IV. Extract of a memoir, and experiments on the nutrition of plants

M. Rafn

To cite this article: M. Rafn (1799) IV. Extract of a memoir, and experiments on the nutrition of plants , Philosophical Magazine Series 1, 5:19, 233-236, DOI: [10.1080/14786449908677145](https://doi.org/10.1080/14786449908677145)

To link to this article: <http://dx.doi.org/10.1080/14786449908677145>

Published online: 18 May 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

IV. *Extract of a Memoir, and Experiments on the Nutrition of Plants.* By M. RAFN, *Affessor in the Office of Commerce at Copenhagen* *.

HASSENFRATZ considers carbon as the substance which nourishes vegetables†. Ingenhous, in his work on the nutrition of plants, published in 1797, endeavours to prove, that if carbon has any influence in this respect, it can be only in the state of carbonic acid, as that acid is absorbed and decomposed‡ by vegetables; while the ligneous carbon, furnished by Nature, produces no effect on the expansion of plants. Mr. A. Young has endeavoured to demonstrate the same thing by experiments. M. Rafn, desirous of discovering the truth amidst these contradictory opinions, made, for three years, a series of experiments, from which he concludes, by the expansion, size, and colour of the plants employed, that carbon, either vegetable or animal, has a decided influence in the nourishment of vegetables. What is new, and particularly worthy of remark in these researches, is, that, according to M. Rafn, the carbonic acid produces exactly the same effect as charcoal of wood. The following are the experiments which conducted the author to this result:—

Having half filled a large box with brick-kiln rubbish, or pounded tiles, which he covered with a layer of vegetable earth, he placed over the latter a stratum of carbonate of lime (pounded limestone) and alum, and then two or three of vegetable mould, in which he sowed barley. He presumed that the sulphuric acid of the alum, abandoning the argil to join the lime, with which this acid has greater affi-

* Translated from the Danish, with notes by C. Vauquelin and Brogniart

† This opinion of C. Hassenfratz appears to be very probable; but, as he says, the carbon must be held in solution by hydrogen gas, by water, by that saponaceous extract which separates from vegetables when in a state of putrefaction, or by any other liquid.

‡ This decomposition is possible, but it has not yet been proved by any direct experiment.

nity, the carbonic acid gas would be disengaged, which would furnish the means of knowing its influence on the vegetation. Another box was filled merely with mould, a third merely with charcoal, and a fourth with animal carbon. These were to be employed in comparative experiments, and barley was sown in them all.

Though the plants which germinated in the first box were sown in a stratum of mould about two or three inches in thickness, they had no resemblance, either in strength or colour, to those sown in the second box filled with mould alone; but they had, on the other hand, such a perfect resemblance to those of the third box filled with charcoal, that it would have been difficult to distinguish the difference. This resemblance continued several weeks, after which they seemed to have not quite the same vigour as those which grew in the charcoal, for which it is not difficult to assign a reason. The author convinced himself that a decomposition had really taken place, because, on examining the first box in autumn, he found that sulphat of lime had been formed. These experiments seem proper to conduct to a knowledge of the manner in which plants attract the carbonic principle, which all the researches of the author demonstrate to be necessary for vigorous vegetation. He proposes to repeat them on a larger scale, and to vary them as much as possible*. He repeated, several times, those of M. Humboldt on germination, accelerated by the oxygenated muriatic acid, and always with success, though with this difference, that this acid did not favour vegetation so much as that philosopher asserted.

M. Raft sowed barley in a mixture of mould, sand, and manganese, in order to see whether the oxygen gas would

* These experiments would be more conclusive had not the author added mould in the boxes into which he put the rubbish. It is well known that mould contains a great quantity of carbon, exactly in the state which renders it fit for the nutrition of vegetables.

Mr. A. Young, on the other hand, asserts, that plants grow exceedingly ill in charcoal: and this observation agrees more with the others, and with the reasoning, which induces us to believe that carbon must be dissolved to enter into combination with the other principles of vegetables. As plants grow exceedingly well in pure water till a certain period, it would appear that they ought to grow equally well in watered charcoal.

not

not be disengaged in such a manner as to produce some effect on plants. At first he obtained no effect; but having watered this box with diluted sulphuric acid, he remarked that the barley visibly grew faster in this box than in those not watered in the same manner*.

Of all the mixtures which he tried for sowing, none appeared to him better than that of equal parts of charcoal, mould, and sand, moistened with water filled with infusion animals, which may be easily obtained by steeping flax in the water destined for that purpose. He observes, on this occasion, that, of all the substances he tried, flax is that which furnishes the most of these animalculæ. An incredible multitude of them are found in the water in which women dip their fingers when they are employed in spinning. The water put into a vessel for that use in the morning, is found filled with them in the evening. The author ascribes to these small animals a much greater influence on vegetation than has hitherto been believed.

Haffenfratz relates, that he could not make plants vegetate well in simple earths. The author asserts, that he had great success when he reared them in pure flint, quartz sand thrice washed, fine sand from the sea-shore, &c. But these plants continued stunted and pale, and their roots were twice as long as the whole of the part above the earth. In charcoal, on the other hand, the parts were large and vigorous; they were of an exceedingly dark colour, and their roots were not a sixth part of the length of the plant itself†.

Coal-ashes, on which the German and English farmers bestow such praise, destroy the plants if the soil contains an eighth part of that admixture. The leaves become faded, as

* The sulphuric acid cold does not disengage the oxygen of the oxyd of manganese: besides, according to the experiments of Ingenhous, this acid alone, in small quantity, seems to have the property of rendering vegetation more active.

† The first results are perfectly similar to those obtained by C. Haffenfratz. In regard to the second, they depend on the purity of the charcoal employed, which may contain wood undecomposed, and consequently disposed to putrify, and to yield a liquid which may hold the carbon in solution.

if scorched, at the end of from fifteen to twenty days, and the plants themselves die at the end of four or five weeks.

No seed germinates in oil. A single grain of common salt in two hundred grains of water is sufficient to retard the vegetation of plants, and may even kill them if they are watered with that saline liquor *.

Shavings of horn, next to infusion animals, are the most favourable to vegetation : charcoal holds the third rank.

V. On the Assaying of Iron Ores and Iron-Stones by Fusion.

By Mr. DAVID MUSHET, of the Clyde Iron Works †.

IT will easily be conceived, from the mode of operation which I have adopted, that, in order to procure accurate results, the proportion of flux must be varied according to the mixtures in the iron-stones or ores ; and that no universal solvent can be used as capable of assaying *all* ores.

As the gradation of mixtures in the ores is almost imperceptible, there are, in fact, no fixed limits by which Nature has distinguished the various classes : we find all the varieties diminishing their predominant earth, and assuming, in equal proportions, those of each other, thus constituting the class of equalised mixtures ; yet, here, the variety of combination ceases not, the predominating earth gradually becomes the minor part of the mixture, and that which only held a second rank, as to quantity, is now the chief component earth ; the permutation goes round, till the earth, which existed in the most sparing quantity, now predominates to excess.

* C. Sylvestre obtained a result absolutely similar, by employing marine salt as manure.

† The present is a part of the communication from Mr. Mushet which appeared in our Number for July last, (Vol. IV. p. 178.) but by an oversight of the Editor was omitted in its place. It contains the table of proportions alluded to in our Number for September last (Vol. IV. p. 360.) requisite for the obtaining from all the various iron-stones an accurate assay, and should have immediately followed Mr. Mushet's article given in our July number.