SUMMARY

Increasing herbicides application in agricultural fields to control harmful weeds which restricts the growth of crop plants, lead to contaminate water resources and field soil by these herbicide residues.

Apart from the desired toxic effect of herbicides on weeds, a number of possible harmful effects on soil algae, for which the treatment was not intended can also be induced. The physiological activities of these organisms may be also subjected to variable degrees of disorder.

Herbicide interactions with soil algae are always influenced by the changes of soil physical and chemical characters (pH, temperature, light and mineral elements). Consequently, the action of these herbicides is governed by chemical, physical and biological phenomena.

Many previous studies reported the harmful effects of the herbicides, but no much more work has been published concerning environmental factors affecting toxicity of herbicides to soil algae of cultivated lands. Therefore, the present study intended to investigate an important ecological issue, which concerned with influence of some herbicides widely used in controlling weeds of rice fields in Egypt on soil algae.

The study was divided into two parts:

1) Field studies were intended to follow the effect of thiobencarb, pendimethalin and pretilachlor herbicides upon species composition and

frequency of an algal flora of an Egyptian rice field compared with control, and changes of soil physical and chemical features.

2) Laboratory study was intended to investigate firstly, toxicity of thiobencarb, pendimethalin and simazine herbicides to growth and photosynthesis of *Protosiphon* green alga and *Anabaena* blue-green alga, purely isolated from an Egyptian rice field by using batch culture technique. Secondly, studying the interaction effect of nitrate and phosphate nutrients as environmental factors to herbicides toxicity on both of the previously mentioned algae. Thirdly, studying residual thiobencarb on *Protosiphon* and *Anabaena* algal cells.

The main results are summarized in the following points:

1) Soil physico-chemical characters reported approximately the same values in herbicides treated and the control soils, which indicated that the physical and chemical features were unaffected by herbicides application.

2) Cyanophyta algal species dominated the whole-recorded algal groups, which represented 50% of the total algal species. Chlorophyta represented 37% followed by 10% for Bacillariophyta; *Tribonema utriculosum* was the only species represented the Xanthophyta group with 3% of the total recorded algal species.

3) Tolerance, stimulation and inhibition growth responses of some algal species were revealed from data of the recorded algal species composition after field application of the studied herbicides.

4) Time-dose dependent growth curves revealed that increase in herbicide toxicity was correlated to the increase in its doses.

5) The ability of *Protosiphon* and *Anabaena* to recover in a herbicide-free media after its exposure to herbicide treatments, was observed. Algal cells started to grow with high specific growth rate and biomass yields from the first day of recultivation, which means that all the studied compounds has an algistatic effect on *Protosiphon* and *Anabaena*.

6) The obtained results revealed that 3 mgL^{-1} thiobencarb lead to reduce the growth of *Protosiphon* and *Anabaena*, due to the reduction in its biomass and protein content.

7) Simazine 0.8 mgL^{-1} lead to reduce the growth of *Protosiphon* and *Anabaena*, due to the reduction in its biomass and carbohydrate content.

8) Results from pendimethalin herbicide experiment revealed that 1 mgL^{-1} reduced the growth of *Protosiphon*.

9) As an indication of ecological stress under contamination with herbicide, dark respiration rate revealed an elevation with increase in herbicide concentrations, whereas gross photosynthetic rate revealed unfixed correlation with increase in herbicide concentrations.

10) Increasing nitrate as a nutritional source three times than that in BBM standard medium caused decrease in thiobencarb toxicity to *Protosiphon* growth, whereas its elevation five times lead to synergize pendimethalin herbicide toxicity.

11) Increasing phosphate as a nutritional source three times than that in BBM standard medium revealed insignificant effects on thiobencarb toxicity and its elevation five times for pendimethalin toxicity synergized its toxicity to *Protosiphon*.

12) Elevation of phosphate concentration three times over its regular strength in BG-11 medium omitted its nitrogen source, had no clear effect on thiobencarb toxicity to *Anabaena variabilis*.

13) Results obtained from nutritional sources nitrate and phosphate experiments revealed that nitrogen/phosphorus ratio was very important in affecting algal growth, where N:P less than one was detrimental to *Protosiphon* growth and lead to synergize herbicide toxicity.

14) Increasing photosynthetic activity and respiration rate of the studied algal organisms are biological phenomena appeared as a defence mechanism under ecological stress (herbicides treatment) in order to resist its toxic effect.

15) Uptake of thiobencarb herbicide by *Protosiphon* and *Anabaena* attained its maximum values in presence of the lowest thiobencarb concentration, where maximum growth and surface area of the *Protosiphon* and *Anabaena* algal cells could be reached.