Table 1 *Effects of temperature and a substituted phthalimide AC 94,377 on acquisition of thermotolerance in mung bean seedlings*

Treatment	Hypocotyl length (mm)	Primary root length (mm)	Whole seedling length (mm)
28°C (5 h)	95[a]	75[a]	170[a]
28°C (2 h), 45°C (3 h)	40[d]	36[e]	76[f]
40°C (2 h), 45°C (3 h)	63[c]	66[b]	129[d]
40°C + Phthalimide (2 h), 45°C (3 h)	66[c]	64[b]	130[d]
40°C + Phthalimide (2 h), 45°C + phthalimide (3 h)	83[b]	68[b]	151[b]
28°C + Phthalimide (2 h), 45°C (3 h)	65[c]	50[d]	115[e]
28°C + Phthalimide (2 h), 45°C + phthalimide (3 h)	80[b]	60[c]	140[c]

Values are means of 20 readings. Means within the same column with the same letter in the superscript are not significantly different at $P=0.05$ according to Duncan's multiple range test.

applied during the 40°C pretreatment, phthalimide did not significantly enhance the thermotolerance response; however, hypocotyl growth was further enhanced when its application was continued during the heat-shock period. When the phthalimide treatment was given at 28°C, statistically similar increases were observed in respect of hypocotyl growth, but increase in root growth was less. The application of phthalimide to seedlings grown entirely at 28°C had a rather small growth-promoting effect.

Thus, a prior treatment of seedlings at an elevated temperature within a permissive range (40°C, 2 h) imparted protection to seedlings against heat-shock stress. Similar observations have been made by other workers[1,2]. The presence of phthalimide during the 40°C pretreatment and the heat-shock period enhanced the protective response, as has been observed[1] for GA_3. Hence AC 94,377 is capable of mimicking the heat-shock response induced by GA_3. In the present study, the phthalimide protection against heat-shock was provided by pretreatment not only at 40°C but also at the normal temperature of 28°C. In addition, both hypocotyl and root appear to be the site of the phthalimide effect, whereas in the case of GA_3 it is mainly the hypocotyl[1].

Application of phthalimide warrants further investigation to understand the mechanisms through which it triggers a protective response.

Thanks are due to Dr A. D. Pavlista of the American Cynamid Co. for a gift of AC 94,377.

24 October 1988; Revised 30 December 1988

1. Chen, Y. M., Kamisaka, S. and Masuda, Y., *Physiol. Plant.*, 1986, **66**, 595.
2. Lin, C. Y., Roberts, J. K. and Key, J. L., *Plant Physiol.*, **74**, 152.

COLORIMETRIC METHOD FOR THE ESTIMATION OF *p*-COUMARIC ACID FROM THE BARK OF *OROXYLUM INDICUM* VENT

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p-COUMARIC acid has been estimated colorimetrically using ammonium vanadate–perchloric acid reagent[1], by reverse-phase high-pressure liquid chromatography[2], spectrophotometrically using 4-hydroxybenzaldehyde[3], and by high-pressure TLC with UV and fluorescence[4]. *p*-Coumaric acid from sunflower seeds was determined by titration with $KMnO_4$[ref. 5]. This method was rapid and simple, and gave good results.

p-Coumaric acid was extracted from the bark of *Oroxylum indicum* (Bignoniaceae) according to Subramaniyan and Nair[6]. It was further purified by preparative TLC using silica gel GF 254 as adsorbent and benzene:dioxane:acetic acid (90:25:4)[7] as solvent. The prominent spot obtained at R_f 0.45 was scraped out and the compound so obtained was recrystallized from methanol. The compound was confirmed as *p*-coumaric acid from its m.p., R_f and IR spectrum[8].

A more sensitive colorimetric method was established by reacting *p*-coumaric acid with molybdophosphoric acid in alkaline medium. A reference solution was prepared by dissolving 10 mg of *p*-coumaric acid in 100 ml of ethyl alcohol. To prepare

a test solution bark extract[8] was concentrated, the residue so obtained was dissolved in 10 ml of ether, and 2 ml of this was made up to 100 ml with ethyl alcohol.

Three activated silica gel GF 254 plates were streaked with 0.25, 0.5 and 0.75 ml of reference and test solutions. Chromatography was performed using benzene:dioxane:acetic acid (90:25:4) as the solvent system. Scrapings of the band corresponding to *p*-coumaric acid were subsequently transferred to a test tube and extracted with 5 ml of ethyl alcohol. Following centrifugation the supernatant liquid was filtered through Whatman No. 42 filter paper into a 10-ml volumetric flask. To the above filtrate 3 ml of 5% molybdophosphoric acid and 1 ml of 1 N NaOH were added. The resultant blue chromogen was measured at 720 nm in a Carl–Zeiss speckol spectrocolorimeter. Percentage recovery of *p*-coumaric acid by this method was 98%. The *p*-coumaric acid content of the bark of *O. indicum* was found to be 1.84%.

26 September 1988; Revised 9 January 1989

1. Bajaj, K. L. and Ahuja, K. L., *Analusis*, 1986, **14**, 161.
2. Winter, N. and Herrmann, K., *J. Chromatogr.*, 1984, **315**, 243.
3. Mossor-Pietraszewska, T. and Schramm, R. W., *Bull. Soc. Amis. Sci. Lett. Poznan. Ser. D*, 1981, **21**, 5.
4. Zerr, W. and Funk, W., *Proc. Int. Symp. Instrum. High Performance Thin Layer Chromatography*, 1982, p 321.
5. Mironova, O. P., Shcherbakov, V. G. and Ivanitskii, S. B., *Izv. Vyssh. Uchebn. Zaved., Pishch Tekhnol.*, 1980, 143.
6. Subramaniyan, S. S and Nair, A. G., *Curr. Sci.*, 1973, **42**, 770.
7. Randrath, K., *Thin Layer Chromatography*, II edn, Verlag Chemie, Academic Press, New York and London, 1968, p. 210.
8. Pouchert, J. C., *The Aldrich Library of Infrared Spectra*, III edn, New York, 1981, 953B.

NEW HOST RECORDS OF THE BRUCHID *SULCOBRUCHUS KINGSOLVERI* ARORA AND THE PARASITE *OEDAULE STRINGIFRONS* WATERSON FROM INDIA

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DALBERGIA PANICULATA Roxb. (Leguminosae) is distributed throughout southern and central India, extending northwards to Oudh and the Siwaliks. The wood of this tree is used for building purposes and to make instruments. A small (200 g) sample of *D. paniculata* seeds was received at the Quarantine Laboratory of the Bureau from the National Botanical Garden, Lucknow. It was intended for export to the USA. On examination it was found that, about 2% of the seeds were damaged, and some live bruchids and parasites were recovered. These were later identified as *Sulcobruchus kingsolveri* Arora (Bruchidae: Coleoptera) and *Oedaule stringifrons* Waterson (Pteromalidae: Hymenoptera).

A study of the literature revealed that *D. paniculata* seeds are infested by *Bruchidius uberatus* (Fahraeus)[1]. There is no record of *S. kingsolveri* infesting *D. paniculata* seeds. However, *S. kingsolveri* is known to infest seeds of *Albizia* species[2]. The present record of *S. kingsolveri* infesting *D. paniculata* seeds is a new host record for this bruchid.

Oedaule stringifrons is a known parasite of the groundnut bruchid, *Caryedon serratus* (Olivier) (=*C. gonagra* (Fabricius)), and a reference to the published literature shows that *O. stringifrons* has never been detected as a parasite of *S. kingsolveri*. The present record of *O. stringifrons* along with *S. kingsolveri* from *D. paniculata* seeds constitutes a new host record for this parasite.

The author is grateful to Dr J. E. Decelle, Chief of the Department of Zoology and Section of Entomology, Musée Royal de l'Afrique Centrale, Tervuren, Belgium, and Dr S. I. Farooqui, Division of Entomology, IARI, New Delhi, for identification of the bruchid and parasite species respectively.

31 October 1988; Revised 16 January 1989

1. Mathur, R. N., Singh, Balwant and Kishori Lal, *Indian For. Bull.*, 1958, **223**, 1.
2. Arora, G. L., *Orient. Insects Suppl.*, 1977, **7**, 1.