ACTA AGROBOTANICA
vol. 34, z. 2 — 1982
235 - 238

The effect of abscisic acid, coumarin, scopoletin and cinnamic acid on the formation of roots in isolated potato sprouts

M. BIELIŃSKA-CZARNECKA, A. BANAŚ, T. BOREK

Department of Plant Physiology, University of Agriculture and Teachers College, Prusa 12, 08-110 Siedlce, Poland

(Received: March 1, 1980)

Abstract

It has been found that low concentrations of ABA (0.001-0.01 mg l^{-1}, coumarin (0.01-1 mg l^{-1}), scopoletin (0.01-5 mg l^{-1}), and cinnamic acid 0.01-10 mg l^{-1}) have a stimulating effect on the number and weight of roots in isolated sprouts in cultures in vitro. Higher concentrations of these compounds inhibit rooting.

INTRODUCTION

ABA as well as other phenolic compounds may stimulate rhizogenezis. ABA stimulated rooting of bean and English Ivy cuttings in concentrations from 1 to 100 mg l^{-1} and 1 to 10 mg l^{-1}, respectively (Ting-Yan Chin et al., 1969) and also that of lilac in 0.1 and 0.5 mg l^{-1} concentrations (Bojarczuk and Jankiewicz, 1975). ABA and p-coumaric acid stimulated rooting of isolated potato sprouts in cultures in vitro in the following concentrations: 0.04 and 0.2 mg l^{-1} (ABA), 10 mg l^{-1} (p-coumaric acid) (Rakitin and Khovanskaya, 1977). The aim of our experiment was to investigate the effect of the above mentioned compounds on the formation of roots in isolated potato sprout in cultures in vitro.

MATERIALS AND METHODS

The experiment was carried out in the years 1978/79. Aquous solvents of growth synthetic inhibitors were used. Isolated potato tip sprouts, cv. 'Pierwiosnek' served as testing material. Sprouts 20 mm long were separated from bulbs, sterilized in a 3% solution of oxygenated water for 10 min, washed 5 times in sterile distilled water and then placed in test-tubes containing sterilized agar culture medium (White, 1943) to which inhibitors at various concentrations were added. For control

plants, medium free of inhibitors was used. In each test-tube, one potato sprout was placed, preserving sterile conditions, next it was put in thermostat at the temperature 25°C for 5 days. After this period of time new roots were counted and weighed.

RESULTS

All tested growth inhibitors at low concentration stimulated root formation on isolated potato sprouts (Fig. 1). The stimulating effect of low-concentration inhibitors was more distinctly noticeable in the weight of formed roots (Fig. 2). For each concentration of inhibitors, the stimulation of root weight was generally higher than that of the number of roots. In the case of ABA, the range of concentrations stimulating the weight of formed roots was shifted toward higher concentrations, as compared with the range of concentrations stimulating the number of

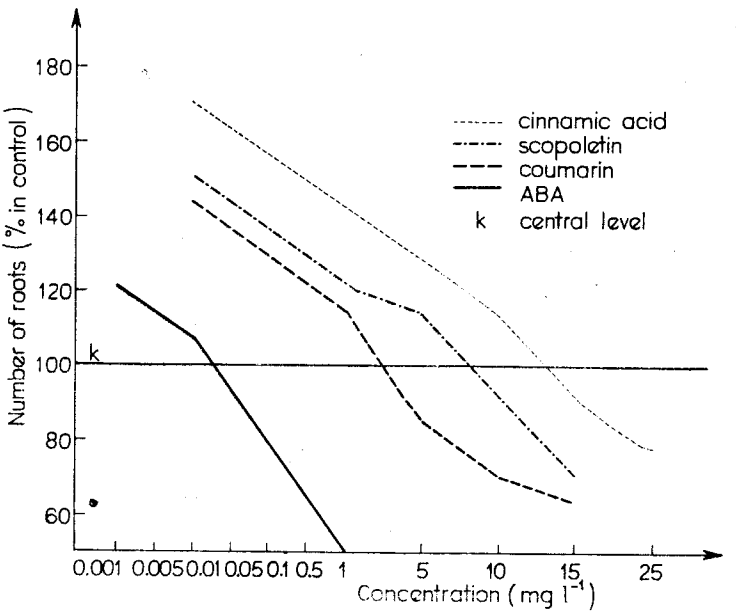

Fig. 1. Effect of growth inhibitors on the number of grown roots on isolated potato sprouts (3 replicates, 10 sprouts each)

roots. Neutral concentration, on the verge of stimulation and inhibition — was the lowest for ABA and then for coumarine, scopoletin and cinnamic acid. In each inhibitor, the lowest concentration of all used had the storngest effect on root formation.

This indicates that the optimum stimulating effect of the above mentioned regulators could be obtained at even lower concentrations.

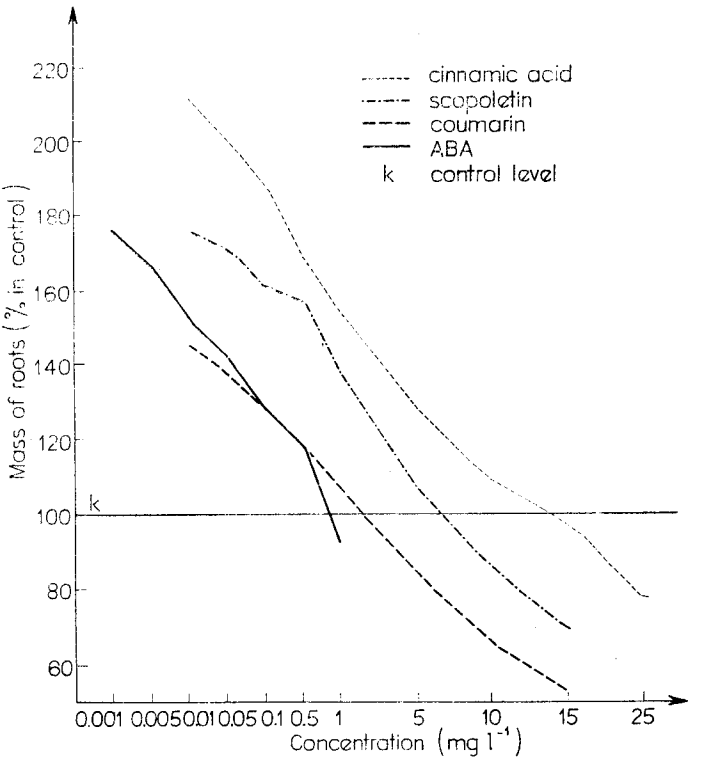

Fig. 2. Effect of growth inhibitors on the weight of grown roots on isolated potato sprouts (3 repliicates, 10 sporuts each)

DISCUSSION

Our present experiment made it possible to determine concentration of the studied compounds either stimulating or inhibiting rhizogenesis in the tested potato sprouts. For this purpose a fairly wide concentration range of abscisic acid and phenolic compounds was used. Our studies have also proved that a certain limit of concentration is not always the same for the increase in the number of roots and in weight. It is very interesting that these compounds influence rhizogenesis of potato sprouts at exceptionally low concentrations, usually much lower than those formely observed in various plants.

The obtained results demonstrate that a number of copounds so far considered to be inhibitors may stimulate rhizogenesis, when applied at an adequate concentration level. The test of potato sprouts, simple, very sensitive and easy to perform seems to be very satisfactory in the study of effect of this kind of compounds on rooting.

REFERENCES

Bojarczuk T., Jankiewicz L. S., 1975. Rooting of *Syringa vulgaris* L. softwood cuttings using auxin, vitamins, phenolic substances, indole, SADH and abscisic acid. Acta agrobot. 18: 229-239.

Ting-Yan Chin M., Meyer I., Beewers L., 1969. Abscisic acid. Stimulated rooting of stem cuttings. Planta 88: 192-196.

Rakitin Yu. V., Khovanskaya J. V., 1977. O rostingibirujushchem dejstvii gidrazida małeinovoi kisloty, abscizovoi i p-kumarovoi kislot na intaktnye i izolirovannye rostki klubnei kartofela. Fizjol. Rast. 24: 153-159.

White T. R., 1943. A handbook of plant tissue culture. The Ronald Press Co. NY.

Wpływ kwasu abscysynowego, kumaryny, skopoletyny i kwasu cynamonowego na tworzenie się korzeni u izolowanych kiełków bulw ziemniaka

Streszczenie

Stwierdzono stymulujący wpływ niskich stężeń ABA (0,001-0,01 mg l^{-1}), kumaryny (0,01-1 mg l^{-1}), skopoletyny (0,01-5 mg l^{-1}) i kwasu cynamonowego (0,01-10 mg l^{-1}) na liczbę i masę wytwarzanych korzeni u izolowanych kiełków bulw ziemniaka w kulturach in vitro. Wyższe stężenia inhibitorów hamowały tworzenie się korzeni.