

Research Paper :

# Influence of herbicides on cellulolytic, proteolytic and phosphate solubilising bacteria

P.C. LATHA AND H. GOPAL

International Journal of Plant Protection (April, 2010), Vol. 3 No. 1 : 83-88

See end of the article for authors' affiliations

Correspondence to :

P.C. LATHA

Department of

Agricultural

Microbiology, Tamil

Nadu Agricultural

University,

COIMBATORE (T.N.)

INDIA

## SUMMARY

Experiments were conducted at the Department of Agricultural Microbiology to study the effect of herbicides viz., 2,4-DEE, butachlor, pretilachlor and pyrazosulfuron ethyl on soil microorganisms and enzyme activities in laboratory microcosms, *in vitro* effect on growth of pure cultures of *Azospirillum lipoferum* and *Bacillus megaterium* and their nitrogen fixation and phosphate solubilisation abilities and also on the effect of herbicide application to rice in pot culture inoculated with biofertiliser, Azophos. Soil microbiological, biochemical, chemical and agronomic variables were also studied in a permanent herbicide trial to study the impact of long term herbicide application in transplanted low land rice-rice system. In laboratory incubation studies, it was observed that butachlor was more inhibitory to microbial populations (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. Among the herbicides tested, the soil microbial population and enzyme activity inhibition followed a trend, butachlor > 2,4-DEE > pretilachlor > pyrazosulfuron ethyl.

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.

In India, herbicides constituted only 15 per cent of the total consumption of pesticides, compared to the worldwide consumption of 47.5 per cent. The herbicide consumption is expected to increase dramatically in future as the use of herbicides has been expanding more rapidly than that of the other pesticides (Bhan and Mishra, 2001). Herbicide usage, which was earlier confined to plantation crops, has now expanded to crops like wheat (42 per cent of the total consumption of herbicides) and rice (30 per cent) with the states of Punjab, Uttar Pradesh, Tamil Nadu and Andhra Pradesh leading in the consumption of more herbicides.

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). Hence, the increasing reliance of rice cultivation on herbicides has led to concern about their ecotoxicological behaviour in the rice field environment.

With this background, the present investigation was carried out with the main objective, 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 to 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

## Key words :

Herbicides,  
Cellulolytic,  
Proteolytic,  
Phosphate  
solubilising  
bacteria

Accepted :  
February, 2010