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Structure & Economy of Vegetables

See Cicero's de Senectute, by Melmoth
on the pleasure of contemplating the pro-
-cess of vegetation - p. 78 - the vine
especially - See

A Plant is an organized body, destitute of spontaneous motion; adhering to another body, in such a manner as to draw from it nourishment, and having a power of propagating itself by seed.

The seeds of veg. are several offsprings, corresponding with the eggs of animals, & contain like them, not only the rudiment of the new organization, but also a quantity of aliment laid up for its early nourishment.

A Vegetable is an hydraulic body, containing various vessels replete with different juices, by means of which it derives the matter of its nutriment & growth. (Boerh.)

11 The principal vessels of Plants are of two kinds, Tubes and Cells.

The Tubes run from the roots to the different parts of the Plant in separate bundles, communicating with one another, but not joining & branching, as in animals.

These Tubes contain principally the mucilaginous and saccharine juices, serving for the nourishment of the vegetable.

The tubes, if empty, and immersed in water, or any other fluid, have a power of filling themselves. They therefore possess a power similar to the muscular power in animals, by which this motion, and all the other motions of Vegetables are performed.

"Botanic Elements. Agriculture & Vegetation"

The Cells contain the peculiar juices of Plants. They com-
municate with the tubes, w. are only open at the extreme
points of the fibres, and fluids cannot be absorbed by
them any where else.

The Tubes: : are not simply open at the ~~extreme~~ end
of the fibres, but there is a particular configuration, which
adapts them to absorb fluids; so that if the ends of all the
fibres of the roots of any Vegetable be cut off, the growth
of that vegetable is stopped, till fresh fibres, constituting
this peculiar configuration, are formed.

Unless there be a competent number of fibres in the Root,
a Plant will seldom flourish, in as much as a sufficient
quantity of nourishment cannot be absorbed.

A competent number of Fibres may be made to shoot out
by, 1st a sufficient tenacity in the soil; 2^d by richness
of soil; and by cutting the fibres of the root, in which
cases they will branch out into new ones. —

Or the Branches may be too luxuriant for the root; in
which case we should adjust the ballance between root
and branch by lopping them. Hence the rationale of trimming trees.

The fibres of a Vegetable are rendered too weak for the
support of the Plant, by too great tenacity of soil; and by
applying some manures that are poisonous, (dead animals)
and by cutting them branches too much.

As

For it may be with the tree natural as with the tree (injure its root) where its too luxuriant branches may

As Roots can only absorb nourishment from the points of their fibres, the Cells surrounding them serve to defend the Tubes from water, w. they do, if the soil be moderately dry; but in moist soils, the water soaks through the tubes, stops the circulation in them, and their structure is thereby destroyed, or as it is commonly phrased, it rots them.

The Roots of some plants will bear a much greater quantity of moisture without injury, than those of others.

Water constantly evaporates from the leaves and the bark of the stem, and carries along with it the volatile parts of the juices, and some small portion of the more fixed particles; But they attract water from the atmosphere at the same time, so as in some cases to nourish the plant totally, & the roots also throw out a part of the juices into the ground.

The exudation from the roots takes place in the greatest quantity, while the leaves are the most flourishing.

Jordyce.

From foregoing page :- whence we may comprehend a difficult question, why the plume of a seed thrown on, or in the earth should ascend, and the root descend; w. has been ascribed to a mysterious instinct; the plumula is stimulated by the air into action, & elongates itself, where it is thus most excited; and the radicle is stimulated by moisture, and is thereby elongated, where it is most excited, whence one of them grows upwards in quest of its adapted object or food & the other downward. [Darwin Phyt Sect IX.]

of
the growth

Of the Growth of Plants — (Hordyce)

A Seed consists of a Husk, and a membrane, or membranes covering the internal parts.

The Cotyledons are one, two, or three masses of farinaceous, or meal-like matter. e.g. walnut; chestnut.

The Embryo, (i.e.) the young Plant, consisting of a Ra-
dicel and Plumula.

The Embryo lies in a dormant state (i.e.) alive, but not exerting its life, until it is put in proper circumstances; which are,

of Heat — Moisture — and exposure to

Air [Heat is the cause of fluidity, without which no motion can exist; water is the vehicle or menstruum in which the nutriment of the vegetable is conveyed to its various organs; and the oxygen of the atmosphere affords the principle of excitability, which is necessary to all organic life.]
It requires different degrees of these to make different
seeds grow. [see preceding page]

If a seed once begins to grow, and is stopped, the Embryo dies: in this it is analogous to the egg.

The Embryo may also die from age (i.e.) if the seeds are kept too long. In some seeds this happens in 12 months, in others not in 12 years. Indian corn 80 years.

It may be destroyed by insects. Or it may undergo fermentations by moisture. Or it may be killed by poison. In all these cases the vegetation of the seeds are destroyed.

When a seed is put in the proper circumstances for growing,

the farinaceous matter in the cotyledons is converted into a milky fluid & sugar; the Embryo swells, and the Radicle pushes forward, till it gets through the husk, and afterwards runs perpendicularly downwards, till it breaks out into fibres.

These fibres run in different directions, but never penetrate below a certain depth from the air.

The Plumula, when the Radicle has got into the Earth, rises upwards; sometimes bringing along with it the cotyledons, w.^c in some cases are converted into leaves. During this time the Plant is nourished principally by the cotyledons. —

Roots push forward with considerable force; but are sometimes diverted by a resisting body. If the resistance from the tenacity of the soil be too great, they break out into a vast number of branches, too weak to support the plant; and if too little, they run out into long fibres, having too few ends or mouths to absorb sufficient nourishment. The root always runs where there is the least resistance.

The Stem goes on flourishing more or less according to the moisture of the soil — and the degree of Heat.
The stem

The stem pushes out from it the flower stem. When the flower stem arises laterally, the leaves continue to flourish after the flower is dropped off, and of consequence until the seed is perfected, & the whole Plant dies; but when the flower-stem is terminal, the leaves begin to wither as soon as the flower drops off.

In Grasses no new leaves spring out from the stem after the flowering; and those which have already sprung out, begin to lose their juices. Grasses should therefore be cut for Hay as soon as it is fully in flower. Different grasses flower sooner or later; therefore if two grasses grow on the same field, either one or the other must be cut too soon, or too late.

The parts for the continuation of Plants, are the Anthera w^c are bags on the top of the stamina, containing a powder. They open just as the flower opens, and the powder (impregnates the female part) affects the central part, which influence perfects the seed. This impregnation, (influence) is prevented 1st by cold - 2^d by very violent rains, or long continued fogs. - 3^{thly} by weakness of the whole plant. 4^{thly} by weakness of the roots; so that in moist soils, or very rainy seasons, when the Plant appears to

to be flourishing greatly, & a sufficient quantity of flowers
thrown out, the ^{influence} impregnation does not take place, and the
seed or fruit either drops off entirely, or is small and
shrivelled, the roots being rotted by the moisture.

The impregnation is prevented, lastly by the want of Air.

When the Leaves & Stem of a plant flourish greatly,
it seldom produces many flowers.

In grapes, as the nourishment is drawn from the roots
after they flower^{ing}, if the roots are rotted by moisture, the seeds
will not be perfected: In the ripening of the Seed, the
farinaceous part of the cotyledons is produced.

Plants cannot live without Air. The air is ren-
dered effete by the Plant; so that there must be a con-
tinual supply of fresh air, otherwise the stem runs out
to a great length, is small & weak; the Leaves en-
deavour to spread out to a great distance; and no
impregnation takes place in the flowers; the proper
juices are not formed, & the whole plant fades & dies.

The roots also require air; so that if a root be planted
too deep, it will not grow. It is only respirable air that
will answer these purposes.

Light is also necessary

These obstructions of impregnation are called Warts.

necessary for the growth of a Plant, but not so much so as air.

The smooth sides of a leaf is that which is acted upon by Light, and is that part by which a plant in a great measure lives. In many plants the leaves shut themselves up, so as to cover this smooth side on exposure to cold air, noxious vapour, darkness, or even upon being touched.

The want of a sufficient quantity of Light, prevents a plant from forming its proper juices, deprives it of its green colour, leaving it either yellow or colourless, makes it run up weak, & prevents the impregnation of the seeds. Want of a sufficient quantity of air and light effectually prevents the impregnation of the seeds.

Heat in a moderate degree, (according to the disposition of the plant) makes the leaves flourish, & the stem strong, provided the soil is sufficiently moist. But a very great degree heat makes the plant run up too soon, & prevents the growth of the leaves.

There are some Insects w^{ch} infest vegetables when healthy, as the insect occasioning the smutt, or blackness, in grain. This insect is not destroyed by drying, but re-

vermin upon being moistened, and if sown with the seeds, will be propagated, (it is said) over the whole field.

Most insects attack plants in consequence of a weakness of the plants themselves; the juices in that case being converted into sugar, become proper nourishment for them, and attract them, but when this happens, they hurt the plant & sometimes destroy it. [worms infect the intestines of weakly children. —]

Nourishing of Plants, or the doctrine of Manures

A Plant will grow in sand alone, moistened with ^{is deprived of its earthy matter} water purified by distillation; and in the purest air, but not so luxuriantly as in a rich soil.

A Plant will grow better in a mixture of sand & clay, where the tenacity is adapted to the pushing powers of ^{the} its root, than in sand alone; and it will grow better if a proper quantity of water be applied, according to the disposition of its roots to resist putrefaction, but with both these advantages it will not grow so well as in a rich soil.

If in a proper mixture of sand & clay a plant is properly supplied

supplied with water, it will grow better than in the same mixture exposed to the weather, and the chances of being too moist or too dry; but it will grow still better in a rich soil.

There is, therefore in "a rich soil" something independent of texture, or the retention of water, which contributes to the flourishing of plants.

But a rich soil contains substances insoluble in water, as well as substances soluble in water. The substances insoluble in water cannot enter the vessels of the roots of plants, and therefore can only contribute either to the texture, or production of substances soluble in water.

The substances insoluble in water are sand, clay, asbestos, Talc, calcareous earth, magnesia, Earth of allum, and the calces of metals, and the fibres of vegetables.

Those substances soluble in water which are found in all rich soils are, 1st mucilage, Nitrous Ammoniac, Nitrous Selenites, Common Ammoniac, Fixt Ammoniac. These substances all get into the plant along with the water; and the facts are found in the juices of the plant, unchanged. A mucilage is also found, but very different from that contained in soils. Therefore, a
plant

A Plant may be nourished by pure water & air alone; but it will be more luxuriant, if it also absorbs, and digests, a quantity of gelatinous mucilage, & substances before mentioned. —

It is known from exp.^t that Plants will grow in sand & clay, with the addition of distilled water & atmospheric air only, and that after the plant is grown, if it be taken out by the roots perfectly clean, that the sand & clay will weigh exactly the same as before the plant was placed in it.

The whole of the nourishment of the plant, growing thus in pure sand & clay, is therefore taken from the water, or from the atmospheric air.

It is farther ascertained by exp.^t that certain substances being added to the sand & clay, the Plant will grow more luxuriantly, in all its ^{parts,} than if it had grown in sand and clay alone, the water & the atmospheric air being the same.

Certain substances w.^c when added to sand & clay, occasion a Plant to grow more luxuriantly in all, or in any of its parts are called Manures; and these are commonly putrefying animal substances.

Plants consist of roots, herbaceous stems, and of leaves, of flowers, of fruit and of seeds. Now those substances called manures are known by experience to make plants grow more luxuriantly, some in their roots, some in their herbaceous stems and leaves

leaves, some in their flowers, some in their fruit, and others
in their seeds. Manures of two kinds &c one leaf

To the farmer: it is of the first importance to find out the most
proper & appropriate food for every plant that is used as provender
for beast, or aliment for man. When this is discovered, we
can encrease the size of a vegetable with as much certainty,
as the farmer can fat an ox.

I cannot express too emphatically the importance of
agriculture to our country "By agriculture only can
Commerce be perpetuated; and by agriculture alone can
we live in plenty without intercourse with other Nations.
This therefore is the great art, w^{ch} every Government
ought to protect, every proprietor of land to practise,
and every inquirer into Nature to improve" Johnson

For, says Dean Swift, He who can make two blades of
corn grow, where but one grew, before deserves more of
mankind than all the politicians
metaphysicians that ever wrote.

Delivered the foregoing May 20th - the next
the substance of Botanicus No 2 - and the
Leaf the Bond of Dec &c with purification of the

The next substance of the Botanicus No 2; then the
Leaf & the bond &c. with the purification of the
atmosphere.