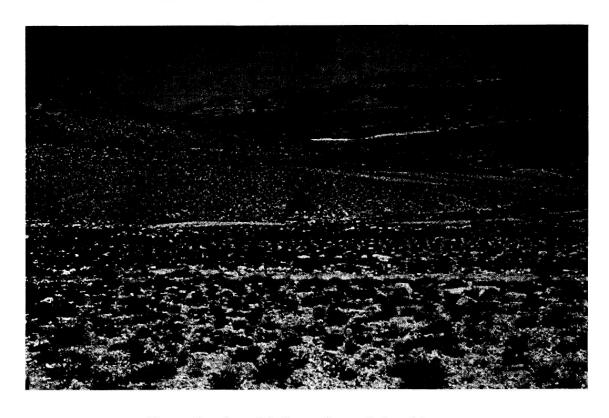


PHYTOTECHNOLOGIES TO PROMOTE SUSTAINABLE LAND USE AND IMPROVE FOOD SAFETY

WG1 & WG3 Workshop

Nutrient Biofortification and Exclusion of Pollutants in Food Plants



Ben-Gurion University of the Negev Jacob Blaustein Institutes for Desert Research Sede-Boqer Campus, Israel October 23-25, 2007













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STUDY OF STRESS RESPONSE FOR FOUR HERBICIDES ON THE GROWTH AND PHYSIOLOGICAL RESPONSES ON ALGAE AND AQUATIC PLANTS (LEMNACEAE)

<u>Foudoulakis Manousos</u>, Libiakis George, Sirbas George, Xristopoulos Nikos and Arapis Gerassimos

Laboratory of Ecology and Environmental Sciences Agricultural University of Athens, Hellas manousosf@yahoo.gr, Tel +30 2105294464-5, Fax: +30 2105294462

Agriculture in Greece is characterised by small scale and great variety of crops. Large volumes of pesticide are applied every year to support the financial profit of agronomy with herbicides covering the largest proportion among them. They are also applied almost throughout the year and they are the most persistent among pesticides as many of them may accumulate in the soil reaching a plateau after some years. Through other routes of exposure (spray drift, run off, leaching) they can also reach the surface and groundwater. To estimate a possibility of phytoremediation application for cleaning soils or water polluted with pesticides, it is required to check their phytotoxicity first.

Among the test plants selected for such screening are the fast growing duckweed plants (Lemna minor, Spirodela polyrhiza) and various algae species well known as "Nature's pollution fighters". This study was designed to standardize the tolerance of these species as high phytotoxicity is the limiting factor for growing of cultural plants for phytoremediation reasons.

The experimental approach involved exposure of Lemna minor or/and Spirodela polyrhiza and various algae species under standard laboratory conditions to four herbicides with different mode of action (chlorsulfuron, oxyfluorfen, glufosinate ammonium and pendimethalin). S. polyrhiza, L. minor and the algae species were grown in liquid nutrient medium under controlled conditions of photoperiod, humidity and temperature. Test solutions were water preparations of the four herbicides at various concentrations. For the aquatic plants the evaluation of results was made by recording the numbers of fronds and other symptoms such as discoloration. For the algae species the assessment of phytotoxicity was made daily by taking measurements (optical density from a spectrophotometer with a filter at 670 nm and a cell holder of 10cm path-length) in order to calculate the growth rate and the biomass.

A differentiate response of species tested was observed related not only as the type of symptoms but also as the time of symptoms development. The severity of symptoms was proportionally related to the concentration of the chemical used.

The NOEC and EC₅₀ values were also estimated indicating large differences in sensitivity among the herbicides tested.

Key words: Algae, herbicides, Lemna minor, phytoremediation, Spirodela polyrhiza