

## BREEDING NEW CARNATION CULTIVARS

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Carnations are dichogamous, i.e. the male and female flower parts are present in the same flower, but they mature at different times, thus preventing self-pollination.

When the anthers ripen first it is known as protandry, and when the stigma is receptive first, it is known as protogyny. The carnation is protandrous as the pollen is mature when the flower opens.

When breeding anything, whether it is plant or animal it is generally accepted that the final result will be as in nature, that is the strongest will be more dominant and eventually the most successful. So the first lesson comes from nature.

**Selection for breeding.** When selecting carnations for breeding, pick strong and vigorous plants. Usually the pollen-bearing male plants contribute more to the physical make up than the female plants, but they both contribute to the progeny.

The things to look at in carnation parent stock are:

- a. resistance to disease, particularly rust.
- b. a strong and lengthy stem.
- c. a flower to look you in the face.
- d. bluish type greenery—this is generally healthier.
- e. quality of plants.
- f. flowers when YOU want it, e.g., I breed for winter flowering.

**Cross-pollination.** Once the parents have been selected it is essential to prevent interference from insects, such as bees. A tent or greenhouse is necessary for pollination, but I would recommend a glasshouse or polyhouse as it also aids in the ripening of the pollen. I have tried using pot covers and outside tents with little success compared to the process inside the glasshouse. Wind is a big factor when working outside as it blows the pollen around.

Inside the glasshouse the cross-pollination can be carried out in still air without fear of contamination.

I recommend that the stripping of most of the petals from the flowers be done, as this ensures that the ovaries area does not hold any excess moisture, as well as making the styles more accessible.

Collection of the pollen is best done in early morning from the just-opened flowers. The pollen is taken from the flowers by the fingers,

the last few days of the flower. Late morning or early afternoon are the best times to carry out the cross-pollination process.

A fine camel-hair brush is used to apply the pollen to the stigmas of the old blooms. The stigmas are located on the upper most ridge of the styles; generally there are two styles. Holding the stigmas uppermost, the pollen is applied to the very end which is curled. It is best to use one hand to straighten out both styles together so the pollen is applied evenly to both stigmas. More than two styles to a bloom generally does not give good seed.

After fertilisation, it helps to open out the calyx to allow the pod to ripen and to ensure it dries out particularly around its base, as any fungal infection in this area can damage all the seed in the pod.

**Harvesting.** The pods can be harvested when the top of the pod starts to split. The pod is allowed to dry out for a few weeks then the black, viable seeds are collected. Seeds will keep for six months or more in dry storage.

**Seed germination.** Seeds are sown into trays using a slightly acid, sterile, sandy U.C. mix. The mix is well watered before sowing, then, after sowing, the seed is covered with a light sprinkling of the same mix. The trays are then left for four or five days without any water. They are then placed under mist until the seed has germinated and the seedlings are growing well. They are then put under light mist before hardening-off a month later. The seedlings are ready for planting out after about two months.

**Planting out.** The seedlings are planted into the open ground about 2 in. apart, in rows about 18 in. apart. Unwanted plants are removed with a 2-in. hoe.

**The testing process.** Out of 5000 seedlings we get about 100 we consider worth testing further. Three replicates of these 100 selections are planted and grown for another year. Out of that 100 we may get about 12 that we will test the following year. From these 12 we may select three or four for final testing over the next three years. These are now tested in the glasshouse for duration of flowering, disease resistance, general appearance, etc.

The average successful carnation cultivar occurs about one in 30,000 seedlings, so patience is indeed a virtue for the successful breeder. The 'Granny Smith' apple would have taken around a million seedlings to produce, using this process, and the 'Sim' carnation even more.

**The future.** New cultivars will always be required, and genetic engineering may be used in this process. Tissue culture may be used to propagate huge numbers of a cultivar, but plant breeding to change the genetic make-up is essential to produce new ones.

"If I believed that I alone made this wonderful fruit, then, indeed, it would be for nought."