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Notes On The Morphology Of Some British Leguminosæ—II. *Melilotus Officinalis*

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MEETING OF THE SOCIETY,

Thursday, April 11, 1895.

SYMINGTON GRIEVE, Esq., Vice-President, in the Chair.

The CHAIRMAN made intimation of the death of CHARLES EYRE PARKER, Torquay, and of Dr. A. G. MORE, Dublin, Non-Resident Fellows of the Society.

Dr. W. G. SMITH exhibited and commented upon a section of stem of horse chestnut, showing large callus-development.

Mr. J. H. BURRAGE exhibited specimens of *Pandanus tenuifolius*, Balf. fil., an endemic Rodriguez plant, which had been killed in the Palm House of the Royal Botanic Garden, through the attack of *Melanconium Pandani*, and he described the phases of the life history of the fungus, which has previously been reported from the Botanic Gardens at Breslau, Berlin, Paris, Kew, and Glasnevin.

Mr. SYMINGTON GRIEVE exhibited twigs of mistletoe, in fruit, from his garden.

The following plants in bloom were exhibited from the Royal Botanic Garden:—*Philageria Veitchii*, *Trichopilia sanguinolenta*, *Vanda tricolor suavis*.

The following papers were read:—

NOTES ON THE MORPHOLOGY OF SOME BRITISH LEGUMINOSÆ.—II. MELIOTUS OFFICINALIS. By JAMES A. TERRAS, B.Sc.

SEEDS.—Ellipsoidal, laterally compressed, embryo pleuro-rhizal, radicle extending from one end to about two-thirds of the length of the seed, and projecting strongly, especially at the apex.

The whole seed is yellow or light yellow-brown in colour, with a smooth but not shining surface.

The small, point-like, hilum scar is situated in the hollow formed by the projection of the apex of the radicle, while on the end of the seed, beyond the hilum scar, is a small patch darker brown in colour than the rest of the seed.

Size, 2.75 mm. long $\times$ 2 mm. broad, including the radicle, $\times$ 1.5 mm. thick; or, according to Hartz, 2.2 $\times$ 1.5 $\times$ 1 mm.

GERMINATION.—During the earlier stages of germination the rapid elongation of the hypocotyl carries the young growing root out of the seed in a downward direction, forcing it into the soil, and when the root itself has reached a length of about 4–5 mm., the hypocotyl is at least twice as long, and the seed still below the surface of the soil. At about this time, however, the formation of the first root hairs may be observed taking place near the point of junction of the root and hypocotyl. These soon attach themselves to particles of soil, and so anchor that particular part of the compound radicle that any further progress made by the root in the soil must be due to its own elongation. The hypocotyl, however, still continues to grow, and, as its lower end is now fixed, this increase in length has the effect of withdrawing the cotyledons from the seed-coat, which is retained below the surface by the weight of the superincumbent soil, while the liberation of the cotyledons is facilitated by the presence of the mucilaginous endosperm.

In a normal germination, the first part of the embryo to appear above the surface of the soil is the bent upper part of the hypocotyl, followed at once by the bases of the cotyledons. As soon as these last are free from the soil a backward curvature of the hypocotyl takes place, the still closed cotyledons are swung round in a vertical plane till the erect position is reached, then each curves outwards laterally till it reaches its permanent horizontal position.

COTYLEDONS.—The petiole is rather short, and the lamina is attached to its apex by a short slightly swollen joint. The lamina is, in general, expanded almost horizontally, and may even droop somewhat at its apex, while the petiole, on the other hand, is nearly, if not quite

erect, and diverges but slightly from the line of the future plumular stem.

The lamina is equilateral, somewhat fleshy, and of an elongated elliptical outline. Both surfaces are quite glabrous, and pale green in colour, though the lower is of a distinctly paler tint than the upper.

A midrib is distinctly visible on the lower surface, being represented by a median longitudinal line, but no ridge, while on the upper its position is indicated by a slight groove at the base.

The petiole is generally about one-third or one-half the length of the lamina, and is rather slender, with a slight longitudinal groove on the upper face, which, however, disappears just below the joint by which the lamina is attached. The lower face is cylindrical, but not keeled.

At its base the petiole expands laterally to form a small distinct vagina, which half surrounds the stem, but scarcely, if at all, unites with that of the opposite cotyledon, consequently no tube is formed round the plumule, the protection of which is, however, assured by the upright petioles themselves.

The cotyledons are not persistent, but after the first three or four plumular leaves are fully formed the lamina falls off at the joint, leaving the yellow withered petiole still attached to the stem.

The hypocotyl is considerably elongated, and the two cotyledons are borne at a height of about an inch from the ground.

PLUMULE.—The first leaf arises in a plane at right angles to that in which the cotyledons lie, and in most cases, before it has fully expanded, the internode bearing it has elongated to such an extent as to raise the first node clear of the cotyledonary petioles.

This internode is in colour pale green, splashed with minute red spots; it is always glabrous, quite smooth, and in many seedlings reaches a considerable height.

The first leaf itself is composed of a simple unbranched lamina, borne at the apex of a long slender petiole, to which it is attached by means of a short joint, and may be expanded either horizontally or obliquely upwards.

The petiole is generally long enough to raise the lamina

of the leaf clear of at least the lower portion of the surrounding vegetation, and in any case to a considerable height above the terminal bud. It is provided with a slight groove on the upper face, and is smoothly cylindrical but not keeled below. At the base it expands laterally into a short but comparatively broad membranous vagina, which scarcely half surrounds the stem bearing on its upper free margin two long, linear, somewhat spreading stipules, each of which is crowned at its apex by a tuft of short delicate hairs, and bears on its inner side (that opposite the petiole) a short triangular tooth which projects from it almost at right angles.

The lamina is composed of a single terminal leaflet of nearly orbicular outline, with an apical triangular sinus, from the base of which arises, in typical cases, an extremely short, blunt, spine-like process, which is, however, not unfrequently absent. The margin of the leaflet is more or less distinctly undulate on at least the upper half of its extent, and the marginal projections correspond with the terminations of the lateral veins. A distinct midrib runs up the median plane of the leaflet, and terminates in the short triangular apical projection after having given rise to three or four pairs of slender lateral branches, which, after again branching once or twice, terminate as above stated in the margin of the leaflet.

Before the second leaf reaches its full development, the internode bearing it has undergone a considerable elongation, sufficient, at least, to raise it half an inch or so clear of the vaginal sheath of the first leaf by which it has been protected. It is placed almost opposite the first, but somewhat approximated to it on the left-hand side, and is trifoliate, all three leaflets being attached to the petiole by short cylindrical joints, one at the apex and the other two laterally opposite each other at about an eighth of an inch behind the terminal one.

The petiole is considerably elongated, and in transverse section may be described as rather broadly triangular, the apex projecting strongly downwards, while a deep groove runs along the upper face from the base, where it expands into the vaginal sheath, to the point at which the two lateral leaflets arise, beyond which the petiole is narrower

and the groove very much smaller. At its lower end the petiole is attached to the stem by a broadly sheathing vagina, the upper margin of which is prolonged into two long subulate somewhat spreading stipules, behind each of which is found a short triangular tooth with a sharp acuminate apex curved distinctly downwards, and somewhat resembling a minute recurved rose prickle. Other tooth-like projections appear occasionally on the vaginal margin, generally in descending series below this main one, but, unlike it, they are not of constant occurrence.

Of the three leaflets constituting the lamina, the terminal one is slightly larger than the other two, but this difference is not so well marked here as in the adult form, the leaflet being but slightly broader than the other, and not very much longer. The apical sinus, with its basal point, is generally more highly developed in this second than in the first leaf, and especially so in the terminal leaflet, but even there not so highly as in the adult leaves. In the same way the serration of the margin here is intermediate between that seen in the first leaf and that occurring in those formed later. The first three leaves may, in fact, be considered as embryonic structures, gradually increasing in complexity as they pass upward. The fourth leaf, on the other hand, differs but slightly if at all from that succeeding it, and must therefore be looked upon as the first adult leaf borne by the plant.

The earlier leaves show, as regards their position on the axis, a gradual transition from the opposite arrangement, exemplified in the cotyledons, to the $\frac{1}{3}$ spiral ascending from right to left, which is characteristic of the higher parts of the primary axis. As the stem increases in height the lower leaves fall off, leaving the vaginæ each with its pair of stipules still attached to the axis.

BRANCHING.—The cotyledons and all the succeeding leaves on the primary axis bear in their axils branch buds, and these with the exception of the cotyledonary buds develop at once into branches during the first year. These branches bear leaves similar in all respects to those borne on the main stem, and arranged, like them, in a $\frac{1}{3}$ spiral rising from right to left, and consequently homodromous.

Secondary branches arise in the axils of the leaves borne on the primary branches, and these in their turn bear similar leaves, but, as a rule, tertiary branches are not formed though they occasionally develop in particularly strong plants.

Every leaf which bears a branch in its axil, whether on the main stem or the primary branches, bears also a small accessory bud placed directly below the axillary branch and completely enclosed by the vagina, which persisting after the leaf has fallen off, protects it from external injury. This accessory bud, however, does not develop under normal conditions, but enters on active growth only when the axillary bud of the same leaf is seriously injured or destroyed. No flowers appear on the primary axis or its branches during the first year of the plant's existence.

During the late summer and early autumn of the first year, the subterranean parts of the plant, but especially the hypocotyl, become considerably enlarged owing to the storage in them of reserve materials; during the same period the cotyledonary node is drawn below the surface of the soil, and the buds in the axils of the cotyledons have increased considerably in size. These buds, if examined towards the end of autumn, will be seen to consist of a number of scales, each composed of the vagina and stipules of a leaf, the petiole and lamina of which are either absent or only developed in the most rudimentary manner.

These leaf organs, which are in general colourless and membranous, are placed alternately to right and left of the bud, and in strong plants one or more secondary buds may be observed in the axils of the lower scale leaves. These exactly resemble the primary buds, and may in their turn bear tertiary buds in the axils of their lower scales.

During late autumn the whole of the aërial branching system of the plant dies down to the level of the ground, leaving only the subterranean hypocotyl and root system, with the above-mentioned cotyledonary buds, to persist during the winter.

During the following spring these various buds elongate into shoots, which rise into the air and bear leaves arranged in a $\frac{1}{3}$ spiral. In the axil of each leaf is to be found an axillary bud with a smaller accessory one, placed vertically

below it, but in the region toward the base of the shoot; comparatively few of the former ever elongate, while the latter never do so under normal circumstances, but replace the axillary branches if these should chance to be injured. In the upper parts of the shoot, however, the axillary buds develop into racemose unilateral inflorescences, while in autumn, after the termination of the flowering period, their accessory buds frequently elongate into leafy branches, the leaves of which, themselves in most cases much smaller than those borne on the main axis, bear inflorescences in their axils, or only the leaves towards the apex of the branch do so while the lower bear leafy branches. The accessory buds themselves occasionally elongate into inflorescences without the intervention of leafy branches, but in either case the result is the same, namely, the production of a second autumnal flowering period. Those of the axillary buds arising towards the base of the shoot which elongate, form branches which behave in the same way as the shoot itself.

NOTES FROM THE ROYAL BOTANIC GARDEN, EDINBURGH.

I. REPORT ON VEGETATION DURING THE MONTH OF MARCH 1895. By ROBERT LINDSAY, Curator.

During March vegetation made considerable progress, but the severity of the previous months has been such as to render the season a very late one. Trees and shrubs are late in developing their leaf buds. Hardly any perceptible change was noticed at the end of the month, many being still in their winter condition. The extent of injury done to various shrubs by frost during the protracted winter is now more apparent, and is even greater than was anticipated. Herbaceous plants are late in flowering, the earlier kinds continued in bloom for a much shorter time than usual. Of the forty spring-flowering plants whose dates of flowering are annually recorded, the following twenty-three came into flower during March:—*Eranthis hiemalis* on 1st March; *Galanthus nivalis*, 1st; *G. plicatus*, 4th; *Corylus Avellana*, 7th;