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<i>Boronia</i> of the New England District — propagation and horticultural research	\$4,620
<i>Stirlingia latifolia</i> — farm production to replace picking in the wild	\$3,709
<i>Ptilotus</i> , its horticultural development/cultivation	\$4,855

While some of these projects concern the horticultural development of the Australian flora others relate to critical needs for conservation. Further details on any of these projects can be obtained from the Honorary Secretary, Australian Flora Foundation, G.P.O. Box 205, Sydney 2001. Why not fund your own project. Remember that you need donate only half the amount required as listed above and still receive full tax deductibility.

For those who cannot afford to support a whole project, you may like to donate \$25 or \$50 to one of them. In this way you may get some satisfaction in making a significant commitment to the conservation of our flora in the future. These smaller donations are also fully tax deductible. There is no better way to contribute to the conservation of our flora.

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COVER PLATE — *Dodonaea ptermicarfolia*, description page 207. Photo by John Simmons.

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Dodonaea

by Jeanette Closs *Dodonaea* Study Group¹
with assistance from Dr J. West²

The genus *Dodonaea* belongs to the Sapindaceae family. Most other Australian members of this family are trees of the northern Australian forests. There are 150 genera in the family. The name *Sapindaceae* is derived from the word "sapo" meaning soap. Saponin is a glycoside which forms as a soapy substance in leaves, roots and seeds of some plants of this family. Many Sapindaceae have economic value. Some yield valuable timbers and others well known fruits, such as Lychee (*Litchi chinensis*), Rambutan (*Nephelium lappaceum*), and the Tamarind (*Tamarindus indica*). Most have distinctive fruits such as drupes or capsules, rather than the spectacular flowers of other dicotyledonous families.

In 1754, Philip Miller named this genus *Dodonaea* after Rembert Dodoens, a 16th Century Flemish botanist, who was professor of medicine in the University of Leyden, Netherlands. At this time, 1754, there are records that *Dodonaea viscosa* was actually in cultivation in Europe!

Dodonaea is predominantly an Australian genus which is well distributed in all states. There are 69 species and 60 of them are endemic to Australia. Most are small shrubs 1–2 m in height, although two species are prostrate, and forms of *Dodonaea viscosa* can be single stemmed trees of up to 8 metres. *Dodonaea* may be found in many habitats (e.g., rocky ridges, forest, riverine communities, mallee, woodland and shrubland), however, they are not found in alpine communities, nor in dense vegetation communities such as heathland and rainforest.

The common name applied to *Dodonaea* is "Hop Bushes", because the colourful fruits resemble the fruits used in brewing. *Dodonaea* is in no way related to the "Hops" (*Humulus lupulus*) which is used for making beer. The *Dodonaea* Study Group usually calls them affectionately "Dods".

The visual attraction of these plants is their colourful fruits, though well grown specimens in cultivation can be attractive in foliage alone, e.g., *D. sinuolata*. I have grown a wide range of *Dodonaea* species here in Tasmania. They are quite hardy plants.

Leaf forms are very variable and are important in identification. In West's revision, there is a general key and a "Vegetative Key" to the species. The latter is very helpful especially when no flowers or fruit are available. Forty-six of the species have simple leaves and 23 species have compound leaves. The leaves are usually alternatively (rarely though sometimes opposite) arranged on the stem. The leaves can be glabrous (without hairs), hairy or in the case of *D. glandulosa* have glandular hairs. Seedling leaves frequently vary in shape from the adult leaves.

¹The *Dodonaea* Study Group has, for 10 years, been run by Jeanette Closs and this article is the result of many years study by gardeners in all parts of Australia. The artistic work in the sketches by Marion Simmons, Karen Stewart and A. Prescott is gratefully acknowledged.

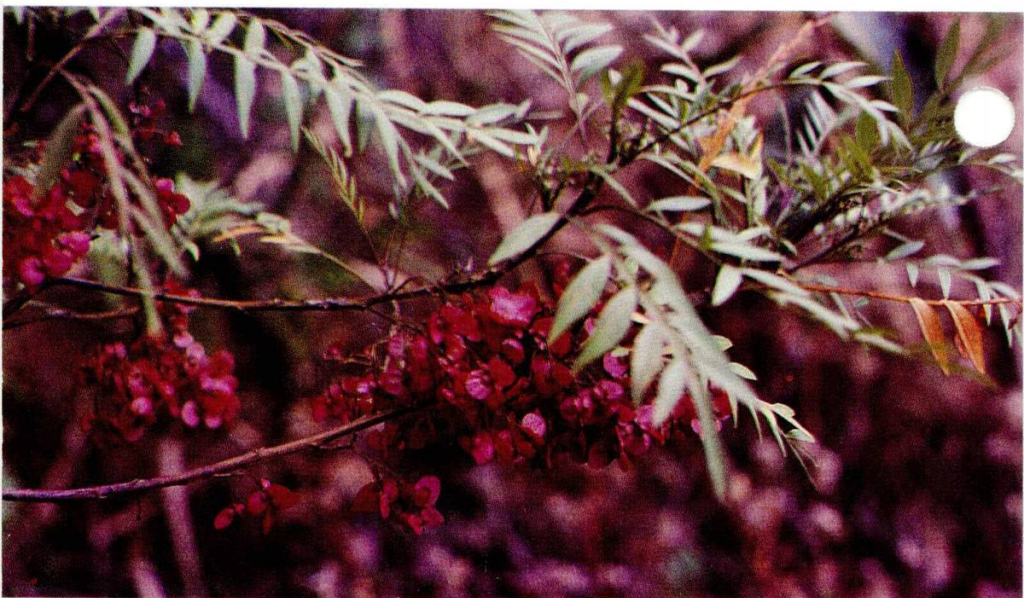
²This report is based on the work of Judy West, a botanist at the Australian National Herbarium. "A Revision of *Dodonaea* Miller (Sapindaceae) in Australia" published in *Brunonia* No. 7, 1984 and her revised key and descriptions in Volume 25 of the *Flora of Australia*.

³**Cultivation of *Dodonaea*** — The articles by Jan Sked on "*Dodonaea* For Queensland Gardens", page 226, and Bob Dixon, "*Dodonaea* in Western Australia", page 230, give a good guide as to the cultivation of these attractive plants in a wide range of conditions throughout Australia.



△ *Dodonaea microzyga*
Group 8 — Photo J. Simmons

▽ *Dodonaea megazyga*
Group 9 — Photo J. Closs





△ *Dodonaea filifolia*
Group 2 — Photo J. Simmons

▽ *Dodonaea filiformis*
Group 2 — Photo J. Closs



The Flowers of *Dodonaea*

The inconspicuous flowers have no attractant for pollinators and the absence of petals allows the pollen to be dispersed unhindered. See "Hop-bushes on the Wind", an article by Judy West that describes how *Dodonaea* are wind pollinated. No nectar is produced, which in other plants is an attraction to pollinators.

The small flowers lack petals, are quite inconspicuous (see photographs on page 212) and usually have a short flowering period. They are rarely used for the identification of species in this genus. The branching system of the inflorescences is spiral or scattered (except in *D. ericoides*, which has a solitary, terminal flower) and the inflorescences are described as a panicle. Beneath each flower is a bract or leaf-like structure.

The size and structure of the flower in each species is similar but they vary in the number of parts, i.e., sepals and stamens. Most species of *Dodonaea* have male flowers on one plant and female flowers on other plants (dioecious). The female flower may be identified by the single style with its sticky receptive tip and the male flower by a whorl of stamens carrying the pollen. Many of these species may also produce bisexual flowers. Each flower has a small stalk (pedicel) that elongates in the fruit. There are usually 3–6 (sometimes 7) sepals in each flower and they are not joined but are free. The position of the sepals at flowering differ in that, in the male flowers (Fig. W(a)) the sepals are usually spreading and in the female flowers, the sepals are more erect and surround the ovary and the style (Fig. W(b)) (female part) protrudes from between them. Usually the position of the sepals in bisexual flowers is more like that of the male flowers.

There are usually twice as many stamens (male parts) as there are sepals. The pollen producing parts (anthers) are large on usually short stalks (filaments) and are usually twisted at flowering time. There are usually 8–10 stamens, but sometimes less and sometimes more as in *D. polyandra* which has 12–14. The style is made up of 3–4 sections, which are usually joined in the lower half. The style is retained in the fruits of *D. bursariifolia*, *D. humilis*, *D. macrossanii*, *D. petiolaris*, *D. physocarpa* and *D. trifida*.

Propagation by Cuttings

The propagation of these plants by cuttings is relatively easy. They should be taken from the plants with female flowers to ensure the colourful capsules. My method of propagation from cuttings is:

- (1) select firm plant material, usually the top 10 to 15 cm;
- (2) carefully strip off the leaves from the lower two-thirds of this cutting;
- (3) cut out the tip if soft and floppy;
- (4) wound the lower $\frac{1}{2}$ –1 cm of stem (scrape with secateurs);
- (5) dip into liquid hormone 2 000 ppm IBA (Indolebutyric acid) for a few seconds; leave this to dry, whilst I write the label;
- (6) make hole in potting mix with knitting needle and place cutting in and press firmly. My cutting mix is 50 per cent perlite and 50 per cent peat moss — sieved in terra cotta pots which have crocks in the base;
- (7) I then bed them into a tray of perlite under which are heating cables set at 25° and this is situated in an unheated glasshouse with automatic mist.

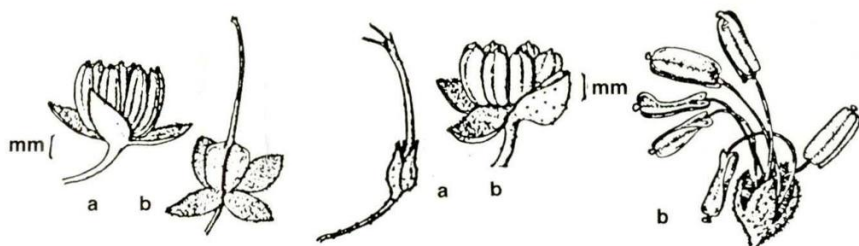


Fig. W. Flowers of *Dodonaea* species. (a) male flowers and (b) female flowers. From left to right *Dodonaea sinuolata*, *D. uncinata* and *D. glandulosa* the exception with stamens on long filaments.

Propagation by Seed

The fruits of *Dodonaea* are often very colourful and vary a great deal in colour and form. The dry dehiscent casules have 2–6 valves. Most capsules display an appendage; these can be rounded or transverse wings, or the capsules may be globose with horn-like or lobe-like appendages. Some fruits are also hairy. The fruits usually change in colour from green to brilliant shades of red, pink, purple or brown before maturing. At maturity they turn dry and papery, then split and expel their seeds. The number of seeds maturing in each fruit varies, as does their shape, but they are usually round, black and shiny. Capsules may not contain viable seeds unless grown near a male flowering plant. If there is room, it is recommended that you plant three or four of the seedlings in the one area and this should ensure a better chance of one of the plants producing viable seed.

It is best to use seed collected from the wild, as *Dodonaea* tend to hybridise. Many Study Group members have found that covering the seed with boiling water and leaving overnight before sowing is the best method. I use a mix of 50 per cent coarse sand and 50 per cent peat moss — sieved. The seed after treatment are put on this mix with a light covering of the same seed mix, and placed in the glasshouse where they are watered as required. When the second pair of leaves appear they are potted on into tubes and hardened off in the unheated glasshouse for a week or two before being put outdoors in a sheltered spot. I usually do this in the spring but one January sowing achieved the best rates of germination.

Lyn Stewart of South Australia boiled seed of various *Dodonaea* species in a microwave for a couple of seconds and got 100 per cent germination. A later trial with no pretreatment had reasonable success. She had lots of *D. viscosa* ssp. *angustissima* seed, but it looked all shrivelled up and useless. She decided to soak them for a few days, but forgot about them. They became swollen and germinated within a week. Soaking is good for them.

A report in May 1984 by CSIRO's Division of Forest Research on hard-seeded *Dodonaea* was that roughly 80 per cent to 90 per cent germination occurred following boiling water treatment and 90 per cent with nicking the seed using a scalpel on the cotyledon end of the seed.

Beverley O'Keefe of Springsure, Queensland, reported that having collected seed of *D. stenophylla* from the Tambo Road. She put them in a glass, poured boiling water over them and left them to sit. These were left in the glass and forgotten as they did not seem to swell. About a month later she found that they had put out small shoots (roots) and were potted into tubes.



△ *Dodonaea boroniifolia*
Group 8 — Photo J. Simmons

▽ *Dodonaea bursariifolia*
Group 5 — Photo J. Simmons



Wildflowers from Seed

Randy Linke from California (USA) reports — Trials of 18 species and varieties of *Dodonaea* seed were conducted using different treatments to assess their effect on germination and to see if there was one treatment that worked best on all types. For each species there were three samples of 12 seeds. Each sample was subjected to a different pretreatment and sown in the seed flats in mix of equal parts perlite and commercial planting mix with a peat base. This was bottom heated at 70°F (21°C).

- (I) The first sample of each species was given no pretreatment.
- (II) The second sample was treated with hot water, allowed to soak overnight.
- (III) The final sample was placed in a small amount of water in the microwave oven. The water was brought to a strong boil and allowed to cool.

Species	Germinated (after 2 weeks)			Number germinated (after 4 weeks)		
	I	II	III	I	II	III
<i>D. baueri</i>		×	×	1	11	7
<i>D. boroniifolia</i>	×	×		10	2	1
<i>D. bursariifolia</i>		×	×		7	12
<i>D. concinna</i>				1		1
<i>D. coriacea</i>		×	×	3	11	9
<i>D. filifolia</i> I		×	×	1	2	1
<i>D. filifolia</i> II			×	2		2
<i>D. filiformis</i>					1	
<i>D. hackettiana</i>		×	×		10	7
<i>D. hexandra</i>		×	×	2	9	6
<i>D. heteromorpha</i>	×	×	×	1	9	4
<i>D. hirsuta</i>		×	×		9	6
<i>D. lanceolata</i>		×	×	1	1	10
<i>D. lobulata</i>	×	×		10	9	
<i>D. triquetra</i>		×	×	1	9	11
<i>D. viscosa</i> ssp. <i>angustissima</i>		×	×		6	6

The Capsules

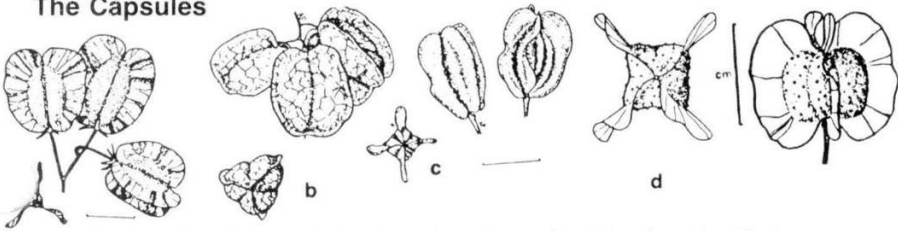


Fig. X. Capsules with rounded wings: Xa, three large wings with a small central seed capsule — Xb, three narrow wings on a large seed capsule — Xc, the capsule with four narrow wings splitting open along one of these wings and Xd, the capsule with four large wings.

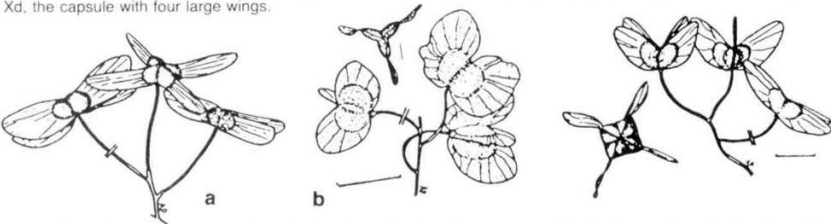


Fig. Y. Capsules with transverse wings: Ya, the four wings forming a cross — Yb, the three wings clearly not meeting at top or bottom — Yc, the four wings raised but not meeting.

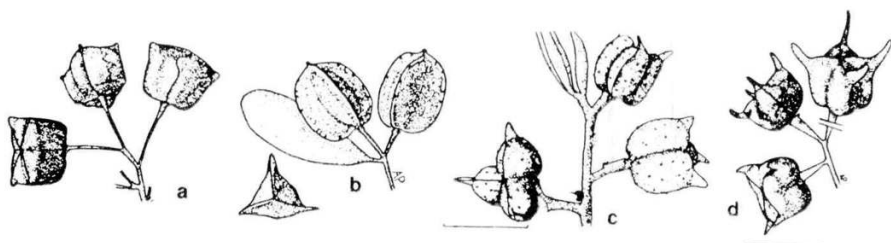


Fig. Z. Capsules with globose seed bodies and without prominent wings or appendages: Z a, capsules with four joined apartments — Z b, a three-compartment capsule with corners sharp but without wings — Z b and Z c, Z d, capsule rounded, without wings, but with beaked appendages on the top.

The following descriptions are presented in groups in accordance with the following table.

Group	Leaves	Capsules	Species
Group 1 page 199	Simple (not narrow, linear or cylindrical)	Rounded wings Fig. X and Fig. 1	<i>D. triquetra</i> , <i>D. viscosa</i> (all ssp. except <i>angustissima</i>), <i>D. amblyophylla</i> , <i>D. coriacea</i> , <i>D. hackettiana</i> , <i>D. intricata</i> , <i>D. lanceolata</i> , <i>D. petiolaris</i> , <i>D. polyandra</i> , <i>D. serratifolia</i>
Group 2 page 202	Simple (narrow, linear or cylindrical)	Rounded wings Fig. X and Fig. 4	<i>D. filiformis</i> , <i>D. viscosa</i> ssp. <i>angustissima</i> , <i>D. falcata</i> , <i>D. filifolia</i> , <i>D. rigida</i>
Group 3 page 203	Simple and lobed	Rounded wings Fig. X and Fig. 5	<i>D. biloba</i> , <i>D. procumbens</i> , <i>D. camfieldii</i> , <i>D. hirsuta</i> , <i>D. lobulata</i> , <i>D. peduncularis</i>
Group 4 page 207	Simple	Transverse wings Fig. X and Fig. 7	<i>D. heteromorpha</i> , <i>D. ptarmicaefolia</i> , <i>D. pachyneura</i> , <i>D. platyptera</i> , <i>D. rhombifolia</i> , <i>D. stenophylla</i> , <i>D. truncatiales</i>
Group 5 page 210	Simple	Globose without appendages Fig. Z and Fig. 9	<i>D. baueri</i> , <i>D. aptera</i> , <i>D. bursariifolia</i> , <i>D. ericoides</i> , <i>D. hexandra</i> , <i>D. humifusa</i> , <i>D. tepperi</i>
Group 6 page 214	Simple	Globose with prominent appendages	<i>D. pinifolia</i> , <i>D. caespitosa</i> , <i>D. ceratocarpa</i> , <i>D. divaricata</i>
Group 7 page 215	Simple	Globose and hairy, Fig. Z	<i>D. triangularis</i> , <i>D. trifida</i>
Group 8 page 218	Compound	Rounded wings Fig. X and Fig. 14	<i>D. boroniifolia</i> , <i>D. sinuolata</i> , <i>D. adenophora</i> , <i>D. concinna</i> , <i>D. larreoides</i> , <i>D. microzyga</i> (some), <i>D. multijuga</i> , <i>D. pinnata</i> , <i>D. polyzyga</i> , <i>D. stenozyga</i> , <i>D. uncinata</i>
Group 9 page 222	Compound	Transverse wings Fig. Y and Fig. 18	<i>D. inaequifolia</i> , <i>D. megazyga</i> (some), <i>D. subglandulifera</i> , <i>D. tenuifolia</i>
Group 10 page 223	Compound and hairy	Winged and hairy, Fig. 19	<i>D. rupicola</i> , <i>D. oxyptera</i> , <i>D. vestita</i>
Group 11 page 224	Compound	Globose and hairy, Fig. 20	<i>D. humilis</i> , <i>D. glandulosa</i> , <i>D. macrossani</i>
Group 12 page 221	Compound	Globose only sparsely hairy	<i>D. physocarpa</i>

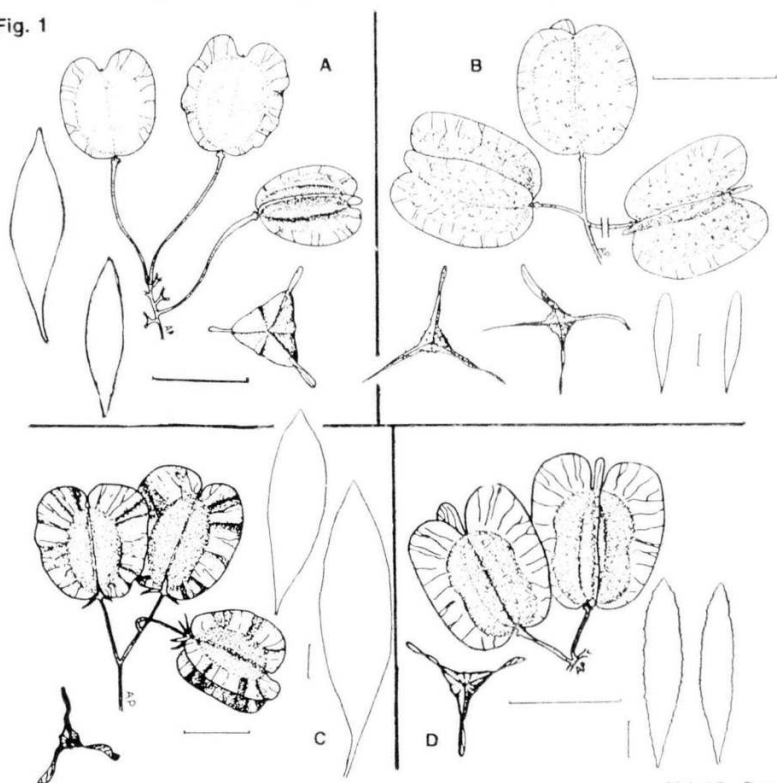
GROUP 1 — *Dodoneaea* species with simple leaves (not narrow, linear or cylindrical). Capsules with rounded wings.

Dodoneaea triquetra Wendl. 1798 is an erect shrub 1–3 m high. The leaves are simple, petiolate, and narrow to broad, elliptic, usually 5–12 cm long by 1–4 cm wide with a prominent mid-vein and pointed at the apex. The capsules are three winged usually 10–15 mm across with the wings about 2–5 mm wide. The body of the fruit is brown or purple and the wings are yellow to light brown at maturity. It flowers in summer and capsules mature in the following spring or early summer. *D. triquetra* is found on the coastal plain and eastern side of the Great Dividing Range from Orbost in Vic. to Bundaberg in Qld. It is a shrub of dry and wet sclerophyll forests; mostly in sandy soil, but in cultivation it seems to adapt to heavier conditions. It regenerates well after fire. Fig. 1A.

Dodoneaea amblyophylla — erect multi-stemmed small to medium shrub, with sessile oblong leaves 2–4 cm long, dark brown to purple fruit. The species sometimes suckers. Southern W.A. Fig. 1B; note also leaf variation.

Dodoneaea lanceolata — the type variety is an erect medium shrub with elliptic, petiolate leaves 3–10.5 cm long, terminal groups of purple-brown fruit. Northern Western Australia, Northern Territory and western Queensland. The variety *subsessilifolia* is similar to the above but the leaves lack the petiole. Eastern Queensland. Fig. 1C showing the small capsule body and leaf variation.

Fig. 1



Dodonaea serratifolia — erect medium shrub, leaves are dark green, paler below, elliptical, with finely toothed margin, 4–7 cm long; capsules pink-brown. North-eastern New South Wales near Gien Innes area. Fig. 1D.

Dodonaea petiolaris — erect medium shrub, leaves broad-lanceolate 2.5–5 cm long, large capsule is unusually inflated with a narrow wing to 3.5 mm wide. Arid areas of W.A., N.T., N.S.W. and Queensland. Photo page 208. Fig. 2A.

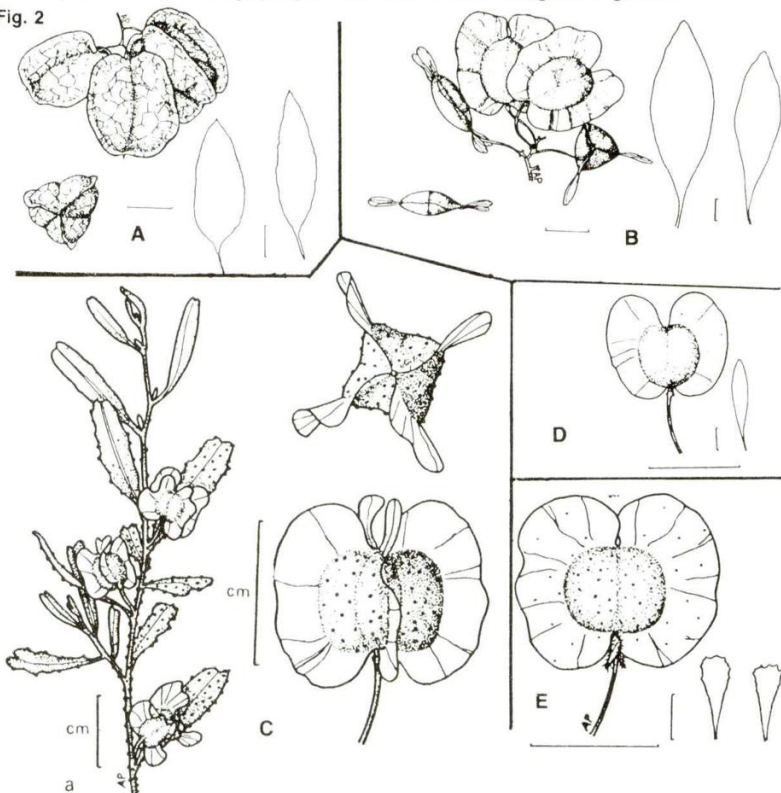
Dodonaea polyandra — erect shrub or small tree, large elliptical leaves 5.5–10 cm long, two or three winged purple capsule 15–30 mm wide. Cape York. Fig. 2B.

Dodonaea coriacea — small spreading shrub, leaves glandular, wedge-shaped, 1.4–3 cm long, fruit usually creamy-yellow. Northern Australia–Hammersleys to Mt Isa area. Fig. 2E.

Dodonaea hackettiana — erect small to medium shrub, leaves narrow-elliptic 3–5 cm, orange-brown fruit in terminal panicles. Lime tolerant. Rare and endangered, found only in small areas near Perth. Fig. 2D.

Dodonaea intricata — small spreading shrub, restricted to Gawler Ranges, South Australia, small oblong leaves with small brown glands on leaves and stems, 0.7–1.7 cm long, purple-red fruit is four winged. Fig. 2C.

Fig. 2



Dodonaea viscosa — the type form is a spreading shrub 1–2 m, large elliptical leaves 7–12.5 cm long, 2–4 cm wide. N. Qld coast, offshore islands and tropics.

subsp. *viscosa* is a compact spreading shrub 1–3 m high. The leaves are sessile or sometimes with a 1 mm long petiole. The blade of the leaf is cuneate to narrow-obovate, 1.5–3 cm long with a very short blunt point or rarely 2–3 toothed. The fruits are 3–4 winged and the wing is 4–6 mm wide. This subspecies grows in mallee scrub in semi-arid areas and in open forests in high rainfall areas in South Australia, Victoria and New South Wales. It grows in sandy loams in nature but is very adaptable to a wide range of soil types in cultivation. Photo page 216. Fig. 3B.

subsp. *burmanniana* — small tree 2–6 m, leaves narrower than ssp. *viscosa* and thicker and 6.5–15 cm long. Eastern Australia from Grafton to Cairns. Photo on page 229.

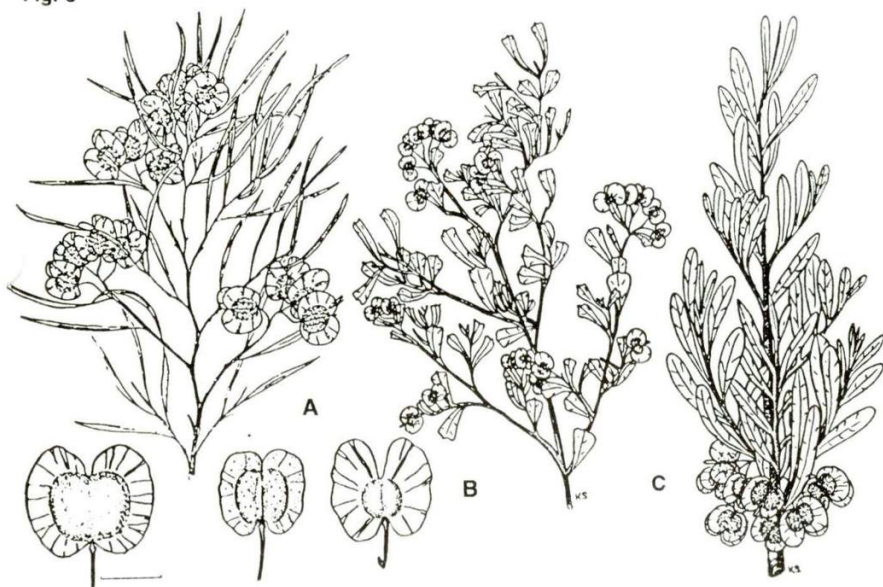
subsp. *angustifolia* — compact shrub to 3 m high, leaves much narrower than ssp. *burmanniana* and about same length. Slopes and tablelands of Great Dividing Range from southeastern Queensland to Victoria. Photo page 213.

subsp. *mucronata* — medium shrub, leaves spatulate, 2.5–6 cm. Mostly in arid areas of Australia. Photo page 212.

subsp. *spatulata* — medium shrub, leaves similar to ssp. *mucronata* but with base attenuate and shorter petiole. Temperate, semi-arid areas, all states except Northern Territory. Photo page 213. Fig. 3C.

subsp. *angustissima* — described in Group 2. Photo page 213. Fig. 3A.

Fig. 3



GROUP 2 — *Dodonaea* species with simple narrow, linear or cylindrical leaves. Capsules with rounded wings.

Dodonaea filiformis Link is endemic to Tasmania. Small isolated groups of plants are found in many locations in the eastern half of the island. It is an erect shrub, 1–2 m high with needle-like foliage densely arranged up the stems. These fine leaves are 1.5–2 cm long. The three-winged capsules are dark red at maturity and almost sessile, so they are clustered along the stems. The male flowers can be spectacular appearing like tiny red crowns. It is hardy in cultivation, even surviving drought conditions. Photo page 193. Fig. 4C.

Dodonaea viscosa* ssp. *angustissima (D.C.) J. G. West is the most attractive of the *D. viscosa* subspecies, with its fine delicate foliage. It is an erect bushy shrub 2–4 m high. Leaves are sessile, linear to narrow-oblong, usually sticky and 3–9.5 cm long with an acute tip. The capsule is 3–4 winged, 10–20 (sometimes to 28 mm long) and 13–22 mm broad, including the wing which is usually 3–6 mm wide. Plants are widespread usually in open woodlands and sand plain areas, and occasionally rocky situations, in south and central parts of the continent. This subspecies has previously been known as *D. attenuata*, *D. attenuata* var. *linearis* and other synonyms. Photo page 213. Fig. 3A.

Dodonaea falcata — medium erect shrub, needle-like channelled leaves 2.5–5 cm long forming a long S-shape, reddish-brown fruit on reflexed pedicels, branches hairy. South-eastern Queensland and eastern N.S.W. Fig. 4B.

Dodonaea filifolia — erect shrub or small tree, similar to *D. falcata* but the grooved leaves are straight 3.5–10.5 cm long and branches glabrous. Central and eastern Queensland. Photo page 193. Fig. 4D.

Dodonaea rigida — erect medium shrub, leaves rigid, terete or four-ribbed, 3.4–7.5 cm long; red to red-brown capsules in leaf axils. S.W. Western Australia. Photo 209. Fig. 4A.

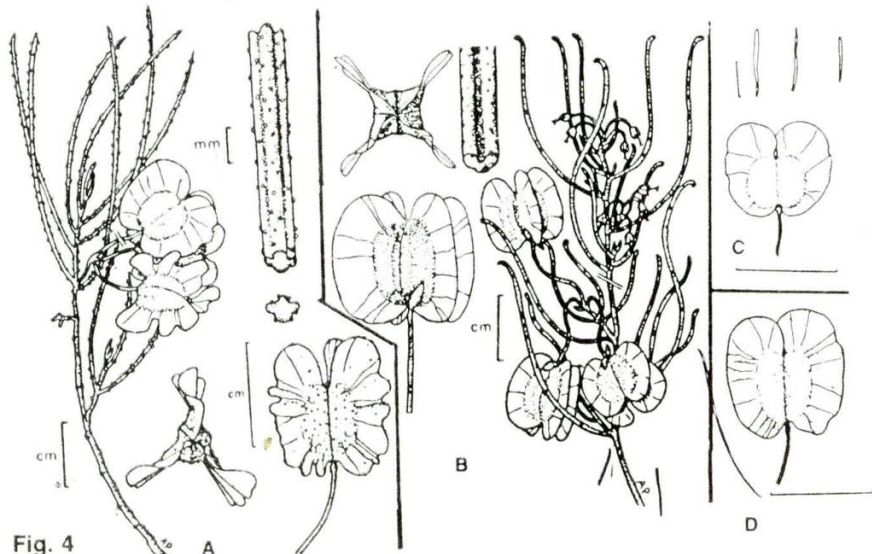


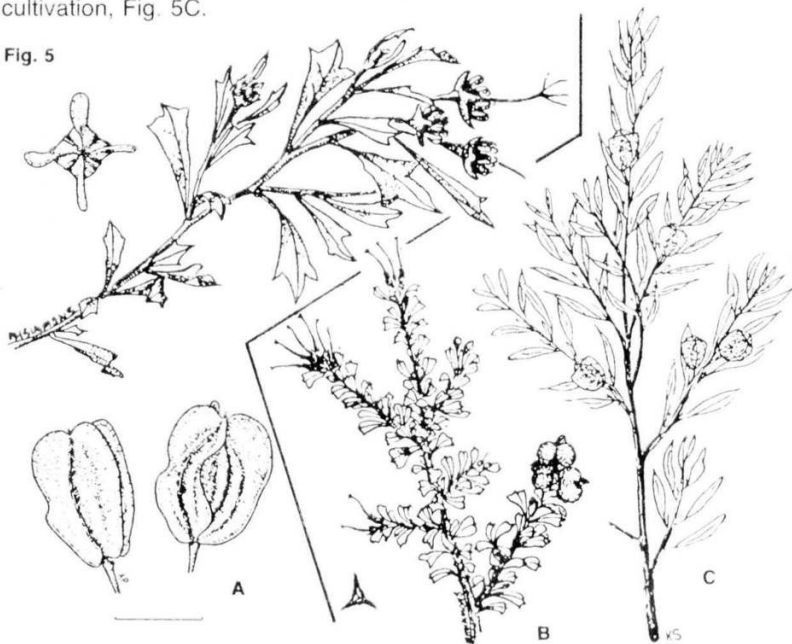
Fig. 4

GROUP 3 — Species, simple and lobed leaves. Capsules with rounded wings.

Dodonaea biloba J. G. West is a spreading or prostrate shrub, which often roots at the nodes. It usually spreads to 1.5 m and occasionally to 3.5 m. The leaves are simple, sessile, cuneate and 2-lobed at the apex, 6–9 × 3–6 mm and sticky. The base is narrowed and the apex has two to three lobes. The female flowers protrude their styles well beyond the leaves. The capsule is 3–4 winged, viscous, glabrous and red-brown at maturity, which is May to September. In general appearance it is very attractive, with bright green foliage and a quite compact form. It is only found in a small area of the Chinchilla-Barakula and Miles region of south-eastern Queensland. More recently, it has been sighted further north alongside the Cracow-Eidsvold Road. It appears to be hardy as it does well in Hobart and Launceston, which is a long way from its natural habitat. Fig. 5B.

Dodonaea procumbens F. Muell. is a prostrate shrub spreading to 1.5 m in diameter with stems rooting at the nodes. The light green, lobed leaves are 1–2.2 cm long (rarely to 3 cm) with revolute margins; unlobed leaves occasionally also occur. It has one or two terminal flowers, which develop into 3–4 winged capsules 9–10.5 mm wide, which are larger than the leaves. The wings on these fruits are relatively small being only 0.5 mm wide. These fruits may take 10–12 months to mature to the fullest red-brown colour and are at their best in the summer. It is often found as a ground cover under eucalypts in open woodlands. Its distribution is Mt Lofty Ranges, South Australia, in south-western Victoria and near Cooma in southern New South Wales. In cultivation it does well in tubs or hanging baskets, it also provides a dainty effect hanging over rocks. Fig. 5A. A natural hybrid of this species with *D. viscosa* has done well in cultivation, Fig. 5C.

Fig. 5



Dodonaea camfieldii — spreading often prostrate shrub, similar to *D. procumbens* but this species has decurrent, undulate, linear to oblong leaves, 1–3.5 cm long; sometimes toothed rather than lobed. Central and south coast of New South Wales. Fig. 6B.

Dodonaea hirsuta — small erect shrub, small hairy obtriangular leaves 0.3–0.6 cm long with three to five lobes, single hairy capsules in leaf axils. South-eastern Queensland and north-eastern N.S.W. Photo page 205. Fig. 6C.

Dodonaea lobulata — medium erect shrub, linear leaves 1.5–5.5 cm long with numerous small lobes on the margins, can be distinguished from *D. ptarmicaefolia* which has a toothed margin and transverse wings on the capsule. Southern Western Australia, South Australia and western N.S.W. Fig. 6A.

Dodonaea peduncularis — small to medium spreading shrub, leaves small 0.7–1.8 cm long, oblanceolate and usually lobed at the apex. Four-winged capsules dark red to brown at maturity. N.S.W. and southern Queensland. Photo page 205. Fig. 6D.

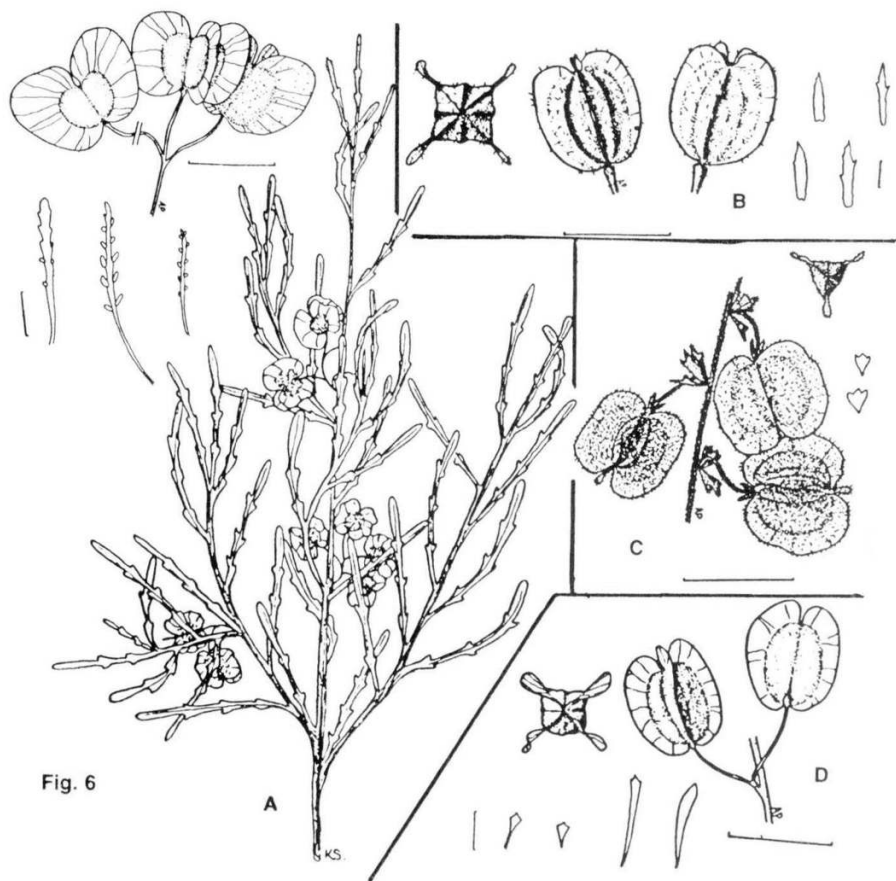


Fig. 6



△ *Dodonaea hirsuta*
Group 3 — Photo J. Simmons

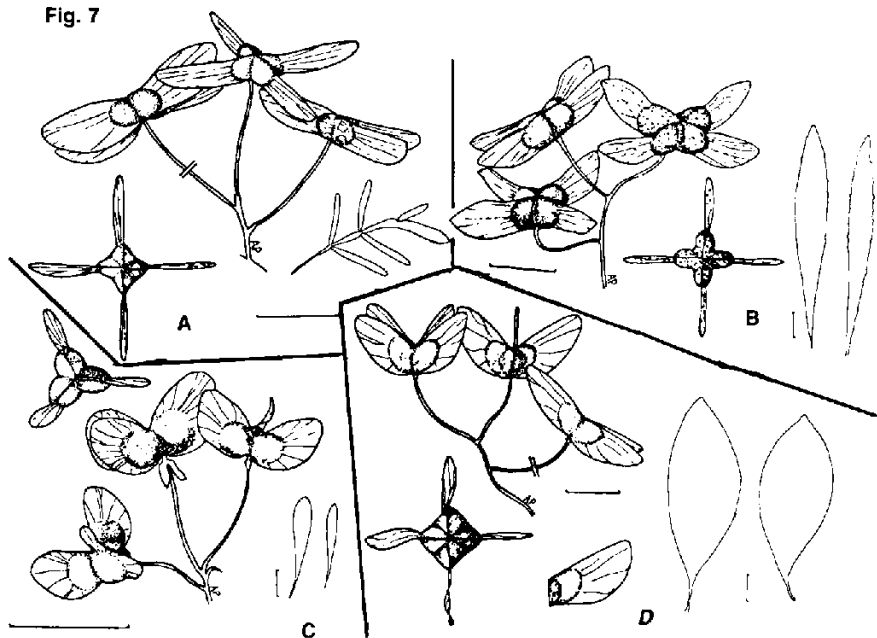
▽ *Dodonaea peduncularis*
Group 3 — Photo I. Armitage



GROUP 4— Species with simple leaves. Capsules with transverse wings.

Dodonaea heteromorpha J. G. West. Although I have listed this shrub as having simple leaves, it also produces some irregularly pinnate leaves. These compound leaves are rarer and range from having one, three, four or five alternate leaflets to five opposite pairs. The leaves are sessile and 3.5–8.3 cm long. It is an erect shrub 1–3 m high and by removing lower branches can be trained as a small tree. The capsules have four transverse wings and can be 18–25 mm broad, with the wing extending up to 10 mm. The clusters of red-brown capsules appear in spring. This is mostly found on the western slopes of the Great Dividing Range in N.S.W. and southern Queensland. Fig. 7A.

Fig. 7



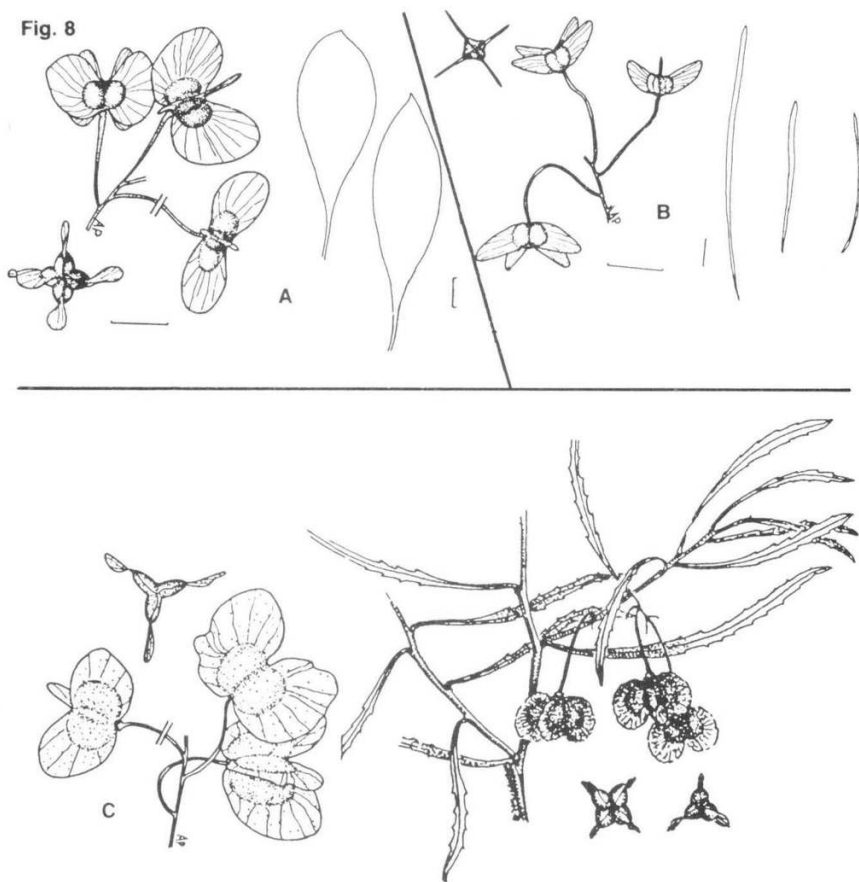
Dodonaea pachyneura — medium erect shrub, leaves linear to oblanceolate 2 cm long, lower lateral veins conspicuous, 3–4 transverse-winged fruit. Hammersley and Robertson Ranges, Western Australia. Fig. 7C.

Dodonaea platyptera — erect shrub or small tree. Similar to *D. pachyneura* but this species has broader leaves and lacks the conspicuous veins. Far north of Australia in Queensland, Northern Territory and Western Australia. Fig. 7D.

Dodonaea truncatiales — erect medium shrub, similar to *D. heteromorpha* but with broader simple leaves which are 5.5–10 cm long. Fruit red to purple-brown or light brown at maturity. Central and south coast of N.S.W. Fig. 7B.

Dodonaea ptarmicaefolia Turcz. is from south-western Australia, frequently on sandy loams in mallee scrub. It appears to be a good coloniser and regenerates rapidly from seed after fire. I find that it is also a fast growing species in cultivation. It is a very attractive, compact and erect shrub 1–4 m high. The leaves have regularly toothed margins and are 2–5 cm long with a tapered base. The spectacular fruits are 3–4 winged and purple-red to red-brown from October to January. Photo page 189. Fig. 8C.

Fig. 8



Dodonaea rhombifolia — medium erect shrub, leaves large broad-elliptic are 4.5–8.2 cm long and spotted with white glands, and four-winged capsule is light brown. North-eastern Victoria, south-eastern and north-eastern N.S.W. Fig. 8A.

Dodonaea stenophylla — erect medium to tall shrub, leaves 3–10.5 cm long, linear, rigid and sticky, closely related to *D. platyptera* which has broader leaves and larger fruit. Qld and New England area of N.S.W. Photo page 229. Fig. 8B.



△ *Dodonaea sinuolata*
Group 8 — Photo J. Simmons

▽ *Dodonaea petiolaris*
Group 1 — Photo J. Simmons





△ *Dodonaea vestita*
Group 10 — Photo J. Simmons

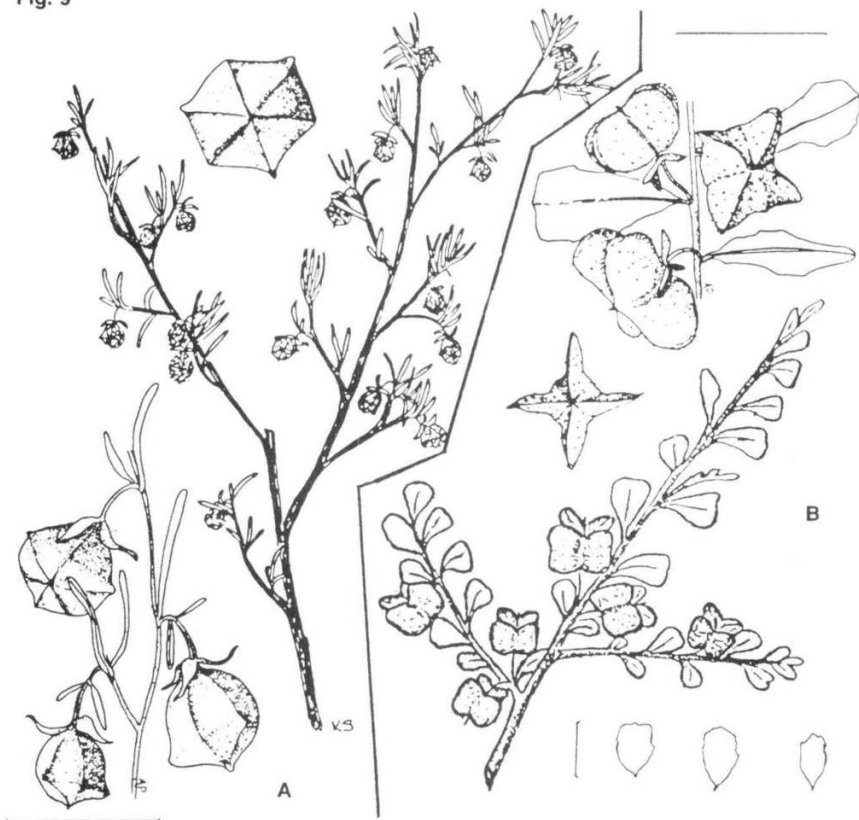
▽ *Dodonaea rigida*
Group 2 — Photo J. Simmons



GROUP 5 — Species with simple leaves. Capsules globose without appendages.

Dodonaea baueri Endl. is a wiry, spreading, sometimes prostrate shrub to 1 m. The leaves are simple, obovate 0.5–1.8 cm long, dark green above and lighter beneath; the margins are wavy and unevenly toothed. The flowers are solitary on short peduncles. The small, sticky, globose capsules are three, four or five angled and are dark red to brown when mature, which is usually August to November. The sepals persist after the fruit is formed. It is endemic to the southern districts and Flinders Ranges of South Australia and Kangaroo Island, where it inhabits rocky hillsides and exposed mountain ridges. In cultivation it appears to tolerate acid soils but prefers alkalinity. Fig. 9B.

Fig. 9



Dodonaea hexandra — low spreading shrub, fine linear leaves 0.8–1.4 cm, rarely to 2.5 cm; long and small brown 3-angled globose fruit. Similar to *D. pinifolia* (Group 6) but that species has horned fruit. Southern mallee regions of South Australia. Fig. 9A.

Dodonaea aptera — erect medium shrub, olive green elliptical leaves 2.2–6 cm long; four-angled subglobose fruit in terminal clusters are cinnamon to pinkish-brown. Lime tolerant. Coastal south-western Western Australia. Fig. 10A.

Dodonaea bursariifolia — small spreading shrub, similar to *D. amblyophylla* (Group 1) but the capsules often lack wings or they have a minute wing at the tips. Southern Western Australia, South Australia and western Victoria and New South Wales. Photo page 196. Fig. 10D.

Dodonaea ericoides — small erect shrub, linear leaves are small olive green, margins are revolute and sometimes lobed. This is the only species with opposite leaves. Capsules 4-angled, hairy and small. This species is rare and restricted to a few areas in south-western Western Australia. Fig. 10B.

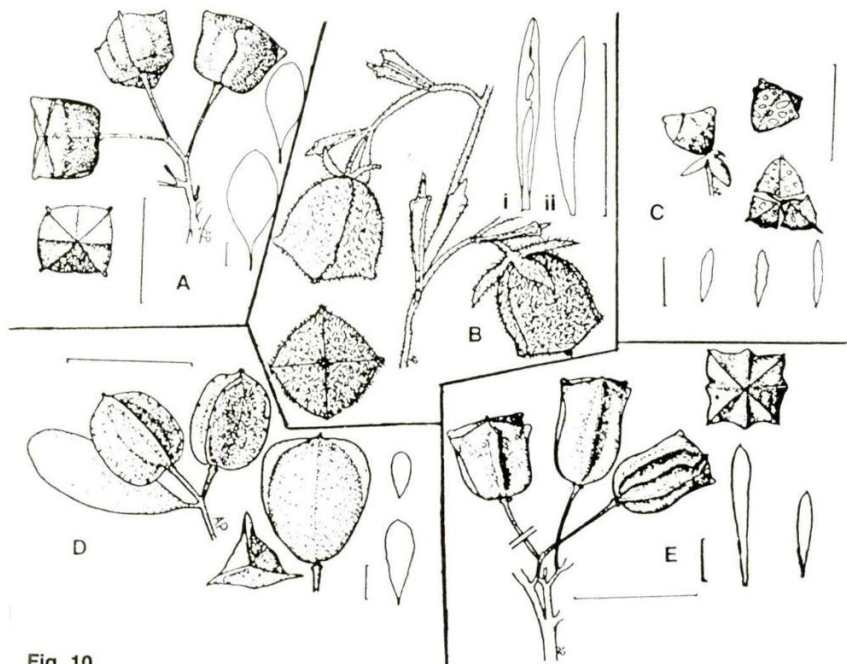


Fig. 10

Dodonaea humifusa — prostrate shrub, stems rooting at the nodes, leaves oblanceolate, sometimes toothed 1.5–2.5 cm, rarely to 4 cm long, tiny capsule usually four-angled and pinkish-brown. Frost tender. North of Stirling Ranges, Western Australia. Fig. 10E.

Dodonaea tepperi — low spreading shrub which is extremely rare, small oblong leaves 0.8–1.4 cm long and tiny 3–4 angled capsules which are dark red-brown speckled with orange. Previously known only at Monarto, S.A., but more recently found in southern South Australia. Fig. 10C.



△ Female flower of *Dodonaea* Photos Judy West △ Male flower of *Dodonaea*
 ▽ *Dodonaea viscosa* ssp. *mucronata* — Group 1 — Photo J. Closs





△ *Dodonaea viscosa* ssp. *spatulata*
Group 1 — Photo Ken Newby

▽ *Dodonaea viscosa* ssp. *angustissima*
Group 2 — Photo F. J. Noble



GROUP 6 — Simple leaves. Capsules globose with prominent appendages.

Dodonaea pinifolia Miq. in Lehm. It is a very variable plant, mostly spreading to 1.5 m across and to a height of 0.2–1 m. The leaves are simple, linear, sometimes terete, 1–3.5 cm long and crowded. The margins are usually entire but frequently revolute and sometimes with 1–4 irregular teeth or lobes. It flowers from December to March. The 3–4 angled, globose capsules have one erect horn-like appendage to each segment of the capsule. They are 4.5–11.5 mm $\times$ 5–11.5 and rarely 20 mm and light to pinkish-brown at maturity, which is late August to November. It is evidently a good coloniser of disturbed sites and grows in granite and lateritic rock areas, or in sandy and gravelly soils, occasionally in sandy loam. It resprouts from the base after fire. It is widespread in south-western Western Australia. It extends from Cue and the Geraldton area in the north to Wongan Hills, further south to the Stirling Ranges and Ravensthorpe, and to Peak Charles and Cape Arid National Park east of Esperance to the east. Fig. 11A.

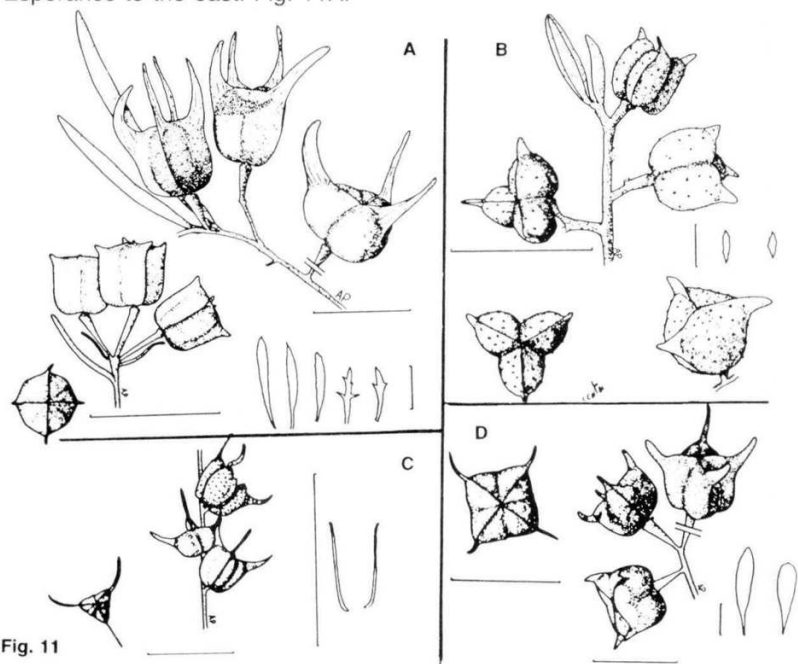


Fig. 11

Dodonaea caespitosa — small compact shrub, tiny (0.2–1 cm long) linear leaves crowded at the nodes on red branchlets, dark red to brown capsules with horn-like appendages. South-western Western Australia. Fig. 11C.

Dodonaea ceratocarpa — medium spreading shrub, oblanceolate or narrowly spatulate leaves to 3 cm, capsule usually 4-angled, small with horn-like appendages. Similar to *D. aptera* which has broader leaves and minute appendages on fruit. Lime tolerant. Southern Western Australia. Fig. 11D.

Dodonaea divaricata — small spreading shrub, tiny linear leaves 0.3–0.8 cm long and capsules about 3 $\times$ 4 mm. Similar to *D. caespitosa* which has larger fruit and red branchlets. South-western W.A. as far north as Three Springs. Fig. 11B.

GROUP 7 — *Dodonaea* species with simple leaves. Capsules globose and hairy.

Dodonaea triangularis — medium to tall erect shrub, leaves hairy, obovate usually with three lobes, 1.2–3.5 cm long, capsules 3–4 angled, with small lobe-like appendages, red-brown. Eastern Queensland and N.S.W. Fig. 12A.

Dodonaea trifida — small erect shrub, leaves and stems hairy, leaves obovate 0.7–1.2 cm long with deep lobes, fruit similar to *D. triangularis*, but leaves smaller and more distinctively lobed. Rare along south coast of Western Australia. Fig 12B.

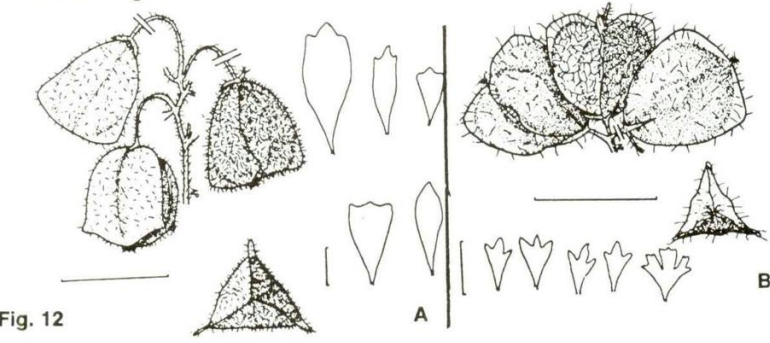


Fig. 12



Fig. 13

Species in Group 8



△ *Dodonaea inaequifolia*
Group 9 — Photo J. Closs

▽ *Dodonaea viscosa* ssp. *cuneata*
Group 1 — Photo J. Simmons





Dodonaea stenozyga flower $\triangle$ and plant ∇
Group 8 — Photos J. Simmons and J. Closs



GROUP 8 — Species with compound leaves. Capsules with rounded wings.

Dodonaea boroniifolia G. Don is a spreading or erect shrub 0.5–2 m high. The pinnate leaves are 0.6–2.8 cm long and have a winged rhachis and usually 8–12 opposite leaflets, which have three or five teeth or lobes at the apex. The flowers appear from May to October followed by large (12–15 mm wide) four winged capsules. These capsules form in groups of two or three in the leaf axils and are red to pink-purple when they mature in spring or early summer. This species is widespread in the eastern states, usually in sandy soils or sandstone country. It appears to be hardy in cultivation and spectacular when in fruit. Photo page 196. Fig. 14C.

Dodonaea uncinata— small spreading shrub, pinnate leaves 0.4–1 cm long have 6–8 opposite toothed leaflets, large 4-winged fruits are bright red to purple. West of Townsville, Queensland. Fig. 14A.

Dodonaea concinna — compact medium shrub, pinnate leaves 0.4–0.8 cm long terminating with a small tooth; 4–10 opposite or alternate linear leaflets, capsules usually 4-winged, dark red or purple to black. Southwestern Western Australia. Fig. 14B. Photo page 223.

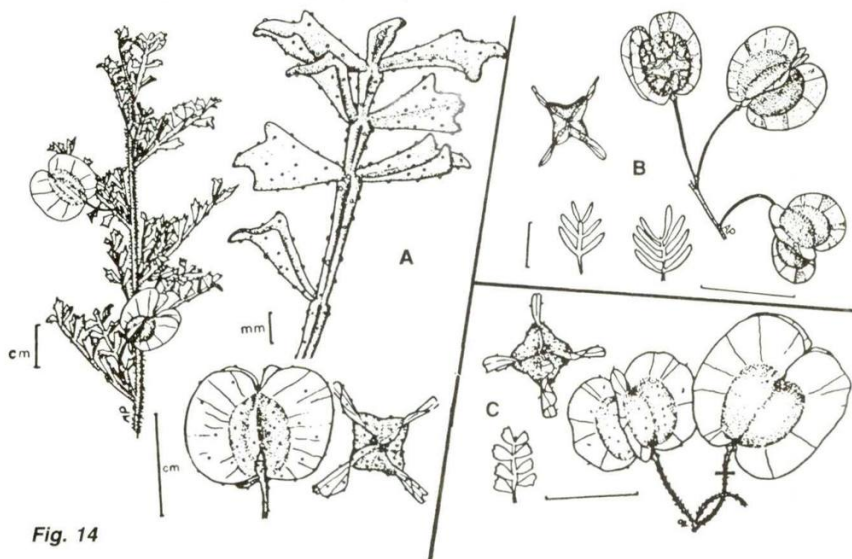


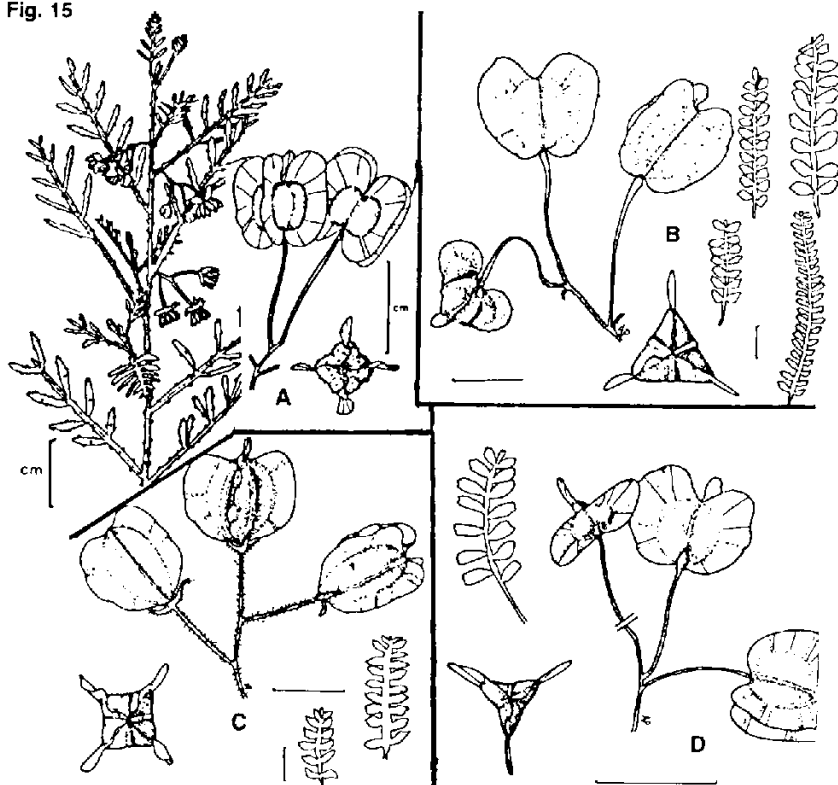
Fig. 14

Dodonaea microzyga. The type variety is a medium spreading shrub, pinnate leaves 0.3–0.9 cm long have 2–3 pairs of oblanceolate leaflets, 3–4 winged fruit, purple to red-brown. South Australia and southern Northern Territory. The variety *acrolobata* — leaves 0.6–1.2 cm long have 3–4 pairs of leaflets, which are usually slightly larger than var. *microzyga*. Southern Western Australia. Photo page 192. Fig. 13A.

Dodonaea stenozyga — medium compact shrub, pinnate leaves with 2–6 (sometimes to 10) linear or terete leaflets are 1–3.8 cm long, 4-winged capsule, purple-brown or red-black. Widespread in southern Australia from Western Australia to western Victoria. Photo page 217. Fig. 13B.

Dodonaea sinuolata* ssp. *sinuolata J. G. West is an erect or spreading shrub 1–3 m high. The pinnate leaves are 1.5–3 cm long with a long petiole. There are 10–14 (sometimes to 22) linear leaflets with a broad-acute apex differing from the leaflets of *D. sinuolata* ssp. *acrodentata* from southern central Queensland, which are usually broader and lobed at the apex. Flowering from January to May, they then produce three or four winged capsules from July to November. These are held above the foliage and are red to red-brown at maturity. It inhabits rocky sites in open forest or woodland and is very successful in cultivation. For many years this species was sold as *D. adenophora*. This subspecies grows on the tablelands and western slopes of the Great Dividing Range from the Hunter Valley and the Warrumbungle Mountains further west in N.S.W., north to Toowoomba in Queensland. Fig. 15A. Photo page 208.

Fig. 15



Dodonaea multijuga — medium erect shrub, pinnate leaves 2–4.8 cm long have 20–28 rarely to 32 oblong leaflets, 3-winged red-brown capsules. Central coast and tablelands, New South Wales, and south-eastern Qld. Fig. 15B.

Dodonaea pinnata — spreading medium shrub, which is similar to *D. multijuga* but has hairy leaves which have 10–16 leaflets and 4-winged capsules with shorter, hairy pedicels and the sepals are persistent. Hawkesbury and Nepean River areas, New South Wales. Fig. 15C.



△ *Dodonaea larreoides*
Group 8 — Photo J. Glass

▽ *Dodonaea physocarpa*
Group 12 — Photo J. Closs



Dodonaea larreoides — medium to tall erect shrub, 2.5–5 cm, long pinnate leaves have 17–27 (rarely to 31) oblong leaflets, capsules 3–4 winged in clusters in axils of leaves, red to purple-brown. South-western Western Australia. Photo page 220. Fig. 15D.

Dodonaea polyzyga — erect medium shrub, pinnate leaves 7.4–15 cm long have a winged rhachis, and 28–46 oblong leaflets very sticky, large capsules with wings somewhat transverse. Kimberley region, Western Australia, and Victoria River area, Northern Territory. Fig. 16A.

Dodonaea adenophora — small to medium, erect or spreading shrub, small pinnate leaves 0.4–0.8 cm long have 4–6, rarely 2 or 3 leaflets, 4 winged capsules to 10 mm wide are red-brown to purple-brown. Previously confused with *D. boroniifolia*. Lime tolerant. Widespread in southern W.A. Fig. 16B.

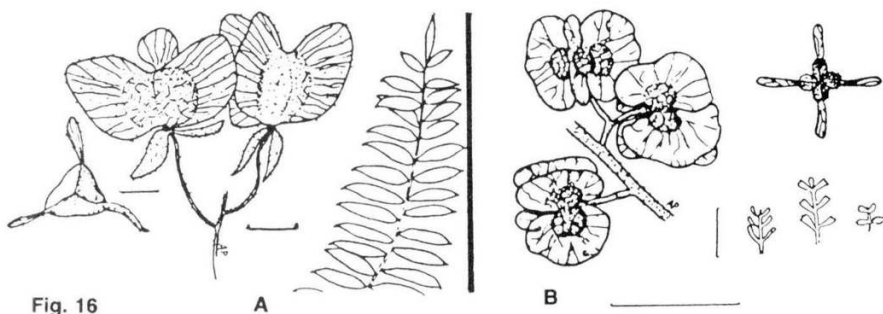


Fig. 16

A

B

GROUP 12 — Species with compound leaves. Capsules globose and only sparsely hairy.

Dodonaea physocarpa — small to medium spreading shrub, pinnate leaves 1.3–3 cm long 6–10 oblong leaflets, very large, greatly inflated capsules which are pink to red-brown. *D. petiolaris* (Group 1), with its simple leaves, is the only other *Dodonaea* with inflated capsules. Photo page 220. Fig. 17.

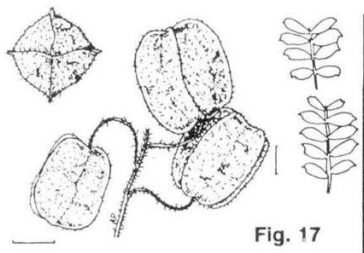


Fig. 17

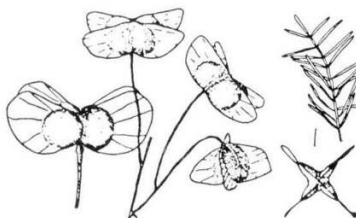


Fig. 18 D

GROUP 9 — Species with compound leaves. Capsules with transverse wings.

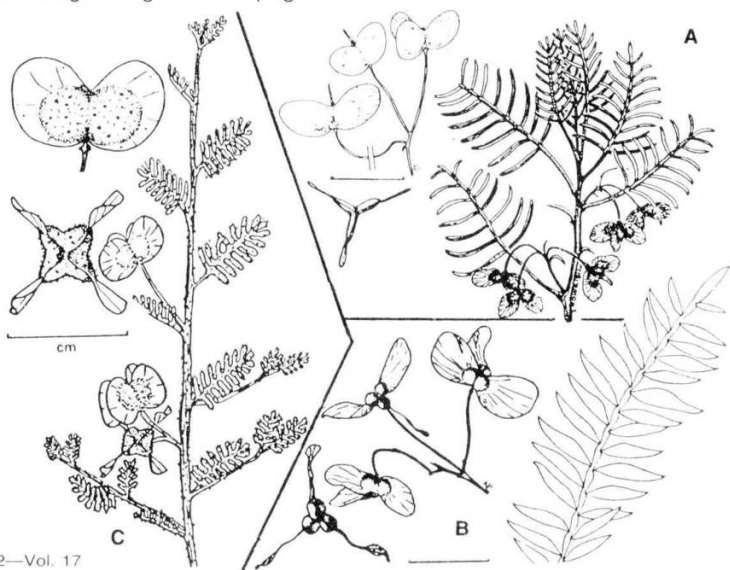
Dodonaea inaequifolia Turcz. is a most attractive plant from south-eastern Western Australia. It is an erect shrub 1–5 m high and its dainty pinnate foliage is extremely eye-catching. The leaves are 2–5 cm long (excluding the petiole) and the 17–23 linear leaflets are sparsely hairy and have entire margins. After flowering in autumn the transverse winged fruits are formed in groups of 2–6 in the axils of the leaves. These fruits are usually 3-winged and dark red to red-brown in the spring. The species occurs on rocky granite or lateritic soils in semi-arid areas. Photo page 216. Fig. 18A.

Dodonaea megazyga (F. Muell.) F. Muell. ex Benth. is, in my opinion, the loveliest *Dodonaea* of them all. It is an erect shrub or small tree 2–5 m in height. The very large (8–20 cm long) pinnate leaves have a winged rachis. There are usually 19–31 lanceolate leaflets, which are dark green above and paler below. The lovely large clusters of pink transverse-winged capsules remain on the plant for 10–12 months, finally turning red-brown in late summer or autumn. This handsome plant grows in dry sclerophyll forests or on the margins of rainforest usually on sandstone, in eastern New South Wales and south-eastern Queensland. In a limited trial it seems to be hardy in cultivation and is fast growing. Photo page 192. Fig. 18B.

Dodonaea subglandulifera — erect medium shrub, pinnate leaves 0.7–1.6 m long usually have 8–16 opposite leaflets similar to *D. inaequifolia* but these are without hairs and the capsules have four wings whereas the latter usually has three. This species is extremely rare in a few widely separated areas of southern South Australia. Fig. 18C.

Dodonaea tenuifolia — spreading shrub 1–3 m high. The pinnate leaves are 4.5–9.5 cm long with 9–25 narrow leaflets. The capsules have four transverse wings and are dark brown-purple or red at maturity. It is known from a small number of isolated sites in south-eastern Queensland on rocky hillsides and in mountain ranges. Fig. 18D on page 221.

Fig. 18

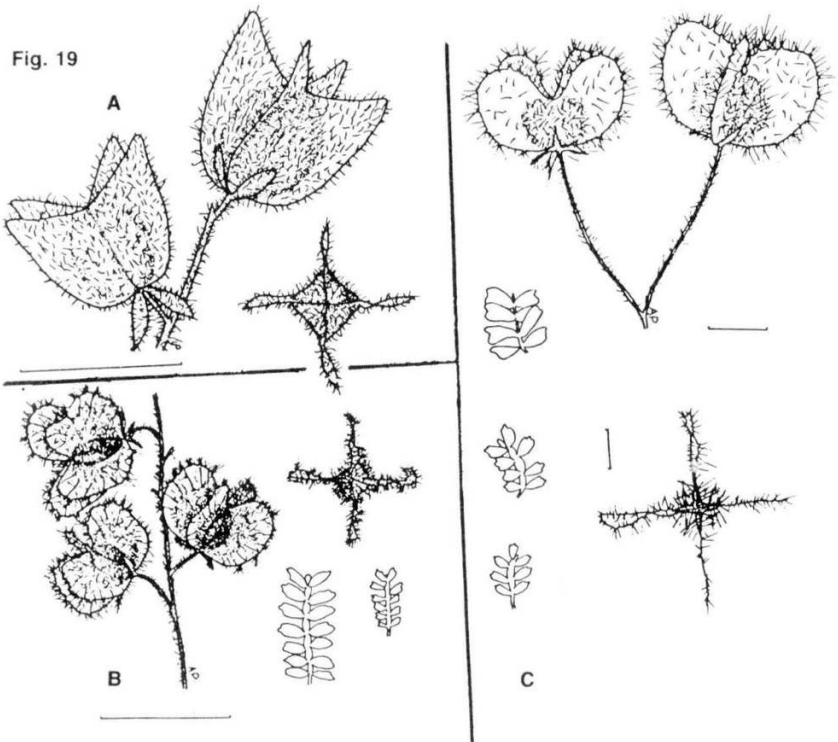


GROUP 10 — Species with compound and hairy leaves. Capsules winged and hairy.

Dodonaea rupicola C. White is a spreading shrub 0.6–1 m high. The pinnate leaves, which are 1.5–3.5 cm long, are densely hairy and have 10–18 opposite oblong leaflets with a winged rhachis, which is grooved down the centre. The 4-winged capsules are large, extremely hairy and have a very long persistent style. This style is very conspicuous even when the fruit forms. The capsules are also sessile and cling closely to the stem. This species grows only in the Glasshouse Mountains area of Queensland, taking hold in cracks in the rocks or at the base of these unusual peaks. It is also doing well in a very different environment in southern Tasmania and will stand wet conditions. Fig. 19B.

Dodonaea oxyptera — medium spreading shrub, pinnate leaves 0.3–3 cm long usually with 4–8 oblong leaflets, hairy 4-winged capsules are red-brown. Northern Northern Territory and Kimberleys, Western Australia. Fig. 19A.

Dodonaea vestita — small shrub, pinnate leaves 0.8–2.2 cm long have 8–14 opposite leaflets, 4-winged capsules are covered with long golden yellow hairs and the fruits are red-brown to purple at maturity. Eastern Queensland. Photo page 209. Fig. 19C.



GROUP 11 — *Dodonaea* with compound leaves. Capsules globose and hairy.

Dodonaea humilis Endl. is a small spreading shrub to 1 m high, from southern South Australia and Kangaroo Island. The pinnate leaves are dark green with a winged rhachis and they are 0.9–2.6 (rarely to 4.5) cm long. There are usually 2–14 opposite, obtriangular leaflets with 3–5 teeth at the apex. The capsules are formed in terminal groups of 3–5 and are small, 4-lobed and oblong with dense glandular hairs, which is unusual for this genus. The fruits form in spring and turn red-brown in November or December. This is a shrub of the mallee scrub and often grows on limestone, but seems happy in more acidic soils. Photo page 233. Fig. 20B.

Dodonaea glandulosa — small erect shrub, pinnate leaves 0.5–1.8 cm long have 11–19 minute leaflets covered with glandular hairs, 2-valved capsules with glandular hairs, are reddish brown. Only in two localities in south-western Western Australia. Fig. 20A.

Dodonaea macrossani — low spreading shrub, similar to *D. glandulosa* but this species has minute pinnate leaves 0.2–0.6 cm long usually with four leaflets that are hairy (not glandular) and the capsules are 3-lobed and very much smaller. South-eastern Queensland and north-eastern New South Wales. Fig. 20C.

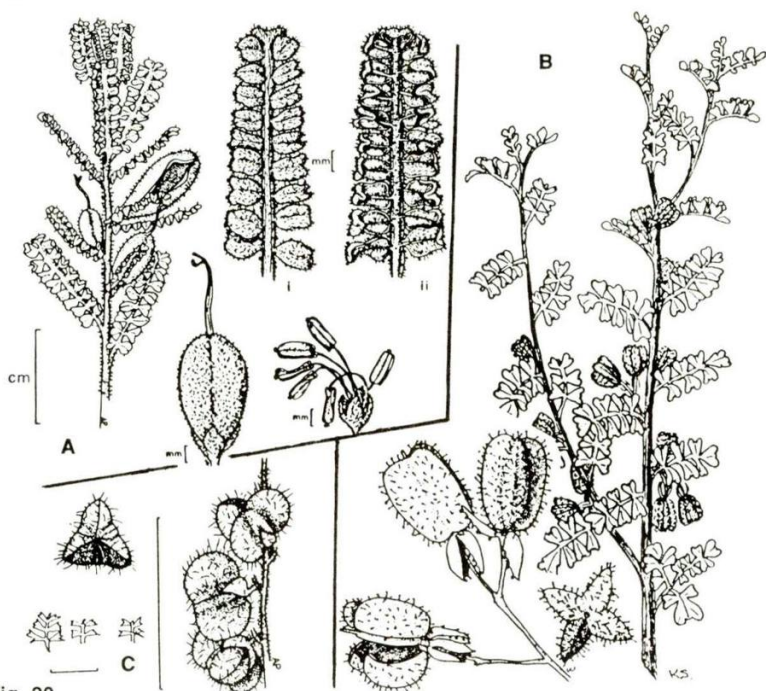


Fig. 20

GROUP 12 — Species with compound leaves, capsules globose — see page 221.

Hopbushes on the Wind

by Judy West

Dodonaea is probably the only member of the family Sapindaceae that is wind pollinated. The family is predominantly tropical and most species grow in closed forest communities. *Dodonaea* is the largest Sapindaceae genus in Australia and it differs from most other genera in that it has come to occupy the more open areas such as woodlands and open shrublands.

There are many characteristics of *Dodonaea*, and the environment it grows in, that show us the genus is wind pollinated, i.e., it is anemophilous. Wind pollination is essentially random and basically inefficient. It depends on large numbers of pollen grains and the whims of atmospheric circulation to transport them to the sticky stigmas of a receptive flower. It appears to have arisen independently in several families of the flowering plants. In some families, e.g., the grasses (Poaceae) and in northern deciduous forests it is the main form of pollination.

The following features of *Dodonaea* suggest these plants are pollinated by the wind.

1. The flowers lack petals or any brightly coloured tissues that are usually necessary to attract animal pollen vectors. The absence of petals allows unhindered dispersal of pollen grains by air currents.

2. Since no nectar is produced, the female flowers lack any floral reward to attract pollinators.

3. The anthers and stigmatic surfaces are fully exposed during flowering. The sepals fold back away from the anthers in male and perfect (i.e., bisexual) flowers and in female flowers the style protrudes well beyond the sepals which enclose the ovary. It is interesting that the two prostrate species, *D. procumbens* and *D. humifusa*, usually have long pedicels in the male flowers and long styles in the female and perfect flowers. Both of these features help to raise the reproductive structures above the foliage for wind pollination.

4. The stigmatic surface area varies in size, but the stigma is branched or tri-partite. This increases the receptive surface area available for interception of the pollen.

5. The inflorescences are almost always produced at the ends of the branches, and so the flowers are projected beyond the foliage, which otherwise may be an obstruction to free pollen movement in the air.

6. *Dodonaea* flowers have large anthers producing copious amounts of pollen, which can easily be seen as yellow pollen "rain" during flowering. In other plant families growing in temperate areas there are many anemophilous dioecious tree species which produce enormous quantities of pollen relative to the number of ovules available for pollination and fertilisation.

I have counted the pollen produced by the male flowers of three species and each flower was found to contain more than 96,000 pollen grains (average of 131,000). In floral biology work the ratio of pollen grains to ovules (p/o) is accepted as a ratio indicative of the breeding system of that species. That is, a high p/o means the flowers of that species produce much more pollen than ovules and that it is likely to be an outbreeding or cross-pollinating species. A low p/o will probably be an inbreeder or self-pollinator. Most *Dodonaea* flowers have only six ovules and so you can easily work out that they have a very high p/o ratio and that they cross-pollinate.

7. The pollen of *Dodonaea viscosa* can travel considerable distances. Air-borne pollen, presumably originating in New Zealand, has been collected several thousand metres above sea level in atmospheric pollen surveys conducted from New Zealand. I have collected some *Dodonaea* pollen over 2 km from the nearest known population. As you would expect the density of pollen decreases with increasing distance from the source population.

8. Although it is not directly related to wind pollination, pollen viability is another factor to be considered. It is of little use a plant producing lots of pollen if it does not have high viability and most of it is not capable of fertilisation. I have found that all *Dodonaea* species have more than 83 per cent viable pollen and most species tested have more than 90 per cent.

9. *Dodonaea* pollen grains are relatively small. Most wind pollinated species possess small pollen grains, not only because they are light to transport, but also because they are less likely to be intercepted by leaves and branches. In terms of energy consumption it is also cheaper to produce smaller grains than larger ones.

10. It is an advantage for dioecious anemophilous species to be gregarious since this decreases the chance of pollen being trapped by other species. Individuals of *Dodonaea* are usually closely spaced and often a single *Dodonaea* species is not only the dominant, but also the only member of the shrub layer of a particular community.

11. For similar reasons *Dodonaea* are absent from dense heath communities and rainforests. They are usually found in habitats of relatively open vegetation such as open sclerophyll forests, woodlands, mallee communities or arid shrublands. In these communities pollen is less likely to be wasted by becoming lodged in the foliage or flowers of a different species.

12. Pollen seems to be released only under climatic conditions favourable for wind pollination to be successful, i.e., warm and dry. In the populations in South Australia on which I have done long-term studies, flowering occurred in early summer or late spring at a time when mean rainfall and humidity drop to summer minimums, mean temperature and the number of clear days increase and the average wind speed reaches its maximum for the year. I have only ever seen pollen being released on dry, warm and/or windy days. ■

Dodonaea

FOR QUEENSLAND GARDENS

by Jan Sked

Dodonaea, or Hop Bushes as they are commonly called, occur over a wide range of habitats, from coastal sand dunes to rocky slopes to low lying water-logged areas; in eucalypt forests and woodlands and in the mallee shrubland of the semi-arid and arid areas. The majority are found in the drier inland, with a few extending to the higher rainfall fringes of the continent. About 30 *Dodonaea* species occur in Queensland and of these, I think about 17 could probably be grown with success in eastern coastal Queensland.

Most are small shrubs, but there are prostrate forms and some of our Queensland species may reach small tree size. There is considerable variation in foliage form. Many have decorative, much-divided leaves. Some have leaves in clusters, some overlap so closely they obscure the branches. Some species, especially the inland ones, have sticky branchlets and foliage.

However, it is the fruits, or “hops”, that are the most conspicuous part of the plant. They are dry capsules with two to four wings or angles and are found in a variety of colours from green to yellow, pink, purple, red and brown to almost black. The fruits of several species were used by early Europeans as a basis for home brews — hence the name “hop bushes”.

D. biloba — From the Chinchilla-Barakula-Miles area where it grows in open forest on sandy ridges. A spreading, prostrate shrub, often rooting at the nodes; a good ground cover for a well drained area. See page 204 for a description.

D. filifolia — Thread-leaf Hop Bush is a small shrub to about 2 metres high with slender, arching branches and simple, very narrow leaves 3.5–10.5 cm long. Capsules have 3–4 prominent wings and range in colour from cream to pinkish-brown to bright red, maturing from September to December. Found in open forests on sandy soils and gravel on sandstone hills and ridges in the Darling Downs, Burnett and North Kennedy districts. An ornamental species that would need good drainage Photo page 193.

D. megazyga — A slim erect shrub or small tree, to about 5 metres in height, with angled branches and attractive, pinnate leaves up to 20 cm long, dark green above and paler below. Capsules are eye-catching, three-winged, pink to red-brown, hanging in clusters on long stalks. They mature from September to March. Found on the edge of rainforest around Lamington National Park, Springbrook and Burleigh Heads and extending south to Sydney along the eastern side of the Great Divide. A very ornamental species for the garden. Photo page 192.

D. multijuga — A small shrub, about 1 metre high, with branches densely covered with hairs and pinnate leaves, up to 7 cm long, with many small leaflets. Capsules are three-winged and may be lime green, purple or red-brown. Maturing from September to November. It is usually found on sandy soil or sandstone on the central and northern tablelands and central coast of New South Wales and also at Perseverance Dam near Toowoomba.

D. peduncularis — Stalked Hopbush is a small, multi-stemmed shrub, sometimes prostrate, with slightly hairy branchlets and simple leaves up to 2 cm long. Capsules are reddish or purple, with four prominent wings and mature from October to December. It occurs in open forest on sandy stony soils and on stony ridges in the Darling Downs and Burnett districts and extending on to the western slopes of the Great Divide in New South Wales. Needs full sun and well drained soil. Photo page 205.

D. platyptera — A tall shrub or small tree, 5–8 metres high, from tropical Australia, where it grows in sandy soils along creeks and rivers. Branches are erect with hairy branchlets and simple, slightly hairy leaves, 5–10 cm × 1–3 cm. Capsules have 3–4 prominent long wings and are light brown in colour, maturing from June to October. It needs a moist, well drained soil in full sun or partial shade.

D. polyandra — A tall shrub or small tree with spreading branches and nicely rounded crown, making it an attractive specimen to about 5 metres in height with large, simple leaves, 6–12 cm × 2–4 cm, dark green above, paler below, with slightly wavy margins. Capsules are 2–3 winged, purple and green, and mature from September to December. Usually found on the margins of riverine scrubs in sandy or gravelly soils on Cape York Peninsula and offshore islands. Should do best in a moist, well drained situation in partial shade.

D. rupicola — Velvet Hop Bush occurs only on Saddleback and Wild Horse Mountains in the Glasshouse Mountains area of southern Queensland where it grows in open forest on stony slopes. It is a small shrub about 1 metre high, with spreading branches covered in long hairs and attractive, densely hairy, pinnate leaves 2–5 cm long. Capsules are four-winged, red-brown, densely hairy, and mature from August to November. Probably does best in well drained soils with adequate moisture and dappled sunlight.

D. sinuolata — Feathery Hop Bush is a showy species that is found near Killarney and Helidon in south-east Queensland, usually at the foothills of the ranges on rather heavy soils. See page 221 for a description.

D. stenophylla — A slender shrub to about 3 metres with sticky new growth. Branches are erect and crowded with sticky angular branchlets and simple leaves that are narrow, rigid, 4–12 cm long. Capsules are light brown to reddish brown with four long wings, and may be found throughout the year. This plant occurs in dry rainforest on rocky soils or sandstone in the Darling Downs district. Also in the New England area of New South Wales and near Daly Waters in the Northern Territory. Often a straggly shrub, it will need pruning to produce bushy growth. Photo page 229.

D. triangularis — A medium shrub, 2–3 metres tall, with erect branches, short, hairy branchlets and simple, usually hairy, triangular-shaped leaves with 3–5 lobes at the tip and up to 3 cm long. Capsules are pale green, 3–4 angled with narrow wings. They mature from September to December. Found in open forests on sandstone hillsides, stony ridges and mountain tops in south-east Qld. and in the Hunter Valley of N.S.W. Should grow well with good drainage.

D. triquetra — Large-leaf Hop Bush is found in open forests and on the margins of rainforest, mainly in coastal areas from Bundaberg south to Orbost in Victoria. It is common on sandy soils and rocky hillsides in the Pine Rivers Shire. This one is very easy to grow. See page 200 for a description.

D. truncatiales — Propeller Hop Bush is an erect bush to about 2 metres in height with angular, ribbed branchlets, hairy when young, and simple leaves. Female flowers are quite attractive, bronzy green, in racemes at the ends of the branchlets. Capsules are red to red-brown, four-valved, with broad spreading wings, rather like a propeller, making it a most attractive shrub. Found in dry sclerophyll forests on rocky outcrops and stony ridges, from southern Queensland to Victoria. Needs good drainage and dappled sunlight.

D. uncinata — A small spreading shrub 1 metre in height, with finely hairy branchlets and pinnate leaves to about 1 cm long, made up of slightly sticky, warty, oval leaflets with toothed ends. Capsules, in clusters at the ends of the branchlets, are four-winged, bright red to purple, and mature from June to September. Found only in the Mt Spec area near Townsville, it occurs in open forest on soils derived from sandstone. It needs a well drained soil in full sun or dappled shade and could benefit from pruning to promote a bushier shape.

D. viscosa* ssp. *burmanniana — This is a medium to tall shrub, 3–6 metres in height, with simple leaves, 7–17 cm × 1–2 cm. Capsules are 3–4-winged, pink to reddish-brown, and mature from September to January. It is found in open forests on rocky hillsides and sandy soils along the coast from Cairns to Grafton and on Lord Howe Island. Should do well with reasonable drainage. Photo page 229. ■



△ *Dodonaea stenophylla*
Group 4 — Photo J. Simmons

▽ *Dodonaea viscosa* ssp. *burmanniana*
Group 1 — Photo I. Armitage



Dodonaea

IN WESTERN AUSTRALIA

by Bob Dixon, Horticultural Advisory Officer,
Kings Park and Botanic Garden

There are over 30 species of *Dodonaea* in Western Australia. They vary considerably in leaf, colour, size and shape from pine like, lance shape and rounded, to pinnate. Fruit are also variable in size, shape and colour and whilst many species have fruit which is brightly coloured some are not attractively coloured. Though we have many species to choose from very few are grown in home gardens. Generally hop bushes are grown for their attractive foliage and or fruit, their flowers being small and insignificant. Some of the smaller or prostrate forms are grown as ground covers.

Some of the more attractive inland species with colourful new foliage and fruit do not colour up so well in Perth, whether this is due to our wetter cooler conditions or soil type we do not know.

Dodonaea are also grown, and have been extensively used, in badly degraded areas for example for mine land rehabilitation. As the common name, hop bush, suggests the fruit were used as a substitute for hops for making beer by the early settlers.

Propagation and Cultivation

Very few species are available in nurseries and they are less popular now than a few years ago. The following are those most commonly sold although some of these are now only seen in nursery stock gardens: *Dodonaea viscosa* with several forms, *D. ceratacarpa* prostrate form, *D. concinna*, *D. viscosa* ssp. *angustissima* and *D. hackettiana*. Therefore if you want to grow *Dodonaea* in your garden you have to grow them yourself.

In Kings Park Botanic Garden, 20 species are grown. Several do not grow well in our poor sandy soil, the local species growing best of all. Most species were initially raised by seed, fresh seed germinating much better than old seed. The species that grow naturally in the south-west and tolerate cold wet winters are sown in autumn whilst those from drier and hotter areas are best sown in spring when the weather warms up. They dislike wet cold conditions under which the seed tend to rot. Also they are susceptible to damping off disease which can be controlled by using Fungarid or Previcur. Germination times vary with some germinating in as little as eight days.

New plants can also be raised by cuttings. In the Kings Park nursery strike rates are best from semi-hardwood tip cuttings. Unfortunately, most cutting material initially brought in from the bush is often harder growth and therefore is difficult to strike. Material taken from stock plants strikes much easier as you can take the cuttings at the right stage.

Generally we prefer to raise plants from seed then repropagate from cuttings. However, as plants can vary greatly selection of unusual forms from the bush requires vegetative propagation to reproduce the form you require. Also most plants have either male or female flowers, therefore if your species has attractive fruit you need to propagate from cuttings to ensure you have a female and if you want to produce viable seed the flowers need pollen from a male plant (flower).

In Perth plants grow best in full sun, but with some protection from strong hot easterly winds, but in heavier soils they tolerate harsher conditions. Of course they are drought tolerant but those from heavier soils grow much better with an occasional summer watering. They also respond well to a general slow release fertiliser.

The following are some species which grow well in Kings Park Botanic Garden, propagation details are from Kings Park nursery records.

Dodonaea hackettiana

A medium size open shrub up to 4.5 m high with narrow elliptic leaves up to 55 mm long and 9 mm wide, medium to dark green mature leaves and light green young foliage. The female plants produce attractive fruit with a mixture of greenish yellow and red colouring. This is a fairly rare plant in its natural habitat, with very few known locations in and near Perth, at one stage it was gazetted rare and endangered. It usually grows in open eucalypt forest over limestone.

Plants are drought tolerant, which is not surprising as they occur naturally in Kings Park bushland. They prefer a full sun position but will grow in broken sunlight. Though they usually grow over limestone they also tolerate slightly acid soils, and prefer well drained sandy soils. Propagation is best from fresh seed which can germinate in 13 days, germination rates are high. Cuttings are difficult to strike, the only record of cuttings taken in April indicate a strike rate of less than 3%.

Dodonaea ceratocarpa

A spreading shrub up to 2.5 m high, however, there are also prostrate forms about 30 cm high and up to 2 m across which are usually found right on the coast often where salt spray washes over them. Their leaves are dark green, broad lance shaped to elliptic with a sharp point at the end, 14 mm to 30 mm rarely to 56 mm long and up to 10 mm wide. Their young stems are dark green and often flattened (fasciated). They occur naturally on coastal headlands and cliffs or further inland on granite rocks and limestone outcrops from Perth to Israelite Bay in low forest and mallee heath communities.

Plants grow well in full sun but prefer some shelter from surrounding vegetation and prefer sandy free draining soils. The common prostrate form grown in home gardens is a rapid growing plant and although drought tolerant prefers an occasional summer watering and full sun position. It tolerates light to medium pruning.

Propagation can be by seed which takes as little as 18 days to germinate or by cuttings. The prostrate form is very easy to propagate from cuttings, records indicate you can get a 50% strike rate from cuttings taken in December or April. They will also strike well at other times of the year.

Dodonaea viscosa

This is a very widespread species occurring throughout Australia and in many other countries. There are several subspecies and forms grown in nurseries. The most common in the nursery trade is known as *purpurea* but I believe this purple form came from New Zealand. *D. viscosa* responds well to light pruning which encourages new growth and therefore better coloured foliage.

The other form which is grown is *Dodonaea viscosa* subspecies *angustissima*, wrongly known as *Dodonaea attenuata* in the nursery trade. This grows naturally in inland areas in south-western Western Australia as well as being widespread in parts of eastern Australia. Again I do not know the origin of this particular form which grows up to 4 m high but it has very attractive foliage.

One other subspecies, *cuneata* formerly known as *Dodonaea cuneata* which occurs in south-eastern Australia, is also produced in nurseries. Other eastern species which are grown include *D. procumbens*, *D. multijuga*, *D. microzyga* (eastern Australian forms) and *D. boroniifolia* which has very attractive foliage making it an attractive foliage plant. ■

Kangaroo Island *Dodonaea*

by Ida Jackson

We have four species of *Dodonaea* on a variety of soils — laterite, rough limestone, sand and clay. I find that all types germinate fairly easily in autumn, especially if the seeds are scalded and allowed to stand for 24 hours. I have not had much success from cuttings.

Dodonaea baueri is a small, rigid, glabrous shrub about 1 metre high and 1 metre wide. The leaves are obovate or orbicular and are often notched at the summit. They are about 6 mm long. The flowers are solitary on short peduncles. Usually male and female flowers are found on the same bush. The capsule is crimson, sometimes almost black, 4–6 angled, 5 mm × 6 mm, without wings. This is a small neat shrub which seems to last for only five or six years in cultivation. It is found in limestone or clay areas, under mallee scrub. Photo page 233.

Dodonaea hexandra is a low slender shrub. The leaves are very narrow, 1–2 cm long with recurved margins. The three sepals are persistent under the fruit which is sticky, globular three-angled, 5–6 mm in diameter with a minute deltoid wing on each angle. The fruit is usually bright red. This plant seems to be confined to sandy soil in the Haines-Macgillivray area.

Dodonaea humilis is a variable, low growing shrub with pinnate leaves. Inland, it reaches a height of a metre or more; on the coast it is prostrate. There are separate male and female bushes, but the bright red anthers make the males almost as attractive as the females. The red capsule is four-lobed with conspicuous red, glandular hairs. It seems to prefer limestone and does well on rough limestone areas on the south coast. Photo page 233.

Dodonaea viscosa is a viscid, rather straggly shrub about 1.5 metres high. The leaves are 3–8 cm long, 6–14 mm wide and tapering into a short petiole. They are dark green and shining. The flowers are in short panicles. There are four sepals. The capsule is three or, rarely, four-winged, red or purple. Usually male and female flowers are on separate plants.

D. viscosa ssp. *angustissima* is a slender upright bush, usually 1–2 metres high, but can be up to 4 metres and resembles a small tree. The leaves are not sticky when fresh, but become sticky when pressed. The bunches of “hops” are larger than in the type and vary in colour from pale lemon through orange and crimson to deep purple. It is common to find fruits of all different colours on the same tree. Usually, there are separate male and female plants, but we have a specimen in our garden that put on both “hops” and stamens last year. ■



△ *Dodonaea concinna*
Group 8 — Photo J. Simmons

▽ *Dodonaea humilis*
Group 11 — Photo J. Simmons



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