 | 3 | 2 | 6* | 2.9 |
| Total Fusarium count | 2 | 1 | 2 | 1 | 1.8 | 3 | 3 | - | - | 1.8 | 1 | 2 | - | - | 1.3 | 4 | 2 | 3 | 1* | 1.6 |
| *Fusarium oxysporum* | - | - | 2* | 1 | 1.3 | 2 | 3 | - | - | 0.9 | 1 | 2 | - | - | 1.3 | 4 | 2 | 3 | 1* | 1.6 |
| *F. poae* | 2 | 1 | - | - | 1.3 | 1 | - | - | - | 0.9 | - | - | - | - | - | - | - | - | - | - |
| *Myrothecium roridum* | - | - | - | - | - | 3 | - | - | - | 0.9 | 2 | - | - | - | 0.9 | - | - | - | - | - |
| *Epicoccum nigrum* | - | 1* | - | - | 0.9 | 2 | - | - | - | 0.9 | 4 | 1* | - | - | 1.3 | - | - | - | - | - |
| Total counts | 67 | 68 | 69 | 65 | 6.3 | 73 | 77 | 72 | 42* | 4.6 | 81 | 69* | 51* | 44* | 6.5 | 78 | 67 | 62* | 58* | 13.9 |

* Means significant difference as compared to control
0 - Control; A - Field dose; B - 2 fold field dose; C - 4-fold field dose

*frequentans, Alternaria humicola* and *Curvularia lunata*. The increase in population of these fungi might be due to their tolerance towards isoproturon. The present findings clearly indicate that isoproturon is highly toxic for soil mycoflora. Its addition to the soil year after year may result in its accumulation in soil. It is suggested that its doses should be reduced in subsequent years.

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