

Statistical evaluation of cumulative effect of chemical substances–humidity over actinomycetes

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Abstract For this study, the attention of research group was oriented to a microbial segment with a big biodegradative capacity, actinomycetes. For the first step it was evaluated actinomycetes` behavior under anthropogenic pressures because of the incorporated insecticides and of the humidity factor. The evolution of actinomycetes in the presence of pyrethroid insecticides: cypermethrin (0.03%) and thimethoxan 25W (0.02%) was followed at 7, 15 and 21 days after the treatment was applied. During the whole treatment period there weren't detected quantitative decreases of actinomycetes from treated varieties, by comparison with untreated witness sample.

Key words

actinomycetes,
cypermethrine,
thimethoxane 25W,
actinomicete, *Streptomyces*
genus, synthetic pyrethroid
insecticides

Synthetic pyrethroid insecticides are natural analogues with reduce toxicity on mammals [5], wisely used to combat pest insects from vegetable crops [15] and substitutes of to toxic insecticides, organophosphorous [7, 10].

The pyrethroids are very toxic for aquatic organisms and fishes, but also for bees, having a similar action in each organism. The DL₅₀ foe small fishes and other aquatic organisms is bellow 1g/L, and the DL₅₀ value for bees is 0.03-0.12g/kg. The experiences has to present buffer zones of 16 – 24 cm in order to reduce the mortality of lepidopteran from limited areas [4]. Although the direct toxicity on birds is small, these are affected through food chain [11].

The studies made in 1990`s, but also recent data, revealed the pollutant effect of this group of insecticides on environment, but also toxicological implications, carcinogenic and lethal for laboratory pets, humans and invertebrates from aquatic medium [17, 18]. Cypermethrin presents extreme toxicity for aquatic medium at reduce concentrations till 10 µg, [13].

Thimethoxan 25W and cypermethrin, are systemic insecticides which combat a large range of pests, take action on pests through ingestion and contact on their neurological system.

Lately, aims at finding some efficient ways to prevent and combat environment pollution due to pyrethroids pesticides. One of the interesting solutions for research world is environment detoxification with microorganisms [6, 12]. The efforts of researchers were to find some species capable to biodegrades synthetic pyrethroids pesticides in soil and polluted water [8, 9]. Besides former conclusion some of

microbiological activities such as ammonification and nitrification are better in soils treated with cypermethrine [14], but also some bacterial genus, including actinomycetes [3].

Because of the fact that microorganisms are very sensitive at changes in their environment, the purpose of this paper is to show the influence of insecticides, cypermethrin and thimethoxan 25W, on actinomycetes from a field soil. The goal of this paper is to isolate the actinomycetes which are resistant to this two substances (cypermethrin and thimethoxan 25W).

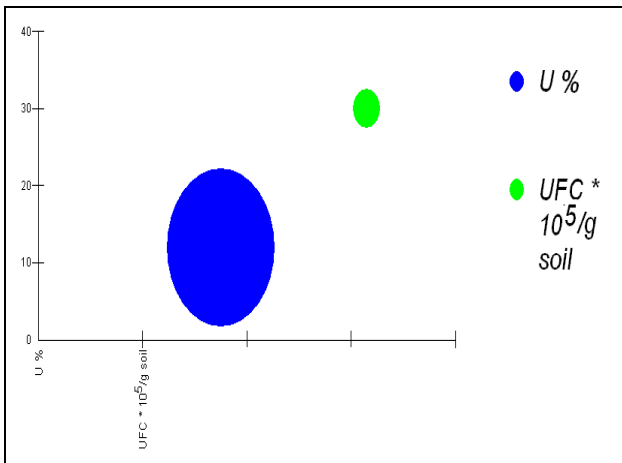
Materials and Methods

The source for actinomycetes isolation was the soil treated with the two pyrethroid insecticides: cypermethrin (0.03%) and thimethoxan (0.02%). Soil samples, treated and not treated, were taken from 0 – 20cm depth, at 7, 15, and 21 days from treatment. Samples were prelucreated in lab conditions. The isolation of actinomycetes was made through serial dilution method, on Gause no.1 medium [1]. Incubation was at 28°C, and observations were made after 72 h.

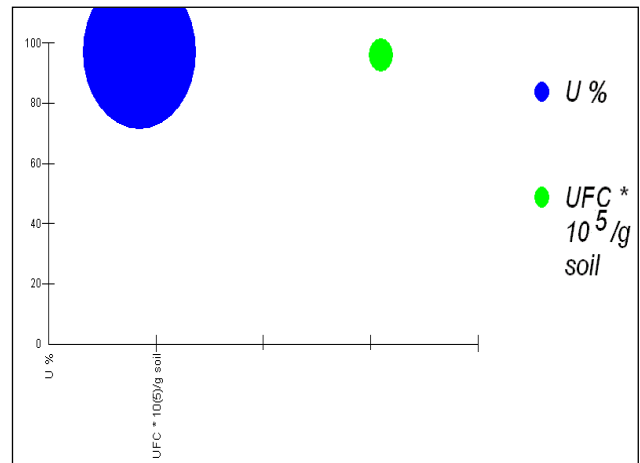
Results and Discussions

From statistical interpretation it could be seen that microbial diversity index was influenced on the whole study by the evolution of soil humidity (figure 1 a, b, c).

a. 7 days from treatment



b. 15 days from treatment



c. 21 days from treatment

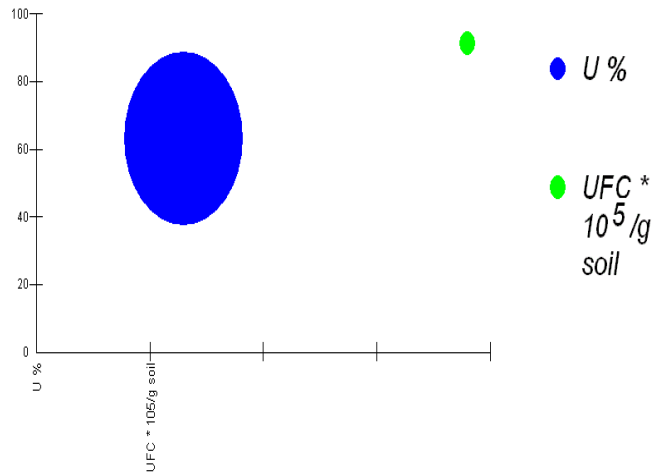


Fig. 1 a, b și c. Graphical bubble representation of biological parameters

The evolution was linear, with decreasing UFC/g solution, from 7 to 21 days proportional to humidity decrease (figure 2b), for both, treated and not treated samples. Day 15 is very important, being marked by a curvature because of the applied substance (cypermethrin), curvature which will decrease to day 21, simultaneous with reduce values of soil humidity (figure 2a).

Through the analyze of the main elements it could be seen in figure 2c and 3 a great variation of UFC/g sol, correlated with the humidity both 7 and 21

days from treatment. At 15 days from the treatment with cypermethrin the variation of actinomycetes under the influence of humidity was insignificant. In relation to witness it could be observed a quantitative stimulation of actinomycetes for all 3 times. According with literature, studied pyrethroide insecticides didn't have a significant influence on *Streptomyces* proliferation or there were imbalances because of the stimulating effects by over 50%, which disappeared at the end of experiment, reaching the climax stage from witness [2, 3, 16].

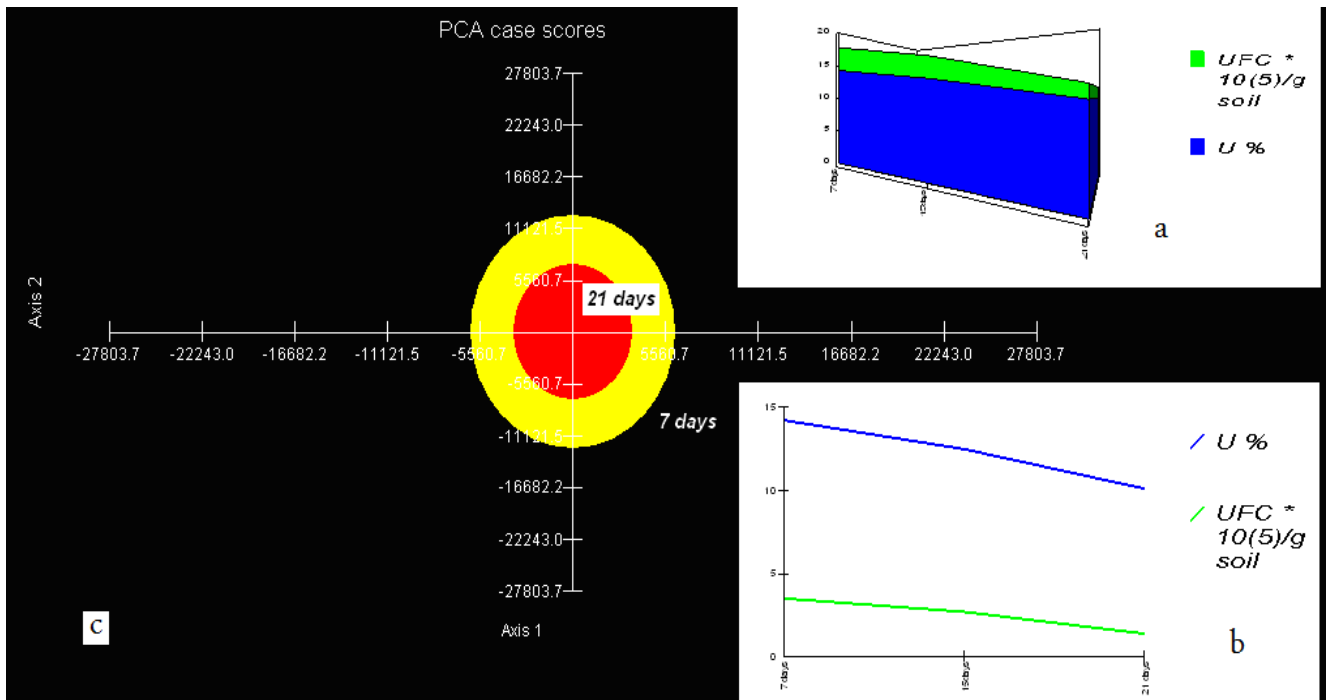


Fig. 2. PCA and PCO representations of treatment duration case scores

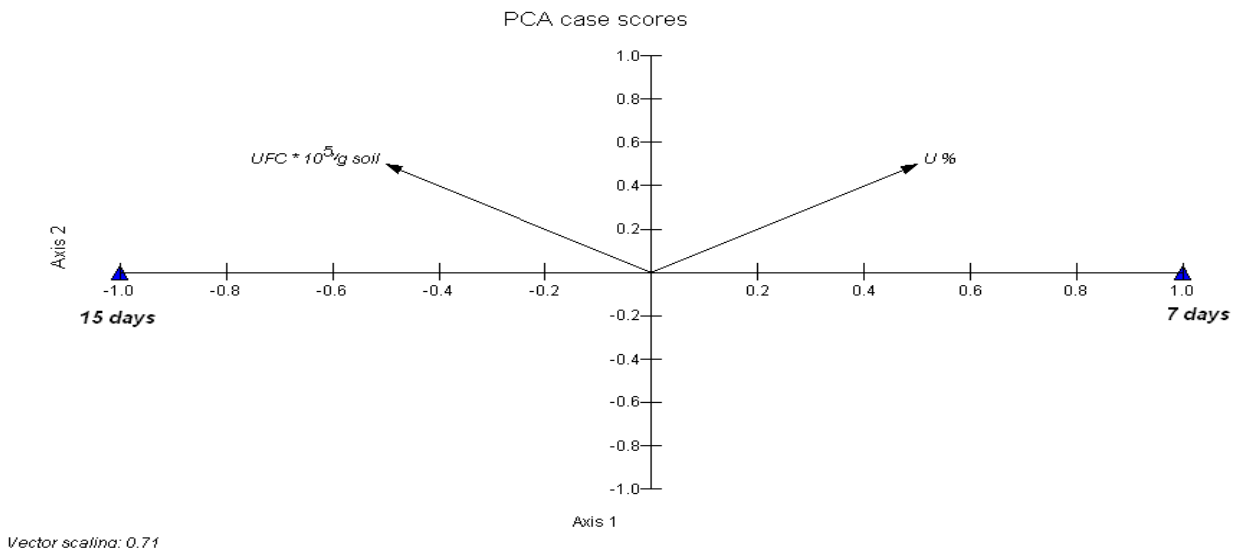


Fig. 3. PCA case score representation of substance influence

Conclusions

Through addition study of the factors that could appreciate the fact that the variation of actinomycetes was determined by the two substances studied, abiotic factors, such as humidity, which was watched all experiment.

Reporting the evolution of actinomycetes to the humidity it was detected a dependence in 2 of the 3 periods of time.

Under the pressure of antropic or abiotic factors it was seen a stimulation of actinomycetes multiplication for treated samples in comparison with witness.

From the two substances, the insecticide cypermetrin had a more stimulator effect.

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