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Acute Toxicity of Fluazifop-P-Butyl (Herbicide) on Daphnia magna (Straus, 1820)

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ABSTRACT
In this research, fluazifop-p-butyl (herbicide) acute toxic effects on *Daphnia magna* (Straus, 1820) (Cladocera, Crustacea) widely used in agricultural areas inside of Çukurova Region was researched by bioassay method for to be informed about the possible negative effects that may be caused in the aquatic environment. In this study, methods of bioassay test which called static method has been applied. The study was carried out under laboratory conditions at 20±2 ^{o}C. The results has been estimated with the dose-response data were fitted a log-logistic model. The 24-h and 48-h acute LC_{50} values were calculated. According to the results, acute toxic effects researched fluazifop-p-butyl the LC_{50} acute toxic lethal concentration values for *D. magna* were calculated (95% confidence limits 7.46–9.52 mgl^{-1}) 24-h LC_{50} 8.78 mgl^{-1} and (95% confidence limits 4.32–4.95 mgl^{-1}) 48-h LC_{50} 4.63 mgl^{-1} .

Keywords **-** Bioassay**,** Herbicide, Fluazifop-P-Butyl, *Daphnia magna*, LC_{50}.

I. INTRODUCTION

Pesticides are contaminants that should be taken into account because of they have difficult decomposition and heavy toxicity due to their ability to accumulate in the nature and in living organisms. Especially in the waters, contamination of pesticides can be caused oxygen shortage and fish poisonings, other aquatic organisms of mass mortality.

Pesticides and other agrochemicals have been increasingly used given their useful in controlling pests, pathogens and weeds. These pesticides compose important source of contamination of non-target systems due to their overuse and implementation techniques [1].

Thanks to the agricultural pesticides used in agricultural applications in the Çukurova Region while protecting the farmer product and obtaining more yield but most of the time pollute aquatic environments by unconscious pesticides [2].

Zooplankton is often used in ecotoxicological tests because they are one of the groups most sensitive to toxic chemicals and they occupy a central position in the lentic food chain. The responses of zooplankton to toxicity tests are considered to be informative of relative effects on the ecosystem as a whole [3].

Fluazifop-p-butyl, a herbicide widespread used in agriculture throughout the Çukurova Region. It is a selective, post-emergent herbicide registered for the control of perennial and annual grass weeds. Fluazifop-P-butyl is currently registered for food/feed use on asparagus, cotton, garlic, coffee, endive, carrot, pecan, macadamia nut, rhubarb, sweet potato, yam, pepper, onion, soybeans and stone fruits. Applications are made as pre-plant, at-plant, post-emergence foliar or soil applications, and/or postharvest applications to the plant [4].

In this study the aim was to evaluate the effects of Fluazifop-p-butyl, a herbicide widespread used in agriculture throughout the Çukurova Region, on *D. magna* are investigated by the static test method of acute toxicity test.

II. MATERIALS AND METHODS

In this study, Çukurova University Fisheries Faculty Freshwater Fish Research and Application Station obtain the *D. magna* were used in the study also static method was applied to acute bioassay method [5]. *D. magna* were taken to stock aquariums for compliance with laboratory condition and feeding until the time of the experiment. Reproductive daphnia were separated and young neonates were used one day before the start of the experiments. Two days prior to the experiment was stopped feeding the *D. magna*. In the experiment 100 ml glass flask were used and oxygen values pH, temperature values in both the experiment and stock aquariums were observed. Observations were made at 24 h and 48 h the results recorded.

The research consists of two parts as preliminary and main assays. Concentrations determined in the preliminary experiments were applied in the main experiments. 6 series consisting of control group and 5 concentrations (0.0-control, 4, 6, 8, 10, 12 mgl^{-1}) were formed in the experiments and worked with two repeated. Fluazifop-p-butyl ($50gl^{-1}$) stock solution was prepared first after than the concentrations in the preliminary experiments and the main experiments were used by diluting this stock solution.

As a result of the experiments, the mortality rates of *D. magna* were determined 50%. The results have been calculated with the dose-response data that were fitted with a log-logistic model [6] by using R 3.0 [7] statistical computation environment and DRC library [8].

III. RESULTS

The experiments were conducted under laboratory conditions at 20±2 ^{o}C, pH, 7.8-8.1 dissolved O_2 7.4-6.9 mgl^{-1}.

Figure 1. LC_{50} value of *D. magna* for 24 hours.

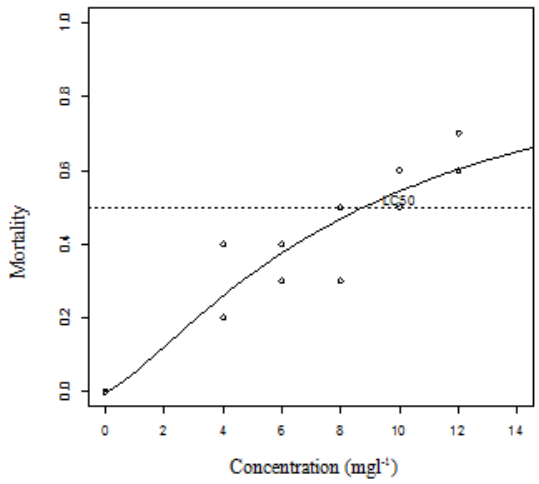
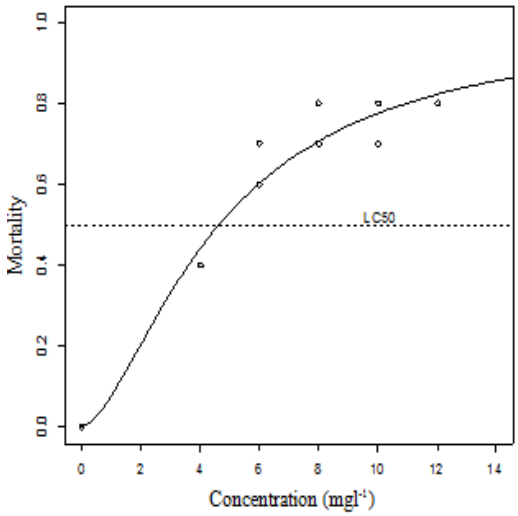


Figure 2. LC_{50} value of *D. magna* for 48 hours.



The calculated 24-h and 48-h acute LC_{50} values of (95% confidence limits) fluazifop-p-butyl, using a static bioassay system for *D. magna* were (95% confidence limits 7.46–9.52 mgl^{-1}) 24-h LC_{50} 8.78 mgl^{-1} and (95% confidence limits 4.32–4.95 mgl^{-1}) 48-h LC_{50} 4.63 mgl^{-1}.

IV. DISCUSSION

Concerning the lethal concentration values obtained as a result of the experiments apply in order to determine the effects of pesticides on the living organisms, there are fairly several results in various sources. This difference is mostly due to diverse causes such as the living biology, living conditions, physical and chemical properties of the water and the method applied.

As a result of the experiments, fluazifop-p-butyl the 24-h and 48-h LC_{50} acute toxic lethal concentration values for *D. magna* were determined to be 8.78 mgl^{-1} and 4.63 mgl^{-1} respectively.

According to the literature data LC_{50} values fluazifop-p-butyl: 96-h LC_{50} value for *Oncorhynchus mykiss* was determined as 1.411 mgl^{-1} and 96-h LC_{50} value for *Cyprinus carpio* was determined as LC_{50} 1.31 mgl^{-1} [9]; LC_{50} value for *Oreochromis niloticus* was determined as LC_{50} 1.94±0.02 mg l^{-1} [10]; LC_{50} value for Daphnia was determined as LC_{50} >10 mgl^{-1} [11]; [12] have been reported.

According to these results; compliance with reports of LC_{50} values 10 mgl^{-1} we have determined for fluazifop-p-butyl in this study. The difference with the others reports are thought to be caused by the differences in species, length, age and ambient temperature.

As a result, when the LC_{50} values determined in the study were taken into consideration, it was observed that the LC_{50} value decreased as the application time of the pesticide was prolonged. In terms of the lethal effects of herbicide and the results obtained in other researches, it is considered that commercial formulations may also be effective in terms of these research results.

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