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IV. *Summary of some of the more interesting Botanical Papers published in France since July 1864.* By G. M. LOWE, Esq.

The following is a brief summary of the more interesting botanical papers published in the French language since July 1, 1864.

In this retrospect I have confined myself chiefly to anatomical and physiological papers.

Prominent in interest amongst these papers stands that of M. Boussingault, entitled "Vegetation in Darkness," in which he shows that in darkness a plant loses its carbon just as the embryonic vegetable and roots do under similar conditions—the carbon being consumed by the oxygen inhaled and carbonic acid given off. Thus a plant is under the power of two antagonistic forces, the one tending to abstract, the other to supply matter; and, according as either of these forces predominate, the *weight* of the plant increases or diminishes. Following up this relation, it becomes evident that the result is determined by the intensity of light and temperature.

The paper is illustrated by a number of tables, the results of the author's experiments. They clearly prove that a plant developed in the dark borrows all the principles of its organism from the seed from which it springs; the atmosphere acting only as a consuming agent. Carbonic acid is incessantly emitted so long as the matters contained in the seed supply carbon, which amounts to saying that the duration of the existence of a plant deprived of light depends on the weight of these matters.

A plant growing in darkness, then, comports itself in many respects like certain animals of the lower types, such as zoophytes, which possess no special respiratory organs, combustion going on in the cellular tissue instead, through the medium of water. The plant subsists by consuming sugar, albumen, fatty matters, and phosphates, elaborated in the perisperm or cotyledons; and when, by exhaustion, these contained matters become insufficient, it languishes and dies of inanition.

Further, an animal of the most simple organisation does

not only emit by respiration, heat, water, and carbonic acid; but a part of the albumen which is consumed is modified by respiratory combustion into a crystalline nitrogenous compound, *urea*, which is met with in the excretions. In the respiratory combustion of a plant living in the dark, a similar modification of albumen cannot be so manifested, because vegetables do not possess excretory organs; but in the juices filling the cells there is found an immediate crystalline compound, *Asparagin*, which is an amide like urea, and transforms itself as easily into aspartite of ammonia as urea does into carbonate of ammonia.

To prove that asparagin is certainly formed during cellular combustion—for at first the seeds do not contain the least trace of it—the author subjoins the following experiment:—

“ On the 6th of July I placed in pumice-stone, washed and calcined to cleanse out all organic matter, 246 seeds of the kidney bean, weighing 261 grammes.* These were placed in a dark chamber, and kept moistened with distilled water, free from ammonia. On the 25th of July 5·40 grammes of crystallised asparagin were obtained from the plants.”

The next paper is extracted from the “Transactions of the Society of Sciences, Agriculture, and Arts of Lille.” The subject is “Chemical Researches on Vegetation,” by M. Coremoinder. The author commences by narrating the irritable and angry discussion which took place between Ingenhousz and Senebier towards the end of last century. The former was the first to show that “the leaves of plants exposed to darkness continually expire a mephitical gas, injurious to animal respiration.” This announcement was strongly opposed by Senebier, who accused Ingenhousz of imposture and impiety. The following singular objection is worthy of mention:—“It is through want of observation,” said he, “that nature and plants are so calumniated, by attributing to them the dangerous property of giving out, during the night, an air calculated to diminish the purity of the atmosphere by its noxious qualities. Nature avenges herself by facts which she makes us see, and ever

* 1 gramme = 15·43235 grains.

proves to us that the number of her beneficent relations increase the more deeply we investigate her sublime processes."

When the nature of the mephitical gas exhaled by leaves in darkness was discovered, the dispute raised between Ingenhousz and Senebier subsided, since carbonic acid, the gas in question, has such characteristic properties, that experiment soon decided in favour of Ingenhousz, the author of this important discovery. In his work, entitled "*Experiments on Plants*," he established, in a special chapter, that "plants exhale a noxious gas during the night, and in dark places during the day, contaminating the air by which they are surrounded; but this bad effect is more than compensated by their salutary influence during the day." The correctness of the latter statement was fully proved by M. Coremoinder in 1858.

The present paper is a long one, and contains in detail an account of the author's experiments. The following are the results:—

1. Plants possess the property of exhaling carbonic acid during the night, and in artificial darkness during the day.

2. Buds and young shoots, whose leaves are still unexpanded, expire carbonic acid during the day, both in the shade and full glare of the sun.

3. Adult leaves exposed to the sun do not expire carbonic acid, inasmuch as they then possess the property of decomposing the acid, of assimilating the carbon, and exhaling the oxygen. The same amount is exhaled under a cloudy sky as on the finest day; but when transferred to a room lighted only by lateral windows, then they cease to disengage it in more or less appreciable proportions, if not exposed to the direct rays of the sun.

In the "*Annales des Sciences Naturelles*" is a translation of the first part of a very lengthy paper by Hugo von Mohl, entitled "*Some Observations on Dimorphous Flowers*," an account of which I hope to lay before you at some future period.

An interesting communication is published in the "*Comptes Rendus*," by M. Chatin, on "*The Anatomy of*

the Balanophoraceæ, considered as regards the characters which they present for classification." The Balanophoraceæ, he says, constitute with Cytinaceæ and Rafflesiaceæ a singular class of parasitic plants, designated by the name of Rhizanth, whose flowers, sometimes small and clustered, at others large and solitary, seem to possess, like the mushrooms, a sort of underground spawn. From their anatomy, the author is inclined to raise the Rhizanth from their position between the Phanerogams and Cryptogams, and place them high in the vegetable scale, between the Mono- and Di-cotyledons; and he assigns them this position, 1st, because of their structure proper; and, 2d, on account of the affinities which they possess with other orders; but more especially from the structure of the stamens and ovules.

M. Jodin has shown that the chemical action of light on chorophyll depends on the presence or absence of the influence of life. Thus life and light, acting together on a vegetable organism, manifest their chemical action by the decomposition of carbonic acid, and the plant becomes green by the production of chlorophyll. Life alone without light is only manifested by the phenomenon of combustion; the plant is blanched. Lastly, light alone, without life, only produces the phenomenon of oxidation; plant tissue, deprived of life, is discoloured by light; chlorophyll is destroyed.

The following facts are deduced from M. Godron's work on the Inflorescence of Cruciferae:—Bracts are generally wanting in the racemes of Cruciferae. In some of the characteristic species we find bracts occasionally in the lower flowers. In *Sisymbrium supinum* (L.), all the flowers are produced with a pinnatifid bracteal leaf, and the same is the case with *Sisymbrium hirsutum* (Lagasc.) *Brassica oleracea* has been seen with large oblong bracts in connection with its lower flowers, while smaller bractlets occurred at the upper part of the raceme. Similar phenomena have been observed in *Erysimum cheiriflorum* (Wallr.), *Arabis turrita* (L.), *Hesperis matronalis* (L.), *Bunias orientalis* (L.) Sometimes the lower and middle part of the inner face of the bract become united to the base of the peduncle. This has been noticed

in *Iberis sempervirens* (L.), and in other cruciferous plants. Sometimes when the bracts are completely wanting, there are traces of the decurrence of leaves at the base of the naked peduncle.

Godron says that—1st, The quaternary type, with two rows of stamens, is the normal condition of Cruciferae; 2d, That the absence of bracts and the greater or less flattening of the peduncle, the more or less depressed form of the flower-bud, the slight irregularity of the calyx, the absence of two stamens in the outer verticil of the andrœcium, and, often of the two glands on which they rest, and, finally, the abortion of two carpellary leaves, are determined by a pressure which is exercised from within outwardly on the flowers of Cruciferae; 3d, This pressure is owing to the accumulation of flowers which are developed in great numbers at the summit of the inflorescence in its corymbiform state, and which are naturally restrained or hindered in their evolution; as well as to the resistance which is presented to this expansion by the accumulated leaves which surround the inflorescence at its origin.

On examining the flowers of Fumariaceae in their early development, M. Godron finds them quite regular, but flattened from before backwards, as if they were compressed between the axis of inflorescence and the bract. They preserved this regularity in *Diclytra*, *Adlumia*, and *Dactylicapnos*. In these three genera, the two external petals, placed laterally, undergo during development an important modification. The base of each is prolonged into a short and rounded spur, and the two nectariferous appendages become finally quite regular. The two sepals placed superior and inferior also remain perfectly regular. Again, in the genera *Fumaria* and *Corydalis* only one spur is developed, so as to render the flower irregular. This spurred petal becomes larger than its antagonist.

M. Godron has examined *Corydalis solida* (Sm.), and *C. cava* (Schweigg), in their early condition, while still under ground. He traces the abortion of one of the spurs in the petals to the flowers during their development being compressed at the base on one side only. In this way development of the nectary and its appendages is prevented. M. Godron made experiments with the flowers of *Diclytra*, so

as to compress one of the petals at the base during its development, and he thus rendered it like *Fumaria*, with a single spurred petal. In *Diclytra* and *Adlumia* the spurs develop at a later period than in *Fumaria*, and in such a way that the raceme, in elongating, separates the flowers from each other, and allows the free and equal formation of spurs. The regular form sometimes continues in the *Fumaria* and *Corydalis*. M. Godrón has seen *Corydalis solida* assuming a pelorian form, by two or even four petals becoming spurred or calcarate. The flowers in this case become sterile.

M. Lemaire has demonstrated by experiment that the spores of *Achorion Schenleinii* are capable of reproducing the skin disease called *favus* through the medium of the air. This fact had long been suspected by M. Bazin, physician to the hospital of St Louis, but it had never been demonstrated.

A paper was read before the Academy of Sciences of France in July, by M. Heht, on the Chemistry of *Cotyledon Umbilicus*—a plant which has been used as a remedy in epilepsy—showing the presence of Trimethylamin, in the form of a chloroplatinate, along with a certain amount of ammonia and nitrate of potash. The author says—"The presence of this tertiary monomine in *Cotyledon Umbilicus*, concurrently with ammonia and an appreciable quantity of nitre, shows that this plant is not inert, as was for a long time supposed, but contains active substances capable of modifying organic tissues."

[I have noticed this paper on account of the conflicting opinions regarding the efficacy of *Cotyledon Umbilicus* in epilepsy; in Ireland, where the plant may be said to abound, it has been used with good effect by many practitioners. It was first used and brought into general notice by Dr Salter of Poole, and afterwards by the late Dr Graves, who considered it a valuable remedy in a disease "so whimsical in its amenability to treatment." (*Dublin Quarterly Journal of Medical Science*, vol. xiv. p. 257.) Nevertheless it has been deemed unworthy of a place in the "British Pharmacopœia." In modern times it has not been tried in