

GARDENING NOTES

(By MR. J. JOYCE, Landscape Gardener, Christchurch.)

ON MANURES.

The following notes are taken from the works of Dr. Lindley, at one time Professor of Botany in the University College, London:—

To manure a plant is to feed it artificially. Plants and animals exist in a wild state without the aid of any other food than what is naturally supplied to them. Providence has created animals and plants to be the food of man. Animals prey on animals and plants, plants subsist upon the decay of animals and plants, and these mutual relations are so nicely adjusted that we have no reason to suppose that any one species has disappeared since the Creation from want of food. When species have perished they have been exterminated by man.

But although plants are surrounded on all sides by materials necessary to sustain life, yet when man invades their haunts and turns them to his own use and benefit, the natural circumstances no longer exist. Water and air, and what belongs to them, remain as before, but the food provided in the soil becomes exhausted. When the races of plants are altered by domestication they require more abundant nourishment, and to obtain from the earth a greater produce than it can yield spontaneously becomes a matter of first necessity: hence arises the application of manure, which is to the vegetable kingdom what artificial feeding is to animals. The object of manuring is either to increase the fertility of land, or, if fertile by nature, to keep it in that state by continually returning to it the substance which crops have removed. A tree in the course of time acquires the weight of many tons. It does so by gradually absorbing from the earth and air food suitable to its nature. The food derived from the air is inexhaustible. But not so with the food derived from the soil, which is neither ever being renewed nor inexhaustible. When a tree perishes and decays where it stood, the soil receives back all that it had given up, and no exhaustion takes place. But if the tree is carried away, then the soil is robbed of all the inorganic matter, which had entered into the composition of the timber, and therefore the nutritive powers of the soil get exhausted. The matter thus removed is restored by the application of manure. Such is the result of cultivation.

Under natural circumstances exhaustion is provided against by the decay of plants where they stand, the soil receives back from the dead not only what it yielded up to the living, but as much more, as the living was able to solidify at the expense of the atmosphere. And hence the extraordinary fertility of the soil of some virgin countries. Nature causes the trees to shed their leaves annually, and by this means restore to the soil what had been abstracted during the season of growth, thus rendering the soil capable of maintaining the vegetation for the ensuing year. If all the dead leaves are removed, naturally the tree must suffer for the want of the nourishment it would receive if the leaves were allowed to remain and decay. But though Nature will supply for the maintenance of the tree inorganic matter, which is contained in the soil, yet the addition of the matter contained in its fallen leaves would greatly add to the nourishment of the tree during the season of growth. The less we rob the soil of its perishing vegetation, which annually furnishes its fertility, the more will our trees and bushes thrive: for the dead leaves of this season assist in the formation and maintenance of the tree to produce leaves for the ensuing season. Those decayed leaves contain the carbon or humus—substances essential to the support of growing plants; and although those substances can be obtained from the soil, even though the leaves are taken away, yet they can never be so well obtained as through the decay of vegetable matter.

For these reasons the practice of removing leaves which fall in shrubberies; in order to preserve neatness, cannot be too much condemned. Neatness must

be observed, but the leaves can be stored away out of sight until winter, when they can be spread about and dug in, thus acting as a natural manure for the shrubs. In manuring plants there are two points to be considered—one is what constitutes the most important food of plants, and the other what certain plants will thrive upon. Nothing can be taken into the system of a plant while in a solid state. It is indispensable that it must be in a gaseous or fluid state, or soluble in water. The most important gaseous substances are carbonic acid and nitrogen. When a plant is exposed to a high heat it is soon reduced to a brown or black substance. That substance is charcoal, which constitutes by far the larger part of all vegetable structure. Charcoal is assimilated by plants from carbonic acid gas in which all atmospheric air abounds. Carbonic acid gas is formed slowly by all animal and vegetable substances undergoing decay, in the presence of moisture; hence the manuring value of decaying leaves, of vegetable mould, and the excrements of animals. Being heavier than atmospheric air carbonic acid gas has a constant tendency to fall to the earth, and to settle down among its crevices. Hence we find it abundantly in wells and drains, old sewers, and similar places, in which, if moisture be present, roots develop with prodigious rapidity.

Nitrogen abounds in all the young parts, especially whilst in rapid growth. As organs become old it disappears. It is evidently connected with high vitality, and is as indispensable to the growth of a plant as carbonic acid gas itself. The atmosphere consists of 79 per cent of nitrogen and 21 per cent. of carbonic acid gas. In the form of ammonia (an acid gaseous compound of nitrogen with hydrogen), it is eagerly consumed when it is reduced to the state of a soluble salt so as to lose its causticity. The carbonate, sulphate, muriate, and nitrate of ammonia are all common forms of the substance, and being soluble in water are readily absorbed by all parts of the live surface of a plant. Nitric acid (a compound of nitrogen with oxygen) is also another source of this element, whence arises the great manuring values of nitrates. It exists abundantly in the atmosphere. Wherever animal matters are decaying, ammoniacal gas is evolved. Thrown into the air in the form of a carbonate, it is immediately dissolved in the vapor eternally present, and when that vapor is precipitated as rain it is conveyed to the earth and to all foliage of plants, and sucked up by the roots. It adds intensity to the green color and vigor to all powers of vegetation. Ammonia in its gaseous form is of extreme solubility in water. Therefore, it cannot remain long in the atmosphere, as every shower of rain must effect its condensation, and convey it to the surface of the earth. Rainwater always contains ammonia, though not always in equal quantity. It contains more in summer than in spring or winter, because the intervals of time between the showers are in summer greater; and when several wet days occur the rain of the first must contain more of it than that of the second. The effect of ammoniacal manure is to promote the growth of all green parts, the color of which becomes very intense under its influence. In excess it causes rankness, that is to say, it forces the vegetable tissue to form faster than it can consolidate. In such a state plants are peculiarly subject to attacks of mildew. It is well known among farmers that rank corn is certain to become mildewed. Rank potatoes suffer more from the same cause than such as form slowly; and the fact has been also observed in the case of the vine disease. The only natural fluid which of itself is a food for plants is water; and there can be little doubt that, independently of its important offices as a solvent and a vehicle of other matters, it does directly contribute to vegetable nutrition. It forms more than half the weight of fresh vegetables. When introduced into a plant it is decomposed and re-composed under the influence of vital force. Its energy is increased by an augmentation of temperature, as shown by the powerful effect of bottom heat.

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