DO SECONDARY SUBSTANCES INHIBIT MYCORRHIZAL ASSOCIATION?

V. MOHAN KUMAR and A. MAHADEVAN
Centre of Advanced Study in Botany, University of Madras, Madras 600 005, India.

MYCORRHIZAL association has been reported in a large number of plant species belonging to families of Angiosperms[1-4], but not in Cyperaceae[1], Commelinaceae, Juncaceae, Urticaceae[3], Polygonaceae[5], Aizoaceae, Amaranthaceae, Chenopodiaceae, Nyctaginaceae, Phytolaccaceae[2]; Caryophyllaceae, Cruciferae, Fumariaceae and Portulacaceae[6].

During a routine examination of the roots of a few medicinal plants, grown in the gardens of the Botany Field Research Laboratory at Maduravoyal and the Indian Medicinal Practioners Co-operative Pharmacy and Stores Ltd., Madras, mycorrhizal association was not observed. This led to an examination of 28 medicinal plants from 20 families for the presence of mycorrhizae.

Root segments from freshly collected plants were fixed in FAA[7] and mycorrhizal infection was examined under high power.

No medicinal plants examined by us possessed any mycorrhizal association (table 1). Repeated efforts were made to locate mycorrhizae in the roots of plants collected at different seasons, but without any success. Giltrap[9] pointed out that polyphenols especially gallic and tannic acids reduced the growth of ectomycorrhizal fungi. The absence of mycorrhizae in the roots of Chenopodiaceae and Cruciferae was attributed to glucosinalates and their products of hydrolysis, isothionalates in and around the roots[10].

All the plant species examined by us contain a spectrum of secondary substances such as alkaloids, phenolics, terpenoids, tannins, stilbenes etc (table 1), which are essentially concentrated in the roots[8]. The sensitivity of mycorrhizae to the toxic substances may influence their association with plants.

VM thanks UGC, New Delhi for the award of a research fellowship and AM thanks DST, New Delhi for financial support.

18 May 1983

1. Asai, T., *Jpn. J. Bot.* 1934, **7,** 107.
2. Koch, L. W., *Can. J. Res. Soc.*, 1935, **13,** 174.
3. Maeda, M., *Kumamoto J. Sci. Ser.* 1954, **B3,** 57.
4. Mosse, B. and Hayman, D. S., In *Tropical mycorrhiza research*, (ed.) P. Mikola, 213, University Press, Oxford, 1980.
5. Stahl, E., *Jahr. Wiss. Bot.* 1900, **34,** 539.
6. Schlicht, A., *Landwirts. Jahr.* 1880, **18,** 477.
7. Phillips, J. M. and Hayman, D. S., *Trans. Br. Mycol. Soc.*, 1970, **55,** 158.
8. Anonymous. *The Wealth of India*, Vol. 1–11, C.S.I.R. New Delhi, 1948–1976.
9. Giltrap, N. J., *Trans. Br. Mycol. Soc.* 1982, **78,** 75.
10. Gleen, M. G., *Phytopathology*, 1982, **72,** 951 (Abstract).

Table 1 *Plants not showing mycorrhizal association*

Family	Plant Species	Secondary substances[8]
Acanthaceae	*Adhatoda vasica*	Vasicine
	Andrographis paniculata	Andrographolid
Amaranthaceae	*Achyranthes aspra*	Carapanaubine, vincamine, reserpinine, oleanolic acid and ecdysterone (I).
Apocynaceae	*Catharanthus roseus*	Perivincine, vincine, serpinine, vinoxine
	Rauwolfia serpentina	Ajmalicine, rauwolfinine, renoxiline, sarpagine, tetraphyllicine.
Aristolochiaceae	*Aristolochia bracteata*	Aristolochin
Asclepiadaceae	*Hemidesmus indicus*	*p*-Methoxy salicylic aldehyde, β-sitosterol, α and β-amyrins, lupeol, tannins, saponins
	Pergularia daemia	Hentriacontane, lupeol, α and β-amyrins, β-sito-sterol, 5β-stigmart-8 (14)-en-3α-ol.
	Tylophora indica	Tylophorine, tylophorinine, (+)-septicine (+)-isotylocrelerine, phyto sterol.

(*Contd-next page*)

Table 1 (*contd*)

Family	Plant Species	Secondary substances[8]
Asteraceae	*Eclipta alba*	Nicotine
Cactaceae	*Opuntia dillanii*	Glucosides of isohammetin and quercetin.
Costaceae	*Costus speciosus*	Diosgenin, tigogenin, lanosterol and stigmasterol
Cucurbitaceae	*Coccinia indica*	Cucurbitacin
Euphorbiaceae	*Jatropha glandulifera*	Sitosterol, myristic, palmitic, stearic, oleic and linoleic acids.
	Phyllanthus niruri	Phyllanthin, hypophyllanthin, saponin
	Ricinus communis	Ricin, ricinine, albumin, α-pyridone alkoloid.
Lamiaceae	*Coleus amboinicus*	Carvacrol
Liliaceae	*Aloe vera*	Aloin, chrysophanic acid, emodin, aloenin, barbaloin.
	Sansevieria roxburghiana	Saponin and sapogenin
Meliaceae	*Azadirachta indica*	Nimbidin, flavonol, coumarin, saponin
Nyctaginaceae	*Boerhaavia diffusa*	Saponin, enthalten
Poaceae	*Vetivera zizanoides*	α and β-vetivon, vertivenol vetinene
Santalaceae	*Santalum album*	Santalol oil, teresantalic acid, α and β-santalenes, santanol, teresantalol
Sapindaceae	*Cardiospermum helicacabum*	Cardiospermin
Umbelliferae	*Centella asiatica*	Sitosterol, oleic, linolic, linoleic, lignoceric, palmitic and stearic acids.
Verbenaceae	*Clerodendrum serratum*	Luteolin, apigenin
	Vitex negundo	Nishindine, tannic acid, gluconitol, aucubin, agniside, *p*-hydroxybenzoic acid, hydrocotylene, casticin
Zygophyllaceae	*Tribulus terrestris*	Saponins, steroidal sapogenins, diosgenin, gitogenin, chlorogenin, ruscogenin

CYTOLOGICAL STUDIES IN *CHASSALIA OPHIOXYLOIDES* (WALL.) CRAIB (RUBIACEAE).

M. S. CHENNAVEERAIAH and
P. M. SHIVAKUMAR*

Department of Botany, Karnataka University, Dharwar 580 003, India.
** Present address: Department of Botany, D. R. M. Science College, Davangere 577 004, India.*

CHASSALIA is a small genus comprising of about ten species distributed in Asia, tropical Africa and Mascarene islands[1]. *Chassalia ophioxyloides* (Wall.) Craib is found in Karnataka, an evergreen weak shrub, flowers in peduncled cymes. There is no earlier report of cytological work in any species of the genus. The chromosome number reported in the present investigation for *Chassalia ophioxyloides* is $2n = 44$.

Plants were collected from Hettur (Karnataka) and raised in the departmental glass house. Root tips were excised from the potted plants and pre-treated with 0.002 molar 8-hydroxyquenoline for 2 hr at 10–30°C. Slides were prepared following Belling's standard technique. While fixing the bud in Cannoy's fluid. For description of Karyotype, the method of Adhikary[2] has been adopted.

Fortyfour chromosomes were counted from the somatic cells (figure 1). The chromosomes are small, the chromosome length ranging from 1.61 to 2.93 μm with an absolute length of the chromosome is 37.3 μm. The karyotype formula is $2n = 44 = 8\ M + 30\ nm + 6\ nsm$.

Meiosis reveals certain irregularities. At diakinesis quadrivalents, bivalents and univalents are seen (figure 2). At anaphase I and II laggards, unequal distribution