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SHORT COMMUNICATION

Plant growth regulators from species differing in salt tolerance as affected by soil salinity

Summary

The effect of soil salinity on the level of growth regulators from species differing in salt tolerance was studied. It was found that NaCl salinity, as compared to non-saline control, increased the level of growth inhibitors in the leaves of *Zea mays* which completely neutralized the presence of growth promoting substances. The leaves of *Suaeda fruticosa* growing in saline soil indicated the presence of 'Inhibitor-A' and 'Inhibitor-B' whose growth retarding properties were similar to that of the inhibitors obtained from maize leaves.

Introduction

In non-halophytic plants the effect of NaCl-salinity on the levels of endogenous growth promoters [2 8 7 9] and growth inhibitors [4 5 6] have been reported. This communication gives an account of the level of growth regulators in salt-sensitive and salt-tolerant plants as affected by soil salinity.

Seeds of *Zea mays* L. (*cv.* Akbar), sensitive to NaCl-salinity, were planted in undrained plastic pots containing 4.2 kg sandy loam. The salinity was achieved by adding 150 meq/l NaCl prepared in half-strength Hoagland solution (pH 6.5) to field capacity. The pots were irrigated periodically with distilled water to field capacity. The plants were grown for 45 days in a growth chamber maintained at 22°C and 10 h light of 6000 Lux. The relative humidity ranged from 60 to 80 %. For the isolation of growth regulators, 6 g shoots of plants grown in saline and non-saline conditions were extracted with distilled water (10 ml/g fresh tissue) and the pH adjusted to 3 using 0.5 *N* H_2SO_4. This fraction was treated three times with peroxide-free ether and the pooled ether fraction was concentrated *in vacuo* over $CaCl_2$ in a desiccator at 22°C.

Ten g fresh leaves of *Suaeda fruticosa* Forsk, tolerant to NaCl salinity, were collected from the mature plants growing in saline soil having high sodium and low potassium contents at Karachi University Campus. Growth regulators were extracted from the crushed leaf sap as mentioned above.

The concentrated ether extracts were streaked on 10 cm wide strip of Whatman No. 1 paper and the chromatograms were developed at 22°C by descending chromatography in isopropanol : ammonia : water (10 : 1 : 1). When the solvent had moved to 30 cm from the starting point, the chromato-

grams were taken out, dried, cut into ten equal sections of 3 cm and assayed for growth regulators using wheat straight growth test of Nitsch and Nitsch [8].

The result presented in Fig. 1 (A) revealed the presence of growth promoting substances in a region of R_f values similar to IAA and a second promoter at R_f 0.8–1.0 in maize shoots grown in non-saline soil. The growth inhibiting substance was also found at R_f value 0.7. However, the growth promoting substances were completely neutralized by predominating amount of growth inhibiting substances in the shoots of maize grown in saline soil (Fig. 1 B). Instead the growth inhibitor (R_f 0.4–1.0) increased in quantity. Similarly Mizrahi *et al.* [5] reported the presence of ABA-like inhibitor (R_f 0.5–1.0) in the leaves of *Nicotiana rustica* grown under saline and non-saline conditions. They also found that the amount of inhibitor in the leaves of salinized plants increased substantially in low relative humidity, as also observed in the present investigation. Although the extraction procedure adopted in the present

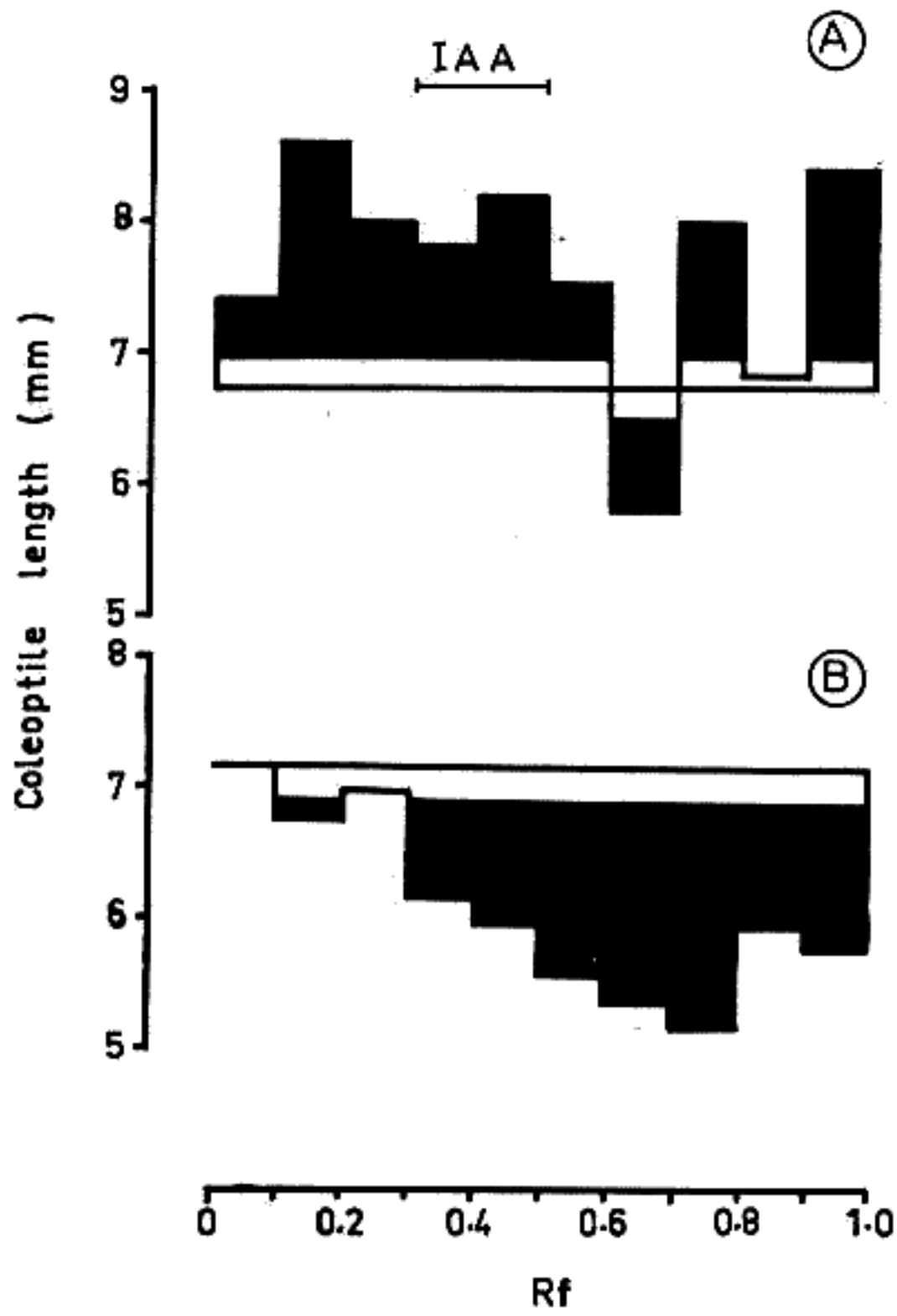

Fig. 1. The content of growth promoting and inhibiting substances in shoots of *Zea mays* grown in non-saline (**A**) and saline (**B**) soil. *Dark* areas are significantly different (P 0.001) from the control.

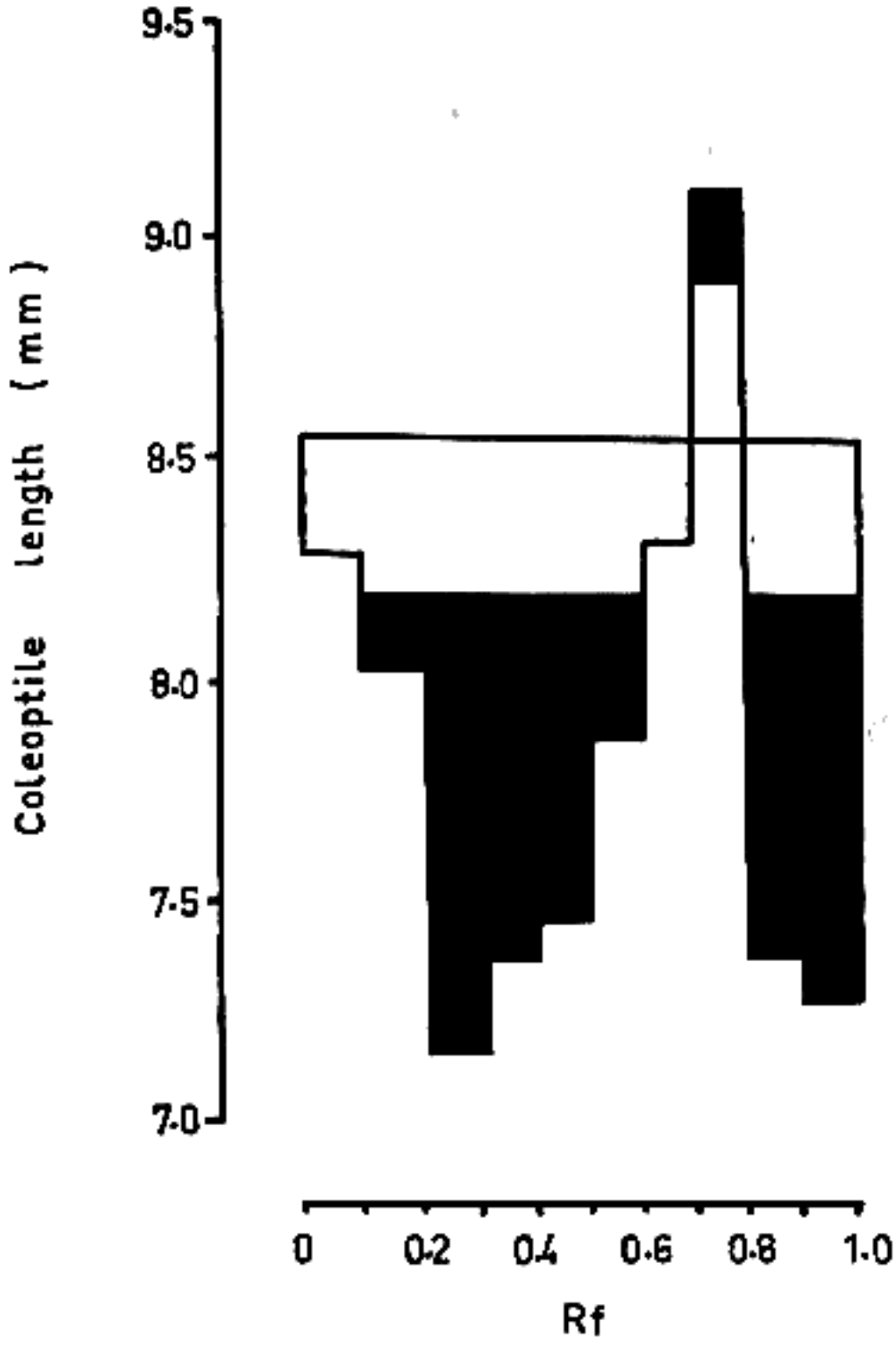

Fig. 2. The content of growth promoting and inhibiting substances isolated from 2 g fresh leaves of *Suaeda fructicosa* growing in saline soil. *Dark* areas are significantly different (P 0.001) from the control.

study was crude and that no correlation were made for the losses during purification, yet the results are in agreement with the highly purified fraction obtained by Mizrahi *et al* [5].

The result presented in Fig. 2 indicates the presence of 'Inhibitor-A' (R_f 0.1–0.6) and 'Inhibitor-B' (R_f 0.8–1.0) in the leaves of salt-tolerent *Suaeda fructicosa*. Effect of these inhibitors on the growth inhibition of intact wheat shoots was also studied. It was found that 'Inhibitor-A' and 'Inhibitor-B' substantially decreased the growth of young wheat shoots (Fig. 3) indicating their effectiveness in suppressing the growth of excised as well as intact tissues. Increasing concentration of inhibitors from maize (R_f 0.4–1.0) and Suæda (R_f 0.1–0.6 and 0.8–1.0) increased the growth depression of wheat coleoptiles (Fig. 4). When IAA @ 1 ppm was included in the growth medium, the activity of the inhibitors were partly or completely reversed.

It would, therefore, appear that growth inhibitors, having similar growth retarding effects on cell extension and IAA-induced growth of wheat coleop-

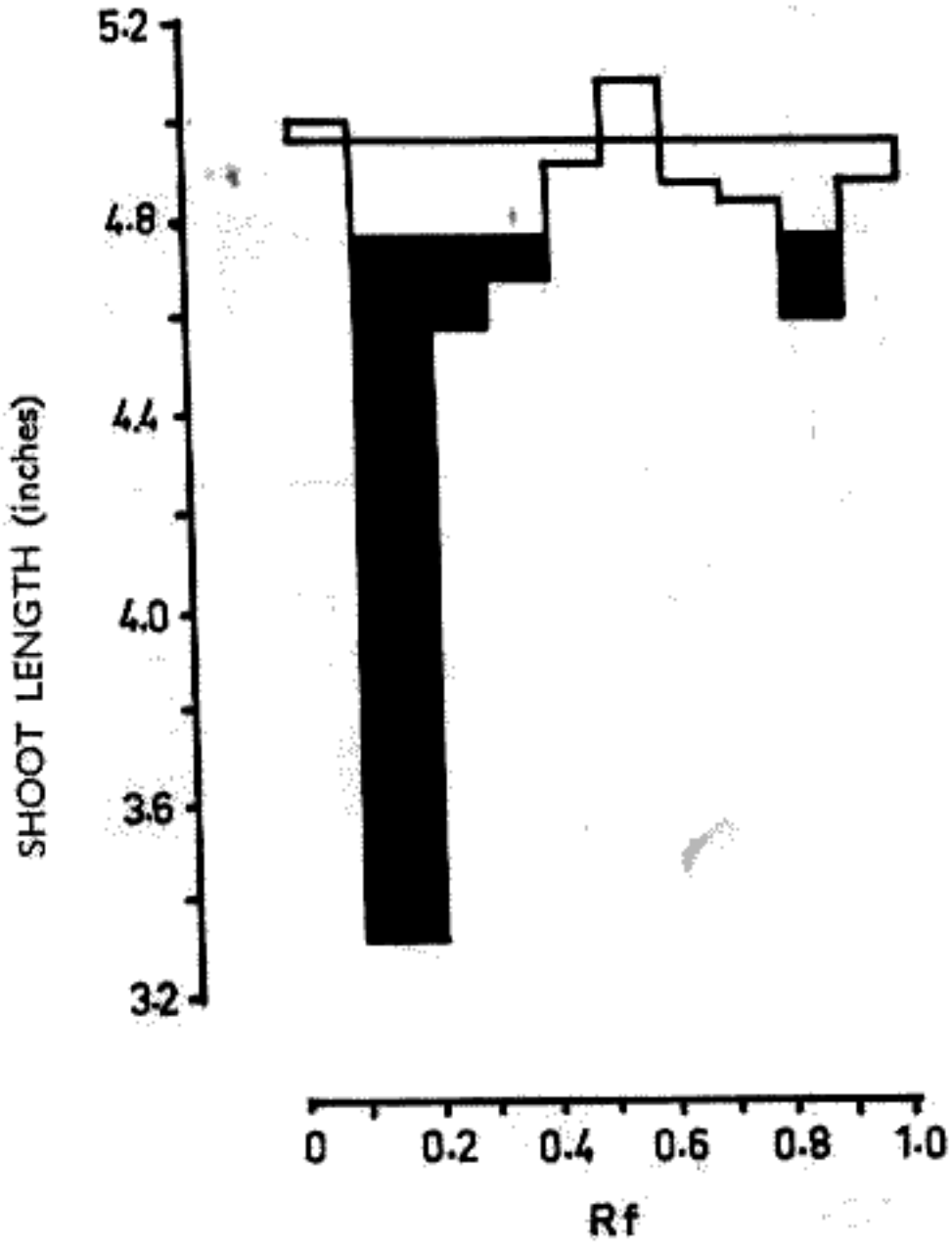

Figure 3

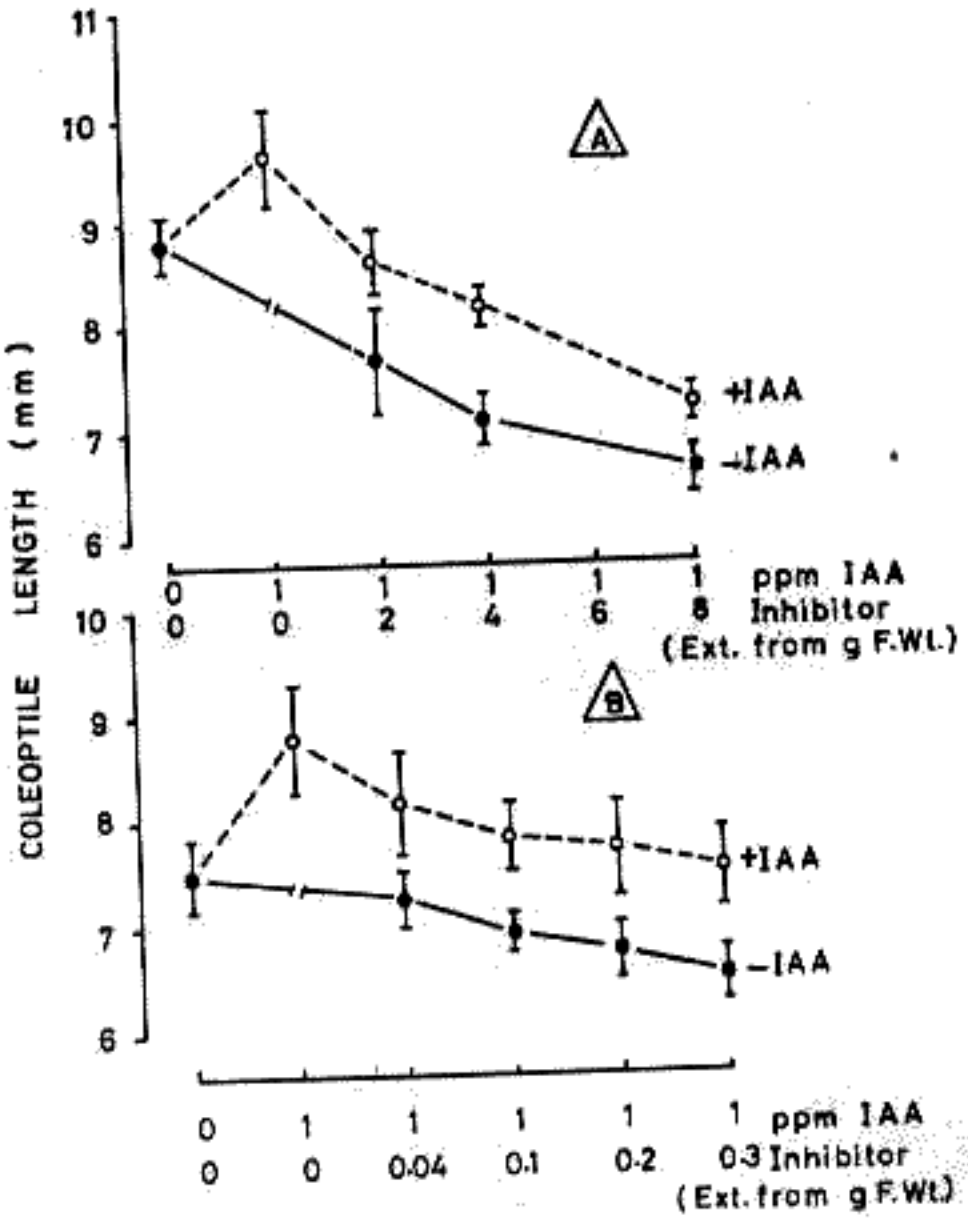

Figure 4

tiles, are produced in both the salt-sensitive *Zea mays* and salt-tolerent *Suaeda fructicosa*.

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Fig. 3. The effect of growth inhibiting substances isolated from 5 g fresh leaves of *Suaeda fructicosa* on the growth of young wheat shoots after 10 days of treatment. *Dark* areas are significantly different (*P* 0.001) from the control.

Fig. 4. The effect of inhibitors isolated from maize shoots (**A**) and Suæda leaves (**B**) on the growth of excised wheat coleoptiles in the presence and absence of 1 ppm IAA. The *vertical* lines indicate the 2 standard error limits.