

EFFECT OF SOME VITAMINS ON STOMATAL BEHAVIOUR IN *CLEMATIS GOURIANA* ROXB.

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THE mechanism of regulation of stomatal movements in isolated leaf epidermal strips is not well understood, although considerable amount of literature is available on this subject^{1,2}. The role of certain metabolites^{3,4}, growth substances⁵, rare earth elements⁶ and cations⁷ is on record. But there appears to be no work done on the effect of vitamins on the physiology of stomata in isolated epidermal peelings, despite the fact that vitamins are found endogenously in plants and act as coenzyme for several enzyme systems.

A critical assessment of responses of stomata against ascorbic acid and riboflavin in epidermal peelings of *Clematis gouriana* Roxb. is made in the present study

Leaves were cut from the *C. gouriana* plant grown in the college campus and immediately placed in water and kept as such for 12 hr to allow them to become fully turgid and also to ensure the complete closure of stomata. Epidermal peelings from lower surface were peeled and carefully transferred to different concentrations of ascorbic acid, riboflavin (0.1, 0.5, 1.0, 1.5, 2, 3, 5 and 10 ppm) and distilled water (control) both in continuous light having an intensity of 3.61×10^{-4} K Cal $m^{-2} s^{-1}$ and complete dark at $28^{\circ} \pm 2^{\circ}$ C for 3 hr. Width of 50 stoma was measured every time by a precalibrated microscope (15 \times 40 magnification).

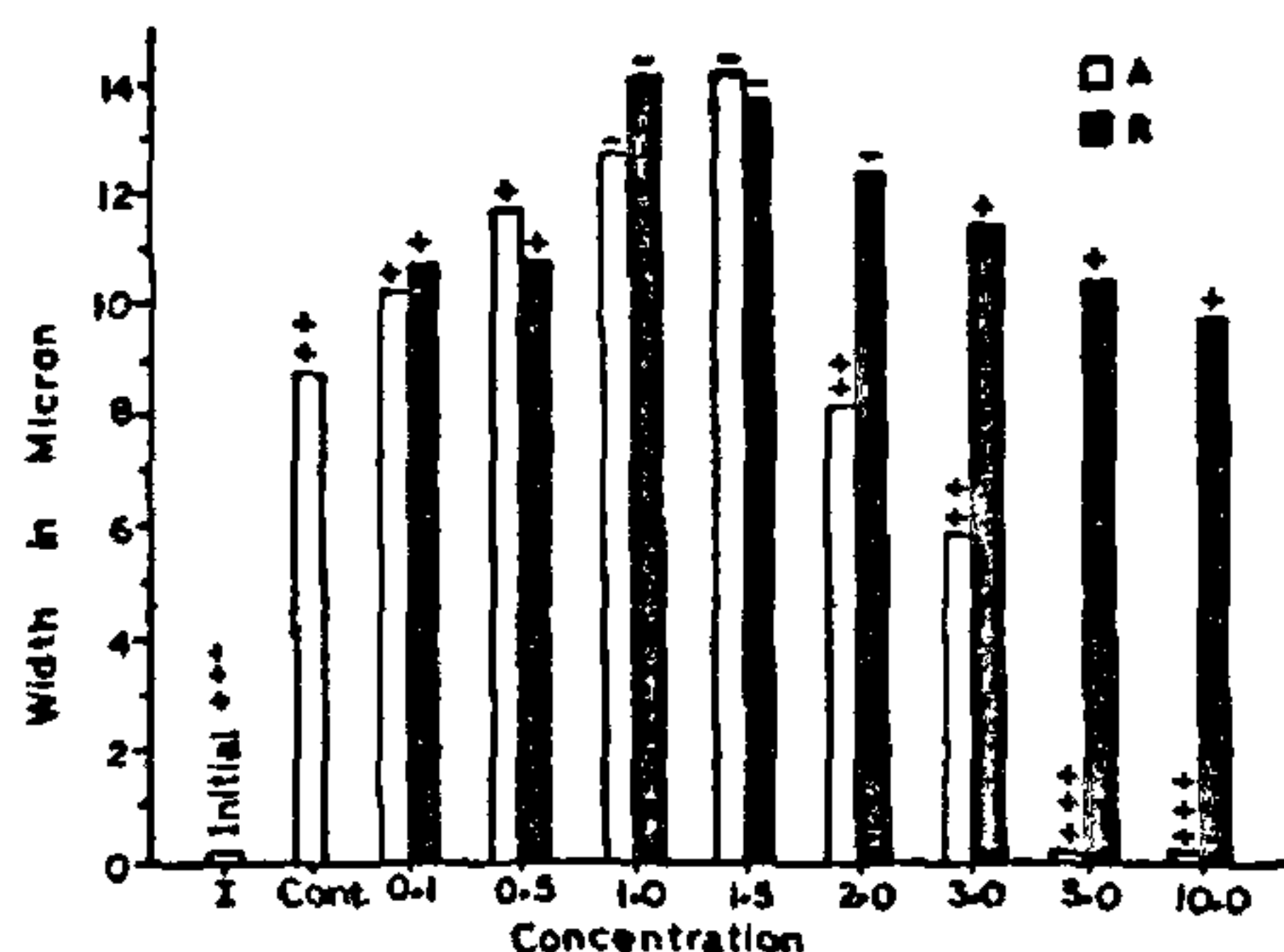


Figure 1. Effect of different concentrations (ppm) of ascorbic acid (A) and riboflavin (R) on the width of stomatal aperture and on starch (low = +, moderate = ++ and intense = +++) in guard cells of isolated leaf epidermal strips of *C. gouriana*.

The criterion for open stomata was the width of the stoma because the length did not show any significant change.

The presence of starch in the guard cells was determined by iodine test. Values regarding the width given in figure 1 are mean of triplicates.

The results revealed that both ascorbic acid and riboflavin promote the opening of stomata. The maximum pore width was $14.25 \pm 2.0 \mu$ in ascorbic acid at 1.5 ppm and $14.22 \pm 1.2 \mu$ in riboflavin at 1.0 ppm. At all higher concentrations the width of stoma was reduced and in ascorbic acid (5.0 ppm) they were completely closed. The area of stomatal pore was maximum in stomata placed in 1.5 ppm of ascorbic acid (247.94μ) and 1.0 ppm of riboflavin (249.56μ) whereas in the control it was 178.93μ . All sets placed in dark showed negative result i.e. the vitamins had no apparent effect on the opening of stomata.

It was also noticed that starch was heavily concentrated in guard cells of stomata which were completely closed; it was moderately concentrated in guard cells of stomata that had intermediate aperture but was not detectable in guard cells with open stomata (figure 1).

The vitamins are the constituents of the prosthetic groups or coenzyme of important plant enzymes which are probably necessary in the metabolism of all living cells. The present study revealed that exogenously applied vitamins promote the opening of stomata. It is concluded that the effect of ascorbic acid and riboflavin on opening of stomata follows a two phase concentration curve⁸ with promoting effect to low concentrations and inhibiting at higher concentrations, similar to the responses by auxins.

We are thankful to Dr K. B. S. Dhillon, Principal for facilities and to S. Gurdev Singh for his help.

20 October 1981; Revised 12 April 1982

1. Meidner, H. and Mansfield, T. A., *Physiology of stomata*, McGraw Hill, London, 1968.
2. Willmer, C. M. and Mansfield, T. A., *New Phytol.*, 1969, 68, 363.
3. Zelitch, I., *Proc. Nat. Acad. Sci., U.S.*, 1971, 47, 1423.
4. Sen, D. N., Bhandari, M. C. and Mathur, T., *Curr. Sci.*, 1972, 41, 553.
5. Bhandari, M. C., Yamdagani, N. and Sen, D. N., *Botanique*, 1974, 5, 35.
6. Harsh, L. N. and Sen, D. N., *Biochem. Physiol. Pflanzen (BPP)*, 1974, 165, 216.
7. Mathur, T. and Sen, D. N., *Flora*, 1973, 162, 180.
8. Zeeuw, D. de and Leopold, A. C., *Am. J. Bot.*, 1956, 43, 47.