

GYPSOPHILA MOTHER STOCK CULTIVATION AND YOUNG PLANT PRODUCTION



THE CULTURAL INSTRUCTIONS PRESENTED HERE, SHOULD BE REGARDED AS GENERAL GUIDELINES. IT IS ADVISED TO MAKE NECESSARY ADJUSTMENTS WHEN GROWING IN DIFFERENT CLIMATIC CONDITIONS AND AGRICULTURAL PRACTICES. DANZIGER DAN FLOWER FARM IS NOT RESPONSIBLE FOR ANY DAMAGE CAUSED BY IMPLEMENTATION OF THE RECOMMENDATIONS

GYPSOPHILA MOTHER STOCK AND PLANT PRODUCTION

Background

Nature of growth

Gypsophila has weak apical dominance. When the plant is stimulated by long days, the stem elongates and blooms. Under short-day conditions and low temperatures the plants develop a rosette of leaves. After planting, a single central stem develops. Secondary stems develop from the plant's base, fill out and appear as independent stems.

Additional stems develop after pruning. Their number and thickness depend upon the plants' height at time of pruning as well as the source of the shoots. Stems that develop from the plants' base are stronger.

Physiology

The development of the Gypsophila plant can be divided into four main stages:

- a. Vegetative stage
- b. Induction
- c. Elongation)bolting(and flower initiation
- d. Flower formation and flowering

According to its growth pattern, Gypsophila is defined as an obligatory and quantitative long-day plant. This means that long-day conditions will enable the plant to proceed from the vegetative stage)a(to the flowering stages)b-d(. The day length required for the plant to achieve flowering reaction is at least 13 hours, and varies with the clone and the variety. At a given temperature level, the longer the day the earlier the flowering reaction.

The duration of the growing process and time until flowering is also affected by the temperature: the higher the temperature (above a certain minimum), the earlier the flowering reaction.



Nursery Cultivation

A. Maintaining vegetative mother stock

Gypsophila tends to flower when exposed to long day conditions and high temperatures. These conditions exist in Israel during the summer, and during this period the mother stock tends to become elongated. This tendency can be decreased by darkening the stock. It is recommend to darken the Mother stock so you will achieve 14 hours of darkness. This can be done by automated or manual horizontal black curtains spread on top of the structure or on cables stretched above the tables. It is important to maintain darkness but not to over heat the plants by closing them with such a curtain.

During spring when the temperature is moderate and the day lengthens, it is recommended to shorten day length to 11 hours.

During summer, when temperatures are on the rise, it is recommended to shorten the day to 9 - 10 hours of light. Darkening the stock is to be stopped as soon as day length has reached 12 hours. During the night hours the darkening sheet is rolled up in order to prevent moisture from accumulating. An additional action taken in order to decrease the tendency of cuttings to elongate is regular harvesting of the cutting.

B. Recommended growing conditions in Mother plants

Temperatures: 26C during the day, and 18 - 20C during the night.

Moisture level: 60-80%

Light intensities: Gypsophila is a plant which requires high intensity light in order to grow and flower. In Israel, during the winter, the plants are to be provided with the maximum light intensity possible. During the summer, the quality of the cuttings in the stock is better when slightly shaded (20-30%). Sometimes, when there are no other means of lowering the temperature in the greenhouse, shading must be applied more extensively.

You must be aware that extensive shading in the summer may cause growth to become etiolated and cause cuttings to be weaker.

C. Maintaining a healthy mother stock

Maintaining sanitation will assist in decreasing the possibility of penetration and infestation of diseases and pests in the greenhouse.

Any weeds growing inside or near the greenhouse should be removed. These weeds are possible pathogenic carriers. Sterilization of working tools used in the greenhouse should be carried out on a regular basis. Rooting trays and other various growing containers which are not disposable should be sterilized from one growing cycle to the next. Should an infected plant be found, it must be immediately removed from the greenhouse. Left over plant material such as leaves falling off during harvesting of cuttings is to be removed. A shoe disinfectant with the proper disinfecting solution should be placed at the entrance of the greenhouse. Upon entering the greenhouse hands are to be washed with soap and water.

D. Avoiding mix-up of varieties

Throughout the entire growing procedure it is of great importance to avoid a mix-up of the various varieties. This is especially true with Gypsophila, since amongst several of these varieties, visual differences are not obvious during the vegetative stage.

During Harvest - During harvest of cuttings each variety should be picked and put into separate containers. Each container will be marked both inside and out side by a suitable sticker, stating the name of the variety.

During Rooting Process - Workers working in the same area will not root two different varieties at the same time. Space is to be left between the different varieties, marked at the beginning with the name of the variety.

While rooting cuttings, stickers stating variety name are to be placed upon rooting trays, with reasonable distances between the different trays.

Sorting and planting stage -Each variety will be sorted separately by workers working in the same area. Each plant tray will contain plants from only one type of variety.

Each plant tray that has been sorted will be marked with the suitable variety sticker. The plant tray will be placed upon the predestined table.

Workers will plant each variety separately, at the suitable table. Each section is to be marked from it's beginning with the name of the variety.

E. Growing medium

Mother stock is grown in separated medium. In Israel, Gypsophila mother stock is grown in volcanic medium. Lately we have also begun to grow stock in Perlite 2 medium, so far with good results. We do not have any experience growing Gypsophila stock in medium based on peat. The plants can be planted on benches, in pots width 12-13 cm.

F. Fertilization & irrigation

The amount of runoff water at the end of each irrigation period is of great importance when growing in separated medium. The runoff is important in order to avoid accumulation of minerals in the medium. When irrigation water is of good quality (less than 0.7 EC) it is sufficient enough to have runoff of 20%. When irrigating with EC of 1.0 – you should irrigate with 30% runoff. When Irrigating with EC of 1.3 - keep 40% runoff.

The conductivity level of the medium should not exceed that of the irrigating water by more than 20%.

The irrigation frequency is a function of the quantity of water in the medium and the growing requirements. If the medium used has a high water capacity and the water consumption of the plant is low, then the irrigation sessions can be applied less frequently. Since the amount of foliage of Gypsophila mother stock is comparatively small throughout the entire life cycle, intervals between watering sessions can be relatively long. We water the stock around once every 3-4 days. Despite the above, it should be mentioned that if using well aerated medium, there should not be any problem with shorter watering intervals

When growing in pots, frequency of watering is higher - once every two days.

It is advised to avoid excessive irrigation in order to lower the risk of fungi disease spreading in the sterile medium.

The level of fertilizer after planting is comparatively low, adding 1.0 milimo to conductivity. Beginning from two weeks from time of planting, the level of fertilizer is increased, reaching 1.5 milimo.

Following is a list of various elements recommended for growing mother stock with dripping system. (The values are based upon yearly averages. During the summer, use an additional amount of 10% fertilizer. During winter use 10% less.)

Table No. 1: Recommended Fertilizing Program in mother plants.

Element	Concentration (ppm)
Mo	0.05
Zn	0.2
N	200
P	30
K	170
Ca	100
Mg	30
S	50
B	0.2
Cu	0.15

Mother Stock

A. Preparations before Planting

Disinfecting by steam (thermal disinfection) is considered to be the most efficient disinfecting method against the various pathogens. The steam is driven through pipes with holes situated on the bench. The medium is piled on top of the pipes all along the bench which is enclosed with polyethylene wrapping, trapping the steam within. A temperature of 95C is to be reached in the medium (at this stage the polyethylene wrapping is completely inflated) and this temperature is maintained for at least one hour. If you are growing the mother stock in pots you may steam the medium in a concrete closed area with pipes running through

Another popular method of disinfecting medium is by inserting Methyl Bromide inside polyethylene covered medium. This method is not recommended as a sole method of

Disinfecting Gypsophila, since Methyl Bromide is less effective in exterminating bacteria, and there is always a chance that Erwinia, should it exist, would not be destroyed.

Using Formalin is more effective than using Methyl Bromide in exterminating bacteria and is applied by sprinkling the dissolved solution entirely throughout the greenhouse. Its disadvantage lies in its lower effectiveness in exterminating fungus. Should you use this solution it is advised to carry out an additional disinfection by using Methyl Bromide.

B. Disinfection of the green house

Before removing the polyethylene covering from the benches which have been disinfected, all appliances in the greenhouse need to be disinfected too (net, polyethylene cover, benches and floors).

After disinfecting the entire greenhouse, all polyethylene covering is removed and the medium is spread once again over the benches.

The pipes which are to be placed on the bench are also disinfected.

This disinfection can be carried out with 3% Chlorine.

C. Washing the medium

Should there be a chance that the salt percentage contained in the medium is too high, then the medium should be washed before planting. Conductivity should not exceed that of irrigation water by more than 0.7 milimho.

D. Planting

Planting density is around 80 plants per square meter if grown in benches or 3 per pot when grown in separated pots (19 cm pots).

The mother stock source are cuttings taken from the foundation house. It is of vast importance that during the entire process all possibility of mixing up the different varieties be avoided, beginning with plants taken from the rooting bench and up to the time of their planting. This point is very important, especially with Gypsophila, since with Gypsophila there are many varieties where one cannot see any visual difference between them.

The plants are placed on a tray marked with stickers bearing the name of the variety. Each bench is to be marked with a sign stating the variety's name and date of planting. During the days after planting, irrigation should be moderate and in accordance with the weather.

Should there be any chance that soil born fungus exists in medium, such as Pythium or Rhizoctonia, disinfect by using Ridomyl , Terachlor or Rhizolex by dissolving in water according to 2 gram per square meter of medium, and drenching. It is possible that there may appear some dry burns on the tips of the leaves as a result of drenching, but this will only appear in cuttings which have been pinched.

E. Pinching and harvesting first cuttings

After about 17-21 days from planting, and after ensuring that the plants are well established in the medium, you may pinch them. By doing so the plant is allowed to branch out. Pinching is carried out by removing the main cuttings. After doing so, the plant remains with 8-10 sets of leaves, which enfold buds which in the future will grow to become cuttings. It is recommended to stop irrigation four days before pinching, and renew irrigation around 3-4 days later. Should the medium be exceedingly dry as a result of not having received irrigation for several days, it is possible to water sooner. Beginning from a week after pinching, the early cuttings should be removed in order to encourage the remaining cuttings to emerge, and receive a plant which is evenly balanced.



F. Harvesting cuttings

The development of the mother stock is greatly influenced by the action of harvesting cuttings, in addition to removing the cuttings and using them for propagation purposes. Harvesting cuttings allows the plant to branch out, new cuttings to emerge and the plant to maintain a correct balance.

A cutting which is considered to be good, is one with 4 sets of leaves with a base which is sufficient and sturdy.



The cutting is picked in a manner allowing 4-6 leaves to remain below the area which was picked. If for some reason the cuttings are too long, then it is cut down to the right size - around 4 pairs of leaves.

The stock evens out around 10-12 weeks from the time of planting. From now on maintaining a regular and orderly harvest of cuttings is essential in order to receive well balanced compact mother stock, as well as homogeneous cuttings



During the winter, harvesting cuttings is carried out in weekly cycles. In the summer, it is advisable to begin harvesting more frequently, up to two times a week. Frequent harvesting of cuttings seems to result in cuttings which are more uniform in their appearance.

The cuttings are cut with the help of a knife, which is sterilized with 50% alcohol when moving from one plant to the next, in order to avoid disease spreading between the mother plants.

Great care should be taken in picking cuttings which are the most uniform in their appearance. The more uniform cuttings are in their appearance, the better the results that will be achieved in rooting the plants and receiving homogeneous rooted cuttings.

**Over sized cuttiting
Cutting**

Good Cutting

Small Cutting



After finishing harvesting of cuttings in a certain container, it is to be covered and moved as soon as possible to a cooler at 4°C.

An alternative method of picking cuttings is to do so by hand. Gently hold the cutting in the area which is to be the breaking point, bend the cutting and pull. This type of harvesting is only possible when the plant is well established in the medium. There is a higher possibility of transferring disease by harvesting by hand, and the uniformity of the cuttings is lower.

G. Cuttings yield

The quantity of cuttings yield depends upon the following factors:

1. The variety type and time of year - there are significant differences in yield depending upon the type of variety and time of year. The yield of the varieties Golan, Gilboa, Yukinko, Arbel, Tavor, and Festival are 1.4 - 1.6 times higher than those of the Perfecta.
2. Frequency of harvesting - in order to reach it's full yield potential, the stock is to be harvested on a regular basis, twice a week during summer and once a week during winter.

These values reflect the period when stock has reached its full yield potential (11-13 weeks from planting).

Due to differences in growing conditions, it should be pointed out that every geographic site has its own sub climate and that the yield quantity may differ between sights.

H. Packing cuttings which are intended for greenhouse rooting

The cuttings are horizontally placed in a plastic container or styrofoam box, with all cut edges on the same line. The container is lined with polyethylene, which the cuttings are placed on. A small polyethylene sheet is placed between each set of cuttings. When finished with harvest, close the polyethylene covering over the cuttings in a manner which will prevent loss of moisture which lowers the cuttings' turgor.

Each container is filled with only one type of variety, and has a sticker with the name of the same variety placed on it. The sticker should also state the source of the cuttings (bench and greenhouse from which they were picked), date of harvest and name of Harvester. These details are also stated on a sticker stuck on to the front part of the box. When rooting the cuttings, the identical sticker is attached to the area where the same cuttings taken from the container were rooted.

I. Packing cuttings intended for shipping to customers

The cuttings which were picked are placed in an orderly fashion (all cut edges on the same line) into a polyethylene bag, 50 cuttings per bag. The open end of the bag is folded in order to prevent loss of moisture, but is not sealed in order to ensure some ventilation.

J. Storing cuttings

Gypsophila cuttings are stored at a temperature of 1cC. When cuttings are placed in the refrigerator, the box is left open without the seal in order to ensure that the cuttings cool off quickly. It is important to make sure that the cuttings are well wrapped in polyethylene, preventing loss of moisture. After several hours the box may be closed. If the need should arise, it is possible to store cuttings in a styrofoam box at 1C for a duration of up to 3 weeks, usually without any significant loss in percentage of rooting or impact regarding the quality of the plant grown from the cuttings.

During the period when using stored cuttings, it is very important to ensure that there is no loss of moisture from cuttings during the entire process, from harvest and up to planting the cutting.

Cuttings which have had growing hormone applied to the base of the cutting are not to be stored.

Plant protection

One of the main criteria's regarding the quality of the plant is it's being clean from all pests and disease. In order to ensure that this criteria is maintained, we must take care of the Mother plants and stock in such a way as to avoid any appearance whatsoever of disease and pests by applying preventive spraying and drenching.

Following are details of the various diseases and pests which attack Gypsophila. You must keep in mind that it is possible that part of these pathogens do not exist in various areas, while at the same time it is possible that others do. The recommended solutions to use against the various pathogens are those in use in Israel. In other countries some of the solutions are not marketed, whilst at the same time they may market other solutions for the same pathogen. In addition, it is possible that a certain pesticide which is effective in one area is not in use in another due to the difference of it's effectiveness in the various areas – dosage of chemical should be checked for phytotoxic habit before applying on plants.

A. Pests

Insect proof Net can be very effective in substantially decreasing pest infestation. The net should enclose the entire green house structure without leaving any unprotected openings. It is also recommended to have the net cover all ventilation openings as well as fans. The net keeps all the relatively larger pests out of the structure. Pests smaller than the holes in the net will be able to penetrate, but will have a harder time in doing so, resulting in less pests entering the nursery.

The following detailed plan referring to the extermination of pests is based on nurseries without nets.

B. Leafminer

Mature leaf miner's fly and lay eggs inside leaf tissue. The larvae hatching from the eggs burrow inside the leaf. Extermination of this pest is based on spraying during the larvae stage. In order to be free of this pest it is necessary to spray once a week. Sometimes, when this pest is at the peak of it's activity, it is necessary to spray more than once a week. Covering the entire nursery with an insect proof net can ensure that this pest will not penetrate.

C. Caterpillars

The damage is caused by the caterpillars feeding on the leaf tissue. The caterpillars are active mainly during the night, eating the leaf tissue. During the day they can mostly be found on the medium. Extermination of caterpillars is based on two types of pesticides. The first one is active only for a short time, and is mostly effective during the primary stage of the caterpillar's life. The second pesticide is based on insect growth regulators (GR) which are active for long periods and are also effective during the more progressive stage of the caterpillar's development. In most cases, the pest penetrates the nursery during it's mature stage when it is relatively big. Therefore, even nets that are not dense will manage to prevent the caterpillar from entering the nursery.

D. Western flower thrips

The Californian Western Flower Thrips is considered to be the most problematic pest in very wide areas. This thrips is harder to exterminate in comparison to the other types of thrips. In addition to the direct damage caused to the plant tissue due to the thrips sucking activity, the Californian Thrips also carries the problematic virus TSWV, which also attacks Chrysanthemum plants.

Due to the thrips small size and elongated shape, even densely screened nets (insectproof) cannot entirely keep this pest from penetrating the nursery. The net will only decrease the number of pests that manage to penetrate.

E. Whiteflies

The mature, small flying Whitefly is mostly found on the underpart of leaves. There it lays its eggs. At the peak of this pest activity, clouds of whiteflies can be seen flying. The nymphs are flat bodied, colored light green and are permanently stationed on the lower side of leaves, continuously feeding on the leaves.

During the peak of the whiteflies activity, it is impossible to avoid infestations of this pest even when the nursery is well covered by insect proof nets. Since this host infests many types of plants, it is very important to destroy all weeds nearby and inside the mother stock nursery.

F. Spidermites

A small sized pest, located on the bottom side of the leaf. This pest grows in large populations, especially when exposed to high temperatures and low humidity. Webs can be seen when infestations are medium or extreme. This pest sucks the sap from the plants cells, causing damage such as chloroza spots in the foliage, and even causing leaves to wither up and fall off the plant. This pest prefers dry climate.

G. Aphids

A very small sized pest (1.5-3.5 mm) which exists by sucking sap from the plant cells. This pest's action is liable to transfer various viruses to the plant. These pests prefer sucking the apical shoots of the plant. They can be found mainly in hidden places near the newer growth in plants.

H. Broad mite

A small mite (up to 0.3 mm). laying it's eggs upon the lower side of leaves. Mature mites can also be found there. In order to diagnose this pest, it is possible to use with the help of a magnifying glass to look at the bottom side of leaves or else shake the leaves above a dark smooth surface. Upon the dark surface mites are viewed as white dots moving fairly fast.

Table No. 2: *Gypsophila* Pest Control Program

PEST	TREAT WITH	FREQUENCY OF TREATMENT
WESTERN FLOWER THRIPS	FURATHIOCARB ABAMECTIN METHIOCARB DICHLORVOS)DDVP(EACH WEEK ALTERNATE WITH DIFFERENT PESTICIDE.
LEAFMINERS	OXAMYL ABAMECTIN THIOCYCLAM CYROMAZINE	EACH WEEK ALTERNATE WITH DIFFERENT PESTICIDE.
CATERPILLARS	FENPROPATHRIN DICHLORVOS)DDYP(METHOMYL CYHALOTHRIN	IN ACCORDANCE TO THE LEVEL OF THE CATERPILLARS ACTIVITY.
	HEXAFLURON LUFENURON CHLORFLUAZURON	ONCE EVERY THREE WEEKS, ALTERNATING WITH DIFFERENT PESTICIDES.
WHITE FLIES	BUPROFEZIN PYRIPROXYFEN DIAFENTHIURON	ONCE A WEEK. ALTERNATING WITH DIFFERENT PESTICIDES.
	IMIDACLOPRID	APPLY BY ADDING TO WATER ONCE EVERY 4 WEEKS OR ALTERNATE SPRAYING WITH APPELORD/TIGER/PEGASUS .
	THIOCYCLAM FENPROPATHRIN CYHALOTHRIN	IN ACCORDANCE TO THE LEVEL OF THE WHITE FLIES ACTIVITY.
MITES	ABAMECTIN FENPYROXIMATE CHLORPHENAPYR	ONCE EVERY 3 WEEKS.
APHIDS	CARBOSULFAN ENDOSULFAN IMIDACLOPRID	ONCE EVERY 2 WEEKS.
BROAD MITES	ABAMECTIN ENDOSULFAN	ONCE EVERY 3 WEEKS.

I. Disease

Pathogenic fungus can be divided into two groups. The first group consists of fungus which mainly attack the foliage and cause appearance of symptoms called "spotted leaves". The second group of fungus causes damage to the various plant tissues. This group of fungus is found inside the various plant tissues and therefore is harder to treat.

Gypsophila mother stock does not have much foliage, therefore usually you can maintain a low level of moisture in the stock. In most cases, the low level of moisture aids in preventing the development of fungus which cause spots in the foliage.

We have not come across any mildew fungus in our mother stock greenhouse, which has been known to attack the plants whilst flowering.

Gypsophila Disease Control Program

DISEASE	FUNGICIDE	TREATMENT FREQUENCY
Botrytis	PYRIMETHANIL POLYOXIN-AL IPRADIONE	According to the amount of moisture in the greenhouse.
Leaf spots	MANEB CHLOROTHALONIL BENOMYL	According to the amount of moisture in the greenhouse.
Rhizoctonia	TOLCLOFOS METHYL QUINTOZENE)PCNB(Only if there should be infestation.
Mildew	PYRIFENOX POLYOXIN AL MYCLOBUPANIL	Only if there should be infestation.
Pythium	METALAXYL	Only if after planting there should be infestation. Is known to cause dry, burnt tips in foliage.

REMARKS: (referring to both tables)

1. This list contains the pesticides and fungicides in use in Israel, which are not phytotoxic to Gypsophila. The pesticides and fungicides appear in their suitable concentration and formulation.

2. The list includes pesticides and fungicides which do not mention "Gypsophila" upon their sticker/bottle.

3. The frequency of pest treatment is based upon growing Gypsophila in a structure with no insect proof nets, which are known to considerably prevent these pests from penetrating the structure. Frequency of spraying treatments can be cut down in structures which are well covered these kind of nets.

4. In some cases the Gypsophila shows signs of damage after pesticide and fungicide have been applied. Damage appears as partial dryness of the leaves tips. In order to prevent this occurring, spraying during the hot hours is to be avoided.

The recommendations herewith are based on growing conditions in Israel.

WE HOPE YOU FIND THIS INFORMATION HELPFUL.

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