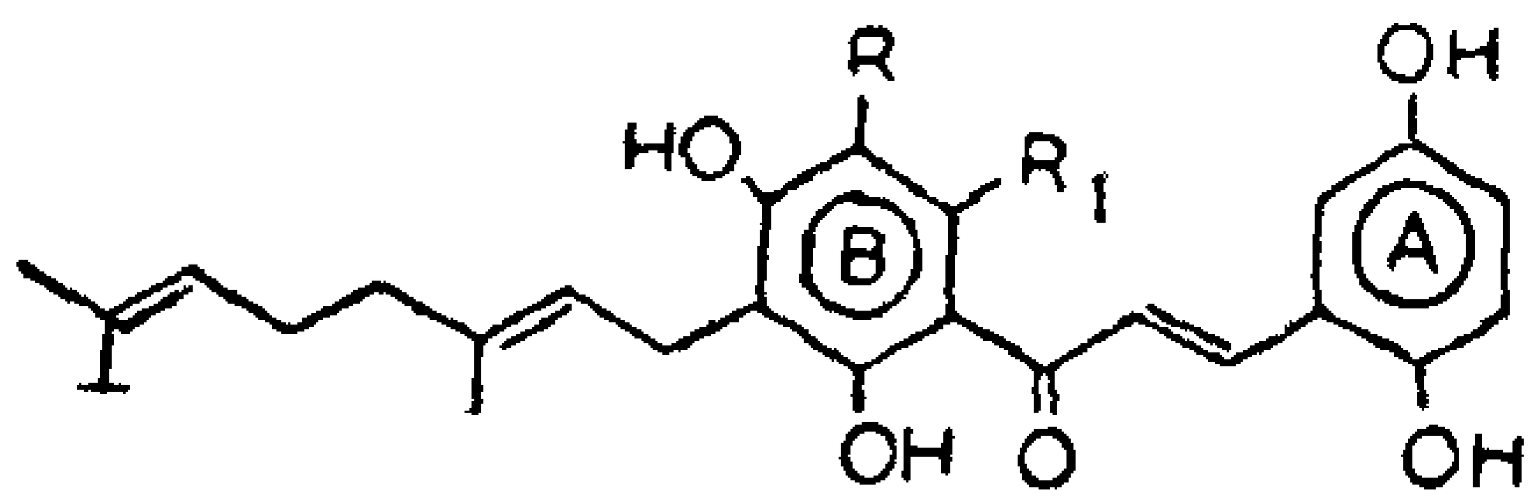
HOMOFLEMINGIN AND FLEMIWALLICHIN-C FROM THE LEAVES OF *FLEMINGIA WALLICHII* W. & A.

THE presence of two new chromenochalcones[1], in the leaves of *Flemingia wallichii* W. and A. (Family: Leguminosae) was reported earlier. After separation of flemiwallichin-A and -B from the acetone extract of the leaves, the mother liquors when subjected to elaborate column and preparative thin layer chromatography gave two other chalcones in very minute quantities. One of them was identified as homoflemingin (I) and the other chalcone was named Flemiwallichin-C (II) and found to be isomeric with homoflemingin.



I R = OMe ; R_1 = H

II R = H ; R_1 = OMe

Homoflemingin crystallised from benzene as golden yellow needles, m.p. 167° (Found C, 70·90; H, 6·62 ; $C_{26}H_{30}O_6$ requires C, 71,·21 ; H, 6·90%). Its UV, I.R. and NMR agreed fully with those reported[2] by Merlini *et al.*. Moreover, direct comparison with authentic homoflemingin confirmed its identity.

Flemiwallichin-C, crystallised from ethyl acetatehexane as bright yellow microcrystals, m.p. 202° (Found C, 70·80 ; H, 7·08. $C_{26}H_{30}O_6$ requires C, 71·21 ; H, 6·90%) ; λ_{max}^{EtOH} 215 nm (4·8) and 270 nm (4·08) ; ν_{max}^{Nujol} 3360 (broad), 2920, 2860, 1640, 1610, 1570, 1450, 1375, 1320, 1270, 1200, 1110 and 1030 cm^{-1}. Its NMR spectrum* (DMSO) showed a chelated OH at 14·17 and a CH = CH trans (7·66, 8·06 J = 16 Hz) providing evidence for the 2′-hydroxychalcone system. It also showed two almost superimposed vinylic protons centred at 5·1 (2 H), a doublet at 3·2 (2 H, J = 7 Hz, Ar–CH_2–CH =), an isopropylidine group Me_2C = (1·5 and 1·56), one Me on a tertiary unsaturated carbon (1·73, d, J = 1 Hz), four equivalent protons centred at 1·93 (–CH_2–CH_2–), a methoxyl group at 3·83 (S, 3H) and an ABX pattern of five line [$\delta_X = 7 \cdot 13$ *t* ; $\delta_A = \delta_B = 6 \cdot 70$ (2H)] from ring A. All this data is in good agreement with that of homoflemingin[2]. The only difference is that in homoflemingin, the aromatic proton on ring B appeared at 7·45 whereas in flemiwallichin-C it appeared at 6·40 which has to be located between two oxygen functions because of its shift to up-field. The presence of two hydroxyl groups ortho to the carbonyl group is excluded as there is no signal for a weakly chelated hydroxyl group[3]. Positive Gibb's test confirms the presence of a proton para to the hydroxyl group. All the above data suggest the presence of a chelated hydroxyl group at 6′-position and the methoxyl group at 2′-position. Thus, flemiwallichin-C can be assigned structure-II.

Our grateful thanks are to Professor L. Merlini, Politechnico, Instituto di Chimica, Milano, Italy, for comparison of our sample with homoflemingin. Two of us (J. M. R. and S. R. B.) thank C.S.I.R. (India) for the award of research fellowships.

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* δ values.

1. Madhusudhana Rao, J. Subrahmanyam, K. and Jagannadha Rao, K. V., "Chromenochalcones, from the leaves of *Flemingia wallichii* W. and A.," *Indian J. Chem.*, 1975, **30**, 1000.
2. Cardillo, G., Merlini, L. and Mondelli, R., *Tetrahedron*, 1968, **24**, 497.
3. Ringshaw, J. and Smith, H. J., *Chemy. Ind.*, 1965, p. 1383.

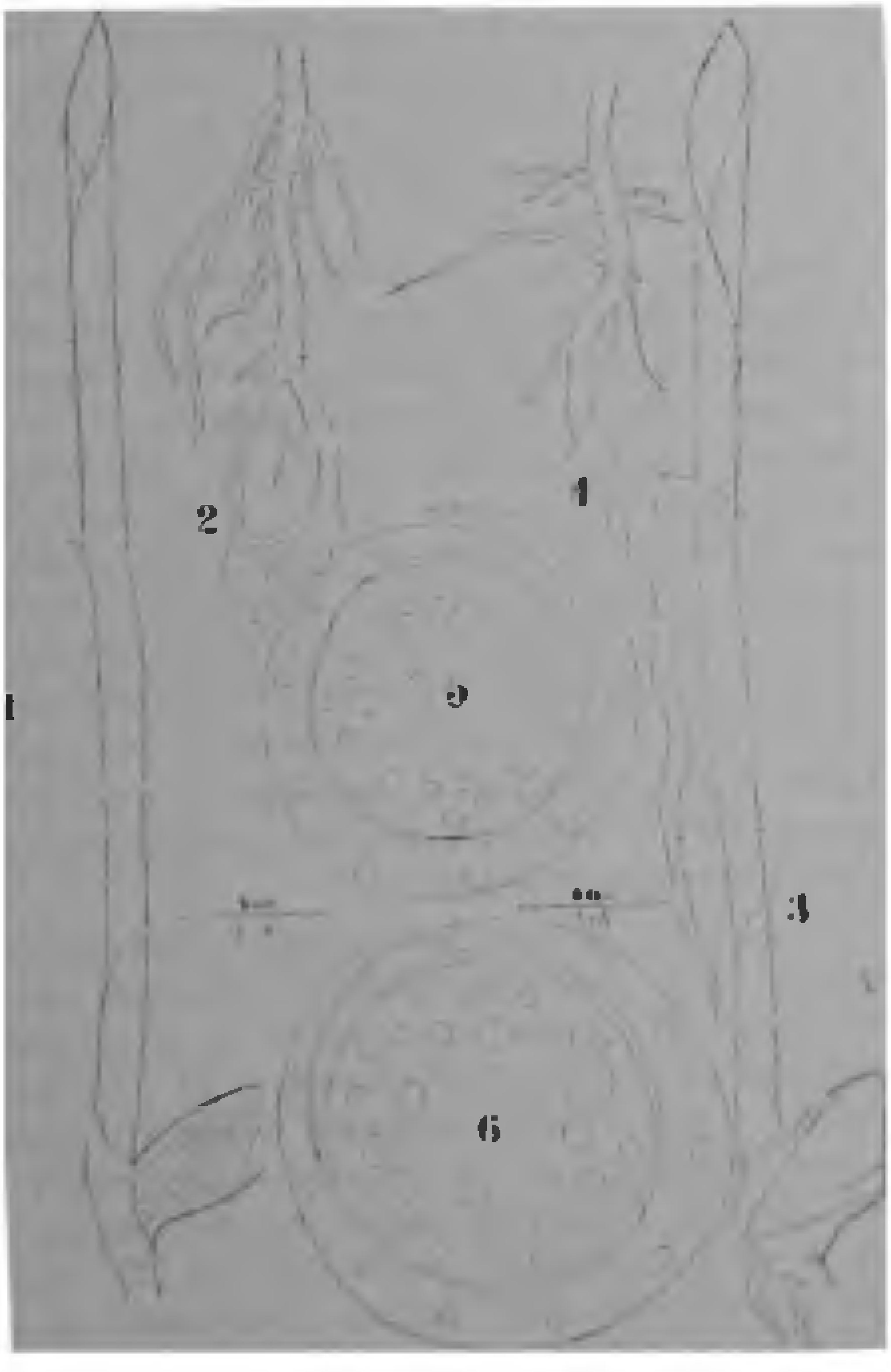
LEFT AND RIGHT HANDEDNESS IN SEEDLINGS OF *BAMBUSA ARUNDINACEA* WILLD.

COMPTON[2,3,4] first studied the seedling handedness in several members of Gramineae with reference to the folding of the first leaf above the coleoptile. Revival of interest in this problem is recent. Ono and Suemoto[7] have studied the handedness in *Triticum* in considerable detail while Udayachandra[8] has recently studied the same in *Sorghum vulgare*. In continuation of our studies on handedness in plants, we describe in this communication handedness in *Bambusa arundinacea* Willd, a species of the tribe Bambuseae (Gramineae).

Seed material of *B. arundinacea* obtained through the courtesy of Andhra Pradesh Forest Development Corporation was used to study the seedling handedness. Seeds were sown in earthen flats and germination was complete in 6 to 8 days. The seedlings were sorted out for their handedness following the terminology first proposed by Compton[2]. Stomatal indices of leaves were calculated following Cutter[5] while the quantitative determination of chlorophylls was done following the procedure of Witham, Blaydes and Devlin[9].

Depending upon the direction of the folding of the first leaf either to the left or to the right, the seedlings were classified as left (L) or right (R) handed (Figs. 1 and 3). No neutral seedlings were observed.

A total of 667 seedlings were scored out of which 322 were L (48·28%) and 345 were R. The χ^2 value for 1 d.f. is 0·793 and the p value is high which is not significant. The L/R ratio is 0·933 suggesting unity of the L and R seedlings in the sample, although there is a slight excess of R seedlings. A similar excess of R seedlings was noted in *Avena sativa* and the L/R ratio was found to be 0·814. It may be pointed out that a marked excess of L seedlings was observed in 8 varieties of *Hordeum distichum* (L/R = 1·101), *H. hexastichum* (L/R = 1·282), *Setaria italica* (L/R = 1·19) and even in *Secale sereale* (L/R = 1·111). It is only in *Zea mays* that the L/R ratio was found to be unity, though different ratios were obtained when the kernels were tested from even and odd rows of a cob (*see* Compton[2,3,4]).



FIGS. 1–6. Figs. 1–3. Left and right handed seedlings of *B. arundinacea*. Note the folding of the first leaf above the first coleoptile turning to left or right respectively. Figs. 2–4. Root system of L and R seedlings showing the tufted and the untufted condition. Figs. 5–6. Semi-diagrammatic transverse section of seedlings stem showing the folding of the leaf around the stem to the left and right. The numerous circles represent vascular bundles.

The folding of the leaf is well marked and extends down to the leaf base. Further the second and the subsequent leaves in both the L and R seedlings also show folding. In the L seedling the second leaf is R handed and in the R seedling the condition is reversed. Irrespective of L and R seedlings, the left leaf alternates with right and the *vice versa* such that the distichous condition results.

TABLE I

Comparison of some characteristics of left and right handed seedlings of Bambusa arundinacea

	Left	Right
Coleptile length in cm		
Coleoptile I	0·5	0·43
Coleoptile II	1·108	1·080
Coleoptile III	2·528	2·360
Length of the first leaf in cm	1·448	1·336
Seedlings root length in cm	6·08	5·116
Stomatal index		
First leaf:		
Upper epidermis	9·55	9·12
Lower epidermis	23·0	21·0
Mature leaf :		
Upper epidermis	15·0	11·05
Lower epidermis	27·7	22·62
Stomatal size in microns:		
First leaf:		
(upper epidermis)	25·69 × 10·85	25·6 × 9·54
(mature leaf)	34·72 × 14·8	26·8 × 13·3
*Chlorophyll content in mg/gm of tissue (seelding)		
Chlorophyll *a*	0·0336	0·028
Chlorophyll *b*	0·0204	0·0135
Total chlorophyll	0·0520	0·044

* *N.B.*—Data based on mean of 10 samples; others mean of 25 readings.

In Table I comparison of characteristics of L and R seedlings are given. A perusal of the data shows that the L seedlings are omparatively bigger not only in size but also in the sizes of the coleoptiles, first leaf and even the root length. The root system of L seedling as shown in Fig. 2 is tufted in comparison to the right seedling. Further differences exist in the diameter of the culm as also the number of vascular bundles (Figs. 5 and 6). It is interesting to note that the handedness in the species is expressed at a much deeper level of organization, *viz.*, the stomatal index of the first leaf as well as the mature leaf are high in the L seedlings; although the stomatal size in both the L and R seedling leaves is identical but the mature stomata are larger in L seedlings. It has been further observed that the L seedlings grow much faster producing taller plants with more leaves than the R seedlings. In view of these differences the chlorophyll content of seedlings was estimated and as shown in Table I, once again the L seedlings gave higher values. On the basis of the data presented it may be deduced that L seedlings possibly are 'superior' to R seedlings and hence are expected to produce more 'bamboos'. It is therefore suggested that the L and R seedlings be grown separately. The fact that bamboo seedlings are first raised in nursery beds and later transplanted to the field, the suggestion appears practical. Davis[6] showed that R coconut palms give a higher yield of coconuts than the left. In view of the relationship between handedness and yield on the one hand and the very high utility, of bamboo in paper industry and the like, the handedness in the Bambuseae in general and the genus *Bambusa* in particular deserve further investigations.

According to Compton[2-4] the dircteion of folding of the first leaf is not inherited. He further states, "the ratio of left handed/right handed is hereditary though right and left handedness are not". This possibly holds true for *Bambusa* but it must be emphasised that it is a difficult material to tackle experimentally in view of its flowering once in its lifetime. The L and R seedlings thus represent stereoisometric forms and hence mirror images and constitute a case of bioisomerism[1].

We are grateful to Prof. R. H. Compton, Professor Emeritus, University of Cape Town, S. Africa, for providing the xerox of one of his earliest papers and for encouragement and to Prof. U. B. S. Swami for facilities.

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1. Bahadur, Bir, Vijaya Kumar, P., Reddy, N. P., and Rao, K. L., *Curr. Sci.*, 1977, 46, 869.
2. Compton, R. H., *Proc. Camb. Phil. Soc.*, 1910, 15, 495.
3. —, *IV Conf. Int. de Genet. Paris*, 1911, p. 1.
4. —, *J. Genet.*, 1912, 2, 53.
5. Cutter, E. G., *Plant Anatomy. Part. I*, Edward Arnold, London, 1969.
6. Davis, T. A., *Proc. Indian Natl. Sci. Acad.* Part B, 1974, 40, 424.
7. Ono, H. and Suemoto, H., *Seiken Zibo.*, 1957, 8, 60.
8. Udayachandra, U., *M.Sc.*, *Dissertation*, Kakatiya University, Warangal. 1977.
9. Witham, F. H., Blaydes, D. F. and Devlin, R. M., *Experiments in Plant Physiology*, Van Nostrand, Reinhold Co., N.Y., 1971.

SOME FUNGI ASSOCIATED WITH THE ROOT SYSTEM OF COCONUTS IN THE ROOT (WILT) AFFECTED AREA

EXTENSIVE root damage is an important symptom of coconut root (wilt) disease. Menon and Pandalai[6] reported that the root system of affected palms manifested considerable deterioration quantitatively as well as qualitatively. Most of the rootlets and the main roots dry up from their tips backwards In portions from tips of actively growing roots Indira and Ramadasan[3] found internal browning of vascular elements sometimes extending into the cortex in the diseased palms and mild internal browning of tissues of apparently healthy palms growing in diseased soil. Histological studies revealed degenerate phloem. Many healthy looking roots from apparently healthy and diseased palms had fungal hyphae (?) in metaxylem (Govindankutty and Vellaichamy[2]). Radha (personal communication) had observed spores of *Cylindrocarpon* sp. in the metaxylem. Results of attempts to isolate the fungi, associated with similar roots, are reported here.

Root tips, six inches in length, having no external damage, were collected from palms free of visual symptoms of disease. Three-inch portion above the root cap was examined for the presence of internal browning. After surface disinfection this was cut aseptically into thin cross sections using razor blade and plated on coconut root extract agar medium. *Monacrosporium bembicodes* (Drechsler) Subram. (IMI 193424), *Graphium* sp. (IMI 193425), *Fusarium equiseti* (Corda) Sacc. (IMI 193426), *Cylindrocarpon effusum* Bugn. (IMI 193427), *Penicillium spiculisporum* Lehman (IMI 193428) and *Penicillium javanicum* van Beyma (IMI 193429) were isolated from the roots which showed internal browning.

Presence of some of these genera in the root (wilt) affected area bears significance. *Fusarium equiseti* is capable of producing tuber rot in cycas (Subramanyam *et al.*[11]). Superimposed on Cucumber Mosaic Virus infected cucumber *F. equiseti* brought about the death of the plant (Nitzany *et al.*[8]). In this context it is worth mentioning that Shanta and Menon[9] attributed the association of a virus in the coconut root (wilt) disease. Subsequent to root infection by *Cylindrocarpon panacis* on ginseng (Matuo and Miyazawa,[5] and *C. tenue* on coffee (Subramanian and Govindarajan[10]) the plants died after exhibiting foliar symptoms. Significantly, the presence of *C. effusum* is reported here. Occurrence of *Radopholus similis* on coconut root (Koshy *et al.*[4]) necessitates investigation on the mode of spread of *C. effusum* apart from its pathogenic potentialities as Booth and Stover[1] suggested dissemination of *C. musae* by the same nematode. *Monacrosporium*