

base of the tube, are 3 lines long; the style is $3\frac{1}{2}$ lines in length; the lower moiety of the ovary is enclosed in the cup-shaped individual base of the corolla*.

38. *Lycium brevipes*, Benth. Voy. Sulphur, 40; DC. Prodr. xiii.; —*spinosum*, glaberrimum, ramulis striatulis, subflexuosis, nitidis, stramineis, apice spinosis; foliis solitariis, 2–3nisve, cuneato-oblongis subovatisve, obtusis; floribus parvis, brevissime pedunculatis, solitariis; calyce brevi, poculiformi, 5-dentato; corollæ tubulosæ tubo calyce 5plo longiori, limbi laciniis 5, brevibus, rotundatis, reflexis; staminibus insertis. —California.—*v. s. in herb. Hook.*—Magdalena Bay (*Barclay*), *specim. flore manco*.

A spiny shrub with a barren aspect, apparently with few ovate leaves, which are 4 to 9 lines long, narrowed at the base into a slender petiole, and 2 to 3 lines broad. The specimen above referred to has only a single imperfect flower, with a peduncle $\frac{1}{2}$ line long; the calyx measures 1 line, the corolla 3 lines, including the segments of its border $\frac{1}{2}$ line in length; more perfect flowers, according to Mr. Bentham, are 5 lines long†.

[To be continued.]

XVI.—Note on the supposed Antheridia of *Rhamnus*.

By J. S. BURDON SANDERSON, M.D.‡

[With a Plate.]

IN Mohl and Schlechtendal's 'Bot. Zeitung' for 1844, certain peculiar organs are described by Dr. Grisebach as occurring on the stipules of the rudimentary leaves forming the centre of the leaf-bud of several species of *Rhamnus* and other plants belonging to different orders. In these organs, to which he applies the term *corynidia*, Dr. Grisebach finds a structure which he supposes to resemble that of the antheridia of the higher Cryptogamia. Any evidence to prove the occurrence of antheridia among the Phanerogamia must, if confirmed, necessarily alter the views which we are now entitled to entertain of the general signification of the organs in question: it appeared therefore desirable to repeat the observations above alluded to. With this object I procured, through the kindness of Prof. Balfour, a sufficient number of the buds of several species of *Rhamnus*, viz.

* This species with sectional details is represented (*loc. cit.*) plate 69 B.

† This species with floral sections is represented (*loc. cit.*) in plate 69 C.

‡ Read before the Botanical Society of Edinburgh, May 9, 1854.

R. Alaternus, latifolia, cathartica, &c. The last-mentioned was selected for examination as most suitable.

1. *Arrangement and development of parts forming the leaf-bud.*—The leaf-buds were examined at two periods,—first, in the middle of last January, and afterwards early in April, when nearly ready to open. The internal parts are protected by a resistant tegument, composed of scales of a brown colour and horny consistence. Each of these scales presents a modified form, not of the leaf, as is most commonly the case, but of the stipule; or rather, to speak more accurately, each scale corresponds to a combination of the two stipules which belong to one leaf. The arrangement of the scales is imbricated, each scale covering all its successors by both its margins. The rudimentary leaves are arranged in pairs, which alternate with each other; the two leaves forming each pair being opposite and of nearly equal size. The four stipules of the last pair of leaves (viz. the pair most distant from the axis) are enclosed in the first pair of tegumentary scales, while they, on the other hand, enclose the four stipules of the penultimate pair of leaves, and so on to the centre of the leaf-bud; an arrangement that illustrates in a beautiful manner the correspondence between the scales and the stipules. Frequently the scales of the first pair are bifid, thus manifesting a tendency to division into two symmetrical organs. The vernation of the rudimentary leaves is convolute; the stipules occupying the space intervening between the convexities of their rounded folds.

Structure and development of the rudimentary leaves and stipules.—In its earliest condition the leaf is nothing more than a lateral budding out of the axis, which soon becomes compressed from behind forwards*. In a stage slightly more advanced, it is an awl-shaped organ, the lateral margins of which are curved inwards and forwards; it is inserted into the axis by an expanded base. In this condition the stipules are seen as two flattened projections, one on each side (Pl. III. A. fig. 1 a). Still later, as in fig. 1 b, the involution of the margin of the leaf is more complete, and the stipules have lost their rounded form, having become somewhat spatula-shaped organs,—much broader, however, below than above. In this state both leaf and stipule consist entirely of cylindrical cells, the greatest diameter of which is about 0.009 millim. The breadth of the leaf now diminishes considerably in proportion to its length, a result which is produced by the continued involution of its margins. The con-

* The terms anterior and posterior, right and left, internal and external, &c., are usual in relation to the leaf, taken by itself; its future upper surface being considered as *anterior*, as it is by it that it looks towards the axis.

vexities of the rounded folds are seen on its anterior aspect to form two undulating ridges, one on each side of a median furrow. In the mean time the stipule, originally a mere lateral projection from the base of the leaf, has increased in relative size, and now equals or exceeds the leaf itself. A difference of size is also observed between the two stipules belonging to the same leaf, the right one from the first somewhat exceeding its fellow. After they have arrived at about one-eighth of their ultimate length, both are furnished with a linear median thickening, which extends from the base to the apex. The space intervening between this thickening and the margin is greater on the side next the leaf than on the opposite, as a result of which, the margin itself is convex on the one side, while on the other it is nearly rectilinear. Those of the outer stipules of the leaf-bud, which have assumed the character of protective scales, are brown and horny at their upper part, and much broader in proportion to their length than the rest (fig. 1 *f*).

Origin and development of the so-called Corynidia.—The corynidia are found only in stipules which have arrived at about one-eighth of the length of the whole bud, those of smaller size presenting no trace of their existence. They originate from the median thickening of the stipule, as nipple-shaped buddings-out of the anterior surface (fig. 2 *a*). Soon they assume a clavate form and overhang the inner margin of the stipule, appearing in the interval between this organ and the leaf (fig. 2 *b*). Each consists of a central column of cellular tissue surrounded by a simple layer of others, which do not differ in any respect from those which surround them, and form the superficial layer of the stipule. On the more external stipules of the leaf-bud, the corynidia are found to have altered their form, having become flask-shaped (fig. 2 *b*). It is difficult to determine whether the enlarged extremity is occupied by a cavity containing a transparent fluid, or simply by a lax cellular tissue. It is, however, certain, that if such a cavity exists, it is not limited in any distinct manner.

At this point the development of the corynidia ceases, and they soon become marcescent; the upper part of the corynidium shrinking into a mass of irregular form and dark brown colour, which, after remaining for a time attached to the stipule by a slender pedicle, eventually separates. In examining the leaf-bud, there are always to be found a number of such masses floating free in the water used for dissection. On pressing them between two glasses, they are found to be solid, resistant bodies. When sufficient force is used to disintegrate them, they are resolved into a number of grains of irregular form, which for the most part correspond in size to the cells of which the corynidia were

originally composed. This granular matter, there can be little doubt, is to be considered as a resin, with the characters of which, both physical and chemical, its characters correspond.

Conclusions.—The corynidia of Grisebach differ from true antheridia in the following particulars:—

1. They are not developed from a single, special mother-cell, differing in form and contents from those surrounding it, as in the case of the true antheridia; but are merely buddings-out of the tissue of the stipule, and consist even in their earliest condition of several cells.

2. They possess at no period of their growth a central cavity lined by a membrane.

3. They do not discharge their contents, when mature, by dehiscence, but simply shrink up and wither.

4. The most careful observation fails to detect any structures which resemble, in the slightest degree, the antherozoids of the higher Cryptogamia, or which correspond to the "long-tailed globules enclosed in minute spherical cells" described by Grisebach.

There seems to be no reason to suppose that the corynidia are at all connected with reproduction; the function which may be assigned to them with the greatest appearance of probability is that of the secretion of the resinous material, which is so important an auxiliary in the protection of the rudimentary organs of the leaf-bud from external influences.

EXPLANATION OF PLATE III. A.

Fig. 1. (All the objects are represented of the same relative size, as magnified about twelve times.) *a*, a rudimentary leaf with its stipules. The median depression which intervenes between its folded margins may be already distinguished. *b*, the same in a more advanced condition, viewed from the right side. There is as yet no indication of corynidia. *c*, here the two corynidia are seen in the space between the leaf and stipule, and projecting over the inner margin of the latter. *d*, more advanced condition, in which the leaf has arrived at the greatest length to which it attains while enclosed in the bud, but the stipules are considerably shorter. Numerous bunches of corynidia are observed occupying various positions on the median thickenings of the stipules. *e*, later stage, in which the stipules which now equal or exceed the leaf in length, have lost their corynidia and have become brown and horny at their upper part.

Fig. 2. (Magnified about ninety times.) *a*, part of the inner margin and anterior surface of a stipule $\frac{5}{8}$ ths of a millim. in length. At the upper part is seen a corynidium in its earliest condition, viz. as a nipple-shaped budding-out of the middle layer of cells. Below are seen two other corynidia more advanced. *b*, a mature corynidium. *c*, a marcescent corynidium.



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