

EFFECT OF ACTINOMYCIN D AND 2-THIOURACIL ON THE ELONGATION OF OAT COLEOPTILES INDUCED BY DIFFERENT PHENOLIC ACIDS

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Introduction

It is known that high concentrations of some phenolic acids occurring naturally in plants inhibit and lower, physiological concentrations of them promote the growth. It is also established that these compounds show an interaction with indoleacetic acid (IAA) as antagonists or synergists (VARGA, 1957; VARGA és KÖVES, 1959; TOMASZEWSKI, 1964; KÖVES, 1965). The possible basis of the interaction is the promotion or inhibition of the IAA-oxidase, however, this explanation can be not quite satisfying in some cases (KÖVES, 1965; KÖVES, SIROKMÁN és MILASSIN, 1972).

Our previous examination showed that low concentrations of some phenolic acids enhance the incorporation of 14-C-leucine into the protein fraction of bean hypocotyl segments and this effect of these compounds is similar to that of the phytohormones.

These results provide a possibility to suppose that — similarly to the hormones — one of the essential parts of the action of phenolic acids in the growth is the regulation of protein synthesis. In present paper the authors wish to investigate how specific inhibitors of protein synthesis influence the effect of some phenolic acids on the elongation of coleoptile segments.

Materials and Methods

The compounds applied in the experiments were: o-coumaric-, salicylic-, gallic-, p-oxi-benzoic-, ferulic- and chlorogenic acids in concentrations 10^{-3} , 10^{-4} , 10^{-5} and 10^{-6} M.

Twentyfive segments of *Avena coleoptile* (5 mm) were floated as test-material in a solution containing different combinations of Actinomycin D (1, 10 and 20 $\mu\text{g}/\text{ml}$) or 2-thiouracil (10^{-3} , 10^{-4} and 10^{-5} M) with 10^{-4} , 10^{-5} and 10^{-6} M phenolic acid, up to 5 ml of phosphate-buffer pH 6.5. The incubation took place for 24 hours 24 °C, followed by measurement of the elongation of coleoptile segments.

Results and discussion

The growth-promoting effect of the applied phenolic acids is the highest at 10^{-6} M and it takes about 20%. Almost in all combinations examined, 1 $\mu\text{g}/\text{ml}$ of Actinomycin D was sufficient to inhibit the growth induced by phenols but in some cases the inhibition is significant only at 10 $\mu\text{g}/\text{ml}$ of Actinomycin D concentration, because of the high value of the standard devi-

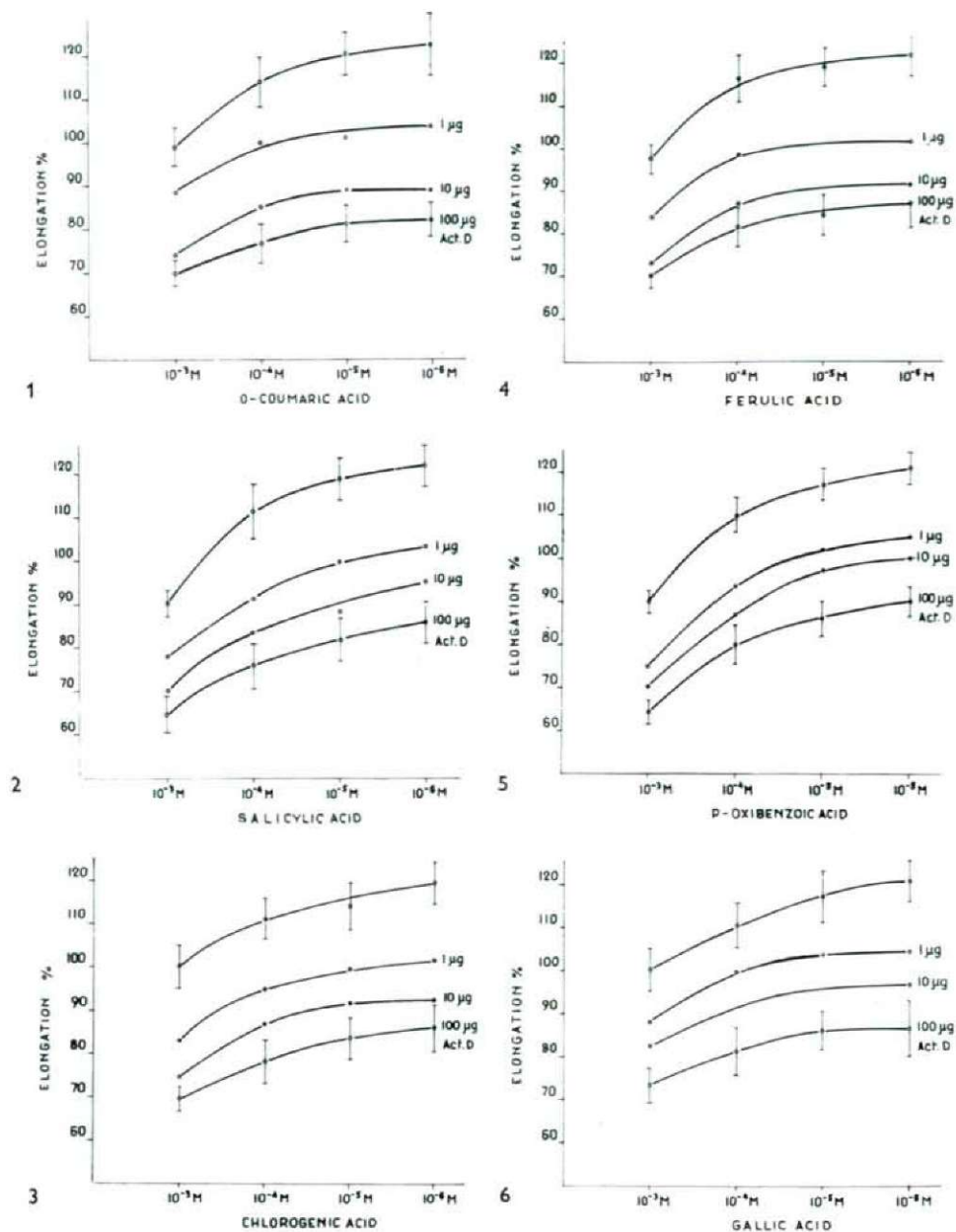


Fig. 1—6. Effect of Actinomycin D in different concentrations on the elongation induced by o-coumaric- (1), salicylic-, (2) chlorogenic-, (3) ferulic-, (4) p-oxi-benzoic- (5) and gallic acid (6).

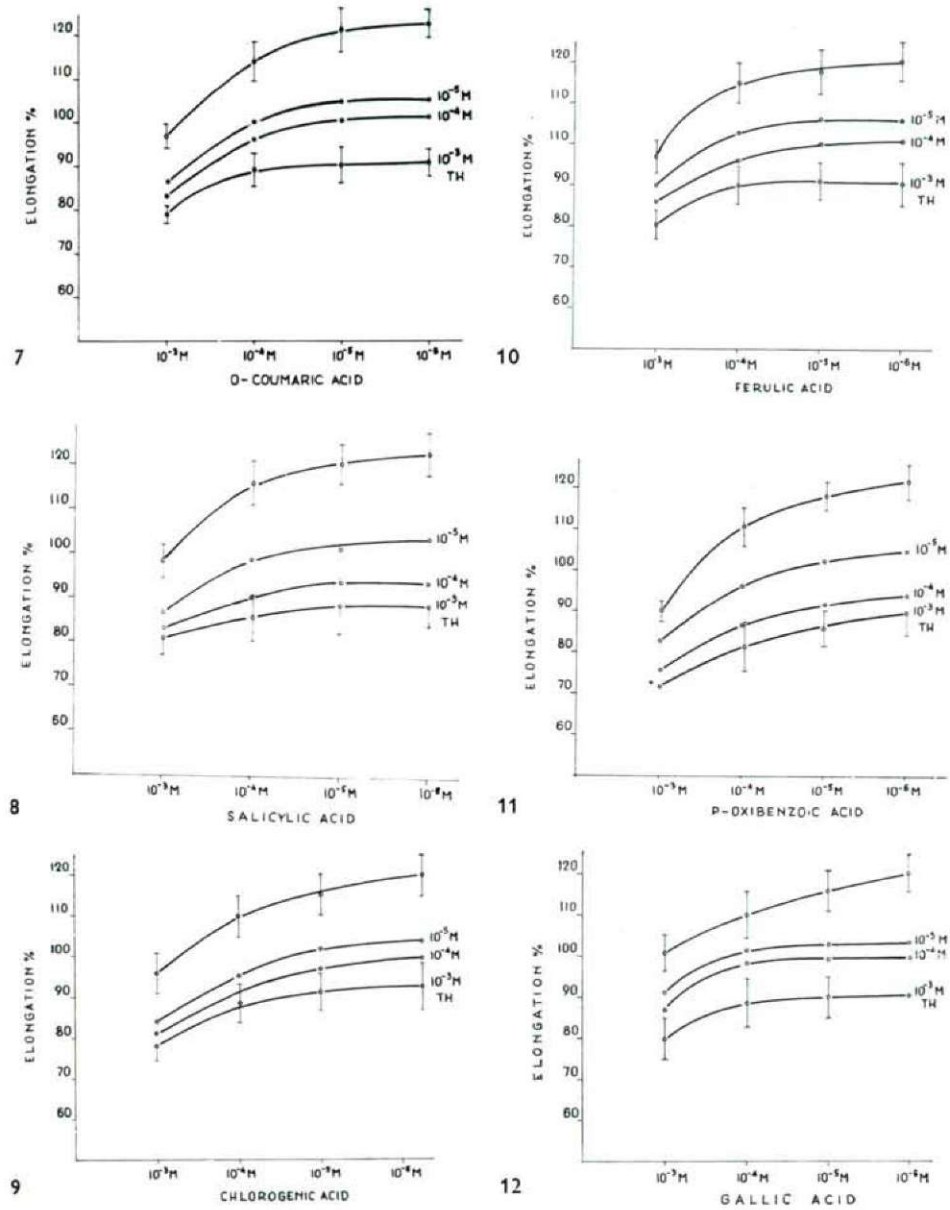


Fig. 7—12. Effect of 2-thiouracil in different concentrations on the elongation induced by o-coumaric-, (7) salicylic-, (8) chlorogenic-, (9) ferulic-, (10) p-oxi-benzoic- (11) and gallic acid (12).

ation. The results obtained at higher concentrations of Actinomycin D show that the inhibitor decreases not only the growth induced by phenols, but also the normal growth measured in the control segments.

2-Thiouracil at 10^{-4} M concentration has some inhibiting activity while at 10^{-3} M inhibits the growth induced by phenolic acids significantly in all of the experiments.

In the investigations described above, it is proved that the growth promotion induced by phenolic acids can be prevented by inhibitors of protein synthesis. The phenolic acids in lower concentrations have an effect resembling that of the phytohormones in this respect too. This effect is however, slighter than that produced by the phytohormones. In some cases the auxin synergisms can be explained by this properties of the phenolic compounds.

The result obtained complete the knowledges on the mode of action of phenolic acids, providing some informations about the effects produced by its physiological concentrations.

Summary

Growth promotion induced by six naturally occurring phenolic acids (o-coumaric-, salicylic-, ferulic-, p-oxi-benzioc-, chlorogenic- and gallic acid) can be inhibited by $10 \mu\text{g/ml}$ Actinomycin D and 10^{-4} M 2-thiouracil. Increasing the concentration of the inhibitors with one magnitude the normal elongation of the coleoptils can be inhibited too. In addition to the results of our earlier investigations, present data also show that the effect of the physiological concentrations of the above mentioned phenolic compounds on the protein metabolism resembling that produced by phytohormones.

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