RESEARCH PAPER

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Effect of herbicides on fluorescent pseudomonads and spore forming bacilli

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The herbicides *viz.,* 2,4-DEE, butachlor, pretilachlor and pyrazosulfuron ethyl were evaluated at different concentrations of 1FR (Field rate), 2FR, 5FR, 10FR and 100FR for their effect on microbial population (Fluorescent pseudomonads, spore forming bacilli) and enzyme activities (β-glucosidase, protease, alkaline phosphatase and dehydrogenase) in laboratory microcosms. The result of the experiment revealed that butachlor, among the herbicides was more inhibitory to microbial population (7.85 to 34.20% reduction over control) and soil enzyme activities (5.03 to 19.11 % reduction over control) when compared to 2,4-DEE, pretilachlor and pyrazosulfuron ethyl. The different concentrations of herbicides also exerted significant influence on the population of bacilli. The highest population of bacilli was observed in control (5.799 log CFU g^{-1} soil) followed by treatments receiving 1FR (5.786 log CFU g^{-1} soil) and 2FR (5.781 log CFU g^{-1} soil). concentrations of herbicides. The lowest population was recorded with the 100 FR treatments (5.743 log CFU g^{-1} soil). Significant differences were also observed in the population of bacilli due to the interactive influence of herbicides and concentrations. The 1FR treatments of all herbicides recorded higher population comparable to the control, while butachlor at 100FR recorded the lowest population of 5.707 log CFU g^{-1} soil.

Key words : Fluorescent pseudomonads, Herbicides, Spore forming bacilli

INTRODUCTION

The present day agriculture depends upon high yielding varieties, inorganic fertilizers and pesticides to achieve the increased food production required to keep pace with the increasing population. The progressive modernization of irrigated rice cultivation in India, using the above technologies has led to tremendous increase in rice production, which has more than doubled over the last 35 years, mainly driven by 85% increase in productivity (Kumar, 2006).

Since the herbicides are used when the crop is either absent as pre-emergence or at its early stage of growth as post-emergence, a high proportion of the herbicide reaches the soil and accumulates in the microbiologically active top layer of 0-15 cm soil. Herbicides being biologically active compounds, an unintended consequence of the application of herbicides could influence the microbial ecological balance in the soil leading to significant changes in the populations of microorganisms and their activities and affecting the productivity of soils (Boldt and Jacobsen, 1998).

The increase in food production, till date, had come at the cost of the environment with both qualitative and quantitative degradation of land, water and bioresources (Sarkar and Ghosh, 2001). Hence, it has been advocated that, in the future, any increase in production should be obtained with practices that maintain or enhance the quality of the environment and that the environmental security should no longer be peripheral to the food and nutritional security. With this background, the present investigation was carried out to understand and predict the effect of herbicides *viz.*, 2,4-D-2ethylhexyl ester (2,4-DEE), butachlor, pretilachlor and pyrazosulfuron ethyl on rice soil microorganisms and their activities, which could lead to their judicious use and thereby reduce their negative effects, if any on the environment.

MATERIALS AND METHODS

A laboratory incubation experiment was conducted using field soil obtained from wetlands of TNAU, Coimbatore, by devising microcosms to study the effect of different concentrations of herbicide formulations on cultivable microflora and potential enzyme activities.

Soil microcosms:

Soil obtained from wetlands of TNAU, Coimbatore was air dried and passed through 2 mm sieve. The soil in portions equivalent to 250 g oven dry weight was placed

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