

Table 1 (contd)

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

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

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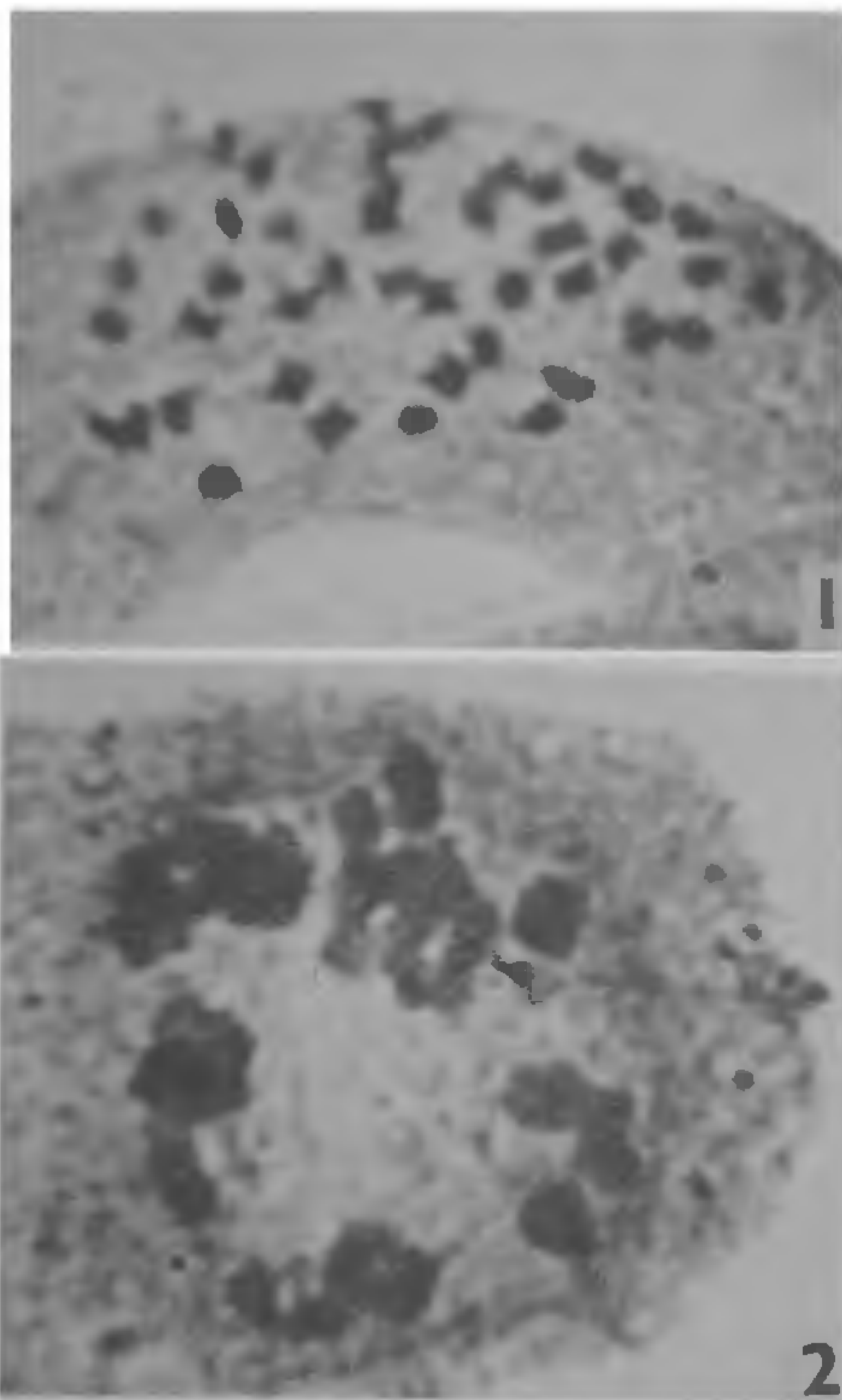
*CHASSALIA* is a small genus comprising of about ten species distributed in Asia, tropical Africa and Mascarene islands<sup>1</sup>. *Chassalia ophioxyloides* (Wall.) Craib is found in Karnataka, an evergreen weak shrub, flowers in peduncled cymes. There is no earlier report of cytological work in any 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-hydroxyquinoline for 2 hr at 10–30°C. Slides were prepared following Belling's standard technique. While fixing the bud in Carnoy's fluid. For description of Karyotype, the method of Adhikary<sup>2</sup> 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  $\mu\text{m}$  with an absolute length of the chromosome is 37.3  $\mu\text{m}$ . The karyotype formula is  $2n = 44 = 8M + 30nm + 6nsm$ .

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



**Figures 1 & 2.** 1. Somatic metaphase plate showing  $2n = 44$  Chromosomes. 2. Diakinesis showing quadrivalents, bivalents and univalents.

and isobilateral tetrad were observed. Pollen fertility is 96.1%.

Unless the chromosome numbers are known in all the other species it is difficult to say authentically the basic chromosome number of the genus. However, based on the basic numbers within the family 9, 10, 11, 12, 14 and 17 with 11 as the most predominant one according to Fagerlind<sup>3</sup>, most likely the basic number of the genus may be eleven. Multivalent formation, laggards and grouping of chromosomes indicate the polyploid nature of the taxa.

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1. Cooke, T., *The flora of the Presidency of Bombay*, BSI reprint, 1906, 2, 47.
2. Adhikary, A. K., *Cytologia*, 1974, 39, 11.
3. Fagerlind, F., *Acta. Horticult. Berigani*, 1937, 11, 195.

#### DIRECT DIFFERENTIATION OF SHOOT BUDS FROM INTERNODE EXPLANTS OF *BRASSICA CAMPESTRIS* CV. YELLOW SARSON

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ONE of the most important aspect of plant tissue culture is clonal propagation<sup>1</sup>. However, micropropagation through tissue culture suffers from a serious disadvantage as the resulting plants may be polyploids if regeneration takes place *via* callus formation<sup>2</sup>. There are only a few reports where direct differentiation of shoots from the explants, without callus formation has been reported<sup>3</sup>. In the present communication we report direct differentiation of shoot buds from stem internodes of *Brassica campestris* cv. yellow sarson.

Young internodes collected from the field-grown plants, raised from seeds procured from Indian Agricultural Research Institute, New Delhi, were surface-sterilized with 0.1% mercuric chloride. After thorough washing with sterile distilled water, 10 mm long explants were implanted on MS<sup>4</sup> medium supplemented variously with kinetin, benzylaminopurine (BAP), indoleacetic acid (IAA), indolebutyric acid (IBA) and naphthalene acetic acid (NAA). Medium (pH 5.8) was autoclaved at 1.06 kg/cm<sup>2</sup> pressure for 15 min and all cultures were maintained at  $26 \pm 2^\circ\text{C}$  under continuous diffused light of 3000 lux from fluorescent tubes and incandescent bulbs.

Kinetin or BAP (3–5 mg/l) incorporated singly in MS medium induced direct differentiation of shoot buds (5–10 per explant) from the inner cortical cells of the explants (figure 1). BAP proved better than kinetin in shoot bud induction. The first visible change was slight swelling of the explant. Inner cortical cells of the cut end side showed cell divisions (figure 2). Divisions and sub-divisions in this region produced a mound of tissue on which shoot-buds developed (figure 3). The procambial vascular tissue of the developing shoot bud was eventually connected with the main vascular