PRELIMINARY NOTE ON THE DYNAMICS OF ^{14}C UPTAKEN BY BLACK SEA PHYTOPLANKTON

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RESUME

Dû aux differences qui existent concernant l'application de la méthode du ^{14}C afin de déterminer la production primaire planctonique, on a testé expérimentalement le moment du début de l'exposition et la durée nécessaire à l'exposition des flacons clairs et noirs; si le début de l'exposition s'intègre dans la période d'illumination suffisante du processus de la photosynthèse, et cependant se réalise l'équilibre dynamique de l'assimilation du ^{14}C, alors la durée nécessaire de l'exposition est de 4 - 5 heures.

ZUSAMMENFASSUNG

Wegen den unterschiedlichen Anwendungsmöglichkeiten derv ^{14}C-Methode für Primärproduktionsbestimmungen wurde der Beginnzeitpunkt der Exposition und die notwendige Expositionsdauer der durchsichtigen und opaken Glasfläschchen unter experimentellen Bedingungen probiert; wenn der Beginn der Exposition in der für die Photosynthese ausreichende Lichtperiode mitinbegriffen ist, und somit das dynamische Gleichgewicht der ^{14}C-Assimilation erreicht ist, beträgt die notwendige Expositionsdauer 4 - 5 Stunden.

As generally known, despite the wide use of the ^{14}C method (STEEMANN NIELSEN,1952) for planktonic primary production measurements, there still is no definite consensus concerning the best moment of sample collection, the starting moment and the exposure time span. Thus, it seems that most of the researchers prefer the exposure of the ^{14}C innoculated light and dark bottles for 6 - 8 hours (half a day) during the a.m. or p.m., other consider durations under 6 - 8 h to be more accurate, or of 4 h (e.g. between 1000 - 1400 h) or even under 4 h; on the contrary, others would use exposures of 24 h. The most suitable moment of ^{14}C innoculation during the day and the necessary duration of bottle exposure have been experimentally checked by determining the dynamics of ^{14}C uptake by the natural phytoplanktonic communities during various periods of the day.

MATERIAL AND METHOD

Phytoplankton was collected in the prebosphoric sector ($41^{\circ}32'3$ N, $28^{\circ}59'9$ E) and in the Caliacra sector ($43^{\circ}21'4$ N, $29^{\circ}01'3$ E) of the Black Sea.

To determine the daily dynamics of ^{14}C uptake by phytoplankton, the previously filtered (no.49 sieve) sea water samples were introduced in light

and dark 5 liter bottles with an initial ^{14}C radioactivity of 5o - 166 /uCi (= 1.9 - 6.2 MBq) l^{-1}.

The experiments started at o7oo a.m. going on for 24 h. Besides the main experiments (24 h), some extra simultaneous experiments of shorter duration were carried out between o7oo - 13oo h, 13oo - 2ooo h and 2ooo - o7oo h. At the same time the primary production was also dtermined by means of the usual light and dark bottle ^{14}C technique. The samples together with their controls were filtered on Synpore membrane filters no.4 (ϕ = o.85 /um). The ^{14}C activity of the filters was measured by means of a lead-screened end window Geiger-Müller counter.

RESULTS AND DISCUSSION

The results of the experiments on the ^{14}C uptake dynamics by the marine phytoplankton on a totally cloudy day (prebosphoric sector) and on a completely cloudless day (Caliacra sector) prove that the daily ^{14}C uptake evince the same tendency. As it results from the data on the ^{14}C presence in phytoplankton, the radioactivity of phytoplanktonic cells increases in direct ratio with the exposure duration during the initial 4 - 5 h, followed by a stage of slow increase, and finally it becomes constant. From the experiments it was clear that the modification of light intensity within sufficiently large limits (from 7,ooo to 1oo,ooo lux) does not bring about a modification of the ^{14}C assimilation speed by the natural phytoplanktonic communities.

The ^{14}C assimilation dynamic balance by phytoplankton started after 4 - 5 h from the beginning of the exposure. It was also found that if experiments with various exposure periods (4, 8, 12 and 24 h) are carried on at the same starting moment (o7oo h), the carbon flow speed will decrease with the increase of the exposure duration. The exposure duration must correspond to the linear component of ^{14}C uptake (of at least 3 - 4 h); but the bottles for primary production determination can be exposed practically at any moment of the light span of the day (within the interval when the dependence of ^{14}C assimilation to the light intensity does not occur and the inhibition of this process by light does not take place).

The results on the dtermination of ^{14}C uptake by phytoplankton under the above experimental conditions need further study for their use in aquatoriums with a richer phytoplanktonic biomass, in other seasons, and vertically as well.

REFERENCE:

STEEMANN NIELSEN (E.), 1952 - The use of radiocarbon (C^{14}) for measuring organic production in the sea. J.Cons.Perm.Int.Explor.Mer, 18, 117-14o.