

SMZ) disks (Nährböden und Chemie GmbH, Wesel) and Mueller-Hinton agar (MHA, Difco).

It was found that TMP, at a concentration over the range of 0.63 to 2.5 µg/ml, induced synthesis of *P. rettgeri* bacteriocins at titers comparable to those obtained with 1 µg/ml of MC (Table I); however, in SCASB, the defined medium, TMP yielded far lower titers of bacteriocins. Both b<sup>+</sup> *P. rettgeri* strains proved resistant against TMP (Table II); no detectable inhibition zones were obtained with TMP-SMZ disks on MHA; the control strain of *E. coli* yielded inhibition zones that measured 29 mm in diameter. It may be added that TMP was found to induce elaboration of group A bacteriocins (phage tails) of subgroups I and II of *Serratia marcescens*<sup>12</sup> as well, though at lower titers as compared with our two b<sup>+</sup> strains of *P. rettgeri* (unpublished results).

At the moment, we have no explanation for the seemingly paradoxical finding, namely that TMP at sub-inhibitory concentrations is an efficient inducer of defective prophage (phage tail bacteriocins) in b<sup>+</sup> strains of *P. rettgeri*, that are resistant to this drug, as determined

with conventional antimicrobial susceptibility tests. Most likely, the 2 strains of *P. rettgeri* examined are not completely, but rather 'relatively', resistant against TMP, thus allowing for subtle interactions between the drug and the cells' metabolism, with, among other(s), resultant production of phage tails.

**Zusammenfassung.** Zwei bacteriocinogene (Phagenschwänze) Stämme von *Proteus rettgeri* konnten mit subinhibitorischen Konzentrationen von Trimethoprim (0.63 bis 2.5 µg/ml) induziert werden.

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<sup>12</sup> W. H. TRAUB, Zentbl. Bakt. Hyg., I. Abt. [A] 222, 232 (1972).

## Antagonism Between Plant Growth Regulators in Pollen Tube Elongation of *Calotropis procera*

Abscisic acid is an inhibitory hormone found to be involved in control of growth regulation together with other naturally occurring growth promoters<sup>1</sup>. Studies with synthetic abscisic acid have shown that applications of the chemical caused inhibition of germination, cessation of extension growth, leaf senescence and formation of resting buds in woody species<sup>2</sup>. But contrary to these observations, recently abscisic acid has been reported to induce pollen tube elongation in *Calotropis procera*<sup>3</sup>. The possible role of abscisic acid in the regulation of pollen tube growth led us to study its interaction with growth-promoting hormones when applied in combination with the abscisic acid in culture medium exogenously.

Isolated pollinia, dissected out from fully opened flowers of *C. procera* were incubated in hanging drop cultures consisting of basal medium, 0.3 M sucrose (analar) with or without abscisic acid and other growth hormones (IAA, GA<sub>3</sub> and kinetin) separately and in combination with abscisic acid. The pollinia were allowed to germinate under the conditions of light received from two 40-watt fluorescent lamps hanging at a distance of

1 m. Each hanging drop culture contained 3 pollinia, and 3 replicates for each were run. The mean length of pollen tubes were measured after 24 h of incubation. In order to avoid genetical discrepancies, pollinia were obtained from flowers of one and the same plant.

It is evident from the results presented in the Table that all the growth hormones tested promoted the pollen tube elongation. The maximum promotion of pollen tube elongation was observed in basal medium containing 10 ppm GA<sub>3</sub>. The growth hormones when applied alone caused increase in tube length, but in combination with abscisic acid they acted antagonistically and greatly inhibited the elongation of the tube. It may be postulated that some sort of physiological antagonism exists between abscisic acid and other growth hormones studied as regards their role in pollen tube elongation of *C. procera*. Such antagonism between abscisic acid and GA<sub>3</sub> or abscisic acid and kinetin has been reported earlier in relation to plant growth<sup>1</sup>.

**Zusammenfassung.** Während Abscissinsäure allein das Pollenschlauchwachstum in *Calotropis procera* stimuliert, hebt sie in binärer Kombination mit Auxin, Gibberellinsäure (GA<sub>3</sub>) und Kinetin deren fördernde Wirkung teilweise auf.

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Growth of pollen tube in relation to different plant growth regulators

Treatment	Length of pollen tubes (µm)
Control	660 ± 140
ABA (1.0)	1110 ± 120
IAA (1.0)	909 ± 75
IAA (0.1)	872 ± 120
GA <sub>3</sub> (10.0)	1180 ± 180
GA <sub>3</sub> (1.0)	1050 ± 135
Kinetin (5.0)	740 ± 130
ABA+IAA (1+1)	360 ± 40
ABA+IAA (1+0.1)	285 ± 60
ABA+GA <sub>3</sub> (1+10)	393 ± 150
ABA+GA <sub>3</sub> (1+1)	480 ± 150
ABA+Kinetin (1+5)	440 ± 30

The number in parenthesis indicates concentration of the chemical in ppm.

<sup>1</sup> F. T. ADDICOTT and J. L. LYON, A. Rev. Plant Physiol. 20, 139 (1969).

<sup>2</sup> B. V. MILBORROW, Sci. Progr. 57, 533 (1968).

<sup>3</sup> S. N. SHUKLA and M. N. TEWARI, Indian J. exp. Biol. 11, 258 (1973).

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