

Cruciforms - Their Uses to the Plant
Harriet E. Thackeray.

The study of trichomes is very interesting, because of the great diversity in form and function, while at the same time there is a similarity between all of the forms. They are commonly called plant hairs, because of the hair-like coating of some leaves. They are also known under several other names, as spines, prickles, briars, and down which are all more or less descriptive terms. Some of these forms are often confused with other parts of the plant which are modified into forms similar to trichomes. The thorns on the honey locust and sage orange are really modified stems but they look very much like the spines on the gooseberry and wild rose. The only way to distinguish is to determine whether or not they originate in the epidermis. If they do they are truly trichomes, if not they belong under some other classification.

They have many different ways of attaching themselves to the plant. Some are an extension of an epidermal cell. These are formed by the outer wall of the cell pushing out and forming a thread-like appendage. Others have a globular base which is beneath the outer portion of the epidermis. Still others, where they are not intended to be permanent, grow smaller toward the end and are inserted between the epidermal cells.

They have almost an infinite variety of forms. Some are long slender tubes filled with air or perhaps a liquid of some sort. They may be in chains with the end enlarged as they are in nearly all glandular hairs. Again, they may be formed into a solid mass of dead cells with lignified walls. These are found where they are expected to stand some strain. But all of these will be taken up later under other headings.

The larger number of different forms seems to be to protect the plant from the numerous herbivorous animals. On the gooseberry and wildrose, we find what we may call the typical form for the protection against animals. These are large, long, smooth, and sharp-pointed; well calculated to pierce the skin of any animal which might seriously damage the plant. The cells of which these are composed are dead, but the walls are very thick in order to make them more rigid. On the gooseberry these have a very regular arrangement. They always consist of three prongs - the longer one in the centre and they are always found just beneath the leafscar. Their general appearance is shown in Fig. I. On the wild-rose the spine stands alone and has no branches. They have no regular arrangement but are scattered promiscuously over the stem. They are also more easily rubbed off than are those on the gooseberry. The spines on the raspberry and blackberry are very much like these

Plate I

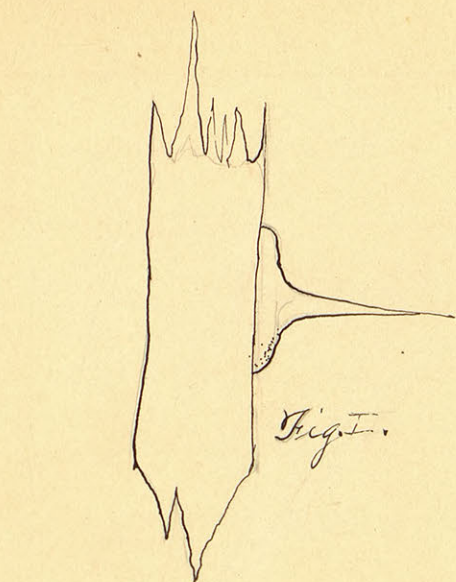


Fig. I.

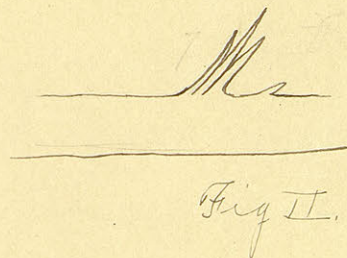


Fig. II.

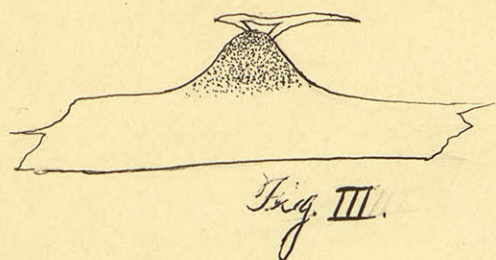


Fig. III.

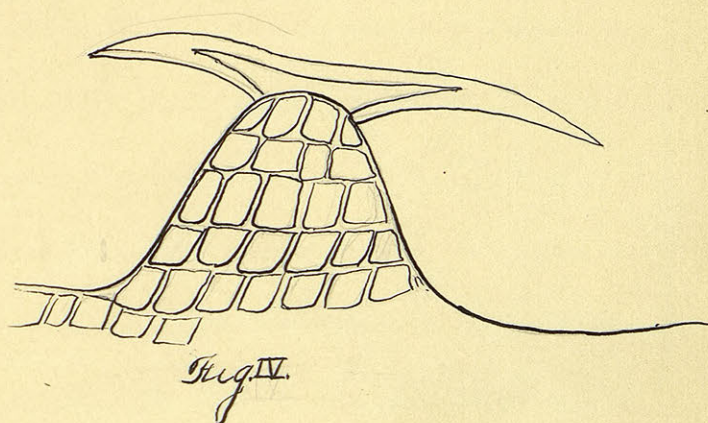


Fig. IV.

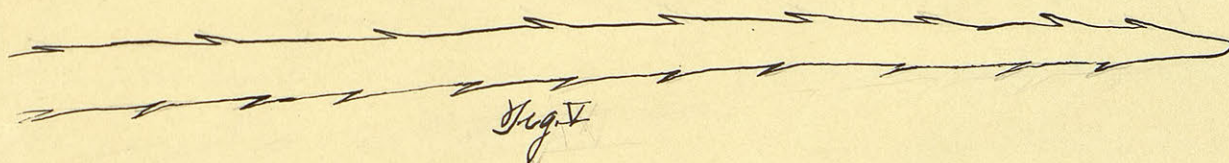


Fig. V.

Figs.

- I. Spine on Wild Rose
- II. Spine on Gooseberry. Side View.
- III. Low Power of Spine on Hop Vine
- IV. High Power of Spine on Hop Vine
- V. Small hair from Prickly Pear.

except that they have their ends slightly curved, which in some ways increases their power of wounding.

There are many plants which do not resort to such extreme measures but accomplish the same purpose by irritating the tongue of the intrusive animal. These hairs have a great variety of forms, the simplest being the long slender hair, and one of the most complex being those found on the *Shepherdia Canadensis* (Plate II, Fig.) There are all kinds of intermediate forms. Most of these only tickle the mouth and throat but those found on the hopbine (Plate I Fig III and IV) seem to prick it. Here the trichome proper is placed on a small raised portion and consists of two minute spines pointing in opposite directions. On the prickly pear we find a very malicious little trichome. We do not mean the larger thorns which are modified leaves, but the small brown hairs found in abundance at the base of these. These are so very brittle that they will break if they are touched. They are very irritating also, because of the small projections all over the outside, all of which point backwards making it very hard to pull them out. See Fig. V.

The stinging nettle shows another method of protecting the plant against its foes. These hairs are glandular and the fluid they secrete is poisonous to the flesh and produces a result similar to the stinging of an insect. It is this which gives them their name.

Plate II

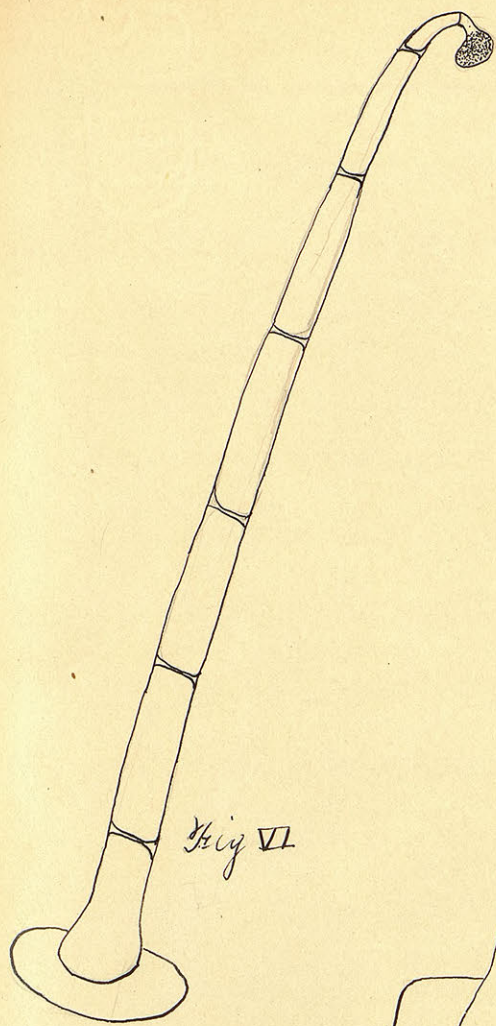


Fig. VI

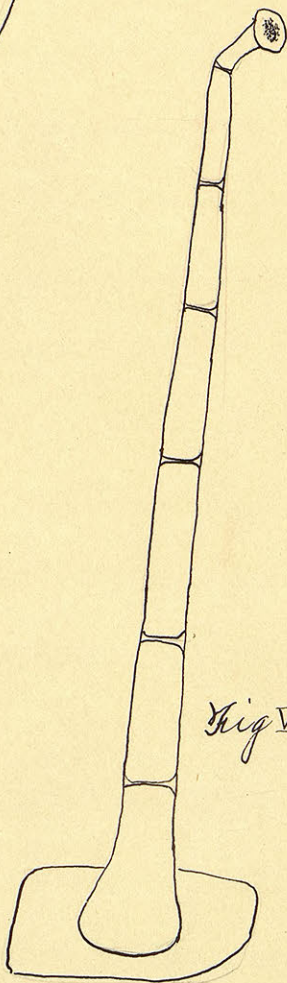


Fig. VII

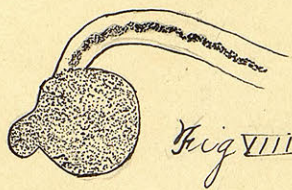


Fig. VIII

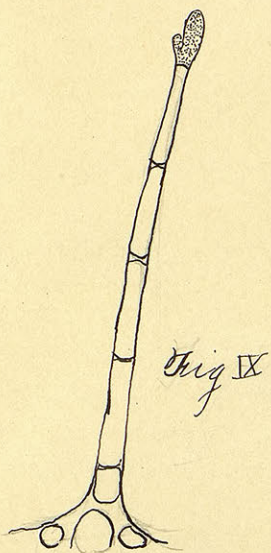


Fig. IX

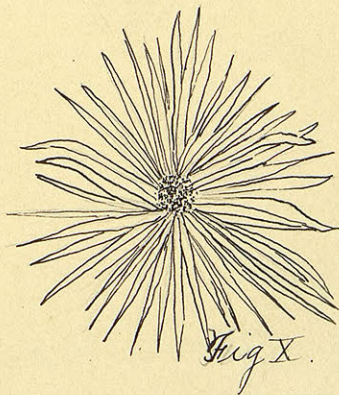


Fig. X

Figs.

- VI Spine from *Geranium*.
- VII Trichome from *Petunia*.
- VIII End of trichome of *Begonia* leaf.
- IX Trichome from *Geranium*.
- X Trichome from *Shepherdia Canadensis*.

Glandular hairs usually consist of two rows of overlapping cells, which form the stem of the trichome and an enlarged end which forms the gland. Often the substance secreted is a kind of sticky may be drawn out into a thread, sometimes several inches long, leaving the gland in a hump relaxed condition. These have many different functions to perform. The stinging nettle has already been mentioned. In the *Potunia* figs the secretion has an odor which is very offensive to animals which would otherwise be very glad to eat the plant. It is thought that some plants catch and hold insects by means of the waxy substance and then secrete a fluid which has properties similar to the gastric juice found in the stomachs of animals. By means of this the insect is digested and used as a food for the plant. It is possible that the particles of dust which lodge there are used in the same way.

It is sometimes thought that the briars on the sand bar and cockle bar are also to protect the plant, but they are not as is shown by the fact that they are not developed enough to harm any intruder until the plant is so old that it does not need any protection. Let us look at their construction. They are not straight thorns but each one forms a small hook at the point. Would this be of any use if the function of the brier were protection against animals? It might be of

one advantage, but it is of greater advantage in another way. By means of these they are enabled to cling to the tails of cattle and horses or the bodies of shaggy-coated dogs. In this way they are carried long distances and serve to constantly enlarge the area in which these plants are found. The spines on the seed sac of the bull-nettle and Jamestown weed are also to enable the plant to scatter the seed, but it is accomplished in a different way and the results are not nearly so comprehensive. These catch just enough on the passing object to give the plant a vigorous shake, which sometimes sends the seeds several yards. We know that these are not for protection for the same reason as those above, and even though they were they would be of little use, because no animal would care for a second taste of the Jamestown weed.

Another method of scattering the seed is shown in the cottonwood, thistle, dandelion and milkweed (Plate III). As the seeds of these plants become more mature, they become drier and lighter, and each one has enough small, thread-like hairs attached to enable the plant to carry the seed, which finally drops off leaving the down to float whither it will.

There is another function which trichomes perform, and that is preventing too much evapora-

Plate III.

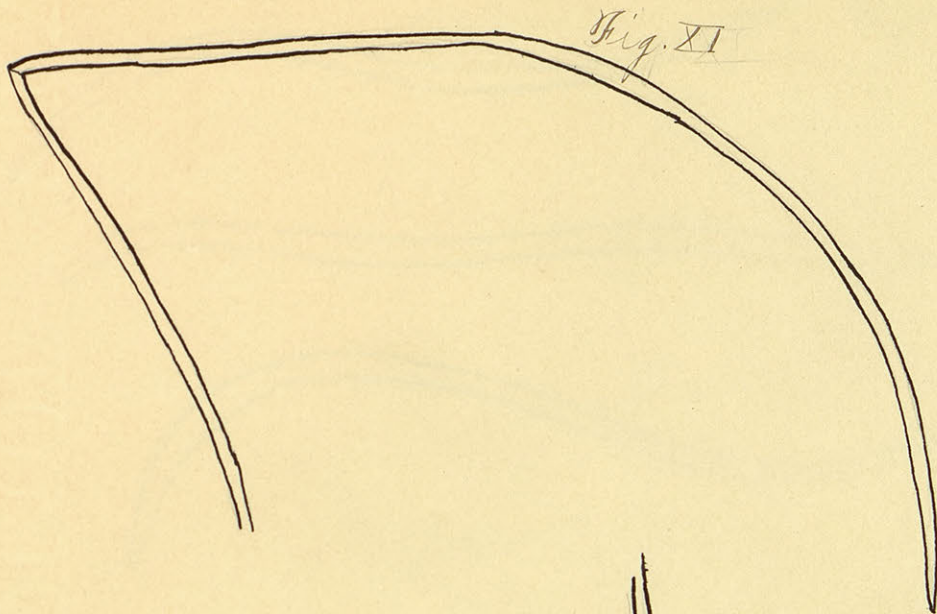


Fig. XI

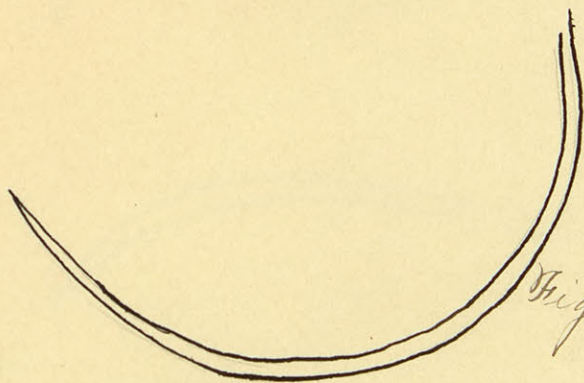


Fig. XII



Fig. XIII

- Figs. XI Hair from cottonwood seed.
 XII Hair from Stamen of Buckeye.
 XIII Thorn from Jametown weed.

Plate IV.

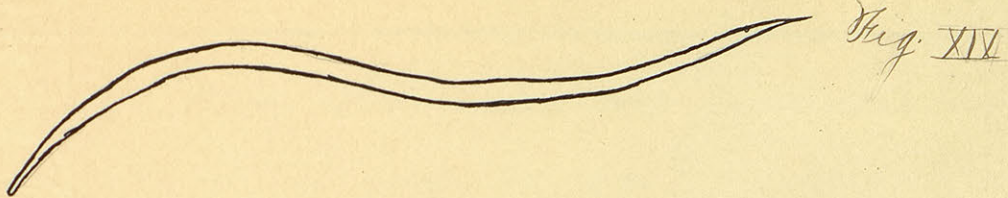


Fig. XIV



Fig. XV

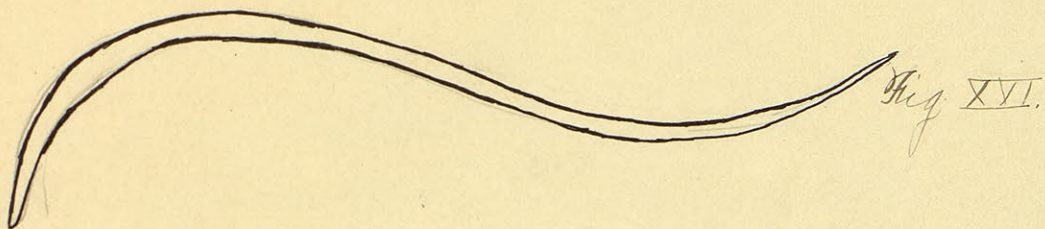


Fig. XVI

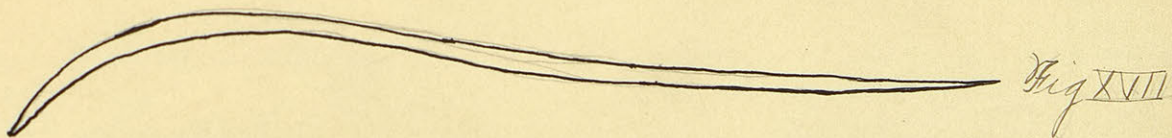


Fig. XVII



Fig. XVIII

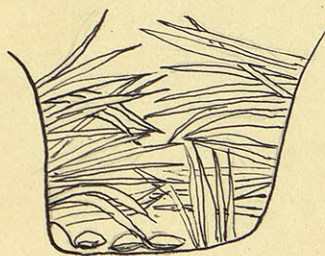


Fig. XIX

Figs. XIV maple.

XV Walnut.

XVI Crabapple.

XVII Willow.

XVIII Cherry.

XIX Cleander.

ation. When the buds are just beginning to open in the spring they are, on nearly all of our common plants, covered with small hairs. These always consist of one long slender cell which is tube like and filled with air. They are dead and dry; otherwise they would only increase the evaporation.

Plate IV will show the uniformity of structure in these - they are very close together, and form a kind of meshwork which prevents a change of air over the stomata. Most of these drop off when the leaf becomes mature. In the oleander, however, we find several stomata in a small cavity, with a mass of these to guard the opening. These always remain on the plant. Trichomes are not the only means of preventing too rapid evaporation. The currant, for example, has a waxy coating over all the leaves which serves the same purpose.

Different plants resort to various methods for securing fertilization. Some are self-fertilized, some are wind-fertilized, and others are fertilized by insects. There are some of the latter class which are fertilized only by a certain kind of insect. In order to secure the visit of this insect, those plants usually secrete a substance very much like honey. This nectar, as it is called, is in the bottom of the cuplike flower, and the insect may draw it forth

Plate IV.

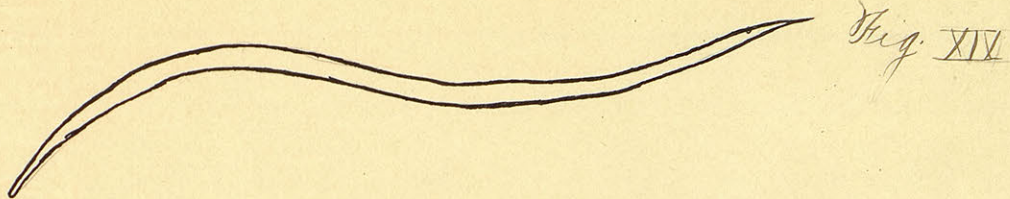


Fig. XIV.



Fig. XV.

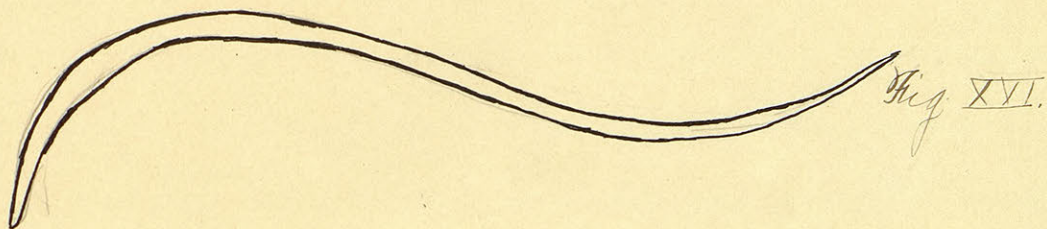


Fig. XVI.

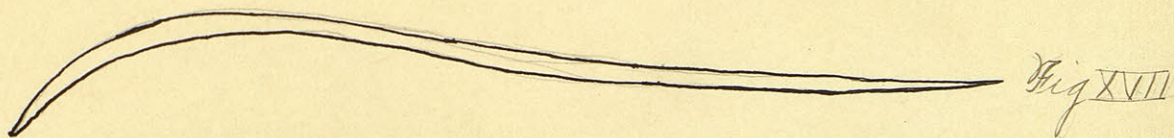


Fig. XVII.

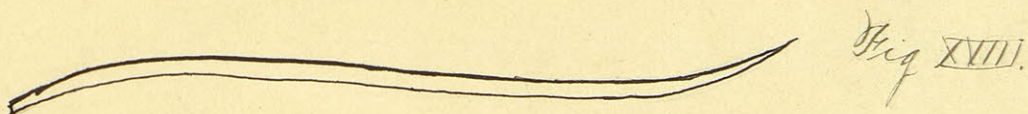


Fig. XVIII.

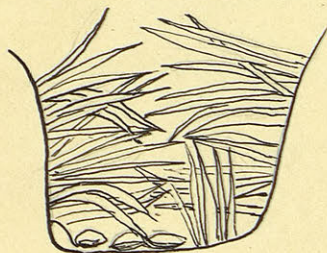


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by means of its long proboscis. But other insects are also very fond of this, and to prevent their getting to it or doing any other damage to the flower, different ones of the petals are bearded very heavily so that the insect cannot pass through. Sometimes we find all of the petals bearded. This is usually according to the shape of the flower.

Root hairs are the only kind of trichomes that are found on all plants. They are found only on the mature portions of young roots. They would locate them from one fourth to one inch from the end of the root. These permeate the soil around the plant, and because of their very thin walls they can, by osmosis, gather the water with all it may hold in solution, and thus furnish the plant with food.

In this article nothing more than a brief sketch of the most common forms of this locality has been attempted, and any one who might wish to go farther would find a large field open to him. It is very interesting to try to determine the functions of different kinds about which scientists are still in doubt.