Table 1. Orthorhombic system: Mwt 222.12

	a	*b*	*c*	Volume (CD)	*Z*	Dx	Dm	*d*
Refs 4 and 5	11.574	13.182	10.709	1633.86	8	1.806	1.816	4.961 6.751 5.091
Present work	11.569	13.177	10.709	1632.04	8	1.807	1.800	4.956 5.342 3.046

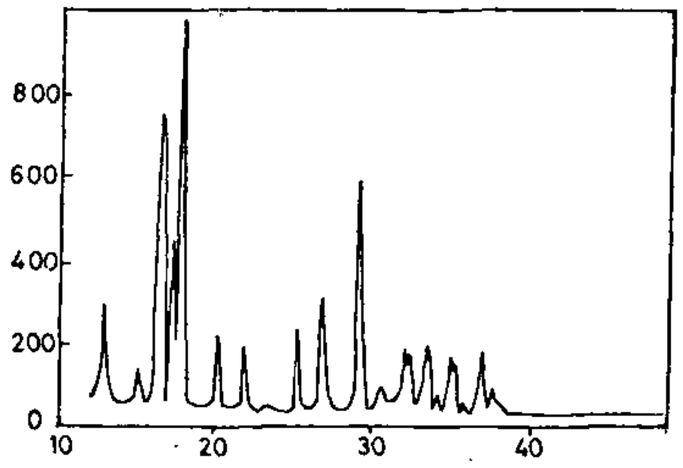
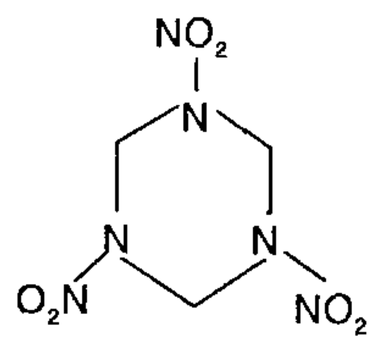


Figure 1. X-ray diffraction pattern of cyclonite.

temperature of 3380°C. It has been shown that breathing cyclonite dust gives rise to toxic spasms.

The chemical structure of cyclonite is as follows:



The oldest and simplest method of preparing cyclonite is based on treating hexamine with nitric acid. The following two possible reactions may produce cyclonite.

$$(CH_2)_6N_4 + 4HNO_3 \rightarrow (CH_2NNO_2)_3 + 3CH_2O + NH_4NO_3,$$

$$(CH_2)_6N_4 + 6HNO_3 \rightarrow (CH_2NNO_2)_3 + 6H_2O + 3CO_2 + N_2.$$

The crystal structure of cyclonite has been determined by Terpstra[2], Hultgren[3], Choi and Prince[4] and Sullenger *et al.*[5]. In this communication we report XRD analysis of cyclonite. The results of references 2, 4 and 5 and our analysis are given in Table 1.

We have used Philips X'Pert MPD system and software provided by Philips India Ltd. The cyclonite sample was obtained from TBRL Pune. The diffraction pattern of the sample has been recorded at 30 kV and 20 mA at a scanning rate of 0.8 degree per second (Figure 1).

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A report on polyembryony in *Commiphora wightii* from Thar Desert, India

The present paper deals with a new report on seed polyembryony in *Commiphora wightii* from the Thar Desert in India. In *C. wightii* two types of seeds, viz. black and white have been observed in mature fruits. The black ones are found to be viable. The seed produces more than one seedling (maximum four) due to its polyembryonic nature.

Commiphora wightii (Arnott) Bhandari is also known as Indian bdellium. The other names are guggulu, koushikaha and devadhupa in Sanskrit and guggal in most Indian languages[1]. The oleo-resin of guggal is an indigenous plant drug known to be highly effective in the treatment of obesity, arthritis and several other diseases in the Indian System of Medicine (Ayurveda)[2]. The plant belongs to family Burseraceae which is a large pan-tropical family, forming an important element of the flora of both rain forests and arid areas. The plant is dimorphic, one having bisexual and male flowers and the other having female flowers with staminodes[3,4]. A third category of plants with only male flowers has also been reported by Rao *et al.*[5]. Gupta *et al.*[6] have

Table 1. Morphological parameters of seeds in *C. wightii*

Seed colour	Length (cm)	Width (cm)	Thickness (cm)	Weight 100 seeds (g)	Maturity (%)	Viability (%)	Germination (%)
Black	0.69	0.48	0.33	4.678	45.93	70.0	36.25
White	0.70	0.50	0.31	3.768	54.05	*	*

*Non-viable.

Figure 1. *C. wightii* seeds showing white immature seeds (A), mature black seeds with two embryo sacs (B), and white and black seeds having three embryo sacs (C).

Figure 3. Emergence of four seedlings from one seed due to polyembryony in *C. wightii*.

Figure 2. Polyembryonic condition in *C. wightii*. (A)–(D), One, two, three and four seedlings emerging from a single seed, respectively.

documented for the first time the formation of seeded fruits from female flowers with no access to pollen or even after emasculation and bagging; failure of pollen tubes to enter the ovule following hand pollination; occurrence of nucellar polyembryony; and autonomous development of endosperm.

In the present investigation various morphological parameters, viz. seed weight, percentage seed viability and seed maturity as well as the presence of a number of plants (seedlings) per seed showing polyembryony have been studied. Mature fruits of *C. wightii* were collected during February–March 1999 from plants growing on slopy hillocks in Nakoda (Barmer). The plants showed luxuriant growth in nature. The seeds were stored in plastic containers with BHC powder/parad tablets to protect them from insects.

The weights of 100 fruits/seeds were taken with the help of an electronic balance in triplicate. The length, width and thickness of the seeds (50 samples) were recorded with vernier callipers. The viability of seeds (20 seeds in triplicate) was tested with TTC, as suggested by Porter *et al.*[7] and Mitter[8]. It has been observed that a large number of seeds contain more than one embryo (Figure 1). The percentage of polyembryony has been observed through sowing of seeds (triplicate of 30 seeds) in polybags containing soil mixture of sand:clay:farm yard manure (2:2:1). The polyembryonic seeds produced two or more seedlings from a single seed. The length, width and thickness of mature fruits are 1.104, 0.719 and 0.61 cm, respectively. The average fresh and dry weights of fruits are 21.014 and

5.460 g, respectively. Two types of seeds, viz. black and white are observed in mature fruits. The average dry weight of black and white seeds is 4.250 g. Various morphological parameters of seeds studied are given in Table 1.

A seed produces more than one seedling due to its polyembryonic nature, viz. one to four seedlings from a single seed (Figures 2 and 3). The germination percentage was 36.25 in black seeds under nursery conditions during July 1999. Out of the total germinated seeds, nearly 58.62% seeds produced one seedling per seed, 27.58% produced two seedlings per seed, 10.34% produced three seedlings per seed and 3.45% seeds produced four seedlings per seed.

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High frequency *in vitro* shoot multiplication of *Plumbago indica*, a rare medicinal plant

Plumbago indica L. (Plumbaginaceae) is a rare medicinal plant species found in Assam and other parts of north-east India[1]. It is important due to the presence of the active principle 'Plumbagin', an orange–yellow pigment. Plumbagin, in small doses has stimulant action on the central nervous system, on muscle pain and on the secretion of sweat, urine and bile[2]. Roots are reported to be vesicant, sialogogue and abortifacient, and are used in leucoderma, syphilis and leprosy. Roots are also recommended as a substitute for cantharides. Tincture of roots is used in dyspeptic and other digestive disorders and in piles[2,3]. In traditional medicinal practices of Assam, the aerial parts fried with fresh fish are eaten to cure piles. Tender twigs fried with eggs of domestic duck are given in asthma and epilepsy. Root paste is applied on wounds to get relief from pain[4].

P. indica L. is found in natural habitats of Jorhat, Golaghat and Dibrugarh districts of Assam[1,4]. The species is becoming rare due to massive collection by medicinal plant traders and also destruction of the natural habitat. For conservation as well as mass multiplication of these medicinally-important species, tissue culture may prove to be an important tool. In an attempt to standardize a protocol for micropropagation of *P. indica*, multiplication of shoots was considered an important step. Culture of shoot meristem, especially through enhanced axillary branching, permits rapid clonal propagation of certain plants and a high degree of genetic uniformity of the progeny. The paper presents the results of *in vitro* shoot multiplication of *P. indica* from nodal explants.

Small tender twigs collected from field grown mature plants of *P. indica* were thoroughly washed with tap water several times. Twigs were cut into 1–1.5 cm nodal segments and soaked in Tween 20 (20%) for 15 min. The shoot segments were then washed several times with sterile distilled water (SDW) in a laminar flow and then surface sterilized with a fungicide, carbendazim (1%), followed by mercuric chloride 0.1% (W/V) for 10 minutes. The explants were further rinsed in 70% ethanol for 30 s and washed thrice with SDW. These surface sterilized nodal segments were used as explants.

Explants were inoculated in MS medium[5] containing 0.8% agar and 3% sucrose supplemented with 6-benzyl adenine (BA, 0.25–1.0 mg/l), indoleacetic acid (IAA, 0.05–0.2 mg/l) and adenine sulphate (AS, 10–40 mg/l) in various combinations in 25 × 150 mm culture tubes. The pH of the medium was adjusted at 5.8 prior to autoclaving at 1.06 kg/cm^2 for 15 min. The cultures were maintained at 25 ± 2°C under 2000 lux light intensity provided by a white fluorescent lamp for 16 h photoperiod. In all experiments 20 replicates were used and each experiment was repeated thrice. Results presented are based on 60 days of observation.

The explants were cultured in two groups of hormone combinations with different concentrations. The first group consists of BA and IAA, while the second group consists of BA and AS. The nodal explants inoculated in the MS medium with BA (3 mg/l) and IAA (0.1 mg/l) showed shoot initiation after