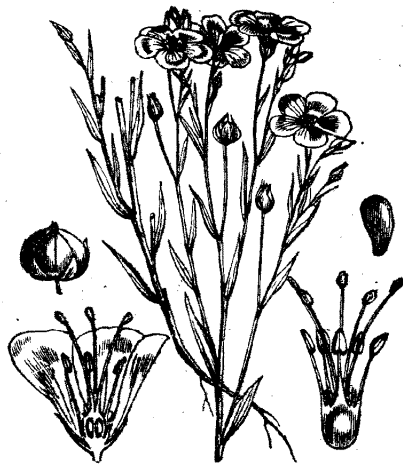


FLAX

Flax [O. Eng. *flax*; Mod. Germ. *Flachs*]: a plant important as the source of the fiber from which linen cloth is made, and of flax seed. Like the more important cereal grains, flax was known throughout the ancient seats of civilization in the East. It is therefore impossible to determine where it originated. It is known throughout the civilized world, and is valued as an almost indispensable adjunct of civilization. Its botanical name is *Linum usitatissimum*. The genus *Linum* contains several species, of which this is the only one of especial value or of commercial importance. The plant is an annual of quick



Flax (*Linum usitatissimum*).

growth, and probably a race which originated from a species still indigenous to Southern Europe. It grows from 1 to 3 feet high. The leaves are alternate upon the straight slender stem and branches. The flowers, which are in loose terminal panicles, are blue, about an inch in diameter, having a calyx of five sepals, a corolla of five petals, five stamens, and a pistil having five styles. The petals drop within a few hours after the flowers open, and the seed-heads, called *bolls*, form rapidly, becoming finally nearly globular. These consist of ten cells, each containing a flat oval seed of a reddish-brown color, very smooth and glossy. When the plant grows by itself in good soil, it branches freely, blossoms profusely, and yields a proportionately large quantity of seed. When, however, many plants are crowded together, each one grows as a single upright stem, bearing a few blossoms and little fruit at the summit. The valuable portions of the plant are the fibrous coating of the stalk, and the seed. The *stalk* is a woody cylinder, more or less pithy and hollow when dry, and inclosed in a bark consisting of long, strong, silky fibers cemented together by a kind of glue, and encased in an outer bark or skin, which adheres as if glued to the fiber. The *fiber*—when freed from all else, so far as possible, by the processes of rotting, to destroy the glue; breaking, to free it from the woody part of the stalk; scutching, to whip out the small particles of bark and stalk adhering; hatcheling, to straighten it and free it from tangles—is nearly pure bast, of a light grayish-brown color inclining to green, exceedingly tough, adapted to spinning and weaving, capable of being bleached to snowy whiteness and of taking a variety of colors in dyeing, which it holds faster than cotton, though it does not take readily so many dyes.

The ultimate filaments are hollow, thick-walled, and thus nearly solid cylindrical cells, which are terminated by exceedingly attenuated points. They are semi-transparent, of a silky luster, and under the microscope the walls of the tube appear like a double line through the center. These filaments vary in thickness from $\frac{1}{625}$ th to $\frac{1}{3000}$ th of an inch,

according to the measurements of Mr. John Phin, who describes the cells as jointed, apparently like the stalks of the bamboo cane. (See FIBER.) When the fiber is separated from the bark and wood of the stalk, as above indicated, it appears in market in two principal forms—namely, “dressed flax” and “tow,” which are each of several qualities.

The seed consists of the embryo or kernel and its outer coverings, principally its reddish-brown shell, which is very mucilaginous, yielding, particularly to hot water, a thick, glairy gum, becoming quite viscid when cold. The kernel is rich in a valuable oil, which possesses the property of “drying” or hardening on exposure to the air to a remarkable degree (see LINSEED OIL), by which process of drying it gains, instead of losing weight. Powdered flaxseed and powdered oil-cake (linseed meal) are much used in medicine and surgery for poultices, epithems, etc., and are useful on account of their long retention of heat and moisture. The cake remaining after the oil is extracted from the seeds makes when ground an exceedingly palatable and nutritious food for animals, largely used in the U. S. and Great Britain for fattening animals and milch cows.

FLAX-CULTURE.—Flax is a plant of rapid growth, and is sown in April or May and harvested early in August. When raised for seed it makes considerable drafts upon the soil, which should therefore be rich and in fine tilth. As it is almost impossible for manure to be evenly distributed through the soil the first season, it is best to grow flax upon land heavily dunged the previous year as for a corn-crop, but dressed the same season with wood-ashes or some other “hand manure” which can be evenly applied and is adapted to the wants of the land. Good wheat-soils are especially favorable to flax. Heavy clays, coarse gravels, light sands, and peaty soils are not so. Moderately stiff soils should be plowed in autumn, light ones early in the spring. As soon as weeds begin to germinate and grass to grow the land should be thoroughly and evenly plowed and harrowed. If the weather be not favorable to sow, the harrowing may be repeated, and thus successive crops of weeds killed in the seed-leaf. Finally, when the ground is warm in spring the seed should be sown. The practice in Europe is to sow very early; in the U. S. flax should not be sown until after the oat-crop is in—say from Apr. 15 to May 1 in the Middle States. The quantity of seed sown to the acre depends upon the object for which the crop is raised; if principally for seed, half a bushel to three pecks is used; if for fiber mainly, a bushel to a bushel and a half is employed. It is very important that the sowing should be even, for otherwise the tendency to branch is great, and those plants which are less crowded will grow coarser and larger, ripen their seed unevenly, and cause the crop of lint to be of unequal fineness, and to leave much more of the fiber in the tow than otherwise need be. Flax should be sown as carefully as fine grass-seed, and to enable the sower to handle it more easily it is sometimes soaked a short time in cold water and then rolled in plaster. It should be harrowed in evenly with a light harrow, or, better, put in with an improved grain drill. Some farmers, who raise flax for the lint principally, preferring that no horse should tread upon the land after sowing, brush the seed in with a heavy hand bush harrow, made like a stable broom by inserting short pieces of brush in a hard-wood head 5 or 6 feet long. This is drawn over the ground by means of handles attached at right angles, or nearly so, to the brush. It is most important that the flax should get the start of the weeds, and when it is about 3 or 4 inches high it should be carefully examined, and if necessary weeded at once—an operation best done in moist weather and by women and children, who go upon the crop without shoes, and work facing the wind, so that the breeze may favor the down-trodden plants to rise again. It is better to let the weeds grow than to weed the crop after the plants are 6 or 8 inches high, or to do this hurriedly, mashing and bruising the plants. After this the crop is “laid by” until pulling-time.

Pulling.—Flax is ready to pull when it changes color decidedly after blooming, becoming of a yellowish or golden-brown color, two-thirds of the bolls being plump and beginning to turn brown, and the leaves having shriveled and dried upon the lower half of the yellow stalks. Pulling should take place a little earlier than we describe if lint be the principal object, but a little later if the seed pays best. This is done by grasping a handful of stalks in one hand near the tops, and then pulling them with both hands, giving a steady jerk, so to speak. This handful is not laid down, but held while other handfuls are pulled, until as

much is gathered as can conveniently be grasped; then it is bound after “butting” the roots even. Stalks which fall out and scatter are used for bards. These bundles are set up in long shocks, to become cured thoroughly before stacking. The drying process is greatly shortened if, instead of binding as soon as pulled, the gavels are spread out on the ground, so as to be turned and sunned on both sides before binding.

If the fiber is an important object with the farmer, the flax should be pulled as described, but otherwise it may be mowed with a scythe or cradle, or with a reaper, cutting close as possible to the ground, and harvested and threshed in the same manner as any other grain crop.

Threshing.—After drying and standing in the stacks, or not, as the case may be, the seed may be threshed off by a flail or by beating the heads of the sheaves against a block of wood, which easily removes the bolls. On a large scale the seed is most easily removed by holding the bundles spread out, fan-shaped, upon the cylinder of a threshing-machine, the “concave” being taken off. After this the flax is ready to be subjected to the process called

Retting (rotting).—This is conducted either under water, or upon the grass, where the flax is exposed to the action of the dew and sunshine. In “water-rotting” the flax is subjected in the bundles to the action of soft water in pools called “dams.” The methods of setting or laying the bundles are various, and the rapidity of the action depends upon the warmth and softness of the water, varying from four to fourteen days. It is more uniform if it does not progress very rapidly. During the whole process it must be kept submerged, being weighted with stones. Waters containing iron or other mineral matters are likely to stain the fiber and to hinder the action. It requires some experience to know exactly when to remove the flax, for a few hours may make a considerable difference in the amount of fiber realized. If too much rotted, the lint will break and tangle, and be lost in the tow. If too little rotted, the fiber will break up with the stalk, and be scutched out with the shives. When the rotting (or retting) has been continued long enough, the woody part of the haulm separates easily and completely from the fibrous bark, which itself is easily divided upon the finger into individual fibers. When, however, the process has gone too far, the fiber is weakened, but this can only be quickly detected by the most experienced. When sufficiently rotted, the flax bundles are lifted from the water, opened, and spread upon the grass until perfectly dry. Then they are rebundled and housed until they can be conveniently subjected to the next process, which is

Breaking.—This is accomplished by machines called flax-breaks, which are variously constructed, but all accomplish the same end—namely, the breaking up of the stalks without doing violence to the fiber. A flax-break in common use and easily constructed consists of several hickory slats hinged at one end upon a form, and fastened at the other end into a heavy wooden head. These slats when let down occupy a horizontal position, and shut in between other similar fixed slats, but do not touch them. By means of a handle attached to the head the movable slats are raised up and down by one hand, while the flax held in the other is thrust in and drawn through, and thus “broken,” so that the “shives,” or pieces of broken stalk, or “boon,” may be whipped or “scutched” out.

Scutching or swingeing is the next operation, and one performed both by simple hand-appliances and by more complicated machinery. The essential implements are the scutching-block and the scutching-knife. The former is an upright hard-wood board set in a block or fixed in any convenient place. It has in it a large notch, with one edge horizontal and cut to a sharp edge, the bevel being altogether upon one side. This notch is to receive a handful of flax, which, resting upon the sharp wooden edge, hangs over upon one side. The scutching-knife is made of hard wood also, and must be 9 or 10 inches broad and very thin. With this the “hand” of flax is struck sharp blows as it is turned in the notch, the knife being brought down close, parallel with the side of the board. Thus the fiber is freed from most of its adhering impurities, and in this condition is usually baled and marketed in the U. S., but before it can be spun much more is necessary. In this condition the lint and the tow remain together, only the coarsest tow being separated from the fiber by the scutching process.

Hatcheling or heckeling consists in drawing the hands of flax-fiber through combs of long iron teeth set filling a circle or a square. The instrument is called a “hatchet”

or "heckel," and there are usually two hatchels used—one coarse, for a preliminary operation, the other fine, for finishing. The hand of flax is hatched from the tips to the middle—first one half, and then the other, the tow being left in the teeth of the hatchel, and the teeth being frequently cleaned of the same. The ends accomplished by this process are three—namely, the subdividing of the fibers into their finest filaments, the separation and removal of all broken or short fibers (the tow), and the laying of the lint parallel and untangled. The operation requires considerable skill, and upon it depends to a great extent the value of the result. It will be long before American farmers to any great extent will prepare their flax-fiber for market by the careful dressing practiced in Germany, Holland, and Great Britain, but until this is done the value of the crop will be greatly less than it might otherwise be. In general, this crop is and will be cultivated in the U. S. almost solely for the seed, the lint being roughly treated and sold for cordage and for coarse fabrics. The product of flax-seed in the U. S. in 1899 was 29,601,000 bush.; the exports, 2,830,991 bush. The world's product was 68,553,000 bush. Minnesota, Iowa, South Dakota, Nebraska, Kansas, and Missouri were the largest producers in the order named. No statistics were collected for the production of fiber in the U. S. During the "cotton-famine" caused by the civil war greatly increased interest was manifested in flax-culture, and great efforts were made to treat the fiber so that it could be worked upon cotton machinery; but these experiments resulted in no marked success, and were given up when cotton again became abundant. Russia is the largest flax-producing country in Europe, her yield being about two-thirds of the whole production. The total quantity of flax fiber produced in the whole of Europe in 1899 was 1,123,943,000 lb., distributed as follows: Russia, 876,788,000 lb.; Austria-Hungary, 112,809,000 lb.; Italy, 41,917,000 lb.; Belgium, 32,309,000 lb.; France, 27,834,000 lb.; Ireland, 16,034,000 lb.; all other countries, 16,252,000 lb. The total area in Europe sown with flax aggregates about 5,700,000 acres, of which more than 3,700,000 are in Russia. See FLAX, NEW ZEALAND.

Revised by L. H. BAILEY.