THESIS.

BOTANY AND FLORIGULTURE OF CARNATIONS.

Bertha M. Wellman.

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August 13th, 1896.

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The carnation belongs to the family of plants named Caryophyllaceae of the genus Dianthus. The genus Dianthus includes annual and perennial herbs, with opposite, narrow, often rigid grass-like leaves, the flowers with their parts in fives; calyx cylinderical, nerved or striated, five parted subtended by two or more imbricated bracklets. Stamens ten, styles two; the ovary repening into a one-cell seed vessel; four valved at the apex and contains numerous seeds which are flat on the back and of a black color.

There are but few of this family which deserve the atten tion of the Florist. Of these few meritorious species the carnation stands foremost. Because of its beautiful variegations in color its delightful fragrance, and its good keeping qualities it has become a favorite with all, until today it stands second only to the rose.

During the past few years many new varities have been brought about by crossing. The life of all these varieties is comparatively short. Te period during which they may be grown with profit being generally limited to four or six years. The method of propagation is largely responsible for this state of things. Nature designed a period of rest for this plant, which, if it could be secured would bring about a great change. But such a period of rest, it seems

almost impossible to give to any extent when propagated in the usual way. It is therefore necessary to replace the old plants, every few years, with seedlings.

The question of carnation culture has become one of great interest and we find opinions differ materially among growers in relation to many points in its cultivation. Perhaps the safest rule for a grower to follow is to carefully test some of the meritorious varieties each year and thus determine and retain those varieties best suited to the conditions he is able to give them.

Because of the fact that carnations are a success in one place under certain conditions while they are a failure in another place under the same care, only a few general principles can be laid down as a basis of growth, and some of them must be varied to meet the alteration produced by variety soil or climate.

The carnation was formerly propagated by layering, but because of the great length of time which this process takes they are propagated now exclusively by cuttings.

Cuttings three inches long should be made from the first of November to the last of February, as this is the time when we have the least amount of sunshine. The sunshine increases the top heat causing the leaves to grow while the roots do not. They should be selected from wood which shows a tendency to flower early; which is moderately strong with short

joints and of a healthy constitution. They are preferably pulled, not cut; the off-shoots from flowering stems being used. They should be propagated in sharp sand, two inches apart between the rows, and need not be more than one-half inch in the row. The sand should be packed firmly around the cuttings, and settling it by means of thorough wetting is beneficial. When a small number of cuttings are to be made, a shallow box with holes bored in the bottom to afford perfect drainage, can be used with more convenience than benches, as the boxes can be moved about giving the cuttings new facings to light and air.

Since thecarnation is a native of moderate climate it refuses to grow well above sixty-five degrees. The best of bottom heat for propagating being from fifty to sixty degrees; the air temperature being fifty degrees at night and from sixty to sixty-five degrees during the day. The cuttings should be sprinkled once a day and with this temperature they will form roots in about three weeks. After the roots are well formed them may be moved to a cold house or frame. This relieves the benches which is much needed at that season and hardens and fits the plant for being placed out of doors at an early date. Early out of doors and early in seems a good rule to follow.

As soon as the ground can be properly worked, varying from the twentieth of April to the twentieth of May, the

plants may be placed in the open field. The soil should be of a clayey nature, well underdrained, heavily coated with finely rotted manure, deeply plowed, thoroughly pulverized with a harrow, evenly rolled, and acurately marked out for the plants in rows thirty inches apart, and twelve inches apart in the rows.

Carnations should be kept free from weeds; this together with breaking off the flower-shoots as they appear during the season, is nearly all the attention they require until late in August. By this time the carnation benches in the house should be prepared for the plants by being fitted with four inches of good garden soil. There is danger of having the soild too rich, and also the bottom too tight. Great danger to a good crop of carnation flowers lies in these two possible errors.

The benches being ready, during cool, damp weather, the carnation plants are lifted with a ball of earth adhering to each, which, when planted, will increase the depth of the bench earth one inch. Excavations are made with the hand in the finely pulverized soil on the benches, down to the bottom in which the ball is placed and the soil brought firmly around it. The plants should be planted in rows twelve inches apart, eight inches apart in the row, and five inches from the margin of the benches. There should be an air space

between all the benches and the wall.

The plants being in place in the benches, should be freely sprayed, shaded and the soil moderately dampened; the doors and ventilators should be left open until required to be closed by severe weather. The necessary watering, ventilating, weeding, fumigating and the plucking of flowers need to be given attention during the season. In April when the power of the sun becomes great the plants need to be shaded by strong lime-water on the glass.

The early June varieties, if watered and shaded will continue to blossom until August, after this the bloom is so scarce the plants will not repay for their care and may be thrown away.

In the cultivation of carnations among the many things that need careful attention are the various troublesome diseases of these, perhaps the rust is the most common. It is one of the fungous diseases which are prevalent in this country. It is a fungous parasite which produces countless millions of microscopic spores, a protion of which rise up into the air and float about and are carried by the wind, thus cusing a rapid spread of the disease.

It appears on both sides of the leaves and on the stems, in form of small brown spots. These are raised above the surface and will rub off and discolor the hand when it is

passed over them. Wherever the rust has obtained much headway, no treatment is as sure a remedy as to pull up and burn the affected plants at once. Certain precautionary measures may, however, be used to guard off this pest. The air in the house should be kept as cool and dry as is suitable to the health of the plants. Care should be taken not to select any diseased plants, and still farther, certain mixtures may be used as preventatives, of which the Bordeaux mixture is at present the most used. It consists of sic pounds of sulphate of copper dissolved in two gallons of boiling water and allowed to cool. One peck of quick lime dissolved in six gallons of water and allowed to cool, and then added to the other solution. This solution is poured into a barrel containing forty gallons of water and stirred while useing it.

The presence of the spot, another fungus disease, is indicated by the appearance of blotches on the leaves, which unless arrested extend to the stem and soon destroy the plant. The disease arrises from a stagnant atmosphere, f om sour, pasty soil, from a severe chill; the remedy is indicated in the conditions.

Cut away the affected leaves, brush and clean the plant and soil, stirring the latter, and remove all stagnant matter; then expose the plant to the full influence of the light and air and soon the enemy will disapear.

Bacteriosis of carnations is abundant and frequently present in the carnation plant, when neglected. It was not until recently known to the cultivator although it has for some time been present. When once noted it was throughly investigated until it has become very well mastered. The disease is caused by parasitic bacteria entering the plant from the air through the stomata or occasionally from the puncture of aphides. It is chiefly (seated) in the leaves of the immature and weaker plants, rarely attacking the stems or other parts of the plants. The affected leaf, even when the surface presents no unusual appearance to the eye, if held towards the light, shows small transparent dots scattered irregularly through the leaf, sometimes having a faint yellow color, which are the centres of infection. Sometimes the surface of the leaves are slightly raised over the dots making watery pimples. After a time the dots become distinct spots, and as they extend inside the leaves the surface tissues dry, the internal tissues collapse and whitish sunken spots appear. As this spot increases in size the leaves wither but continue to cling to the stem.

Plants may be kept from this disease by keeping the foliage dry and preventing the presence of aphides. The temperature should be kept below fifty degrees.

The nematode disease of carnations manifests itself in

shriveling the tissues, usually on one side of the plant, progressing from below upward, and resulting in the destruction of the plant. At the base of the affected plant may be seen, irregular shaped galls varying in size and usually appearing on the thin roots or those of medium thickness. These galls are of a yellowish white color, easily recognized from the abrupt swellings appearing on the root. As they become older they are very irregular and covered with little nodules. On some of the older galls these nodules are replaced by cavities surrounded by a thin, ragged margin.

This disease is one of the most difficult to control. For open air cultivation there is hardly any precaution that will enable one to escape the disease except by rotating the carnation with other plants which are known not to be infested by the nematode.

Within the greenhouse the problem is a much simpler one. It ought not to be troublesome if care is taken to propagate from sound stocks, since sterilization of the soil by heat will be quite efective in preventing its introduction through either earth or compost.

The carnation is also attacked by various insects such as the aphis or green-fly, the red-spider and the carnation twitter.

The aphis subsists upon the juices of the plant by perforating the outer skin and sucking the sap.

Tobacco in any form is quickly fatal to this insect, but should be applied on its first appearance; as a preventative rather than a cure.

The conditions favorable for the red spider are hot and dry atmosphere, continued for some time. These conditions are as damaging to the carnation as they are favorable to the insect.

The temperature should be reduced and a moist atmosphere maintained by spraying. This should be done only on bright days and during the early part of the day as to have the leaves dry at night.

The carnation twitter, a little insect not generally known, is found in certain sections of the country, and mostly upon plants grown in light soil. The leaves of the plants attacked curl up and have a frosted appearance. The only remedy seems to be to have heavy loam or clay soil, such as is suited to the health and nature of the carnation. There is little fear of carnation diseases if we start with healthy cuttings and treat the plants well.

Among carnation growers the question of what constitutes excellency is one full of interest and needs consideration.

First, no carnation that bursts its calyx is worthy of cultivation. This bursting of the calyx has been brought about by increasing of petals from five to fifty, while the

strength of the calyx has not kept pace with this multiplication. The calyx has been strengthened by bracts and it is not noticed that it never bursts except between these supports.

Second, the stem should be strong and erect. When we have drooping stems only the back of the flowers may be seen.

Third, the varieties should develop a large number of flower stems.

Fourth, The plants should have healthy well-formed buds.

Fifth, the flowers should be symmetrical and large, with petals regularly arranged, decreasing in size to the centre. The petals are preferably fringed.

Sixth, the color should be bright, not having a faded appearance, should be clear and distinct.

In this limited treaty on a subject involving so many questions of practical nature an attempt has been made to set forth as clearly as possible some general rules which may be followed in the cultivation of carnations. But as has been said, each grower must vary these general principles laid down as a basis of growth to meet his particular case.