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Izuchenie pitaniya kolovratok *Asplanchna* s pomoshch'yu C^{14}.

A study of the nutrition of the Rotifer *Asplanchna*, with the help of $Carbon^{14}$.

Byulleten' Instituta Biologii Vodokhranilishch, No. 12, pp.17-20, 1962.

Translated By Dr. J.W.G. Lund.

FRESHWATER BIOLOGICAL ASSOCIATION.

December, 1962.

The carnivorous rotifers *Asplanchna priodonta* Gosse and *A. herricki* de Guerne are widely distributed in the Rybinsk Reservoir, and play an important role in the trophic connections of the organisms inhabiting it. The data in the literature about the question of their nutrition are extremely poor and refer in the main to the composition of the food. The majority of authors consider that carnivorous nutrition, even reaching sometimes to cannibalism, is characteristic for *Asplanchna*. (Skorikov 1896; Naumann 1929). At the same time Naumann, Lucks (1931) and Myers (1941) point out that algae are an important component of the nutrition of *Asplanchna*.

The quantitative side of the nutrition of rotifers has scarcely yet been studied. Data on this question have been brought forward only in the work of L.A. Erman (1956), in which, however, information about the nutrition of *Asplanchna* is absent. Information about the utilisation of algae by *Asplanchna* was obtained by us as a result of opening the guts. However, partial swallowing by the rotifer of algae along with other food does not prove that the animal utilises them. Because in experiments on the nutrition of cyclopoids with the help of C^{14}, (Monakov & Sorokin 1959a) it was shown that although they swallow protococcoid algae they scarcely digest these algae at all.

Our problem was the clarification of the question about the role of algae and bacteria in the nutrition of *Asplanchna priodonta* and *Asplanchna herricki* and also the obtaining of the quantitative characteristics of the carnivorous nutrition of these rotifers. The work was carried out with the aid of the radiocarbon method described in the works of Monakov & Sorokin (1959a, 1959b).

For the experiments were picked out *Asplanchna priodonta* and *Asplanchna herricki* of the size 0·6 – 0·8 mm. As choice for nutrition were taken various algae, bacteria and the crustacean *Bosmina longirostris*.

The algae were labelled by means of growing them in a buffered medium containing labelled carbonate. The bacteria for the experiments were isolated from the water of the Rybinsk Reservoir on a glucose medium. They were labelled with C^{14} by means of growing them up on an agar medium to which was added glucose with completely labelled carbon atoms, as C^{14}. For labelling the

Bosmina with C^{14} they were fed from 3-4 days with labelled Chlamydomonas algae. The activity of the algal and bacterial mixtures prepared for the experiments was 0·1 - 2·0 x 10^6 impulses per ml. The activity of the Bosmina varied within the limits of 200 - 250 impulses per specimen.

40-50 rotifers were put here and there in small glasses with 50 millilitres of water taken from the reservoir and filtered through a membrane filter. Then labelled C^{14} food was introduced into the glasses in such quantity that its concentration was somewhat higher than is observed in the marginal region of the Rybinsk Reservoir. After 24 hours the experiment was stopped. The rotifers were picked out, and in order to free their intestines from traces of labelled food, were planted for one to one and a half hours in pure water, to which was added a small quantity of normal food. After the lapse of this time, the rotifers were transferred onto a glass in a drop of 0·1% agar and dried. In this form they were placed under the counter for the estimation of their radioactivity. The radioactivity of Bosmina was estimated by the same method. The coefficient of self-absorption by radiation in the body of the dried Bosmina, which was determined by means of burning the labelled Bosmina, and that of the following determination of the activity of C^{14} in the form of barium carbonate equalled 1·17. In determining the radioactivity of the rotifers we neglected the influence of self-absorption, inasmuch as the thickness of the layer of matter remaining after the drying of the rotifers on the apparatus was of an order of less than 1mg. per Cm^2. The activity of the algae and bacteria was counted on membrane filters.

The main quantities characterising the intensivness of the nutrition and utilisation were, in our experiments, the amount of the organic matter of the food utilised per day expressed in γ of carbon per single specimen (Ca) and the percentage relationship of this quantity to the total quantity of carbon in the body of the animal (Cn) - index of utilisation - P. These quantities were calculated according to the formulae:

$$Ca = Cr. \gamma C/\text{specimen}$$

$$P = \frac{Ca.100}{Cn}\%$$

where Cr is the quantity of the carbon of the marked food in γ per one impulse of its activity, r is the radioactivity of the animals at the end of the experiment with a correction for self-absorption.

The amount of the carbon in the algae, bacteria and invertebrates was determined by wet combustion with the chromic mixture. In the invertebrates it was equal; in the body of Asplanchna to 0·7 γ carbon per specimen, and in the body of Bosmina to 0·36 γ of carbon per specimen. The results of the experiments with labelled algae and bacteria are shown in Table 1. They show that the algae and the bacteria cannot satisfy, even to a small degree, the nutrient demands of Asplanchna. Among the algae noteable utilisation was observed only in the experiments with the big Chlamydomonads. However, these algae approximate in certain characteristics to flagellates, and are hardly ever met with in the reservoir. Other big algae, Scenedesmus and Anabaena, small algae and bacteria are utilised much worse. The index of utilisation in these experiments (0·02 – 0·4) is 100-200 times less than with carnivorous nutrition.

So the algae and bacteria were not normal food of the carnivorous rotifers, but perhaps serve only as a source of additional elements of nutrition-vitamins.

The main food of Asplanchna is small planktonic animals.

In the experiment of T.M. Tribush (1960) Asplanchnas quickly died when feeding in pure cultures of Scenedesmus, but lived well feeding on rotifers. This confirms our data. In carnivorous nutrition the daily ration of rotifers exceeded 1·5 – 2 times the weight of their own body (Table 2). The index of utilisation reached 36%. This points to the high intensity of the exchange of the carnivorous rotifers in the presence of sufficient food. Per day the matter of their bodies renews itself approximately by a third at the expense of the utilisation of the food. In Daphnia longispina the maximum index of utilisation in the most favourable conditions of nutrition reached 25% (Monakov & Sorokin 1960).

The utilisation of the food in feeding on Bosmina is 15-20%. These amounts are close to the amounts of utilisation of food in the carnivorous nutrition of cyclopoids (Monakov & Sorokin 1959a), and somewhat lower than the utilisation of algae when daphniae are feeding on them (Monakov & Sorokin 1960).

The data about the nutrition of the carnivorous rotifers brought forward in our present communication once again demonstrates the great delicacy of the isotope method which permits one to study in short period experiments the nutrition of animals whose dry weight scarcely exceeds 0·001 mg. The suitability of this method in such investigations is shown by this, that with its help it is possible to determine the utilisation of this or that nutrient object, and by such a method to evaluate its true importance in the nutrition of aquatic animals.

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[In text MONAKOV & SOROKIN 1960 is referred to but does not appear in References This may be the missing ref.:

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