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BRIEF COMMUNICATION

A Growth Inhibitor from *Castanea sativa* Mill. Cuttings

ADELINA VAZQUEZ, M. D. V. GESTO and E. VIEITEZ

Plant Physiology. Instituto de Investigaciones Agrobiológicas de Galicia.
C.S.I.C. Santiago de Compostela*

Abstract. The effect on growth of an aliphatic acid isolated from *Castanea sativa* cuttings was studied as well as its interaction with IAA. The *Avena* coleoptile straight growth test was used. A growth inhibition was observed in a wide range of concentrations. The compound lowered or suppressed the IAA induced elongation of the *Avena* coleoptile growth sections.

During a comprehensive study on endogenous growth substances of woody cuttings from easy- and difficult-to-root plants, an alifatic acid was isolated from an inhibiting zone detected by the *Avena* coleoptile growth test on the chromatograms of *Castanea sativa*, a difficult-to-root plant (VIEITEZ *et al.* 1967). Endogenous chemical inhibitors had been proposed to explain the lack of root formation capacity of certain difficult-to-root plants (TIMMAN and KOEPFLI 1935, FADL *et al.* 1963, LIBBY and CONKLE 1966, VIEITEZ *et al.* 1966a, REUVENI and ADATO 1974).

As the alifatic acid isolated from the inhibiting zone of the chromatograms of chestnut together with some phenolics not having previously received sufficient attention, it seemed of interest to make a more detailed study of the biological effects of this compound on the extension growth and its interactions with IAA.

Woody cuttings of chestnut previously frozen at −45 °C were sliced and extracted with methanol at 0 to 2 °C for 24 h. Then the liquid was filtered off and the extraction repeated twice. The combined extracts were evaporated and the aqueous residue adjusted to pH 3 with 6N HCl and extracted with ether. The ethereal phase was washed with 0.5 N Na_2CO_3 and the aqueous basic solution acidified again and back-extracted with ether. The ether extract was chromatographed on Whatman 3 MM paper using isopropanol : ammonia : water (10 : 1 : 1) as solvent and assayed by the *Avena* coleoptile straight-growth test. The inhibiting zone detected at Rf 0.6—0.85 was

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* *Present Address:* C.S.I.C. Apdo. 122. Santiago de Compostela, Spain.

eluted and extracted with $NaHCO_3$. The $NaHCO_3$ solution was acidified, extracted with ether, chromatographed on paper in butanol saturated with 1% ammonia as solvent and bioassayed. The alifatic acid was isolated from the inhibiting zone at Rf 0.45—0.6.

The *Avena* coleoptile straight-growth test was performed as before (VIEITEZ *et al.* 1966b). Briefly: Seeds (*Avena sativa* L. cv. Victory) were soaked in distilled water for 2 h and grown for 72 h at 25 °C in the dark except for 12 h of exposure to red light. Sections of 4 mm length were cut from 2.5 cm long coleoptiles at 4 mm below the tip. After being washed in distilled water

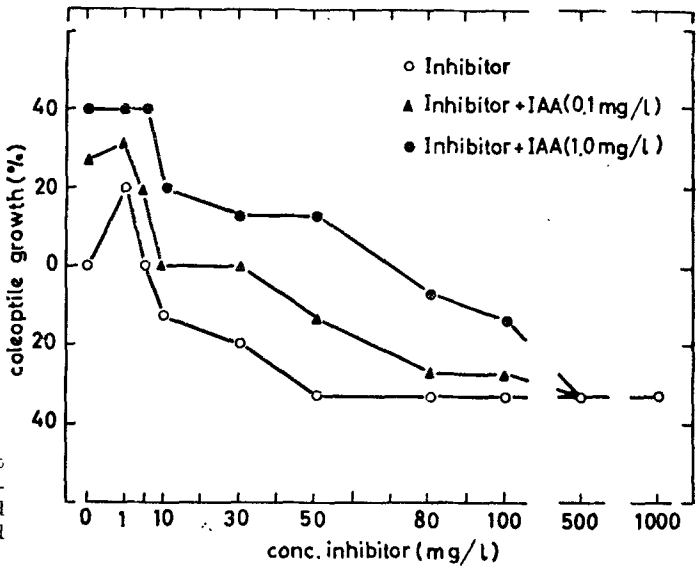

Fig. 1. Growth of oat coleoptile sections in presence of the inhibitor and combinations of IAA and inhibitor.

for 2 h, the sections were distributed in dishes (10 per dish) with 1 ml of the solution test. Quantities of the alifatic acid from 1 to 1000 mg l^{-1} were tested alone or with 0.1 mg l^{-1} or 1.0 mg l^{-1} of IAA. After incubation for 24 h, at 25 °C, the sections were measured and the results expressed following PILET and DEBOUCHET (1962).

The alifatic acid showed an inhibitory effect on the growth of the coleoptile at concentrations higher than 10 mg l^{-1} as can be seen in Fig. 1. The inhibition reached a maximum between 50 and 1000 mg l^{-1}. It is clear that the inhibitory activity of this compound is low and it does not increase with increasing concentration. It is not a toxic compound as no signs of toxicity were observed in the wide range of concentrations tested. When IAA was added, low concentrations of the inhibitor supressed or lowered the effect of IAA on the elongation of the coleoptiles, this being the most important property of the inhibitor so far determined. IAA clearly reduced the growth inhibition caused by high concentrations of the inhibitor, but it had no effect on the highest concentration tested (1000 mg l^{-1}).

From these results it seems that this compound could be a natural growth regulating substance in chestnut and that it might be correlated with the

lack of rootability of this plant, as in cuttings from 3 month old plants which are able to root, no significant zone of inhibition of growth was detected, whereas it was apparent when the plant became older (VIEITEZ *et al.* 1966a).

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BOOK REVIEW

SUTCLIFFE, J. F., PATE, J. S. (ed.): **The Physiology of the Garden Pea.** — SUTCLIFFE, J. F. (ed.): Experimental Botany: An International Series of Monographs Vol. 12. Academic Press, London—New York—San Francisco 1977. 500 pp. £ 18.5, US $ 36.10.

This book published as Volume 12 of Experimental Botany: An International Series of Monographs, is unique in its subject and scope. In contradiction to traditional textbooks of plant physiology, in which individual processes and interactions between them are derived from various plant species, this book is a comprehensive survey of the physiology of one of the most useful experimental plant material — garden pea (Pisum sativum L.).

In 16 chapters the contributors deal with various physiological features of this valuable material. The introductory chapter, written by the first editor, J. F. Sutcliffe, is a well overviewed History of the Use of the Pea in Plant Physiological Research; the second chapter — Classification, Genetics and Breeding is written by G. A. Marx. In 11 chapters attention is paid to physiological aspects of separate phases of ontogenesis and their characteristic structures and processes. The two chapters on — Nodulation and Nitrogen Metabolism and Photosynthesis and Translocation are relatively comprehensive. The latter deals with the exchange of carbon dioxide and its components, *i.e.* photosynthesis and respiration, structures and pathways of assimilate production and translocation. Unfortunately, the corresponding specialized chapter on water relations is lacking as well as the chapter on experimental cultivation and environmental requirements in general, and the conclusions of individual chapters, applicable to experimental conditions, are too brief or missing. The last chapter — The Pea as a Crop Plant deals with practical questions namely production and husbandry of pea as a significant producer of proteins, and with the possibilities of production improvement. Each chapter ends with a list of references, containing on an average nearly one hundred references.

This book will be certainly welcomed as a valuable compendium of information on this commonly used experimental material. It is very well arranged and printed, illustrated with 27 tables and 137 figures, diagrams and excellent photographs, and supplemented with a detailed subject index. Although the book was written above all as a monograph on pea for researchers working with this material, it will be appreciated by many other plant physiologists, especially by those interested in plant development and interactions between various organs.

JARMILA SOLÁROVÁ (*Praha*)