inhibited by 0.5 mM NaN_3 or KCN (data not shown) which are known inhibitors of heme enzymes including catalase. Table 2 shows the catalase activity of 14 strains of water-isolated leptospires in course of classification in our reference laboratory, together with 8-azaguanine resistance and growth at 13 °C[3]. These strains behave as saprophytic leptospires as regards catalase activity, growth at 13 °C and 8-azaguanine resistance. Statistical analysis[7] stressed the significant difference between the 2 species *L. biflexa* and *L. interrogans* with regard to catalase activity ($F = 17.36^{**}$). In addition our data confirm the saprophytic behaviour of strain CH 11, even though it was isolated from a mammalian host. Likewise strain 3055, serovar *illini*, showed a weak catalase activity of 5.4 µmoles $H_2O_2 \cdot min^{-1} \cdot 10^9$ cells, but this value differs significantly from that for the saprophytic strains ($F = 26.69^{**}$).

It is interesting to recall in this respect that strain 3055 was isolated from a mammalian host and differs in morphological characteristics, G/C content and cultural behaviour from the two leptospiral species. These findings support the proposal to include strain 3055 in the new genus *Leptonema*[8].

According to the data presented, catalase activity can serve as an additional characteristic for the taxonomy of leptospires.

1 S. Faine, J. gen, Microbiol. *22*, 1 (1960).
2 R.E. Corin, E. Boggs and C.D. Cox, Infect. Immun. *22*, 672 (1978).
3 R.C. Johnson and P. Rogers, J. Bact. *88*, 1618 (1964).
4 H.C. Ellinghausen and C.G. McCullough, Am. J. Vet. Res. *26*, 45 (1965).
5 P. Bellavite, P. Dri, B. Bisiacchi and P.L. Patriarca, FEBS Lett. *81*, 73 (1977).
6 F. Rossi, G. Zabucchi, P. Dri, P. Bellavite and G. Berton, in: Macrophages and Lymphocytes: nature, functions and interaction, part A, p. 53. Ed. M.R. Escobar and H. Friedman. Plenum Press, New York 1980.
7 Lison, L., Statistica applicata alla Biologia Sperimentale, p. 57. Casa Editrice Ambrosiana, Milano 1961.
8 K. Hovind-Hougen, Int. J. Syst. Bact. *29*, 245 (1979).

Effects of dikegulac-sodium on negative geotropic response, endogenous tryptophan and IAA-oxidase activity in *Glycine max* roots

S.S. Purohit and K. Chandra[1]

Department of Botany, Government Post Graduate College, Nagaur 341 001 (Raj., India), 10 June 1980

Summary. Dikegulac-sodium inhibited primary and lateral root growth in *Glycine max*. The roots, curved and showed negative geotropic response after dikegulac-sodium treatment. The tryptophan level decreased and the activity of IAA-oxidase increased with increasing concentrations of dikegulac-sodium.

Dikegulac-sodium (sodium 2,3:4,6-di-O-isopropylidene-α-xylo-2-furanosonate) or Atrinal® affects most of the phases of growth, physiological processes and metabolic steps in plants[2-10]. Negative geotropic responses of radicles in *Helianthus annuus* and *Brassica campestris* have recently been established[6,7]. Negative geotropic responses would be expected if the IAA content of roots remain sub-optimal[9]. No information is yet available on the tryptophan and IAA content of dikegulac-sodium-treated ageotropically growing roots. The present report deals with it for *Glycine max*.

Seeds of *Glycine max*. L (Mill) were soaked in 15 ml distilled water or aqueous solutions of dikegulac-sodium (50–750 mg/l) of pH 7.0 in the dark for 8 h at 28 ± 2 °C. The rest of the procedure adopted has already been described[7] 6 days after the start of the experiment, the roots of half of the control seedlings were decapped by cutting of approximately 3 mm of the tips. All the roots, treated and untreated, were harvested on the 7th day after the start of the experiment. For determination of tryptophan, the root-tissue was extracted after sampling. The fresh weight of the

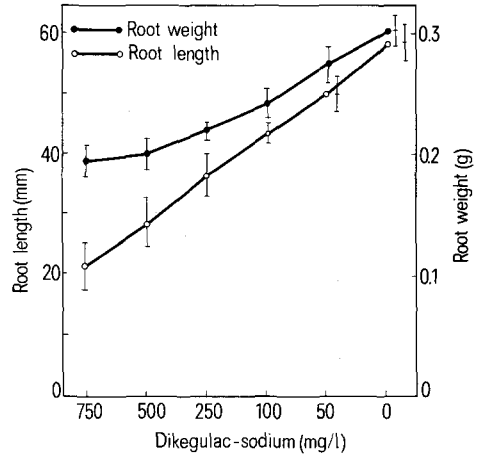

Fig. 1. Weight and length of *Glycine max* roots treated with dikegulac-sodium.

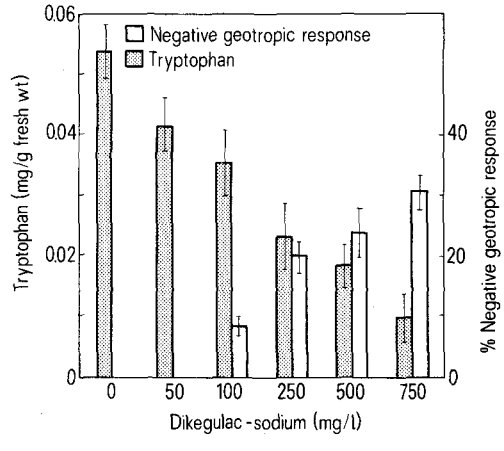

Fig. 2. Tryptophan content and negative geotropic response in *Glycine max* roots treated with dikegulac-sodium.

tissue used in each extraction varied from 0.5 g to 1.0 g. The qualitative and quantitative estimation of tryptophan was made by 2-dimensional chromatography as described by Plummer[11]. The activity of IAA-oxidase was determined on the same day as described[12] with slight modification. The data are the averages of 3 determinations from each combined sample of the plant tissue.

Data presented in figure 1 reveal that the average root length decreased with increasing concentrations of dikegulac-sodium. However, the decrease in weight of roots was less pronounced than the decrease in length, as the roots were relatively thicker and stunted for the dikegulac-sodium-treated seedlings. At higher concentrations (250–750 mg/l) the roots turned brown 4 days after radicle emergence. The radicles of treated seedlings became negatively geotropic while control and decapped roots remained normal. Lower concentrations (50–100 mg/l) did not show any effect on geotropic response. The highest content of tryptophan was in untreated roots: its content decreased with increasing amounts of dikegulac-sodium (figure 2) and was at its lowest in the decapped roots. The activity of IAA-oxidase was higher in all dikegulac-sodium-treated roots than in controls (table).

The action of dikegulac-sodium is similar to that of morphactins[13]. Chifford[14] indicated that the inhibitory effects of morphactins on root growth (dikegulac-sodium shows similar effects with respect to root growth and geotropic response) would not fit the assumption of the Cholodny-Went theory[2] that endogenous auxin in the root is supraoptimal for growth. The present study confirms Chifford's view. It reveals that a reduction in tryptophan and IAA level tends to give rise to a sub-optimal level of IAA and is directly proportional to root growth and inhibition of negative geotropic response. The content of tryptophan and IAA in the untreated roots may reflect the accumulation in the root tips, derived from the acropetal stream. It may therefore be concluded that dikegulac-sodium interferes with geotropic response and thus acts as a endogenous growth regulator and can modify tryptophan level and IAA-oxidase activity in roots.

Effect of dikegulac-sodium on IAA-oxidase activity of *Glycine max* roots after 7th day of seeding

Dikegulac-sodium (mg/l)	mg/IAA destroyed/g/h
Distilled water	0.01 ±0.002
50	0.036±0.001
100	0.053±0.003
250	0.061±0.002
500	0.082±0.004
750	0.094±0.001

1 Acknowledgments. We are grateful to Dr R. Maag Ltd, Switzerland, for supporting this work.
2 N. Cholodny, Jb. Wiss. Bot. *65*, 477 (1928).
3 S.S. Purohit, Thesis, University of Udaipur, India, 1977.
4 S.S. Purohit, Comp. Physiol. Ecol. *4*, 264 (1979).
5 S.S. Purohit, Comp. Physiol. Ecol. *5*, 24 (1980).
6 S.S. Purohit, Comp. Physiol. Ecol. *5*, 83 (1980).
7 S.S. Purohit, Curr. Sci. *49*, 403 (1980).
8 S.S. Purohit, Comp. Physiol. Ecol., in press (1981).
9 S.S. Purohit and K. Chandra, Phyton, Argentina, *39*, in press (1981).
10 S.S. Purohit and K. Chandra, Curr. Sci. *49*, 635 (1980).
11 D.T. Plummer, An Introduction to Practical Biochemistry, 2nd edn. McGraw-Hill Company, London 1978.
12 O.P. Srivastava and R.B. VanHaystee, Can. J. Bot. *51*, 2207 (1973).
13 P.F. Bocion and W.H. de Silva, in: Plant Growth Regulation, 9th International Conference on Plant Growth Substances, p. 189. Ed. P.E. Pilet. Springer Verlag, Berlin 1977.
14 P.E. Chifford, Z. Pflanzenphysiol. *90*, 309 (1978).

Influence of photoperiodism on high temperature-induced testicular recrudescence in the green frog[1]

L. Di Matteo, S. Minucci and R.K. Rastogi

Institute and Museum of Zoology, University of Naples, 8, via Mezzocannone, I-80134 Naples (Italy), 30 May 1980

Summary. In connection with the circannual testicular rhythm *Rana esculenta* does not seem to be a strictly photoperiodic species. In fact testicular growth can be induced (at a favourable temperature) with a daily 2-h light pulse as well as with a daily 12-h light pulse.

We have evidence that the testicular cycle in *Rana esculenta* is regulated by an endogenous circannual rhythm. Both light and temperature have remarkable influence on the annual testicular cycle in this species. Light, however, has been considered to have only a permissive role in facilitating the temperature response which apparently is the more direct modifier of testicular recrudescence and spermatogenic arrest. At favourable temperatures (15–24 °C) a positive testicular response to temperature is obtained if the animals are maintained under a 12:12 LD cycle. Darkness has deleterious effects[2–4].

Is *R. esculenta* a photoperiodic species? We have no answer to this question so far. This preliminary investigation was carried out to study the effects of a 2-h light pulse on the testicular growth in frogs having involuted and quiescent tests and maintained at a constant temperature of 20 °C.

Animals procured in January and February were acclimatized for 1 week in the laboratory, before being transferred to the photo-thermo-static chambers. Each group was composed of 20 frogs. The 4 groups of experimental animals for each month received a daily 2-h light pulse respectively at 09.00, 11.00, 13.00 and 15.00 h. 10 animals each were sacrificed respectively at 15 and 30 days after the beginning of the experiment. 2 additional groups were maintained under total darkness or with a 12:12 LD cycle (the 12-h light pulse beginning at 09.00 h) and a constant temperature of 20 °C for 30 days. Initial values were obtained by sacrificing a batch of 8 frogs at the start of each experiment. Animals were weighed, and then sacrificed by decapitation. The testes were taken out, weighed, and fixed in Bouin's fluid for histological examination.

Results are summarized in the table. In January a daily 2-h light pulse, given at any hour of the day (from 09.00 h–15.00 h), did not favour testicular growth at high temperature. The same holds true for animals maintained in total darkness. On the contrary, a daily 12-h light pulse induced