ACTA BIOL. SZEGED. 40, pp. 133-135. (1994)

Short communication

GROWTH AND ETHYLENE EVOLUTION OF TISSUE CULTURES IN PRESENCE OF NITRITE

J. CSISZÁR and M. SZABÓ

Department of Plant Physiology, József Attila University, H-6701 Szeged, P.O.B. 654, Hungary

It was earlier established (ZSOLDOS et al., 1993) that the growth of wheat roots and shoots is inhibited by nitrite in the uptake solution. However, little information is available on the effects of nitrite on other kinds of growth. The experimental conditions in in vitro cultures are much more controlled, but the cells are not organized as in in vivo tissue. Thus, correlative influences are excluded. Tissue cultures are suitable and useful objects for the study not only of cell enlargement, but also of cell division.

The present paper reports on the effects of nitrite on in vitro callus cultures of *Nicotiana tabacum* cv. Petit Havana, SR1. The calli were grown on Murashige-Skoog basal medium (MURASHIGE and SKOOG, 1962) containing 0.2 μM kinetin, 17.14 μM indole-3-acetic acid and 0.45 μM 2,4- dichlorophenoxyacetic acid. The medium also contained nitrogen in the form of NH_4NO_3 (20.6 M) and KNO_3 (18.79 M), and nitrite was added to the medium in a concentration of 0.4-9.4 mM in the form of KNO_2. The fresh weight was measured on day 21 after inoculation.

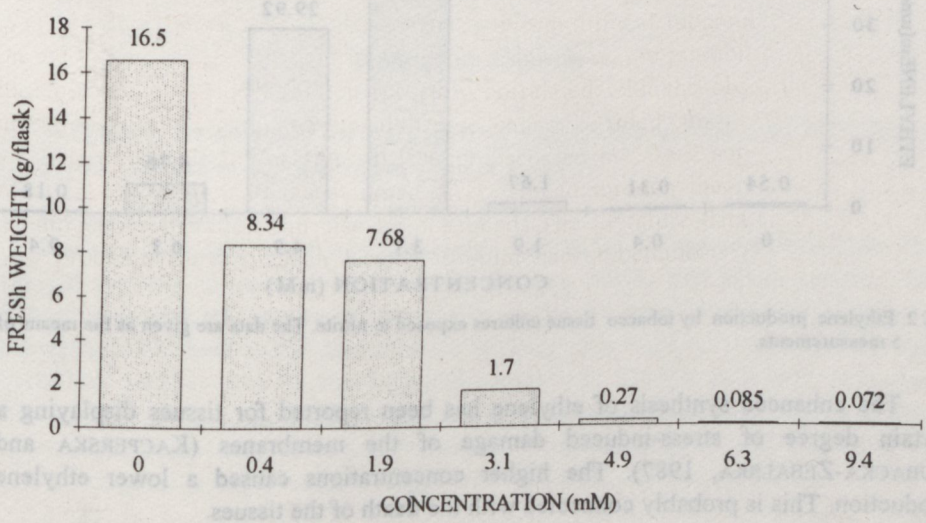

Fig. 1. Effects of nitrite on the growth of *N. tabacum* tissue cultures. Values presented are the means of 7-10 measurements.

Nitrite strongly inhibited the growth and the proliferation of the cultures (Fig. 1). When only 0.4 mM nitrite was present in the medium (this concentration is equivalent to 1/50 of the nitrate in the MS medium), the growth of the cultures was inhibited to an extent of about 50% as compared with the control (without nitrite), and there was no proliferation in the presence of 4.9 mM nitrite.

Nitrite could be considered a kind of stress factor. In addition to other physiological functions, ethylene, a gaseous plant hormone, is associated with a wide variety of stress responses in higher plant cells, too. Earlier experiments indicated that ethylene production by tobacco calli exhibits a slight peak on the 6th-8th day after inoculation (KÖVES and SZABÓ, 1987). The ethylene evolution of 7-day-old calli grown in basal medium containing different concentrations of nitrite was measured by gas chromatography at 80 °C with a flame ionization detector. The culture flasks were sealed by gas-tight caps until measurement. The total accumulation of ethylene was determined after a 24-h incubation. On increase of the nitrite concentration of the medium, the ethylene production slightly rose up to 1.9 mM nitrite (Fig. 2). The ethylene evolution suddenly multiplied for calli grown on medium containing 3.1 mM nitrite. This nitrite concentration resulted in a significant decrease in the growth of the calli (Fig. 1).

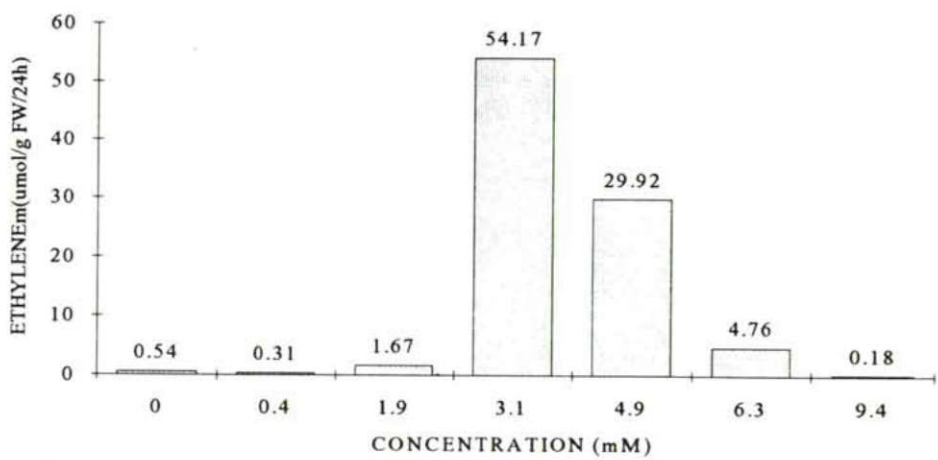

Fig. 2. Ethylene production by tobacco tissue cultures exposed to nitrite. The data are given as the means of 5 measurements.

The enhanced synthesis of ethylene has been reported for tissues displaying a certain degree of stress-induced damage of the membranes (KACPERSKA and KUBACKA-ZEBALSKA, 1987). The higher concentrations caused a lower ethylene production. This is probably connected with the death of the tissues.

References

KACPERSKA, A., and KUBACKA-ZEBALSKA, M. (1987): Formation of stress ethylene depends both on ACC synthesis and on the activity of free radical-generating system. - Physiol. Plant. *77*, 231-237.

KÖVES, E. and SZABÓ, M. (1987): Ethylene production in habituated and auxin requiring tobacco callus cultures. Does ethylene play a role in the habituation? - Physiol. Plant. *69*, 351-355

MURASHIGE , T. and SKOOG, F. (1962): A revised medium for rapid growth and bioassay with tobacco tissue cultures. - Physiol. Plant. *15*, 473-497

ZSOLDOS, F., HAUNOLD, E., VASHEGYI, Á. and HERGER, P. (1993): Nitrite in the root zone and its effects on ion uptake and growth of wheat seedlings. - Physiol. Plant. *89*, 626-631.