Tiscia (Szeged) Vol. XI, pp. 99—103 (1976)

PRELIMINARY INVESTIGATIONS OF THE EXPERIMENTAL AREA IN THE INTEREST OF PROTECTING THE WATER QUALITY OF THE FUTURE KISKÖRE RESERVOIR

MÁRIA B. TÓTH and P. VÉGVÁRI

Hydrobiological Laboratory of Kisköre Reservoir, Kisköre, Hungary
(Received 30 June, 1975)

Abstract

The preliminary investigations carried out by us in the experimental area designated in the vicinity of Abádszalók have served partly for evaluating the quantity of organic matter and vegetable food there, partly for proving the right selection of the sampling points designated for the regular hydrochemical and biological investigations.

Introduction

It is an important task to determine the quantity of organic matter and vegetable food content (nitrogen, phosphorus), remaining in the area of a reservoir, before filling up the reservoir, as in case of knowing these results the load of organic matter and vegetable food on the reservoir can be evaluated in advance, taking into consideration the time of decomposition, as well.

Our preliminary investigations have prepared the surveyings of this character to be performed in the area of the Kisköre Reservoir. We have determined the organic matter, nitrogen and phosphorus content remaining in the experimental area, endeavouring to clear up the methodological questions that considerably facilitate the serial investigations later.

Material and method

The area of investigations is lying on the territory bordered by the old Tisza dike and the new dam north-north-west of Abádszalók. Its length is 2 km, its breadth changes between 200 and 400 m. Its surface is 404.000 sq.m, stretching out in the direction West-Southwest-East-Northeast (Fig. 1).

Filling up of the experimental reservoir took place in April 1974. The mass of water stored was 850.000 cc.m.

Along the dam lying on the side to Abádszalók, in a 50 to 100 m wide strip, a shelter-belt extends, formed mostly by willows variegated with ash-trees, trembling and white poplars. A part of the willow plantation was clear-felled in the winter before filling it up.

In the experimental area the remains of an old dead arm and an oozing canal are running. Before filling up, there was 1 to 1.5 m deep water in the canal, without reed-grass and uliginal vegetation. Along the dam-side of the backwater, in a 5 to 10 m wide strip, an ash-wood extends. The bed is silted up strongly. *Uticularia vulgaris*, *Iris pseudacorus* and various *Carex* species were growing in large numbers.

The N—NE-end of the experimental-reservoir is, forming, because of the bridge that crosses the oozing canal, a separate unit (Fig. 1) where before filling it up there was but some soft-stalked vegetation consisting of a few willow-bushes and uliginal weeds.

The representing sites, suitable for, taking soil samples, were demarkated after a thorough surveying of the area.

Soil samples were taken from four sites of the experimental area and are to be characterized by the following plants:

Soil sample 1: It is originating from a little variegated area with a mostly soft-stalked vegetation of small stature. Its characteristic plants are: *Potentilla anserina* L., *Ranunculus repens* L., *Carex distans* L., *Glechoma hederacea* L., *Lotus corniculatus* L., *Euphorbia salicifolia* HOST.

Soil sample 2: It was taken from an area with a vegetable stand rich in species, its plants being: *Trifolium repens* L., *Agropyron repens* (L.) BEAUB., *Cirsium arvense* (L.) SCOP., *Symphytum officinale* L., *Euphorbia salicifolia* HOST., *Carec distans* L., *Festuca pratensis* HUDS., *Rubus caesius* L., *Tussilago farfara* L., *Chrysanthemum vulgare* (L.) BRENK, *Matricaria inodora* L.

Soil sample 3: It is originating from a site that has a thinner-scattered vegetable stand than the former areas. Its plants are: *Althaea officinalis* L., *Potentilla reptans* L., *Cirsium arvense* (L.) SCOP., *Rorippa silvestris* (L.) BESS, *Rubus caesius* L., *Salix fragilis* L., *Amorpha fruticosa* L.

Soil sample 4: It was taken from a deeper-lying, marshy area, containing only *Chrysanthemum vulgare* L.

There is no uniform methodology concerning the methods of soil investigations to be performed from the point of view of water quality; therefore we felt it necessary to drescribe the method applied by us, so that the results may be compared later.

Sampling: By means of a shovel-shaped spade, the vegetation was removed together with a $25 \times 25 \times 10$ cm earth ball.

Preparation: In the laboratory, the sample is cut in $15 \times 15 \times 10$ cm, then the living green vegetation *(C-fraction)* and the dry vegetable remains *(B-fraction)* are separated from the surface obtained. Following that, the $15 \times 15 \times 10$ cm earth piece is cut in $15 \times 15 \times 2$ cm *(A-fraction)* and put on a tile. The samples are dried at 105 °C in an exsiccator till getting weight-balance. After being cooled down, they are weighed, and in that way we get the dry weight of A-, B-, and C-

fractions. For a further preparation the samples are ground in a soil-milling machine, in order to be homogenized completely.

The determination of the total nitrogen and phosphorus content is methodically elaborated (FELFÖLDY 1974). We achieve well-measurable extinction values (0.5 to 0.8) if we choose the mass to be weighed as a function of the total organic matter. The more organic matter is contained in the given fraction of the sample, the less of that is to be recorded.

The determination of the oxygen requirement of the sample measured with acid potassium permanganate was carried out with the method applied in hydroanalytics (FELFÖLDY 1974). The oxygen requirement of the 15×15×2 cm sample is given by the sum of fraction values.

From the values of the C. O. D. measured with potassium permanganate, the organic carbon can be calculated on the basis of the following formula (FELFÖLDY 1974).

Organic C mg/sample = 0.1898 "C.O.D.Mn" (sample = 15×15×2 cm soil sample)

For designating the sampling points of the area filled up with Tisza-water, we have taken water samples in six profiles, from four sampling points each (Fig. 1).

Evaluation of results

On the basis of the data obtained in the course of the laboratory investigations, the quantity and oxygen demand of the matters, that exert a considerable influence upon water quality after remaining in the experimental reservoir, could be evaluated.

The total organic matter was 1510 tons, of which 1114 tons were found in the 2 cm surface layer of the soil, and 406 tons in the vegetation contained. While from the 406 ton organic matters found in the vegetation 262 tons were at the shrub and tree-levels, hardly more than one third of them, 144 tons were found at the grass-level.

The total nitrogen quantity remaining in proved to be 27 tons, the total phosphorus quantity 8 tons.

On the basis of the values of C. O. D., measured with acid potassium permanganate, 4.000-ton oxygen is necessary to oxidize the organic matter in the 2 cm upper layer of the soil and at grass-level. That is 600 times as much as the oxygen demand of the organic matter that got in with feed-water till filling up the reservoir completely.

From the results obtained in the course of the elaboration, the data of *soil sample 2* are given here as an illustration [g (sample) 15×15×2 cm].

fraction A B C Total 2 cm layer of the soil dry vegetation green vegetation

Component				Total
Total weight (dry)	447.0000	20.7889	19.4200	497.20
Organic matter	36.3174	11.1451	17.8712	64.3337
Inorganic matter	410.6826	9.6438	1.5488	421.8752
Total nitrogen	0.9311	0.2430	0.3383	1.5124
Total phosphorus	0.3759	0.0209	0.0489	0.4457
C.O.D.Mn.	86.88	68.48	102.70	258.06

On the basis of soil investigations we could ascertain that the organic matter and vegetable food contained only in the soil and grass-level of the land-ecosystem under inundation is representing such a considerable quantity that in our case it would accumulate in the experimental area as many as 2.000 years, in spite of the water supply providing for the replacement of the loss of oozing and evaporation.

Another important aim of our preliminary investigations is to supervise the selection of the previously designated sampling points that became necessary to survey the water conditions of the experimental area reliably.

The investigations have comprised the determination of dissolved oxygen, free carbon dioxide, the C. O. D. measured with potassium permanganate, dissolved orthophosphate, pH, conductivity, sodium, potassium, "a", "b", and total chlorophyll.

At determining the sampling points, besides the results of profile investigations, we took into consideration the bottom-formation of the experimental area, the different vegetation of the sites lying deeper or higher, whether the post-inundation water-surface is unsheltered from the wind or not, as well as the different degrees of being shaded, the comparatively isolated state of the single sites, the local differences in the degrees of water exchange, as well. On the basis of these took place the designation of the five sampling points. (Fig. 1).

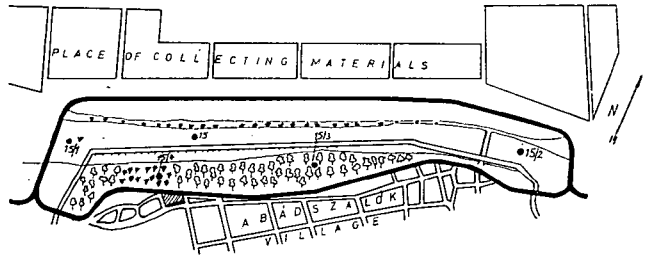

Fig. 1. Plot of the experimental area with the sampling points

Sampling point 15: It was designated in the open-water part of the old backwater, sheltered from the wind moderately. Water depth changed between 3.00 and 3.30 m.

Sampling point 15/1: It was in the western part of the reservoir. Before the inundation, vegetation and surface soil were completely missing. Here ran the pipe work providing for the water supply. Water depth was 2.00 to 2.3 m.

Sampling point 15/2: It was designated in the easter part of the experimental area, in the middle of the part lying between the bridge that crossed the oozing canal and the dams. Before inundation, there were weed-associations in the area. Water depth has changed between 1.80 and 2.10 m.

Sampling point 15/3: It was designated in the strongly shaded protective forest of dense foliage, bordering the reservoir from Abádszalók. The underwood was formed by ash and willow-bushes. Water depth fluctuated between 1.10 and 1.40 m.

Sampling point 15/4: It was designated in the wood cut down. In the early summer period it was but a little shaded, later on however it bacame strongly shaded

owing to the dense canopy of the willows coming into leaf. Before inundation, the bottom was covered by a thick leaf-litter layer. Water depth was 1.40 to 1.70 m.

For studying the conditions of water quality in the experimental area (hydrochemical and biological investigation), samples were taken from sampling point 15 weekly, from sampling points 15/, 15/2, 15/3 and 15/4 fortnightly (B. TÓTH 1975, HAMAR 1975, BANCSI 1975).

In the course of our preliminary investigations carried out in the experimental area at Abádszalók, we evaluated the quantity of vegetable food remaining in the inundated area, as well as we designated, on the basis of chemical and biological investigations, the representative sites for sampling, promoting in this way that we can give correct answers concerning the water quality of the area inundated, with our hydrochemical and biological investigations to be performed in the experimental area in 1974.

References

BANCSI, I. (1975): Zooplankton investigations in an experimental area, at the Kisköre River Barrage. — Tiscia (Szeged) *11.*

FELFÖLDY, L. (1974): A biológiai vízminősítés (Biological water qualification). Vízügyi Hidrobiológia 3. (Water Conservancy Hydrobiology 3). Budapest.

HAMAR, J. (1975): Investigation of bacterio- and phytoplankton in the experimental area at the Kisköre River Barrage). — Tiscia (Szeged) *11.*

KGST Egységes Vízvizsgálati Módszerek (COMECON Unitary Methods of Water Investigation). Chemical methods I—II. "VITUKI", Budapest 1970.

B. TÓTH, M. (1975): Hydrochemical conditions of an experimental area in the region of the Kisköre River Barrage — Tiscia (Szeged) *11.*

Talajtani és agrokémiai vizsgálati módszerek (Methods of the agrochemical and soil research). Dept. of Prod. and Techn. Development. Min. of Housing and Public Construction, 66096/1970,