



# Cultivation Manual

## Dianthus

## **GENERAL INFORMATION**

The carnations belong to the genus *Dianthus* of the family Caryophyllaceae. It is one of the most popular cut flowers in the world. In temperate zones carnations are mostly planted in glasshouses, in subtropical areas in plastic- and glasshouses and also in open air and in the tropics more or less in the shade.

## **TRANSPORT**

Transport of the cuttings in cool conditions is crucial. The temperature during transport has to be 2°C. till maximum 5°C. When the cuttings arrive, they must be directly placed in a coldstore of 5°C. When there is no coldstore, the cuttings must be placed in a cold place where is no direct sunlight. Local transport must also be in cool conditions.

## **PREPARATION**

The soil must be well drained and in a good condition. A good soil is as follows:

- Good loose structure (air in soil)
- Well drained and a constant groundwater level
- Enough nutrients and organic material
- EC 1,0 - 1,5 mS
- pH 5,5 -6,5
- Free off pests and diseases

## **SOIL**

Carnations can successfully be grown in any type of soil, but it must be well drained and in good physical condition. The soil must be substantially free of weeds and weed seeds. There must be no herbicide residues.

## **DISINFECTION**

Soil disinfection can be done by steaming or chemical disinfection. With chemical disinfection methylbromide is mostly used (use 40-80 gr. per 1 m<sup>2</sup>). After applying the methyl-bromide, it is important to leach the soil. Advisable is 200-300 mm per m<sup>2</sup>.

## **BASE DRESSING**

Take soil samples before planting and add a base-dressing according to analysis.

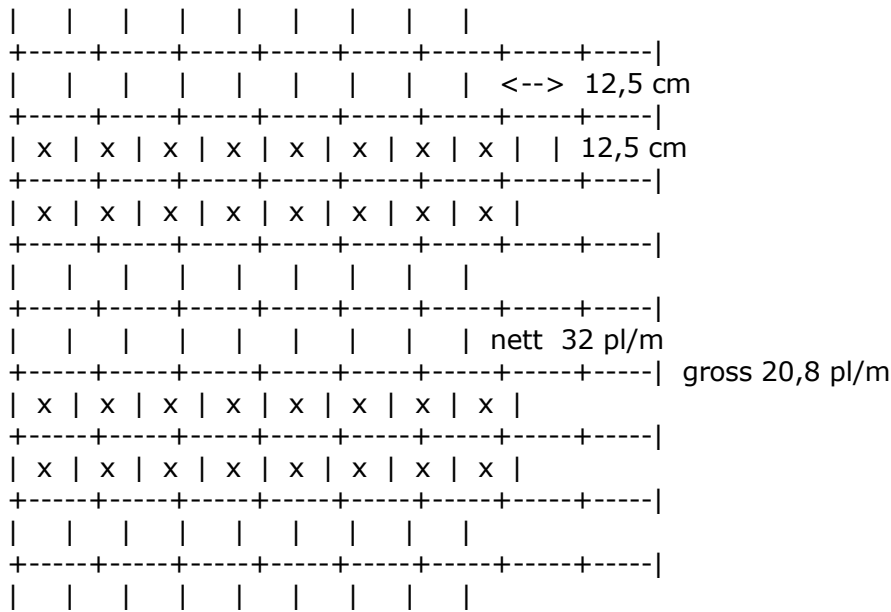
A guideline for 1000 m<sup>2</sup>

50 kg	sulphate of potash
50 kg	calcium ammonium nitrate
50 kg	tripelsuper phosphate

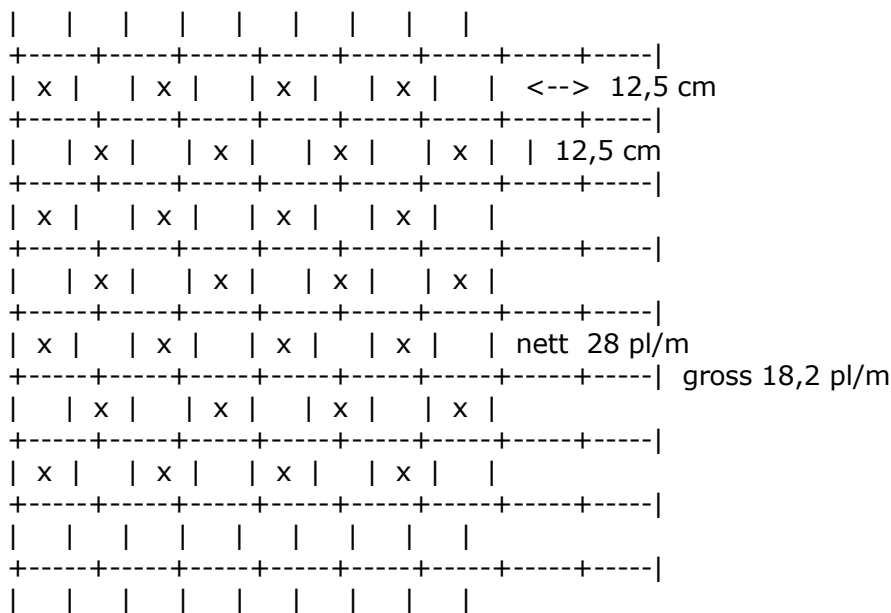
**BED LAYOUT**

For maximum production, you need wide beds and narrow paths. Normally beds are 1 metre wide. Paths are between 45-60 cm wide. Wider beds or narrower paths make working conditions difficult. Correctly laid out the floor should comprise 1/3 paths and 2/3 beds.

Possibilities for plantingsystems:



or



Within limits the more cuttings you plant, the more flowers you pick. This extra production only comes in the first flush. Dense planting gives more second quality stems and disease problems are more likely, especially during 2nd and 3rd flush. Some varieties produce more shoots and must be planted at a lower density. Plant whole beds and/or whole sections with 1 variety in order to be able to administer a accurate fertilization programme.

## **IRRIGATION SYSTEMS**

Points to consider are:

- \* Start with a 'clean' water supply.
- \* Install a sand filter. Take care not to use fertilizer mixes which may give precipitation problems.

A good irrigation system must:

- \* Water evenly throughout the field. Wet or dry areas mean extra work and lost revenue.
- \* Do not wet the foliage. Spraylines are not suitable for carnations. Flat tubing is sometimes used but a dripsystem, 2-4 lines a bed, is preferred during the crop. For the first 6-10 weeks it's preferred to use a irrigation system that gives water 'overhead' for a better division of the water in the total planting area.
- \* Be flexible. Occasionally, one variety may need less water than the rest of the field. You should have some means of cutting off or cutting down the flow to such varieties.

## **PLANTING**

Planting must be done carefully. Poor planting often leads to delayed cropping and disease.

### **It's vital that the cuttings get a good start.**

First moisten the soil evenly. Give light shading when you are planting in very hot periods, up to 40% shade for the first 10-21 days.

Do not actually 'plant' the cuttings. Make a small depression with your fingers or knuckles and 'stand' the cutting as shallow as possible. Do not firm it in or move soil or peat around the base of the cutting.

After planting, the white perlite in the root ball should still be visible. Make sure that everyone involved knows what he's doing and check frequently. Watch out for drying out (dehydration) just after planting. Depending on weather conditions you may need to start giving water 'overhead' for 5 minutes. Ideally, they require following conditions; very warm, humid and fairly bright - good light conditions.

Maintain a high air humidity. Spray the paths as well, not just the plants.

Prevent the cuttings and/or rootballs from drying out. Keep spraying water until new ( tiny white ) roots can be seen. Gradually reduce the frequency of spraying then change over to the drip system.

## **PINCHING**

After planting, the cutting continues to grow a main stem. If left unpinched, this main stem produces a " crown flower ". Pinching removes the head of this main stem at an early stage. This allows the side shoots to develop; these shoots eventually produce the first flush.

Pinching involves breaking out the head of the cutting and to leave 5 or 6 pairs of leaves (internodes). The top of the cutting breaks easiest in the morning when the cutting is still fresh and fully turgid.

Time from planting to pinching varies from 2 to 5 weeks.

### **One and a half pinch:**

The first pinch will produce 5 or 6 lateral shoots. With a 'one-and-half' pinch, 2 or 3 of these shoots are than again pinched at 4-6 leaf pairs. Each such shoot should then produce 2 or 3 further shoots which flower in due time but later than the main flush. This give you a somewhat lesser quality but a better continuity of production.

## **WATERING**

Carnations have fine, easily damaged roots. Over-watering and poor drainage cause root death and stunted growth. Take care not to isolate the roots from oxygen by waterlogging. The aim is to keep the growing medium evenly moist.

## **FEEDING**

Good quality and production are dependant on proper feeding. Incorrect nutrient levels can quickly cause problems. Like all plants, carnations need a wide range of nutrient elements. However, most problems are connected with following elements:

### **1. Nitrogen (N)**

Encourages growth. Extra nitrogen may be needed to produce extra growth, (e.g. young plants or after cutting a flush). But otherwise, nitrogen is balanced by an equal amount of potash. If too much nitrogen is given in the absence of adequate potash, growth will become rank and soft. Stems become floppy and foliage more sensible to disease. Very high nitrogen levels can cause thin hard growth. Plants which are lacking nitrate are pale and lack growth vigour, leaves are narrow and do not curl.

### **2. Potash (K)**

Balances nitrogen to give firm stems, low potash levels give weak and floppy growth. Excess potash makes the foliage very dark green and reduces growth. Potash levels must be build up during the season.

### **3. Calcium (Ca)**

Another important "quality" element. One of the main functions of calcium is to give strength to the plant-cell walls. Plants well supplied with the calcium have strong stems, leaves and flowers. Consequently they have a better resistance against diseases; plants grown at low calcium levels are more susceptible !

Chronic calcium shortage causes 'scorching' (drying-out) of the developing flower buds during hot weather, losses can be high.

Root tips die when short of calcium. This makes it more difficult for the plant to absorb calcium, so the problem worsens.

Aim to avoid problems by:

Keeping adequate calcium levels in soil This is achieved by base dressings (pre-planting) and regular feeding.

### **4. Boron (B) (micro element)**

Carnations require more boron than other crops. As the boron levels drop

- Brittle stems. Cracking off near a leaf joint when getting mature or easy stem breakage while harvesting the flowers.
- Excessive calyx splitting
- Complete failure of development of a flowerstem. Instead of a proper flowerbud, the stem produces a bunch of short shoots (bushy/broom-shape-like) and/or misformed flowerbuds with yellowish, brown or purple coloured scorching.

Like calcium, Boron is not very mobile, deficiency must be diagnosed early, or damage and loss of production may have been incurred before you are able to rectify the deficiency. Note that high potash levels can induce boron deficiency. In these cases, the soil may contain adequate boron but the plant is unable to absorb it. The remedy lies in keeping a good balance of nutrients and avoiding over-fertilization (excesses).

### **pH in soil**

Try to achieve a pH between 6 and 7 with a optimum of 6.5

### **EC in soil**

EC is a measure of soluble salts concentration. Salts can accumulate in the substrate from fertilizers and their residues as well as impurities in the water. Plants grown with a with a low EC figure will be soft and pale; high EC levels will produce hard thin grey though growth.

Sometimes unwanted salts such as sodium accumulate from the water supply. Together with the residue salts from the normal fertilization programm the total of the accumulated salts will be pushed-up too high. In these cases it is necessary (during the crop) to wash out the salts.

A good EC figure is:

at the start	1,2
gen. stage	1,5
or winter time	

### **DISBUDDING**

Only the central terminal bud is removed in the case of Spray-carnations. Identifying which bud to remove often confuses the beginner. With some experience the job becomes much easier. Identification is easiest at an early stage, when the terminal bud is just showing some first colour.

Keep well up with disbudding; once you are behind it becomes a much more difficult task to quickly identify the 'central-bud' which you are looking for !

### **PICKING OF THE FLOWERS**

Harvesting is done with the use of a sharp knife. The knife should be relatively small so that it does not catch in the support nets.

Cutting is faster when both hands can be used, one to cut and the other to hold and remove the flowerstem. Place the harvested stems on top of the topnett or on top of a pair of 2 strings rundown the length of the bed.

Picking stage:

If you pick too early, (flowers are still too tight) it will reduce the vasselife, and not all flowers will open on water. Flowers are to be picked when about 3 buds are coloured, but before the petals turn outward. Slower opening varieties must be allowed to open more fully before picking. They must be well coloured.

### **HANDLING**

Do not expose the harvested flowers to very high temperatures. (keep them out of the direct sunshine) As much as possible, avoid harvesting during the heat of the day. During picking, periodically collect the flowers and remove them to a cooler place. Handle them carefully. Flower 'collecting-sheets' are recommended. Put them immediately into STS solution in order to give proper pretreatment.

## **STS**

This is a very effective means of reducing ethylene damage and it greatly extends the flower vase life. Treated flowers are usually described as "long-life" or "silver-treated" carnations and are recognized as such by salesmen and buyers.

STS treatment:

minimum time: 4-6 hours in packing house or 24 hours in cool store (longer periods are not harmful)

Use only plastic containers and clean fresh water: rainwater is most suitable, but it should always be fresh and clean. If the solution is kept cool and out of bright light, it will last indefinitely. During usage the level of solution in the buckets will drop. Refill when necessary but once a week filter the remaining residue and use the 'clean' leftover solution for re-use.

## **COLDSTORAGE**

If flowers are to be kept in the best possible condition, coldstorage facilities are essential, even for the smaller grower. The coldstore size does not have to be very large.

Delay sleeving and boxing the flowers until they are thoroughly cold; sleeving the flowers before they are cooled will increase condensation and may prevent adequate cooling.

storage temperature: 4°C to 6°C is best, but not lower.

## **GRADING AND PRESENTATION**

Your reputation on the market very much depends on consistent grading and presentation. Set your standards as high as possible and stick to them!

### **General guideline:**

Aim to grow only class 1 flowers:

1. Do not take on too much in the first year.
2. Plant good varieties.
3. Do not plant too dense.
4. Take care with feeding
5. Use a routine pest and disease control programme.
6. Get help before you get into difficulties.

### **Quality Standards: General Requirements**

1. Stems should be undamaged by pest, disease or handling.  
Chemical deposits should be unobtrusive.
2. Flowers should be at a uniform stage of development within the box, not immature or over mature.

### **Class I**

1. Flowers must be cut at opening stage appropriate to time of year.
2. At least 40 cm stem length including the flower spray.
3. The main stem shall be of sufficient strength so that the flower can be held upright with little bending
4. Bunches must contain either 5 or 10 stems each having at least 4 openable flowers except in cases of exceptional quality where bunches may contain 4 stems each having a minimum of 5 openable flowers and provided such bunches fill the sleeve. Boxes must be marked accordingly.
5. Stem lengths must comply with the following scale:

<u>code</u>	<u>length (cm)</u>
40	40 - 50
50	50 - 60
60	60 - 70

After boxing, return the boxes to the cold store for final cooling before despatch.

## **SLEEVES**

A range of polythene, polypropylene and paper sleeves is available. A good quality sleeve should protect the bunch from damage and enhance the appearance. For sprays, clear polypropylene perforated sleeves are generally used.

Remember to cool flowers before sleeving, or you will get condensation problems.

## **BOXING**

Do use a good quality box. Boxes are not handled very carefully and if they get damaged, so do your flowers. Cheap boxes are a false economy. Pack firmly. Fill the box completely but keep the heads away from the end of the box. Allow an inch or so to absorb any movement.

## **PEST AND DISEASES**

Prevention is always better than having to cure a crop. Do not simply rely on chemicals; they can do no miracles for you.

If conditions are favorable to a disease you may find that it may be impossible to control the disease chemically. Cleanliness, Hygiene and the environment are just as important as the preventive weekly spraying program which you need.

It is important to realize that diseases start in a very small way. Spores build up and spread if conditions become favorable. Most favorable conditions for Fungi are moisture and high humidity.

Any moisture on foliage, stems or flowers will allow fungal spores to develop. If the crop foliage is kept dry all the time, diseases would virtually disappear

## **ROUTINE SPRAY PROGRAMME**

Good pest and disease control can only be obtained by maintaining a routine preventative spraying program. Use a range of wide spectrum fungicides and insecticides alternating them to prevent build-up of resistant species.

**Note:** The chemicals we mention are generally most widely used.

There are many equally suitable substitutes.

Check label before use.

Regular use of these materials i.e every 7-10 days should prevent problems.

Where diseases are well established other specific fungicides may be needed.

### Spray before problems are visible

Spray under relative slow drying conditions; late afternoon or early evening are best. To spray chemicals, try to pick dry days with no direct sun (cloudy and dry weather is most suitable).

NEVER SPRAY PLANTS THAT ARE WEAKENED BY INTENSE HEAT / SUNSHINE.

PLANTS MUST AT ALL TIME BE SUFFICIENT TURGID (maximum water capacity of plant cells)

Note:

This information is based on trials carried out under Dutch growing conditions. This information only serve to obtain a general impression, it provides no guarantee whatsoever.