

ACACIA SEEDLINGS, PART III.

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With Plates XV to XIX.

[Read before the Royal Society of N. S. Wales, November 7, 1917.]

SYNOPSIS:

VITALITY OF SEED IN SEA-WATER.

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Vitality of Seed in Sea-water.

In previous papers on *Acacia Seedlings*¹ it was pointed out that seeds of *Acacia Farnesiana* had germinated after having been immersed in sea-water for 190 and 405 days respectively. In order to further test the vitality of seeds of this species, which were collected by Sir William Cullen in Central Queensland in July 1914, another seed was planted after having been in sea-water for 839 days. Previous to being planted it was placed in boiling water, and in 17 days the seedling appeared above the soil.

These experiments demonstrate the possibility of various seeds retaining their powers of germination for a sufficient length of time to be drifted many thousands of miles, provided they found suitable agents of transport.

A test was also made with seeds of *Acacia penninervis* var. *falciformis*, and *A. melanoxylon*, collected at Jenolan Caves, at an elevation of about 2,700 feet above sea-level.

¹ This Journal, Vol. XLIX, p. 94; Vol. L, p. 144.

Two of each were planted after having been immersed in sea-water for 133 days, and both of the former and one of the latter germinated in from two to three weeks, and the remaining one in eight weeks. The seeds were placed in boiling water immediately before being planted.

Although these experiments show the great vitality of certain seed in sea-water, they do not, of course, prove that the seeds secure transport. Nor does it follow that seeds of all species which are transported find suitable homes when cast ashore. It is well known that various species of different genera, in their natural state, exercise the greatest discrimination in the selection of soils and climate, and that while the seeds of many species may germinate when cast ashore, only certain species would establish themselves without having care and attention in their infancy. Bushels of seed from our typical mountain Eucalyptus species might be scattered over the black-soil plains of the west, and the great bulk of it would probably germinate, though it is most unlikely that a single tree would become established as the result.

A. Farnesiana will grow in Australia on the sea-shore or in the dry interior, and, as a result of its adaptability, is very wide-spread throughout the tropics.

Considering the marvellous distribution of the world's plants, it seems imperative, when seeking for the solution of the problem, that the investigation of all sources of natural dispersal should be exhausted before it be assumed that certain portions of such distribution may be attributed to the agency of man.

It was mentioned in Part I, (p. 24), that of four seeds of *A. Farnesiana* from Boomarra, in tropical Queensland, which were planted after having been in sea-water for three months and afterwards placed in boiling water, two immediately germinated. In Part II, (p. 145), it was

recorded that the third seed germinated after having remained in the soil for twenty-three months. The fourth seed was left in the soil and watered regularly for three years, then taken out and found to be quite hard and sound; after having been placed in boiling water it was again planted, with the result that the seedling appeared in three weeks.

Length of Hypocotyl.

The variation in the length of hypocotyl was referred to in Part I, (p. 86), when the greatest length then noticed was given as 5·5 cm. Recently a seedling was raised of *Acacia Baileyana* whose hypocotyl measured 10·5 cm.

Sequence in the Development of Leaves.

As previously pointed out, the great bulk of *Acacia* seedlings have only one simply-pinnate leaf and this is the first leaf on the plant, the second leaf being usually bipinnate. A few species have an opposite pair of simply-pinnate leaves. In addition to those mentioned in previous lists (Parts I and II), as having only one pinnate leaf, are the following:—

<i>A. verticillata</i> Willd. ¹	<i>A. subcærulea</i> Lindl.
<i>A. montana</i> Benth. (with an exception).	<i>A. subulata</i> Bonpl.
<i>A. Chalkeri</i> Maiden.	<i>A. cyclopis</i> A. Cunn.
	<i>A. polybotrya</i> Benth.

Another species which has an opposite pair of pinnate leaves is *A. crassiuscula* Wendl., (*A. pycnophylla* Benth.).

In the case of *A. montana* nine plants each produced one pinnate leaf, while one seedling had an opposite pair, so that it seems evident this species is still in something of a transition stage.

Out of about eighty species examined, only seven have constantly produced an opposite pair of simply-pinnate

¹ Also recorded by Sir John Lubbock. See Part I, p. 83 of these papers. The name should be *A. verticillata* Willd. non Sieb.

leaves. One of these is *A. myrtifolia*, in which case seeds from Sydney and Adelaide were examined (Part II, p. 157). Plants recently raised from seeds of this species, kindly forwarded to me by Professor W. G. Woolnough, from Mount Melville, Albany, Western Australia, have produced an opposite pair of pinnate leaves, thus showing an interesting constancy.

Simply-pinnate Leaves.

When speaking of simply-pinnate and bipinnate leaves in Part I of this series, it was pointed out that a simply-pinnate leaf had not so far been observed above the third leaf on an *Acacia* seedling, nor at all on an *Acacia* sucker.¹ Early this year, however, Mr. J. J. Fletcher, B.Sc., found several such leaves on specimens of *A. suaveolens* growing at Woolwich, near Sydney, and which he kindly handed to me. Others have since been found by me at La Perouse. These simply-pinnate leaves were growing in pairs, one on each side of the base of bipinnate leaves which had appeared as reversion foliage, among the phyllodes at heights up to four or five feet from the ground, and were apparently the result of some pathological trouble around the growing-point of the plants. Bipinnate leaves are common on adventitious growths of phyllodineous *Acacias*.

In June of this year I found one example of a simply-pinnate leaf on a sucker of *Acacia Dorothea* Maiden, at Mount Victoria, and later, several were found on suckers of this species, and of *A. obtusata* var. *Hamiltoni* Maiden, at Leura. These discoveries go to suggest that extended search may reveal more examples of both features among various species.

Number of Pinnæ on one Leaf.

In Part I, (p. 90) it was mentioned that in a few species the pinnæ increase on some of the succeeding leaves to several pairs. The remark referred to phyllodineous *Acacias*.

¹ This Journal, XLIX, p. 90 (1915).

In Part II, (p. 158) *A. myrtifolia* is mentioned as sometimes having two pairs, and *A. amœna*, *linifolia* and *buxifolia* are so recorded (*infra*) in the present paper. *A. suaveolens* and *A. penninervis* var. *falciformis* may have two, *A. neriifolia*, *A. accola*, and *A. implexa* up to at least three, *A. rubida* five, and *A. melanoxylon* seven pairs. Two pairs of pinnae have recently been noticed in West Australian examples of *A. myrtifolia*.

Tripinnate Leaves.

On one plant of *A. buxifolia* the sixth leaf had a third pinna about 3 mm. below the terminal pair, and between this pair the excurrent point of the petiole was clearly visible before the leaf was pressed. There was no trace of even the rudiments of a pinna opposite the odd one, which was so close to the terminal pair as to make the leaf appear tripinnate. Had the petiole been produced into the rachis of the central pinna, instead of the excurrent point, the leaf would have been strictly tripinnate. (Fig. 1.)

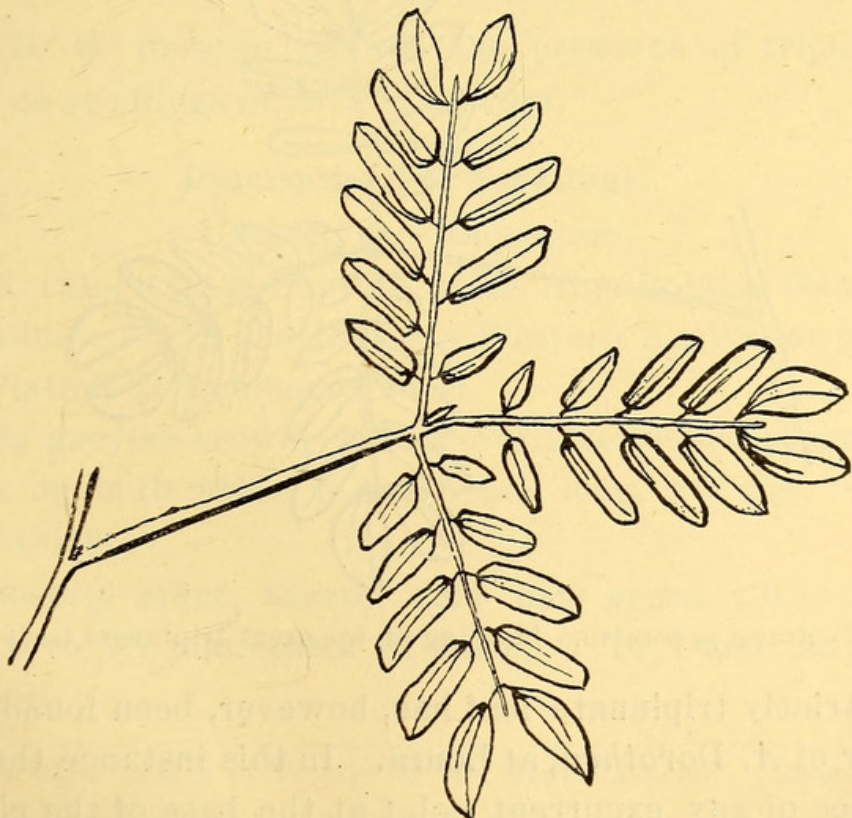


Fig. 1. *Acacia buxifolia*. Showing an apparent tripinnate leaf. $\times 2$.

The same feature was noticed on the fourth and fifth leaves of separate seedlings of *A. spectabilis*, but here the lower pinna was 1 mm. below the terminal pair on the fourth leaf, and 3 mm. below in the case of the fifth leaf.

A similar case was found on a plant six feet high of *A. decurrens* var. *normalis*, the lower pinna being 4 mm. below the terminal pair.

On a seedling of *A. pycnantha* the fourth leaf was apparently tripinnate, but in this instance, while the excurrent point was between the central and right-hand pinnæ, it was the central and left-hand pinnæ which from their position looked like the terminal pair. The outer pair were opposite at their bases, but the left-hand pinna was the most robust of the three, and the right-hand one began to wither off as soon as it was fully developed. (Fig. 2.)

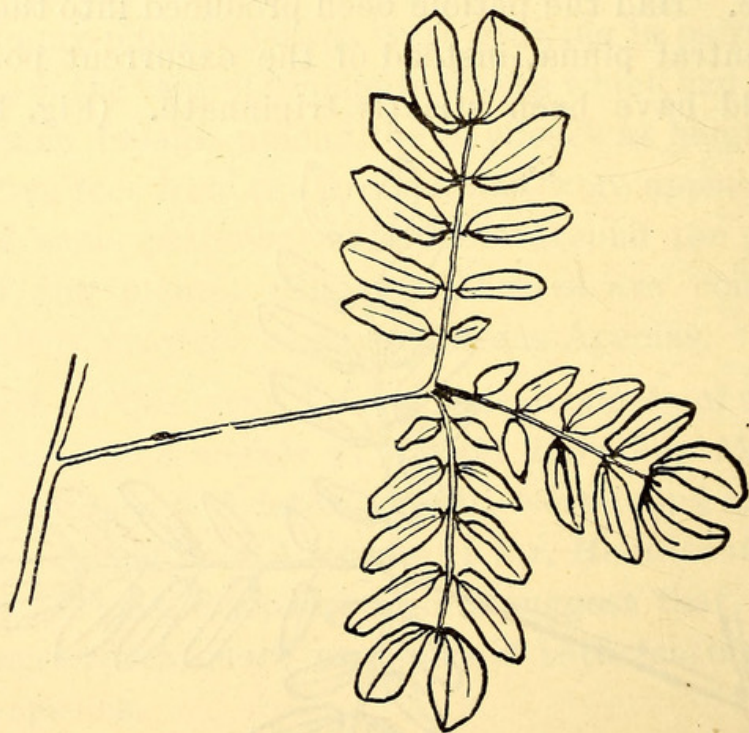


Fig. 2. *Acacia pycnantha*. Showing an apparent tripinnate leaf. $\times 2$.

A strictly tripinnate leaf has, however, been found on a sucker of *A. Dorothea*, at Leura. In this instance there is no trace of any excurrent point at the base of the pinnæ,

and the petiole continues straight on into the rachis of the central pinna. Fig. 3.

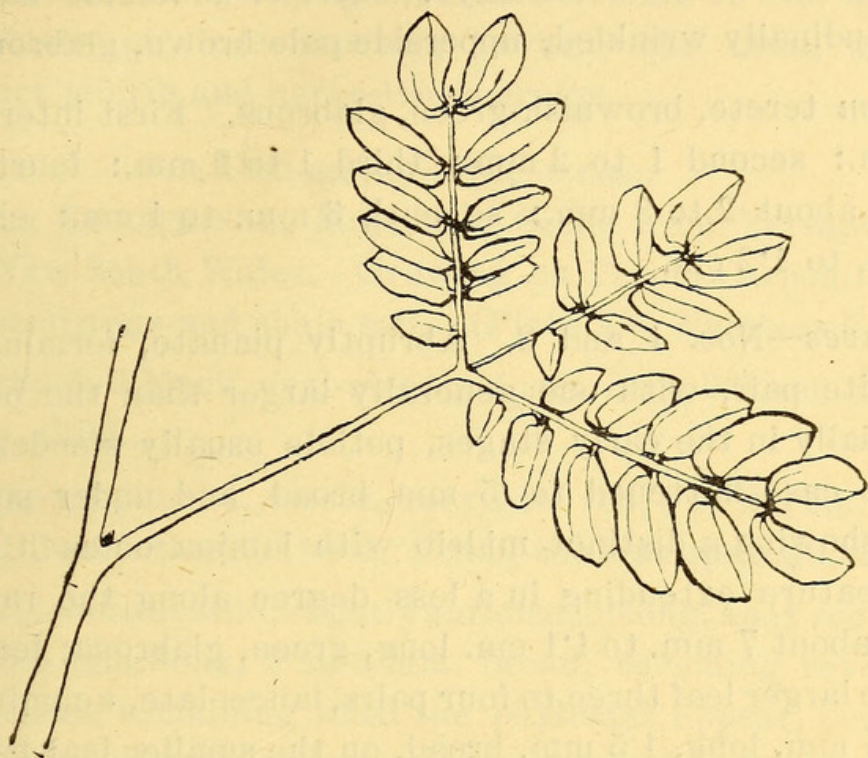


Fig. 3. *Acacia Dorothea*. Showing a strictly tripinnate leaf. $\times 2$.

Mr. C. E. Preston records the presence of tripinnate leaves on seedlings of *Acacia leprosa*.¹

Descriptions of Seedlings.

UNINERVES—Racemosæ.

ACACIA LEIOPHYLLA, Benth. Seeds from Botanic Gardens, Sydney, (J. H. Maiden). A Western Australian plant. (Plate XV, Numbers 1 to 4).

Seeds greyish-brown, oblong-oval, depressed along the middle on both sides, 5 to 5.5 mm. long, 2.5 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, very pale green, 1.6 to 3 cm. long, 1 to 1.7 mm. thick at base, .7 to 1 mm. at apex, glabrous.

¹ "Peculiar Stages of Foliage in the Genus *Acacia*." Amer. Nat., xxxvi, p. 727 (1902).

Cotyledons sessile, auricled, oblong, apex rounded, 6 to 7 mm. long, 2 to 2.5 mm. broad, remaining erect and falling in about a week or ten days: outer or underside brown, longitudinally wrinkled, upperside pale brown, glabrous.

Stem terete, brownish-green, glabrous. First internode .5 mm.: second 1 to 2 mm.: third 1 to 2 mm.: fourth to sixth about 2 to 3 mm.: seventh 3 mm. to 1 cm.: eighth 5 mm. to 1.2 cm.

Leaves—Nos. 1 and 2. Abruptly pinnate, forming an opposite pair, with one generally larger than the other, especially in the early stages, petiole usually slender but in one case flattened to .5 mm. broad, and under pocket lens showing a distinct midrib with lamina on each side, the feature extending in a less degree along the rachis, from about 7 mm. to 1.1 cm. long, green, glabrous; leaflets on the larger leaf three to four pairs, lanceolate, acuminate, 4 to 5 mm. long, 1.5 mm. broad, on the smaller leaf two to three pairs, and slightly smaller, upperside green, underside paler, midrib distinct under pocket lens; rachis 5 to 7 mm. long, green, glabrous, excurrent; stipules reduced to scales.

No. 3. Bipinnate, petiole 9 mm. to 1.6 cm. long, green, slender, excurrent; leaflets three to four pairs, not always opposite; in one case the pinna was unequally pinnate; stipules flat, about 1 mm. long.

Nos. 4 to 6. Abruptly bipinnate, petiole slender, that of No. 6 sometimes showing a little vertical flattening, 1.6 to 3.2 cm. long, glabrous; leaflets four pairs, upperside green, underside sometimes brownish-red; rachis glabrous, excurrent.

Nos. 7 and 8. Abruptly bipinnate, petiole 2 to 3.5 cm. long, vertically flattened from 1 to 2 mm. broad, narrowed towards the base, with a strong nerve running along or

close to the lower margin, the lamina showing reticulating veins; leaflets four to five pairs.

No. 9. Either abruptly bipinnate similar to No. 8, or a lanceolate phyllode tapering towards the base, with a distinct midrib and nerve-like margins.

UNINERVES—Racemosæ.

ACACIA FLOCKTONIÆ, Maiden.¹ Seeds from Yerranderie, New South Wales. Growing on Permo-Carboniferous sandstone and shale soil. (Plate XV, Numbers 5 to 7.)

Seeds dull black, oval-oblong, 4 mm. long, 2.5 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, very pale red, 1 to 2.5 cm. long, .5 to 1.5 mm. thick at base, .5 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled, oblong, apex rounded, 4 to 5.5 mm. long, 2 to 3 mm. broad, becoming revolute, sometimes remaining until the phyllodes appear, outer or underside greenish-yellow, sometimes reddish towards apex, upper or innerside brown, becoming dark green, glabrous.

Stem terete, glabrous. First internode .5 mm.; second 2 mm. to 1.1 cm.; third 1.6 to 1.8 cm.; fourth 1.4 to 2.7 cm.; fifth 2.6 to 3.2 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 5 mm. long, green, glabrous; leaflets three pairs, oblong, acuminate, 4 to 5 mm. long, 1 to 1.5 mm. broad, green on both sides, midrib showing under pocket lens, more distinct on underside; rachis 4 mm. long, green, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole 6 to 9 mm. long, green, slender, glabrous, excurrent; leaflets three pairs; rachis glabrous, excurrent.

No. 3. Abruptly bipinnate, petiole up to 1.6 cm. long, slender, glabrous, excurrent; leaflets four pairs; rachis up to 1 cm. long; stipules 1 mm. long, fragile.

¹ This Journal, XLIX, p. 476, (1915).

No. 4. Abruptly bipinnate, petiole up to 1·8 cm. long, sometimes very slightly dilated, glabrous, excurrent; leaflets up to five pairs; stipules as in No. 3.

No. 5 and upwards. Usually phyllodes with the midrib running just below the centre of the lamina.

UNINERVES—Racemosæ.

ACACIA AMÆNA, Wendl. Seeds from banks of Wollondilly River, Burragorang. (Plate XVI, Numbers 1 to 3.)

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

Hypocotyl erect, terete, at first creamy, becoming pink to red, 1·6 to 2 cm. long, 1·5 to 1·8 mm. thick at base, about ·7 mm. at apex, glabrous.

Cotyledons sessile, sagittate, oblong, apex rounded, 5 to 6 mm. long, 2·7 to 3 mm. broad, at first erect, becoming horizontal, revolute and cylindrical, outer or underside reddish-green to reddish, upperside pale green to brownish-green, glabrous.

Stem terete, brownish-green, glabrous. First internode ·5 mm.; second 2 mm. to 1 cm.; third 3 mm. to 2·2 cm.; fourth 3 mm. to 1·5 cm.; fifth 4 mm. to 4·1 cm.; sixth 1 to 2·3 cm.; seventh 1·2 to 38 cm.; eighth 1·2 to 2·3 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 6 mm. long, reddish-green, glabrous; leaflets two to three pairs, oblong, acuminate, often mucronate, 6 mm. long, 1·5 to 2·5 mm. broad, midrib just discernible on upperside, more distinct on underside, upperside greenish-red, becoming green, underside red, glabrous; rachis 4 to 6 mm. long, glabrous, excurrent; stipules flat, ovate, acuminate, 1 mm. long, with central nerve.

No. 2. Abruptly bipinnate, petiole 1·1 to 1·7 cm. long, slender, brownish-green, glabrous, excurrent; leaflets three

to four pairs, the number not being constant on each pinna of the same leaf; rachis 5 to 7 mm. long, glabrous, excurrent.

No. 3. Abruptly bipinnate, petiole 1·4 to 1·8 cm. long, sometimes channelled above, glabrous, excurrent; leaflets four pairs, upperside green, underside paler or sometimes reddish-green, the terminal pair being opposite, while the remaining leaflets are sometimes alternate; rachis glabrous, excurrent; stipules as in No. 1.

Nos. 4 and 5. Abruptly bipinnate, petiole 1·3 to 2·5 cm. long in No. 4, and 1·7 to 3·1 cm. in No. 5, about ·8 mm. broad, with a strong nerve along the lower margin, dilated above, glabrous, excurrent; leaflets five to six pairs, the basal pair usually small, the inner one the smaller, the terminal pair often obliquely obovate; rachis up to 2 cm. long, excurrent.

Nos. 6 and 7. Abruptly bipinnate, petiole 2·1 to 3·3 cm. long in No. 6, and 1·6 to 4·2 cm. in No. 7, 1 to 2 mm. broad, dilated as in Nos. 4 and 5, excurrent; leaflets six to seven pairs, up to about 1 cm. long, the basal pair often less than half that length; No. 7 may have two pairs of pinnae; stipules about 1·5 mm. long.

Nos. 8 to 10. These may be phyllodes with a fairly central midrib and nerve-like margins, though not always with any evidence of the glands which are a feature of more mature phyllodes, or they may be abruptly bipinnate with petioles up to eight pairs.

There is no constancy in the number of bipinnate leaves which occur before the phyllodes appear. In any case they are few, as compared with the numerous bipinnate leaves on a seedling of *A. rubida*, a species with which this has considerable affinity.

UNINERVES—Racemosæ.

ACACIA LINIFOLIA, Willd. Seeds from Cheltenham and Waterfall, New South Wales, growing on Hawkesbury Sandstone formation. (Plate XVII, Numbers 1 to 3.)

Seeds black, oblong-oval to obovate, edges thin, 5 to 6 mm. long, 3 mm. broad, 2 mm. thick.

Hypocotyl erect, terete, pale coloured below soil, reddish above, 1 to 5·5 cm. long, 1·5 to 2·7 mm. thick at base, ·7 to 1 mm. at apex, glabrous.

Cotyledons sessile, auricled, oblong-oval, 6 to 7 mm. long, 3·5 to 4 mm. broad, soon becoming revolute and cylindrical, falling in about two or three weeks, outer or underside pale pink, at first convex, sometimes with two or three raised longitudinal lines and a few small glands, upperside at first brownish-pink, becoming brownish-green, glabrous.

Stem terete, hirsute. First internode ·5 to 1 mm.; second 1 to 4 mm.; third 2 mm. to 1·5 cm.; fourth 2 mm. to 2·4 cm.; fifth 3 mm. to 2·5 cm.; sixth 2 mm. to 1·5 cm.; seventh 2 to 6 mm. In some of the young plants the early phyllodes become crowded, as many as thirty occurring in the length of 1 cm.

Leaves—No. 1. Abruptly pinnate, and showing beyond the edges of the cotyledons as soon as they are up, petiole 4 to 7 mm. long, green, pilose; leaflets four to seven pairs, oblong, acuminate, 4 to 7 mm. long, 1·3 to 2·6 mm. broad, the basal and terminal pairs often the smallest, the latter being sometimes obovate, upperside green, underside at first reddish, becoming pale green, midrib distinct on underside, secondary vein showing under pocket lens; rachis 1·3 to 1·7 cm. long, pilose, excurrent.

No. 2. Abruptly bipinnate, petiole 1 to 1·4 cm. long, slender, green, pilose, excurrent; leaflets five to seven pairs, oblong, acuminate; rachis 1 to 1·4 cm. long, green, pilose, excurrent.

No. 3. Abruptly bipinnate, petiole 1·2 to 1·8 cm. long, green, sometimes brownish-green, pilose to hoary, excurrent; leaflets six to ten pairs, sometimes mucronate; rachis 1·4 to 2 cm. long, green, pilose, excurrent; stipules sometimes showing as minute scales.

Nos. 4 and 5. Abruptly bipinnate, petiole up to 2 cm. long in No. 4, and 2·5 cm. in No. 5, pilose to hoary, excurrent; leaflets seven to twelve pairs in No. 4, and up to thirteen in No. 5, which, with No. 6 may sometimes have two pairs of pinnæ;¹ rachis green, pilose, excurrent.

Nos. 6 and 7. Sometimes phyllodes or they may be abruptly bipinnate, petiole up to 3·1 cm. long, pilose to hoary; leaflets up to fourteen pairs.

No. 8 and upwards. Phyllodes, varying in length from about 1 to 3 cm., ·4 to ·6 mm. broad, on plants up to 1 foot or 18 inches high.

In some cases the phyllodes are slender and weak, while on other plants they are fairly stiff, with the midrib showing under a pocket lens, and they taper into a straight or a bent point, glabrous or with a few scattered hairs towards the bases of the first dozen or so.

UNINERVES—Racemosæ.

ACACIA BUXIFOLIA, A. Cunn. Seeds from Grattai near Mudgee, (J. H. Maiden), and foot of Victoria Pass, Mount Victoria, N. S. Wales. (Plate XVII, Numbers 4 to 6).

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

Hypocotyl erect, terete, pale red, 1·7 to 3 cm. long, 1 to 2·5 mm. thick at base, ·6 to ·9 mm. at apex, glabrous.

¹ Several examples, on natural seedlings, were handed to me by Mr. J. J. Fletcher, collected at Hunter's Hill, near Sydney.

Cotyledons sessile, slightly auricled, oblong, apex rounded, 6 mm. long, 3.5 mm. broad, soon becoming horizontal, revolute, and cylindrical, soon falling, outer or underside reddish to red, sometimes becoming pale green, inner or upperside pale red to red, becoming green, with distinct midrib.

Stem terete, except in upper portion where affected by decurrent leaf-stalks, glabrous. First internode .5 mm.; second 2 to 6 mm.; third 2 mm. to 1.5 cm.; fourth 3 to 9 mm.; fifth 7 mm. to 1.3 cm.; sixth 5 mm. to 1.9 cm.; seventh 5 mm. to 1.4 cm.; eighth 7 mm. to 1.5 cm.

Leaves—No. 1. Abruptly pinnate, showing at a very early stage, petiole 5 to 7 mm. long, green to reddish-green, glabrous; leaflets three pairs, oblong, acuminate, the terminal pair often cuneate, about 7 mm. long, 2 mm. broad, midrib and secondary vein fairly distinct, upperside green, underside pale green or reddish; rachis 6 to 8 mm. long, glabrous, excurrent; stipules reduced to scales.

No. 2. Abruptly bipinnate, petiole slender, up to 1.5 cm. long, glabrous, excurrent; leaflets three pairs; often reddish green on both sides; rachis glabrous, excurrent.

Nos. 3 and 4. Abruptly bipinnate, petiole 7 mm. to 1.7 cm. long; leaflets three to five pairs, often mucronate, margins sometimes red; rachis glabrous, excurrent.

Nos. 5 and 6. Abruptly bipinnate, petiole 5 mm. to 1.9 cm.; terete or sometimes channelled above and showing transit to the dilated petiole, often with a small marginal gland, No. 6 being sometimes dilated above a strong nerve along the lower margin, excurrent; leaflets up to six pairs; stipules reduced to scales about 1 mm. long. No. 6 may have two pairs of pinnæ.

Nos. 7 and 8. Sometimes phyllodes, or they may be abruptly bipinnate, petiole 5 mm. to 1.5 cm. long, dilated

above the midrib to a width of 1 mm., or perhaps both above and below to a total width of about 3 mm., and with a small marginal gland, excurrent; leaflets up to six pairs.¹

PLURINERVES—Nervosæ.

ACACIA EXCELSA, Benth., "Ironwood." Seeds from Geera, Central Queensland (H. C. Cullen), and Cobar, New South Wales (Archdeacon F. E. Haviland). (Plate XVIII, Numbers 1 to 3.)

Seeds from light to dark brown, irregularly oblong to ovate and oval, 5 to 6 mm. long, 4 mm. broad, 1 mm. thick.

Hypocotyl erect, terete, pale green to reddish, up to 2.5 cm. long, 2 mm. thick at base, 1 mm. at apex, glabrous.

Cotyledons sessile, auricled, ovate-oblong to oblong-oval; somewhat fleshy, 7 to 8 mm. long, 4.2 to 5 mm. broad, outer or underside at first pale to yellowish-green, becoming green, inner or upperside green, midrib sometimes distinct, with a few lateral veins showing under pocket lens, becoming horizontal in a few days, later folded down past the middle, often remaining until the phyllodes appear.

Stem terete, varying from green to red, glabrous. First internode .5 mm.; second 1 to 3 mm.; third 2 to 7 mm.; fourth 3 to 8 mm.; fifth 4 mm. to 1.5 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 7 mm. long, reddish-green, glabrous; leaflets two pairs, 5 mm. to 1.1 cm. long, 3 to 4 mm. broad, obovate-oblong to oblong-acuminate, sometimes mucronate, midrib and secondary vein fairly distinct, sometimes distinctly triplinerved, upperside green, underside paler, petiolules often reddish; rachis 3 to 7 mm. long, green, glabrous, excurrent; stipules reduced to scales.

No. 2. Abruptly bipinnate, petiole 6 mm. to 1.5 cm. long, green, glabrous, excurrent; leaflets two to three pairs, not

¹ See reference to an apparent tripinnate leaf on this species. (*Supra*).

always opposite, oblong-acuminate to almost oval, 3 to 7 mm. long, 2 to 3 mm. broad, upper side green, underside paler; rachis 3 to 6 mm. long, green, glabrous, excurrent; stipules as in No. 1.

No. 3. Sometimes a phyllode, or abruptly bipinnate, petiole 1.4 to 2.5 cm. long, vertically flattened and with a strong nerve along or near the lower margin, with sometimes a second finer vein above, excurrent; leaflets two to three pairs, lanceolate-acuminate to obliquely obovate.

Nos. 4 and 5. These may be triplinerved, mucronate phyllodes narrowed at the base, or they may be abruptly bipinnate; petiole up to 2.4 cm. long, vertically flattened to 6 mm. broad, tapering towards the base; leaflets two to three pairs, obliquely obovate.

The first and second phyllodes are usually triplinerved with the central nerve most prominent, the third and fourth show three fairly prominent nerves with a finer vein next to, and on each side of the central and most prominent one; subsequent phyllodes often have up to seven nerves.

This is the first seedling described in this series where the No. 3 leaf has been reduced to a phyllode. In one case while No. 3 was a phyllode. No. 4 was bipinnate, though this irregularity of sequence is not confined to *A. excelsa*.

This species may develop a phyllode before the stem is half an inch high.

JULIFLORÆ—Tetrameræ.

ACACIA LINEARIS, Sims. Seeds from Lidcombe, and Warrunga, near Sydney. Growing on Wianamatta Shale formation, sometimes at its junction with Hawkesbury Sandstone, and usually along a moist course; also from Mosman, on Hawkesbury Sandstone formation. (Plate XIX, Numbers 1 to 3.)

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

Hypocotyl erect, terete, white or pale below soil, pale green to reddish above, up to 1·8 cm. long, 1·2 to 2 mm. thick at base, ·5 to ·8 mm. thick at apex, glabrous.

Cotyledons sessile, slightly auricled or sagittate, oblong, apex rounded, 6 mm. long, 2 mm. broad, outer or underside pale green, with usually one or two raised lines, inner or upperside green, glabrous, soon becoming horizontal and revolute, and sometimes remaining until the advent of the fifth leaf.

Stem terete, green, almost glabrous but with a few scattered hairs. First internode ·5 mm.; second 3 to 5 mm.; third 3 mm. to 2·4 cm.; fourth 4 mm. to 1·6 cm.; fifth 4 mm. to 1·2 cm.; sixth 3 mm. to 1·3 cm.; seventh 6 mm. to 1·5 cm.; eighth 7 mm. to 2·3 cm.

Leaves—No. 1. Abruptly pinnate, petiole 4 to 8 mm. long, green, glabrous; leaflets three pairs, rarely four, oblong, acuminate, 5 to 7 mm. long, 2·5 to 3 mm. broad, venation indistinct, upperside green, underside paler; rachis 5 to 8 mm. long, green, glabrous, excurrent.

No. 2. Abruptly bipinnate, petiole up to 2 cm. long, slender, green, glabrous, excurrent; leaflets three to four pairs; rachis up to 1 cm. long, excurrent.

No. 3. Abruptly bipinnate, petiole up to 2·5 cm. long, slender, excurrent; leaflets up to six pairs; rachis up to 2 cm. long.

No. 4. Abruptly bipinnate, petiole up to 3·2 cm. long, slightly dilated vertically, with a few scattered hairs; leaflets up to eight pairs, up to 8 mm. long, the inner ones of the basal pair usually much smaller in this and most of the leaves, (Nos. 2 to 7); rachis sometimes with a few scattered hairs; stipules 1 mm. long, flat, tapering to a point, and showing a central nerve under pocket lens.

No. 5. Abruptly bipinnate, petiole 1 to 3·7 cm. long, vertically flattened and showing midrib just below centre of lamina, with a few scattered hairs, excurrent; leaflets up to eight pairs; rachis pilose, excurrent; stipules as in No. 4.

No. 6. Abruptly bipinnate, petiole up to 4 cm. long, similar to that of No. 5; leaflets up to ten pairs; rachis pilose, excurrent.

No. 7. Abruptly bipinnate, petiole up to 5·8 cm. long, vertically flattened to 1 mm. broad, with distinct midrib just below centre of lamina, almost glabrous; leaflets up to twelve pairs; rachis with a few scattered hairs; stipules as in No. 4.

No. 8. Abruptly bipinnate, petiole up to 6·6 cm. long, with a few scattered hairs, vertically flattened to 2·5 mm. broad, with distinct midrib along centre; leaflets up to twelve pairs.

Nos. 9 and upwards. Usually phyllodes, No. 9 being sometimes up to 12·5 cm. long, while No. 13 may be 17 cm. long, and usually about 3, but sometimes 4 mm. broad, with a prominent midrib and sometimes one or two very indefinite faint nerves on each side.

JULIFLORÆ—Falcatae.

ACACIA AULACOCARPA, A. Cunn. Seeds from Cairns (John Hill), and Bibbohra (Miss L. Martin), Tropical Queensland. (Plate XVIII, Numbers 4 to 6).

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

Hypocotyl erect, terete, brownish-red, 1·6 to 3 cm. long, 1·5 to 2 mm. thick at base, 1 mm. at apex, glabrous.

Cotyledons sessile, auricled, ovate-oblong to oblong-oval, 8 to 9 mm. long, 3·5 to 4 mm. broad, outer or underside

greenish-brown to pale red, smooth or with a raised line along centre on which are sometimes one or two gland-like formations, inner or upperside green, glabrous; soon becoming horizontal, and in some cases remaining until the phyllodes appear.

Stem terete and pilose in lower portion, angular above, where affected by decurrent leaf-stalks. First internode .5 mm.; second 1 mm.; third 3 to 5 mm.; fourth 3 to 7 mm.; fifth 6 mm. to 2 cm.

Leaves—No. 1. Abruptly pinnate, petiole 3 to 6 mm. long, green, pilose, excurrent; leaflets three pairs, oblong, acuminate, often mucronate, 5 to 9 mm. long, 2 to 3 mm. broad, midrib fairly distinct, secondary vein showing under pocket lens, upperside green, underside paler, margins ciliate; rachis 6 to 7 mm. long, pilose, excurrent; stipules weak, flat at base, 1 mm. long.

No. 2. Usually bipinnate, but this species shows considerable instability in regard to the sequence of its bipinnate leaves. In one instance the second leaf was simply-pinnate with only one pair of leaflets. In several instances the second leaf developed with only one pinna, but the presence of the excurrent point of the petiole, at the base of the rachis, indicated that the leaf was not a typical simply-pinnate leaf, though no evidence could be seen of even the rudiments of the second pinna. In another leaf, each pinna had three leaflets on one side of the rachis, while those on the other side had fused into one abnormal leaflet, extending along the corresponding length of the rachis.

In normal cases the petiole is 4 to 8 mm. long, pilose to hirsute, excurrent; leaflets two to three pairs, oblong acuminate, margins ciliate, opposite leaflets often of unequal size; rachis 7 mm. to 1 cm. long, pilose, excurrent.

No. 3. Bipinnate, petiole 7 mm. to 2 cm. long, sometimes slightly dilated, with gland on upper margin, hirsute,

excurrent; leaflets two to four pairs, often irregular in size and not always strictly opposite; rachis pilose, excurrent; stipules as in No. 1.

No. 4. Sometimes a phyllode 3.5 cm. long, up to 6 mm. broad; or it may be bipinnate, with petiole up to 2.3 cm. long, vertically flattened to 2 mm. broad towards the middle, with the strong nerve or midrib along the lower margin, and a gland on upper margin, pilose, excurrent; leaflets three to six pairs, up to 8 mm. long, and 3 mm. broad, margins ciliate; rachis pilose, excurrent.

Nos. 5 to 10. Phyllodes so far as seen, falcate-lanceolate, with gland near the base of upper margin; No. 5 having one prominent nerve along centre of lamina, with numerous fine veins on both sides and nerve-like margins; No. 6 and upwards usually having two or more prominent nerves. The ashy-grey or hoary appearance so common on mature phyllodes of this species is absent from the early phyllodes, which are pale green.

EXPLANATION OF PLATES.

PLATE XV.

Acacia leiophylla, Benth.

1. Cotyledons, and opposite pair of pinnate leaves, one developing in advance of the other. From Western Australia, cultivated in Botanic Gardens, Sydney, (J. H. Maiden).
2. Opposite pair of pinnate leaves and bipinnate leaves.
3. Bipinnate leaves and phyllodes.
4. Seeds.

Acacia Flocktoniae, Maiden.

5. Cotyledons. Yarranderie.
6. Pinnate leaf, bipinnate leaves and phyllodes.
7. Pod and seeds.



Acacia leiophylla (1 to 4); *A. Flocktoniae* (5 to 7).
Natural Size.



Acacia amœna.
Two-thirds Natural Size.

1875-1876

General Report of the Board of Trustees



Acacia linifolia (1 to 3); *A. buxifolia* (4 to 6).

Three-fourths Natural Size.



Acacia excelsa (1 to 3); *A. aulacocarpa* (4 to 6).

Slightly under Natural Size.



Acacia linearis.

Two-thirds Natural Size.

PLATE XVI.

Acacia amœna, Wendl.

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

PLATE XVII.

Acacia linifolia Willd.

1. Cotyledons. Cheltenham near Sydney.
2. Pinnate leaf, bipinnate leaves and phyllodes. Nodule on root.
3. Pod and seeds.

Acacia buxifolia, A. Cunn.

4. Cotyledons. Grattai near Mudgee, (J. H. Maiden).
5. Pinnate leaf, bipinnate leaves and phyllodes.
6. Seeds.

PLATE XVIII.

Acacia excelsa, Benth.

1. Cotyledons and pinnate leaf. Cobar, (Archdeacon Haviland).
2. Pinnate leaf, bipinnate leaves and phyllodes.
3. Seeds.

Acacia aulacocarpa, A. Cunn.

4. Cotyledons and pinnate leaf. Bibbohra, Tropical Queensland, (Miss L. Martin).
5. Pinnate leaf, bipinnate leaves and phyllodes.
6. Pods and seeds.

PLATE XIX.

Acacia linearis, Sims.

1. Cotyledons and pinnate leaf. Lidcombe.
 2. Pinnate leaf, bipinnate leaves and phyllodes. Nodule on root.
 3. Pod and seeds. Wahroonga.
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<https://doi.org/10.5962/p.359716>.

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