Vernonia amygdalina Delile (Asteraceae) – An African medicinal plant introduced in India

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Abstract

The present paper deals with *Vernonia amygdalina* Delile, an African medicinal plant belonging to the family Asteraceae which has been found in cultivation in different places of Central and Eastern India as well as an escape from cultivation. The aim of this paper is to report its availability in India, facilitate identity of the species with detailed description and photo-plate and to explore the scope of commercialization of *V. amygdalina* in the country as health supplement and medicinal plant.

The genus *Vernonia* Schreb. (Asteraceae) is represented by *ca*. 1,000 species distributed in tropical Asia, Africa, North and South Americas. In India, the genus is represented by *ca*. 56 species and 15 varieties (Karthikeyan *et al*. 2009). Robinson (1999, 2007) has proposed the segregation of genus *Vernonia* into many smaller genera [e.g. *Acilepis* D. Don, *Baccharoides* Moench, *Cyanthillium* Blume, *Decaneuropsis* H. Rob. & Skvarla, *Distephanus* Cass., *Gymnanthemum* Cass., *Khasianthus* H. Rob. & Skvarla, *Monosis* DC., *Strobocalyx* (Blume ex DC.) Spach, *Tarlmounia* H. Rob.] with *Vernonia* s.s. (ca. 17 species) restricted to North America. However, most of these segregates are rather difficult to delimit. Therefore, we prefer to follow Chen & Gilbert (2011), keeping *Gymnanthemum* under the synonymy of *Vernonia*.

Vernonia amygdalina Delile [= *Gymnanthemum amygdalinum* (Delile) Sch. Bip. ex Walp.], commonly known as 'African bitter leaf' is a shrub to small tree of the tribe Vernonieae (Asteraceae) native to tropical Africa. The species is widely cultivated in Yemen and Ethiopia, South Uganda, Kenya and Tanzania, Brazil (Robinson 1999, 2007). However, it is wrongly treated as 'Endemic' to Brazil in 'Global Compositae Checklist' (Flann 2012). Interestingly, Sharma and Sharma (2010) revealed the occurrence of antimicrobial compounds (alkaloids, flavonoids, tannins, saponins etc.) in the leaves of *V. amygdalina* collected from Sagar, Deveri District of Madhya Pradesh. But *V. amygdalina* is not

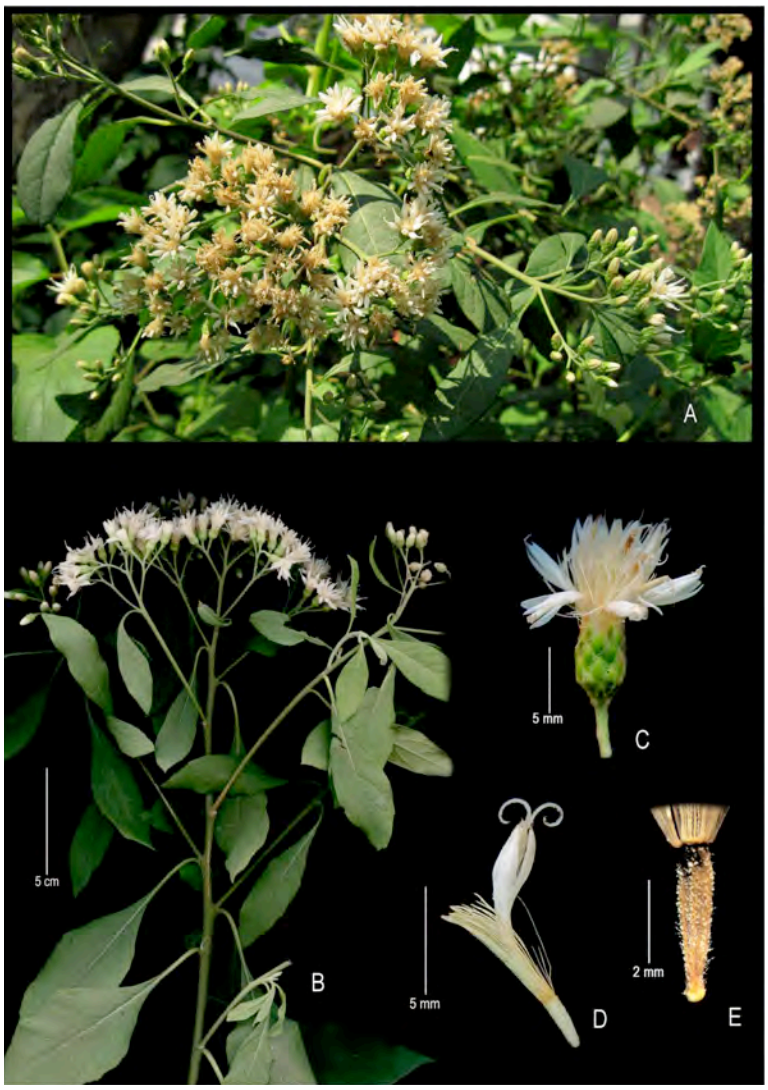

Image 1: *Vernonia amygdalina* Delile – A. Habit; B. Flowering twig; C. Inflorescence; D. Floret; E. Cypsela with portion of pappus

reported from India as evident by the works of Clarke (1876), Hooker (1881), Rao *et al*. (1988), Uniyal (1995), Karthikeyan *et al*. (2009). Sharma and Sharma (2010) neither made any comment on taxonomy of this alien species mentioning its first occurrence in India, nor did they cite any voucher specimen in their treatment. During the revisionary study of the tribe Vernonieae for 'Flora of India' by one of us (BB) and on the basis of different collections from Bihar (Bhagalpur), Odisha (Jokhipali), West Bengal (Howrah) it has been found that 'African bitter leaf' is now being cultivated as well as found to grow as an escape from cultivation in different parts of Central and Eastern India, at least for more than a decade, where some local people are consuming its leaves as herbal remedy for diabetes. The present occurrence of *V. amygdalina* in India is probably as a result of its introduction to some experimental gardens for research

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purpose due to its several medicinal properties, from where it has been spread.

Vernonia amygdalina Delile, Cent. Pl. Afr. Voy. Meroe: 41. 1826. *Gymnanthemum amygdalinum* (Delile) Sch. Bip. ex Walp. in Repert. Bot. Syst. (Walpers) 2: 948. 1843. Type: Sudan, Sennar, Fazogl, *Cailliaud* s.n. (holotype MPU, not found) Image 1.

Shrubs or small trees, 1.5 – 3 m high. Stem moderately to densely branched, terete with solid pith, somewhat angular above, striate, almost glabrous below, puberulous above. Leaves alternate, highly variable in shape and size, lanceolate-oblanceolate, some ovate-elliptic, 3 - 17 × 1.3 - 7 cm, membranous, acute at apex, very finely toothed at margins, glabrous on upper surface, somewhat glossy with fine, soft pale hairs below and on midrib, subsessile or petiolate; petioles 1-4 cm long. Inflorescence terminal, densely corymbiform with small bracteoles of 0.1 cm 0.2 cm long, sweetly scented, with short peduncle. Capitula 11 – 35 flowered, campanulate 0.2 – 0.5 cm wide, on pedicles 0.2 – 0.5 cm long, small creamy white. Involucre with 25 – 30 phyllaries in 4 – 5 gradate series, ovate-elliptic or oblong-obtuse or subacute, 0.4 – 0.6 cm long, coriaceous to subcoriaceous, appressed, pale green with darker spot near tip, outer surface with median shield, scarcely glabrous or ciliolate, inner bracts deciduous. Corolla gradually narrowed below, throat very deeply cut, lobes with glands or spicules on outer surface, white. Androecium 4.5 – 5 mm long, with 5 epipetalous stamens, syngenecious, anther linear to linear-lanceolate, 3 – 4 mm long, base broadly tailed. Gynoecium 11 – 14.5 mm long; ovary oblong-elliptic, 2 – 2.5 × 0.5 – 0.9 mm; style 8 – 9.5 mm long, with 2 coiled or decurved style branches at apex and a small basal node (knob like structure) at base, with stout pointed sweeping hairs on branches. Cypselae oblong-elliptic, 3 – 4 × 0.5 – 1 mm, with minute glands and bristly hairs, 10 costate. Pappus of many rather persistent capillary bristles with broadened tips, sub-uniseriate.

Flowering & Fruiting: December – March

Distribution: INDIA (Bihar, Madhya Pradesh, Odisha, West Bengal); Tropical Africa.

Specimens examined: 17.iii.2010, Nawab Colony, Bhagalpur, Bihar, India, S.K. Varma s.n. (CAL); 21.iii.2011, Jokhipali (cultivated), Bargarh, Odisha, D.K. Agrawala 23235 (CAL); 03.iii. 2011, Near Udayachal Sporting Club playground, Daneshseikh Lane, Howrah, West Bengal, India, B. Bhattacharjee 52404 (CAL); 05.ii. 2012, Near Bakultala, Howrah, West Bengal, India, B. Bhattacharjee 52457 (CAL); 1837, Ethiopia, Kotschy 479 (K, photo); Fernando Po, Nigeria, Vogel 257 (K, photo).

V. amygdalina is traditionally used in the management of diabetes in Africa (Akah & Okafor 1992; Atangwho *et al*. 2010). Traditional medical practitioners in tropical Africa use this plant also as an anti-helminth, anti-malarial, laxative, digestive tonic, appetizer, febrifuge and for the topical treatment of wounds (Ijeh & Ejike 2011). In some parts of Nigeria, stems are used as chew sticks for oral hygiene and for the management of some dental problems (Ijeh & Ejike 2011). In Malawi and Uganda, it is used by traditional birth attendants in the expulsion of placenta after birth, aid post-partum uterine contraction, induce lactation and control post-partum hemorrhage (Kamatenesi-Mugisha 2004). Research on this highly medicinal plant also claim that it has also many other phytotherapeutic properties like anticancer activity (Izevbigie 2003; Khalafalla *et al*. 2009), antibacterial activity (Ibrahim *et al*. 2009), antihepatotoxic activity (Arhoghro *et al*. 2009), antioxidant property (Adaramoye *et al*. 2008), serum lipid modulation properties (Ugwu *et al*. 2010), fungitoxic as well as phytotoxic effects (Alabi *et al*. 2005). *V. amygdalina* contains significant quantities of lipids (Eleyinmi *et al*. 2008), proteins with high essential amino acid score (Eleyinmi *et al*. 2008), carbohydrates (Ejoh *et al*. 2007) and fiber (Eleyinmi *et al*. 2008). It also possesses appreciable quantities of ascorbic acid and caroteinoids (Ejoh *et al*. 2007). Calcium, iron, potassium, phosphorous, manganese, copper and cobalt have also been found in significant quantities in this species (Eleyinmi *et al*. 2008).

A wide array of phytochemicals oxalates, phytates and tannins has been reported (Udensi *et al*. 2002; Ejoh *et al*. 2007; Eleyinmi *et al*. 2008) from leaves of *V. amygdalina*. Stigmastane-type saponins such as vernoniosides A1, A2, A3 (Jisaka *et al*. 1992); A4, B2, B3 (Jisaka *et al*. 1993); C, D and E (Ohigashi 1994) are present in the leaves. The A-series saponins are responsible for the bitter taste of *V. amygdalina*. Other steroidal saponins have been identified in the plant (Igile *et al*. 1995). Sesquiterpene lactones are another class of phytochemicals found abundantly in leaves of the species. Some of the identified sesquiterpene lactones are vernolide, vernodalol (Erasto *et al*. 2006), vernolepin, vernodalin and hydroxyvernolide (Koshimizu et al. 1994). Igile *et al*. (1995) reported presence of the flavonoids luteolin, luteolin 7-O-β-glucoroniside and luteolin 7-O-β-glucoside, in the leaves of *V. amygdalina*. Other researchers have confirmed presence of flavonoids in the plant (Tona *et al*. 2004). Other phytochemicals present in the leaves of *V. amygdalina* are terpenes, coumarins, phenolic acids, lignans, xanthones and anthraquinones (Tona *et al*. 2004). Izevbigie (2003) reported the presence of bio-active peptides called edotides in the leaves of *V. amygdalina*.

V. amygdalina is an important vegetable in Cameroon, where out of 93,600 tons of leafy vegetables harvested in 1998, 23% (21,549 tons) was bitter leaf (Smith & Eyzaguirre 2007). There is a very good scope to commercialize this species in India as health supplement for its health promoting effect and also as medicinal plant. We expect further research on bioactive properties, cultivation, micropropagation, molecular studies of *V. amygdalina* in Indian context.

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