florist

CULTURE DESCRIPTION GERBERA

CONTENTS

To be successful in growing Gerbera jamesonii a number of aspects is of importance and requires initial consideration, viz.:

1. soil structure
   - airiness
   - pervious ness to water
2. soil water level
3. soil sterilization and soil tillage
4. nutrious condition of the soil
5. soil heating

First of all an explanation on the above mentioned aspects is given after which more technical aspects will be described.

1. Soil structure

The main factors for the structure of the soil are its airiness and its permeability (quality of being pervious to water).

Airiness

Each soil type has got its optimum ratio between the quantities of air and solid particles. An initial demand made on the soil is that it is sufficiently airy, which may be realized by bringing tree bark or peat (dust or litter) in it. This also enlarges the potential moisture content of the soil. Caution should be considered when bringing in tree bark or peat. Experience already showed that if too heavy machinery is used to mix this organic matter with the soil, deterioration of its structure easily occurs. This, however, becomes only late visible.

Permeability

Profile and type of the soil define its pervious ness to water. If a soil is well pervious to water of its own an interfering layer still may annul this quality. An interfering layer opposes two risks :

-plant roots encounter a layer that is hard to penetrate, which easier leads to a check in growth.

-watering easier leads to root rot caused by Phytophtora cryptogea or other fungal diseases. A tight layer does not drain fast enough.

In case that the soil contains an interfering layer it has to be bruised by deep ploughing the soil. If possible this should be done before putting in soil heating conduits.

2. Soil water level

The soil water level is of great importance in Gerbera growing. A temporarily (too) high level of the soil water often results in wilting and an early death of Gerbera plants. If the soil water level is higher that 1 meter we advise to dig in soil water level indicators in order to check this
level regularly. The best way to come to a constant water level is to lay out a closed drainage circuit. In general a system of drains at 80 centimeters of depth is acceptable. For sandy and peaty soil types, however, we advise a depth of 70 centimeters; these soil types are characterized by their good permeability and their little capillary rise capacity.

3. Soil sterilization

Before starting a Gerbera culture disinfection of the soil is absolutely necessary. In particular the fungus Phytophtora cryptogea which causes a serious wilt disease may destroy a crop partly or even completely. Besides eelworms may cause failure of a culture. Disinfection of the soil can be achieved in different ways :

I.
Steam sterilization by means of covers or drain-pipes. If covers are used, they should be bulging for 6-8 hours. Under covers the soil is disinfected rather superficially. Steaming via drain-pipes results in sterilization over a greater depth but this method presents 2 objections, viz.:

-this investment is quite expensive

-soil heating materials must be quarantined to resist high temperatures (70 - 90 centigrades).

Both methods of disinfection are applied with good results. In view of possible deterioration
of its structure the soil should be rather dry; this also enables a better sterilization.

II.
Sterilization by means of methylbromid-gas. Although use of methylbromid-gas for soil disinfection is not always permitted this method also leads to good results. Especially when used on sandy, peaty or sandy clay soil type good results may be achieved. When methylbromid-gas is used on heavier soil types a stagnation in growth of the plants may occur.
This method of soil sterilization requires a rather moist soil for good results.

Whichever method of disinfection you choose we advise to wash out the soil afterwards. While steaming insoluble manganese combinations dissolve under the influence of high temperatures; this increases the percentage of manganese that can be taken up by the plants. To prevent excessive uptake of this trace element it is better to wash out the soil beforehand. After gassing with methylbromid the bromine content may have increased strongly. Although no visible damage has yet been shown we advise to wash out the soil as not only the surplus of bromine but also other superfluous salts are removed.

It is not possible to give an exact number of the quantity of water use but washing out during a period of 4 -8 hours (depending on the soil type) is sufficient. Of course the water is dosed in stages.

After sterilizing and subsequent washing out the soil it is necessary to wait 1 - 2 weeks before starting a possible soil tillage, this in order to enable the soil to drain.

Soil tillage

After sterilization the soil has to be tilled. For Gerbera ploughing over 30 centimeters of depth will do provided that the subsoil meets the requirements motioned before. In case that washing out has taken place it is very important not to start ploughing too soon. Tillage of too moist, damp soil easily results in deterioration of its structure. That is why the use of heavy machinery for this purpose must be dissuaded strongly. When organic matter (manures) is added it should not be mixed in the soil too deeply in order to prevent reduction in the subsoil.

4. Nutritious condition of the soil

Before planting we advise to check the nutritious condition of the soil. By having a soil sample taken you will know the exact contents of elements in the soil. Referring to the analysis it will be easy to adjust by addition of manures and or fertilizers. In case fertilizers are used it is possible to calculate the exact quantity to be added. Also the elements can be taken up by the plants directly. In case manures are used (tree bark, straw, farmyard manure) they also have to be sterilized in order to kill harmful organisms in them. Dried manures do not have to be disinfected.
When using manures or other organic matter the soil condition will be improved by :

- an increasement of the potential moisture content
- an improvement of the soil structure (texture, pore space)
- a gradually becoming available of nutritious elements

5. Soil heating

Gerbera can be grown with or without soil heating. Experience already showed that when the soil is heated considerably better results may be achieved. These better results proceed from :

- an easier strike after planting, followed by a faster growth
- a higher winter production
- a faster production start in spring
- a decrease in infection by fungal diseases from the soil, especially Phytophtora.

Besides soil heating has a positive influence of flower diameter and stem length. The above mentioned advantages largely defray the extra expenses for laying out the heating system and the additional heating costs.

For a soil heating circuit the mutual distance between conduit-pipes should be 70 - 80 centimeters. They should be dug in the soil at 50 centimeters of depth. In order to prevent root damage the temperature of the water running through the pipes must be limited at 40 centigrades. Higher water temperatures dry out the layer of soil just around the tubes and cause a warmth insulating crust. With 40 centigrades water temperature a soil temperature of 18 - 20 centigrades over 10 - 50 centimeters of depth may be achieved, which is okay for growing. In late spring and summer the soil heating can be switched off. Warming up the soil activates the root system of the plant, which, of course, also influences its uptake. The grower should take this in account.

When sufficient attention has been paid to the foregoing subjects the soil is ready for starting out a Gerbera culture. Than you will probably meet with more technical questions.

The following aspects will come up for discussion:

a. stock dressing
b. furrowing
c. planting time and duration of a culture
d. planting method
e. greenhouse climate
f. dosing carbondioxid (CO^2)
g. watering
h. additional fertilizing
i. cropping
j. prevention and control of pests and diseases
k. cares

a. Stock dressing

After having had a soil sample taken it is possible to decide whether stock dressing is required and is so which is its composition. Along with the manure dug in, nutritious elements were already added to the soil. A combination of fertilizer and manure ensures a good stock dressing.

b. Furrowing

In general Gerbera is grown on beds. On soil types that have little capillary rise the grower might consider to grow this crop on flat soil. In view of an easier working and a better drainage furrows are made. The ridges that arise from this activity are about 30 - 40 centimeters high. Here again using too heavy machinery and or on too moist soil is fatal for its structure.

c. Planting time

In principle gerbera can be planted all the year round. Roughly speaking there are 2 times when its is planted :

- spring : January, February, March
- summer : June, July, August

Planting in autumn and early winter is less profitable due to high heating costs and low light intensity (during the months of November and December). When planting in spring starting out with bigger, potted plants is the best way to achieve a quick initial growth. For then the plant already formed its root system in the pot and it will continue its growth undisturbed. These plants are grown in 12 centimeters containers. Spring is the best time to plant when the intention exists to start a culture for 1 ½ year: then one will have to do with only one summer, the time when the average price is lower.

Summer plantation :

- on heavier soil types we prefer to plant early, viz. In May or June. The plant will be able to develop a good crop before the winter season.
- on lighter soil types Gerbera is planted until the 3rd week of July as a rooted cutting; until in August 15th (only on lighter soil types) it is planted as a young plant grown in a 8 ½

centimeter container. These soil types enable a somewhat faster growth than the heavier ones.

When planting in summer production in autumn will be reasonable. In winter the production will decrease a little but in spring (March, April) it will increase considerably. Summer plantation is suitable for 1, 1 ½ and 2 year's culture. Especially for a 1 year's culture Gerbera is planted in summer. Gerbera should not be planted in late August or September as its crops will then be insufficiently developed to enter and pass wintertime. Concerning the duration of a Gerbera culture it is possible to grow one crop for 1, 1 ½ or 2 year's culture is not often done as during its 2nd winter the production and the quality will fall considerably. As well in a 1 as in a 2 year's culture there will be a peak in the demand for labour, which is not the case in a 1 year's culture.

d. Planting method

In general there are 2 systems of planting :

In general 2 rows per bed are planted. When planting more than 2 rows per bed, the inner ones will get less light than the outer ones; besides, it is less easy to work with. With 2 rows per bed the outer leaves will be able to bend out, which brings more light in the heart of the plant. The mutual distance between the rows should be 30 - 40 centimeters. Between the beds (ridges) there is a path of 50 - 60 centimeters of width. Mutual distance in the row varies from 25 - 30 centimeters; these measures result in about 6 to 7 plants per square meter. Of course the distances mentioned differ per variety and per duration of a culture.

In time of planting it is important that the plants are not planted too deeply. The heart of the plants should be level with the soil or somewhat above it. When you plant Gerbera plants too deeply fungal diseased easier occur; in case that the plants are planted rather shallows shoots will be pulled loose easily while cropping.

e. Greenhouse climate

After planting rather high temperatures stimulate a fast taking root and initial growth: during the day the temperature should be 22 - 25 centigrades, at night, however, it should be 20 - 22 centigrades. These temperatures should be kept for 3 - 4 weeks. Soil temperature must always be 18 - 20 centrigrades. After this period of starting off, temperatures may be adjusted as follows :

- spring plantation 14 - 16°C at night
- summer plantation 12 - 14°C at night

These are minimum temperatures; during the day they may vary from 18 to 25 centigrades.

In winter a minimum night temperature of 12°C and a day temperature of at least 14 - 17°C is necessary to continue production. Too high temperatures in winter result in high heating costs and weaker plants with an inferior flower quality. In the low light autumn and winter season we prefer to activate Gerbera early in the morning (dawn) by adjusting the temperature gradually to its day level. Discharge of the moist can be achieved by ventilating slightly. To prevent strong shocks, the temperature is adjusted gradually to its night level late in the afternoon. In case that carbondioxid gas is dosed these temperatures may be adjusted somewhat higher.

When planted in summer it is important that the plants do not dry out too much. Owing to sharp solar radiation Gerbera plants may not to able to keep up with their strong, forced evaporation which is caused by an insufficient uptake of water. Shading of the greenhouse will then be necessary to stimulate an easy striking of the roots. Shading by means of chalk, or even better a movable shading screen decreases the urgency of ventilating and raises the relative humidity of the air. In consequence the plants will have to evaporate less, which may also be achieved by watering a little now and then. As for this a relative humidity of the air of 80 - 85 % is optimal for Gerbera. If it exceed 90 % the air will get too damp and flowers may become deformed. Then we advise to heat and ventilate in order to decrease the humidity.

f. Dosing carbon dioxide gas (CO^2)

In recent years dosing CO^2 has proved to influence growth and production of Gerbera positively. As for the dose we can not possibly give one advise for all. On the average a limit of 700 ppm. (0,07 %) is all right. The varieties 'Marleen', 'Helios' and 'Veronica' are rather sensitive to CO^2 and bear a lower concentration. For these a limit of 350 and 400 ppm. is safer. Beneath 300 ppm. the plants will not grow anymore. Therefore it is advisable to check the CO^2 concentration regularly, especially on sunny, wintry days when very little is ventilated. Besides it should be considered that even without dosing carbon dioxide gas the concentration may get too high. Early in the morning it may even be over 1000 ppm., which might be harmful for the plants.

g. Watering

Immediately after planting the young Gerbera plants should be watered either by means of an overhead sprinkler system or with a sprinkler connected to a hose. Sprinkling by means of a sprinkler connected to a hose is more laborious but results in a better taking root of the plants. For sure in case that large plants (potted in 12 centimeter container) are planted sprinkling this way is preferable; then it will be easier to water the dry pots some more. This enables the crop to grow off equably. Regular inspection on an equable water distribution is demanded during all further culture. Digging a hole in the crop may give an indication of the moistness of the soil.
Soil water level-indicator and soil-bore are excellent expedients as well. Roughly speaking the soil should be moderately moist.

Until the first flowers are produced watering can be done via the overhead sprinkling system. Afterwards we prefer to water underneath the flowers. From autumn light intensity and temperature fall; in consequence watering must be decreased. Especially during the winter months (low light intensity) one should be very careful in this field. After watering the crop will remain damp too long a time, which stimulates infection by fungal diseases. In spring watering once or twice by the overhead sprinkling system may activate the plants; of course this can only be done if the weather allows to do so, that means if it is fine. Besides it will be necessary to tick off the flowers in order to prevent Botrytis specks. On moistly, dark days watering must be minimized. Preferably it is done (then) in the morning in order that the crop will have time enough to dry up before night falls.

The quantity of water to give depends on various aspects, soil-type, stage of development of the crop, light intensity, season etc., so there is no advise of the same tenor.
The following watering systems are used :

- a sprinkler conduit system amidst the plants
- a sprinkler conduit system just above the plants, underneath the flowers
- a sprinkler branch amidst the plants
- drip-irrigation: each plant is watered by 1 dripper, which is together with the other drippers connected to 1 conduit-tube.

The sprinkling systems should be laid out as level as possible in order to prevent the tubes, conduits, branches etc. from draining on one spot. Besides it should be considered that watering by means of these systems also results in a moist crop which will need time to dry up. In case that branches are used they may be covered with plastic foil to prevent the plants from getting wet. The drip-irrigation systems enable the sides of the beds (ridges) to dry out; covering the sides with white, light reflecting foil prevents this and brings more light in the crop at the same time.

h. Fertilizing

During a Gerbera culture the grower will have to apply additional fertilizer in order to keep a good, regular growth and production. It is advisable to have soil samples taken once per month. The analysis sill show whether to add fertilizer or not. As for the acidity Gerbera grows well at a pH of 6,0 - 7,0. A higher acidity may result in a lack of manganese or iron, a lower acidity causes a worse soil structure.

The quantity of fertilizer to add depends on soil temperature, moisture content, greenhouse climate, plant attitude, etc... Besides, stock dressing influences the quantity of fertilizer to add.

i. Cropping

The first flowers may be yielded 7 to 9 weeks after planting. Flowers of most of the varieties (single types) are ready to be picked when 2 - 3 whorls of stamens have entirely been developed. Some of the varieties are picked a little riper, especially the double types. For those, flatness and openness of the flower are of more importance. When picked in an earlier stage the flowers will have a shorter vase life.

In a young plantation the plant may be pulled loose while picking. Therefore, the first flowers have to be picked very carefully. The transport of the flowers from the greenhouse to the shed can take place by means of several systems: monorail, gutter-cart, a cart with buckets

on it and others. Whichever method you choose, see to it that the water in which the Gerberas are put, is always clean, add 1 cc Chlorine 10% in the water. Before putting the flowers in the water the "heels" (the hairy, woody lower 2 -5 centimeters of the stem) must be cut off in order that they can suck water.

j. Prevention and control of pests of diseases

In Gerbera culture hygiene is very important. Still control of pests and diseases will be necessary.
These are the most important infections in Gerbera plants :

■ **aphis**

Aphides cause deformed leaves. They excrete some substance on which a certain kind of fungus develops. Continuing inspection and control are important.

■ **greenhouse white fly**

Soon after planting this fly may occur, especially in summer when they come in via the ventilation. Its life cycle is only a few days long, especially when the weather is warm and sunny. Therefore control every 2 - 4 days is necessary (depending on the quantity of flies to be fought). We advise to alternate the chemical means in order to prevent reduced sensitivity or even resistance to a certain chemical mean.

■ **leafminer**

This insect may affect a crop sincerely.

There are 2 symptoms :

- white specks on the leaves caused by the flies.
- white tunnels in the leaves caused by the larvae.

The complete life-cycle (egg-imago) takes about 24 days. This plaque can be controlled as follows :

- preventive : once per 7 days spray treatment
- curative: twice per 7 days spray treatment
  twice per 7 days room treatment (pulverizer of pulsfog) In winter carrying

out both treatments once a week will do.

■ **red spider mite**

This mite attacks the plants at draughty places. It spins webs on both leaves and flowers.

■ **cyclamen mite**

This mite causes deformed crooked flowers which may not be full-grown. Older leaves are curled up, the younger ones being deformed and rubbrish.

■ **strawberry-mite**

This mite feeds on tubal flowers which later becomes visible as small pits in the flower heart but also the ray flowers may be deformed, curled.

■ **thrips**

This insect causes white specks or small stripes on the ray-flowers Flower-heads may be deformed. On the leaves silverish, grayish spots can be seen.

■ **PhytophthoraCryptogea**

This is a fungus that results in a serious wilting diseases in Gerbera. The foot and roots of the plant colour brownish. The fungus deliberates its spores when a cold-shock has occurred. We already spoke of the effect of soil heating in this field.

Gerbera wilt disease may also be prevented or controlled by :

- soil sterilization
- healthy planting material;
- optimal soil structure (drainage)
- spraying with pre-heated water
- treating the infected spots with liquid formaldehyde and cover them with plastic foil.

■ **Botrytis**

This fungus occurs especially when the relative humidity of the air is high (often in a tight) closed crop.

Its symptoms are:

- spots (gray specks) in the flower.
- rot in the heart of the flower, showing brown-brown dusty fungal fluff.

Botrytis can be prevented or controlled by :

- watering underneath the crop (a covered branch, drip irrigation)
- watering underneath the flowers
- gradually heating the greenhouse room to its day temperature in order to prevent condensation on the flowers
- picking leaves in a full-grown, tight crop
- spraying

■ **slugs**

This animal feeds on young buds. At first small holes appear in the leave and slimy traces are left on the leaves. Control slugs by spreading grains.

■ **mice**

These rodents eat buds or bite them off just above the soil; a small piece of stem remains. Fight mice by using mousetraps or by spreading poisoned wheat grains.

■ **eelworms**

Eelworms may cause the "tuberous disease". An infected plant fades yellowish and falls back in growth. The roots show thickenings these are the larval stages of the eelworm. These result in very serious infections.

Eelworms can be controlled by :

- soil sterilization
- starting off with healthy plants
- spreading out and digging in chemical means in order to prevent infection
- treating infected spots with chemicals during the culture

Concerning the control of the pests and diseases mentioned before, we can not advise the chemical means that we use in Holland. First of all we do not know if those manse are permitted in foreign countries. Secondly we have no knowledge of the effects, whether they are the same in other climates or not.

Deficiency symptoms

■ iron

The leaves turn yellowish, starting with the younger ones. The veins remain green. Serious deficiency results in a yellowish-white colouring.

■ magnesia

The leaf margins turn yellowish, leaves get thick and crispy

■ manganese

The leaves turn yellowish, starting with the older ones. The veins, including a small margin along them, remain green.

Deficiency of iron and manganese can be taken away by treating a crop with chelates (organic iron or manganese combinations).
Deficiency of magnesium may be taken away by spraying with magnesium sulphate.

k. Cares

In the past the need to pick leaves in gerbera culture has often been exaggerated. In general picking leaves during a 1 year's culture is not done; a 2 year's culture demands for leaf-picking, this in order to start the second year of cultivation with an airy crop. When growing 1 ½ year only now and then leaves are picked. In case leaves are picked do not pick too many at a time. The wounds caused are all angles of attack for fungal diseases. Together with these leaves old dead leaves should be removed as these leaves in particular foster occurrence of Botrytis.