

MADDER, in *Agriculture*, the common name of a plant, sometimes cultivated in the field, as an ingredient in the dyeing of a scarlet colour. The sorts commonly cultivated for this use is, the *rubia tinctoria*, which is a plant of the thick fleshy tap-rooted kind.

It is stated by a late writer, that this plant "was formerly much more cultivated in particular districts in this country than it is at present, the importations from Holland having lessened the demands, and reduced the price of it, so much as to render its culture incapable of being conducted with profit to the farmer."

Soil.—The soils which are the most suited to the cultivation of this plant, according to the same writer, are those of the deep fertile sandy loams that are not retentive of moisture, and which have a considerable portion of vegetable matter in their composition. It may also be grown on the more light descriptions of soil that have sufficient depth, and which are in a proper state of fertility to admit of its being grown upon them.

Preparation, and Plants or Sets.—In the preparation of the land for the reception of this crop, "it will be necessary to plough it up deeply before the winter into high ridges, in order that it may be exposed to the action and influence of the frosts, and the atmosphere. Early in the spring these ridges should be well harrowed down by a heavy long-tined harrow, and then ploughed again in the contrary direction to a good depth. And when after this the land is not perfectly clean from weeds, or not rendered sufficiently fine and mellow, another ploughing and harrowing should be given. In the last operations the ground should always be left in as level and even a state as possible. It is then ready for the reception of the plants. The sets or plants may then be obtained either by sowing the seed upon a bed of earth which is rich, and made perfectly fine by digging and raking in the spring, and then lightly covered in, or from offsets or suckers from the old plants. In the first method, on the plants appearing they should be made perfectly clean by weeding, and be set out to the distance of three inches in the beds by the hoe. In this way, by keeping the ground quite clean and well stirred about the plants, they will be ready to set out in the second autumn, though it will mostly be better to defer the business till the spring, in this climate, if the sets can be procured, as the plants seldom ripen their seed perfectly, or afford it in a state to vegetate well. It requires about twenty thousand plants for setting an acre of land. The most suitable time of taking the sets is shewn by the plants having attained the height of ten or twelve inches from the ground, and the suckers having thrown out fibrous roots at their bottoms. This may be seen by drawing up a few of the plants, and usually about the latter end of May or beginning of June." Besides "it is necessary that the sets have formed root-fibres at the bottoms, before they are removed, as where that is not the case, they never succeed well."

The land being prepared in the manner directed above, and the plants thus provided, "a sufficient number of labourers are to be provided, that the work may be performed as expeditiously as possible. In taking off the sets, much care is necessary not to injure them. Some perform it by means of a dibble with a flat edge, and which is shod with iron; this tool, on being thrust into the ground on the side of the shoots, divides and separates them by depressing the handle without hurting the fine fibrous roots. The number of
plants

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plants that can be set in a short space of time should only be taken up at once. They should be prepared by having about a third of their top parts cut off. A sort of thin batter should likewise be made, by mixing good vegetable mould and water well together, into which the roots of the sets should be dipped before they are placed into the earth, as by this means the necessity of watering the plants afterwards is prevented. This work is executed by a person before the planting commences. Two others are employed afterwards in distributing the plants so as to be convenient for putting them into the ground."

There are different methods employed in setting the plants; in some cases they are put in the furrow by means of the plough, while in others they are set in beds by a dibble. The former is probably the better method, and as being the most expeditious, is best adapted to the culture of the plant on an extensive scale. In this the planter begins by drawing a straight furrow on one side of the plantation to a good depth; a row of plants is then laid in it by a person for the purpose, at the distance of five, six, or more inches from each other, according to the circumstances of the land, in such a manner as to lean off from the plough; another furrow is then formed, by the mould of which they are covered. In this manner the work proceeds until the whole is finished.

In the other method, it is observed, the sets, after the land has been formed into beds, five feet in breadth, with two feet between each for intervals, are put in by means of a line and a dibble, beginning at the distance of six inches from the outides, and setting a row of plants at suitable distances from each other, as just mentioned; then removing the line two feet farther on them, and putting in another row; after which it is again removed two feet, and a third row of plants set in, which finishes the bed; the work proceeding in this manner till the whole of the plantation is completed. In this way each bed contains three rows of plants, at two feet distance each, three feet being left between the rows on the different beds."

But "in Holland, where the culture of this root is extensive, their method is, it is observed, a little different from the above. The plants, after being taken from the older plantations about the month of May, are immediately set in rows at the distance of three or four inches from plant to plant, and about fifteen inches from row to row, the beds being ten or twelve feet in width, with intervals of only about two feet."

It is suggested that, "as in whatever manner the plants are set, some of them, even in the most favourable seasons, are liable to die soon after the work has been performed, it is necessary, in the course of a fortnight or three weeks, to look over the ground and put fresh vigorous plants in the places where the others have been destroyed. By this means the plantations may be rendered more perfect and productive."

But whatever method of planting may be practised, it is of the greatest importance to the success of the crop, "that it be kept perfectly clean from weeds, and that the mould be occasionally stirred about the roots of the plants." The first of these is accomplished, according to the survey of Kent, by means of hand-weeding and hoeing during the summer season, and the latter either by the use of a hand-hoe, or a light plough; this last is the most easy and expeditious. In this manner, or by digging the intervals of the rows, the mould is also laid up to the plants once each year after the stems have been removed in the autumn season. Where the bed practice is followed, they are sometimes earthed up in the autumn after the stems have been cut down, by paring the intervals somewhat in the manner of those of the asparagus kind. This method is, however, in general

too expensive and troublesome where the crops are cultivated on an extensive scale.

According to Mr. Young, the best way of performing this culture is "to use the shim, not for turning a ridge against the rows, as the plants will yet be too weak for that operation, but merely to loosen the earth of the intervals, thereby to kill the weeds, and prepare the soil for being thrown up against the rows by a succeeding operation. Hand-hoeing and weeding should depend on the number of the weeds that arise among the plants. Let the cultivator of madder, through the whole process of the crop, remember, says he, that he must be to the full as accurate as a gardener; his soil must be rendered little inferior to a dung-hill; all weeds must be forever eradicated; not one must injure the plants; his land must always be kept perfectly loose and well pulverized; for a crop that depends merely on the quantity of the roots, can never thrive to profit in land that is bound or in an adhesive state."

Whatever practice is adopted, "the crops are to be managed in this manner until the third autumn after planting, when the plants will be in a state to be taken up; this is known by their stalks beginning to wither, and is generally about October. This business is performed either by trenching the land over with a spade, or by means of the plough. The first is the more certain, though much less expeditious method. In executing it, the workmen dig along the rows to the depth of about two feet, breaking and reducing every spit of earth as perfectly as possible, each being attended by two persons, who pick out the roots of the madder. But when the planting has been done in narrow beds, it is sometimes the practice to take the roots up by turning the earth into the intervals by a *spud*, or broad three-tined fork. In this way it is supposed that the roots are taken up more perfectly, and with less danger of being injured. But the most ready method is by means of the plough, which after having the earth-board and coulter removed, is passed along each side of the rows, so as to fully loosen the mould; persons being employed to pick out the roots, loosening such parts of the earth as may have escaped the action of the plough by their spades." And "when the roots have been taken up, they should be exposed some time to the air, in order that they may be rendered so dry as to be cleared from dirt. They are then to be conveyed to a kiln, such as is employed for the purpose of drying malt, or hops, when they are to be brought into such a state of dryness as to be perfectly brittle. This is to prevent the danger of their being injured by becoming mouldy, or from running into a state of fermentation; but much caution is necessary in conducting the process. After this they are packed up in bags, in order to be disposed of to the dyer, who reduces them into a powder by a mill before they are made use of as a colouring ingredient." Mr. Young, however, observes, that he is "informed, that at present (1803) the largest quantity of madder used in our manufactures, is used without being powdered as formerly, and that it is saleable with common drying, without stove-work; but that, that common degree is open to much uncertainty, so that the preceding remarks are not done away. The price of 4*l.* per hundred weight, marks a considerable desiccation in his opinion."

It is hinted, that in order to judge of this root, the best is that which, on being broken in two, has a brightish red, or purplish appearance, without any yellow cast being exhibited.

It is stated, "in order to collect the seed of the madder plant, it is necessary to let the plants remain in the field till the seed is almost wholly ripe, which is generally in the month of September. The heads are then to be separated from

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from the stems, and exposed in a cloth in the sun, till the seed can be easily forced out by slightly beating them. It is then to be rendered perfectly clean, and afterwards placed in a sunny situation, until it become quite dry; for if the least dampness remain, it will grow mouldy, and its vegetative power be either greatly impaired or wholly destroyed. When thus properly dried, it should be put in small bags, and hung up to the ceiling of a room where a fire is constantly kept."

The produce from the root of this plant is different, according to the difference of the soil; but mostly from ten to fifteen or twenty hundred weight, where they are suitable to its cultivation.

It seems not improbable, a late writer says, "that the cultivation of madder might be rendered a profitable article of field-husbandry in different districts, if the importation of the root from Holland was prohibited; as the event of different trials has shewn that full crops of good madder are capable of being raised." And it is supposed by the intelligent writer of the Survey of Kent, "that if the price was never lower than 3*l.* the hundred weight, it might be grown not only with profit by the farmer, but without injury to the consumer." As it is supposed, "from the high degree of culture which land under this sort of crop must necessarily undergo, and its not being so much exhausted as in many other cases, that it must be an excellent preparation for wheat, or any other crop that requires a clean and fine pulverized condition of the mould or soil."

But the author of the Farmer's Calendar "recommends the young farmer to remember that the culture of these plants, applicable only to the use of manufactures, and which are also largely imported from abroad, is rarely advisable. He was a madder planter once, and lost by every acre he planted. A man may plant in the moment of a high price, and take up his crop three years after at a low one. All such speculations are too hazardous; nor was there even a fair open competition among the purchasers. Those who have cultivated madder with the success boasted by the writers of husbandry, should not hold these observations in contempt. There appears to him almost as much use in mentioning trials that were unsuccessful, as in those that are ever so profitable; for it is certainly of as much consequence to tell one man that his soil *will not do* for madder, as to assure another that his *will do*. Instead of an acre or two, he might possibly have launched (like many others) into ten or fifteen acres; in which case, the loss would have been no trifle. And it is surely highly incumbent on every one to make known to the world such of his experience as will probably be of any use to it. Bad success of several persons in a culture is too apt to prejudice others in general against it. However irrational, still it is so; and it ought to be a caution not to recommend any thing in general, under the extravagant notion, that because an article of culture is profitable on one soil, it must be the same on very different ones. But the grand obstacle to the culture of madder is the difficulty of sale: for while a man has not a fair market for his unmanufactured madder, none can with any prudence engage in it, unless on so large a scale as to admit the whole apparatus of reducing it to such a state as to be absolutely a marketable commodity. In answer to this it may be said, that madder really dry is a *marketable commodity*. But this matters not, if the purchaser has it in his power to be a knave: he has a pretence, a screen always at hand that will cloak the greatest knavery, and to a degree known in no other branch of agriculture. Among the gentlemen of trade who have a mutual understanding and confidence, such objections appear trivial; but to the culti-

vator at a distance from the market, it is a different affair. He writes to a madder-merchant to know the price. The answer is, *4*l.* an hundred weight*. Up he sends his madder, and instead of *4*l.** he receives but *3*l.**, not from a variation in price, but in *weight*. It may be said, that the correspondent in London may be right. Very true; but will the countryman believe it? He thinks himself right, and has no other proof that he is not so but the interested assertion of the man who buys it. Is it not evident that, in such a case, the cultivator will be disgusted, and throw aside a business in which he knows neither the market-weight nor the market-price? If encouragement is designed to this culture from any quarter, it should not be exclusive of this circumstance. Manufactures should be erected and established, in which the madder could be prepared for any one, at so much an hundred weight, and that by persons not the least concerned in purchasing. Then the cultivator would have a commodity in his hands, which he could sell in as simple and fair a way as any other. If nothing of this sort can be effected, all encouragement should be for such a number of acres (and no less) as will answer the expence of a private manufacture; which would prevent persons being unguardedly drawn in, by premiums apparently considerable, to cultivate a root which, when raised, is in its sale absolutely at the mercy of the purchaser."

Kilns are often necessary in the culture of this root; but for small crops, a common oven may serve, though it is very tedious, and would require large ovens to supply the place of kilns. However, to save the expence of building such kilns, a place may be made over the roof of the oven, to put the roots in, that they may begin to dry. Where much madder is grown, it is, notwithstanding, absolutely necessary to have a kiln proportioned to the quantity that is to be dried. These may be made of different forms, being attentive that it may contain a large quantity of roots; that it be worked with ease, and the smallest proportion of fuel; and that it may be so contrived as to retain an equal moderate heat.

Those made use of in the Low Countries differ very little from that used here in drying malt. There is a large furnace, in which a great fire is made: this furnace is made under an arch; the hot air and smoke pass through a funnel over the furnace, and spread themselves in a space in form of an inverted pyramid, the bottom of which is covered with a perforated floor, on which the madder-roots are spread. See *KILN*.

And where the manufacture of the article is carried on, a mill for the purpose of pulverizing the dried madder is likewise necessary. See *MILL*.

Expences of Culture per Acre.—This is on land worth forty shillings *per acre*, in the digging mode, and before the great rise in the price of farm labour.

	<i>£</i>	<i>s.</i>	<i>d.</i>
Rent for three years - - - - -	6	0	0
Digging ditto at two-pence <i>per perch</i> - - -	1	6	8
Dividing ditto into beds, two men one day, at one shilling each - - - - -	0	2	0
Raking ditto, two men one day, at one shilling each - - - - -	0	2	0
Planting ditto with two thousand plants, one day, at one shilling and sixpence each -	0	3	0
Six women to take up two thousand ditto, at sixpence each, one day - - - - -	0	3	0
Hoing the first summer five times - - - - -	0	15	0
Covering ditto in autumn the first year - -	0	6	0

Carried over *£* 17 8
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	£	s.	d.
Brought over - - -	8	17	8
Hoeing ditto the second summer three times - - -	0	9	0
Covering ditto in autumn the second year - - -	0	6	0
Hoeing ditto the third summer twice - - -	0	4	6
To be paid in lieu of tithe, at five shillings per acre per annum - - -	0	15	0
Digging ditto out of the ground - - -	5	0	0
Beer - - -	0	6	0
	15	18	2

<i>Produce.</i>			
Produce of an acre of madder - - -	52	12	2
Expences - - -	15	18	2
	36	14	0
Profit - - -			

In this estimate, which is much below the present price, nothing is allowed for plants; as, though expensive at first, when once done, a supply from the plantation will constantly be had for a long time.

MADDER, in *Botany and Gardening*. See RUBIA.

MADDER, in *Law*. See LARCENY.

MADDER, in the *Materia Medica*. The roots of madder were employed by the Greek writers with the same medicinal intentions for which they are recommended by most modern writers on the materia medica. Madder differs from some other substances used in dyeing, by its property of tinging with a florid red colour, not only the milk, urine, &c. but the bones of those animals which have fed upon it. This circumstance was first noticed by Antonius Mizaldus, (*Memorab. ut. ac jucunda Cent. 7. Aph. 91. Lutet. 1566.*) but not known in England till Mr. Belchier published an account of a pig and a cock, whose bones became red by eating madder mixed with their food. (*Phil. Transf. vol. xxxix. vol. xli.*) Since that time various experiments have been made, by M. Hamel du Monceau and others, from which it appears that the colouring matter of madder affects the bones in a very short time, and that the most solid or hardest part of the bones first receives the red colour, which gradually extends, *ab externo*, through the whole osseous substance, while the animal continues to take the madder; and if the root be alternately intermitted and employed for a sufficient length of time, and at proper intervals, the bones are found to be coloured in a correspondent number of concentric circles. *Mem. de l'Acad. des Scienc. 1739. Med. Ess. Edinb. abr. vol. ii.*

According to Lewis (*Mat. Med.*), the roots of madder have a bitterish, somewhat austere taste, and a slight smell not of the agreeable kind. They impart to water a dark red tincture, to rectified spirit and to distilled oils a bright red: both the watery and spirituous tinctures taste strongly of the madder.

By medical writers, madder has been considered as a deobstruent, detergent, and diuretic, and is chiefly used in the jaundice, dropsy, and other diseases, supposed to proceed from visceral obstructions, particularly those of the liver and kidneys; and some modern authors have recommended it as an emmenagogue (*Home's Clin. Exp.*), and in rickety affections. (*Levret sur les Accouchemens.*) With regard to its diuretic quality, for which there are several respectable authorities, Dr. Cullen asserts, that in many trials, both for this and other purposes, such an effect is not constant, as it never occurred to him. As a remedy for

the jaundice, it has the authority of Sydenham, and was formerly an ingredient in the icteric decoction, which the college of Edinburgh directed to be prepared by boiling an ounce of madder, the same quantity of turmeric, and the same quantity of the roots and leaves of celandine, in three pints of water to a quart; to which, when strained and cooled, the juice of 200 millepedes are added; and a quarter of a pint of this liquor was ordered to be taken twice a day, or oftener. But as this decoction seemed to be more adapted to the "fæces albidæ," than to the disease itself, it was expunged from the Pharmacopeia. That some French writers should prescribe madder in a rickety state of the bones, appears a little surprising, says Dr. Woodville, as the brute animals to which it was given, especially the younger, suffered considerable emaciation and prostration of strength from its effects. Its virtues, as an emmenagogue, rest principally on the authority of Dr. Home, who gave from a scruple to half a dram of the powder, or two ounces of the decoction, three or four times a day. But this medicine failed with Dr. Cullen, who also says, (*Mat. Med. vol. ii.*) "I know of other practitioners in this country, who, after several ineffectual trials made with it, have now entirely deserted its use." *Woodv. Med. Bot.*

MADDER, *Rubia Tinctorum*, in the *Arts and Manufactures*, grows wild in many parts of the Levant, as well as in the south of Europe, and has been very largely cultivated in Holland, particularly in Zealand, and also in the northern parts of Europe, for the use of the dyers and calico printers. (See DYEING.) The method of cultivating it in Holland is this: in autumn they new plough the land, where the madder is to be planted, if it is strong and heavy, laying it up in high ridges, that it may be mellowed by the winter's frosts. In March they plough it again, working it very deep, and laying it in ridges at eighteen inches asunder, and about a foot deep. Then, in the beginning of April, when the madder begins to shoot out of the ground, they open the earth about the old roots, and take off all the side shoots, which extend themselves horizontally just under the surface of the ground, preserving as much of the root as may be with them. These they plant immediately on the tops of the new ridges, at about a foot distance from each other; and this they usually do in showery weather, when the plants immediately take root and require no more water. In these ridges they let the plants remain two seasons, keeping them clear of weeds; and at Michaelmas time, when the leaves are fallen off, they take up the roots, and dry them for the market. See RUBIA.

The madder-plant grows to about three feet in height, but it is the long-spreading fibrous root that is used in dyeing. The madder of the Levant, called "Lizari," or "Azala," has a somewhat higher and finer colour than that of the Dutch; but that of Holland is more carefully prepared. The Dutch method is as follows: the roots, as soon as they are gathered, are put under a shed, or in a granary, or other sheltered place, and there remain, exposed to a current of air, for ten or twelve days, till they are quite pliable, and till no juice can be pressed out by squeezing them. They are then farther dried, either in a common oven of slack heat, if the quantity be small, or in large stoved rooms, constructed for this purpose, and heated with turf, a large opening being left for the escape of all the internal vapours. This process requires particular attention and management. When the roots are quite hard and brittle, they are laid on a threshing-floor, and beaten with a flail, in order to separate the dirt and outer thin skin; they are afterwards ground in a mill, and the powder, being sifted and sorted, is carefully

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fully packed in large barrels: it is thus exported, and in this state used by the dyers. For the method of cultivating and preparing madder in England, see the article RUBIA. The method practised in Turkey and Persia for preparing the madder used in the beautiful Adrianople red, is stated by an eye-witness, cited in Aikin's Dictionary, to be as follows: For every 100lb. weight of the fresh root, a steeping liquor is prepared of 2lbs. of bran, and 1lb. of honey and alum, in four gallons of water. The roots, having been previously washed clean, are soaked in this liquor for two or three days, and then dried, first under cover, and lastly in the sun. They are afterwards ground and sifted, the powder last produced in the mill being of the best quality.

The powder of madder should not be dry and harsh, but feel somewhat greasy, and adhere together under the fingers. Madder-root consists of three parts, viz. the skin or cuticle which is rubbed off under the nail, and is of no use; a thicker bark or cortical part, and within this a woody portion. These two latter parts are of a high red, and both are intermixed with many yellowish particles, which injure the red colour, but cannot be separated in grinding the root. When the colour is extracted in the dyeing vat, the red part is less soluble in water than the yellow, and is not so readily extracted; and, therefore, the beauty of the red colour is deteriorated by long boiling, and by using too large a quantity of the root. In the state of madder, when used by the dyers, it is an orange brown powder, liable to become damp, and to be spoiled in a moist place. As to the chemical properties of madder, we shall detail the following experiments by Mr. Wall, from Berthollet Elem. de Teinture, vol. ii. Zealand madder of the best quality, was of an orange-brown colour, and in moderately fine powder. This powder, with water, gave an orange-red infusion, by maceration with or without heat, but in the latter case the colour was finer. By slow evaporation of the infusion, or decoction in a shallow vessel, a pellicle is gradually formed, and sinks to the bottom, and is successively replaced by others. The extract, when nearly dry, is of a dingy brown, and is only in part again soluble in water. Alum added to the infusion gives a precipitate of a very deep brown-red, and the supernatant liquor assumes a brownish-yellow tinge. If the alkaline carbonats be added to this liquor, they give a blood-red lake, miscible with oils, but very inferior in beauty to the cochineal lake. With an excess of alkali, the precipitate is re-dissolved, and the liquor becomes red. The colour given by soda is not so fine as that by pot-ash. Lime precipitates a brown-red lake, having no beauty. The acids added to all infusions of madder turn it yellow, but form no precipitate. The natural colour is again restored by alkalis. Carbonat of magnesia, added to the water in which madder is infused, turns it of a clear blood red colour, which, when spread upon paper, becomes yellow by the sun's rays. The following effects are produced by different metallic solutions: acetate of lead, added to the aqueous infusion of madder, gives a brownish-red precipitate; nitrat of mercury a purple-brown; sulphat of iron a beautiful clear brown; and sulphat of manganese also a purplish-brown. The solutions of tin, as Berthollet observes, produce a lake void of brilliancy and beauty, owing, as he conjectures, to the precipitation of the yellow as well as the red particles of madder, so that this metal, which serves to heighten the beauty of cochineal, can hardly be used with any advantage for madder. Sir Henry Englefield has invented a method of extracting the red of madder of lakes, for which he obtained the gold medal from the Society of Arts. (See Trans. of the Society, vol. ii.) His method is founded on the disco-

very that the red colouring part is scarcely soluble in cold water, but in the usual method of extraction is chiefly suspended by means of the mucilage of the root. His principal process is as follows: Inclose two ounces (troy weight) of the finest Dutch madder, known in commerce by the name of "crop madder," in a bag capable of containing three or four times that quantity, made of strong and fine calico. Put it into a large marble mortar, and pour on it a pint of soft river water, pressing the bag in every direction, and rubbing it as much as possible without danger of bursting; the water will soon become quite opaque, and loaded with colouring matter. Pour off the water, and add another fresh pint of water, triturating it with the madder as before; and repeat the operation, till the water, the last added, comes away but slightly tinged. About five pints will be required to exhaust the colour, after which the root, if taken out dried, will be found to have lost $\frac{1}{4}$ ths of its weight, and also its peculiar smell; and the colour will be a light nankeen or cinnamon. The water loaded with the colouring matter must then be put into an earthen or well-tinned copper vessel (not iron) and heated till it just boils. Then pour it into a large basin, and add an ounce of alum dissolved in a pint of hot soft water, carefully stirring the mixture. Afterwards add about 1½ oz. of a saturated solution of carbonat of potash, which will immediately excite an effervescence, and a subsequent precipitation of a coloured lake. When it has stood till cold the lake is to be collected, well washed with repeated quantities of warm water, and gently dried. It will then be found to weigh about half an ounce, or a fourth part of the madder employed. This madder lake, which is very beautiful, is found by analysis to consist of more than 40 per cent. of alumine, the remainder is the colouring matter of the madder. If the alum solution and the madder infusion, without the alkali, be suffered to stand for a while, a dull red lake will equally precipitate, and the clear liquor will afterwards yield a beautiful ooze-red lake by alkali, but wanting a sufficient body of colour. A lake equally good with the first mentioned, but of a lighter colour, will be afforded by previously allowing the madder and cold water to stand for a few days in a moderately warm place, by which a slight fermentation will be induced, and a portion of the mucilage of the root destroyed. The process is then to be continued as before. The same ingenious experiments also succeeded very perfectly in obtaining a still more beautiful and equally durable lake, from the fresh madder-root imported from Holland, packed up in moss. Aikin's Dict.

Wool, previously boiled in a solution of alum and tartar, receives from a hot decoction of madder and tartar, a very durable, but not a very beautiful red colour. M. Margraaf (Berlin Mem. 1771) shews how a very durable lake, of a fine red colour, fit for the purposes of painting, may be obtained from madder. The process is as follows: take two ounces of the purest Roman alum, and dissolve it in three (French) quarts of distilled water that has boiled, and in a clean glazed pot. Set the pot on the fire, and when the water begins to boil, withdraw it, and add to it two ounces of the best Dutch madder. Boil the mixture once or twice, then remove it from the fire, and filtrate it through a double filtre of paper not coloured. Let the filtrated liquor stand for a night to settle; and pour off the clear liquor into the glazed pot, well cleaned. Make the liquor hot, and add to it gradually a clear solution of salt of tartar in water, till all the madder is precipitated; filtrate the mixture, and upon the red precipitate which remains upon the filtre, pour boiling distilled water, till the water no longer acquires a faint taste; the red

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red lake is then to be gently dried. The colour of this precipitate is deep; but if two parts of madder be used to one part of alum, the colour will be still deeper: one part of madder, and four parts of alum, produce a beautiful rose-colour.