CULTIVATED PLANTS OF THE FARM

DONALD McDONALD.

THE

CULTIVATED PLANTS

OF

THE FARM.

The Legumes, the Grains, and the Esculents,

COMPRISING

THE SCIENTIFIC DESCRIPTION AND CULTIVATED USE OF

WHEAT	RYE	BARLEY
OATS	VETCHES	BEANS
PEAS	TURNIPS	CABBAGES
RAPE	CARROTS	PARSNIPS

BEETROOT AND POTATO.

By JOHN DONALDSON,

PROFESSOR OF AGRICULTURE AND BOTANY, HODDESDEN, HERTS;

Author of a Treatise on Manures and Grasses;
Editor of the 5th and 6th Editions of Bayldon on Rents and Tillages,
and the British Farmers' Almanack.

LONDON:

R. GROOMBRIDGE & SONS,

PATERNOSTER ROW.

1847.

LONDON:
PRINTED BY J. WERTHEIMER AND CO.
CIRCUS PLACE, FINSBURY CIRCUS.

CONTENTS.

THE

CULTIVATED PLANTS OF THE FARM.

THE Cultivated Plants of the Farm are naturally divided into four sections:—I. The Cereal Plants:—II. The Leguminous:—III. The Esculent: and—IV. The Tuberous. The first section contains, Wheat, Rye, Barley, and Oats; the second, Vetches, Beans, and Peas; the third embraces Turnips, Cabbages, and the varieties of each, and Beet, Carrots, and Parsnips; and the fourth comprehends the single plant of Potato, being the only tuberous-rooted plant that is cultivated in Britain.

I. THE CEREAL PLANTS.

1. WHEAT.

THE word *Wheat* is derived from hpeate, Saxon; *weyde*, Dutch; *hwaitei*, Mæso-Gothic;

hweite, Icelandic, from "hwit," *albus* (Serenius). It is the grain of which bread is chiefly made.

The generic name of Wheat is *Triticum*, a word very satisfactorily derived by Varro himself from *tritum* (Latin), *ground* or *rubbed*, because of the manner in which its grain is prepared for the food of mankind. It belongs to the class and order *Triandria Digynia* of Linnæus; and the natural order *Gramineæ* of Jussieu.

GENERIC CHARACTER:—*Calyx*, a common receptacle elongated into a spike. *Glume*, two-valved, sub-triflorous; valves, ovate, bluntish, concave. *Corolla*, two-valved, nearly equal, size of the calyx; exterior valve, ventricose, blunt with a point; interior valve, flat. *Nectary*, two-leaved, leaflets acute, fibrous at the base. *Stamina*, filaments three, capillary. *Anthers*, oblong, forked. *Pistil*, germen, turbinate. *Styles*, two, capillary, reflexed. *Stigma*, feathered. *Pericarp*, none; corolla fosters the seed, opens and drops it. *Seed*, one, ovate, oblong, blunt at both ends, convex on one side, grooved on the other.

ESSENTIAL CHARACTER:—*Calyx*, two-valved, solitary, sub-triflorous, or many-flowered, on a flexuose-toothed rachis. *Corolla*, blunt with a point.

Botanists have experienced very considerable difficulty in distinguishing this genus from *Secale* or common rye. They both agree in the transverse or lateral position of their bi-valve calyx; by which position the side of each spikelet is parallel to the common receptacle, not, as in *Lolium*, contrary. The greater number of florets in *Triticum*, which are only two in *Secale*, is the only technical distinction. The outer valve of the corolla of the genus *Triticum* is often terminated by a long awn; but this appendage varies, even in the same species.

The genus *Triticum* is divided into two sections: — I. Root Annual — II. Root Perennial. The former comprehends the cultivated varieties; the latter, the plants, which are called permanent wheat grasses. Some writers add a third section of annual grasses.

The annual roots comprehend the *grains*, or *corn*, and are seven in number: — 1. *Triticum æstivum;* Summer, or Spring Wheat. — 2. *Triticum hybernum;* Winter, or Lammas Wheat. — 3. *Triticum compositum*, or Many-spiked Wheat. — 4. *Tricum turgidum;* Gray-pollard, or Duck-bill Wheat. — 5. *Triticum Polonicum;* Polish, or Poland Wheat. 6. *Triticum spelta*, or Spelt Wheat. — 7. *Triticum monococcum*, or One-grained Wheat.

1. Spring Wheat. *Calyx*, four-flowered, tumid, smooth, with imbricated awn; supposed to be a native of Siberia. This wheat may be

supposed to be nothing more than a permanent variety of Winter Wheat, obtained by accidental circumstances.

2. Winter, or Lammas Wheat. *Calyces*, four-flowered, ventricose, even, imbricate, with little or no awn; *ears*, or spikes long, with the grains ranged in four rows, and imbricate; the *chaff* smooth, ventricose, or bellied, and not terminated by awns, or beards. Wheat has, however, occasionally short awns, but not the length of those in Spring Wheat. Native country unknown; the root consists of downy fibres. *Stems*, one or more, erect, straight, from three to five feet high, round, jointed, smooth, leafy. *Leaves*, linear, pointed, flat, many-ribbed, rough, entire, rather glaucous. *Stipula*, jagged, bearded. *Spike*, solitary, two or three inches long, dense, two-ranked, smooth; joints of the common stalk, bearded. *Glumes*, smooth. *Calyx* in the upper part of the spike, with a more elongated point. *Corolla* of the upper spikelets, frequently more or less awned.

Wheat being exposed to the severity of winter, its roots are most wonderfully disposed to withstand the inclemency of the season. The first, or seminal root, is pushed out at the same time with the germ; and that, together with the meal, nourishes the plant, until it has formed the crown. When this has become sufficiently large, it detaches a number of small fibres, which push

themselves obliquely downwards. These are the coronal roots. A small pipe preserves the communication between them and the seminal roots. It makes an essential part of the plant, and is observed to be longer or shorter, according to the depth at which the seed has been buried. The crown, however, is always formed just without the surface; and its place is the same, whether the grain has been sown deep or superficially. As the increase and fructification of the plant depend upon the vigorous absorption of the coronal roots, it is no wonder that they should fix themselve so near the surface, where the soil is always the richest. The stalk, straw, or culm, as Linnæus calls it, is three feet high on an average, is jointed, cespitose, or in tufts: seventy-two stalks have been known to proceed from one root. The leaves are smooth, three lines wide, often much more, and on rich grounds of a very dark green colour. The spikes are close, weighty, and several inches in length. The lower flowers are imperfect, as is commonly the case in this order of plants. The glumes, or chaff of the calyx are ovate-lanceolate, and end in a point like a short awn: they each contain for the most part, four flowers, but sometimes only three, and often five or six; but one or more frequently fall off without producing any grain. The two glumes, or chaffs of the corolla are equal; but the outer one puts forth an awn a

little below the tip, an inch or two inches in length; sometimes, however, there is none: the inner one is hollow, awnless, and two-toothed. Between these, lies the seed, or grain, which is villose, and the largest of its congeners. The nectaries are small, fringed, and silky.

A very great many kinds and subordinate varieties are comprehended under this most important and familiar species of wheat, which have not yet been sufficiently investigated either by the botanist or the agriculturist. The chief of these, are the White and Red Lammas Wheat; and these varieties will supply our subjects for description.

3. *Triticum compositum*, or Many-spiked Wheat. *Spikes*, compound. *Spikelets*, crowded. *Corolla*, awned, Native of Egypt, and cultivated at Naples and in the south of France. The *glumes* are smooth. *Awns*, three or four inches long. Linnæus' account of the Many-spiked Wheat is, that it is allied to the Summer or Spring Wheat, but that the spike is four times as large, and a hand in length; formed of spikelets in two rows, alternate, approximating from nine to twelve; the lower ones shorter, but the upper ones single. *Chaff*, smooth, keeled. *Awns*, a hand in length. It is probably a variety of *Triticum hybernum*, rather than of *Triticum æstivum*, as Linnæus thought.

4. *Triticum turgidum*, Turgid, or Cone Wheat,

and Barbary Wheat. *Calyx*, four-flowered, tumid, villose, imbricated, obtuse, with a short point. Native country unknown. The *corolla* varies, with or without long awns. The silky or villose glumes alone distinguish this from various awned or awnless varieties of *Triticum hybernum*.

5. *Triticum Polonicum*, Polish, or Poland Wheat. *Calyx*, three or four-flowered, pointed, naked, lanceolate like the corolla, which is compressed, with a long awn; teeth of the *rachis*, bearded. Native country unknown. The plant grows large, and yields much flour; but, being very easily lodged by rain, it is not much regarded by the farmer. There is no doubt of its being a distinct species. The strength of the whole plant, its large ears, and long, narrow, scarcely tumid glumes, readily distinguish it at first sight. Linnæus defines this *Triticum* as having a two-flowered calyx, the character of *Secale;* but Haller asserts the presence of one, if not two, imperfect florets.

6. *Triticum spelta*, or Spelt Wheat. *Calyx*, imperfectly four-flowered, elliptical, obliquely pointed, shorter than the long-awned corolla. *Straw*, very stout, almost solid. *Spikes*, strong, white. *Glumes*, very glaucous. The origin of the species is unknown, and the specific character is unsatisfactory. It is much cultivated in the southern countries of Europe, and is given to horses in Spain, when barley is scarce. The

bread made of it is very dry in quality; but no kind of flour is better for pastry. In the South of France, it is called *épéante blanche*, and is sown in the Spring. It ripens in July and August, and requires very strong land. Spelt is supposed to be the *Zea* of the Greeks, and the *Far* of the Romans.

7. *Triticum monococcum*, or One-grained Wheat, or St. Peter's Corn. *Calyx*, angular, strongly toothed, about three-flowered; first floret awned, intermediate one imperfect. Native country unknown. It is much cultivated in the most mountainous parts of Switzerland, where it remains one whole year on the ground. The neat quadrangular form of the ripe ear, as if carved out of ivory, is very remarkable. The straw is hard and firm, and makes excellent thatch. It is less subject to smut than common wheat. The flour is of good quality, and much esteemed for gruels. The bread of it is brown in colour, and light in quality.

For the sake of conciseness, the wheats used in Britain may be reduced to the Red and White varieties, and the Spring and Lammas kinds. The latter is thought to have been got from the former by accidental circumstances, which have imparted the persistent quality. The awns constitute no permanent distinction in any graminous plant.

The Red Wheats are more hardy than the White

varieties, and produce more largely on poor soils, and in late situations; but they are inferior in value, as the colour would tinge the flour, if so far driven as white wheats are in the process of grinding. But the flour of red wheats is of very fine quality. The different colours are entirely owing to the soils on which they grow; and it is not a little remarkable, that the grain sooner changes colour than the chaff or straw.

The soil that is best adapted for the growth of wheat, is a deep loam inclining to clay, with a dry firm subsoil. It requires a large portion of alumen, and also of calcareous matter. Pure clays do not yield large quantities of wheat; but the quality is generally good.

A certain portion of nitrogen is essential to the production of good wheat, that element entering into the composition of the gluten, which will be found to abound in proportion as nitrogen exists in the soil, or can be supplied from the atmosphere. The experiments of Liebig seem to show, that the nitrogen of the atmosphere will not enter into the substance of plants, except in the form of ammonia; and hence the efficacy of manures has, of late, been estimated by the quantity of ammonia which they can produce. But this theory requires much experience for the confirmation of it. The analysis of the ashes of grains of wheat by T. Saussure gives the following results:—

Potash	15.
Phosphate of potash . .	32.
Muriate of potash . . .	0.16
Sulphate of potash . .	a trace
Earthy phosphates . .	44.5
Silica	0.5
Metallic oxides . . .	0.25
Loss . .	7.59
	100.00

The analysis of the ashes of the straw gave the following result:—

Potash	12.5
Phosphate of potash . .	5.
Muriate of potash . .	3.
Sulphate of potash . .	2.
Earthy phosphates . .	6.2
Earthy carbonates . .	1.
Silica	61.5
Metallic oxides . . .	1.
Loss . .	7.8
	100.0

The analysis of the ashes of the whole plant when in blossom, gave of:—

Soluble salts	41.
Earthy phosphates . .	10.75
Earthy carbonates . .	0.25
Silica	26.
Metallic oxides . . .	0.5
Loss . .	21.5
	100.00

These results show, that from the time of flowering to the maturity of the seed, a portion of the soluble salts is converted into the earthy phosphates, and that silica increases the straw, but not the grain.

The fresh ashes of wheat contain:—

Phosphate of potash . .	36.51
,, of soda . .	32.13
,, of lime . .	3.35
,, of magnesia .	19.61
Perphosphate of iron .	3.04
Silica	.15
Coal and sand	4.99

The ashes of the bran of wheat contain in 100 parts:

Potash	14.
Phosphate of lime . .	7.
Chloride of potassium .	.16
Earthy phosphates . .	46.5
Silica	.5
Metallic oxides . . .	.25
Loss . .	8.59

100 lbs. of wheat bran contain 48 lbs. of nutritive matter.

100 lbs. of wheat chaff contain 60 lbs. of nutritive matter.

Wheat in 100 parts contains:—

Carbon	46.1
Hydrogen	5.8
Oxygen	43.4
Nitrogen	2.3
Ashes	2.4
	100.0

Wheat contains:—

Starch	70.00
Gluten	23.00

100 lbs. of wheat contain 95 lbs. of nutritive matter.

Wheat straw contains in 100 parts:—

Carbon	48.4
Hydrogen	5.3
Oxygen	38.9
Nitrogen	0.4
Ashes	7.0
	100.0

100 lbs. of wheat straw contain 14 lbs. of nutritious matter.

Wheat thrives best on clays that have been well wrought, cleaned, loosened, and pulverised, by the process of fallowing; for, though the plant requires a compact subsoil, some land is found so very stiff and adhesive in quality, as to require loosening of the texture to adapt it for the vegetating of seed, and for the tillering of the roots of plants. Lands that appear to be loose on the surface will produce wheat, provided the subsoil be firm and compact, and at the same time healthy, and not of a repellent nature.

Besides being sown on bare summer fallows, wheat follows as a crop on pea and bean grattans with one ploughing, and on potato and turnip fallows, and is also sown after tares, and on grass lands that have lain for two, three, or more years in pasturage.

A brief mention will be made of each process.

Clay-lands will have been duly prepared and cleaned by repeated ploughings, harrowings, and rollings, and the lime and manure applied and ploughed in by the month of September; and during that month, and very early in October, the seed-furrowing of the land will commence; and where the extent of clay-lands is great, aud where the quality of the soil is wet, and the climate precarious, the whole strength of the farm must be combined for this most important purpose. The first day, ploughing only goes on; on the second, a sower enters, followed by two or three pairs of two-horse harrows, which will finish all the land that is ploughed. As soon as any part of a field is finished by harrowing, the water-furrows must be carefully cleaned out, and all cross-cuts drawn by the plough, and cut by the spade, that no water stagnate in any part. This point requires the most serious attention to keep wet lands artificially dry. On the wetter clays, sowing the grain in broadcast is yet found preferable to drilling, owing to the often inconvenient breadth of the ridges, the waxy adhesiveness of the soil, and the great precariousness of the climate. In such soils, it is often necessary to harrow the ridges, by means of harrows attached to a tree stretching across them, and the horses walking in the furrows. Where the ridges are permanently wide, the tree reaches from the furrow

to the top of the ridge on which the horse walks, which prevents the poaching of the side of the ridge by the feet of the animal. In every case of wet clay-lands, the water-furrows and cuts must be made with the least possible delay. A dry seed-time is of very great importance on such lands; and yet in wet seasons, when the crop is thinner on the ground, the ears are always found to be plump and heavy. But this may not compensate for the want of number of plants. At the same time, too dry weather does not suit for sowing clay-lands, if the clods, from hardness, do not break with the action of the harrows. A medium state is preferable.

Wheat is sown on the heavier turnip soils after the Swedish turnips are removed in autumn, and on the potato-grounds after the crop is raised. In both cases one ploughing is sufficient, with a previous harrowing to prepare the ground for the drill-machine. The lands that can be made to produce these green crops are of a drier nature, and the attention to water-furrows and cuts may be somewhat relaxed; but in many cases they are still necessary. The same may be said of pea and bean grattans, and of tare stubbles; only in case of foulness, the ground may require a scuffling to clean it of weeds before it is ploughed. On stiff close-bottomed loams, these crops form an excellent preparative for wheat.

In what is called the Norfolk rotation; viz. turnips, barley, clover, wheat, this latter plant gets one ploughing from grass; and the seed is usually deposited by the drill-machine. The decomposition of the roots of the clover is thought to afford very soluble food for the wheat; and the natural looseness of the land is in many cases remedied by the consolidation produced by an implement called the "land-presser," which follows the ploughs, and presses the seams of the furrows by means of cast-iron cylindrical wheels, grooved to suit the interstices. But lands that require this artificial consolidation are not properly wheat soils; and the firmness had better be produced by the land remaining longer in grass. No finer specimen of farming can be seen than the drilled wheats in Norfolk, the rows straight as a line, and not a strayed pickle.

Wheat is, in some cases, sown by dibbling the seed in the ground, by means of prongs making holes in the land, into which the seeds are dropped. Machines are now invented to perform this work very correctly. Much benefit is supposed to be derived to light lands, by the treading of the feet of the work-people employed in performing the proccss; but, as before observed, lands that require artificial consolidation are not wheat soils, and may better be employed in lighter cropping. On all wet or damp soils,

dibbling is altogether unsuitable, and drilling also, where wetness and adhesiveness prevail.

Four single times of harrowing are usually sufficient on proper wheat-lands, in order to cover the seed, and two on lighter loams after the drill-machine. Three bushels of seed to an acre may be stated as an average allowance, and less in early seasons, and on good lands.

Previous to being sown, the seeds of wheat are now almost universally steeped in solutions of corrosive substances, in order to destroy the seeds of disease that are supposed to adhere to the pickles. Various substances have been recommended, and are used; the most common are, stale urine, and common salt in a strong solution, made so powerful as to swim an egg. This liquid, or the stale urine, is put into a close tub; a bushel of seed is put into a smaller vessel, with a thin iron bottom thickly pierced with holes, which is sunk in the close tub, when the liquid rises; and on being strained, the light grain floats on the top, and is very carefully skimmed off. After frequent stirrings, the small vessel is raised, when the liquid escapes downwards into the close tub, and the seed, after being well dripped, is thrown on a boarded floor, encrusted with quick lime, carried to the field, and sown immediately. How the effect of such a preparation is communicated so as to prevent

disease, yet remains a secret: but the fact is settled beyond all dispute.

Wheat should be reaped before it is dead ripe, or the ears bend downwards; the yellowness of the straw below the ears indicates the readiness; and the meal will harden after being cut, and is always finer in quality than when dead ripe. The straw is also more juicy. The crop is best cut by sickle, and tied into sheaves; the straw is too tall, and the ears are too heavy for being mowed, as they fall over the cradle scythe. The expense of cutting an acre of wheat varies from six shillings to ten.

It is very customary to cut wheat crops high above the ground, and to mow and secure the stubble afterwards for the purpose of litter. But it may be preferable to cut the crop low at once, and tie it into sheaves of a moderate size. The crop is then built into ricks, or lodged in barns, thrashed by machine, or flail, and winnowed for use. These processes are all well understood.

Hard wheats contain most *gluten*, which, containing a portion of nitrogen, readily promotes the rising of the *dough*, which is so very necessary for making good light bread. The quantity of this substance varies with soil and climate, from 5 per cent. in some soft wheats, to 30 per cent. in the hardest and most flinty. This presence of

gluten fits the Italian wheats so much for rich paste. The soft wheats contain most starch, and are, therefore, the most fitted for brewing or distilling.

The choosing of wheat for seed, is a matter of very great importance. The finest wheat does not always make the best seed; but it depends on the nature of the land on which it grows. The proportions of gluten and starch in wheats vary much, and by those proportions, a perfect vegetation has been found to be very much influenced. These proportions are varied from the original seed by the quality of the soil on which the wheat grows, by its containing more animal manure or vegetable *humus:* and by increasing the one or the other, we may bring our wheat to have all the properties of the original seed. Some places in certain districts soon become known for yielding good seed; and to these, recourse must very frequently be had, as wheat is known to degenerate very quickly in other soils.

Wheat is very subject to diseascs of different kinds; the most common in Britain being rust, mildew, ergot, the wheat midge, burnt-ear and smut. Rust and mildew are very similar, and are consequently often confounded, and appear by infecting both the grain and the straw with a yellow ochre, which prevents the growth and the further development of the

plant. The disease evidently proceeds from an atmospheric stroke, often pervading whole fields in a zig-zag direction, and following the course of the aerial blast. Against these diseases, no remedy has been found. The ergot is a bony excrescence into which the seed is transformed, and it is supposed to be caused by the puncture of some insect, introducing a virus which entirely alters the functions of the germ. It has a poisonous quality, and also a medicinal one. The wheat midge is allied to the Hessian fly, which, at one time, caused such wide depredations in America and Canada. It deposits its eggs at the root of the germ in the ear, and prevents the filling of the grain, the maggot living on the nutritive juices which should produce the farina. This disease is not very prevalent in Britain. The disease called burnt-ear, pepper-brand, and dust-brand, destroys the whole fructification of the plant, and attacks oats and barley, as well as wheat. It is often confounded with smut, but differs in having no fetid smell, and so very little specific gravity, that it is easily blown away by light winds, and (beyond the loss of the grain so turned into a light dust) no detriment arises to the crop, as in the case of smut infecting sound grain, and deteriorating the flour. Moist situations often produce many burnt ears, and are consequently supposed to proceed from dews lodging in the

ears, and producing rottenness. Washing and steeping form no preventives, as in the case of smut, for the dust does not adhere to any other body. It has been supposed to be a variety of smut, which attacks the external part of the fructification before the skin of the grain is formed. But on this point, nothing beyond supposition exists.

Smut is the most prevalent and the most fatal of all the diseases which infest the wheat plant. It is found in almost every country where wheat is grown, being most prevalent on wet soils and in humid climates. The pickle is transformed into a brownish black powder very fetid in smell; and it imparts its noxious qualities to the bodies to which it adheres.

Of the numerous and discordant theories, opinions, and conjectures, that have been promulgated on the subject of this affection of the wheat plant, no one has yet progressed beyond the limits of bare supposition: and even the most scientific theory yet entertained, of attributing the disease to the action of the seeds of parasitical fungi, under various botanical appellations, has not enlightened the agricultural world, otherwise than in exhausting patience, and arriving at no conclusion. Experience has long ago most amply shewn, that the disease is infectious: but how this infection is commu-

nicated, forms the grand puzzle, as sound and diseased grains are found placed side by side, on the same ear; and sound and diseased ears are found to proceed from the same root. This circumstance shows, that the infection does not proceed regularly from the root, or every part of the plant would be affected alike.

The disease is very infectious, and is cured, or at least very much modified, by steeping the seeds, previous to being sown, in strong solutions of corrosive substances. Jethro Tull relates, that this fact was accidentally discovered by the sinking of a ship near Bristol, which was laden with wheat, and which being afterwards sold at a low price, and bought by the poor farmers in the neighbourhood and sown by them for want of better, escaped smut, when nearly all the wheat in England was infected. The steeping of the seed, on being repeated, gave the same results, and has led to the use of other corrosives. The efficacy of corrosives has been most satisfactorily proved in the case of seeds being purposely rubbed and infected with smut powder, and then washed, and which showed fewer diseased ears than where washing of the seed was not applied. And this fact has been amply settled by a majority of similar results.

This is all that is known in the present state of science, as to the cause and prevention of smut. The real nature of the disease has

hitherto eluded the search of the most scientific inquirers; and the veil which nature has drawn over many of her works yet remains unbroken. But a hope may be very reasonably entertained, and even very confidently expressed, that the very great advances that have been lately made in scientific knowledge, and the unceasing efforts of genius in endeavouring to explore the secrets of nature, may soon render the mystery of smut as clear and intelligible as many other arcana of nature, which half a century ago were reckoned equally obscure. But on these subjects, it would be presumptuous to be sanguine, and unphilosophical to despair.

2. RYE.

THE word *Rye* is derived from ryge, Saxon, signifying a coarse kind of bread corn. It is the *Secale* of botanists, a native of the island of Candia, and introduced into Britain many ages ago. Etymologists, from Pliny downwards, are unanimous in deriving the word *Secale*, from the Latin verb, *Seco*, to cut; and hence the word *Seges*, the Latin appellation of all grain that is cut with a similar implement.

The genus *Secale* belongs to the class and order, *Triandria Digynia*, of Linnæus; and the natural order *Gramineæ* of Jussieu.

GENERIC CHARACTER:—*Calyx*, common receptacle, toothed, elongated into a spike. *Glume*, containing two flowers, and consisting of two opposite, distant, erect, oblong, pointed valves, smaller than the corolla. *Florets*, sessile. *Corolla*, of two valves, the outermost hardest, turned, pointed, compressed, fringed at the keel, and ending in a long awn; the inner, flat, lanceolate. *Nectary*, of two, lanceolate, sharpish, fringed, scales, tumid on one side at the base. *Stamina*, filaments, three, capillary, hanging out of the flower. *Anthers*, oblong, forked. *Pistils*, germen superior, turbinate. *Styles*, two, reflexed. *Stigmas*, cylindrical, feathery. *Pericarp*, none, except the permanent corolla, which finally opens and lets the seed escape. *Seed*, solitary, oblong, somewhat cylindrical, naked, pointed. There is sometimes a third floret, scarcely perfect, stalked, between the other two. It is very difficult to distinguish this genus from *Triticum*.

ESSENTIAL CHARACTER:—*Calyx*, of two valves, solitary, two-flowered, or a toothed elongated receptacle.

Botanists enumerate four kinds of Rye:—1. *Secale Cereale*, or Cultivated Rye, a native of most parts of the world.—2. *Secale Villosum*, or Tufted Rye, a native of the South of Europe, and of the Levant, and gathered by Dr. Sibthorp, in the fields of Crete and Zante. It is cultivated in

those islands; but we know nothing of its agricultural merits in this country.—3. *Secale orientale*, or Dwarf Oriental Rye; is a native of the sandy soils in the Archipelago.—4. *Secale Creticum*, tall Cretan Rye, a native of Crete, and gathered abundantly in the Levant, by Tournefort.

Our description is limited to the first-mentioned kind, or the Cultivated Rye. *Glumes* of the *calyx*, bordered with minute parallel teeth; the root is fibrous, and annual herbage somewhat glaucous. *Stem*, jointed, slightly branched at the bottom, smooth. *Leaves*, linear, rough towards the point. *Spike*, terminal, solitary, erect, three or four inches long. *Awns*, erect, straight, rough, four or five times the length of the glumes.

The cultivation of Rye is very simple. It thrives best on dry sandy soils, where it produces a crop in cases where no other known plant would exist. It requires no other preparation than one ploughing. Three to four bushels of seed are allowed to an acre, whether intended for a seed-bearing crop, or for being eaten green by sheep in the spring. Rye is also mixed with tares, in the ratio of one to three or four. When cut in a young state, the grass of it is very palatable to animals—but if allowed to grow tall, it becomes very coarse, and is very generally rejected.

The great and invaluable use of Rye consists in its yielding, in the early spring, a very grateful

and succulent food for ewes and lambs, at a period when no other plant known to us, can be brought forward, and on soils where any other plant could scarcely exist. The crop can be consumed in time for the land being prepared for a crop of turnips. When mixed with winter tares, the fibrous nature of the gramincous stem of rye, forms a wholesome corrective to the watery consistency of the leguminous vetch. Rye is often sown mixed with wheat in the ratio of onc to four, and forms "meslin," (from *mesler* to mix), which, in the opinion of medical men, is the best bread that can be used. It is curious that millers universally prefer Wheat and Rye that have grown together, to any mixture of the two grains that have grown separately.

The comparative value of wheat and rye is as 71 to 64. The spirit called "Hollands" is distilled from Rye, which is flavoured with juniper, in Dutch called *Genever*, whence, the name of *Geneva*, and its contraction, *Gin*. When malted, it makes excellent beer, one bushel of rye-malt bcing reckoned equal to one and a quarter of barley-malt. Rye is yet much used for brcad in poor countries; but the use of it must be held as a mark of an inferior advance in civilisation. The pure bread of rye is clammy, and very detergent. The straw of rye is very strong, makes good thatch, and is oftcn of equal value with the crop of grain.

The ashes of rye contain in 100 parts:—

Phosphate of potash	52.91
,, of soda	9.29
,, of lime	5.21
,, of magnesia	26.91
Perphosphate of iron	1.88
Sulphate of potash and common salt	2.98
Silicate of potash	.34
Sand	.50
	100.

Rye contains in 100 parts:—

Carbon	46.2
Hydrogen	5.6
Oxygen	44.2
Nitrogen	1.7
Ashes	2.3
	100.0

Rye straw contains in 100 parts:—

Carbon	49.9
Hydrogen	5.6
Oxygen	40.6
Nitrogen	0.3
Ashes	3.6
	100.0

Rye is subject to the common diseases of gramineous plants, but in a modified form; so much so, that a mixture of rye sown with the wheat, has been thought to prevent mildew; and certainly, in our country, any disease of rye is almost wholly unknown. In foreign countries, however, it is affected by one most remarkable distemper, called "ergot," the French name of a cock's spur, which the diseased grain resembles in shape. The affection is most prevalent in wet seasons, and on poor soils, and in a humid close air. It is doubtful, if this disease proceeds from an altered condition of the pistil, or whether it results from the puncture of insects, or from the development of a fungus: this last view is most generally adopted, and is rendered probable by the investigations of Wiggers, who found by analysis, that the basis of the structure of the spur is almost identical in chymical properties with the principle called "fungin," that the white dust is infectious, and appears to be analogous to the sporidia, or spawn of fungi. De Candolle considers the fungus to be the *Sclerotium clavus*. The spur is of variable length, from a few lines to two inches, and from two to four inches in thickness; when large, only a few grains in each ear are affected; when small, in general, all of them are diseased. The colour varies externally and internally, from a bluish-black to a dullish white, or gray tint. It is

specifically lighter than water, which distinguishes sound from healthy grain; when fresh, it is tough and flexible; but when dry, it is brittle, and easily pulverised. The powder is very apt to attract moisture, which impairs its properties: and time completely dissipates its peculiar qualities. It has a disagreeable heavy smell, resembling that of fungi, a nauseous slightly acrid taste, and imparts both its taste and smell to water and alcohol. Bread which contains it is defective in firmness, liable to become moist, and cracks and crumbles soon after being taken from the oven. The analysis of Wiggers found it to contain a heavy smelling fixed oil, fungin, albumen, osmazome, waxy matter, and an extractive substance of a strong peculiar taste and smell, in which, from experiments on animals, he was led to infer that its active properties reside. To this substance, he gave the name of "ergotine." Dr. Christison, of Edinburgh College, found Wiggers' statement very generally correct, except in his finding "ergotine" to be destitute of any marked taste, or smell. Willdenow thinks that there are two varieties of spur, and that only one of them is possessed of active properties.

The poisonous effects of spurred rye were observed as early as 1596; and it is said to have produced spasmodic and gangrenous disorders, epilepsy, and lunatic stupidity. Since that time,

the poisonous quality has been sufficiently proved, in producing spasms and ultimately dry gangrenes. The medical quality consists in forwarding parturiency, and in some other cases, where its utility rests upon less decisive evidence than in the case already quoted. Latterly, it is said to have proved a most efficient styptic in cases of external hemorrhage.

Ergot has become an article of commerce, and is sold by druggists at ten shillings to twenty shillings an ounce, so that, if only one pound of ergot could be collected from an acre, it would be worth more than the value both of straw and sound grain.

De Candolle is of opinion, that ergot is caused by a peculiar fungus which attacks the ovary of grasses, destroying them when young, and protruding from them in a lengthened form, in rye, and other European grasses; and Fontaine asserts, that it may be propagated by contact. But this latter statement has been contradicted.

Ergot attacks other gramineous plants, besides rye. In Carolina, and in Colombia, it attacks Indian corn, and assumes, in some cases, a globose, and in others, a pear-shaped figure.

Some botanists admit the disease to be a real fungus — others think that it is a diseased state of the grain, swelling into a fungoid body, and covered externally with powder. The question

must be regarded as far from being settled. The definitive form assumed by ergot, is unfavourable to the idea of its being a mere disease; the powdery efflorescence proceeding from its surface requires to be more particularly examined, and the microscopical anatomy of the production in different states, must be far more exactly studied than it has yet been, before the true nature of ergot can be positively determined.

3. Barley.

Junius derives the word *barley* from a Hebrew noun, of the same meaning with *bere* of the northern nations, and the *hordeum* of the Romans. This latter word procceds from *horridum*, Latin, on account of the plant having long awns, or beards; or, by frequent alterations in the spellings of the word from *φερβω*, Greek, *to feed* or *nourish.* The plant belongs to the class and order, *Triandria Digynia* of Linnæus, and to the natural order, *Gramineæ* of Jussieu.

Generic Character.—*Calyx*, common receptacle lengthened into a spike. *Glume*, six-leaved, three-flowered, flowers sessile, leaflets distant, in pairs, linear, acuminate. *Corolla*, two-valved, lower valve bellying, angular, ovate-acuminate, longer than the calyx, ending in a long awn; inner valve, lanceolate, flat. *Smaller*

nectary, two-leaved, leaflets, ovate, sharp, ciliate. *Stamina*, filaments, three, capillary, shorter than the corolla. *Anthers*, oblong. *Pistillum*, germ, ovate-turbinate. *Styles*, two, villose, reflex. *Stigmas*, similar. *Pericarpium*, none; the corolla grows round the seed, without opening. *Seed*, oblong, bellying, angular, acuminate to both ends, marked with a groove on one side, covered with permanent corolla. *Radicles* of the embryo, six.

In some species, all the three flowers are perfect in all their parts, and fertile in others; the lateral ones are male, the central ones only being hermaphrodite and fertile.

Essential Character.— *Common receptacle*, toothed, and excavated. *Calyx*, lateral, ternate, two-valved, single flowered.

Willdenow, and other botanists, reckon ten species of Barley, four of which are cultivated grains, and the six are barley grasses, which are rather hurtful than useful to the farmer. As many as fifteen species of *hordeum* are distinguished by Professor Kunth; and, in addition, there are many varieties. The species are found in a wild state in most parts of the old and new world. *Hordeum* is distinguished from *Triticum*, by its spikelets having only one perfect floret in each, and by its glumes being somewhat unilateral and bearded. Rye, or *Secale*, differs in

having two perfect florets to each spikelet, and in the same additional circumstances as *Triticum*.

Hordeum vulgare, or our Common Cultivated Barley, is said to have been found wild in Sicily and in Russia. It is annual. The flowers and seeds are disposed indistinctly in several rows, with very long, compressed, rough, awns. There is a supposed variety, termed *Hordeum celeste*, in which the husk or corolla does not stick to the seed,—and another, with black seeds, said by Willdenow to be biennial.

Hordeum hexastichum, has six rows of seeds—ears, cylindrical—awns, very long, rough, and rigid, rather spreading away from the ear,—grains adhering to the husk. The native country of this species of barley is unknown. It is the *bere* or *bigg* of farmers, and is valuable in ripening quicker than the common two-rowed barley, and it is more productive in high latitudes, and on inferior soils. It is invaluable in northern countries where the summers are short. The grain is inferior in quality.

Hordeum distichum, or Two-rowed Barley—ears cylindrical—awns almost parallel with the ear—grains adhering to the husk. This is the *Hordeum vulgare* of some botanists, and is the common Summer Barley of England. The ears are not so large as those of the *Hordeum hexastichum*, but the grains are heavier. It is commonly stated to be a native of Tartary. Colonel Chesney found it

wild in Mesopotamia, upon the banks of the Euphrates.

Hordeum zeocriton, has the ears conical, — awns spreading away from the ear, in a flabelliform manner — grains adhering to the husk. From the spreading direction of the awns, the ears of this barley acquire a much broader figure at the top than at the bottom; and on this account, it has been called, "Battledore Barley," and also "Sprat Barley." The native country is unknown, and it is little cultivated, on account of the shortness of the straw.

The *Orge céleste* of the French is a naked six-rowed barley, very productive, and in many parts of Europe, it is reckoned to be the most productive of all. The grains are loose in the husk — ear, cylindrical — awns, very long, rough, and rigid, and rather spreading away from the ear. It is the *Hordeum gymo-hexastichum*, of scientific writers.

Hordeum Ægiceras, or Tartarian Wheat, is a most curious species, found in Tartary, and in the northern parts of India; ears, cylindrical — florets arranged in a confused manner, not in rows — awns, soft, short, hooded, and bent downwards — grains loose in the husk. It resembles wheat more than barley; and its naked grains assist the resemblance.

There are many other varieties of Barley, but not of sufficient importance to require particular

notice, except in works that treat of agriculture in lengthened detail.

Barley requires a good, free, and mellow soil, of a medium consistency—loose, but not composed of a pulverulent mass of distant unconnected particles—and firm, but not cemented into lumps by a viscous aluminous adherence. If the soil partakes very considerably of the latter quality, it is unfit for the growth of Barley; but if the inclination to stiffness be moderate, it may and must be overcome by working of the land. Barleys are now almost universally sown in the spring, on turnip or potato fallows, that have been well wrought, cleaned, and dunged for these crops; and may be sown in March, by hand or by drill, at the rate of two and three bushels per acre. One ploughing is sufficient, and the seed must be committed to the earth without the least delay, in order that the commencement of germination may derive the benefit of the fresh combinations that take place between the earthy and atmospheric elements. No exposure of the newly stirred land must be allowed; two or three ploughings, with harrowings and draggings, were formerly and are yet occasionally used; but the custom is a bad one: it allows drought to penetrate the soil, and reduces the bed of the seed to a collection of dry clods. The rule is:—to plough, sow, harrow, and roll the same day if possible. If that despatch be not possible, then

let it be done on the next day; and in all cases roll the land across, immediately on the harrowing being finished. Light lands will require probably two applications of a roll, not less than one ton in weight. Farmers, in general, are afraid to use the roll, from a dread of producing too much firmness; but light lands never can be too much consolidated: and on those of a stiffer nature, the pulverisation must be effected during the fallowing for the green crops; and on being again stirred, the surface requires a firmness in which to fix the seeds, and a flatness to hold moisture, and to exclude droughts. Experience shows, that seeds vegetate and grow best in a certain degree of consistency of the earthy particles, and not in a loose incoherent surface, that is exposed openly to drying winds and scorching suns. In sowing barleys, therefore, the drill machine must follow closely upon the ploughs — the harrows closely on the sower — and the roll must be used athwart, so soon as the sowing and harrowing lengthwise are finished. On very large farms, where the fields are extensive, and where the farmers are alive to the great value of despatch in every operation, more especially at the opening season of the year, the rolling commences across when the field is about half sown and harrowed, which makes a turning necessary in the middle of the field. But this seeming awkwardness is disregarded, for the very im-

portant purpose of securing the advantages of a fresh tilth, and the attendant invigorating combinations.

The yellowness in the straw and the drooping heads of barley, show that maturity is approaching—and, like all other grain, barley is the better for being reaped before dead ripeness has taken place. The latter state produces a thick husk, which is very detrimental in the process of grinding, while an early reaping yields a much thinner husk, and also induces a kindlier germination in the hands of the maltster. The crop is cut by sickle or by scythe. In the former method, it is tied into sheaves, and set into shocks of twelve sheaves each, and when sufficiently dry, it is carried into barns, or built into circular or oblong ricks, and thatched with straw. When cut by the scythe, and laid in rows, the swathes are turned over several times to promote the drying, and when this state has been attained, the crop is carried in a loose state, and stacked like hay. But the tying in sheaves is the most advisable mode, as it forms much the neatest process, and sheds least seed in the handling. The tied state also suits best in the scutchers of the thrashing machine; whereas loose straw generally requires to undergo the process of scutching twice. The most commonly used of these machines separate the grain and chaff by one and the first operation,—the grain is riddled from the chaffing machine,

and then put through a fanner that is attached to, and driven by, the impelling power. But by raising the threshing machine to the height of a third floor, a height is obtained for placing the fanning machines below each other, into which the grain passes in its descent, and reaches the lowest floor in a clean marketable state. A travelling carrier driven by the machinery, can be contrived to convey the unthreshed sheaves from the ground to the feeding board, to the hand of the person who feeds the rollers, and thus will be obviated the complaint that has been often made, of getting the unthrcshed grain raised to the height of three stories.

The awns of barley are very rigid, and strongly attached to the husk of the grain, of which they form the elongated termination. The first process of scutching the grain from the straw fails in cutting the awns from the grain; and another process, called "hummeling," is performed, by which the grain is spread thinly on the floor, and stamped over repeatedly by a hand tool made of square thin iron bars joined into a square, and moved by an upright wooden handle; or the grain is a second time passed through the rollers of the threshing machine, which, in most cases, effectually breaks the awns from the grain. But of late years, an upright cylinder has been attached to, and is driven by, the end of the axis of the drum of the machine; and, being provided in the inside

with fixed flat knives, the rotatory motion breaks the awns, on the grain passing down the length of the cylinder. This appendage forms a very valuable addition to the threshing machine, where human power should direct and not perform.

The chief use of barley is the being converted into malt for the purpose of brewing and distilling, in all climates that do not permit the vine to grow. The best and heaviest grain is chosen for this purpose—the least heating, or discoloration, rendering the grain suspected, and not so saleable. For this invention, the world is indebted to the monks, who, if they degraded the intellect, it must be acknowledged that they at the same time improved the physical enjoyments of the human race.

Barley, and malt made from it, contain:—

	Barley.	Malt.
Gluten	3	1
Sugar	4	16
Gum	5	14
Starch	88	69
	100	100

Barley is very usefully employed in being ground into meal for feeding cattle and pigs, and also for human food. "Pot Barley," is made by removing the outer husk or skin; and "Pearl Barley" is a finer preparation, effected by removing the skin and a considerable portion of the

barleycorn, and leaving only a small round kernel. Both these preparations of barley are made by means of mills constructed for the purpose, and differ only in the degree of grinding, which the grain undergoes. Barley thus prepared is very wholesome and nutritious, and is much used in broths, stews, and puddings. The grains swell, and unite with the fat and oily matters of meat in boiling. The essential oil of barley, which gives it the peculiar taste, resides chiefly in the skin and the adjacent parts of the grain — the interior is a purer farina, more nearly resembling that of wheat. This circumstance, no doubt, suggested the idea of removing the outer part, and using the interior, as approaching nearer to pure *fecula*, or starch. It is to be regretted, that these highly nutritive substances have not yet found a more extensive use among the labouring classes.

In the Eastern countries, barley is very extensively used as food for horses; but there seems to be something in the climate that adapts this food to the body; for in our country, the use of barley has never gained any ground in that way, probably from the coolness of the climate requiring a more heating food in the oat.

Decoctions of barley are useful in medicine. They are palatable and demulcent, but are apt to cloy the stomach, and require the addition of lemon juice, or some other acid, to quicken the

action. Barley-waters are very grateful in fevers, allaying thirst, without exciting the circulation.

Barley is subject to the same diseases as other gramineous plants; but none affect it so much as to render necessary any preparation of the seed. The burnt ear does appear sometimes in very dry hot seasons. The greatest enemy to it is a wet harvest, barley being very apt to germinate from the ear, and its straw being so very retentive of moisture. When the clover grows luxuriantly, it much helps this propensity; and when sprouting takes place, the grain is fit only for feeding pigs and poultry.

The produce of barley may be stated, on an average, at forty bushels per acre, and the weight at fifty pounds per bushel. It contains 65 per cent. of nutritive matter, while wheat contains 78 per cent. The value of wheat, barley, and oats, in feeding cattle, may be represented by the figures 47, 32, 24, the measure being the same. This calculation is founded on the experiments made on a large scale, by Von Thaer, at his establishment at Mögelin, in Prussia, where an account of the results was very accurately kept.

Saussure, the well known French analytical chymist, has very carefully analysed the ashes produced by burning barley and its straw; with an account of which we shall close our notice of the barley plant.

The grain, reduced to ashes with its skin,

gave from 100 parts, 18 of ashes, which contained:—

Potash	18.
Phosphate of potash . .	9.2
Sulphate of potash . .	1.5
Muriate of potash . .	0.25
Earthy phosphates . .	32.5
Earthy carbonates . .	0.0
Silica	35.5
Metallic oxides . . .	0.25
Loss . . .	2.8
	100.00

100 parts of the straw produced 42 of ashes containing:—

Potash	16.
Sulphate of potash . .	3.5
Muriate of potash . .	0.5
Earthy phosphates . .	7.75
Earthy carbonates . .	12.5
Silica	57.0
Metallic oxides . . .	0.5
Loss . . .	2.25
	100.00

Barley contains:—

Starch	79.00
Gluten	6.00

These products will, no doubt, vary in different soils; but it is very remarkable, to observe the proportion of silica in the straw and in the skin of barley.

3. Oats.

The word *Oat* is derived from the Saxon verb aten or eten, *to eat*. It is the *Avena* of botanists, which word proceeded from the Latin verb *aveo*, to desire or covet, cattle being very fond of it. The plant belongs to the class *Triandria Digynia* of Linnæus, and to the natural order *Gramineæ* of Jussieu.

General Character.—*Calyx*, glume generally, many-flowered, two-valved, loosely collecting the flowers: valves lanceolate, acute, ventricose, loose, large, awnless. *Corolla*, two-valved; lower valve harder than the calyx, of the size of the calyx, roundish, ventricose, acuminate at both ends, emitting from the back an awn spirally twisted, reflex, as at the knee-joint. *Nectary*, two-leaved; leaflets lanceolate, gibbous at the base. *Stamina*, filaments, three, capillary. *Anthers*, oblong, forked. *Pistillum*, germen obtuse. *Styles*, two, reflex, hairy. *Stigmas*, simple. *Perianthium*, none. *Corolla*, most firmly closed; grows to the seed, and does not gape. *Seed*, one, slender, oblong, acuminate at both ends, marked with a longitudinal furrow.

Essential Character.—*Calyx*, two-valved; many flowered. *Awn* from the back of the corolla, jointed, twisted.

The varieties of the oat-grass are very numerous. No botanist has been able to ascertain satisfactorily the native growth-place of the oat, or any other grain now cultivated in Europe. Our present notice is exclusively restricted to the cultivated oat, or the *Avena sativa*, which is panicled—calyces, two-seeded—seeds very smooth —one-awned. Root annual. Culm, or straw, two feet high and upwards. The two glumes, or chaffs of the calyx are marked with lines, pointed at the end, longer than the flower, and unequal. Two flowers and seeds in each calyx; alternate, conical; smaller one, awnless; the larger puts forth a strong, two-coloured, bent, awn, from the middle of the back: both are cartilaginous and fertile.

The most common cultivated varieties of the oat, are the Potato Oat, Siberian or Tartarian, the Poland, the Dutch, the White, or Short Essex Oat, the Black, Brown, and Red.

The first-mentioned variety requires the best land, yields the greatest quantity of grain, and the most meal in that quantity. The Siberian, or Tartarian, grows best on poor lands: the Poland is thick in the husk, and coarse in the straw. The red variety is fine in quality; but on medium soils, the short white varieties are

mostly preferred, which have different names in the different places of cultivation.

Oats, to grow abundantly, require a rich adhesive soil; but they also yield fair crops on inferior lands that are judiciously cultivated. They are mostly sown on the turf furrow of grass lands of any age, as the first crop, and in preparation for green crop fallows: and, from whatever cause it may arise, the fact is certain, that all green crops thrive better after oats, than any other precursory plant. This fact has long since fixed oats in all judicious rotations, as the first in the commencement of the course of the cropping.

Oats are most generally sown broad-cast, and harrowed, and rolled. The latter process is absolutely necessary in dry seasons. Large weeds, as docks and thistles, must be cut by hand before the crop gets too tall. So soon as the straw of the oat turns yellow below the panicle, the crop should be reaped, however green the lower part of the straw may be; the straw will be better fodder for cattle, and all the corn will be saved—as the grain when fully ripe, is very apt to be shed. Oats are often mown with a scythe, and raked and carried loose; but it is better to tie the crop into sheaves, and to be cut close by the ground. When sufficiently dry, the crop is carried, built into ricks, or lodged in

barns. The threshing is performed by flail, or machine, and winnowed for use.

The average of five bushels of oats is sown on an acre; and the produce varies from four to eight and ten quarters per acre.

The general use of oats in Britain is as food for horses; though in the northern parts of the kingdom, the grain is ground into meal, and used as food by the lower classes of the population; and it has become a very general observation, that nowhere are there to be seen such horses and such men. But in producing such results, climate must be allowed its due share. Oats are also ground into *Grits*, and used for making gruels for children and invalids.

Oats have not been chymically examined; but the greater part of their substance appears to consist of *fecula*, or starch. For medical purposes, gruels, or decoctions of groats or of oatmeal, are very excellent demulcents, and are very often prescribed in inflammatory diseases, and in most febrile affections. They may be sweetened, acidified, or used plain. They are also used in glysters, and the meal, boiled with water into porridge, forms an excellent suppurative poultice.

The ashes of oats contain in 100 parts:—

Potash	6.
Soda	5.
Lime	3.
Magnesia	2.5
Alumina	0.5
Silica	76.5
Sulphurie acid	1.5
Phosphoric acid	3.
Chlorine	.5

Oat straw contains in 100 parts:—

Carbon	50.1
Hydrogen	5.4
Oxygen	39.
Nitrogen	0.4
Ashes	5.1
	100.0

Oats contain in 100 parts:—

Carbon	50.7
Hydrogen	6.4
Oxygen	36.7
Nitrogen	2.2
Ashes	4.0
	100.0

Oats like a humid climate, and are, consequently, much more profitable than barley on all poor moist lands, and in high cold latitudes. Clover and rye-grass are sown with oats, when they follow turnip and potato fallows as a crop.

In France and Germany, the practice gains ground, of baking oats and rye into loaves for horse food, and it is said to be attended by an evident saving of food. A pound of good oats, is equal to two pounds of the best clover, or sainfoin hay.

II. THE LEGUMINOUS PLANTS.

1. Vetches.

We now come to the second division of cultivated plants; viz., Vetches, Beans, and Pease.

The word *Vetch* is derived from the old Latin name *viciæ*, which is, by some etymologists, derived from *vincio*, to bind together, as the various species of this genus twine with their tendrils round other plants. De Theis traces this word to its Celtic synonym, *gwig*, whence also, according to him, comes the modern Greek name of the vetch, *βικιον* or *βήκα*. The tribe of *viciæ* belongs to the class and order *Diadelphia Decandria* of Linnæus, and to the natural order, *Leguminosæ* of Jussieu.

GENERIC CHARACTER.—*Calyx*, perianth one-leafed, tubular, erect, half-five cleft, acute: upper teeth shorter, converging, all of equal breadth. *Corolla*, papilionaceous. *Banner*, oval, with a broad oblong claw at the tip, emarginate with a point, bent back at the sides, with a longitudinal compressed raised line. *Wings*, two, oblong, erect, half-cordate, with an oblong claw, shorter than the banner-keel, with an oblong two-parted claw; the belly compressed, semi-orbicular, shorter than the wings. *Stamina*, filaments diadelphous, single, and nine-cleft. *Anthers*, erect, roundish, four-grooved; a nectareous gland springs from the receptacle between the compound stamen and the germ, short, acuminate. *Pistil*, germ linear, compressed, long. *Style*, filiform, shorter, ascending at an erect angle. *Stigma*, obtuse, transversely bearded below the tip. *Pericarp*, legume long, coriaceous, one-celled, two-valved, terminated by a point. *Seeds*, several, roundish.

ESSENTIAL CHARACTER. — *Stigma*, transversely bearded on the under side.

The *Faba* of Tournefort has oval compressed seeds. The *Vicia* of that author and Rivinus has roundish seeds. The most important genera belonging to the tribe are *Vicia*, *Faba*, *Pisum*, *Ervum*, *Lathyrus*, *Orobus*, and *Cicer*.

The species of the genus *Vicia* are very numerous. Don, in Miller's Dictionary, describes

above one hundred. It forms a most extensive genus of herbaceous, perennial, or annual plants, climbing by means of tendrils, which terminate the common foot-stalk of their abruptly pinnated leaves.

The species are mostly natives of Europe, a few of Barbary, and of North America, scarcely any occurring in tropical climates. The flowers are axillary; either racemose on a longish common stalk, or nearly sessile, solitary, or two or three together; their colour crimson, purplish, or pale yellowish, rarely white or blue.

Botanists divide *Viciæ* into two sections:—I. Flower-stalks elongated:—II. Flowers axillary, nearly sessile. The plants to which our attention is at present directed; viz., the *Vicia sativa*, or the Cultivated Vetch, and the *Vicia faba*, or Common Bean, belong to the second section.

The *Vicia sativa*, or the Cultivated Vetch, is a native of cultivated grounds, and of grassy pastures throughout Europe, and in Barbary and Japan, flowering in May and June. Legumes sessile, subbinate, nearly erect; lower leaves, retuse; stipules, toothed, marked; seeds smooth and even. Root annual. A very variable annual plant, more or less hairy, distinguished by a brown or blackish depressed mark on each stipula, which is visible in all the supposed varieties. The leaflets, usually four to six pair, vary much in breadth; those of the lower leaves

are shorter, abrupt, or even inversely heart-shaped; the rest lanceolate, or linear; all tipped with a bristle. Tendril of the common stalk, long and branched. Flowers variously shaded with red and blue. Legume compressed, rough, or a little downy, with many globose, or slightly lenticular, very smooth seeds. The seeds are a very favourite food of pigeons. Vetches contain in 10,000 parts, about 275 parts of potash.

Vetches form one of the most valuable of the cultivated plants of the farm. There are two varieties of the cultivated vetch very slightly differing in appearance; one of which is hardy, and will withstand the severity of winter; the other is more tender, and is sown in the spring, and has the property of vegetating and growing more rapidly. The first has, no doubt, been got from the second by occasional leavings of the spring-sown vetches withstanding the winter's cold, and have thus been impressed with the persistent quality. The winter variety is sown in September and October in two or three successive sowings, and comes into use in the beginning of May following, by being eaten on the ground by sheep, or by being cut for soiling horses and cattle in the yards of the homestead. A mixture of rye, or of winter beans, is reckoned advantageous. The more delicate variety, called spring vetches, are sown in February or March, according as the temperature of the weather will

permit, and continued at intervals of three weeks in April and May, affording three or four cuttings in succession during the summer, and throughout the autumn. A small mixture of oats, or barley, is reckoned beneficial. The land from which the earliest crop of winter vetches is got, may be prepared for turnips, or wheat, according to its quality; and the land on which spring vetches are grown, may be sown with wheat after one ploughing.

Vetches delight in strong deep loams, tenacious and at the same time mellow. The land must be of good quality, and clear of weeds, and much benefit is derived from top-dressing, with rank farm-yard manure, the winter variety in cold latitudes. Not less than four bushels of seed should be sown on an acre. When they grow thick, and quickly and closely cover the surface of the ground, all weeds are smothered, and the land is most beneficially mellowed. But if the crop be thin, and leaves open spaces between the plants, weeds very quickly appear in abundance, and render the land very foul. In the whole course of the cropping of land, there is not a greater evil both to the land and to the farmer, than a failing crop of vetches—they ought to be ploughed down in the early spring ; and on the other hand, no crop, when it succeeds, is more advantageous.

Vetches, as green food, are more valuable than

red elover, and horses thrive better when eating them, than on any other plant, lueerne not exeepted. They are mostly sown on wheat stubbles or on grass land along with oats,—they are also used for being ploughed into the land as a manure. A good hay may be made from them in favourable seasons. The seeds have been ground into meal, and baked into bread; but it is very poor food, and when given to horses, the seeds have been found to be very heating; and though they produee a fine glossy eoat, they cannot be reeommended for that purpose. In Germany, they are given to horses, eows, sheep, and swine.

2. Beans.

The word *Bean*, like all our monosyllabic words, is of Saxon origin, and signifies an edible pulse. The plant is a speeies of the vetch tribe, being the *Vicia Faba* of botanists. Latterly, *Faba'* has been made to eonstitute a genus, with one speeies, or the *Faba Vulgaris*, or the Common Cultivated Bean.

Generic Character:—*Stalks*, with several flowers, very short. *Legumes*, aseending, tumid, eoriaeeous. *Leaflets*, elliptical, aeute, entire. *Tendril*, abortive. *Stipula*, half-arrow shaped, toothed at the base; annual, flowering in June and July. *Stem*, three to five feet high. *Leaflets*, smooth, larger, aeute at eaeh end and alternate. *Flowers*, from six to ten, and more, on a short raeemose

stalk, deliciously fragrant, white, with a broad black velvet-like spot on each wing. *Calyx*, whitish, with ovate taper teeth. *Legume*, large, thick, oblong, pulpy within while unripe, containing four or five seeds. Said to be a native of Egypt, but found also in Persia.

The genus *Faba* differs from *Vicia* in the greater size of the legume, which is coriaceous, and rather tumid, and in the seeds being oblong, and in the *hilum* being terminal.

There are now many kinds or varieties of beans in use, all derived from one original. The plant likes a strong moist soil, a whole firm furrow, and never thrives better than on a layer. The seed is generally committed to the earth on one furrow of tilth, by hand in broad-cast, or in rows by the dibbling machine. About three bushels are allowed to an acre; and when drilled, the crop is horse and hand-hoed, according to the width of the intervals. Manure is often applied to beans, laid on in autumn, and ploughed in. The quantity of seed sown on an acre varies from two to five bushels; and the average produce may be stated at thirty bushels. The quality of the season has a very great influence on the production of beans—a wet summer provoking the undue growth of leaves and stem, and a dry season stunts the growth in every respect. The horse-hoeing of the intervals must commence so soon as any weeds appear, and may be continued

till the height of the stems impedes and stops the proeess; the hand-hoeing must aeeompany the seuffler, and be eontinued after the former is given up, in pulling the tall weeds that afterwards arise. Wide intervals of twenty-four to twenty-seven inehes are preferable to narrow spaees, in admitting horse-hoeing, and the latter only the hand-hoe, whieh is of very little avail on elay soils. A very good way of sowing beans in wide intervals, eonsists in drilling the land with one furrow of the eommon plough, sowing the beans by hand, whieh fall into the hollows, and then reversing the drills, or harrowing the field aeross. In any way of spring-sowing, the land must have an early winter furrow. In the wide drilling system, two more furrows will be required in the spring, so soon as the state of the weather will permit. When the seed is dibbled at narrow intervals, the winter furrows must be well harrowed. Beans may be sown from the beginning of January to the end of Mareh, and later in some eertain loealities.

The shrivelling of the leaves of the haulm, and the blaek eolour of the pod, or legume, with the hardened state of the seeds, give notice of the maturity of the bean erop. They are most generally eut by the sickle low by the ground, tied into sheaves, and built into thatehed ricks, or lodged in barns. The straw and the grain are very easily separated by flail, or by maehine,

and winnowed for use. The sheaves are tied by straw-ropes, or tarred twine, which lasts for years on being preserved for use. Pease in mixture are not unfrequently sown with beans, and then the pea-straw serves very conveniently for being made into ropes to tie the beans.

The straw of beans when well harvested, is very particularly relished by horses, and the husks of the legumes by sheep; and it forms in any shape, a very useful *short* litter for swine in sties, and for sheep confined in cots. In a good state, it is reckoned equal to the best hay of any kind, or quality.

The broad-cast crops of beans are equally valuable with the drilled; but the true object of cultivation being to yield crops in succession, that system must be adopted, which prepares the land by pulverisation and the admission of air. Hence, the drilling of beans at wide intervals is recommended. But when they are sown on clay lands after grass, and previous to a summer fallow, they must be sown broad-cast, for the quality of the land admits no preparation for the drill or the dibble. When drilled at wide intervals, cleaned, and the land pulverised, bean culture forms a most excellent preparative for wheat, which is sown on the bean grattans with one ploughing, in broad-cast, or in drill. The success of a culmiferous crop after a leguminous one, as in the case of wheat following beans, has

afforded to scientific theorists, a confirmatory example of the exudatory system, which supposes that plants of an entirely different kind live and thrive on the fæces, or exudations of another. Be this as it may, the practical fact was known long before the theory was dreamed of.

The chief use of beans in this country is to feed horses, for which they are very usefully mixed with oats, as they contain the tanning principle, and tend to bind the muscular frame. They are also used in fattening hogs, bruised and unbruised: they make the flesh very firm. Bean meal is used in fattening oxen; mixed with water, and given to cows, it greatly increases the quantity of milk. Some beans are also mixed with new wheats in grinding. Millers generally contrive to use a due proportion, pretending that the clammy new wheats will not grind well without some such mixture.

The proportion of nutritive matter in beans, compared with other grains, is thus given by Einhof:—

	By weight, or		in a bushel.
Wheat . . .	74 per cent.,	about	47 lbs.
Rye	70 ,,		39 ,,
Barley . . .	65 ,,		33 ,,
Oats . . .	58 ,,		23 ,,
Beans . . .	68 ,,		45 ,,
Pease . . .	75 ,,		49 ,,
French beans .	84 ,,		54 ,,

The ashes of beans contain:—

Phosphate of potash and soda . . .	68.59
,, of lime	9.35
,, of magnesia	19.11
Sulphate of potash and common salt .	1.84
Silicate of potash	1.11
	100.00

The ashes of bean-straw contain in 100 parts:—

Carbonate of potash . . .	3.32
,, of soda	6.06
Sulphate of potash	32.4
Common salt	0.28
Carbonate of lime	39.50
Magnesia	1.92
Phosphate of lime	6.43
,, of magnesia . .	6.66
,, of iron and alum .	3.49
Silica	7.97

Beans contain in 10,000 parts, about 200 parts of potash.

The medicinal qualities of beans are said to be nutritive, but flatulent; the pods yield a water held good against the gripes in children. The

bean has been used as a succedaneum to coffee, which, in principle, it much resembles — only that it contains but half the quantity of oil. Flatulency is occasioned by the great quantity of air they contain, and which is extricated, and cannot be again absorbed during their digestion in the stomach. The expansion of beans in growing, is very great, one bean being sufficient to raise a weight of 100 lbs.

3. PEAS.

THE word *Pea*, of which *Peas* and *Peasen* are the plural, is derived from the Saxon, piꝑa. It is the *pisum* of the Latins; the *piso* of the Italians, and the *pois* of the French. The word *pisum* is deduced from the Greek πισον. De Theis thinks the Celtic *pis* is the common root of this word in all languages.

The Pea plant belongs to the class and order *Diadelphia Decandria* of Linnæus; and to the natural order *Leguminosæ* of Jussieu.

GENERIC CHARACTERS :—*Calyx*, perianthium, one leaved, five-cleft, acute, permanent: the two upper segments shorter. *Corolla*, papilionaceous; standard, very broad, obcordate, reflex, emarginate with a point — wings two, roundish, converging, shorter than the standard — keel compressed, semilunar, shorter than the wings.

Stamina, filaments, diadelphous; one, simple, superior, flat oval-shaped; and nine, awl-shaped below the middle, united into a cylinder which is closer at top. *Antheræ*, roundish. *Pistillum*, germen, oblong, compressed. *Style*, ascending, triangular, membranaceous, keeled, with the sides bent outward. *Stigma*, growing to the upper angle, oblong, villose. *Pericarpium*, legume large, long, roundish, or compressed downwards, with the top acuminate upwards, one-celled, two-valved. *Seeds*, several, globular.

Essential Character :—*Style*, triangular, keeled and downy at the upper side; two upper segments of the calyx broadest. *Stamens*, in distinct sets.

Some botanists admit three, and others describe five species of the *Pea*:—1. *Pisum sativum*, or Common Pea.—2. *Pisum arvense*, the Field, or Grey Pea.—3. *Pisum fulvum*, or Tawny Flowered Pea.—4. *Pisum maritimum*, or Sea Pea.—5. *Pisum ochrus*, or Wing Pea.

Our description is limited to the first species, or the Cultivated Pea. *Footstalks*, cylindrical. *Stipula*, rounded and crenate at the base. *Stalks*, bearing several flowers. *Root*, annual, slender, fibrous. *Stems*, hollow whilst young, brittle, branched, smooth, weak, climbing by terminating tendrils. *Leaves*, abruptly pinnate, composed usually of two pairs of leaflets, which are oval and smooth. *Stipula*, large, surrounding the

stem or branch. *Flowers*, lateral, two or three together on long peduncles; *corolla*, white, or greenish-white, purple, or variegated. *Legumes*, commonly in pairs, about two inches long, of an oblong form, smooth, swelling at the straight suture, where the seeds are fastened, flattened next the other suture, which arches especially towards the end. *Seeds*, from five or six, to eight or nine, commonly globular, but in some varieties, irregular, or approaching to a cubic form; smooth, white, yellow, blue, grey, brown, or greenish, with a small oblong umbilicus. The colour of the whole plant is glaucous, or hoary-green, from a white meal which covers it. Linnæus remarks that the leaflets are conduplicate, or doubled together. It is a native of the South of Europe, and Dr. Sibthorp found it, apparently wild, in various parts of Greece. It is sometimes found in China, and in Cochin China; but that is not very frequent, and it may not be indigenous. According to Thunberg, it is cultivated in Japan.

Like other favoured plants, the Pea has many varieties that have been produced by soil and climate, and by casual impregnation. The Grey or Field Pea produces most straw, and is preferred in all late and high latitudes; in dry and early situations, the Yellow-marl or Hastings Pea obtains the ascendancy.

The Pea plant affects a deep warm earthy

loam, where it grows luxuriantly, and yields very abundantly. They are usually sown broadcast, or in drills of one foot apart, on wheat or barley stubbles, or on grass layers. As a drilled crop, the use of Peas is not very evident; for the plant is procumbent, and soon falls down, covers the intervals, and excludes at an early season any further use of the hoe. The same objection applies to the common vetch, but not to the bean, owing to the upright and permanent nature of the stem. The great use of Peas and Vetches, as a smothering crop, consists in their locking together by means of the tendrils and the leaves, completely covering the ground and killing the weeds, thereby producing a finely mellowed surface of ground. For this purpose, the seed must be sown very thick, not under four bushels to an acre; and this mellow surface of the land, produced by a closely matted covering that excludes air and moisture for the growth of weeds, may be preferable to the condition of the land that is produced by scarifying and hoeing, even when possible from the nature of the plant to effect that purpose.

The season of sowing peas extends from the beginning of January to the end of March, and it is essential that the seed have a dry bed. The maturity of the crop is evidenced by the ripeness of the pods on the lower part of the stalk; the crop must be then reaped, as a further ripeness

opens the pods and occasions much loss by bursting and shedding. The reaping is done by the hand-sickle, partly cutting, and partly pulling the stems from the ground; the crop is then rolled into small heaps, where they lie until sufficiently dried, when they are carried and built into ricks, or lodged in barns. The processes of thrashing and winnowing are very easily performed, owing to the slight attachment of the parts of the plant to each other in a dried state. The average return of peas on an acre of land, may be stated at thirty bushels.

Peas contain much farinaceous and saccharine matter, and are highly nutritious; no other leguminous plant surpasses them in this quality, except the *French Bean.* But a certain toughness, which makes them adhere to the teeth, renders the seed of this latter plant disagreeable to be eaten. The meal of peas has been baked into bread, and used unmixed. The digestion is difficult, and it is better mixed with oatmeal, or barley-meal. Mixed with the skim-milks of the dairy, there is no better nourishment for young pigs and for farrowing sows; as such a mixture very much provokes the milking propensity. When pigs are weaned, it forms a most proper food for them. It is also given to bacon hogs; and notwithstanding the supposed loss when they are given unbroken, the belief yet obtains, that in the last month of fattening, they are most

useful in that state for the purpose of giving a firm consistence to the bacon. It has been proposed to malt the seeds for this purpose, and kiln-dry them slightly, in order to diminish the flatulent property.

The straw or haulm of peas, when well got, is an excellent fodder for horses and cattle, and especially for sheep, who are very fond of the dry pods, when the seeds are gone by thrashing.

Peas like good lands and in good heart: it is vain to expect a crop under other circumstances. Dung is not profitably applied with the pea crop, as it encourages the growth of the haulm at the expense of the number of pods. The land must, therefore, be in previous good heart: a barley stubble suits well, on which clover seeds have not been sown, in order to remove to a greater distance the recurrence of that crop. Peas must be thickly sown in order to lock together, and cover the ground: a thin crop of peas, or vetches invariably leaves the land foul, and in an arid parched state. So soon as a failure in these crops is observed, the crop should be ploughed down, and the land fallowed. Peas, beans, tares, and barley, sown together, form a very abundant, and a most useful green crop for soiling all the animals of the farm. Peas are a very precarious, but rather a valuable crop.

The ashes of peas contain in 100 parts:—

Phosphate of potash	52.78
,, of soda	5.67
,, of lime	10.77
,, of magnesia	13.78
Perphosphate of iron	2.46
Sulphate of potash	9.09
Common salt	3.96

The ashes of pea-straw contain in 100 parts:—

Carbonate of potash	4.16
,, of soda	8.27
Sulphate of potash	10.75
Common salt	4.63
Carbonate of lime	47.81
Magnesia	4.05
Phosphate of lime	5.15
,, of magnesia	4.37
,, of iron and alum	2.10
Silica	7.81

Peas contain in 100 parts:—

Carbon	46.3
Hydrogen	6.2
Oxygen	40.0
Nitrogen	4.2
Ashes	3.1

Pea-straw contains in 100 parts:—

Carbon	45.8
Hydrogen	5.0
Oxygen	35.6
Nitrogen	2.3
Ashes	11.3
	100.0

III. THE ESCULENT PLANTS.

1. Turnips.

The Third Division of Plants now comes for description, containing Turnips and Cabbages, and some varieties.

The word *Turnip* is referred to næpe, Saxon; *napus*, Latin; and to turnan, Saxon, *to turn*, because of its roundness. Both this plant and cabbages, belong to the genus *Brassica*, of the class and order, *Tetradynamia Siliquosa* of Linnæus, and the natural order, *Cruciferæ*, of Jussieu. The word *Brassica* is derived from *βραζω*, or *βρασσω*, Greek, *to devour;* because the plant is

cagerly eaten by cattle. Linnæus derives it from the same word, and renders it *to boil*, from its being a common pot herb. Scaliger conjectures, that it was originally written πρασικης, from πρασια, *a division*, or a bed in a garden. The Greeks did not know the word, and very probably, it is of Latin origin. Varro and Festus derived it from *præsica*, on account of its being cut off from the stem. This seems forced, and the etymology remains uncertain.

THE GENERIC CHARACTER. — *Calyx*, perianthium, four-leaved, erect; leaflets lanceolate, linear, concave, channelled, gibbous at the base, erect, parallel, deciduous. *Corolla*, tetrapetalous, cruciform. *Petals*, subornate, flat, expanding, entire, gradually lessening into claws nearly the length of the calyx. *Nectareous glands*, four, ovate, of which, one on each side between the shorter stamens and the pistil, and one on each side, between the longer stamens and the calyx. *Stamina*, filaments, six, subulate, erect; of these, two opposite ones are of the length of the calyx, and four are longer. *Antheræ*, erect, acuminate. *Pistillum*, germ columnar, the length of the stamens. *Style*, short, the thickness of the germ. *Stigma*, capitate, entire. *Pericarpium*, *silique*, long, somewhat like the shaft of a column, but flattened on both sides; partition, with a prominent columnar top, two-celled, two-valved; valves

shorter than the partition. *Seeds*, many, globular.

ESSENTIAL CHARACTER: — *Calyx*, erect, a little converging. *Seeds*, globular. *Dissepiment*, prominent. *Nectariferous glands*, four; a gland between the shorter stamens and the pistil, and between the longer and the calyx.

It is distinguished from *Sinapis*, by its firm and close calyx, and from *Raphanus*, by its siliquæ not being articulated. The distinctive character is rather obscure, and some of the species might be referred to other genera. The Turnip plant is the *Brassica rapa*. Root caulescent, orbicular, depressed, fleshy; radical leaves lyrate, rough; stem leaves very entire, smooth. Root biennial; stem erect, branched, round, smooth. Root leaves unequally toothed, deep green, rough, and jagged, or gashed almost to the middle. Stem-leaves cordate, lanceolate, embracing the stem, a little glaucous; oblong, pointed, smooth. Flowers yellow, and placed on long, slender, smooth, peduncles. Siliquæ, or pods, cylindrical, seeds of a reddish brown colour. La Marck reckons the Turnip and the Rape to be only one species, and alleges, that the Linnæan specific characters drawn from the root, afford no real distinction. Found in a wild state on ditch-banks in England.

It appears that the turnip plant was known to the ancients; for Columella frequently recommends *rapa* for cultivation, both for man and beast. The first mention of it in England occurs in 1645, and in 1686, Mr. Ray informs us, that they were sown for the sake of the roots for feeding kine in England, and in foreign countries. The cultivation of turnips originated chiefly in Norfolk, where a great impulse was given to its extension by Lord Viscount Townshend, about the year 1730, who had seen the great value of the turnip culture on the continent, when he was Ambassador extraordinary to the States-General. It is certain that turnips were not in cultivation, except for the table, at the end of the sixteenth century. It seems to have been known to Theophrastus, the oldest Greek naturalist, and is mentioned by all the succeeding Greek and Latin authors who have written on the natural history of plants, or on subjects of rural economy; but, like all other cultivated plants, it has gradually undergone so many changes, and assumed so many permanent varieties, that it is not easy to form a description that will apply to the whole, or to discover what modern plant answers to the description that is given by these ancient naturalists.

The Turnip plant is naturally inclined to grow on light loams or sandy lands; but the growth of it has been gradually extended to

soils of a heavier denomination, that have been rendered more friable by the process of cultivation. The introduction, and the successfully extended cultivation of the Turnip, very soon most completely revolutionised the whole circle of British husbandry, by increasing both the quantity and quality of animal and vegetable food, and by insuring a steadier supply of the necessaries of life at all seasons of the year. This abundance and regular supply have had a most manifest influence in promoting the development both of the physical and moral powers of man; forming a most beautiful illustration of the benefits that may be derived from the investigation and use of the bounties of nature. Turnips are accounted a very salubrious food: demulcent, detergent, somewhat laxative and diuretic, but liable, in weak stomachs, to produce flatulencies, and sometimes difficult of digestion; they relax the bowels, and sweeten the blood; the rind is acrimonious. The seeds have been accounted alexipharmic or diaphoretic, and have a mildly acrimonious taste, seemingly of the same nature with that of mustard seed, though rather weaker. The juice, well fermented, affords by distillation an ardent spirit; and the liquor, pressed out from them after boiling, is sometimes used medicinally, in coughs and disorders of the breast. The young leaves and buds of the Turnip are gathered and eaten under

the name of *Turnip tops*. The root consists of a large mass of soft cellular tissue, in which starch and sugar is deposited. The root of the Turnip contains a very large proportion of water. The latest analysis of 100 parts of the turnip, gave—

Water	89
Unazotised matters (starch and sugar)	9
Albumen	1
Inorganic matter	1
	100

Turnips contain in 100 parts:—

Carbon	42.9
Hydrogen	5.5
Oxygen	42.3
Nitrogen	1.7
Ashes	7.6
	100.0

The merit of every drill system of husbandry, and of every drilling machine, is due to the name of Mr. Jethro Tull, a gentleman of Berkshire, who derived the idea of drilling crops from the chance practice of gardeners; and the notion of drill machines taking up and throwing off into rows the seeds of plants from the gyrations of a revolving spindle, was presented to

his acute and vigorous mind, by the rotatory mechanism of an organ. Like most of the first inventors of any originality, he failed in practice; which may have arisen from the want of the combination of favourable circumstances that are essential to the success of any undertaking, and to which the most brilliant genius is compelled to succumb. But having given publicity to his ideas in the form of an octavo volume, they met the eye of a Captain Pringle, who resided near Coldstream, on the Scotch side of the Tweed, and who amused his retirement with agricultural pursuits. The system again failed, owing to the soil being wholly unfit for the growth of turnips, and to the want of a proper conception of the theory,—which had not had time to be associated with and suited to its practice; a result only to be obtained by observation and actual experience. About the same time, a young man of an adventurous spirit, named Dawson, son of a farmer of that name, who lived at Harpertown, near Kelso, on Tweedside, made a tour of some English counties; and in Norfolk he found the cultivation of the turnips in progress, and observed the practice of yoking two horses a-breast. Being familiar with Tull's ideas, and Mr. Pringle's practice, he conceived the theory of drilling the land with two horses abreast, and of sowing the turnip-seeds on narrow ridges which had been formed by the plough and reversed

upon the dung. His first attempts completely failed; the soil of Harperton farm being a stiff clay, and wholly unfit for the purpose. But being possessed of the means to effect his design, of the genius to conceive it, and of the energy and perseverance to execute it, he was fortunate enough to get possession of a farm called "Frogden," situated on the rising grounds that form the detached bases of the Cheviot hills, where the soil and the climate are alike favourable to the growth of esculent vegetables. The proximity of the hills induces frequent and moderate rains; and the soil is mostly a sharp loamy gravel, or a loam of moderately deep composition, and formed of materials very finely blended, and of very productive elements. In the whole range of the British Isles, there are not any where to be found more useful, or quicker turnip lands, than on the cultivated undulating grounds that surround the range of the "Cheviot Hills." In such a situation, Mr. Dawson succeeded beyond all precedent, having introduced the use of two-horse ploughs guided by reins without a driver—the drilling of the turnip crop by ploughs thus equipped—and the use of the roots in feeding cattle and sheep. This great revolution in farming happened about 1760.

The field is yet shown where Mr. Dawson in person, with the reins in his hands, drew the

turnip drills with two horses yoked a-breast, and the author of this volume, during his practical education in that country, rode a distance of twelve miles to gratify his curiosity by a sight of the field.

The system has been improved by several very eminent successors of Mr. Dawson; and, as the best judges allow it to be the most perfect practice of turnip-farming that is known, our description will be limited to the performance of it, or the drilling mode by forming ridgelets.

Turnips form the second crop in the most approved rotation on light lands, and thrive best after oats, which are most generally the first crop after grass, which begins the course. From whatever cause it may arise, the fact is certain, that turnips thrive better after a crop of oats, than after any other crop, either culmiferous or leguminous. So soon as the harvest is completed, the oat stubble is ploughed, usually to the depth of five or six inches, the general run of turnip lands not admitting a deeper furrow, owing to the shallowness of the staple. In this state, it lies till March, when it is cross-ploughed. The harrows are then applied, and continued, until the clods refuse to be broken by the action of the harrow, or pass unreduced between the tines of the implement. The roll is then used in dry weather, and the harrows be-

hind the roll, in order to raise to the surface the weeds that are now separated from the clods by the action of the roll. The weeds and stones are then very carefully picked off by hand, and removed from the field by carts. So soon as convenience will permit, within fourteen days, if by any means possible, the land undergoes a similar process of ploughing, harrowing, and rolling, and of hand-picking; and another similar process in fourteen days after the last. Lands intended to be sown with Swedish turnips in May, should have received two clean earths by the first of that month, and get another about a week before the sowing commences; the lands to be sown with common turnips in June, should get two or three earths by the beginning of that month.

Four clean earths are at an average reckoned sufficient to clean lands, and to bring them into a proper state of pulverisation.

Before the land is drilled, the complete pulverisation must have been effected by the repeated processes before mentioned, and every weed and stone removed: the dung from the farm-yards must have been laid in oblong heaps on the headland, or near to the gateway, and turned over in order to commence the fermentation, about eight or ten days before the use of it is intended. Upon this fermentation being produced at the proper time, and upon its going on briskly at the time when the dung is deposited in the drills, and the

seed brought within reach of the exhalations and combinations that are taking place during the fermentative process, the success of the turnip crop very much depends, while in its embryo state of existence. On the day before the sowing is intended to be commenced, one or two expert ploughmen are sent to begin the process of drilling, in order to give a little advance to that most important process. The line or direction in which it is wished the drills should lie being fixed upon, a straight furrow is drawn in that line, which is generally used to favour the ready escape of any water, that may fall on the field during autumn and winter. Two furrows at a distance of sixty to one hundred yards from each other, are drawn at right angles to the first drawn furrow; and across these furrows, the extent of the intervening spaces are carefully measured for being drilled. Thus, if the drills be twenty-eight inches in width, an extent of twenty-one yards will contain twenty-seven drills, which space of twenty-one yards is marked out by a straight furrow, parallel to the one first drawn. This marking out of the land by furrows, enables any number of ploughs to work at one time. The plough that draws the first furrow, returns in the hollow it made, with the horses walking on each side, and throws up a ridgelet of soil, from the side of the mouldboard having passed both ways. It then turns down the other side of

the furrow, the near-side horse walking in the furrow, and the far-side horse travelling on the undrilled land, the plough going between them, and making a furrow at the required distance from the other. Any number of ploughs may follow each other, each plough making a furrow and a drill by one operation, or two drills in going and returning. The spaces of ground being marked out by parallel furrows as before mentioned, mistakes may be committed by making the drills wider or narrower at the ends of the field, and thus losing the equality of width, though the parallelism may be preserved. To prevent this awkwardness in closing the spaces of ground, frequent measuring of the spaces at each end with the ploughstaff, which each ploughman carries with him, is necessary, and on which is marked the fixed width of the drills. If the space be found unequal at the ends, he must begin in time to extend or contract gradually and imperceptibly the width of the drills, and thus accomplish an equal and even termination of the measured space of ground.

The common plough is now most generally preferred for the purpose of drilling, on account of the narrow-pointed share being able to penetrate the stiffish bottoms of the best turnip lands, and raise fresh soil, in which to deposit the seed, on which the safety of the turnip crop so very much depends. The double mould-board plough answers the pur-

pose very well on light lands and loose sub-soils, but whenever the subsoil is firm and approaches to clay, the two wings of the share prevent its penetrating stiffish substances, and the resistance of the two mould-boards throw it upwards, despite all the exertions of the ploughman. Consequently it only moves the dry and frequently cloddy surface, and is most decidedly inferior to the common plough.

In the best arrangements of turnip-sowing, two ploughs are employed in opening the drills, and will perform eight to ten acres daily. The most expert ploughmen are selcctcd for this purpose. These ploughs, having had one half-day's start, the next morning the process of dunging and sowing commences. Five or six one horse carts will be required to bring forward the dung according to the distance of the heap in the field; one man to each cart to fill the dung into the carts at the heap; four lads to drive the carts to and fro, and another to lead steadily along the drills the cart that is discharging the dung — a steady man to pull from the cart the dung into the three drills, into heaps of equal size, and at regular distances — three persons provided with light forks to spread the dung along the drills, and a fourth in company to divide thc heaps of dung regularly into three portions for the three drills that are being dunged. Three ploughs are employed in reversing or splitting the drills, and

covering the dung. The far-side horse walks in the furrow, and the near-side one walks on the top of the drill on the left hand of the ploughman, leaving an intervening drill for the plough to split and cover the dung. For this purpose, the main tree of the plough is five feet long, which stretches over two drills, and by enabling the horses' to walk wide apart, the near-side one on the top of a drill, removes the objection of the horses feet jostling the dung about, when walking in the furrow. These three ploughs follow each other; in going out, they split a drill, and cover the dung — in returning, they turn to the left hand, and with a horse walking in each furrow, and the plough moving in an intervening one, they back up the drill and complete the process. So soon as a sufficient number of drills are finished, which may be by eight o'clock in the morning, the work commencing at six, the turnip-sower enters under the guidance of a steady person, drawn by one horse, sowing two drills together, and finishing four in going and returning. If the season be very dry, and the land cloddy, rolling of the drills after sowing is most essential — in damp weather and moist soils, the light roll that is attached to the sower, may be sufficient. But in the case of cloddy soils and a dry season, the quick rolling of the drills is most essential — it breaks the clods, presses the seeds close to the dung, and in imbib-

ing and retaining moisture, it acts as a lock and key. Without that operation, the seeds lie among dry clods, or parched dust; and in many cases they never vegetate at all, from the want of moisture and of that degree of compressure which is necessary to attach the most tender germination to the soil or future bed.

The most essential and indispensable requisite in sowing turnips, is dispatch or quickness of execution in getting the different processes performed, so as to keep in store for the use of the young plant, the moisture that may be in the soil, and to prevent it from escaping. The time of the year is the driest in the whole cycle — the sun is generally hot and parching, and rains are often infrequent, and fall at distant intervals. In such cases, and they are very general, the moisture in the land forms the only dependance; and, in order to retain it for the use of the young plant, a very considerable exertion becomes necessary. After the beginning, the drills must be opened only half an hour before they are closed again, and the seed sown, in order to prevent a long exposure of the land to drought; the dung-cart must be close upon the drilling ploughs — the covering ploughs working within three drills of the dung being spread, and the seed-sowing machine finishes the process of depositing the seed upon every two drills, immediately as the ploughs leave them. The rolling of the drills, as

above recommended, should be finished each night during dry weather.

Turnips should be sown thickly, not less than three or four pounds to an acre, according to the humidity or dryness of the season. When the tender plants stand singly and distant, they grow slowly, and are more exposed to the attacks of enemies: when growing thick together, the plants shoot up much more rapidly, get sooner beyond harm's reach, and attain the state fit for being hoed or singled out.

The above arrangement consequently requires farms of at least four hundred acres, and employing eight or more ploughs. On smaller occupations, a more lax execution is unavoidable. The drills being opened on one day, and dunged and closed on the next, exposes the land to drought; and hence arise the very great advantages that have attended the cultivation of turnips on farms of four hundred to six hundred acres, simply because they afford the quantity of strength that is necessary to effect the combined purposes that have been above detailed. Combination of force has a most magical effect on the spirits of the labourers themselves — but it requires a master mind of its kind to arrange and to direct it, that all the parts of the system may act simultaneously, that order and regularity be maintained, and that no one part of the process fall behind the other, or push too fast on the one before it, by

having an undue portion of strength for the purpose. When properly arranged and conducted, it forms the most beautiful specimen of a combined operation that is anywhere to be seen; and the author yet recollects with pleasure his tyro days when he took an active part in the enlivening and productive process. The great and only drawback, is the want of proper remuneration to the labourer, the stay and support of the whole operation. A more equal distribution of profits is much needed.

The custom yet lingers of sowing turnips in broad-cast by hand on the furrow which covers the dung; and in moist seasons, and where the land is clear of weeds, occasional fair crops are thus obtained. But the mode admits no good opportunity of eradicating weeds, or of pulverising the soil; and as turnip-fallows are as much intended for that purpose, as for the production of a crop, the practice is not to be recommended. Another mode consists in sowing the seed in drills on the flat surface of the land, after it is got ready by cleaning, by means of machines with lengthened coulters, which make ruts in the ground, and deposit at the same time any kind of artificial manure, and either mixed with the seed, or falling from a foregoing coulter, and thrown down from a different range of cups. A very great improvement has been lately introduced in the drop-drill,

which deposits the manure and the seeds mixed, by falling into a cylinder from different funnels. The cylinder is provided with a circular ring and valves, at the distance of nine inches, the average distance at which turnips stand in the rows: the valves are held shut by the circular ring, till, in the course of revolution, they come to the vacuum of nine inches, when they fly open and discharge a bulb of manure and seed at the above-mentioned distance. The first germination of the seed has help at hand, by being in close contact with the stimulating manure. Bones in a dry state, or artificially heated, or dissolved in acids, as they are now prepared, are very beneficially used by means of the drop-drill, which saves from the usual quantity that is deposited in a continuous stream. Bones, as a manure, being chiefly suited for light lands, the drills are well made by one furrow of the common plough, on which the drop-drill deposits the manure and seeds mixed, and is finished by a roll following the sower on the same day, or soon after. The drilling of the land is preferable to the sowing on flat surface, as it affords room for the scarifying process, and the turnip plants being placed high on the drills, escape from being buried by the earth falling upon them in the flat-surface method. It is now customary to lay on the stubble of the culmiferous crop the farm-yard dung, and to plough

it into the land, where it lies during the winter. In the spring, the land is prepared by fallowing in the usual way, drilled, and a quantity of artificial manure is applied with the seed. In this way, the land will have the benefit of the intimate commixture between the soil and the dung, that is effected by means of the working of the land; but it will lose the benefits of the gaseous vapours that are disengaged during the fermentation that is going on when the dung is laid in the drills, and the seed deposited within reach of their influence. Early lands and dry climates only admit the application. In such localities, turnip lands are very much benefited by being fallowed in part during the previous autumn, as the spring operations are thereby much forwarded, especially in the case of Swedish turnips, potatoes, and beet-root. The land, from undergoing less working in the spring, is better provided with moisture, which it imbibes during the winter; and a part of the operations of fallowing being performed, the process of planting the early green crops is very much expedited. Still it requires a dry climate and early harvests, to admit the autumnal operations.

We must not omit to mention a very excellent way of raising turnips on all stiff-bottomed lands, whatever the earthy constituent may be which causes the adhesive tenacity of the soil. When

such lands are wrought by fallowing, and drilled in the usual way, the soil is reduced into a mere mass of clods, which the action of the harrow and the roll is unable to reduce to a smaller size. At the dry season of sowing turnips, the moisture is completely dissipated from land in that condition; and when the seed is deposited in the drills, it lies among dry clods, and no vegetation takes place. In the method we now recommend, the land is fallowed and cleaned by repeated ploughings, and laid in a flat state. The farm-yard dung, in a rotted state, is then laid on the ground, spread, and ploughed under, and the land laid into ridges of from six to twelve feet. A fine tilth is then produced by harrowings performed by the implements attached to a main tree, stretching across the ridges, and drawn by horses walking in the furrows, and yoked in "tandem" fashion. When the surface has thus been made fine, the turnip-seed is sown in broad-cast, and bush-harrowed. Or it may be deposited by a machine with lengthened coulters, which make ruts in the ground, and of a number to cover the ridge. The weeds on such land are not very abundant, and the rows may be eighteen inches in width, or in broad-cast as well. The narrow ridges with the frequent furrows keep the land in a dry state. This method of turnip-farming is pursued with much success on the Royal Farms at Windsor, under the direction of

Major-General Wemyss, who excels both in arable farming and in the animal department. We recommend the above method very much to farmers who possess lands of a mellow top on a stiff bottom.

In ordinary seasons, the turnip plants will have attained a good size in the course of six weeks from the time of being sown, and will show an abundance of large rough leaves. The horse-hoe, drawn by one horse, must be first employed to cut the bottoms and sides of the intervals between the drills; and the next day, the hoers may enter. Each person is provided with a hoe made of thin iron, about nine inches long, and four inches wide; on the middle top of which an eye is attached, which fits into a rounded wooden shaft of such a length as allows the wielder of it to stand upright when the hoe rests upon the ground. A number of women and lads being thus equipped, enter the field under the charge of a steady experienced person, who appoints some one of the band who is well known to him, to go foremost in the process, and to lead the work at a steady and uniform rate. The foremost hoer commences the work, and the others follow in succession; each person stands with a foot on each side of a drill, and hoes, or thins the one immediately before him, and the drill which he bestrides is hoed by the person immediately behind him. By this

arrangement, the band stands in a slanting direction, in order to avoid the hoed drills being trampled by the feet of the hoers, and who for this end are not allowed to pass each other. The thinning of the turnip plants is effected by the hoe, or implement being passed through and pulled back at the distance of its length in the row of plants, leaving one of the best plants to stand for the crop at the distance prescribed. *Pushing* and *drawing* are the terms commonly used to designate the process of hoeing, by which the hoe is pushed through the row of turnips, and pulled back, leaving a plant between the incisions; all the weeds, and the useless plants, being pulled into the hollow of the intervals, where they are killed by the process of scuffling. To perform this process adroitly, requires a length of practice, and very much attention is paid to it by the best turnip farmers. The set-out turnips are generally laid, or made to fall to one side of the drill, usually to the off-side from the hoer; and the smallest hold that the root can have of the soil, is reckoned sufficient. The drill is formed into a narrow ridgelet by the workings of the hoe, and forms a very pleasing appearance when the crop of plants is regular, of one size, and all neatly laid to one side. The plants very soon recover an erect position, and cover the drill with the leaves. The second operation of the scuffler afterwards commences, which cuts

up all the weeds in the intervals. The hoers follow, standing in the furrows, and cut the weeds that escape the scuffler, and rectify the thinning process where any imperfection has happened. Some lands will require a third scuffling and a third hoeing; but it is not of common occurrence. The earthing up of turnips by the double mould-board plough is not now practised, as the earth touching the bulb of the turnip was found to encourage the shooting of lateral fibres, which impart a bitter coarseness to the turnip, and prevent the growth of the bulb. The best scuffler that is known at present, is *Morton's* expanding horse-hoe, constructed on the principle of the parallel ruler, which places the face of the cutting coulters always in a straight line looking forward. It is provided with two duck-footed shares for scarifying the bottom of the drills; one being placed in the forepart of the implement, and the other in the hindmost part, which two positions most effectually cut and destroy every weed that grows. The expanding wings contain each three cutters, which are ranged in a rising tier obliquely from the bottom cutter to the side of the row of turnip plants, so that no part of the interval can escape being cut and stirred. It is the most effectual scarifier yet known, as, from its weight and form, it takes a good hold of stiff-bottomed lands, in which property the lighter horse-hoes are very much deficient.

The land being wholly cleaned of weeds by horse and hand-hoeing, twice or thrice repeated, the turnip plants are then allowed to grow unmolested, and in most cases, they quickly cover the surface, and smother the weeds. But if any strong and tall weeds do arise, they must be pulled by hand. A thick crop of plants kills weeds, and shades the ground, which has a very strong fertilising effect, by excluding light and producing putrefaction. On the contrary, thin crops of every kind encourage the growth of weeds, by leaving open spaces of ground where they can grow; and by admitting the rays of the sun, the land is exsiccated and hardened. Hence arises the double loss from bad crops; the loss in the quantity of produce, and the loss arising from the deteriorating effects on the land.

In the end of the month of October, and almost universally by the first of November, turnips are required for use. The roots and tops are very generally cut off in the field; the bulbs are carted to the farm-yard, and given in cribs entire or cut into slices as food for cattle. Three drills are sometimes carried away, and three left to be eaten on the ground by sheep. Sometimes the whole crop is consumed by sheep on the field where it grows. The eating of the turnips begins at one side of the field, and a space of the ground is surrounded in a square form with flakes, or hurdles, in which the sheep are con-

fined. When the bulbs are eaten close to the ground, the roots are picked up by hand, when they are eaten by the animals nearer to the rind. The fold is then moved and placed on fresh ground, and the same order is observed over the field. In this way the sheep are allowed to range back on the cleared ground, and will always incline to lie on one place, by which means, the excrements are unequally distributed over the ground. To remedy this defect, a night-fold may be placed behind the feeding-ground in which the sheep are confined, for the purpose of voiding their dung and urine, and which, being regularly moved every two days, will ensure an equal manuring to the land. A slanting covering of tarpauling cloth may be thrown over the fold, in order to protect the animals from any extreme violence of the weather. But the eating of turnips on the ground by sheep in any way, supposes a very dry soil, and a genial climate. The animal is naturally impatient of wetness, and likes a dry bed. On the damp poachy loams on which the best crops of turnips are produced, the animal stands and lies in wetness and mud; the bulbs are defiled with the dung and urine of the animals, and are, in consequence, very much wasted. A better plan may probably be found in carting the whole crop of turnips (the tap-root being always cut off) to fields of stubble, or lea, and

spreading them thinly and regularly over the ground, where the sheep can eat the bulbs in a clean state, and where they stand on clean firm ground, instead of mud and mire. By this way, each field on a farm will, in its turn, receive the benefit of the animals' dung and treading, with the only difference of its being in an unploughed instead of an arable state. But on dry lands that are favoured by a genial climate, no greater improvement has ever happened in the agricultural world, than the consuming of turnips on the ground by sheep. Another mode is practised, of cutting into slices the bulbs of the turnips, which are given to the sheep on the ground in wooden troughs. But the utility of cutting turnips into slices for the use of cattle and sheep, may be fairly questioned. The volatile juices escape, from exposure; and, in eating the slices, the natural quantity of saliva is not engendered, which is so necessary for the digestion of the food, and the secretion of nutrition. A very fair example may be quoted, in an apple being much more juicy and agreeable when bitten by the human mouth, than when it is cut into pieces by a knife. The case seems exactly parallel.

It is beneficial to have a store of turnips, to provide against the difficulty of getting them from the fields during the snows and frosts; and for this purpose, the bulbs are laid in a longitu-

dinal heap on dry ground at the farmery, tapering to a narrow top of about four feet in height, and the sides thatched with straw. The light covering admits the air, to prevent fermentation and putrefaction, and prevents the frost from inflicting any material damage. Common turnips may be kept in a wholesome state for one month in this manner; and the hardier varieties may be kept for six months and more.

The most useful varieties of the turnip, are the White Globe, the Green Globe, and the Aberdeen Yellow. The Swedish turnip, or *Rutabaga*, is the most useful of all, as it resists the hardest frosts without injury. It requires the best lands, and heavy manuring, and to be early sown; from the middle of May into the first week in June. The White Globe is used from October to January; the Green Globe from that date to March, when the Swedes and Yellows come into use, and extend to June, when properly stored.

The nutritive powers of the different varieties of turnips, have been stated as follows:—

	Grains.
64 drs. of the Swedish turnip, afford of nutritive matter	110
64 drs. of the Common White turnip .	83

Being nearly as 3 to 2.

The chief disease, or enemy to which the turnip is exposed, is the *Fly*, the *Altica nemorum* of entomologists, a little insect belonging to the order *Coleoptera*. They are bred from *larvæ* deposited in the fields, and there are five or six broods in a summer. They love sunshine and heat, and eat most voraciously the first smooth leaves, or cotyledons of the turnip. No one remedy has yet been found against this destructive insect; many have been suggested, but not one has succeeded. The only plausible one consists in having the land and manure in a fine state of preparation, so as to push the young plant into the rough, or second leaf, when it is beyond the power of its enemy. The destruction by this insect is often very great, and most complete; often devouring a whole field in a very few hours. In such cases, the field should be put under a fresh tilth without delay, and fresh seeds sown.

The latest analysis of turnips, by Dr. Lyon Playfair, gave in 100 parts:—

Water	89
Unazotised matter (starch and sugar)	9
Albumen	1
Inorganic Matter	1
	100

The very great quantity of water that is contained in the turnip, and the absence of the nutritive elements in any quantity, leaves us in very great doubt whence the value of the turnip proceeds in the process of fattening of animals. But, whence or how it comes, the fact is certain. The peculiar combination of the elements may take the place of quantity.

2. Cabbages.

The word *Cabbage* is derived from *Cabus*, French; *Cabuccio*, Italian; *Kabis-Kraut*, German; all from the Latin word *Caput*, the head. Linnæus suggests the Greek word *κολον*, *cibus*, or food; and Mr. Horne Tooke thinks that our word *Cabbage* may be derived from the Greek word *καβη* food. The form of the top part of the cabbage plant so very much resembling a head, shows the Latin word *Caput* to be the original. The French word *Caboche*, also signifies a head.

The *Cabbage* plants form the genus *Brassica* of botanists, the derivation and meaning of which word, and also the scientific and natural classification and distinction of that family of plants, have been given under the preceding article of "Turnips."

The varieties of Cabbages are very numerous. Duchesne throws them into six divisions:—

I. The Wild Cole-wort, which is unaltered by cultivation:—II. The improved kinds, which do not form a head, or undergo any remarkable change in the stalk or root:—III. The proper Cabbages:—IV. The Cauliflower:—V. The Turnip Cabbage:—VI. The Turnip-rooted Cabbage.

The species most commonly cultivated is the *Brassica oleracea* of botanists, or the Common Cabbage, which has a biennial root, and an upright fleshy stalk of oblong roundish leaves, which are closely gathered into large compact heads. The leaves are generally plain and entire. Of the leading varieties of cabbages, the Red-coloured is chiefly cultivated for pickling, and the Common White, or the Yorkshire Drum-head for winter use.

It is not precisely known, when or how the Cabbage was first introduced into field-culture—but it has not long prevailed to any considerable extent. It was well known to Theophrastus, and is mentioned by all the succeeding Greek and Latin authors who have written on the natural history of plants, or on subjects of rural economy—but, like all other cultivated plants, it has gradually undergone so many changes, and assumed so many permanent varieties, that it is not easy to apply any general description. But the plant has always a fleshy, cylindric, ascending *caudex*, a branched, smooth, and leafy proper *caulis* or stem—alternate smooth leaves more

or less green, or tinctured with red and violet — the lower ones petioled, runcinate at their base, and more or less sinuate — the upper ones, simple, smaller, and often embracing the stem — and flowers rather large, yellow, or nearly white, in upright, loose, and terminating racemes, succeeded by nearly cylindrical siliques.

It is related, that a beast was sold in Bury, in 1694, for £30, which was fatted with cabbage leaves. For the table, it has been used from time immemorial. Having been so much in favour with the Romans, it could hardly fail of being introduced by them during the four centuries that they occupied our island. And our Saxon ancestors certainly had some sort of Cabbage, since they called the month of February, *Sprout-cale*. All species of Cabbages are supposed to be hard of digestion, and to produce flatulencies. They tend strongly to putrefaction, and run into that state sooner than almost any other vegetable — when putrefied, their smell is likewise the most offensive, greatly resembling that of putrid animal substances. The variety called *Cauliflower*, is reckoned the easiest of digestion; the White Cabbages are the most fetid, and the red the most emollient or laxative. The latter are medicinal, and used in decoctions for softening acrimonious humours in some disorders of the breast, and in hoarseness. The Germans cut cabbages into shreds or very small pieces, and,

along with some aromatic herbs and salt, press them close down in a tub, where they soon ferment, and are eaten under the name of "sour-crout."

Of the *Brassica capitata*, or the Common Heading Cabbage, the varieties are numerous, and all denominated Cabbages, from the circumstance of the inner leaves lying closely over one another, till, by degrees, they form a large, compact, globular, or oval head, some of them attaining a very large size. From the very numerous list of the varieties of Cabbages that are constantly rising into fame, and falling into oblivion, we select for our agricultural notice, the Common Headed White Cabbage—the Turnip-rooted Cabbage, or the Hungarian Turnip—and the "Scotch Kale," or Curly Green Brocoli.

The Common White Cabbage Plant requires, for its production, the strongest loams or soils, which possess as much alumina in their composition as imparts a viscous tenacity, and as much loam or decomposable *humus* as can produce a degree of mellow friability. The land intended to be planted with cabbages, is prepared as for turnips, by being repeatedly ploughed, rolled, and harrowed, till the utmost possible pulverisation be produced—and every stone and weed must be removed. About the first of May, the land must be made into drills of thirty inches apart by one "bout" of the common plough; and as the root

of cabbages penetrates deeply, all the operations of ploughing and drilling must be deeply and honestly performed, in order to encourage the natural propensity of the plant. The drills must be deep, in order to contain freely, the extra quantity of dung that is used. The manure or the farm-yard dung may be applied in a fresh state, slightly putrescent, but not strawy, and composed of the excrements of animals, and the straws of hay, and grains, well wetted and impregnated with the urinary liquids of the farm-yard. A coarser and grosser form of the manure is allowed in this case of application to cabbage plants, than to the tender germination of the turnip seed — the delicate state of the latter requires support in the form of exhalations, and aeriform combinations that arise from the fermentative process; while the former or the transplanted cabbage plant, has acquired from the nursery bed, a strength to support itself, until the decomposition or the putrefactive process of the dung comes to its aid. Hence arises the different condition in which farm-yard dung must be used for different purposes,—the one requiring an immediate aid from the fermentative process, and the other being able to wait for the ulterior state of utility.

The quantity of dung used on an acre of cabbages, must be large, not under thirty loads of one horse carts, or twenty loads of two horses.

It must be spread evenly along the hollows of the drills, and then covered without delay; the plough working as deep as the animals are able to move the implement. The plants drawn from the nursery bed, with the extreme end of the slender fibrous root cut off, are brought to the field, and immersed in tubs of water with the roots downwards, whence they are taken as they are required for use. So soon as the covering ploughs have finished two or three drills, persons provided with dibbles begin to insert the plants on the top of the drills, at the distance of two feet from each other, making a hole with the dibble for the insertion of the plant to the depth it has stood in the nursery bed, and pushing with the dibble the sides of the hole together, in order to give the plant a firm position. It should be very carefully observed, not to insert the plants deeper than they stood in the nursery bed, as a transformation of the skin is the consequence, and a necessary delay in the onward progress of the plant. All plants with large leaves require much moisture, and consequently the dung that is used for cabbages must be well wetted and the plants immersed in water; and the planting of them in the fields should be performed in the wettest weather in which the work is possible to be done. When any plants are seen to be dead, their place must be immediately filled with a fresh plant, in order to ensure a full crop all over the field.

So soon as any weeds appear on the land, the scuffler or horse-hoe must enter; and as the land will be stiff-bottomed, the implement must be of a weight sufficient to enable it to take and keep a good hold of the ground, and of a strength that will overcome the obstacles that are presented to its action. On such soils, during the first process of scuffling, two horses may be required, which will best walk one in each hollow, two drills apart, and leave an intervening hollow in which the scuffler works. A main tree of five feet in length will be required to stretch over two drills, and allow the horses to walk freely. A miniature plough drawn by one horse, and which moves up and down in one hollow, and lays a small furrow from each side of a drill, performs the work in the most superior manner, as the narrow point of the common share takes a better hold of stiff-bottomed lands than any scuffler that has yet been found. It requires double time in finishing an interval at one round, whereas the common scufflers finish two; but true economy ever consists in having all things well done, whatever the nature or kind may be. The light turnip drill scuffler may afterwards be used in making the intervals after the sides of the drills have been cut and loosened deeply by the skeleton plough. The success of all green crops very much depends on the working, and very frequent stirring of the intervals of the drills; and the

drier the weather, the better—the loosening of the earth allows the roots to spread,—encourages evaporation, of which the moisture is imbibed by the leaves of the plants—and the last, and not the least benefit that is conferred, is the pulverisation of the soil, for the advantage of the next crop that is sown.

So soon as the scuffler has done a half day's work, the hand-hoers enter to their business, by cutting the weeds, breaking the clods, and moving the earth between the cabbage plants, by passing the hoe cross-wise between them. A careful hand-hoeing is equally necessary with the efficient working of the intervals, as both processes effect the same purpose by provoking reciprocal combinations between the air and the soil, for the benefit of the plants. Two or three performances of the operation of scuffling and hoeing will be sufficient for most soils, after which the drills are earthed up by the double-mould-board plough, moving once in the hollow, and drawn by two horses walking asunder, at five feet or two drill intervals. The furrow must be deep, as deep as the plough can penetrate. Any tall weeds that afterwards arise, must be pulled by hand.

Cabbages form the head in autumn; and by the end of October the plants will have attained the full size of the head. The outer leaves are liable to premature decay, and fall off; previous

to which, they may be gathered, by pulling away the loose leaves, which will be very useful as food for pigs and young cattle. In November, the stools may be pulled and stored, by separating the stool from the root below the stock, and pulling the root from the ground, shaking the earth very carefully from the numerous radical fibres, and carrying them to the liquid manure tank, to reduce the very fibrous and indissoluble structure by the action of the urinary corrosives. The stools, after being cleaned of the outside rotten leaves, are carried to the homestead, and piled up in a dry situation in the fashion of cannon balls, and ending in a ridge of a single stool. The longitudinal pile is then thatched over with straw, which is held down with ropes of the same material. The round form of the stools leaves many cavities in the pile for the admission of currents of air, which materially prevents putrefaction. Cabbages may be preserved in this way for use throughout the winter.

Cabbages are very generally used in the early winter, by being pulled from the field as they are wanted for use, without storing being practised. They are very beneficially given to milch cows, store cattle, sheep, and pigs. They are invaluable in the spring, along with beet root, for the lambing ewes. The taste that is said to be given to milk, by the cows eating cabbages, is most effectually prevented, by most scrupulously re-

moving from the stools, when they are given to the cattle, all blades that show the least appearance of an incipient decay; for experience has most amply and satisfactorily shown, that the offensive taste of the milk is communicated from this state of the leaves.

The *Brassica* family of plants yield an abundance of seed, and of very easy management; but they are very liable to accidental impregnation by means of bees in search of honey carrying the impregnating pollen from one plant to another, and thus producing an endless variety of hybrids and kinds that are almost undistinguishable. The seeds are sown in August, on warm beds of ground, well manured and pulverised, where the plants remain during winter, and are pulled for being planted in the field in the following April and May. An over-luxuriance in the plants, arising from a very favourable autumn, may be checked by transplanting. In countries where the autumnal preparation of the land can be effected, the dung may be applied, and the cabbage plants inserted into the land, in autumn, and thus stand over winter. But the autumnal fallowing of lands supposes both a dry soil and a dry climate; and it may be imagined that the soils that are properly adapted for cabbages, are too moist to be prepared in autumn, and that the advance in the spring growth which is gained by the autumnal insertion of the plants,

may induce a running to seed of the plant, before the growth is checked by the following winter's cold.

The average weight of an acre of cabbages may be stated at twenty-five tons. One pound of drum-headed cabbages, or seven thousand grains consist of: — nutritive matter, 430 grains; woody fibre, 280 grains; water, 6,290. One hundred pounds of cabbages contain ninety pounds of nutritive matter. Swedish turnips are superior to cabbages in the nutritive matter they contain, in the proportion of one hundred and ten, to one hundred and seven and a half; and cabbages are superior to the common white turnips, in the proportion of one hundred and seven and a half, to eighty; and inferior to carrots, in the proportion of one hundred and seven and a half, to one hundred and eighty-seven. One pound of cabbage seed will produce about twenty-four thousand plants, and about eight thousand plants are sufficient for an acre; and the produce of twenty-five tons will give three thousand four hundred and forty pounds of nutritive matter.

Cabbages, like green crops in general, are far too much neglected by the farmer. But great as the advantages of a cabbage crop confessedly are, the cultivation of the plant is confined to a much more limited range than that of turnips; it must have a humid climate, a deep rich moist soil, and a very ample allowance of good farm-yard dung.

It may be said that all green crop plants require these conditions: very true—but cabbages require them in the superlative degree; and consequently the range of their utility becomes more contracted. But on all deep clayey loams, that enjoy a humid climate, there is not a more profitable crop than cabbages, in yielding a weight of produce per acre, and in the useful purposes to which that produce can be applied. The comparison in point of utility comes to lie between cabbages and the Swedish turnip, as both plants are raised on similar soils. Taking the expense of cultivating the two plants to be in all points equal, the superiority is usually granted to the Swedish turnip, as it is more nutritive, and can be managed and stored with less trouble; and, from withstanding better the severity of winter, it can be used in a fresher state. The turnip is better calculated to yield fat and muscular fibre in animals, and cabbages to afford milk and the juicy fluids: they are also more laxative; and from whatever cause these qualities may arise, experience shows that the fact is certain. Hence the great value of cabbages for being given to milch cows and to lambing ewes; and the stools are best given whole and uncut, as the animal has a beneficial pleasure in biting the lump, and in exercising its jaws, which engenders a quantity of saliva, very useful in promoting the digestion of the food, and for the secretion of the

nutritious juices. The best use of cabbages may be in being consumed in the early winter, from October to January, and being thus used fresh daily from the field, the mustiness will be avoided that is always found to adhere to a large body of succulent matters in confinement. But a portion of the stools may be preserved for spring use, in feeding the lambing ewes, the great value of the juicy food that is yielded to the animals being more than equal to the distasteful mouldiness that has formed matter of complaint against the storing of cabbages. But if even the one-half of the cabbages can be preserved in a fresh and succulent state, the benefit will be almost incalculable, in having a quantity of juicy food at that most critical season of the year, and the most precarious time to the animal. On the whole, if Swedish turnips are generally preferred, cabbages must not be rejected: the plant yields to none in value and utility, when used under the necessary circumstances of soil and climate, and the means of a profitable consumption.

The Turnip-rooted Cabbage, or the Hungarian Turnip, is a variety of the genus *Brassica*, or the cabbage plant. The seeds are sown on border grounds, where the plants stand over winter, and are planted in the fields in the months of April and May, and receive the same treatment as cabbages in every respect. As the plant progresses in growth, the stem enlarges into a bulb

immediately above the ground, which grows to a very considerable size, and is provided with several protuberances, like warts or tubercles, on the upper part of the bulb, from which the shoots proceed. The bulb is very hard in composition, and is capable of resisting the severest rigour of any winter; but the very fibrous and stringy texture renders it very little useful to the farmer, as it is constantly refused by animals. In the spring, when drought reaches to almost any seclusion, and when some degree of exposure is inevitable, in the act of giving green vegetable food to animals, the juice is very speedily evaporated, and the slices, and even the bulb itself are so much exsiccated, that the remains are nothing more than a quantity of dry fibres joined together, and unpalatable to any animal whatever. One pound of the bulb contains 400 grains of nutritive matter, 320 grains of woody fibre, and 6,280 grains of water. An acre of 14 tons will give 1,881 lbs. of nutritive matter. Here the quantity of woody fibre is greater than in the common cabbage, but not in such a great degree as the vast difference in the nutritious quality of the two esculents would seem to indicate. Neither does the difference in the quantity of nutritive matter, 430 and 400 grs. in one pound of the article, at all account for the very wide difference in the value, which practical experience has so fully established. In addition

to the quality of constituent parts in any article, which are shown by the results of the chemical analysis, there must be some unknown agency exerted from the combination of the elements, and which must be allowed to account for the apparently wide discrepancies that are seen to exist between the investigations of science and the results of practice.

The Green Savoy, or Scotch Kale, is another permanent variety of the common cabbage, with a strong stem, crowned by a large open head of oblong, roundish, broad, thick, cut, curly leaves, but not *cabbaging*, or forming a head. The cultivation of this plant is exactly the same as that of cabbages, with the difference of being thicker planted on the drills, as it requires less room, on account of forming no globular head, and the seeds being sown in the spring, for raising plants to go to the field in June. This property of the plant forming no head, but the leaves remaining open and exposed, very much diminishes the value of this esculent, when compared with cabbages and turnips. The leaves are quickly affected by frosts, and are prone to decay. But no plant that is known to us is more agreeable to animal taste; and from the beginning of October to the beginning of January, or before the frosts commence, the plant will be found of very great service in the feeding of milch cows, young cattle, and sheep. The want of bulbs

renders it ineligible to be kept for winter use, as leaves cannot be stored or kept in any way. One pound of green curled kale gave 440 grains of nutritive matter, 880 of woody fibre, and 5,680 of water. Here, the quantity of woody fibre is greater than in the same quantity of the Turnip-rooted Cabbage — but the value of the two plants lies on the opposite side, even if the comparison be made in the early winter, when the plants are in the most succulent state.

3. Rape and Cole.

Rape and Cole form a species of the genus *Brassica*,— of which the difference is barely perceptible. *Root*, caulescent, fusiform and biennial. *Stem*, somewhat branched, smooth, cylindrical, from one foot to two feet in height. *Root-leaves*, lyrate, almost smooth, divided into deeply-pinnate lobes, which are again irregularly indented or serrated on the edges. *Stem-leaves*, smooth, glaucous, sessile, and an oblong, heart-shaped figure, very slightly toothed on the edges. *Calyx*, yellowish green, spreading as in the *Sinapis*, or Wild Mustard. The leaves do not *cabbage* together, or form a head.

This plant is cultivated in the same way as Turnips; and as it forms no bulb at top or root, to be preserved during winter, it is always consumed on the ground by sheep. It is also sown

in the spring in broad-cast, and eaten on the ground which is sown with wheat; and also on lands from which winter vetches have been raised. It is mostly used in growing great quantities of seed, from which rape-oil is extracted, and the dry residuum is called rape-cake, which is a good manure, and a middling food for cattle, being about one-half the value of linseed cake. A crop of rape, as the plant forms no bulb, is about a quarter the value of turnips.

4. Beet.

The word *Beet* is derived from the Latin word *Beta*, a name given by botanists to a plant which has a resemblance, when it is swelled with seed, to the form of the Greek letter *Beta*, thus β. The plant is a genus of the class and order, *Pentandria Digynia*, of Linnæus, and of the natural order, *Chenopodeæ*, of Jussieu.

Gen. Character: — *Calyx*, perianth five-leaved, concave, permanent; divisions ovate, oblong, obtuse. *Corolla*, none. *Stamina*, filaments five, subulate, opposite to the leaves of the calyx, and of the same length with them. *Anthers*, roundish. *Pistil*, germen in a manner below the receptacle. *Styles*, two, very short, erect. *Stigmas*, acute. *Perianth*, capsule within the bottom of the calyx, one-celled, deci-

duous. *Seed*, single, kidney-form, compressed, involved in the calyx.

ESSENTIAL CHARACTER:—*Calyx*, five-leaved. *Corolla*, none. *Seed*, kidney-form, within the substance of the base of the calyx.

This plant is divided into four varieties. 1. *Beta Vulgaris*, or the Red Garden Beet.— 2. *Beta Cicla*, *Sicla*, or rather *Sicula*, or the White Garden Beet. — 3. *Beta Maritima*, or the Sea Beet. — 4. *Beta Patula*, or the Spreading Beet. A large variety of the *Beta Sicula*, or the Sicilian Beet, has been lately introduced from abroad, under the name of *Mangel-Wurzel*, which in German, means, *Scarcity*-root; and by a very strange translation, it is called in French, *racine d' abondance*, or the root of plenty, as well as *racine de disette*, or the root of scarcity. The name of *Field Beet*, is more appropriate.

Beet has been long known in Germany, whence it was introduced into England, at the latter end of the last century, chiefly by the recommendation and example of Dr. Lettsom, a medical gentleman of great reputation, and one of the Society of Friends. The best improved variety has a red skin, and when cut through, it appears veined with red, in concentric circles. The White Beets, of a smaller size, are preferred for the extraction of sugar from the juice, as they are found to con-

tain a greater proportional quantity of that substance. Mangel-Wurzel has a large, long, reddish, or sometimes whitish red root, — and very large, oblong, thick, succulent, leaves. The taste is nsipid and unpalatable; but the leaves being large and succulent, are good to use occasionally, in the manner of common beet; and particularly to boil like spinach, or put into soups,— and the stalks and midrib of the leaf to be stewed and eaten as asparagus. Dr. Lettsom has written, that he grew roots of the average weight of ten pounds; and if the leaves be calculated at half that weight, there would be fifteen pounds of nutritious aliment on every square eighteen inches of ground.

In Britain, beet-root is planted on land that has been fallowed, drilled, and dunged, as for turnips and cabbages; and the seeds are inserted on the drills at the distance of six inches, in holes made by the hand-dibble, at the rate of 4 lbs. to an acre. Of late years, the seeds have been deposited by a drill-machine, provided with a cylinder and cups, being previously steeped for forty-eight hours in urinary water, suds, or lees, and dried with quick lime, to suit the purpose of being sown. In both ways of planting, the drills must be rolled without delay. The quantity of lime that adheres to the moistened seeds has been proved to give a superiority to the crop, arising from the speedy decomposition of the albumen

which the seed contains, and which is so beneficially converted into food for the young germination. And when a plant acquires a superiority at this stage of growth, it never loses it during the season.

So soon as weeds appear on the land, the intervals of the drills must be horse-hoed and scuffled, as described in the cultivation of cabbages, and performed with the same implements; for the two plants are suitable for similar soils, or what are called the stiffer green-crop soils. At the same time, the plants on the drills are thinned to the distance of twelve to eighteen inches from each other. The sides of the drills and the intervals between the plants must be moved by the hoe, and well broken and pulverised. The horse-hoeing of the intervals must be frequently performed during summer, in order to encourage the growth of the plant, by pulverisation and exhalation. Two or three hand-hoeings will also be required. Any tall weeds that may arise during the latter part of the summer, must be pulled by hand, and no weed must be allowed to grow. Earthing up of the drills, by the double-mould-board plough, is not approved; as the earth laid against the sides of the plants, encourages the growth of lateral fibres, which in every case impart a bitterness and a coarseness to all plants that nature has provided with a tap-root. The upright tapering plant, standing from

twelve to eighteen inches above ground, with one root projecting downwards, is always found to be the soundest, the most palatable, and the most nutritious.

In autumn, the outer leaves of the beet-root plant begin to droop, and to show symptoms of decay. Some persons recommend that these leaves be gathered, by being stripped from the plant, and given to young cattle or sheep, while others assert, that the future growth of the plant is hurt by the leaves being pulled, as they perform a functional part in the process of growth. But it may be very reasonably supposed, that leaves which are in decay, and which are nearly parted from the stem, have ceased to perform any office, and that the removal of them cannot be hurtful; and this observation has often been confirmed by practice. In the end of October, the crop is removed from the field, by being pulled by hand, the earth and roots neatly cut away, and the plants carried to the homestead, where they are built into a pile of about six feet in width at bottom, and about four in height, tapering into a narrow ridge at top, with the the thick end of the plant outwards, on the sides of the pile. The pile is generally covered with earth, about one foot in thickness, with a thin covering of straw next to the plants. But a covering of straw in the form of thatch, may be preferable, as it will admit air, to prevent the

sweating of the roots; and severe frosts may be met with a covering, timely applied, of fresh stable dung in the strawy state.

In this way, beet-roots may be kept in a very fresh state till May and June in the year after they are grown. The tops and leaves are given to young cattle and sheep; but cautiously to cattle, as they are apt to distend the animals, from the quantity of the gaseous fluids which they contain.

Beet-roots, either in a raw or steamed state, are very beneficially given to milch cows throughout the winter, and are found to increase the quantity of milk very much; but the milk is thought to be thin and more watery in quality. In a raw state, there is no better food for store pigs and young cattle. In the feeding of cattle, opinions differ about the value of beet-root when compared with Swedish turnips: the most general opinion prefers the latter, and the experiments made by feeding animals of equal age and of the same breed on the two different roots, have proved altogether inconclusive, because no two animals, of any age or breed, can be found to increase in equal weight in the same time from a given quantity of the same food. Beet-root is equally grateful to sheep; and in the spring months of the lambing season, the greater juiciness of the root places it above any other plant in point of utility; and in that respect, and at that

season of the year, it is most assuredly superior to the Swedish turnip, where milking and not fattening is required. And the preserving of the roots in a fresh state till March and April, is a matter of no difficulty.

Beet-root yields a greater weight per acre, both in roots and leaves, than any other green crop yet known, and must be placed at the head of the cultivated plants. Probably, from a long cultivation, and a gradually extended exposure, the plant may become acclimated, and withstand the severity of winter as well as turnips. This result might be tried for, by planting the roots of the strongest and most vigorous appearance, and by preserving the seed for future propagation, of those plants that escaped destruction during winter, and bore seed the next summer. By persevering in this way for a period of years, it is very probable that the persistent quality might be conferred. Beet-root contains 150 parts in 1000 of nutritive matter; is inferior to potatoes in the ratio of 150 to 200: it is superior to turnips and carrots, and inferior to cabbages. An acre of twenty-five tons of green food will yield 3120 lbs. of nutritive matter, and 100 lbs. of the roots contain $16\frac{2}{3}$ lbs. of nutritive matter.

Einhof states that eighteen tons of *mangel wurzel* are equal to fifteen tons of *ruta baga*, or seven and a half tons of potatoes, or three and three-quarter tons of good meadow hay, each

quantity containing the same nourishment; but then the above quantity of roots can be grown on less than an acre, whereas it will take about three acres of meadow land to produce the equivalent quantity of hay; and of all the root crops, the least exhausting for the land is beet.

It was early observed, that beet-root was a plant of a very saccharine nature, and that a crystallisable sugar was easily obtainable from the juice of the roots. The manufacture of beet-root sugar sprung up in France, under the superintendence of Chaptal, the eminent chemist, in consequence of the decrecs which were issued to exclude the colonial produce of Britain. When the sugar is refined, it cannot be distinguished from the cane-sugar, either in taste or appearance. Five tons of clean roots produce about four and a half cwt. of coarse sugar, which give about 160 lbs. of double-refined sugar, and 60 lbs. of inferior lump-sugar. The rest is molasses, from which a good spirit is distilled. By distilling the juice of beet-root, after it has undergone the vinous fermentation, a very good spirit is obtained, and also a kind of beer, which is said to be pleasant and wholesome in warm weather.

Professor Lampadius obtained from 110 lbs. of roots, four lbs. of well grained white powder sugar; and the residue afforded seven pints of spirit. Achard says, that about one ton of roots produced 100 lbs of raw sugar, which gave 55 lbs.

of refined sugar, and 25 lbs. of treacle. This result is not very different from that of Chaptal in France.

Another variety of beet has been lately introduced, called "Turnip-rooted," or "Orange Beet." There has not yet appeared to be any difference in the quantity or quality of this variety that is deserving of notice.

5. Carrots.

The word *Carrot* is derived from the Greek *καρωτος*, *Pastinaca tenuifolia*, or "Slender-leaved Parsnip," so called in Greek, because it was thought to give to the eaters of it a *carum*, or pleasant relish; or from *καρυων*, from the sweetness of the taste. The plant is the *Daucus* of botanists, from the Greek word *Δαυκος*, a certain plant of Crete, mentioned by Dioscorides and Hippocrates; but evidently confounded by these writers and by Theophrastus with the *Athamanta*, the Cretan Spignel, or the Candy Carrot, which grows abundantly in that island, and of which a species is found on Gog-Magog Hills in Cambridgeshire. The carrot belongs to the class and order *Pentandria Digynia* of Linnæus, and to the natural order *Umbelliferæ*, or *Umbellæat*.

Generic Character:—*Umbel*, compound —concave when in fruit. *Involucrum*, of several

pinnatifid leaves. *Calyx*, superior, obsolete. *Corolla*, petals, five, inversely heart-shaped, inflexed, the outer ones large and radiant. *Stamina*, filaments, five, capillary, spreading. *Anthers*, roundish. *Pistillum*, germen inferior, small, elliptical, compressed, rough. *Styles*, two, reflexed. *Stigmas*, blunt. *Peria*, none. *Fruit*, ovate, hispid. *Seeds*, two, elliptic, oblong. Central flower of each umbel abortive.

ESSENTIAL CHARACTER: — *Involucrum*, pinnatifid. *Corolla*, somewhat radiant. *Fruit*, muricated. *Central Flowers*, abortive.

The *Daucus Carota*, or the Common Carrot, is biennial, and flowers from June to August. It grows very common on pastures, banks, and head-lands. The umbel is at first a little convex, but becomes gradually flat, and then as the flowers are going off, more and more concave, till it forms a perfect basin, in its seeding state, resembling a bird's nest. From this circumstance it has received the name of bird's nest, or bee's nest. In the wild state, the root of the carrot is hard, slender, fusiform, and whitish or brownish in colour. *Stem*, upright, grooved, hispid, two feet high, with alternate branches, which are long, commonly from six to seven, to nine or ten inches, have one leaf on them, except the primary or terminating one, which is naked, and have a single umbel of flowers at top; bottom and prin-

cipal leaves, sheathing tri-pinnate, the last pinnule toothed, and terminated by spinules, the nervcs hispid — the flowers are white, those in thc middlc sometimes tinged with purple; these are fertile, but those in the circumference which are irregular, and larger than the others, are frequently either neutral, or have pistils only. The fruit is spheroidal, composcd of two plano-convex seeds, on the back of which are four membranaceous narrow crests, pectinated with linear, setaceous, innocuous, flexible, teeth; and between these, three raised nerves, having very minute prickles on them, along each side, bowing outwards; the belly is flat, or slightly concave, marked with obscure, longitudinal streaks.

Carrot seeds have been recommended as a powerful diuretic; and an infusion of them has bccn found to give relief in fits of the gravel and stone. The roots are good bait for catching moles, and for destroying crickets, when made into a paste with wheat meal, and powdered arscnic; and are also used for poultices to mitigate the pain, and abate the stench, of foul and cancerous ulcers. When grated fine, or boiled and mashed to a pulp, and applied without the intervention of lint, the poultice has a truly surprising effect in abating the intolerable pain, and in correcting the shocking fœtor that attends these dreadful disorders. A very good spirit may be distilled from carrots; and the refuse will be

exeellent for feeding swine. Carrots were introduced into England from Flanders, about the year 1600.

Carrots delight to grow in deep, warm, light loams, with a dry and porous subsoil, whieh must be prepared by fallowing and eleaning, as for any other green erop, and is best done in autumn, after the removal of a eorn erop. The land should be so rieh by previous cultivation as to produee a crop of earrots, without the application of manure with the earrot seed, as the eontaet of fresh dung never fails to eneourage a large growth of lateral fibres, and a profusion of leaves, which very mueh deteriorate the value of the root. When dung is applied, it should be well rotted, and short. The seeds must be steeped in water and saltpetre, six quarts to one pound, and then spread on a floor till the sprout appears, and then sown; or they may be enerusted with quiek lime, when taken from the steep. The land being wrought and harrowed fine, earrots are best sown by a maehine, with lengthened eoulters, whieh make ruts in the ground for reeeiving the seed. The plant is not of very quick growth, and therefore requires early sowing, in Mareh and April, at the rate of two or three pounds to an aere. As the plant grows upright, and does not require much lateral room, the drills may be about eighteen inehes wide, which will admit a light searifier to horse-hoe the intervals. When

the plants are about three inches high, they are thinned out by hand to the distance of six inches from each other. The horse and hand-hoeing must be repeated till no weeds appear.

Carrots are not easily hurt by frost. They are generally raised from the field in November, and housed or pitted, some persons using sand and saw-pit dust to lay the roots in the heaps, thatched with straw like beet. The tops are cut off by hand-sickle, and the extreme tap-root and the earth are carefully removed, after being raised from the ground by pronged forks. The tops are very much relished by pigs, and the roots in a raw state by horses, and also by cattle—and a very profitable use consists in steaming the roots for fattening hogs, and then mashing and mixing them with meal. Sheep also thrive well on sliced carrots.

Carrots are a very nutritious plant, containing 98 parts in 1000 of soluble matter; they are more nutritive than cabbages in the proportion of 187 to 107½, and superior to Swedish turnips in the ratio of 187 to 110:—64 drams afforded 187 grains of nutritive matter, 100 grains of which consist of 95 of sugar, mucilage 3, and extract 2. The white variety contains 98 of sugar, mucilage 1, and extract 1.

An acre of carrots will yield about 10 to 16 tons in weight, and 2640lbs of nutritive matter, — the White Belgian variety, lately introduced,

will give much more, the tops and the roots of it being much larger than in the Attingham and Orange varieties, the two kinds that are generally used. But a greater bulk usually induces a coarseness in all organised bodies.

6. PARSNIPS.

THE origin of the word *Parsnip* is not very clearly defined — the last syllable is referred to the Saxon word "nepe," which occurs also in turnip. It is often written *Pastnip*, and the derivation referred to *Pascendo*, in Latin, from animals eating it so eagerly. The plant is the *Pastinaca* of botanists, which word is derived from the Latin verb, *Pasco*, to feed, or from *Pastus*, a pasture, on account of the nourishing qualities of the roots. Linnæus rather considered the name to be derived from *Pastinum*, a forked tool, used in digging or planting vineyards, which the root of the *Pastinaca* resembles. It belongs to the class and order, *Pentandria Digynia*, of Linnæus, and to the natural order, *Umbelliferæ*, of Jussieu.

GENERAL CHARACTER:—General umbel, of many rays, flat; the partial umbel of many rays. *General involucrum*, none. *Partial*, none. *Perianth* obsolete. *Corolla*, the universal one, uniform,—

Flowers, all fertile, partial corolla, of five lanceolate, involute, undivided petals. *Stamina*, filaments, five, capillary. *Anthers*, roundish. *Pistillum*, germen, inferior. *Styles*, two, reflexed stigmas, obtuse. *Pericarp*, fruit much compressed, elliptical, divisible into two parts. *Seeds*, two, elliptical, girt round the margin, nearly flat on both sides.

ESSENTIAL CHARACTER: — *Fruit*, elliptical, compressed, almost flat. *Petals*, involute, entire. *Involucrum*, neither general nor partial.

There are three species of the Parsnip. — 1. *Pastinaca Lucida*, or the Shining-leaved Parsnip —2. *Pastinaca Sativa* or the Common Parsnip. —3. *Pastinaca Opopanax*, or the Rough Parsnip.

The Common Parsnip has two varieties; *Pastinaca, Sylvestris*, or the Wild Parsnip; *Pastinaca Sativa*, or the Garden Parsnip.

Our description is limited to *Pastinaca Sativa* or the Common Parsnip. The plant is a native of South Britain, and of the south of Europe, on hills, and in the borders of fields, on a calcareous soil. It flowers in July. Root, biennial, spindle-shaped, aromatic, sweet, but acrid. Stem, three feet high, erect, branched, angulated, furrowed, roughish. Leaves, pinnate; leaflets, from five to nine, cut, or serrated, the terminal one, three-lobed. Flowers, small, yellow, in terminal, solitary, erect, roughish umbels of many rays.

Fruit, large, elliptical, flat, ribbed, smooth, and when ripe, light brown in colour.

The highly saccharine juice of parsnips is found to render it very nutritious for various kinds of animals. The roots are sweeter than carrots, and are brewed (instead of malt) with hops, and fermented with yeast. The liquor is very agreeable in taste. Parsnips contain, in 1000 parts, 99 of soluble matter.

Parsnips require for their profitable growth, a rich, deep, sandy loam, which may be very much fitted for their use, and for that of all tap-rooted plants, by the act of sub-soil ploughing the land and deepening the staple. Parsnips are sown in March in the same way as carrots; and the after-culture of the root is exactly the same. The roots are also stored in the same manner for winter use. It has been recommended to raise the plants of parsnips like cabbages, the previous summer, and to transplant them in the field in the spring. The plants are not easily hurt by frost.

Pigs are very fond of parsnips, which make their flesh very white. Milch-cows fed with them give much milk, and yield a butter that is very well-flavoured. For horses, the use of parsnips seems not to be recommended. The tops of the plant are good litter for the yard of the store pigs, that pick and eat what part they please. The best use of the roots is, in being given to

store pigs in a raw state, or steamed, and mashed with meal and given to the feeding hogs in troughs. When the roots are boiled, the liquor may be mixed and thickened with meal, and will form a very good food for swine. The steamed roots of parsnips are very grateful to milch cows, when mixed with chaff, and steamed together in the vats, whereby the chaff is impregnated with the volatile juices of the root which are expelled by the heat, and would otherwise be lost.

The case of carrots and parsnips shows how very little reliance can be placed on the nutritive qualities of plants as shown by chemical analysis, in reference to the practical use. The two plants now mentioned, are at the head of nutritious esculents — yet the use in practice is at the bottom of the list. The cultivation is more troublesome and expensive, and the storing of the roots, and the preparation of them for use, add very considerably to the cost. Parsnips are best when steamed, and carrots in a raw state. Turnips are best when raw, but the case of potatoes is yet undecided. In all cases of a raw state of an esculent root, or of preparation by steaming, or boiling, very much, if not all, depends on the organic constitution of the animal which consumes the substance. The peculiar and invaluable property of the turnip, consists, in the ease of cultivation, and in its

being best adapted for the use of every animal of the farm in a raw, or unprepared state, whereby the cost of preparation is avoided. And though such a plant as the turnip, that contains about 90 per cent. of water, never would be recommended *a priori* as a nutritive substance, yet, practice and experience, against which there is no arguing, have most amply and satisfactorily established the fact, that for general utility in the keeping and feeding of animals, the turnip has no equal when all circumstances are considered.

IV. THE TUBEROUS PLANTS.

1. Potato.

All etymologists agree in deriving the word *Potato* from the South American word *Battatas*, which was corrupted by the Spaniards into *Patata*, and by the Italians into *Patato*. The English spelling of the word alters it by changing one letter only.

The Potato Plant is a South American species of the genus *Solanum* of botanists, which word

has been referred to the Latin noun *Solamen*, in allusion to the comforting quality of the edible roots, comprising the *potato*, *tomato*, and the *egg plant*. This might, indeed, apply to the Potato, if those who gave it that name, could possibly have had it in contemplation. Another derivation, *a sole*, from the sun, carries no more conviction along with it than the first; nor can we for a moment admit the true orthography to be *Sulanum*, from *Sus*, because the plant is useful to swine. The word *Solanum* must be left among the few ancient names, whose source cannot be traced.

The *Solanum* belongs to the class and order, *Pentandria Monogynia* of Linnæus, and to the natural order, *Solaneæ* of Jussieu.

The Generic Character:— *Calyx*, perianthium one-leaved, half five-cleft, erect, acute, permanent. *Corolla*, one-petalled, wheel-shaped; tube very short; border large, half five-cleft; form reflex, flat, plaited. *Stamina*, filaments five, awl-shaped, very small. *Anthers*, oblong, converging, sub-coalescent, opening at the top by two pores. *Pistillum*, germen roundish. *Style*, filiform, longer than the stamens. *Stigma*, blunt. *Pericarpium*, roundish, smooth, dotted at the top, two-celled, with a convex fleshy receptacle on each side. *Seeds*, very many, roundish, nestling.

ESSENTIAL CHARACTER:— *Corolla*, wheel-shaped. *Anthers*, sub-coalescent, opening at the top. *Berry*, two-celled, superior.

The *Solanum* is a very extensive genus, comprising the various kinds of night-shade, and other deadly plants, along with many esculents, as the potato, the tomato, and the egg plant. Notwithstanding the rude and irregular habit of the genus, the flowers are often so handsome as to attract much notice, and the fruit is, in some cases, very striking and ornamental. The stem is branched, herbaceous, or shrubby, smooth, hairy, or prickly. Leaves, alternate, simple, or compound, lobed, cut, or entire; sometimes prickly. Inflorescence, often lateral, and extra-axillary. Corolla, blue, purple, white, or yellow. Fruit, yellow, or red, rarely black, or white. The herbage is fœtid, narcotic, and dangerous. Flowers, without scent. Fruit, often very nauseous, and in no instance eatable without dressing.

The species are disposed in three sections:—1. *Unarmed;* containing twenty species, and among them, the common potato, and the night-shades.—2. *Prickly;* containing thirty-eight foreign species, but none British.—3. Branches ending in thorns, containing one species, or the *Solanum lycioides*, or the Boxthorn Night-shade, supposed to be a native of Peru, and forming a

stove-plant in England, flowering in May and June. Besides the plants above enumerated, it is supposed that many yet remain unsettled, of which we have only got imperfect, or uncertain specimens. Mr. Brown defines fourteen new species from New Holland; and the tropical regions of Africa, probably, may possess many more.

The *Potato* is the *Solanum tuberosum* of botanists, so called, from forming tubers at the root. Stem, herbaceous; leaves, pinnate, quite entire; peduncles, sub-divided. Stem, from two to three feet in height, succulent, somewhat angular, striated, slightly hairy, frequently spotted with red, branched; the branches long and weak. Leaves, interruptedly pinnate, having three or four pairs of leaflets, with smaller ones between, and one at the end larger than the rest; the leaflets are somewhat hairy, and dark green on the upper surface. The flowers are either white, or tinged with purple; or, as old Gerarde describes them, of a light purple, striped down the middle of every fold, or welt, with a light show of yellowness. The fruit is a round berry, the size of a small plum, green at first, but black when ripe, and containing many small, flat, roundish, white seeds. A native in Quito, in South America.

The history of the Potato, and of its introduction into Europe, is involved in some obscurity,

but the most common opinion ascribes the first general notice of the plant to the illustrious but ill-fated Sir Walter Raleigh, who, on his return home from America in the year 1623, stopping in Ireland, distributed a number of the potato roots in that kingdom. There they multiplied rapidly. But it may be surmised, that it was known before that time, as Gerarde, in his "History of Plants," written in 1597, speaks of two kinds, the "Common and the Virginian," which he cultivated in his garden. Be this as it may, no man need wish for a stronger claim to immortality than the individual has raised for himself, who found, and brought the potato from distant shores—for in so doing, he conferred a greater gift on mankind than kings and princes can bestow.

The varieties of the potato plant are very numerous, and have arisen from casual and intended impregnation, aided by the natural influences of soil and climate.

The two great divisions, are the colours of red and white; and though no very particular quality attaches to any shape or colour of the root, yet there is generally some peculiar modification of it in the form or taste, that renders one variety preferable to another. Thus, the oblong, or the kidney-shaped varieties, are more mealy than the round-shaped roots, in the early part of the season, but less so as the season advances — and

they are generally less productive, and require the superior soils. The round varieties are the most productive and most vigorous in the stem, but are more watery in their composition, and less agreeable to the taste, than the kidney-shaped varieties. There are many modifications in each variety; but, in general, the above observation holds good.

The potato is propagated by using the tubers in cuts or slices, each cut containing an *eye* or bud root, whence the germination proceeds. As the set or cut has to support the germination, until the roots are grown to draw nourishment from the earth, it should not be very small, but contain a fair portion of the tuber to be used in decomposition. A common-sized potato will form four useful sets. The tubers are attached to the stem root of the plant, or to each other, by a strong radicle; and at the end that is opposite to this radicle, the *eyes*, or bud roots are placed. The potato should, therefore, be cut into slices longitudinally, in order to give to each *eye* a fair share of the body of the tuber. The *scooping* out of the *eyes* to be used for sets, failed, as the infant nourishment was wanting—and the planting of the tubers, whole, or uncut, has not been attended with any advantages above the mode of slicing the potato into strong sets.

Potatoes like a strong deep warm loam, with a dry porous subsoil — a soil not adhesive to a

viscous clamminess, nor open to an unconnected pulverulence. It must possess stiffness, rather openness, and be moist rather than dry. The land is ploughed, wrought, and cleaned, as is done for turnips and other green crops: the farm-yard dung is used in a fresh half-rotten state from the yards, or from a heap laid together without being turned over. By the first week in May, the land will be ready, and must be drilled into ridges of thirty inches apart, by the common plough, in the way described in the article *Turnips*. The dung is brought forward, pulled from the carts into heaps in the drills, and spread immediately. Potatoes being juicy plants, require the dung to be in a very moist state; and it is better when the planting of the roots can be done with the land in a moist state, and the weather also damp, but not sufficiently wet to render the soil clammy and adhesive. The potato sets, *fresh-cut*, are brought to the fields in bags, and are deposited in the hollows of the drills without delay, at the distance of eight to twelve inches, by persons carrying the sets in baskets, and who walk in the hollows of the drills, and place the weight of their foot on each set as it is placed on the ground, in order to place it firmly in its position. Two or three ploughs follow closely on the process of planting the sets, and cover the dung by splitting and reversing the drills, the plough being provided with a main

tree of five feet in length, which, by stretching over two drills, enables the horses to walk widely apart, the near side animal always walking on the top of the left side drill, which prevents any jostling of the sets in the hollows of the drill by the feet of the animal. The drills should be deeply made, and very deeply reversed, in order to throw a heavy covering of fresh earth over the dung and the sets. The drills may then be rolled with the farm light roll of six cwt.

So soon as weeds are seen, and the braids of the young plant have fully appeared, the hollows of the drills must be cut and scarified deeply and repeatedly, by the skeleton plough and the light scuffler; the hand-hoeing following, and intervening between each scuffling process, breaking every clod and completely pulverising the soil between and along the sides of the young sets. Both the tops and the intervals of the drills must present an entire mass of finely broken and comminuted earth, in which not one single weed can be seen: and this result is to be obtained by the continual action of the horse and hand-hoe. In the end of July, when the growth of weeds has been extinguished, and the stem and leaves of the plants have become large and overshadowing, the drills must be earthed up, by a double-mould-board plough, drawn by two horses, moving in one hollow, and one horse on each side in the adjoining hollow, a main tree of five

feet in length stretching over two drills as before. The plough must move deeply, and throw up as much earth as possible to the roots of the plants. In about fourteen days after the first earthing up, when the earth will have again crumbled down into the hollows, the process must be again repeated, as before described. This last earthing up of the drills is often attended with very signal benefits to the potato plants. The plucking away the blossoms of potatoes, in order to increase the quantity of tubers at the root, has been often tried, and has as often failed.

The decay of the haulm or stem of the potato plants, and the ripening of the berries, are the signs of maturity, which generally happens in October in the British Isles. The crop of roots is then raised. The stems are pulled by hand; the tubers and the earth are carefully shaken off; and the haulm is then carried to the farmery, to be laid in the bottom of the feeding yards, or laid on a compost heap, or thrown in the liquid manure tank. The stems are slow of decomposition. When the tubers are raised by forks, the stems are thrown into heaps on the field, after being divested of the earth and roots, and are afterwards carted away at convenience. It has become very common to raise the crop by means of the common plough, which lays over the drill by one furrow. The furrow slice requires to be moved and searched by hand forks.

It may be stated from experience, that the raising of potatoes by means of three pronged hand forks is the preferable mode, where one person to each drill raises the roots, and another person gathers the roots into a basket, and deposits them in carts that are stationed on the field, and which are regularly drawn home and emptied, and returned to the field. The land is more pulverised by the forks than by ploughing up the roots, and the tubers are got with more certainty. In either way of gathering the roots, a double tine of harrowing is useful, in dragging to light any root that has escaped observation in digging. The tubers must be carried in a *dry* state, to a dry ground at the homestead, and there piled up in a longitudinal heap, about six feet wide at bottom and four feet high, and covered with a thatching of straw or turf, and with earth to the thickness of one foot. If frosts uncommonly severe should occur, the danger of damage may be easily averted, by covering the potato piles with rough strawy dung from the stable yard. There is no better preventive of frost. In this way, potatoes may be kept quite fresh and wholesome till the month of May, following the year of production.

The list of cultivated plants does not comprehend any one that is nearly so useful as the potato. From the tables of princes and peers down to the dinner of the humblest labourer, the potato holds a place; and for the use of animals,

no one plant can be compared to it. For human food, the use of the root is well known. For horses, it is equally useful in a raw, or in a steamed state; for cattle, the raw state is preferable; for sheep, the roots do not seem eligible; for swine, the best conducted experiments have shown, that the cooked state of the roots is preferable for the feeding of bacon, though the raw state may be equally beneficial for store pigs. When steamed and mashed, and mixed with meal, the roots are very excellent food for poultry, when given to them in troughs. And the last use, and not the least in the estimation of some persons, is, that in a half-rotted state from the effects of frost, when left in the fields where it has grown, and when laid above the earth in order to be devoured, the root forms the best food that is yet known for pheasants, as is shown by the choice of the animals. This last observation alludes only to the general utility of the root, and is not in favour of such application.

Potatoes will produce, on the proper soils, an average of fifteen tons per acre, which will give 4,800 lbs. of nutritive matter, each pound yielding 1,000 grains. The red potato has given, in 64 drachms, about 250 grains of nutritive matter, which consisted of starch 204, and 46 of saccharine, mucilaginous, and albuminous matters. Potatoes are superior to Swedish turnips in nutritive matter, in the ratio of 200 to 64, and to

beet-root in the ratio of 200 to 150, and to cabbages in the ratio of 200 to 73. One hundred pounds of potatoes yield twenty-five pounds of nutritive matter. The most recent analysis of the potato tuber gives the composition as under:—

Water	74.2
Pulp	6.8
Starch	13.3
Albumen	0.9
Sugar	3.3
Fat	0.1
Acids and Salts	1.4
	100.0

The quantity of water that is contained in the turnip and potato, 89 and 74 per cent., affords a most notable instance of the very little reliance that can be placed on the results of chymical analysis, as an indication of the nutritive properties of any vegetable substance. No science would recommend *a priori* any plant for profitable use, that contained so large a per centage of water, if the quality were not previously known; neither is the difference in the quantity of water in the potato and the turnip sufficient to account for the vast difference that exists between the two plants in point of nutritive

value. For most purposes, the potato is improved by boiling and steaming; while the turnip is equally unfitted by that process for general use. The ease and little trouble that attend the cultivation of the potato and the turnip, as compared with cabbages, beet-root, carrots, and parsnips, very much enhance the practical value, while the greater readiness in storing, and in the process of application to animals, tends further to increase the general estimation. If the first place in point of general utility must be conceded to the turnip in the various cases of soil and climate, and the most extensive use of the root, the second must be yielded to the potato without hesitation, and almost in the same breath. The prejudices that exist against the potato, arise wholly from want of consideration, and from hasty conclusions. The plant is said to exhaust the soil, but there is no evident proof; on the other hand, practice always shows a finely pulverised soil after a crop of potatoes, arising from the stirrings which the land undergoes during the raising of the crop of roots. The culture of potatoes forms a very good preparative for wheat; and grass seeds have ever been observed to take a quicker hold, and to thrive more kindly on potato grounds than after any other green-crop culture. The crop is also sold away; whereas, turnips are consumed on the farm, so that in point of a returning quality, or

value in point of manure, no fair comparison exists.

Potatoes may be planted in the usual way in October and November, and will, notwithstanding the danger of the frost, yield a larger produce. They will be a month earlier than the spring-planted sets, which is a matter of some consequence in a precarious climate, where the land is to be sown with wheat after the crop of potatoes is raised. These facts are now most fully confirmed by experience.

In the year 1845, the potato was attacked by a disease called the *rot*, or *murrain*, which destroyed, in that and the subsequent years, full half the crop, and reduced the poorer classes of the people almost to starvation, and raised the retail price to three half-pence and two-pence per pound. Late in July, 1845, accounts were received from the Isle of Wight, that the potato haulm and leaves were attacked by some unknown disease, which produced a series of black spots, accompanied by a nauseating odour, and was succeeded by a rapid and entire decay of the herbage. In England, the same effects were observed in August; and by the end of the month, the black, or dingy brown marking of the leaves, was noticed in most parts of the kingdom. The subsequent progress of the malady on the roots may be stated, in saying, that the spottings and ulcerous erosions on the pulps

of many tubers, and the entire fermentative decay of others, wherein the condition of the pulp was brought to the condition of thick ropy yeast, with a development of ammonia, marked the final condition of the vegetable, so far as the malady had been extended; and thus the matter rested, till the season occurred for planting the crops of the next year.

Such a calamitous occurrence did not fail to attract much notice; and the Government felt interested in an affair pregnant with such great mischief to the sustentation of the people, and the quietude of society. Scientific investigations were instituted to the expense of £19,000, but ended in no particular result. Observation and conjecture were also very busily employed; but beyond the most evanescent suppositions, nothing has yet been advanced, with respect to the cause or cure. Spotted leaflets from a most luxuriant herbage, were repeatedly examined and dissected. A white suffused mealiness had been first observed round the spots, but only upon the under surface of the leaves; and this, when an atom of the cuticle covered with it was placed under a powerful magnifier, was immediately discovered to be a *fungus*, most likely to be a *borytis*, consisting of delicate fibres, arising from a reticulated web-like system, and supporting at some of their summits, egg-shaped, brownish, semi-transparent spores. The elevated fibres were *hygrometric*,

for when touched by the breath during inspection, they rotated from their bases, carrying round with them the spores, which, in some instances, were seen to explode. Hence it may be concluded, that a *fungus*, or *mouldiness*, is a concomitant of the early stage of the malady; but *how* that can be reckoned the *primary* cause of the disease does by no means appear, since, in itself, it is, in most instances, the result of fermentation and decay. The safest scientific conclusion is, that the disease proceeds from electricity, as induced by direct solar power; and recent discoveries have tended to prove, that electricity, magnetism, and light, are intimately connected. The malady must be considered as an *epidemic*, which can only disappear with the absence of its exciting cause.

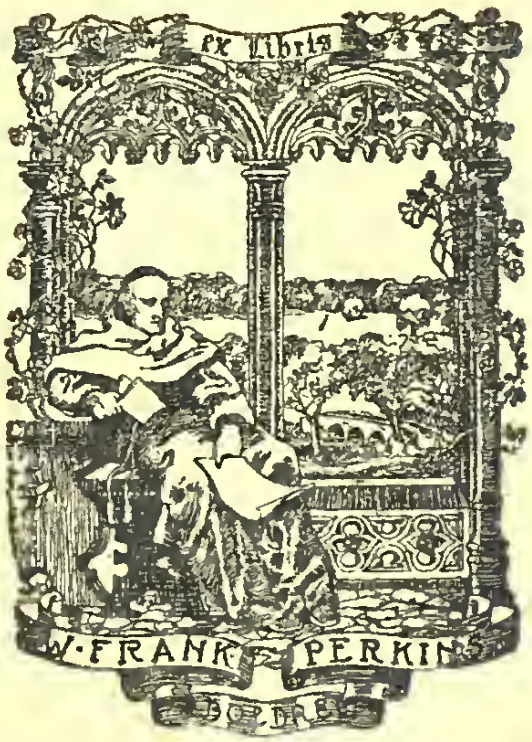
The most plausible practical theory that has been put forth for the cure of the malady is, that as autumn-planted potatoes yield much the largest crop; and as the disease in the plant does not appear till late in July, or in August; and as the autumn-planting is, at least, a month earlier in growth; the planting of the roots in autumn might probably push the vegetation so much earlier, as to place it beyond the reach of affection, and beyond the power of receiving the atmospheric taint: at an advanced state, it may not be so liable to be affected.

A similar affection has partially appeared in

the turnips, and the white poplar tree; but as *only* the leaves of the turnips showed decay, doubts may be entertained if the disease be strictly generic.

The crops of potatoes were nearly affected in an equal degree in the years 1845, 1846, and 1847.

Wertheimer and Co., Printers, Finsbury Circus.


ex Libris
W·FRANK PERKINS

CULTIVATED PLANTS OF THE FARM

DONALDSO