be nipped off when of a proper size; and there would be a succession of fresh ones for at least two months.

It being a perennial too, the roots might be transplanted into beds like those of asparagus.—*Bryant's Fl. Diæletica, p.* 64.

532. SPEEDWELL. *Veronica spicata.*—This is used by our common people as a substitute for tea, and is said to possess a somewhat astringent taste, like green tea.

533. SPOTTED HAWKWEED. *Hypochæris maculata.*—The leaves are eaten as salad, and are also boiled.

534. STINGING-NETTLE. *Urtica dioica.*—The young shoots in the spring are eaten boiled with fat meat, and are esteemed both wholesome and nutritive.

535. SHRUBBY STRAWBERRY. *Rubus arcticus.* — The fruit of this plant is very similar in appearance to a strawberry: its odour is of the most grateful kind; and its flavour has that delicate mixture of acid and sweet, which is not to be equalled by our best varieties of that fruit.

536. SWEET CICELY. *Scandix odorata.* — The leaves used to be employed in the kitchen as those of chervil. The green seeds ground small, and used with lettuce or other cold salads, give them an agreeable taste. It also grows in abundance in some parts of Italy, where it is considered as a very useful vegetable.

537. WATER-CRESS. *Sisymbrium Nasturtium.* — A well known herb in common use, but is not in cultivation, although it is one of our best salads.

538. WILLOW-HERB. *Epilobium angustifolium.* — The young shoots of these are eaten as asparagus.

SECTION XI.—*PLANTS USEFUL IN DYEING.*

THERE is no department of the œconomy of vegetables in which we are more at a loss than in the knowledge of their colouring principles; and as this subject presents to the student an opportunity of making

many interesting and useful experiments, I trust I shall stand excused, if I enter more fully into the nature of it than I have found it necessary to do in some of the former sections.

The following list of plants, which is given as containing colours of different kinds, are the same as have been so considered for many years past: for, latterly, little has been added to our stock of knowledge on this head. It may however be proper to observe, that a great number of vegetables still contain this principle in a superior degree, and only want the proper attention paid to the abstracting it.

Most of our dyeing drugs are from abroad; and even the culture of madder, which was once so much grown by our farmers, is now lost to us, to the great advantage of the Dutch, who supply our markets. But there is no reason why the agriculturist, or the artisan, should be so much beholden to a neighbouring nation, as to pay them enormous prices for articles which can be so readily raised at home; and, according to the general report of the consumers, managed in a way far superior to what it generally is when imported.

Let the botanical student therefore pay attention to this particular; for it is a wide field, in which great advantages may be reaped, either in this country or in any other part of the world where he may hereafter become an inhabitant.

The art of dyeing, generally considered, is kept so great a secret, that few persons have had the opportunity of making experiments. The extracting colours from their primitive basis is a chemical operation, and cannot be expected in this place; but as some persons may be inclined to ascertain these properties of vegetables, I shall go just so far into the subject as to give an idea of the modes generally used; and to state the principles on which the colouring property is fixed when applied to the purposes of dyeing cloth.

In the article Madder, page 32, I mentioned having made an extract similar to the Adrianople red. For which purpose, a sufficient quantity of the roots should be taken fresh out of the ground, washed clean from the dirt, bruised in a mortar, and then boiled in rain-water till the whole become tinged of a red colour, then put into a cloth and all the colouring matter pressed out. This should again be put into hot water in a clean glazed earthen-pan, to which should be added a small quantity of water in which alum had been dissolved, and the whole stirred up together; then immediately add a lump of soda or pot-ash,

stirring the whole up, when an effervescence will take place, the alum that had united with the juice of the madder will be found to become neutralized by the pot-ash, and the result will be a precipitate of the red fecula. This may be washed over in different waters, and either put by for use in a liquid state, or filtered and dried in powder or cakes. Most vegetable colours will not, however, admit of being extracted by water, and it is necessary to use an acid for that purpose: vinegar is the most common. But in making the extract from roots with acids, great care should be taken that they are sufficiently cleared from mould, sand, &c.; for, if the same should contain either iron, or any metallic substance, its union with the acid will cause a blackness, and of course spoil the tint. In a similar mode are all the different colouring principles extracted, either from leaves, flowers, fruits, or woods. The preparation of woad is a curious process on similar principles; which see in page 31.

Weld, or dyers weed, is generally used after it is dried. The whole plant is ground in a mill, and the extract made by boiling it. It is then managed with alum and acids agreeably to the foregoing rules, which are necessary for throwing out the colour.

Instructions how Substances may be tried, whether they are serviceable in Dyeing, from Hopson's Translation of Weigleb's Chemistry.

"In order to discover if any vegetable contains a colouring principle fit for dyeing, it should be bruised and boiled in water, and a bit of cotton, linen, or woollen stuff, which has previously been well cleaned, boiled in this decoction for a certain time, and rinsed out and dried. If the stuff becomes coloured, it is a sign that the colour may be easily extracted; but if little or no colour be perceived, we are not immediately to conclude that the body submitted to the trial has no colour at all, but must first try how it will turn out with the addition of saline substances. It ought, therefore, to be boiled with pot-ash, common salt, sal ammoniac, tartar, vinegar, alum, or vitriol, and then tried upon the stuff: if it then exhibit no colour, it may safely be pronounced to be unfit for dyeing with. But if it yields a dye or colour, the nature of this dye must then be more closely examined, which may be done in the following manner:—

Let a saturated decoction of the colouring substance be well clarified, distributed into different glass vessels, and its natural colour observed. Then to one portion of it let there be added a solution of common salt; to the second, some sal ammoniac; and to the third, alum; to the fourth, pot-ash; to the fifth, vitriolic or marine acid; and to the sixth, some green vitriol: and the mixtures be suffered to stand undisturbed for the space of twenty-four hours. Now in each of these mixtures the change of colour is to be observed, as likewise whether it yields a precipitate or not.

If the precipitate made by the pure acid dissolve in an alkaline lixivium entirely, and with a colour, they may be considered as resino-mucilaginous particles, in which the tingeing property of the body must be looked for, which, in its natural state, subsists in an alkalino-saponaceous compound. But if the precipitate be only partly dissolved in this manner, the dissolved part will then be of the nature of a resinous mucilage, which in the operation has left the more earthy parts behind. But if nothing be precipitated by the acids, and the colour of the decoction is rendered brighter, it is a mark of an acido-mucilaginous compound, which cannot be separated by acids. In this there are most commonly more earthy parts, which are soon made to appear by the addition of an alkali.

When, in the instances in which green vitriol has been added, a black precipitate is produced, it indicates an astringent earthy compound, in which there are few mucilaginous particles. The more the colour verges to black, the more of this acid and mucilaginous substance will be found in it.

The mixture of alum with a tingeing decoction shows by the coloured precipitate that ensues from it, on the one hand, the colour it yields, and on the other hand, by the precipitate dissolving either partly or entirely in a strong alkaline lixivium, whether or not some of the earth of alum has been precipitated together with the colouring particles. Such substances as these must not, in general, be boiled with alum, although this latter ingredient may be very properly used in the preparation of the stuff.

When a tingeing decoction is precipitated by an alkaline lixivium, and the precipitate is not redissolved by any acid, for the most part neither one nor the other of these saline substances ought to be used, but the neutral salts will be greatly preferable. In all these

observations that are made with respect to the precipitation effected by means of different saline substances, attention must be paid at the same time to the change of colour which ensues, in order to discover whether the colour brightens, darkens, or entirely changes.

When the colour of a decoction is darkened by the above-mentioned additions without becoming turbid, it shows that the colouring matter is more concentrated and inspissated. When the colour is brightened, a greater degree of solution and attenuation has taken place in the colouring matter in consequence of the addition. If the colour becomes clearer, and after a little time some of the tingeing substance is separated, it shows that part of the colour is developed, but that another part has been set loose from its combination by the saline substance.

But if the colouring matter is separated in great abundance by the saline addition, (the colour being brightened at the same time,) it may be considered as a sign that the colouring substance is entirely separated from the decoction, and that only an inconsiderable part, of a gummy nature, remains behind united with the additaments, which is in a very diluted state.—This is an effect of the solution of tin, as also sometimes of the pure acids.

If, indeed, a portion of the colouring substance be separated by a saline addition, but the rest of the colouring decoction becomes notwithstanding darker, it shows that the rest of the colouring particles have been more concentrated, and hence have acquired a greater power of tingeing. With regard to the proportion of the addition, the following circumstances may serve by way of guide:

When the colour of a decoction is darkened by the addition, without any precipitate being produced, no detriment can easily arise from using a redundancy of it, because the colour will not be further darkened by it. But if the colour be required to be brighter, the trial must first be made, which is the proportion by which the colour is darkened the most, and then less of it must be employed.

When the colour of a decoction is brightened by an addition without a precipitation ensuing, this addition can never be used in a larger quantity without hurting the colouring particles; because the colouring particles would be made too light, and almost entirely destroyed. —Such is the consequence of too large an addition of the solution of tin or of a pure acid.

When the addition produces a brighter colour, and part only of the colouring substance is separated without a further addition occasioning a fresh separation, somewhat more of it than what is wanted may be added to produce the requisite shading; because experience shows that, by this means, a greater quantity of tingeing particles is united with the woolly fibres of the cloth, and is capable of being, as it were, concentrated in them: for which purpose, however, these barks must be boiled down. This effect is chiefly observed with sal ammoniac and wine vinegar.

When by an addition which causes a separation of the colouring substance the colour becomes brighter in proportion the more there is used of it, it must be employed in a moderate quantity only; because otherwise, more and more of the colouring substance will be separated, and its tingeing power diminished. But when a colour is rendered dark at first by an addition, and afterwards, upon more of the same substance being added, becomes brighter, and this in proportion to the quantity that is added, it will be found that the darkening power has its determined limits; and that, for producing the requisite degree of darkness, neither too much nor too little must be taken.

To the before-mentioned principles also, the different proofs bear a reference, by which the fixity and durability of the colour with which a stuff has been dyed may be tried. Of these, some may be called natural, others artificial. The natural proof consists in exposing the dyed stuff to the air, sun, and rain. If the colour is not changed by this exposure in twelve or fourteen days, it may be considered as genuine; but if it is, the contrary is allowed. This proof, however, is not adapted to every colour: because some of them resist it, and yet will fade in consequence of the application of certain acids; others, on the contrary, that cannot resist the natural proof remain unchanged by the latter. Colours, therefore, may be arranged in three classes; and to each of these a particular kind of artificial proof allotted. The first class is tried with alum, the second with soap, and the third with tartar.

For the proof with alum: Half an ounce of this is dissolved in one pound of boiling water in an earthenware vessel; into this is put, for instance, a drachm of yarn or worsted, or a piece of cloth of about two fingers breadth; this is suffered to boil for the space of five mi-

nutes, and is then washed in clean water. In this manner are tried crimson, scarlet, flesh-colour, violet, ponceau, peach-blossom colour, different shades of blue, and other colours bordering upon these.

For the proof with soap: Two drachms of this substance are boiled in a pint of water, and the small piece of dyed stuff that is to be tried is put into it, and likewise suffered to boil for the space of five minutes. With this all sorts of yellow, green, madder-red, cinnamon, and similar colours, are tried.

In the same manner is made the proof with tartar; only this should be previously pounded very small, in order that it may be more easily dissolved. With this all colours bordering upon the fawn are tried.

From the above we discover that the art of applying and fixing colours in dyeing depends on the chemical affinity between the cloth and the dyeing principle: and accordingly as this is more or less strong, so is the facility with which the substance is coloured, and on this the deepness of the dye depends: for frequently one kind of cloth will be found to receive no colour at all, whilst another will receive from the same composition a deep tinge. Cotton, for instance, receives scarcely any tinge from the same bath that will dye woollen a deep scarlet. Wool is that which appears to have the strongest affinity to colouring matter; next to it is silk; then linen; and cotton the weakest, and is therefore the most difficult of all to dye perfectly. Thus, if a piece of linen cloth be dipped into a solution of madder, it will come out just tinged with the colour; but if a piece of the same be previously dipped into a solution of alum or copperas, and dried previously to being dipped in the madder, the alum will become so far impregnated with the colouring principle, that the cloth will receive a perfect dye, and be so fixed that it cannot be separated by any common means. Thus it will be observed, that the art of dyeing permanent colours depends on this intermediate principle, which is termed a mordant. These mordants are very numerous; and on a knowledge of them appears to rest the principal secret of dyeing. The following mode is, however, a very convenient one for making experiments on fixing the colouring principles of any vegetable extract: To have several pieces of cloth, woollen, cotton, silk, and linen, dipped in the different mordants, and by keeping a small vessel filled with the colouring solution on a fire in a state a little below boiling, by cutting small pieces of each, and immersing them in the colour, and examining and comparing with each

other. Experiments of this kind are well worth the attention of persons; for, when we refer to this department, we shall find very few plants which are either now, or ever have been, cultivated for this purpose, *although it is well known* that so many contain this principle. I have inserted the following, as being known to contain the different colours mentioned; but there are many other plants equally productive of this principle that remain quite unnoticed at present.

539. ACANTHUS *mollis*. BEAR'S-BREECH.—This gives a fine yellow, which was in use among the ancients.

540. ACTÆA *spicata*. BANEBERRY.—The juice of the berries affords a deep black, and is fixed with alum.

541. ANCHUSA *officinalis*. YELLOW ANCHUSA, or BLUE-FLOWERED BUGLOSS.—The juice of the corolla gives out to acids a beautiful green.

542. ANTHEMIS *tinctoria*.—The flowers afford a shining yellow.

543. ANTHYLLIS *vulneraria*. KIDNEY-VETCH.—The whole plant gives out a yellow, which is in use for colouring the garments of the country-people.—*Linn.*

544. ARBUTUS *Uva ursi*. BEARS'-BERRY.—The leaves boiled in an acid will dye a brown.

545. ASPERULA *tinctoria*. WOODROOF.—The roots give a red similar to madder.

546. ANEMONE *Pulsatilla*. PASQUE-FLOWER.—The corolla, a green tincture.

547. ARUNDO *Phragmites*. COMMON REED-GRASS.—The panicle, a green.

548. BERBERIS *vulgaris*. BARBERRIES.—The inner bark, a yellow.

549. BROMUS *secalinus*. BROME-GRASS.—The panicle, a green.

550. BIDENS *tripartita*. HEMP AGRIMONY..—The herb, a good yellow.

551. BETULA *alba*. BIRCH.—The leaves, a yellow.

552. BETULA *nana*. DWARF-BIRCH.—The leaves, a yellow.

553. BETULA *Alnus.* ALDER.—The bark affords a brown colour; which with the addition of copperas becomes a black.

554. CALENDULA *officinalis.* COMMON MARIGOLD.—The radius of the corolla, if bruised, affords a fine orange. The corolla dried and reduced to powder will also afford a yellow pigment.

555. CALTHA *palustris.* MARSH-MARIGOLD. — The juice of the corolla, with alum, gives a yellow.

556. CAMPANULA *rotundifolia.* ROUND-LEAVED BELL-FLOWER. — A blue pigment is made from the corolla; with the addition of alum it produces a green colour.

557. CARPINUS *Betulus.* HORNBEAM.—The bark, a yellow.

558. CHÆROPHYLLUM *sylvestre.* COW-PARSLEY. — The umbels produce a yellow colour, and the juice of the other parts of the plant a beautiful green.

559. CARTHAMUS *tinctorius.* SAFFLOWER.—The radius of the corolla, prepared with an acid, affords a fine rose-coloured tint.

560. CENTAUREA *Cyanus.* BLUE-BOTTLE.—The juice of the corolla gives out a fine blue colour.

561. COMARUM *palustre.* MARSH-CINQUEFOIL. — The dried root forms a red pigment. It is also used to dye woollens of a red colour.

562. CUSCUTA *europæa.* DODDER.—The herb gives out a lightish red.

563. CRATÆGUS *Oxycantha.* HAWTHORN.—The bark of this plant, with copperas, is used by the Highlanders to dye black.

564. DATISCA *cannabina.* BASTARD-HEMP.—This produces a yellow; but it is not easily fixed, therefore it presently fades to a light tinge.

565. DELPHINIUM *Consolida.* BRANCHING LARKSPUR.—The petals bruised yield a fine blue pigment, and with alum make a permanent blue ink.

566. FRAXINUS *excelsior.* MANNA.—The bark immersed in water gives a blue colour.

567. GALIUM *boreale.* CROSS-LEAVED BEDSTRAW.—The roots yield a beautiful red, if treated as madder.

568. GALIUM *verum*. YELLOW BEDSTRAW. — The flowers treated with alum produce a fine yellow on woollen. The roots, a good red.

569. GENISTA *tinctoria*.—The flowers are in use among the country-people for dyeing cloth yellow.

570. GERANIUM *sylvaticum*. MOUNTAIN CRANESBILL. — The Icelanders use the flowers of this plant to dye a violet colour.

571. HIERACIUM *umbellatum*. HAWKWEED. — The whole herb bruised and boiled in water gives out a yellow dye.

572. HUMULUS *Lupulus*. HOP.—The strobiles are used for dyeing; but although they yield a yellow colour, the principal use is as a mordant.

573. HYPERICUM *perforatum*. PERFORATED ST. JOHN'S WORT.—The flowers dye a fine yellow.

574. IRIS *germanica*. GERMAN IRIS. — The juice of the corolla treated with alum makes a good permanent green ink.

575. ISATIS *tinctoria*. WOAD. — The leaves steeped in water till the parts are decomposed, produce a fine blue fecula, which is made into cakes, and sold to the woollen-dyers. For its culture, see p. 32.

576. LICHEN *Roccella*. ORCHIL.—The fine purple called orchil is extracted from this moss.

577. LITHOSPERMUM *officinale*. GROMWELL.—The roots afford a fine red, which is used by the young girls in Sweden to colour their faces.

578. LYCOPODIUM *complanatum*. CLUB-MOSS. — The juice of this plant extracted by an acid forms a most beautiful yellow.

579. LYCOPUS *europæus*. WATER-HOREHOUND.—The juice of this gives out a black colour, and is sometimes used by the common people for dyeing woollen cloth. The gypsies are said to use the juice of this plant to colour their faces with.

580. LYSIMACHIA *vulgaris*. LOOSESTRIFE.—The juice of the whole herb is used to dye woollen yellow.

581. MYRICA *Gale*. SWEET GALE.—The whole shrub tinges woollen of a yellow colour.

582. NYMPHÆA *alba*. White Water-Lily. — The Highlanders make a dye with it of a dark chesnut colour.—*Light. Fl. Sc.*

583. ORIGANUM *vulgare*. Wild Marjoram.—The tops and flowers contain a purple colour, but it is not to be fixed.

584. PHYTOLACCA *decandra*. Virginian Pokeweed.—The leaves and berries produce a beautiful rose-colour, but it is very fugacious.

585. PRUNUS *domestica*. Plum. — The bark is used by the country people to dye cloth yellow.

586. PYRUS *Malus*. Apple,—The bark of this plant, also, produces a yellow colour.

587. QUERCUS *Robur*. Oak.—The juice of the oak mixed with vitriol forms a black ink; the galls are employed for the same purpose.

588. RESEDA *Luteola*. Dyers' Weed, or Weld.—The most usual plant from which the yellow dye is extracted. For its culture, see p. 32.

589. RHAMNUS *Frangula*. Buckthorn.—The bark produces a slight yellow, and the unripe berries impart to wool a green colour.

590. RHAMNUS *catharticus*. Purging Buckthorn. — The bark yields a most beautiful yellow colour; and the ripe berries in the autumn produce a brilliant scarlet.

591. RHUS *Cotinus*. Venus's Sumach.—The bark of the stalks produces a yellow colour; the bark of the roots produces a red.

592. RHUS *coriaria*. Elm-leaved Sumach.—This plant is possessed of the same qualities as the one above.

593. RUBIA *tinctorum*.—The root produces a red colour. For its culture, see p. 32.

594. RUMEX *maritima*. Dock.—The whole herb gives out a yellow colour.

595. SALIX *pentandra*. Willow.—The leaves produce a yellow colour.

596. SCABIOSA *succisa*. Devil's Bit Scabious.—The dried leaves produce a yellow colour.

597. SERRATULA *tinctoria*. Saw-Wort. — The whole herb produces a yellow tincture.

598. SENECIO *Jacobæa*. Ragwort.—The roots, stalks, and leaves, before the flowering season, give out a green colour which can be fixed on wool.

599. STACHYS *sylvatica*. Hedge-Horehound.—The whole herb is said to dye a yellow colour.

600. THALICTRUM *flavum*. Yellow Meadow-Rue.—The roots and leaves both give out a fine yellow colour.

601. THAPSIA *villosa*. Deadly Carrot. — The umbels are employed by the Spanish peasants to dye yellow.

602. TORMENTILLA *erecta*. Erect Tormentil.—This root is red, and might probably be usefully employed.

603. TRIFOLIUM *pratense*. Meadow-Clover. — The inhabitants of Scania employ the heads to dye their woollen cloth green.

604. URTICA *dioica*. Nettle.—The roots of nettles are used to dye eggs of a yellow colour against the feast of Easter by the religious of the Greek church, as are also madder and logwood for the same purpose.

605. XANTHIUM *strumarium*. Lesser Burdock.—The whole herb with the fruit dyes a most beautiful yellow.

Section XII. — *PLANTS USED IN RURAL ŒCONOMY.*

The following few plants are such as are used for domestic purposes which do not fall under any of the foregoing heads, and I therefore have placed them together here.

606. CONFERVA.—This green thready substance has the power of rendering fœtid water sweet; for which purpose, when water is scarce, it is usually put into water-tubs and reservoirs.

607. CORYLUS *Avellana*. Hazel Nut.—The young shoots of hazel