

BRIEF COMMUNICATION

Regulation of Glutamate Dehydrogenase Level in Excised Pea Roots by Some Exogenously Supplied Compounds with Auxin Activity

J. SAHULKA and ALENA GAUDINOVÁ

Institute of Experimental Botany, Czechoslovak Academy of Sciences,
Praha*

Abstract. Besides IAA, other compounds with auxin activity (of both indole and non-indole nature) can also cause an increase in glutamate dehydrogenase level in excised pea roots. The effect of these substances is probably not mediated by ethylene, depends on proteosynthesis, is independent of the regulatory effect of sugars and need not be influenced by the antagonism between auxins and cytokinins.

It has been known that indole-3-acetic acid (IAA) can increase the level of glutamate dehydrogenase (GDH) in explants derived from cambial tissues of *Cichorium* roots (BESEMER 1968), in soybean callus explants (SOULEN and OLSON 1969) and in isolated pea roots (SAHULKA 1972). The aim of this paper was to ascertain if other substances, related to IAA either in composition or in the effect, can influence GDH level similarly as IAA.

For this reason the effects of naphthalenacetic acid (NAA), indolepropionic acid (IPA), indolebutyric acid (IBA), indolelactic acid (ILA) and of ethrel were followed. Simultaneously the effect of kinetin alone and of kinetin in combination with NAA and IPA was also investigated. NAA, IPA, IBA and ILA were dissolved by adding KOH, ethrel was also neutralized by KOH; the resulting pH value was in all the cases approx. 6; thus, the results were not affected by an increase in H^+ concentration in the medium. The above mentioned substances were added to the medium after cold bacterial filtration just before the incubation of root segments, kinetin before autoclaving the liquid medium. The experiments were carried out with 3 cm long apical segments of primary root isolated from 6 days old pea seedlings (*Pisum sativum* L. cv. 'Raman') germinated under aseptical conditions, as described earlier (SAHULKA 1972); the inorganic liquid medium was the same as well. The effect of the above mentioned compounds was followed in both the presence (20 g sucrose l^{-1}) and the absence of sugar in the medium to establish if auxins do not affect GDH level indirectly via the mechanism regulated by sugars (see SAHULKA *et al.* 1975). Ethrel was

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*Address: Ke dvoru 15/16, 166 30 Praha 6-Vokovice, Czechoslovakia.

included into the experiments to ascertain if the increase in GDH level caused by substances with auxin activity is mediated by ethylene. GDH activity was determined spectrophotometrically according to NADH_2 oxidation.

A statistically significant unambiguous increase in GDH activity was caused by higher concentrations of NAA, IPA and IBA (Fig. 1). The effect of concentrations lower than 10^{-6} M was not statistically significant, 10^{-3} M concentration was toxic. The effect of ILA was slight and statistically sig-

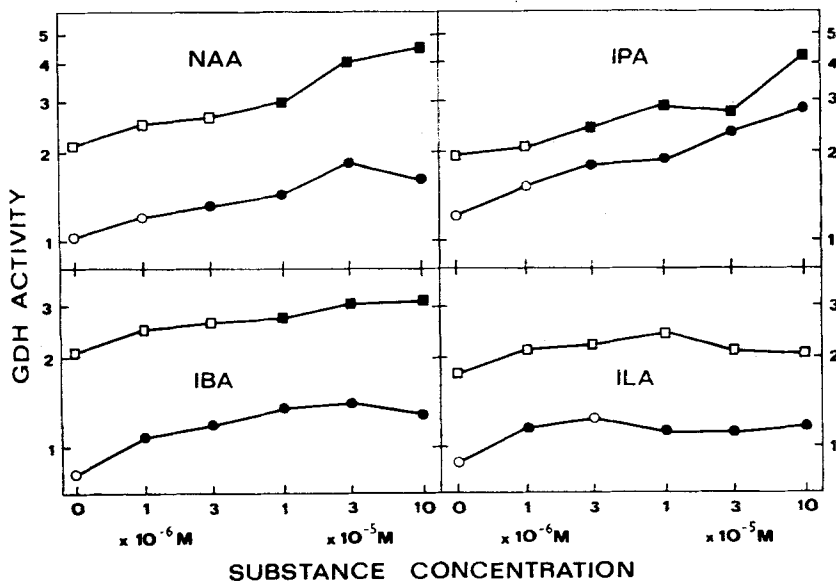


Fig. 1. The effect of naphthaleneacetic acid (NAA), indolepropionic acid (IPA), indolebutyric acid (IBA) and indolelactic acid (ILA) on glutamate dehydrogenase activity ($\Delta \text{E g}^{-1}$ fresh weight min^{-1}) in excised pea roots. Abscissa: substance concentration; ordinate: GDH activity. ○ medium containing sugar (20 g sucrose per litre), □ medium without sugar. Full points ● ■ denote that the difference from the control (no substance added) is statistically significant (starting at the P 0.05 level).

nificant only in the medium containing sugar, in which the differences between individual experiments were less pronounced; ILA also shows the lowest auxin activity among the compounds investigated (THIMANN 1958). The observed effect of the substances with auxin activity was independent of the presence or absence of sugar in the medium (Fig. 1). Ethrel in concentration range from 3×10^{-5} M to 1×10^{-3} M had no influence on GDH level at all (results not presented). Kinetin (0.1; 1 and 5 ppm) did not influence GDH level irrespective of the presence (20 g sucrose l^{-1}) or absence of sugar in the medium and did not abolish the increase in GDH level caused by NAA and IPA (results not presented). Actidione inhibited the increase in GDH level caused by NAA and IPA.

The results presented here indicate that, besides IAA, other substances with auxin activity (of both indole and non-indole nature) can also cause an increase in GDH level and that the increase roughly corresponds to their

auxin activity. The effect of these compounds is probably not mediated by ethylene (as deduced from the experiments with ethrel), depends on proteo-synthesis, is independent of the regulatory effect of sugars and need not be influenced by the antagonism between auxins and cytokinins. However, the relatively high concentrations (from the point of view of the roots) of exogenously supplied substances needed for a significant increase in GDH level in isolated roots indicate that endogenous substances with auxin activity probably do not play a significant role in the regulation of GDH level in the roots of intact normally growing plants.

Acknowledgement

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BOOK REVIEW

BURNS, G. W.: *The Plant Kingdom*. — Macmillan Publishing Co., Inc. New York, Collier Macmillan Publishers London 1974. 540 S. £ 6.95.

Professor der Botanik und Bakteriologie der Ohio Wesleyan University, GEORGE W. BURNS, ist der Verfasser dieses Lehrbuchs der systematischen Botanik. Er war bemüht ein phylogenetisches System zusammenzustellen, d.h. die Pflanzen nach ihrer phylogenetischen Entwicklung zu gruppieren. Mit diesen Fragen der Evolution und Klassifikation des Pflanzenreichs befasst sich der Verf. im 1. Kapitel des Buches. In den weiteren 19 Kapiteln werden einzelne Pflanzengruppen behandelt, begonnen mit Bakterien und blaugrünen Algen bis zu den blühenden Samenpflanzen. Jedes Kapitel enthält: die charakteristischen Hauptmerkmale der Gruppe, Besonderheiten in Anatomie und Morphologie, Stoffwechsel, Reproduktion, praktische Bedeutung, Taxonomie und Evolution und zum Schluss die Beschreibung einiger typischer Vertreter. Am Ende jedes Kapitels stehen Zusammenfassungen und Kontrollfragen, an Hand welcher der Leser seine erworbenen Kenntnisse testen kann. Das Buch ist reich durch Photographien und Skizzen sehr guter Qualität illustriert, besonders instruktiv sind die Bilder aus dem Rasterelektronenmikroskop. In einem „glossary“ am Ende des Buches erklärt der Verf. die wichtigsten botanischen Termini, ein Sachregister ermöglicht ein schnelles Auffinden des Gesuchten.

INGRID TICHÁ (Praha)