the tree ; and in these, sugar seems to be formed out of the other ingredients, as it is formed from fecula in the germi­nation of the seed. M. Berard plucked a pear from the tree when firm and green, and shut it up in a close vessel of at­mospheric air from the 12th to the 29th of August. Its colour had then become yellow, and it was perfectly ripe. During this period. Its total weight had diminished very lit­tle, and this was due to the loss of a little water, and a minute portion of carbon ; but the proportions of its ingre­dients were much changed, for the quantity of sugar was nearly doubled, and that of gum, of water, and of woody fibre had decreased. The united loss of the gum and woody fibre was not, however, equal to more than half the gain of sugar ; and therefore M. Berard supposes that water may have become fixed, and augmented the proportion of this latter substance. If water be thus held to have contributed to the production of sugar in the pear, we may suppose it to have served a similar purpose in the ripening of the apri­cot ; for the loss of water in the ripe apricot, as compared with the green one, comes near to the gain of sugar ; and no change in the relative proportions of the other ingredients can be deemed sufficient to account for the great increase of saccharine matter.

The external agents required to effect these chemical changes in the maturating fruit appear to be heat and air. In the above experiment with the pear, the vessel was kept in a temperature of about 82° Fahrenheit; and the air, as well as the fruit, underwent a change of composition. It indeed remained unchanged in volume ; but 100 parts of it yielded, on analysis, 13∙52 carbonic acid, 7·51 oxygen, and 78·97 azote ; so that, as in other cases, the loss of oxy­gen was supplied by an equal bulk of carbonic acid, since the united volumes of the acid gas and oxygen made together almost exactly the 21/100 of oxygen gas which the air at first contained. Hence no oxygen can have combined with the fruit; nor can the azote of the air be deemed to have under­gone any necessary change, since the very minute portion of that gas unaccounted for may fairly be set down to error in experiment. That this conversion of oxygen gas into carbonic acid is necessary to the maturation of fruits, M. Berard inferred from the fact that the process is arrested if fruits be kept in an atmosphere destitute of oxygen; yet, after being kept for some weeks in such an atmosphere, the process recommences if oxygen be supplied.

To this process of maturation, light, though ordinarily present, and acting on the colours of fruits, does not seem necessary ; for fruits will ripen in dark places ; and, to hasten maturation. It is not uncommon to enclose bunches of grapes in black bags, which must, at the same time, ex­clude light and accumulate heat. Whether light be actually unfavourable to the formation of sugar in fruits, as it appears to be in seeds, remains to be ascertained ; but certainly, though it should retard. It does not prevent maturation : and its presence is ordinarily accompanied with such an increase of temperature as may more than compensate for its supposed injurious operation. Since, also, the vegetating process gradually diminishes as the fruit approaches maturity, and ceases to act upon it when its growth is completed, we can­not ascribe the changes that constitute maturation to vege­tation, but must regard it as a chemical change, effected by the reaction of the several ingredients of the fruit on each other, under the operation of those external agents neces­sary to its occurrence.

Abt. VII—*Fecundity of Vegetables.*

The period required for the accomplishment of those changes in the ovarian vesicles, which terminate in the formation of perfect seeds, varies much in different species of plants, and also in the same species, under different cir­cumstances of climate, soil, habit, &c. When they are completed, the ovary or pericarp, in which the seeds were contained, is opened, in various modes, for their discharge : or the fleshy pulp that invested them decays ; or the stony covering in which they were imprisoned is rent asunder ; so that, in one way or other, they are set frce, and by various means are disseminated over the surface of the earth, des­tined either to reproduce new beings similar to themselves, or to minister to the gratification and sustenance of animal life.

Of the seeds thus produced, the number, size, figure, texture, and other properties, are infinitely diversified. With respect to their number, we have already, in our for­mer article, given examples of the productiveness of wheat and barley, and described the peculiar structure by which, in the family of the grasses, this productive power may be almost indefinitely augmented. Μ. Dodart prosecuted the same inquiry on trees. He selected an elm, which, in the fifteenth year of its growth, he calculated to produce, in one season, 329,000 seeds. Supposing this tree to live 100 years, and its mean fecundity, for its whole life, to be taken at 329,000, this number, multiplied by 100, will give 32,900,000 as the number of seeds produced, through its whole life, by the single seed of an elm. But suppose fur­ther, εays Du Hamcl, all these seeds to be planted, and each to produce a tree as fruitful as its parent, and so on from generation to generation ; then, calculating the pro­duce of each of these trees during 100 years, we shall have an increasing geometrical progression, of which the first term will be one ; the second, thirty-three millions ; the third, the square of that number ; the fourth. Its cube; and so on to infinity ; a fecundity which, in the revolution of ages, would be sufficient to cover the whole surface of the earth with one species of plant.

But propagation by seeds is not the only mode by which plants are multiplied. With the exception of some trees, as the pine and fir, which do not shoot afresh when they have been lopped, except when very young, most vegeta­bles, continues the same author, contain in all parts of their branches, their trunk, and even roots, germs which do not develope unless rendered necessary by the retrenchment of their boughs. Thus, if an elm be headed, and its smaller branches removed. Its trunk and larger branches will, in the following spring, be covered with new productions, which never would have appeared if the first branches had not been removed. At whatever part or height the tree is headed, new shoots spring forth. The whole tree, there­fore, from the root to the extremities of the branches, is filled with germs (or rather, we would say, endowed with a capacity of producing them), when the parts previously ex­isting receive such injury as to render these new produc­tions necessary to supply the place of the former.

Roots also possess this capacity of producing shoots as well as the branches. If the root of the elm he exposed, with certain precautions, to the air. It puts forth young branches ; and many creeping roots, when they come into light and air, produce branches, which, by transplantation, form individual trees. A sprig of willow, when both its ends are thrust into the earth, yields rootlets from both, while the intermediate portion pushes forth leaves into the air ; and the leaves of certain vegetables, as those of *Bryophyllum calycinum,* are capable, in proper circumstances, of produ­cing entire plants. We may therefore say, adds Du Hamel, that there is perhaps no point of the surface either of the branches, the stem, or the root, which does not contain a germ, ready to develope itself when circumstances shall arise wherein this development may be useful to the parent tree. Nay, more, continues the same author, there is not per­haps any point on the branches, the stem, or the root, from which rootlets may not spring, when the conditions required for their development shall be fulfilled. If the root of a species of *campanula* be cut into pieces, and these pieces