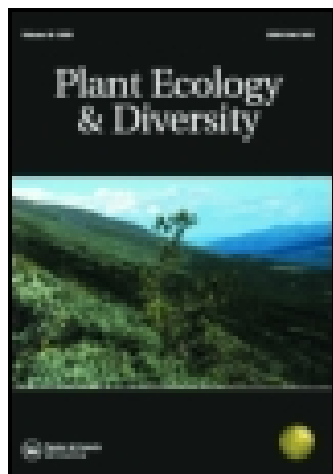


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### II. On the Primary Use of Ammonia in Vegetable Nutrition

Major John H. Hall

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## II. *On the Primary Use of Ammonia in Vegetable Nutrition.* By Major JOHN H. HALL.

The importance assigned to nitrogen in agricultural chemistry in the present day is a fact well known to all. It has come to be taken as the ultimate measure of the value of organic manures, and an analysis is not considered complete without specifying the quantitative amount of nitrogen which a manure contains. Observation of the avidity or capacity for ammonia which plants universally manifest has no doubt originally led to the conclusion that it contains something which must be highly beneficial in the economy of vegetable life. As ammonia is composed of hydrogen and nitrogen, the selection of the latter ingredient as the measure of value to the disregard of its other constituent, expresses a positive view or theory as to nitrogen being the all important element in ammonia which renders it so essential in the growth of plants. But I have never met with any satisfactory explanation of the grounds on which this estimate of the value and importance of nitrogen rests as an element of vegetable nutrition. I think that the true measure of the requirements by plants of any given substance should be found in the amount in which the substance enters into their composition. Now, an examination of the chemical constituents of vegetable substances shows that nitrogen enters very partially into them. Thus some of the most abundant of vegetable substances are entirely destitute of nitrogen. Cellulose, the structural basis of the roots, stems, leaves of plants, contains no nitrogen. Starch, gum, sugar, wax, oils, resins, some of the most abundant of vegetable products, are also destitute of it. Gluten is almost the only form or combination in which nitrogen occurs in plants, and it exists in them in small and variable quantities—in the seeds and fruits of some, and in the leaves of others; and it occurs for the most part in these plants and their products which constitute the food of man and animals, while the chemical constituents of plants fail to give evidence of their having any very great capacity for nitrogen. On the other hand, chemical experiments show the presence of hydrogen in every kind and form of vegetable matter. Its universality is on a par with that of carbon, and it is a remarkable circumstance, that it preserves a close relation with that substance, and generally follows it in the variations of its proportions in vegetable substances. These considerations led me to the conclusion, that the primary use of ammonia in the vegetable economy must be to supply hydrogen, to form in conjunction with carbon the hydro-carbonaceous material which forms the basis of all vegetable structures and productions, and that this alone can explain the reason why plants manifest such a universal avidity or capacity for ammonia. Not that I would question for a moment the concurrent use of ammonia in furnishing nitrogen to whatever extent the special requirements of particular plants may render necessary; but, looking to the very limited and partial extent in which it is found in vegetable productions, I apprehend it can never account for the universal capacity of plants for ammonia; and it seems to me, to say the least, a transposition and misuse of terms—the substitution of the minor and partial effect for the major and universal one—to regard ammonia only with reference to the constituent which has the least place in the vegetable economy, and to overlook that one which, equally with carbon, constitutes the universal pabulum of the vegetable creation. Major Hall then exhibited two plants of spinach, one of which had been watered simply with the common water of Edinburgh, and the other with a solution of carbonate of ammonia, and pointed out the great size which the latter plant

had attained when compared with the former. The effects he endeavoured to trace mainly to the hydrogen in its combination with carbon.

Several members expressed doubts as to the correctness of Major Hall's conclusions, and pointed out the presence of nitrogen in the protoplasm or formative matter of plants as having been overlooked by him. It was stated to be the general belief of vegetable physiologists that no active cell-formation could go on without the presence of nitrogen, and that ammonia, whether in the atmosphere or in manures, was valuable in supplying this.

Dr Balfour exhibited a stem of *Astrapæa Wallichiana*, yielding a large quantity of mucilage. When the stem is cut and put into alcohol the exudation of this mucilage becomes very evident.

Dr Balfour also noticed that some stems of the Banana in the Botanic Garden, when allowed to dry after being cut down, showed a large quantity of white crystals on their surface. These had been analysed by Dr Simpson in the University laboratory, and had been found to consist of chloride of potassium.

Dr Maclagan, Berwick, sent roots of an elder tree, taken from a water-pipe, accompanied with the following note:—"The enclosed production was brought to me by the Superintendent of Works here. When moist it was much more bulky, but the radicles very brittle. It occupied and completely obstructed the main six-inch water-pipe, leading from the reservoir into the town of Berwick. The pipe is eight feet deep, and covered over with clay-puddle, through all which, and through some fissure at a joint, the small rootlet had penetrated. I asked what were the nearest plants, and found that two elders were suspected of being the culprits, and that they had been accordingly eradicated."

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12th January 1860.—Professor ALLMAN, President, in the Chair.

The following Gentlemen were elected Fellows of the Society:—

CHRISTOPHER DRESSER, Ph. D., St Peter's, Hammersmith.

JOHN M. BALLANTYNE, Esq., jun., Dalkeith.

Dr JAMES M'BAIN, R.N.

Rev. ROBERT HUNTER, late of Nagpore.

The following Donations to the Society's Library were announced:—

Observations on the Distribution and Habits of Pelagic and Freshwater free-floating Diatomaceæ, by Dr G. C. Wallich.—From the Author.

Siliceous Organisms found in the Digestive Cavities of the Salpæ, and their relation to the Flint Nodules of the Chalk Formation, by Dr G. C. Wallich.—From the Author.

Botany, as an Ally of Medicine, by Dr George S. Blackie, Nashville, Tennessee, U.S.—From the Author.