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SUMMARIZING EVALUATION OF THE RESULTS OF THE DAPHNIA TEST CARRIED OUT AT THE TISZA-SECTION AND MAJOR DISTRICT WATERS AT SZOLNOK COUNTY (1977—1983)

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Abstract

Between 1977—1983 acute toxicological studies were carried out with *Daphnia* at six points of the Tisza-section at Szolnok county and at the major district waters of the region. It was determined that in the studied periods 21% of the Tisza water samples and 4.8% of the samples originating from the district waters were of toxic effect on the *Daphnia*. From 1975 to nowadays, the positivity of the Tisza water samples taken with great frequency above the area of the surface Water Works at Szolnok showed strongly decreasing tendency; falling back from 74% to 1.2%. The positivity was strikingly higher in the cooler, colder months. As the cause of this phenomenon, it is presumed that the rate of the chemical and micro-biological decomposition of the physiologically affective toxic material shows a decrease in the water of lower temperature.

Introduction

Since 1974, the Water Micro-biological Laboratory of the Service of Public Health and Epidemiology of Szolnok County carries out regular chemical, bacteriological, biological and toxicological studies tending to reveal the environmental effects. Those acute toxicological studies were emphasized several times from the complex hygienic programme, within the frame of which biological tests were accomplished in respect to the Tisza river at the area of Szolnok county, and the major district waters at the region, as well as the drinking water of Szolnok city, provided from the Tisza river. Here, we only wish to refer to a few data published earlier in this topic (CSÉPAI 1975, 1976, SCHIEFNER et *al.* 1979, KÁDÁR 1983).

In the followings a review is given on the results of the *Daphnia* toxicity tests carried out between the period 1977 and October 31, 1983.

Materials and Methods

The water samples were taken from the sites which will subsequently be given, transported in refrigerated state, and processed within 24 hours after moderation to laboratory temperature. The *Daphnia* toxicity tests were performed and the results evaluated according to the specifications for the Hungarian *Daphnia* test (Water Toxicological Studies, 1982). The principle of the study is that only that sample can be qualified as being negative in which half of the *Daphnia* do not become destroyed within the 48 hours' period of exposition; in opposite case, the result of the *Daphnia* test is regarded as positive.

Results and Evaluation

Within the studied period, 21% of the total samples taken from the length of the Tisza river at Szolnok county proved to be *Daphnia* positive. Figure 1 comprises the positive results from the 8 sampling sites of the Tisza river. It could be determined from the Figure that the Tisza river is firstly toxic on *Daphnia* in the Autumn, Winter and early Spring months. These facts refer to the role of temperature elements in the displaying of the effects of the toxic micro-contaminants occurring in the Tisza water.

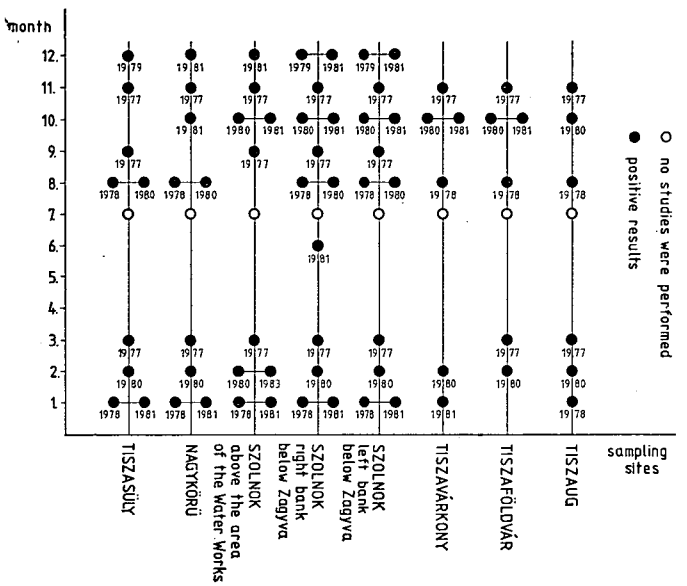

Fig. 1. Seasonal frequency of the positive results of the *Daphnia* test carried out an 6 occasions annually at the Szolnok county section of the Tisza river, between 1977—1983 (October 31).

The toxicity of the district waters is of slight degree; the positive samples amount ot 4.8% of the total studied samples. Figure 2 shows the positive results of the *Daphnia* test carried out on 6 occasions at 11 sampling sites of the more important district waters of Szolnok county, also in seasonal distribution. From the viewpoint of seasonal positivity, the relationship is similar to that experienced during the course of the studies at the Tisza river. As an explanation to this phenomenon, it can be assumed that the decomposition of the micro-contaminants is a slower process in the water of lower temperature. Under such circumstances there is a general decrease in the rate of the chemical reactions, which is also the case regarding the decomposing activity of the micro-organisms.

The results were also favourable regarding the acute water toxicological studies involved in the complex survey carried out between 1974 and 1978 at the Hungarian longitudinal segment of the Tisza river — with the exception of the high positive peak from the year 1975 (74%), (SCHIEFNER et al. 1979). Figure 3 demonstrates, with the purpose of continuity, from 1974 to October 31, 1983, the development of the *Daphnia*-positive results of the Tisza water samples taken from the area before the

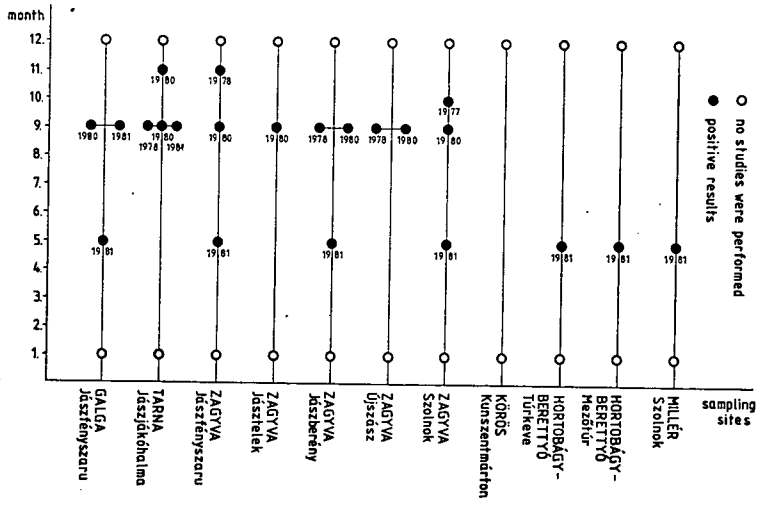

Fig. 2. Seasonal frequency of the positive results of the *Daphnia* test carried out annually on 6 occasions at the more important district waters of Szolnok county between 1977—1983 (October 31).

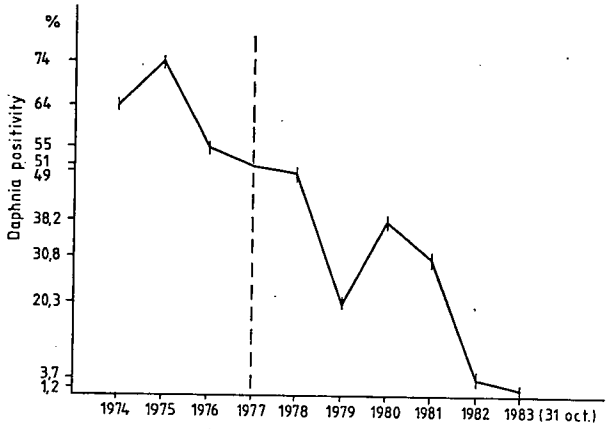

Fig. 3. The *Daphnia*-positive results obtained from the Tisza river above the area of the Water Works at Szolnok between 1977—1983 (October 31), on the basis of 100 studies yearly.

Szolnok surface Water Works. Till the end of the studied period, the strongly decreasing tendency of the positivity can be determined from the Figure; only 1.2% of the samples studied as yet in 1983 proved to be positive.

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A Szolnok megyei Tisza-szakasz és a fontosabb mellékvizek Daphnia teszt eredményeinek összefoglaló értékelése (1977—1983)

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Kivonat

1977—1983 között akut toxikológiai vizsgálatokat végeztünk Daphniákkal a Tisza Szolnok megyei szakaszának 6 pontján és a megye fontosabb mellékvizein. Megállapítottuk, hogy a vizsgált időszakban a Tisza vízminták 21%-a, a mellékvizekből származó minták 4,8%-a volt Daphniákra mérgező hatású. A szolnoki felszini vízmű felett nagy gyakorisággal vett Tisza vízminták pozitivitása 1975 után napjainkig erősen csökkenő tendenciát mutat; 74%-ról 1,2%-ra esett vissza. A pozitivitás szembetűnően nagyobb arányú volt a hűvösebb, hidegebb hónapokban. E jelenség okaként feltételezhető, hogy a fiziológiailag hatásos toxikus anyagok kémiai és mikrobiológiai lebontásának sebessége csökken az alacsonyabb hőmérsékletű vízben.

Общая оценка результатов тестов с Daphia в воде протекающей на территории обл. Солнок р. Тисы и её основных притоков (1977—83)

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Резюме

В 1977—1983 гг. нами были проделаны токсилогические исследования с Daphnia в шести местах протекающей по территории области Солнок р. Тисы и в воде её основных притоков. Мы установили, что за исследуемый период 21% водных проб Тисы и 4,8% проб её притоков оказались токсичными для Daphnia.

Пробы, которые часто брались выше водонапорной станции в Сольноке, свидетельствуют о сильно снижающейся тенденции позитивности воды Тисы с 1975 года до наших дней (она упала с 74% до 1,2%). В более прохладные, холодные месяцы эта положительность воды заметно возрастала. Можно предполагать, что причина этого явления заключается в том, что скорость химического и микробиологического разложения оказывающих физиологическое влияние токсических веществ в более холодной воде снижается.

Vrednovanje rezultata istraživanja reke Tise i značajnijih sporednih voda županije Szolnok, dobijenih Daphnia testom (1977—1983)

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Abstrakt

U periodu 1977—1983. godine, sa šest punktova reke Tise i sa značajnijih sporednih voda županije Szolnok, vršena su akutna toksikološka ispitivanja pomoću dafnija. Utvrdjeno je da su u navedenom periodu uzorkovane vode reke Tise u 21%, a uzorci iz sporednih voda u 4,8% bile otrovnog dejstva na dafnije. Kvalitet vode, uzete sa velikom čestoćom iz akumulacija reke Tise iznad Szolnok-a, od 1975. godine do današnjih dana, pokazuje tendenciju jakog opadanja: sa 75% na 1,2%. Pozitivitet je očigledno bio većih razmera u hladnijim mesecima. Kao uzrok ove pojave pretpostavlja se, da brzina razlaganja fiziološki efikasnih hemijskih i mikrobioloških toksičnih materija, opada pri nižim temperaturama.