

brought to blossom and bear fruit, if exposed to the influence of the atmosphere and rain. The power of the charcoal is increased, if it is previously heated to redness. It has been found to promote the growth of plants on heavy and argillaceous (clayey) soils. "It is," says Leibig "the most unchangeable substance known; it may be kept for centuries without change;" it may yield some salts, especially the silicate of potash, to plants. Some vegetable physiologists are of opinion that it is decomposed in 5 or 6 years, converted into a coaly earth, and in this manner supplies carbonic acid. Dr. Webster, of the Harvard University, mentions an instance of the decided effects of carbonic acid upon vegetation in the volcanic Island of St. Michael. The gas issued from a fissure in the base of a hill of trachyte and tuffa, from which a level field of some acres extended. This field at the time of his visit was in part covered with Indian corn. The corn at the distance of 10 or 15 yards from the fissure was nearly full grown and of the usual height, but the height regularly diminished until it dwindled to the height of a few inches. The carbonic acid from its greater specific gravity was most abundant where the corn was highest, and either deficient, excepting what was obtained from other sources in the atmospheric air, or greatly diluted with it, on those parts of the field where the corn was poorest. A mixture of two thirds of charcoal with vegetable mould produced astonishing effects upon some tropical plants with tuberous roots, it improved the size and colour of their leaves and flowers; and the roots formed more rapidly in it. A Cactus planted in a mixture of equal parts of charcoal and earth thrived progressively in it, and attained double its former size in the space of a few weeks. Similar results were obtained from trials with various other plants. When charcoal was used as a substitute for sand in soils requiring it, to

keep them open and porous, vegetation was always rendered stronger and more vigorous.

The best results were also obtained from charcoal when used without any addition of soil to it. Cuts of plants took root in it well and quickly. "Leaves and pieces of leaves and even pedunculi, or petioles (flower stalks, and leaf stalks,) took, root and in part budded in pure charcoal. The leaves of various plants took root in it, as did also pieces of a leaf of the *Agave Americana*, and tufts of the *Pinus*, &c. and all without the aid of a previously formed bud."

Pure charcoal is an excellent remedy in curing unhealthy plants. A *Doranthus Excelsa*, which had been drooping for three years, was restored to health and vigour in a very short time by it. An Orange tree, which had turned yellow from disease, acquired within four weeks a healthy green colour, when the upper surface of the earth was removed from the pot, containing it, and a ring of charcoal of an inch in thickness strewed in its place.

The charcoal used in the foregoing experiments was obtained from Firs and Pines, which was considered preferable to all others, principally on account of its greater porosity. It was powdered previously to using it, and it was found to be more effectual after it was exposed for a winter to the action of the air.

Wherever charcoal is employed the plants should be plentifully supplied with water, as the experiment without it would fail, owing to the porosity of the charcoal admitting the free access of air to the root, which would thus, without water, soon become dried.

ROTATION OF CROPS.

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EVERY constituent of the body of man and animals is derived from plants when used as food. The vital principle does not generate a single