

origin, and from which this valuable body has been continually washed during ages of rainfall.

We may now pass on to the second form in which nitrogen enters into plants, namely, that of nitric acid. The supposition that nitric acid plays as important a part as ammonia in the nutrition of vegetables is fast growing into a firm belief in the minds of many distinguished agricultural chemists. The theory of the production and preservation of nitric acid is by no means enveloped with so much mystery as that of ammonia. Nitric acid is a constant constituent of the atmosphere, and may be largely produced by electrical agencies, such as flashes of lightning. It is also to a great extent the result of the oxidation of ammonia in various ways. As a general rule it may be stated, that any organic compound containing nitrogen, undergoing the putrefactive fermentation in the absence of lime, potash, &c., gives off its nitrogen in the form of an ammoniacal compound, but in the presence of lime potash, &c., the nitrogen assumes the form of nitric acid. This is merely one of those numerous and most interesting chemical changes which are induced by the *influence of presence*. Lime, that great antagonist of ammonia, when brought into contact with perfectly fresh urine, determines the conversion of the whole of the compounds containing nitrogen (uræa, uric acid,) into nitric acid; but if any decomposition has taken place previous to the application of the lime, all the ammonia produced (carbonate of ammonia from uræa), is driven off.

The formation of nitric acid by the influence of charcoal is well worthy of practical study. If we cover the dead body of a dog, a horse, or any other animal with a layer of roughly crushed charcoal some 2 or 3 inches in thickness, not only will the decomposition of the animal matters take place with remarkable rapidity and without any odour, but in the charcoal we shall find the animal constituents in the form of nitric acid, sulphuric acid, and phosphoric acid, the bones alone resisting the rapid process of destruction induced by the charcoal. The nitrogen, the sulphur and the phosphorus of the animal body will be found oxidized to their respective acids, and some of them associated with a limited quantity of base.

And here it may be remarked, that that element of manures which is considered next to nitrogen in value as a plant food, namely, phosphorus, is not generally recognized as possessing important fertilizing properties in the absence of nitrogen compounds. In other words, *the presence of ammonia or nitric acid is necessary*, in order that the phosphates may acquire their *proper value as plant food*.

Having thus briefly adverted to the sources of the most important nitrogen food of plants, ammonia and nitric acid, it only remains to consider the method of their preservation and distribution. It is exceedingly necessary in Canadian husbandry to keep in view the second axiom laid down at the commencement of this paper,—that we should be guided by economical considerations in the preservation and distribution of our plant food,—we may therefore pass over all so called special manures with the exception of common salt, gypsum, and spent wood ashes, and devote exclusive attention to what every farmer has the opportunity of accumulating and preserving, namely, the valuable portions of Farm Yard Manure.

No single fact in agricultural science has been so exclusively proved as that the urine of animals forms the richest and most valuable portion of their excrements, consequently of farm yard manure. I think that in the present condition of husbandry in this country we are justified in assuming that the forcing elements of farm-yard manure, such as the nitrogen compounds, are without any question or comparison by far the most valuable. Our soils still contain abundance of phosphoric acid, sulphuric acid and potash, in a condition capable of being dissolved by water, without any artificial application beyond the mineral constituents of farm yard manure,—and if we look well to that grand element of fertility, and the preservation of its most valuable but