

ACACIA SEEDLINGS, PART IV.

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With Plates XXXI – XXXV.

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SYNOPSIS:

VITALITY OF SEED IN SEA-WATER.

SEQUENCE IN THE DEVELOPMENT OF LEAVES.

NUMBER OF PINNÆ ON ONE LEAF.

ABSENCE OF BIPINNATE LEAVES.

DESCRIPTIONS OF SEEDLINGS.

Vitality of Seed in Sea-water.

In order to further test the vitality of *Acacia* seeds in sea-water, two seeds each of *A. penninervis* var. *falciformis* and *A. melanoxylon*, both from Jenolan Caves, N. S. Wales, which had been in sea-water for 469 days, were planted after having first been placed in boiling water, and one seedling of the former appeared in about two, and the other in six weeks, while a seedling of the latter came up in four weeks.

A seed of *A. Farnesiana* from Central Queensland, remained in sea-water for 1,375 days, or $3\frac{3}{4}$ years, and was then quite hard and sound. After having been placed in boiling water it was planted, and germinated in a week.

Sequence in the Development of Leaves.

In previous papers of this series it has been pointed out that of 81 species of *Acacia* seedlings raised, 74 had one simply pinnate leaf, and this was succeeded by a bipinnate leaf. The remaining 7 species always produced an opposite pair of pinnate leaves, and these were succeeded by a bipinnate leaf. In a few instances a species usually having only one pinnate leaf was found to have an opposite pair.

In addition to those mentioned in previous lists (Parts I to III), the following species have produced only one pinnate leaf, and this brings the number up to 83:—

<i>A. diffusa</i> Lindl.	<i>A. cultriformis</i> A. Cunn.
<i>A. sentis</i> F.v.M.	<i>A. Howittii</i> F.v.M.
<i>A. hakeoides</i> A. Cunn.	<i>A. Chisholmi</i> Bailey
<i>A. difformis</i> R. T. Baker	<i>A. cardiophylla</i> A. Cunn.
<i>A. decora</i> Reichb.	

Three further species have now been found to have an opposite pair of pinnate leaves, which brings the number of such species up to ten. These are *A. alata* R. Br., (with an exception), *A. continua* Benth., and *A. Oswaldi* F.v.M.

Number of Pinnæ on One Leaf.

In Part III, (p. 393), a list is given of phyllodineous Acacias which may have two or more pairs of pinnæ on the same leaf, and the following are now added to such list:—*A. lanigera*, *A. oxycedrus*, *A. pendula*, and *A. pycnantha* may have two pairs, *A. trinervata* four, and *A. rubida* six pairs. As each pair of pinnæ is attached to the midrib, the appearance of the leaf is somewhat remarkable in cases such as where *A. neriifolia* has three pairs. Where the lamina is continued between the first and second pairs, the midrib comes to the upper margin of such lamina at the base of the first or basal pair. The width of the lamina varies between the first and second pairs, but between the second and third pairs the extension of the midrib is not dilated. (Fig. 1.)

Absence of Bipinnate Leaves.

Seeing that bipinnate leaves are such a feature of the genus, especially among the seedling foliage, it is of interest to observe that one species, *A. alata*, does not appear to produce such leaves at all. In about a dozen seedlings so far examined, there has been an opposite pair of simply-

pinnate leaves, though in one case only one such leaf appeared, and these have been succeeded by a phyllode, but in no case has there been a bipinnate leaf. Further tests will be made.

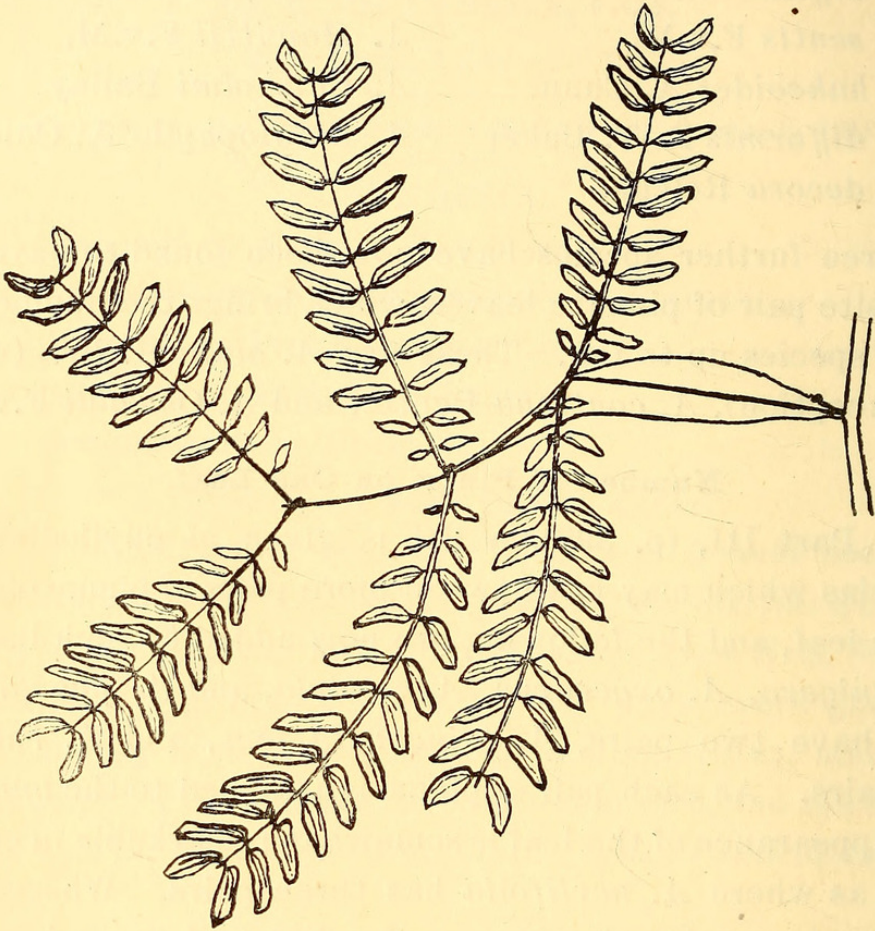


Fig. 1. *Acacia neriifolia*. Leaf with three pairs of pinnae. Natural size.

Acacia Oswaldi commences with an opposite pair of pinnate leaves, and these may be succeeded by a pinnate, a bipinnate leaf, or a phyllode. In a few cases where the third leaf has been simply-pinnate, the fourth has been reduced to a phyllode, and in such cases, as also where No. 3 has been a phyllode, there has been no bipinnate leaf on the plant. Lubbock describes this species as having abruptly pinnate leaves, but speaks of one first leaf as "pinnate, with one pair of pinnae," the word pinnae being possibly intended for leaflets. He appears to have had only two seedlings to guide him.¹

¹ "A. Contribution to our Knowledge of Seedlings," by Sir John Lubbock, I, 473, (1892).

Descriptions of Seedlings.

ALATÆ.

ACACIA ALATA R. Br. Seeds from Botanic Gardens, Sydney, (J. H. Maiden), a Western Australian plant. (Plate XXXI, Numbers 1 to 3).

Seeds rusty-brown, oval, 4 mm. long, 3 mm. broad, 1 to 1·5 mm. thick.

Hypocotyl erect, terete, creamy to brown, 7 mm. to 1·5 cm. long, 1·5 mm. thick at base, 1 mm. at apex, glabrous, or rarely with a few short roots just above the base.

Cotyledons sessile, sagittate, oval to oblong-oval, 5 mm. long, 3 to 3·5 mm. broad, outer or underside yellowish-green at base, purple towards apex, inner or upper-side green to purplish-green, remaining erect, becoming revolute and soon falling, glabrous.

Stem sinuous, slightly angular owing to position of decurrent leaf-stalks, green, glabrous to faintly pilose. First internode ·5 mm.; second 3 to 8 mm.; third 7 mm. to 1·3 cm.; fourth 4 mm. to 1·3 cm.; fifth 5 mm. to 1·2 cm.; sixth 8 mm. to 1 cm.

Leaves—Nos. 1 and 2. Abruptly pinnate, forming an opposite pair, petiole 4 mm. to 1·2 cm. long, terete, green, glabrous; leaflets one to two pairs, oblong-acuminate, mucronate, 5 to 7 mm. long, 2 to 3 mm. broad, midrib fairly distinct, secondary vein showing under pocket lens, light green on both sides, underside slightly paler; rachis up to 3 mm. long, glabrous, excurrent; stipules 1 to 1·5 mm. long. In one case only a single pinnate leaf appeared.

No. 3. A linear phyllode, 5 to 7 mm. long, ·5 to 1 mm. broad, tapering to a pungent point, slightly decurrent, margins pilose; stipules 1 to 2 mm. long.

No. 4. A linear phyllode, 7 to 8 mm. long, 1 to 2 mm. broad, pungent-pointed, decurrent, glabrous or with hirsute margins; stipules about 1 mm. long.

No. 5 and upwards. Falcate, pungent-pointed phyllodes, bifacial and decurrent, each one extending down to the next on the same side of the stem, the whole phyllode having a remarkable flange-like appearance, midrib approximately at right angles to the stem, the decurrent portion of the lamina being marked by reticulating veins, margins hirsute; stipules spinescent, 1 to 3 mm. long, gland not conspicuous on first few phyllodes.

This is the second seedling described in this series where the No. 3 leaf has been reduced to a phyllode, the previous one being *A. excelsa*.¹ In some examples of the latter species, however, the third to fifth leaves were bipinnate, but in about a dozen seedlings examined of *A. alata*, no instance of a bipinnate leaf was found. In one example the second and subsequent leaves were reduced to phyllodes.

CONTINUÆ.

ACACIA CONTINUA Benth. Seeds from Broken Hill, N.S. Wales (Archdeacon F. E. Haviland and E. C. Andrews). (Plate XXXI, Numbers 4 to 6).

Seeds dark brown with paler centre, obliquely obovate, 3 to 3·5 mm. long, 2 to 2·5 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, green to pale pink, 1·3 to 1·6 cm. long, 2 mm. thick at base, 1 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled, obovate to oval, 4 mm. long, 3 mm. broad, underside creamy to brown or reddish-purple, sometimes with raised centre line, inner or upperside pinkish-brown, remaining erect and soon falling.

Stem terete, except where affected by the slightly decurrent leafstalks, brown at base, green above, striated with several nerves. First internode ·5 mm.; second 1 mm.; third 1 mm.; fourth 2 mm.; fifth 2 to 3 mm.; sixth 3 to 5 mm.; seventh 4 to 6 mm.; eight 5 to 8 mm.

¹ This Journal, Vol. LI, p. 403.

Leaves—Nos. 1 and 2. Abruptly pinnate, forming an opposite pair, petiole slender, 5 to 8 mm. long, green, glabrous; leaflets two to three pairs, oblong-acuminate, 6 to 7 mm. long, 1·5 to 2 mm. broad, upperside light green, underside at first reddish-brown, becoming pale green, venation obscure, midrib showing under pocket lens on underside; rachis 3 mm. long, glabrous, excurrent; stipules 1 mm. long.

No. 3. Abruptly bipinnate, petiole 1·3 to 2 cm. long, slender, green, glabrous, excurrent; leaflets three to four pairs, the number not being constant on each pinna of the same leaf, obovate to oblong-acuminate, 3 to 5 mm. long, 1 to 2 mm. broad; rachis 6 to 9 mm. long, glabrous, excurrent; stipules linear, 1·5 mm. long.

Nos. 4 and 5. Abruptly bipinnate, petiole 1 to 2·4 cm. long, slender; leaflets four pairs, often mucronate; rachis 7 mm. to 1 cm. long, glabrous, excurrent; stipules as in No. 3.

Nos. 6 to 8. Usually abruptly bipinnate, petiole 1·5 to 2·3 cm. long, glabrous, or with scattered hairs, excurrent; leaflets four to five pairs, obovate to oblong-acuminate, often mucronate; rachis 8 mm. to 1·3 cm. long; stipules linear-acuminate, with an almost spinescent point, up to about 2 mm. long.

Nos. 9 to 12. These may be phyllodes vertically broadened to about 1 mm., sometimes almost, but never quite terete, from about 7 mm. to 1·5 cm. long and continuous with the stem, not articulate, striate with two or three nerves, straight, or sometimes falcate or recurved, tapering into a pungent point; stipules present on most plants but absent from some. No. 9 may be abruptly bipinnate, petiole up to 2·3 cm. long, leaflets four to five pairs.

PUNGENTES—(Spicatae).

ACACIA OXYCEDRUS Sieb. Seeds from Galston Road, Hornsby, and Faulconbridge, N.S. Wales. (Plate XXXI, Numbers 7 to 9).

Seeds brownish-black, oblong to almost cylindrical, 4 mm. long, 2 mm. broad, 2 mm. thick.

Hypocotyl erect, terete, pale green, 1·1 to 3 cm. long, 1·5 to 2·5 mm. thick at base, 1 to 2 mm. thick at apex, glabrous. In one case a root grew to a length of 7 mm. at about 6 mm. from the base of the hypocotyl.

Cotyledons sessile, not auricled, oblong, apex rounded, 6 mm. long, 2·5 to 3·5 mm. broad, outer or underside pale yellow, sometimes reddish towards apex, slightly wrinkled longitudinally, inner or upperside yellowish-green, becoming dark green, glabrous.

Stem terete, green, hirsute. First internode ·5 mm.; second 1 to 7 mm.; third 1 mm. to 1 cm.; fourth 1 mm. to 1·4 cm.; fifth 1 mm. to 1·5 cm.; sixth 1 mm. to 1·3 cm.; seventh 3 mm. to 1·2 cm.; eighth 1 to 8 mm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 8 mm. long, green, faintly pilose; leaflets three to five pairs, oblong-acuminate, mucronate, 5 to 7 mm. long, 1·5 to 2·5 mm. broad, midrib and secondary vein, as well as lateral venation, showing under pocket lens; rachis 7 mm. to 1·1 cm. long, glabrous, excurrent; stipules about 1 mm. long, tapering from a broad base to a fine point. Out of about twenty seedlings raised, one example from Hornsby had an opposite pair of simply pinnate leaves.

No. 2. Abruptly bipinnate, petiole 6 mm. to 1·6 cm. long, pilose, excurrent, leaflets two to four pairs, oblong-acuminate, mucronate, 5 to 6 mm. long, 1·5 to 2 mm. broad, the basal pair sometimes smaller; rachis 4 mm. to 1 cm. long, faintly pilose, excurrent.

Nos. 3 and 4. Abruptly bipinnate, petiole 1 to 3·3 cm. long, pilose, excurrent; leaflets two to five pairs; rachis 6 mm. to 1·5 cm. long, faintly pilose, excurrent; stipules acuminate, 1·5 to 2 mm. long. In one case, No. 3 had two pairs of pinnæ.

Nos. 5 and 6. Abruptly bipinnate, petiole 1·4 to 3 cm. long, sometimes vertically flattened to 1 mm. broad, No. 5 having a strong nerve along the lower margin, and No. 6 sometimes having a definite midrib below the centre of the lamina, in the upper portion of which is a finer vein, margins nerve-like, pilose, excurrent; leaflets four to six pairs; rachis 8 mm. to 1·7 cm. long; stipules as in Nos. 3 and 4. No. 6 may sometimes be a phyllode,

Nos. 7 to 10 may be pungent pointed phyllodes, from 5 mm. to 1·2 cm. long, ·6 to 2 mm. broad, with midrib just below and finer vein above centre, the upper vein sometimes coinciding with the margin, especially towards the apex, pilose; stipules about 1·5 to 2 mm. long, pointed, but at this youthful stage scarcely spinescent. No. 7 may be abruptly bipinnate, petiole up to 3 cm. long; leaflets four to six pairs.

UNINERVES—(Armatae).

ACACIA ASPERA Lindl. Seeds from Temora, (Rev. Father J. W. Dwyer per J. H. Maiden), and Wyalong, N.S. Wales. (Plate XXXII, Numbers 1 to 3.)

Seeds black, oblong-oval to oblong, 5 mm. long, 2 to 2·5 mm. broad, 1·5 mm. thick.

Hypocotyl erect, terete, pinkish-brown or very pale brown, 1·2 to 2·6 cm. long, 1 to 1·5 mm. thick at base, ·7 to 1 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled, oblong-oval to oblong, apex rounded, 6 to 7 mm. long, 3 mm. broad, outer or underside green, with one or two raised longitudinal

lines, upperside green, glabrous, becoming revolute in about two weeks, and later sometimes partly cylindrical, remaining on the plant until the phyllodes appear.

Stem terete, glabrous, to pilose. First internode .5 to 2 mm.; second 3 mm. to 2.2 cm.; third 5 mm. to 1.9 cm.; fourth 5 mm. to 2 cm.; fifth 3 mm. to 1.2 cm.; sixth 4 to 8 mm.

Leaves—No. 1. Abruptly pinnate, petiole 4 mm. to 1.1 cm. long, green, glabrous or rarely faintly pilose; leaflets two to four pairs, oblong-acuminate 4 to 6 mm. long, 1.5 to 2 mm. broad, midrib distinct on underside, greyish-green on both sides, glabrous; rachis 4 mm. to 1.3 cm. long, green, glabrous, excurrent; stipules 1 mm. long.

No. 2. Abruptly bipinnate, petiole 9 mm. to 1.4 cm. long, slender or sometimes slightly flattened vertically, green, pilose, excurrent, the subulate point being sometimes 1.5 mm. long; leaflets one to four pairs, the number not being constant on each pinna of the same leaf, 3 to 5 mm. long, the basal pair smaller, sometimes mucronate, margins may be ciliate; rachis 3 to 7 mm. long, pilose, excurrent; stipules 1 mm. long, flat at base and tapering to a weak point.

No. 3. Abruptly bipinnate, petiole 1.3 to 1.6 cm. long, sometimes vertically flattened to 1 mm. broad, with the midrib slightly above the lower margin, pilose to hirsute, excurrent; leaflets two to three pairs, the number not constant on each pinna; rachis 4 to 6 mm. long; stipules pilose to hirsute, 1.5 mm. long. In one case No. 3 and upwards were phyllodes.

No. 4. Sometimes a phyllode, or abruptly bipinnate, petiole up to 1.7 cm. long, leaflets three pairs; stipules as in No. 3.

Nos. 5 to 8. Phyllodes from about 1 to 3 cm. long, 1 to 2.3 mm. broad, oblong-linear, with a few scattered hairs,

somewhat oblique, tapering towards the base, and terminating in a short, straight or curved point.

This is the third seedling described in this series where the No. 3 leaf has been reduced to a phyllode, the previous ones being *A. excelsa* and *A. alata* (supra).

In one case, after the second bipinnate leaf had appeared, a simply pinnate leaf grew in the axil of the cotyledon, a most unusual occurrence, and a further remarkable feature was that the under, and not the upperside was next to the stem of the plant.

UNINERVES—(*Angustifoliæ*).

ACACIA MONTANA Benth. Seeds from Temora, (Rev. Father J. W. Dwyer per J. H. Maiden). Plate XXXII, Numbers 4 to 6).

Seeds dark brown, oblong-oval to obovate-oblong, 4 mm. long, 2 to 2·5 mm. broad, 1 to 1·3 mm. thick.

Hypocotyl erect, terete, pale brown, 1·7 to 3·5 cm. long, 1 mm. thick at base, ·8 to 1 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled, oblong-oval, about 6 mm. long, 3 mm. broad, outer or underside pale green, often with one or two longitudinal raised lines, and sometimes with a warty protuberance near centre, upperside green, glabrous, soon becoming horizontal and doubling downwards from about the middle, often remaining until after the advent of the phyllodes.

Stem terete, except where affected by decurrent leaf-stalks, pinkish-brown towards base, green above, becoming brown and pubescent. First internode ·5 to 2 mm.; second 2 mm. to 1·1 cm.; third 6 mm. to 1·8 cm.; fourth 4 mm. to 2·2 cm.; fifth 5 mm. to 2·7 cm.; sixth 5 mm. to 2·6 cm.; seventh 5 mm. to 1·8 cm.

Leaves—No. 1. Abruptly pinnate, petiole 4 mm. to 1 cm. long, green, glabrous; leaflets usually two pairs, sometimes

three, obliquely oblong-obovate, 4 to 7 mm. long, 2 to 3 mm. broad, midrib often distinct, secondary vein showing under pocket lens, upperside green, underside paler, rachis 3 to 6 mm. long, green, glabrous, excurrent; stipules reduced to scales about 1 mm. long.

In one instance leaves Nos. 1 and 2 were both simply-pinnate, forming an opposite pair.

No. 2. Abruptly bipinnate, petiole 6 mm. to 1·4 cm. long, green, glabrous, excurrent; leaflets two to three pairs, the number not being constant on each pinna of the same leaf, the pinna also often irregularly pinnate, oblong-acuminate to oblong-obovate, 3 to 6 mm. long, 2 to 3 mm. broad; rachis 5 mm. to 1 cm. long, glabrous, excurrent; stipules as in No. 1.

Nos. 3 and 4. Abruptly bipinnate, petiole 1·1 to 1·6 cm. long, sometimes vertically flattened to 1 mm. broad just above the middle, with a strong nerve or midrib along the lower margin and extending to the base of the pinnæ, with perhaps a fine vein running along the upper portion of the lamina, glabrous or with a few scattered hairs, usually excurrent; leaflets three to four pairs on both, oblong-acuminate, often mucronate, margins ciliate; rachis 6 mm. to 1 cm. long; stipules with flat broad bases, tapering to apex, 1·5 mm. long.

Nos. 5 to 8. These may be phyllodes or they may be abruptly bipinnate, petioles 1·1 to 2·1 cm. long, with scattered glandular hairs, vertically flattened from ·5 to 5·5 mm. broad, with a strong midrib just below the centre of the lamina and a finer vein above; leaflets three to four pairs; rachis 7 mm. to 1·5 cm. long, with a few scattered hairs, excurrent; stipules as in Nos. 3 and 4.

Nos. 9 and 10, and sometimes including Nos. 5 to 8. Phyllodes, 2 to 3 cm. long, up to 5 mm. broad, very like those of *A. aspera* in shape but differing in venation, nar-

rowed at the base, often with a small outward curved point at the apex, midrib distinct, and finer vein above which is not always continuous to the apex, lateral venation fairly clear, small gland near base, slightly viscid but less so than phyllodes of more mature plants.

UNINERVES—(Racemosæ).

ACACIA CHALKERI Maiden.¹ Seeds from Wombeyan Caves, New South Wales, (O. Trickett). Growing on limestone formation. (Plate XXXII, Numbers 7 to 9).

Seeds black, oblong to oblong-oval, 4 to 5 mm. long, 2 to 3 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, reddish-green to brownish-red above soil, pale beneath soil, 1·2 to 3 cm. long, 2 to 2·7 mm. thick at base, 1 mm. thick at apex, glabrous.

Cotyledons sessile, sagittate, oblong-oval, about 7 mm. long, 3 mm. broad, becoming revolute in a week or two, outer or underside dark green, with a few raised longitudinal lines, inner or upperside green, glabrous.

Stem terete, green, glabrous. First internode 5 mm.; second 1 to 6 mm.; third 1 to 8 mm.; fourth 3 mm. to 1·6 cm.; fifth 4 mm. to 1·7 cm.; sixth 6 mm. to 1·3 cm.; seventh 4 mm. to 1·3 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 5 mm. long, green to reddish-green, glabrous; leaflets three pairs, 3 to 4 mm. long, 2 mm. broad, oblong-acuminate, the terminal pair being sometimes obliquely cuneate, venation obscure, midrib showing under pocket lens, upperside green, underside brown to pale green, glabrous; rachis 3 to 6 mm. long, green, glabrous, excurrent, the point being often brown; stipules reduced to scales.

¹ This Journal, XLIX, 482, (1915).

No. 2. Abruptly bipinnate, petiole 5 mm. to 1·3 cm., glabrous, excurrent; leaflets two to three pairs; rachis 3 to 7 mm. long, glabrous, excurrent.

Nos. 3 and 4. Abruptly bipinnate, petiole 7 mm. to 1·8 cm. long, No. 4 being sometimes vertically flattened slightly, and showing a strong nerve along the lower margin; leaflets three to five pairs, oblong-acuminate; rachis 5 mm. to 1·1 cm.; stipules reduced to scales.

Nos. 5 and 6. Abruptly bipinnate, petiole 1 to 2·5 cm. long, often vertically flattened up to 1 mm. broad with the midrib towards the lower margin, glabrous, excurrent; leaflets four to six pairs. In one case No. 6 was reduced to a phyllode.

Nos. 7 and 8. These may be phyllodes, or abruptly bipinnate, petiole up to 2 cm. long, 2 mm. broad, with the midrib just below the centre of the lamina, glabrous, rarely with a small gland above or below the middle, excurrent; leaflets five pairs.

Nos. 9 and 10. Phyllodes, oblanceolate, commonly from 3 to 5 cm. long, up to 5 mm. broad, with the midrib slightly below or in the centre of the lamina, and terminating in a short mucrone. On one plant No. 9 was 6, and No. 10 was 7 cm. long, linear-oblanceolate, the broadest portion only measuring 2·5 mm. This is much longer and narrower than is usually the case with the mature foliage. There is often a small gland a little above the base.

ACACIA NERIIFOLIA A. Cunn. Seeds from Howell, N.S. Wales (T. S. McCrae). (Plate XXXIII, Numbers 1 to 4).

Seeds black, oval to oblong-oval, 5 mm. long, 3 mm. broad, 2 mm. thick.

Hypocotyl erect, terete, red, up to 3·6 cm. long, up to 2·3 mm. thick at base, ·7 to ·8 mm. thick at apex, glabrous.

Cotyledons sessile, auricled, oblong, apex rounded, 5 to 7 mm. long, 3.5 mm. broad, becoming revolute and cylindrical, soon falling, outer or underside pale brown to yellowish and straw-coloured, central portion raised, sometimes rugose with gland-like formations, upperside reddish-brown.

Stem terete, bluish to brown, pilose to tomentose. First internode .5 mm.; second 2 mm. to 1.1 cm.; third 3 mm. to 1 cm.; fourth 3 mm. to 1.4 cm.; fifth 5 mm. to 1.7 cm.; sixth 7 mm. to 2.5 cm.; seventh 1 to 2.2 cm.; eighth 1 to 2.8 cm.; ninth 1.2 to 3.5 cm.

Leaves—No. 1. Abruptly pinnate, petiole 2 to 8 mm. long, green, glabrous; leaflets three to five pairs, oblong-acuminate, often mucronate, 5 to 7 mm. and rarely 1.2 cm. long, 1.5 to 3.5 mm. broad, midrib often distinct, secondary vein and some lateral venation seen under pocket lens, upper-side green, glabrous, underside red to reddish-green, often becoming pale green, the midrib dark red and usually raised; rachis 1 to 2.2 cm. long, pale green, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole 8 mm. to 1.3 cm. long, green, sometimes with gland below middle of upper margin, excurrent; leaflets three to five pairs, the leaflets not always opposite, 3 to 6 mm. long, 1.5 to 2.5 mm. broad, the basal pair sometimes smaller, oblong-acuminate to obovate, often mucronate, upperside green, underside pale reddish-green; rachis 5 mm. to 1.1 cm. long, glabrous, excurrent; stipules reduced to scales.

No. 3. Abruptly bipinnate, petiole sometimes slightly flattened vertically, 1.2 to 1.5 cm. long, often with gland below middle of upper margin, excurrent; leaflets four to six pairs; rachis 1.1 to 1.7 cm. long; stipules as in No. 1.

No. 4. Abruptly bipinnate, petiole vertically flattened to 1.2 mm. broad with strong nerve or midrib along the lower margin, gland towards base on upper margin, 1.7 to 2.7 cm.

long; leaflets six to eight pairs, the number not always equal on each pinna of the same leaf, up to 7 mm. long; rachis 2 to 2·3 cm. long.

Nos. 5 and 6. Abruptly bipinnate, petiole up to 4 mm. broad in the case of No. 6, gland towards base, 1·5 to 3·9 cm. long; leaflets eight to ten pairs on either; rachis up to 3·7 cm. long.

Nos. 7 and 8. Abruptly bipinnate, sometimes with two pairs of pinnæ, petiole up to 6 mm. broad in No. 7 and 9 mm. in No. 8, with the midrib below the centre of the lamina, 2·7 to 4·7 cm. long; leaflets eight to eleven pairs.

Nos. 9 and 10. Abruptly bipinnate, sometimes with two pairs of pinnæ, petiole up to 4·7 cm. long, 1 cm. broad, gland near base; leaflets nine to eleven pairs.

Nos. 11 and 12. Abruptly bipinnate, often with two pairs of pinnæ, petiole up to 4·3 cm. long and 1·4 cm. broad.

Nos. 13 and 14. Leaflets sometimes up to fourteen pairs.

This species is very variable in regard to the stage at which phyllodes appear. In one case No. 9 was reduced to a phyllode while several later leaves were bipinnate. On plants two feet high there may be numerous leaves with petioles developed as broad phyllodes, but having one, two and even three pairs of pinnæ (Fig. 1). There is usually a gland at the base of the dilated petiole, and also at the bases of the second and third pairs of pinnæ.

ACACIA OBTUSATA Sieb. Seeds from Wingello and Tallong, N.S. Wales. (Plate XXXIV, Numbers 1 to 3).

Seeds black, oblong-oval, 4 to 5 mm. long, 3 to 3·5 mm. broad, 1·5 to 2 mm. thick.

Hypocotyl erect, terete, pale pink to brownish-red, 1 to 2 cm. long, 1 to 2 mm. thick at base, about 1 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled to sagittate, oblong to obovate, 6 to 7 mm. long, 3 to 3·7 mm. broad, outer or underside brownish-red to red, with two or three longitudinally raised lines, inner or upperside reddish-green, glabrous.

Stem terete, reddish to bluish-green, glabrous. First internode 5 mm.; second 1 to 2 mm.; third 1 to 2 mm.; fourth 1 to 4 mm.; fifth 2 to 8 mm.; sixth 2 to 7 mm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 5 mm. long, glabrous, excurrent; leaflets three pairs, oblong-acuminate, the terminal pair sometimes obovate, sometimes mucronate, 5 to 7 mm. long, 1·5 to 3 mm. broad, upperside green, margins often red, underside reddish to pale green, midrib sometimes obscure and at others fairly distinct; rachis 5 to 9 mm. long, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole 6 mm. to 2·7 cm. long, sometimes with a small gland on upper margin, glabrous, excurrent; leaflets three to five pairs; rachis 7 mm. to 1·2 cm. long, glabrous, excurrent.

No. 3. Abruptly bipinnate, petiole 1·2 to 3 cm. long, vertically flattened up to 1 mm. broad, with strong nerve along lower margin and gland on upper edge, glabrous, or with a few scattered hairs, excurrent; leaflets three to seven pairs, the numbers not constant for each pinna of the same leaf, 4 to 5 mm. long, the basal pair smaller, oblong-acuminate, the terminal pair sometimes obovate, often mucronate; rachis 1 to 1·9 cm. long, glabrous; stipules reduced to flat acuminate scales.

No. 4. Abruptly bipinnate, petiole 1·5 to 3·6 cm. long, vertically flattened up to 2 mm. broad, strong nerve or midrib very close to lower margin, the upper edge nerve-like and sometimes with a gland below the middle, glabrous or with a few scattered hairs; leaflets five to nine pairs; rachis 1·2 to 2·2 cm. long, excurrent.

No. 5. Sometimes a phyllode, or it may be abruptly bipinnate, petiole 3 to 3·5 cm. long, up to 4 mm. broad, with midrib below the centre, and with nerve-like margins and sometimes a gland on upper edge; leaflets six to eight pairs.

Nos. 6 to 8. Phyllodes with fairly central midrib and nerve-like margins, and gland towards base.

ACACIA HAKEOIDES A. Cunn. Seeds from Wyalong and Tottenham, N.S. Wales. (Plate XXXIV, Numbers 4 to 6).

Seeds dull black, oval to oblong-oval, 4·5 to 6 mm. long, 2·5 to 3·5 mm. broad, 1·5 to 2 mm. thick.

Hypocotyl erect, terete, brownish-green, 1·2 to 2·7 cm. long, 2 mm. thick at base, 1 mm. thick at apex.

Cotyledons sessile, slightly auricled, oblong-oval to oblong with apex rounded, 6 to 8 mm. long, 3 to 3·5 mm. broad, outer or underside yellowish to brownish-green, paler towards apex, with a few longitudinally raised veins, the central one the largest, upperside green, soon becoming revolute.

Stem terete, reddish-brown, pilose. First internode 5 mm.; second 5 to 1 mm.; third 1 mm.; fourth 1 to 2 mm.; fifth 1 to 5 mm.; sixth 4 to 8 mm.; seventh up to 9 mm.

Leaves—No. 1. Abruptly pinnate, petiole 4 to 6 mm. long, greenish-brown, glabrous, or with a few short stiff hairs, excurrent; leaflets three to four pairs, oblong-acuminate, up to 9 mm. long, 2 to 4·5 mm. broad, upperside green, underside paler, venation indistinct, midrib sometimes showing without the aid of a pocket lens; rachis 5 to 9 mm. long, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole 8 mm. to 1·4 cm. long, greyish-green, pilose, excurrent; leaflets three to four pairs,

rarely two; rachis 4 mm. to 1·3 cm. long, glabrous, excurrent; stipules reduced to small scales.

No. 3. Abruptly bipinnate, petiole 1·2 to 2·5 cm. long, vertically flattened to sometimes 1·5 mm. broad, with a strong nerve or midrib along lower margin, upper margin brownish and somewhat nerve-like, pilose, excurrent; leaflets four to five pairs, oblong-acuminate, often mucronate, the terminal pair often obovate, the basal pair small, margins often brownish-red; rachis 6 mm. to 1·3 cm. long, glabrous, or with a few scattered hairs.

No. 4. This may be a linear-lanceolate phyllode 6 to 8 cm. long, narrowed towards the base, or it may be abruptly bipinnate, petiole 1·8 to 4·7 cm. long, up to 4·5 mm. broad, much narrowed towards the base, midrib slightly below centre of lamina, pilose; leaflets four to six pairs, the number on any of the bipinnate leaves not always constant on both pinnæ of the same leaf; rachis up to 1·4 cm. long; stipules flat, acuminate scales, 1 mm. long.

Nos. 5 to 7. Phyllodes, at first reddish, becoming green, up to 10 cm. long, 7·5 mm. broad in widest portion, sometimes with a straight or hooked point, faintly pilose, with gland below middle.

ACACIA CRASSIUSCULA Wendl. (*A. pycnophylla* Benth.).

Seeds from Mount Melville, Albany, Western Australia (Professor W. G. Woolnough). (Plate XXXV, Numbers 1 to 4).

Seeds black, oblong, 4 to 5 mm. long, 2 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, creamy to pale pink, 1 to 1·5 cm. long, 1 mm. thick at base, 1 mm. thick at apex, glabrous, except that in one case it was noticed that several roots grew from a point about 5 mm. above the base of the hypocotyl.

Cotyledons sessile, very slightly auricled, oblong, apex rounded, 6 to 7 mm. long, 2 to 2.5 mm. broad, remaining erect and soon falling, outer or underside brownish-red, sometimes wrinkled longitudinally, inner or upperside reddish, glabrous.

Stem terete, green, glabrous. First internode .5 mm.; second .5 mm.; third and fourth 1 mm.; fifth 1 to 2 mm.; sixth about 2 mm.; seventh 2 to 4 mm.; eighth 5 to 7 mm.

Leaves—Nos. 1 and 2. Abruptly pinnate, forming an opposite pair, petiole 3 to 6 mm. long, pale red to reddish-brown and reddish-green, glabrous; leaflets two pairs, 3 to 4 mm. long, 1.5 to 2 mm. broad, oblong-acuminate, mucronate, venation obscure, midrib showing under pocket lens, upperside green, margins red, underside bright red, often becoming reddish-green, glabrous; rachis 2 to 3 mm. long, reddish, glabrous, excurrent.

No. 3. Abruptly bipinnate, petiole 7 mm. to 1.2 cm. long, greenish-brown, often slightly dilated vertically, with gland on upper margin, usually a little below the middle, glabrous, excurrent; leaflets two pairs, oval-oblong to oblong-acuminate, the terminal pair sometimes obovate, often mucronate, margins often reddish, upperside green, underside paler with midrib distinct.

Nos. 4 and 5. Abruptly bipinnate, petiole 8 mm. to 1.5 cm. long, slightly dilated vertically, gland just below middle on upper margin, glabrous, excurrent; leaflets two pairs on No. 4, and three pairs on No. 5, up to 6 mm. long, 4 mm. broad, mucronate; rachis up to 1.2 cm. long; stipules reduced to flat, acuminate scales.

Nos. 6 and 7. Abruptly bipinnate, petiole up to 1.7 cm. long on No. 6, and up to 2.5 cm. on No. 7, dilated vertically to 1 mm. broad, gland below middle, and sometimes a second gland at base of pinnæ, with strong nerve along lower

margin, glabrous, excurrent; leaflets three to four pairs; rachis up to 2.5 cm. long on No. 7.

Nos. 8 and 9. Abruptly bipinnate, petiole up to 3.5 cm. long on No. 8, and 4.8 cm. long, 2 mm. broad, on No. 9, midrib below centre of lamina; leaflets five pairs; rachis up to 2.4 cm. long.

No. 10. Abruptly bipinnate, petiole linear, up to 7.8 cm. long, 3 mm. broad, with definite midrib; leaflets five pairs.

Nos. 11 and 12. Linear, erect, phyllodes, up to about 10 cm. long, with gland near base.

Although the phyllodes are markedly erect, the leaves below them are disposed horizontally, and give to the little plants a prostrate appearance, especially prior to the advent of the phyllodes.

PLURINERVES—(Oligoneuræ).

ACACIA HOWITTHI F.v.M.¹ Seeds from Melbourne, (E. E. Pescott. Cultivated). (Plate XXXIV, Numbers 7 to 9).

Seeds brown to black, oblong to oblong-oval, 3 to 4 mm. long, 1.5 to 2 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, reddish-brown, 7 mm. to 1.5 cm. long, up to 1.8 mm. thick at base, .8 mm. thick at apex, glabrous, except that in one case six roots grew at about 5 mm. from the base.

Cotyledons sessile, auricled, oblong, apex rounded, about 5 mm. long, 2 mm. broad, soon becoming revolute, remaining until the phyllodes appear, outer or underside brown, upperside green, glabrous.

Stem terete, the decurrent stems of the phyllodes often giving it a striated appearance which partly disappears with age, green, somewhat viscid, pilose to hirsute. First

¹ *Vict. Nat.* x, 16, (May, 1893).

internode .5 mm.; second 1 to 2 mm.; third 1 to 5 mm.; fourth 2 to 5 mm.; fifth 3 to 8 mm.; sixth 4 mm. to 1 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 4 mm. long, green, glabrous; leaflets three to four pairs, oblong-acuminate, the terminal pair usually obovate, 4 to 5 mm. long, about 2 mm. broad, upperside green, underside paler, venation obscure; rachis 5 to 7 mm. long, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole 8 mm. to 1.2 cm. long, excurrent; leaflets three to four pairs, oval to obovate, usually mucronate; rachis 7 to 8 mm. long; stipules reduced to flat, acuminate scales.

Nos. 3 and 4. Abruptly bipinnate, petiole 7 mm. to 1.4 cm. long, dilated vertically, sometimes to nearly 1 mm. broad in the case of No. 4, with strong nerve along lower margin, pilose; leaflets five to seven pairs, oblong-oval to obovate, about 5 mm. long, 2 to 2.5 mm. broad; rachis 1.2 to 1.6 cm. long, excurrent.

No. 5. This may be a phyllode, or abruptly bipinnate, petiole about 1 cm. long, dilated, hirsute; leaflets six to seven pairs.

Nos. 6 to 9. Phyllodes, from obovate to obliquely-ovate, mucronate, 7 mm. to 2.5 cm. long, up to 1 cm. broad, 2 to 3-nerved, the upper vein not always extending to the apex, lateral veins numerous, glabrous. Later phyllodes usually become viscid. On plants 1 foot high the phyllodes may not exceed 1.5 cm. long, by 9 mm. broad.

BIPINNATÆ—(Botryocephalæ).

ACACIA SPECTABILIS A. Cunn. Seeds from Gungah, N.S.

Wales (J. H. Maiden). (Plate XXXV, Numbers 5 to 7.)

Seeds black, oblong, 5 to 6 mm. long, 2.5 to 3 mm. broad, 2 mm. thick.

Hypocotyl erect, terete, pale red, soon becoming dark red, 1.2 to 2.7 cm. long, 1 to 2 mm. thick at base, .6 to 1 mm. thick at apex, glabrous.

Cotyledons sessile, auricled, oblong, apex rounded, 8 mm. long, 3·5 mm. broad, becoming revolute and cylindrical within one week, outer or underside yellowish, sometimes becoming brownish-red, with raised portion 1 mm. broad extending along centre from base to apex, outer flanges thinner, inner or upperside yellowish to reddish-green, becoming green, glabrous on both sides.

Stem terete, green to reddish-green, later becoming bluish, hirsute. First internode 5 to 2 mm.; second 2 mm. to 3 cm.; third 7 mm. to 1·5 cm.; fourth about 1 cm.; fifth 1·4 to 2·4 cm.; sixth 1·8 to 5·3 cm.; seventh 3·2 to 6 cm.

Leaves—No. 1. Abruptly pinnate, petiole 4 to 6 mm. long, reddish to reddish-green, with a few scattered hairs; leaflets four to five pairs, oblong-acuminate, 4 mm. to 1 cm. long, 2 to 3·5 mm. broad, midrib often distinct on underside, secondary vein showing under pocket lens, upperside green, sometimes reddish-green, underside reddish to reddish-green, becoming pale green, margins often red; rachis 6 mm. to 2·4 cm. long, reddish-green, becoming green, glabrous or with a few hairs, excurrent; stipules reduced to small scales.

No. 2. Abruptly bipinnate, in one case with two pairs of pinnæ, the lower pair not quite opposite, petiole 7 mm. to 2·1 cm. long, pilose, with a band of reddish-green at the base; leaflets five to six pairs, 4 to 8 mm. long, 2 mm. broad, the basal pair smaller, oblong-acuminate, often mucronate, the terminal pair often obovate; rachis 1 to 1·6 cm. long, with brown band at base, glabrous, excurrent; stipules as in No. 1.

Nos. 3 and 4. Abruptly bipinnate, No. 3 with one or two pairs of pinnæ, and No. 4 with one, two or three pairs, petiole from 1 cm. in No. 3 to 2·5 cm. in the case of the common petiole of No. 4 having three pairs of pinnæ, pilose to hirsute; leaflets six to eight pairs in No. 3, and six to

nine in No. 4, often mucronate; gland on petiole and often at base of terminal pair of pinnæ; rachis 1·2 to 2·4 cm. No. 4 may be an apparent tripinnate leaf.¹

Nos. 5 and 6. Abruptly bipinnate, No. 5 with three and four pairs of pinnæ, and No. 6 with five pairs; the common petiole up to 3·5 cm. long in No. 5, and 5·7 cm. in No. 6, hirsute, excurrent; leaflets on the terminal pair of pinnæ nine to ten pairs; gland on petiole and often at base of terminal pair of pinnæ; rachis on the terminal pair of pinnæ up to 3 cm. long.

A plant a little over one foot high may have nine pairs of pinnæ on one leaf.

EXPLANATION OF PLATES.

PLATE XXXI.

Acacia alata R. Br.

1. Cotyledons and opposite pair of pinnate leaves. From Western Australia, cultivated in Botanic Gardens, Sydney, (J. H. Maiden).
2. Opposite pair of pinnate leaves and phyllodes.
3. Pod.

Acacia continua Benth.

4. Cotyledons, with tips of opposite pair of pinnate leaves showing. Broken Hill (E. C. Andrews).
5. Opposite pair of pinnate leaves, bipinnate leaves and phyllodes.
6. Pod and seeds.

Acacia oxycedrus Sieb.

7. Cotyledons and pinnate leaf. Hornsby.
8. Pinnate leaf, bipinnate leaves and pungent pointed phyllodes. Nodule on root.
9. Pod and seeds.

¹ This Journal, Vol. LI, 394, (1917).

PLATE XXXII.

Acacia aspera Lindl.

1. Cotyledons. Temora (Rev. J. W. Dwyer).
2. Cotyledons, pinnate leaf, bipinnate leaves and phyllodes.
3. Pod and seeds. Wyalong.

Acacia montana Benth.

4. Cotyledons. Temora (Rev. J. W. Dwyer).
5. Pinnate leaf, bipinnate leaves and phyllodes.
6. Seeds.

Acacia Chalkeri Maiden.

7. Cotyledons with young pinnate leaf showing. Wombeyan Caves (O. Trickett).
8. Pinnate leaf, bipinnate leaves and phyllodes.
9. Pod and seeds.

PLATE XXXIII.

Acacia neriifolia A. Cunn.

1. Cotyledons with tip of pinnate leaf. Howell (T. S. McCrae).
2. Pinnate leaf, bipinnate leaves and phyllodes.
3. Large bipinnate leaf on plant two feet high.
4. Pod and seeds.

PLATE XXXIV.

Acacia obtusata Sieb.

1. Cotyledons. Tallong.
2. Pinnate leaf, bipinnate leaves and phyllodes. Wingello.
3. Pod and seeds.

Acacia hakeoides A. Cunn.

4. Cotyledons. Tottenham.
5. Pinnate leaf, bipinnate leaves and phyllodes. Wyalong.
6. Pod and seeds.

Acacia Howittii F.v.M.

7. Cotyledons. Melbourne (E. E. Pescott. Cultivated).
8. Pinnate leaf, bipinnate leaves and phyllodes.
9. Seeds.

PLATE XXXV.

Acacia crassiuscula Wendl.

1. Cotyledons, with tips of opposite pair of pinnate leaves on each side. Albany, Western Australia (Prof. W.G. Woolnough).
2. Opposite pair of pinnate leaves, also first and second bipinnate leaves.
3. Bipinnate leaves and phyllodes.
4. Pod and seeds.

Acacia spectabilis A. Cunn.

5. Cotyledons and pinnate leaf. Gungal (J. H. Maiden).
 6. Pinnate leaf and bipinnate leaves.
 7. Seeds.
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Cambage, Richard Hind. 1918. "Acacia seedlings, Part IV." *Journal and proceedings of the Royal Society of New South Wales* 52, 410–434.

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