

stems are present which although scarcely true spines, are narrowed towards the tip. The inflorescence-units, too, in *B. triflora* can approach those of *B. roxburghii*, being sometimes sub-fasciculate, while the limits of the flowering shoot (not exceeding 5.5 cm in *B. triflora*) is a matter of interpretation, only reaching '6-8 inches' in this species as Sprague suggested, if several leaf-subtended units are included.

However, the Burmese specimens present a distinctive facies with their slender branching and scattered small spines bearing neither leaves nor flowers. While petiole length has already been shown to be an unreliable character, the petiolules are, almost without exception, considerably longer than those of the Indian species, in which the leaflets are usually subsessile. Furthermore, the indumentum of the leaflets in *B. roxburghii*, although variable and not easily defined, tends to be adpressed to subsericeous above, a feature not exhibited by the Burmese specimens. In the inflorescence, a peduncle is frequently distinguishable in *B. triflora* and the flowers are never truly fasciculate from a swollen cushion, whereas in *B. roxburghii* extension of the pedicel-bearing axis occurs only rarely in vigorous compound inflorescences. In the flowers of *B. triflora* the sepals are larger and noticeably early-caducous, and the petals tend to be pointed or emarginate, rather than truncate to obtuse as in the Indian species.

In conclusion, therefore, van Tieghem and Sprague were right to regard the Burmese plants as a separate species. The characters of the petiolule, peduncle and sepals, discussed above, support this view. However, until more material can be examined, the precise relationship between *B. triflora* and *B. roxburghii* must remain uncertain.

4. *Balanites roxburghii* *Planch.*, Ann. Sci. Nat. Bot. 4 (2): 258 (1854); Brandis, Forest Fl. N.W. India: 59 (1874); Bennett in Hook. f., Fl. Brit. India 1: 522 (1875), *pro parte*; Kurz, Forest Fl. Burma 1: 204 (1877), *pro parte*; King, Indian Forester 4: 233 (1879); Gamble, Man. Ind. Timb.: 65 (1881) & Ed. 2: 135 (1902) *pro parte*; Lisboa, Usef. Pl. Bombay: 37 (1886); Watt, Dict. Econ. Prod. India 1: 363 (1889) *pro parte*; Talbot, List of trees, Bombay: 35 (1894); Dickinson, Notes Fl. Berar: 2 (1894); Woodrow, J. Bombay Nat. Hist. Soc. 11: 268 (1897); Cooke, Fl. Bombay 1: 195 (1902); Prain, Bengal Pl. 1: 308 (1903); Gage, Rec. Bot. Surv. India 3(1): 33 (1904) *pro parte*; Brandis, Indian Trees: 124, 125 (1906) *pro parte*; Van Tieghem, Ann. Sci. Nat. Bot. 9(4): 224, 250, 251 (1906); Talbot, For. Fl. Bombay 1: 210 & Fig. 128 (1909); Haines, Forest Fl. Chota Nagpur: 239 (1910); Sprague, Bull. Misc. Inform., Kew 1913: 135 (1913); Engler, Veg. der Erde 9, Pflanzenw. Afr. 3: 743 (1915) & in Engler & Harms, Pflanzenfam. 2, 19a: 180, 182 (1931); Gamble, Fl. Madras: 164 (1915); Haines, Descr. List, S. Circ., C. Prov.: 32 (1916); Witt, Descr. List. N. &

Fig. 8. *Balanites roxburghii*. A - C habit $\times 0.7$; A first year stem showing young growth, spine and leaf development and a few flowers; B second year stem, from a proximal bud, bearing small leaves and spines; C second year development of inflorescences in an axillary position on the stem and spines as well as on a secondary shoot from a distal spine-bud; D inflorescence, showing reflexed hairy petals $\times 1.5$; E sepal, abaxial $\times 6.7$; F petal, adaxial $\times 6.7$; G bract, pedicel, stamens, disc, ovary and style $\times 6.7$; H developing fruits nearing maturity $\times 0.7$; J mature fruit $\times 0.7$ (see also Figs. 3Di - v). A from Griffith 1172, B from Wight 387, C - G from Gardner s.n. (Coimbatore), H from *Falguem* s.n., J from 'ex Paris Exhib.' s.n. in carp. coll. (K). Drawn by Margaret Tebbis.



- Berar For. Circ., C. Prov.: 38 (1916); Saxton & Sedgwick, Rec. Bot. Surv. India 6 (7): 252 (1918); Parker, Forest Fl. Punjab: 68 (1918); Kirtikar & Basu, Ind. Med. Pl.: 289 (1918) *pro parte*; Blatter & Hallberg, J. Bombay Nat. Hist. Soc. 26 (1): 232 (1918); Haines, Bot. Bihar Orissa, 2: 154 (1921) & Repr. Ed. 1, 2: 160 (1961); Fischer, For. Fl. E. Central Madras: 53 (1923); Dastur, Useful Pl. Ind. & Pakist.: 40 (? c. 1950); Santapau & Ruizada, Indian Forest Rec., Bot. 4: 125 (1955); Nair & Jain, Lloydia 19: 269 (1956); Meshewari, Fl. Delhi: 98 (1963); Biswas, Pl. Darjeel & Sik. Him. 1: 225 (1966) Saxena & Shukla, Bull. Bot. Surv. India 12 (1-4): 190 (1972); Amalraj, J. Bombay Nat. Hist. Soc. 78: 194 & Figs 1 & 2 (1981); Mathew & Britto in Mathew, III. Fl. Tamilnadu Carnatic: t. 116 (1982); Mathew, Fl. Tamilnadu: 218 (1983); Singh & Singh in Hajra, Nair & Daniel, Fl. India 4: 40 (1997). Type: India, — *fade* Planchon: 'Bombay, Capt. Geturne' (= Geburne), *Wall. Cat.* 6855c (lectotype K, selected here) — Hort. Bot. Calcutta, *Wall. Cat.* 6855c (isotypes K-W, BM).
- Balanites aegyptiaca* var. *indica* Voigt, Hort. Suburb. Calcutt.: 32 (1845); Drury, Useful Pl. Ind.: 59 (1858) & Ed. 2: 61 (1873), based on descr. *Ximenia aegyptiaca sensu* Roxb., non L. in Fl. Ind., Ed. Carey 2: 253 (1832). Type: Roxb. Icon. 174 (lectotype K, selected here).
- Agralida roxburghii* (Planch.) Kuntze, Revis. Gen. Pl.: 103 (1891).
- Zygophyllum rigidum* B. D. Jacks., Index Kew. 2 (4): 1257 (1895), based on descr. *Balanites aegyptiaca* 'variety *rigida*' Royle, Illus. Bot. Himal. Mts: 154 (1835); Type: Royle '10', India, near Delhi (holotype LIV).
- Balanites rigida* B. D. Jacks. in loc. cit.: 1269 (1895), as *rigidum*, based on descr. *B. aegyptiaca* 'variety *rigida*' Royle, loc. cit. (1835).
- Balanites aegyptiaca* var. *roxburghii* (Planch.) Duthie, Fl. Gangetic Plain 1: 145 (1903); as 'var. *roxburghiana* Sprague', Majumdar, Bull. Bot. Surv. India 13 (1 & 2): 117 (1973).
- Balanites jacquemontii* Tiegh., Ann. Sci. Nat. Bot. 9(4): 252 (1906) & in Repert. Spec. Nov. Regni Veg. 7: 120 (1909). Type: India, — 'Voyage de V. Jacquemont aux Indes Orient.' — *Jacquemont* 196 (holotype P).
- Balanites indica* Tiegh. in loc. cit. (1906) & in loc. cit. (1909). Type: India, Maharashtra State, between Ellora and Poonah, *Jacquemont* 272 (isotype K).
- [*Ximenia aegyptiaca sensu* Roxb., Hort. Bengal: 28 (1814) & in Fl. Ind., ed. 1832, 2: 253 (1832), non L.].
- [*Balanites aegyptiaca sensu* Wall., Cat.: 6855 (1832), excl. 6855E; Royle, loc. cit. (1835), *pro parte*; Graham, Cat. Pl. Bombay: 23 (1839), *pro parte*; Wight, Icon. Pl. Ind. Orient., 1: 14, t. 274 (1840); Walpers, Repert. Bot. Syst. 1: 379 (1842); Drury, Handb. Ind. Fl., 1: 122 (1864); Powell, Handb. Econ. Pl. Punjab: 568 (1868); Aitchison, Cat. Pl. Punjab Sindh: 30 (1869); Beddome, Fl. Sylv. S. India, 2 (For. Man.): 50, *pro parte*, & Anal. Gen.: t. 8, f. 2 (1871); Balfour, Cyclop. Ind., ed. 2, 1: 301 (1871); Engler in Engler & Prantl, Pflanzenfam. 3, 4: 355 (1896) *pro parte*; Blatter, J. Bombay Nat. Hist. Soc. 34 (4): 895 (1931), *pro parte*; Wealth of India 1: 143 *pro parte* & pl. 21, f. 4 (1948); Mohinder Nath, Fam. Burm. Fl. Pl. 1: 118 (1983) *pro parte*; G. S. Puri *et al.*, Rec. Bot. Surv. India 19 (1): 39 (1964); Chevan & Oza, Fl. Pavagadh: 55 (1966), *pro parte*; Panagrahi *et al.*, Bull. Bot. Surv. India 8 (2): 123 (1967) Kaushik, *ibid.*, 11 (1 & 2): 55 (1971); Malhotra & Moorthy, *ibid.*, 13: 3 & 4,

- 296 (1974); Oommachan, Fl. Bhopal: 90 (1977); Bhandari, Fl. Indian Desert: 94 & Fig. 33 (1978) and ed. 2: 88, Fig. 33 & Pl. 108 (1990) *pro parte*; Basak, Fasc. Fl. Ind. 4: 20 (1980) *pro parte*; Nair & Henry, Fl. Tamil Nadu 1: 63 (1983); P. J. Parmar in Shetty & Singh, Fl. Rajasthan: 176 (1987) *pro parte*, — non (L.) Delile] [*Balanites aegyptiaca* 'variety *arborescens*' Royle, Illus. Bot. Himal. Mts: 154 (1835) *nom. nud.*, as *arboresum*].
- [*Balanites aegyptiaca* 'variety *rigida*' Royle, loc. cit. (1835), *nom. inval.*, as *rigidum*].
- [*Ximenia arborescens* Aitch., Cat. Pl. Punjab Sindh: 30 (1869), *nom. nud.*, *pro syn.*; B. D. Jacks., Index Kew. 2 (4): 1239 (1895); based on *Balanites aegyptiaca* 'variety *arborescens*' Royle].
- [*Ximenia rigida* Aitch., loc. cit. (1869), *pro. syn.*; Jackson in loc. cit. (1895); based on *Balanites aegyptiaca* 'variety *rigida*' Royle].
- [*Zygophyllum arborescens* B. D. Jacks. in op. cit.: 1256 (1895), *nom. nud.*, based on *Balanites aegyptiaca* 'variety *arborescens*' Royle].
- [*Balanites arborescens* B. D. Jacks. in op. cit.: 1269 (1895), as *arboresum*, *nom. nud.*, based on *B. aegyptiaca* 'variety *arborescens*' Royle].

A semi-evergreen or deciduous, usually spiny, erect shrub or small tree, often suckering, sometimes up to 9 m high with a trunk up to 20 cm diam. at the base; bark up to 7 mm thick, grey or yellow; branches dull yellowish green, becoming grey-brown and longitudinally fissured with age by the opening of the lenticels. Branchlets and immature spines dull green, densely puberulous, at least at first, the indumentum variably persistent into the second and third year. Spines (0.6–0.8–3.5(–7) cm long, 1–2.5(–3) mm diam. at the base, usually ascending, borne at an angle less than 90° to the parent stem, 0.8–2.5 cm apart, axillary or up to 4(–5) mm above the axil, occasionally bearing branch-spines, straight, slender, cylindrical or tapering evenly, dull green except the orange-brown tip; spinules absent. Scale-leaves occasional on young spines, minute, narrowly triangular. Leaves frequently arising from the spines as well as the stems; stipules 0.5–0.75 mm long, very early-caducous, triangular, acute, puberulous; leaves subsessile or petiole (0.1–0.2–0.7(–1.2) cm long, puberulous; leaflets subsessile or with petioles 1–2 mm long, (2–)2.5–3.8(–4) × (0.6–)1.6–2.5(–4) cm, smaller on axillary flowering shoots (0.8–)1–2(–2.2) × (0.15–)0.5–0.9(–1.2) cm, ovate to narrowly elliptic to elliptic-obovate, broadly acute, obtuse or rounded, rarely slightly mucronate, broadly cuneate, membranous to thinly coriaceous, variably glabrescent, usually finely and sparsely adpressed-pubescent to subsericeous above, closely puberulous beneath; foliole minute, puberulous, conical or triangular, occasionally linear to 1 (2 in *Griffith* 1172) mm long. Inflorescence axillary or supra-axillary directly from, or on lateral shoots from, the proximal bud on 1-year old stems, or from 1–2(–3) nodes on the mature spines, fasciculate from a small swollen tomentellous cushion, or compounded of irregular clusters on an extended tomentellous rhachis up to 7(–8) cm long, or occasionally the flowers solitary. Bracts minute, sometimes to 0.5 mm long, bluntly triangular, scarcely emergent from the indumentum; pedicels (0.4–)0.5–0.8(–1.2) cm long, densely tomentellous, slender, thickening to 3.5 mm diam. in fruit. Flowers 5-merous, scented. Sepals (3–)3.5–4(–4.5) × 2–2.5 mm, ovate, broadly obtuse to bluntly acute, tomentellous outside, the glabrous margins broad, remaining concave

and eventually reflexed after anthesis. Petals $4.2 - 6(-6.5) \times (1.4 - 1.5) - 2$ mm, narrowly lanceolate to elliptic-oblong, rounded to obtuse, often apiculate and sometimes contorted and irregular at the apex, silky-villose within, greenish white to pale greenish yellow, becoming reflexed. Stamens 10, spreading; filaments $1.8 - 2.4(-2.8)$ mm long, filiform to subulate, anthers $0.7 - 0.9 \times 0.3 - 0.5$ mm, oblong-ovoid. Disc $0.5 - 1$ mm high. Ovary hemispherical, $0.5 - 1$ mm high, $0.8 - 1$ mm diam., densely silky-pilose; style $(0.25 - 0.4 - 0.5(-0.6))$ mm long, terete, rounded or truncate and sometimes slightly lobed at the stigmatic tip. Fruit $3.8 - 6.2$ cm long, $1.8 - 3.5$ cm diam., not obviously elongating in early development but later becoming cylindrical and eventually shortly ellipsoid to ovoid, sometimes 5-grooved, rounded or sometimes sulcate at both ends when mature; exocarap leathery, dull, yellowish green to light grey; mesocarap pulpy (often granular or mealy when dry); endocarap hard, rather fibrous outside, up to 6 mm thick, eventually splitting from the apex to form 5 flanges. Figs. 2Di & ii, 3Di - iii & 4Di - iv and 8.

SELECTED SPECIMENS. INDIA. Haryana, Karnal Distr., between Karnal and Panipat, 15 Aug. 1885, *Drummond* 1293/E (K) and 1294/E (K); West Bengal, Darjeeling, *Griffith* 1172 (K, BM); Bihar, E bank of Sone R., 7 Sept. 1906, *Haines* 5492 (K); Uttar Pradesh, Etawah, *S. Kurz* s.n. (CAL)*; Rajasthan, Alwar Distr., Alguwal, Sariska Tiger Reserve, *P. J. Parmar* 9550 (CAL)*; Bhilwara Distr., Dudu-jaipur Road, *B. M. Wadhwa* 8311 (CAL)*; Gujarat, Junagadh Distr., Gir Forest, Pilipar, 1 mile N of Sasan, 23 March 1969, *Hoddi* 144 (K); Madhya Pradesh: Moti Lake, March 1843, *Jameson* 29 (K); Maharashtra, between Ellora and Poona, *Jacquemont* 272 (*B. indica*, isotype, K); Karnataka, Dharwar Distr., ... plains below Dharwar', *Jacquemont* 235 (K); Andhra Pradesh, Godavery forests, *Beddome* 1078 (BM). Tamil Nadu, Coimbatore Distr., Coimbatore, *Gardner* s.n. (K).

*Examined in CAL by Dr B. M. Wadhwa and kindly reported to the author as being *B. roxburghii*.

DISTRIBUTION. Semi-arid areas of northern and south-central India. Map 3.

ECOLOGY. Very drought-resistant, occurring mainly in dry scrub and deciduous forest, along river banks or on open, dry plains (Wadhwa, pers. comm.). It frequently occurs on stiff clay, black clay ('cotton') or sandy quartz soils and, rarely, flourishes in rocky situations. Often forms groups by suckering from the extensive root-system. In parts of Maharashtra State, where it is frequent, it may be associated with species of *Acacia*, *Capparis* and *Zizyphus*.

Flowering generally between December and May, probably beginning when a plant is five years old. A second, less profuse flowering occurs during October and November but fruits rarely result from this. Amalraj (1981) suggests that although some flowers have been observed on young trees no more than 90 cm high, flowering is profuse only when they are over 2 m high. Fruit setting begins when trees reach 2.5 m high with a girth of 20 cm or more, and becomes abundant only when they attain 4.5 m. Amalraj (1981) indicates that the flowers are pollinated by flies attracted to a secretion from the glandular margin of the disc. Fruiting time varies with locality (Parmar (1987) states March to July); most commonly November and December. Up to 30% of the fruits may be infected by fly larvae which eventually emerge by drilling through the hard endocarap.

USES. Attribution of economic uses to this species is sometimes difficult because of its earlier acceptance as a synonym or at least variety of *B. aegyptiaca*, but the following uses seem to have been associated fairly consistently with the Indian plant. Watt (1889) and *The Wealth of India* (1948: 143 - 144 & 1988: 1355) provides the most detailed data.

The wood, which is said to be yellowish-white and moderately hard without heartwood or annual rings, is used as fuel and for making walking sticks. The young shoots and leaves are browsed by cattle. The bark has been used to provide an anthelmintic and, notably in Maharashtra, a fish poison. The pulp of the fruit, like the seeds, bark and leaves in some regions, has sometimes been used in local medicine. Bhandari (1978 & 1990) records that 'the outer rind of fruits contains a brown greasy pulp with a disagreeable smell which is used as a remedy for skin diseases and coughs'. The pulp contains saponin and is reported to be used in cleaning silk and cotton in Rajasthan. Amalraj (1981) reports that the steroidal precursor, diosgenin, can be extracted from the roots and the fruits, the latter yielding up to 3.65%. The fruit, variously reported as tasting 'bitter' to 'sweet but disagreeable', is also occasionally eaten and sometimes fermented to produce an alcoholic drink. A tasteless yellow oil can be obtained from the kernel (up to 44%) and the emptied nut, filled with gunpowder, has been used as a small firework called 'anar'.

VERNACULAR NAMES. Well over twenty local names have been recorded in the literature (notably by Watt, loc. cit. (1889)). Almost all appear to be variants or adaptations of one of three forms: *Nanjunda* which can vary to *Nanchunta*, *Gari* (Talju) occurring also, for example, as *Garrah* or *Garapandu*, and many, as in the Sanskrit *Ingudi-Vrikshaha*, based on the sound *ing* such as *Ingua*, *Hingu*, *Hingol*, *Hingol*, (Hindustani), *Hingolia* (Hindi), *Hingambel*, *Ingor*, *Ingudi* and *Rengri*. Biswas (1966) records that *B. roxburghii* is 'often mentioned in Ramayana, Mahabharata, Kalidas' poems and other literature, where the name *Ingudi Falam* is used. The English name *Wood Apple*, given on one herbarium sheet, may occasionally refer to this species.

NOTES. The first published record of *Balanites* occurring in India appear in 1814 in Roxburgh's *Hortus Bengalensis* where, as *Ximonia aegyptiaca*, it was merely listed. Later, in his *Flora Indica* account (ed. Carey, 1832), Roxburgh applied this name to all *Balanites* then known, whether from Africa, India or Burma, even though his description was almost certainly based on Indian material and indeed refers to the production of flowers and leaves on the spines, one of the characters which serves to distinguish *B. roxburghii* from *B. aegyptiaca*. Three years later, while continuing to regard plants from India and Africa as conspecific, Royle (1835) referred to distinctive 'varieties' of *B. aegyptiaca* growing near Delhi under the names '*rigidum*' (with small narrow lanceolate leaves) and *arboresum*.

Both Royle's names (1835) are invalidly published. Although they bear the brief descriptive phrase, 'with small narrow lanceolate leaves', Royle did not actually make the combination (Article 33.1 of the Code), referring only to the application of the name in his journal (presumed to be manuscript). Nor is it clear that he accepted the name (Article 34, 1a). Furthermore he was not definite about the rank of '*rigidum*', indicating it to be a 'distinct variety, if not a new species' — and, in fact, in

his journal referred 'both with doubt to *Zygophyllum*'. 'Arboresum', despite the implication that it is referable to typical *B. aegyptiaca*, is similarly invalidated and, lacking even a minimal description, must be designated a *nomen nudum*. Thus, when Jackson in the Index Kewensis made several combinations having the Royle 'varieties' as basionyms, only *Balanites rigida* and *Zygophyllum rigidum* were validly published, being based on Royle's brief description of 'rigidum' which, in turn can be typified by Royle '10' at Liverpool (LIV).

Voigt (1845) was the first to recognise the Indian plant as distinct, regarding it as a variety, *B. aegyptiaca* var. *indica*. Voigt referred to the description by Roxburgh of *Ximena aegyptiaca* (1832) and to Graham's account of *Balanites aegyptiaca* (1839) which itself refers, *inter alia*, to Roxburgh's description. Accordingly, as var. *indica* Voigt is effectively based on the earlier description, Roxburgh's drawing number 174, at Kew, is here selected as the lectotype.

The importance of the spines bearing leaves and flowers (Fig. 8B) as a diagnostic character of *B. roxburghii* was not appreciated until this study, but another feature of the Indian plant, the villous upper surface of the petals (Fig. 8F), was first used by Planchon (1854: 258) as the basis for describing it as a distinct species. His opinion was not always followed, however, and later authors, including Engler (1896: 355) and several more recently such as Basak (1980) and Bhandari (1990) have continued to regard Indian *Balanites* as referable to *B. aegyptiaca*. References to this species in the synonymy above (p. 46) are marked 'pro parte', where either a proportion of the description clearly refers to the African or Burmese plant, or the description is not sufficiently diagnostic of the Indian plants, or references to the African plant are cited. 'Pro parte' applied to *B. roxburghii* references generally implies the exclusion of Burmese localities.

Planchon (1854: 258) did not indicate a type. However, he stated that his species was based on material seen a few years previously while he was in charge of Sir William Hooker's herbarium, which he left in 1848. Several specimens would have been available to him then and a Wallich Catalogue sheet, 6855, which bears the name in Planchon's handwriting, is here selected as the lectotype. Comparison with the five specimens under this number in the East India Company's herbarium at Kew, reveals that it in fact matches 6855C, a plant cultivated in the Calcutta Botanic Garden. Specimens 6855A, B and D are also referable to this species. 6855E, however, is a sterile specimen of a species of *Athagi* (*Leguminosae - Papilionoideae*). On another Hooker herbarium sheet of 6855C, a ticket bearing the words '*B. roxburghii*, Bombay Capt. Geturne' has been added, perhaps by Planchon. The source of this additional information is unknown but the name is undoubtedly a mis-spelling and refers to Captain Henry Geburne who, according to Burkill (1961: 685), was a 'botanist' as well as an artillery officer in Bombay before his retirement in 1846. Geburne could well have sent seed or other propagating material to the Calcutta Botanic Garden.

Despite confusion arising from the superficial resemblance of the Indian plant to *B. aegyptiaca*, *B. roxburghii* differs from all other species except *B. wilsoniana*, *B. maughamii* and *B. triflora*, by the petals being hairy on the upper surface (Fig. 8F) (series *Roxburghianae* of Sprague (1913)). From these three species, as well as from *B. aegyptiaca*, it can be distinguished by the frequent occurrence of leaf- and flower-

bearing spines (Fig. 8C), a character it shares with the remaining species of *Balanites*. The combination of leaf and flower position and hairy petals therefore clearly establishes *B. roxburghii* as specifically distinct. Furthermore, even though the fruits eventually may become narrowly ellipsoidal prior to maturity (Fig. 8H), the ovary does not elongate markedly soon after flowering, unlike *B. aegyptiaca*. Indeed, Duthie (1903) mentioned this feature as one of the characters distinguishing his variety *roxburghii* from the African species.

B. jacquemontii and *B. indica*, described by van Tieghem in 1906, represent no more than age and seasonal variation within the single Indian species, as Sprague (1913) noted. His paper, as well as manuscript notes in the Kew herbarium, indicate that he gave considerable thought to shoot development in this species. With the additional material now available, this can be clarified further; indeed, the general underlying pattern may prove to be similar in other species with flower-bearing spines. Young, primarily vegetative, extension shoots (Fig. 8A) develop during a first year, these occasionally having one or two axillary, few-flowered inflorescences arising some distance from the shoot apex, but usually producing only relatively large leaves and long spines. (The spines, in contrast to those in certain African species, are never more than 5 mm above the axil). In the second year inflorescences, sometimes compound and of several small clusters, may arise in axillary positions on the one-year-old shoots. Alternatively, one long shoot (or in vigorous growth, two) may emerge from the proximal axillary bud (Fig. 8B), sometimes reaching 20–30 cm long and bearing smaller and often narrower leaves, small spines and sometimes sessile inflorescences. In addition, flowers often develop on the one-year-old spines (Fig. 8C). Occasionally secondary shoots, sometimes branching two or three times, can arise from the spines.

Nair & Jain (1956), in studying floral anatomy and development in *B. roxburghii*, maintain that, because the vascular supply to a group of flowers is indeterminate and the developmental sequence acropetal, the inflorescence is racemose. Bennett (in Hooker 1875: 522), though with less detailed evidence available, described them as cymose. Examination of all available material shows that, while larger, elongated inflorescences may exhibit overall racemose development, subordinate inflorescence units are generally determinate and cymose (Fig. 8C & D) and it seems likely that, as in so many plants, the inflorescence is a mixture of racemose and cymose elements.

The effects of different habitats, particularly on leaf-size, spine-development, and sometimes indumentum, is often also evident. Further field observations could certainly contribute to a clearer understanding of the factors governing the varying development of this species and the interrelationships of its shoot forms.

5. *Balanites aegyptiaca* (L.) Delile, Descr. Égypte, Hist. Nat.: 221 & t.28 & fig. 1 (1813). Type: T.39 (excl. fruits), in Alpinio, Pl. Aegypt. Liber. 38 (1640) as Agialid, lectotype, *fide* Basak in Fasc. Fl. Ind. 4: 20 (1980) *pro parte*. Epitype, chosen here: Tanzania, Tanga Prov., Mombe Forest reserve, 29 Nov. 1962, Semsel 3580 (K). For discussion of the typification see notes below (p. 55).

A semi-evergreen or sometimes deciduous, usually spiny, shrub or small tree up to 12(–15) m high, extremely variable in many of its characters. Bole usually straight,