

How Plants protect the Flowers
from Unbidden Guests.
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Outline.

I. Pollination of flowers.

Secured by particular insects.

II. The Unbidden Guests.

a. Who they are.

b. Reasons for attraction.

c. Means used, (perforations &c.)

d. Why they are unbidden.

III. Why flowers should be protected.

IV. How flowers are protected.

a. Protection of flowers by aquatic plants.

b. Protection of flowers of land plants.

1. Protection against ants.

1st slippery leaves.

2^d spines &c.

2. Protection against other insects

(Perforations) and means
of protection.

As the result of the enormous increase in the numbers of individuals of almost every species, a constant struggle for existence has become the fate of nearly every organism, animal and vegetable. Thus, in order to withstand these struggles, and not lose the object of their competition; there has been developed in the different competitors, different features of their constitution. In some, we find the perfecting powers of active attack; but in the plant world the most particular feature is the facility for active or passive defence. The aggressive movements of plants are prevented by their want of locomotion, and so in order to succeed in the struggle, they must be better adapted to environments than their competitors, or the individual must be guarded from other organisms inclined to prey upon it, by some protective mechanical mean.

The means for protection are many, but this is often an obscure fact, until the surroundings of the plant is studied,

together with the conditions of its life, and the enemies against which it has to contend. Here will only be considered the part which the plant itself plays in protecting the flowers from unbidden guests.

The flower secretes honey with which it allures the particular insect adapted to bring about properly the process of fertilization. The pollen grains are moist, viscid, and provided with entangling threads and other contrivances which adhere in masses to the head, body, and leg of the insect which visits the flower, and in this way is secured the transference of pollen from the stamens of the flower to the pistil of another. But other insects are attracted by this process of fertilization, and their object is the securing of the pollen as food, which results in the loss of honey or pollen, and sometimes both. Thus, the end aimed at is not secured.

Flowers are sometimes perforated by insects, and in this way they secure the

nectar without going to the proper source, and pollination cannot be brought about. Bees and wasps are among the chief perforators. But why should insects perforate flowers? Darwin believes as an outcome from his observations that insects perforate flowers only when they are found growing in large quantities. Flowers growing in masses are conspicuous, and therefore attract insects, and as perforated flowers as a rule contain much nectar, the number of insects visiting the flowers at any one time is very large. He has also shown that sometimes all the honey is taken from the nectaries, and perforations are made by insects in order to save time. Sometimes an insect will perforate flowers, when he is unable to get nectar in an ordinary way.

In guarding against the attack of insects, there are both mechanical and chemical means employed, and some which partake of the nature of both.

All aquatic plants are protected from

crawling insects by their isolation in water. In the land plants the enemies most guarded against are ants; they attack the plant by ascending the stem from the ground, and the means for protection against them are various. In some plants, the leaves are arranged in pairs along the stem, the base of the leaves being attached to the stem and to each other forming deep cups, which when filled with water obstructs the insect's way in ascending the plant. Examples may be found where different arrangement of leaves brings about the same result. Similar to these cups around the stem, are found rosetted leaves around the base of the plant near the ground. In these rain and dew collect, and is retained for some time, preventing the ascent of crawling insects. In the case of plants that grow sometimes on land and sometimes in water, two distinct means for protection are found, (as in the *Polygonaceae amphibium*.)

the land form has developed around the flower stalk sticky glands. while in the water form they are absent, their isolation in water forming the protection necessary. Among other means, we find slippery leaves with curved surfaces, over which insects cannot climb. and other flowers where the reflexed lobes of the corolla are turned upward so that ants cannot crawl over them. In some plants especially the parts near the corolla are covered with hairs and spines pointing downward. as in the Verbena. Viscid and glutinous secretions, occur on different parts in the different plants. In some they occur on the stem, on others we find them on bracts, calyx and stem, or on young branches. In all these cases, the secreting glands shrivel up when the flowers are pollinated. It is believed that the milky juices of some plants serve as a means to keep ants away. The forms of flowers lend themselves as protecting purposes, as when

the corolla is close shutting; sometimes the corolla is covered with fine hairs, which block the way to the nectar. These insects cannot mount. Counter attractions are sometimes placed in the way of unwelcome visitors, directing them to other parts of the plant where their presence will be harmless; as where honey glands are found on the leaves which are said to stop ants on their way to the flower.

The arrangements against creeping insects occur outside the capacity of the flower. while arrangements against undesirable winged insects are chiefly situated on the inside of the flower, and take the form of hairs, and fringes which have a various arrangement, sometimes in the form of irregular tufts, sometimes more regular as crowns etc. The access to the honey by other than the intended way, is sometimes hindered by chemical means, as in those cases where the insects cease to perforate flowers for the honey on account of the bitter taste.

Protection is obtained in a variety of ways by the converging of the different parts of the flower, and by bending and twisting, so that the honey is hidden in grooves, and special cavities, this includes flowers with long, narrow tubes, into which the proboscis of butterflies can be introduced, but which is too narrow for small insects to crawl into. In the (Pinks) the honey is found deep and these flowers are usually visited by the Hymenoptera. Sometimes there are projections, and the lobes of the corolla narrow and subdivide into the aperture. Some flowers are closed in such a way, that only powerful insects can open them; in some the stamens are so crowded that small insects cannot gain access to the honey. Flowers that open directly upward, are provided with a landing stage for insects, which is placed either at the outer edge of the corolla or at the center. Sometimes the edge is thin and will not support heavy insects. In this case, the flower

is provided with an expanded disc or star shaped stigma forming a platform, (ex. Tulip) In the buttercups, are present a large number of carpals at the center, which is used as a platform. The power of producing all these arrangements for the aiding in making it quick and easy for insects to obtain food from the flowers, is evidently enhanced by other existing arrangements that exclude those insects which interfere with or prevent a speedy transference of pollen from flower to flower. as when considering the small wingless insects that must reach their food by going on foot. When the flower is reached, it covers itself with pollen, but in order to transference it to another flower, a long journey is necessary, which is in most cases beset with dangers, not considering the time taken, so that when the next flower is reached, the pollen may not be in as good a receptive condition as when transferred by quick-flying insects, that are capable of visiting and trans-

ferring pollen to a number of flowers in a very short time, making them the most welcome of guests. But all winged insects are not welcome, some on account of their size and shape are unable to transfer pollen, and provisions are made for such cases. Peculiar foldings, cushions, brushes of hair &c, are often found at the entrances, which large insects can brush aside but the smaller must climb over. Often this forcing of insects from the direct way brings about the desired result, for in passing over and through these folds and hairs, they are unconsciously brought in contact with the stigmas, and anthers, which cannot be avoided. In this way what would otherwise be harmful or useless insects, now become welcome guests. The arrangements and structures take them directly to the honey. All flying insects secure honey by introducing the proboscis into the flower: in this case, small creeping insects would only block the honey orifices, so in order to guard against this, tufts with

sticky bristles fringe the flowers. and guard
the mouth of the calyx tube.