Dear Customer:

Your shipment of Holland flower bulbs has arrived. To assure you the best possible results, we suggest you proceed as follows.

**Storage of bulbs before planting**

- Directly upon arrival and prior to planting, store your bulbs in an outside air ventilated room at (60-70 degrees F) or (17-20 degrees C)
- Storing unplanted Hyacinth, Tete a Tete & Daffodil bulbs at lower temperature will increase the risk of mold, mildew, botrytis and penicillium.
- If you receive your shipment of bulbs in card board boxes, open the boxes immediately for more ventilation.

**Potting soil**

Plant bulbs in well drained growing mix. The growing mix should be as follows:

- P.H. level between 5.5 – 6.5
- Low in soluble salts
- Should be moist not wet at planting time
- Leave enough room in pot to water them during the greenhouse forcing phase.

**Growing mix should contain the following:**

- 20% clean top soil or sand* (very important to avoid botrytis)
- 60% peatmoss
- 20% Styrofoam or vermiculite for added drainage and to increase oxygen in the pot for better aeration on your tulip roots.

The growing mix can greatly influence the quality of your tulip crop. A ph of 5.5 to 6.5 versus a ph of 6.5 to 7.0 will lessen the amount of roots in your pot (this is good) and will also fight of more bacteria for healthier roots. Should your ph be at the level of or close to 7.0 bring it down to a less neutral level. The sand in your mix will naturally fight off bacteria and will increase the drainage and oxygen levels around the tulip roots; which is desirable.

**Providing water when planting:**

Do not over water after planting and then placing the pots in the cooler. You should self test the moisture level in your growing mix.
The procedure is as follows:
Take a hand full of growing mix and place it in your palm. Squeeze as hard as you can and if there is water dropping out, your mix is too wet. Adjust your mix accordingly, because too much water will cause a shortage of oxygen leading to a weakening root system, and thus increasing the risk and susceptibility of Pythium. Rooting can then proceed quickly and satisfactorily.

Cultural information for late tulip forcing
This is an important section stating the facts for increasing the quality on your tulip bulb crop for the next growing season.

There is increase concern on tulip root diseases. The disease in particular that we are referring to is called Botrytis Cinerea or more commonly referred to as “GREY MOLD”. This does not affect hyacinths or daffodils.

What is grey mold? Exists only on tulip roots
Grey Mold or Botrytis Cinerea is a BACTERIAL root infected disease. This disease will start to grow if conditions are favorable. The favorable conditions are:
1. When too many roots are in the bottom of the pot.
2. Wrong growing medium is used
3. Long extended rooting time at 48 degrees

Symptoms:
• Grey mold can be seen in the cooler during the winter months already.
• Grey puffy or fuzzy mold growing from drainage holes
• Slimy, glazy roots in the bottom of the pot.

Caused by:
The primary cause for this disease is the dying back or the decomposing of root mass in the bottom of the growing pot. The roots decompose because of:
1. Lack of oxygen around the roots
2. Too many roots in the bottom of the pot (layer upon layer of roots)

What to do to avoid grey mold:
1. Always use new pots
2. Use the proper growing mix as described above
3. Root tulips until they just hit the bottom of the pot
4. Follow temperature schedule included in your shipment

Bulb fully yours,
Peter Langeveld Jr.
# FLOWER BULB FORCING

## SERVICE BULLETIN

### LOWER COOLER TEMPERATURE !!!!!!

**RECOMMENDED PLANT TIME = SEPTEMBER**

### COOLER TEMPERATURE

<table>
<thead>
<tr>
<th>SPECIE VARIETY</th>
<th>POT MOISTURE CONTENT</th>
<th>STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @</th>
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<th>Temp Range 2</th>
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<tr>
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<td>45 7</td>
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<tr>
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**FAHRENHEIT / CELSIUS**

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**FOLLOW THIS TEMPERATURE SEQUENCE FOR BEST RESULTS AND A QUALITY ROOT SYSTEM.**

### RECOMMENDED PLANT TIME = OCTOBER/NOVEMBER

### COOLER TEMPERATURE

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**FOLLOW THIS TEMPERATURE SEQUENCE FOR BEST RESULTS AND A QUALITY ROOT SYSTEM.**

**SPECIE VARIETY If Planting & Rooting between 9/1 to 10/25 maintain**

**HYACINTHS PRE-PARED If Planting & Rooting between 10/10 & 10/25 maintain**

**TULIPS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**DAFFODILS**

**TETE A TETE STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**CROCUS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**IRIS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**NOTE: DROP TEMP. TO ZERO ONLY AFTER HYACINTHS HAVE BEEN FULLY VERNALIZED (# OF COLD WEEKS). SEE FORCER’S GUIDE BOOK.**

**SCHEDULE 2. LATE & EASTER FORCING**

**RECOMMENDED PLANT TIME = OCTOBER/NOVEMBER**

**FOLLOW THIS TEMPERATURE SEQUENCE FOR BEST RESULTS AND A QUALITY ROOT SYSTEM.**

**SPECIE VARIETY If Planting & Rooting between 9/1 to 10/25 maintain**

**HYACINTHS PRE-PARED If Planting & Rooting between 10/10 & 10/25 maintain**

**TULIPS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**DAFFODILS**

**TETE A TETE STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**CROCUS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**IRIS STORE BULBS BEFORE PLANTING IN WELL VENTILATED AREA @ 60-70 F°**

**NOTE: DROP TEMP. TO ZERO ONLY AFTER HYACINTHS HAVE BEEN FULLY VERNALIZED (# OF COLD WEEKS). SEE FORCER’S GUIDE BOOK.**
1. Plant bulbs between the end of October and end of November.
2. Use a good well balanced growing mix. (see other sheets)
3. Place rooting bed in a well drained area.
4. Place rooting bed in an open area or field. Not in between greenhouses due to the fact that the sun reflects heat onto the rooting bed.
5. Water all pots before placing winter cover over top.
6. Cover pots with 2-3" of sand.
7. Cover sand layer with 3-4" of straw for winter cover.
8. Remove winter cover (weather permitting) in February. Call for details before removing.
CD-ROM over bulb flower diseases
The International Flower Bulb Centre and the KBGBB (an export group by the name of the Royal Dutch Wholesalers' Association for Flower bulbs and Nursery stock) introduced a CD-ROM with information about the diseases, pests and physiological disorders that can affect tulips, hyacinths, daffodils, crocuses and grape hyacinths during cut flower or pot plant production. This CD-ROM provides a description of each of these problems, its cause, and its prevention and control measures. The CD-ROM presents its information in several languages: Dutch, English, German, Swedish, Finnish, Danish, Polish and Chinese. The CD-ROM is available from your supplier or can be purchased directly from the IBC by placing an order by fax (+31-252-628970) or by E-mail (cbu@bulbsonline.org), being sure to mention CBBC as the code. Price: Euro 10.00 plus sales tax and shipping and handling costs.

Cold period
The cold period was often blamed for stems that were too short. This was the case when forcers maintained a temperature of 48°F throughout the cold period and forgot to introduce at least 3 weeks at 41°F.

Pythium
The Pythium fungus present in potting soil was somewhat more common this year than in previous years, and the standard control agents were often ineffective. To what degree this may indicate an increase in the number of new Pythium strains, is still an open question; research is presently being conducted in an effort to answer this.

Oedema
During a year with little snow, the greenhouse climate is extremely important. Managing the climate sometimes left something to be desired last season; this can also be said of heating systems. Moist air must not be present between the plants for long periods of time. This problem should be solved by using horizontally aimed fans to circulate the air or, even better, by using a crop heating system. A too densely planted crop is also at a disadvantage with regard to sufficient transpiration, because the plants will open up and spread out less quickly following emergence. Housing once the shoots have become long is another disadvantage in this regard because it hampers transpiration.
Topple
Topple was seen to be much more of a problem during this season. The causes for this are almost always rapid growth and insufficient light. Remarkably, the incidence of topple increased later in the season. This resulted from the fact that an increase of late planting in potting soil, this being done for logistical reasons, meant that a low rooting temperature was initiated too soon. The bulbs thus failed to develop enough roots and the plants did not grow at a uniform rate. And in some unfortunate cases, this also encouraged root rot caused by Pythium.

Act now to prevent problems later!
Although various other diseases and disorders occurred less frequently, now is the time to consider taking measures to prevent them later. Examples of such measures that can be taken now are:

Augusta disease
Augusta disease can lead to high losses, particularly when plunge beds are used to provide a cold treatment. In this case, make sure that the soil in the plunge beds and/or the forcing containers is/are not already infected, and make sure that the soil in the plunge bed is cold (48°F or preferably even colder), well drained (wet soil encourages the spreading of this disease) and free of weeds. Augusta disease is caused by a virus and spread by a fungus. In addition to tulips, Augusta disease also occurs in weeds and such crops as potatoes. Certain tulip cultivars, including ‘Christmas Marvel’, ‘Apricot Beauty’, ‘Angelique’, ‘Carola’ as well as botanical tulips and early-flowering tulips, are more prone to this disease than others.

Veinal streak
Plant susceptible cultivars in sand with a low salt level, do not water excessively, and if applicable, ensure proper drainage in the standing ground. When planting in moisture retentive soil, do not plant too deep. After housing, maintain the highest permitted greenhouse temperature. Never place containers holding susceptible cultivars on the ground but on a greenhouse bench and/or an empty container. Susceptible cultivars include ‘Merry Widow’ and its sports, ‘Monte Carlo’ and its sports, ‘Negrita’ and ‘Ad Rem’. After housing, maintain the highest permitted greenhouse temperature.

Long necks.
Use large bulb sizes and do not subject the bulbs to more cold than is strictly necessary.
Potting soil requirements
Potting soil is usually used as a substrate in the boxes. This potting soil consists of a mixture of the different peats plus sand and should satisfy a variety of requirements: You should not change the composition of your potting soil if you experienced no problems with Botrytis cinerea, Trichoderma, Fusarium avenaceum and Pythium last season.

A good mixture will contain 40-80% upgraded black peat plus 60-20% peat litter. Black peat by itself increases the risk of the appearance of Pythium and Fusarium (in the bulb), while using only peat litter increases the risk of the development of Botrytis cinerea, Trichoderma and Fusarium avenaceum (in the root). What is preferable, however, is to use a mixture consisting of 60% black peat and 40% peat litter because the Pythium problem is easy to solve by adjusting the amount of water used in irrigation according to the potting soil mixture (see “the proper proportion of water and air in the soil”).

To provide a maximum amount of moisture, to produce sturdy plants and to reduce the risk of a fungal attack (Pythium, Trichoderma and Botrytis cinerea), as well as to prevent hollow stems in ‘Monte Carlo*, we advise mixing the potting soil with 25% - 30% coarse sand or soil containing no pathogenic organisms. To improve the structure of the potting soil, you can test mixing such materials into the substrate as well-rotted bark (fibers) or clay granules and well-rotted compost. The structure of the potting soil should be neither too coarse nor too fine. If too coarse, it will be difficult to work and water will drain off too quickly. If too fine, this will reduce soil permeability so that water cannot escape quickly enough. The proper proportion of water and air in the soil. The air content should be at least 10% at “container capacity”. This is after the draining off of excess water. Potting soils containing types of peat that tend to dry out are unsuitable. A standard that can be applied here is that the soil may not shrink more than 35% after having dried out. If the composition, structure and/or moisture content of your potting soil has changed, the quantity of water being used for irrigation must be adjusted to these changes. After all, each kind of potting soil needs its own specific quantity of water.
A good way to check to see if your potting soil contains the right amount of moisture is to do the “pinch test”. To do this, squeeze a handful of potting soil in your hand. If you can just squeeze a few droplets of water, the potting soil is moist enough but not too wet. In all other cases, it is either too wet or too dry. If potting soil is overly wet, the roots will not receive enough oxygen. This will weaken the roots and make them easy prey for Pythium fungus. (Continues on next page) The potting soil should not be too acidic. A pH of 4 to 5 will harm the crop. This is why we advise using a potting soil with a pH of 6 to 6.5. To measure this, have a soil sample taken, even if a soil diagnosis was provided with the potting soil itself. If the soil pH is too low, you will have to lime the soil by applying 1 kg. of calcium carbonate to every cubic metre in order to increase the pH by a factor of 0.3.

The salt level of the soil should not be too high, because excessive salt levels in the soil will be detrimental to the development of roots on tulip bulbs. A maximum level for salt is indicated as an EC of 0.5 - 1.0 (based on a saturated paste extract). This measurement should be taken following the application of any fertilizer (the adding of fertiliser, however, not being recommended). The soil must not contain any pathogenic organisms.

Reusing potting soil
The reuse of potting soil, especially potting soil that has been used for several years for forcing tulips, should be done with a great amount of caution. You should be absolutely certain that it contains no Pythium spores from any infestation that might have occurred the previous year. If you decide on reusing potting soil, Pythium control will certainly be advisable. Rhizoctonia fungi can also develop in recycled potting soil and will have to be controlled by means of a soil treatment (e.g. the application of Rizolex) or by steaming. Moreover, the soil should not have dried out during summer storage. Once all requirements are met (including the meeting of hygienic standards), reusing the soil may be considered. However, in view of the risks attached to reusing potting soil and the low investment involved in using new potting soil, we strongly recommend that you buy new potting soil.

Order the right kind of topping sand
Order only coarse, highly permeable sand. Using sand with too many fine particles, silt or pollutants as a topping sand will cause the underlying substrate to become muddy when the plants are watered. When this happens, the bulbs can suffocate.
Are you using the right forcing boxes?
The boxes must be suitable for forcing tulips and be at least 8.5 cm. deep to allow them to contain sufficient potting soil. A layer measuring about 2 inc thick under the bulbs provides support for the roots and acts as a buffer for oxygen and water. Moreover, the bottoms of the boxes must have the right number of openings. Having plenty of openings reduces the number of roots growing on the bottom of the box and therefore lessens the risk of Trichoderma. Too few openings can cause the bulbs to suffocate because water will not drain off sufficiently. Finally, when stacking the boxes, leave at least 7 cm. or better still, 10 -11 cm. between the boxes.

Should forcing boxes be disinfected?
Rhizoctonia tulipae (causing grey bulb rot), Pythium (causing root rot), Fusarium avenaceum (causing leaf and stem spot, Tricoderma (causing leaf-tip burn) and Olpidium (causing Augusta disease) may all still be present in forcing boxes. If these fungi developed during the previous season, the boxes should be disinfected by spraying them with water and then subjecting them to an aerated steam treatment for one hour at 60°C (140°F), or to treat with a labelled disinfectant such as Greenshield. Tests have shown that spray-cleaning containers will not remove the Pythium fungus.

Know-how
Unfortunately, the forcing industry is faced every year with problems caused by the incorrect storage of bulbs just before planting. The storage of bulbs, however brief, requires the kind of know-how and equipment available to suppliers but not usually to growers. Although early bulb deliveries on demand may initially reduce transportation costs, this method will eventually cost more in bulb losses.

Leave this treatment phase to a specialist or your supplier. If you need to store your bulbs for a brief period, make sure your company has the right equipment for this and follow the recommendations below.

Temperature and RH during storage
Uncooled tulips are best stored at a temperature of 20 - 17°C (68 - 62.6°F) and an RH of 70 to a maximum of 75 - 80%. If the tulips are stored at 9°C (48.2°F), this period is considered part of the cold period and must therefore be included in the total number of cold weeks. The bulbs must be planted at least 6 weeks before they are brought into the greenhouse. An RH of up to 90% was not shown to be a cause for alarm during cooling. A lower RH would be even better in conjunction with the possibility of Penicillium growth but would require fairly expensive dehumidifying equipment that would have a limited capacity anyway.
Temperatures over 63°F are permitted, but as temperatures increase and are maintained for longer periods, this can start causing bud desiccation in early November.

The additional shrinkage due to desiccation due to prolonged high storage temperature can also promote Botrytis cinerea. Disinfecting these bulbs with an agent such as Sumico would be recommended, especially if the bulbs have been lifted when still white.

**Providing water when planting**

After planting, the soil mix in the boxes has to be made sufficiently wet—this includes the corners, too! Do not overdo this, however! Too much water will cause a shortage of oxygen leading to a weakening of the roots and thus a higher susceptibility to Pythium. A general rule of thumb is that if you squeeze some soil in the palm of your hand and a few droplets escape, the moisture level in the potting soil is right.

Rooting can then proceed quickly and satisfactorily. When using dry wooden boxes, check the soil’s moisture level fairly soon after planting, and water again as necessary. The use of a sprinkler system is extremely risky due to the poor water distribution in a vertical direction through the boxes that are stacked one on top of another. This is why this system is strongly discouraged. It is important to carry out frequent checks of the soil’s moisture level; this level will remain fairly constant, however, if the relative humidity in the rooting room is high enough (90-95%).

**Rooting room temperature**

After planting, the temperature in either the rooting room or the standing ground must be sufficiently low: not over 9°C (48.2°F) until 25 October and then not over 7°C (44.6°F) until 5 November. After this date, the temperature must drop to 5°C (41°F). Starting on 1 January, the temperature may drop to 4-3°C (39.2 - 37.4°F) and later in February to 2-1°C (35.6 - 33.8°F). This schedule, however, depends on the growth of the shoots. In other words, if the shoots grow too rapidly, the temperature should be allowed to drop more quickly. Never raise the temperature since it will then be impossible to control growth. Make sure that the thermometers and hygrometers are calibrated every year so that you will be kept accurately informed as to the conditions and can then take corrective measures as needed.

**Moisture**

Good rooting is the result of having sufficient moisture and oxygen in the soil. Unfortunately, failures occur every year due to errors in this respect, especially due to too much water. The problems that arise when too much water is provided include suffocation, topple, Pythium, veinal streak and poor rooting. This means keeping a close watch over your bulbs: too much water will produce damage!
Relative humidity
The drying out of the soil in the boxes and having roots growing through the boxes (resulting in problems due to Botrytis cinerea) can be prevented by maintaining a high relative humidity (90 - 95%) in the rooting room. It would be advisable not to allow the indicated RH to drop below this value but more importantly not to allow it to exceed this value. Keeping the floor wet can keep the RH at the proper level, but this also results in the risk of excessive root growth.

Ventilation-air circulation
Opening the door now and then during inspections will not provide sufficient ventilation. Forced ventilation according to the norms is necessary to keep the composition of the air in the right proportions; this will have a positive effect on rooting and, later, on the weight of the plants. In a rooting room not equipped with air conditioning, prolonged storage periods can result in the drying out of soil and roots. Drying out can also occur in the vicinity of a humidifier fan. Be sure to check for this and add water if necessary! A slight amount of air circulation is sufficient for attaining proper temperature distribution. Enough air movement can be obtained by the simultaneous operation of humidifiers and humidifier fans. We should keep the fans on continuously, however, during the period when the bulbs are first being cooled.

From about mid-November onward, growers should keep an eye on whether or not the shoots and roots are growing too quickly. In other words, that the shoot is not pushing its way up against the underside of the container above it, and that the roots are not growing through the bottom of the container in which they are planted. It would be preferable to set the temperature for the room at 5°C (41°F) and then to let the temperature gradually drop from 5 to 2°C (41 to 35-6°F) during the month of December.

Keep the roots healthy
In spite of using a substrate that is free of pathogens, four fungi lie in wait to infect the roots if conditions favour the growth of these organisms. These fungi are: Pythium ultimum, Botrytis cinerea, Trichoderma and Fusarium avenaceum. Conditions become favourable for these fungi when certain factors cause the roots to become weakened or to die back. If the roots become weakened while in the substrate (something that can happen when the substrate becomes either too dry or too wet), the roots can be infected by Pythium fungus. If the roots become weakened whilst not in contact with the substrate, the other previously mentioned fungi can attack them.
Roots not in contact with the substrate can be found on the bottom of the container, inside the tunic of the bulb, and outside of the container. So make sure to prevent the weakening or dying back of the roots by taking the following measures.

**Measures to take during planting**
Wooden and plastic boxes that were infected during the previous season should be shaken out and disinfected. Three methods to do this: immerse them for 30 minutes in water heated to 60°C (140°F), immerse them in water that contains a disinfectant such as Greenshield, or steam them for 2 hours in a cell at 60 to 70°C (140 to 158°F). Never plant in a substrate made up exclusively of a peat product.

When using peat products, always mix them with 20-30% coarse sand or pathogen-free garden mould. Always plant cultivars that are susceptible to Trichoderma in boxes with a 1-2 cm. layer of fine sand at the bottom. When planting, always press the bulbs lightly into the substrate. After planting, cover the bulbs with a layer of coarse sand. Adjust the amount of water being provided to the type of soil mix being used. Moisten the soil in the boxes sufficiently.

**Measures to take after planting**
Check to see that the soil in the boxes remains sufficiently moist. Rule of thumb: When squeezing some soil in your hand, a few droplets of water should almost but not quite be released. Limit the root growth under the boxes by allowing the temperature to drop on time. Prevent the roots that have grown through the joints in the boxes from drying out by providing a high humidity (90-95%).

**Measures to take in the greenhouse**
Always force tulips on open greenhouse benches. Keep the substrate in the boxes sufficiently moist.

**Recognizing fungi**

**Pythium ultimum**
In the affected patches, the growth of the crop will be retarded. Affected roots look watery and glassy and display small brown spots.

**Roots affected by: Pythium.**
Rural enemies. The bulbs are soft and dark brown in color and partially covered with large black sclerotia. The aerial part of the plant is lighter in color and the stem breaks off easily. To prevent these kinds of problems, the bulbs should be treated before planting (see “Recommended bulb treatments for tulips”).

12. Rev. August 2013 © Netherland Bulb company
Botrytis cinerea on the roots
The roots are dark brown, sometimes with sclerotia that form spores in the open air. Affected roots hanging out of the boxes are covered with a dull grey mass of spores. Shoots in boxes located under these roots can develop speckles (these plants being known as “speckle plants”).

Trichoderma
These roots look glassy and brown and are encrusted in a fungal weft. Later, they will begin to rot (a sweetish odor is characteristic). The leaf tips of these plants turn a light gray; in a later stage, the tissue will turn white and finally shrivel. The symptoms are displayed in patches and will not occur until just before flowering. Susceptible cultivars include ‘Ad Rem’, ‘Prominence’, ‘Kees Nelis®’, ‘Angelique’, and ‘Rosario’.

Fusarium avenaceum
Fusarium avenaceum Infected roots are rotten and reddish brown to pinkish-red in color. In affected patches, the crop is taller with leaves that are somewhat lighter in color and a bit glossy. The leaves also bulge somewhat with the upper side growing away laterally. Somewhat different symptoms from what are described here are also possible but the odd root color is always seen. ‘Gander’ and its sports are susceptible.

Botrytis cinerea on the bulb
The bulb, too, can be infected by this fungus, especially when stored for a long time and thus planted late. The use of steamed soil or fresh potting soil encourages the development of this disease due to the absence of natural pathogens.

When should cooled tulip bulbs be planted?
Cooled (9°C - 48.2°F) tulips that will be planted in a non-air-conditioned rooting room should not be planted until the temperature in the rooting room or standing ground has dropped sufficiently (approx. 9°C - 48.2°F). Taking this measure prevents a retarded flowering period and the development of Fusarium, Pythium and Augusta disease. If planting is deferred, the tulips must be placed in a cold store at 9°C (48.2°F) or colder for the interim period. Planting cannot be put off indefinitely, however. Tulips need at least a period of six weeks to take root.
Bud necrosis Kernrot (Central Rot)

Inside the main shoot of a bulb with bud necrosis a black rotten flower remnant will be present (flower necrosis) at the end of a stem that looks like a black stump. The leaves, however, are fully developed.

Cause
Bud necrosis develops with the onset and the presence of ethylene resulting in the space developing between the bulb scales earlier than normal and the reduction in the rate at which the young leaves surrounding the shoot elongate. This means that the young flower bud is not completely surrounded by leaves after reaching Stage G (a phenomenon also known as “open shoots”), thus making the stamens accessible to bulb mites. The bulb mites feed on the stamens causing rotting symptoms that lead to the destruction of the flower and/or shoot.

Prevention
1. Store uncooled bulbs in an ethylene-free store or at least where any concentrations of ethylene is less than 0.1 PPM and also provide sufficient air circulation between the bulbs.
2. Batches showing excessive Fusarium symptoms should receive extra ventilation or even be stored separately.
3. Remove Fusarium-diseased bulbs from the batch as quickly as possible.
4. Avoid ethylene concentrations of more than 0.1 PPM by removing Fusarium bulbs from the batches,
5. Provide sufficient aeration, keep bulbs apart from cut flowers, vegetables and fruit,
6. Avoid any exhaust fumes generally from combustion engine driven equipment (e.g. from forklift trucks).
7. Avoid ethylene gas in the greenhouse by ensuring proper annual maintenance checks on the heating unit checks and by using heating equipment that uses outside air for combustion.

Planting for late flowering
If tulips being forced for flowering in March and April are planted extremely early, the result will be very long cold periods. The disadvantages related to this are:

- Long shoots susceptible to breakage during the housing operation and a tall limp plant later in the greenhouse.
- Excessively rapid growth in the greenhouse that can reduce flower size and cause flower desiccation and topple.
The planting date can be determined by counting the number of weeks backward from the planned housing date. There is no objection to extending the cold period for 1 to 2 weeks but it will then be necessary to count backward two or more weeks (i.e. you will have to plant 2 weeks earlier). This saves energy (faster growth in the greenhouse).

To store tulips until planting requires the proper equipment and is therefore best done at your supplier’s premises. After the arrival of your bulbs, you can keep them at a temperature of 17°C (62.6°F) but until no later than 1 December. During this storage, provide the proper ventilation and air circulation and check for the presence of ethylene.

Planting after 15 November greatly increases the risks for damage to the root crown and the nose of the bulb.

**Planting tulips late in the autumn**
A tulip has to have enough time to develop roots. Most cultivars need 6 weeks to do so. This means, thus, that they need to be planted at least 6 weeks before being brought into the greenhouse. If the bulbs are to receive their cooling treatment in an outdoor standing ground, the grower will also have to watch out for an early frost that would eliminate the possibility of continuing the use of the standing ground.

Another thing to watch for are temperatures that drop too rapidly to allow the recently planted tulips to root sufficiently. Remember that if the bulbs have not developed a sufficient root system, they will be much more susceptible to frost damage.

The grower has two choices: (1) use a rooting room or (2) plant the bulbs early enough in the standing ground, mulch the standing ground, and keep blister padding on hand just in case!

**Transferring from the standing ground to the greenhouse under freezing conditions**
If the forcing boxes are transferred from outside into the greenhouse during a period of freezing weather, their shoots can partially or even entirely dry out. During freezing weather, either postpone the housing operation or take the following measures:

- Do this as quickly as possible, preferably in the afternoon.
- Cover the boxes with plastic sheeting during the housing operation and wait to remove the excess mulch layer until the bulbs have thawed out in the greenhouse.
- When you bring in the boxes, do not immediately expose them to high greenhouse temperatures since this might damage the bulbs. A temperature of 16 - 17°C (60.8 - 62.6°F) is warm enough.
- Another tip for preventing damage is to wait until the bulbs have completely defrosted in the greenhouse before watering them.
When can the tulips be housed?
Tulips to be forced in boxes can be housed as soon as their cold requirement has been satisfied. This requirement, also referred to as the “requisite cold period”, refers to the number of weeks of low temperatures (including the cooling given by the supplier) required by that particular variety in order to achieve the correct growth rate and proper height. More details about cold periods required by the various cultivars can be found in the manual.

Hyacinths: watch out for Penicillium
If hyacinth bulbs have not been properly stored prior to being potted up, they may be affected by Penicillium fungus. This disease develops if the bulbs were exposed to a low temperature and high RH during the period before they were planted. Under these conditions, the fungus can penetrate the spot at which the roots emerge from the bulb.

Plant the bulbs immediately upon arrival. If this is absolutely impossible, store the bulbs but never longer than 3 days at a temperature no lower than 17°C (62.6°F), an RH of 70%, and under conditions of proper ventilation proper circulation. This means that the bulbs should never be stored in a rooting room.

Do not house the bulbs until the correct cold period has elapsed
The first hyacinths can be brought into the greenhouse in the near future. This can be done as soon as a sufficiently long cold period has elapsed. When stored in a rooting room or standing ground at 9°C (48.2°F), the hyacinths can be housed after the number of weeks indicated. For hyacinths being produced for cut flowers, extra length is required. This is the reason for giving the cultivars being forced for cut flowers an additional approx. 3 weeks of cold. If the bulbs were given their cold treatment in standing ground or in a rooting room and the temperature during this time was higher than 9°C (48.2°F) or lower than 5°C (41°F) for longer than 1 week, the cold period should then be extended by a period ranging from a few days to 1 to 2 weeks. Never bring hyacinths into the greenhouse too early as this causes them to grow more slowly once inside. They will then be more susceptible to a condition in which the buds begin to open from the top downwards, sometimes rotting as they open, and spit where the flower disengages from the bulb.

The information in this publication is based on all the information known from scientific research and from practical experience. This information is of a to us general nature. Success is always the responsibility of those who purchase the flower bulbs. For this reason, constant contact between the supplier and purchaser of flower bulbs is very important so that additional information can be provided regarding specific circumstances.

Text: J.C.M. Buschman; Edited by William B. Miller, Cornell University, Ithaca, NY.
For direct help, just get in touch with Prof. W. Miller. - E-mail: wbm8@cornell.edu - www.hort.cornell.edu
Potted Specie Iris, Tete a Tete & Muscari

Specie Iris:

When planting the specie iris, do not over water them after planting & storing in cooler. The soil should be moist, not wet in order to get a good root system on the iris allow them to search for the water. If specie iris is planted in a growing medium that is water logged or too wet the bulbs are unable to make roots and the bulbs will ultimately be attacked by penicillium and rot away in the pot.

Muscari Blue Magic:

The only Muscari suited for potted culture. It is genetically shorter than armeniacum and somewhat slower but does not fall over. Blue Magic is a very easy item to grow but does not like to be forced at a high temperature in the greenhouse. The ideal forcing temperature should be around 14 to 15 degrees Celsius.

<table>
<thead>
<tr>
<th>Forcing period</th>
<th>Storing Bulbs</th>
<th>Cooling Bulbs</th>
<th>Maximum Storage Time</th>
</tr>
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<tbody>
<tr>
<td>Early forcing: Mid December through mid January</td>
<td>68 degrees Fahrenheit until planting</td>
<td>48 degrees Fahrenheit for 15 weeks</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Late Forcing: After Mid January</td>
<td>77 degrees Fahrenheit in August. 68 degrees Fahrenheit in September until planting</td>
<td>48 degrees Fahrenheit for 14 weeks</td>
<td>8 weeks – if bulbs start to sprout early; drop cooler to 36 degrees Fahrenheit</td>
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</tbody>
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An excellent way to force Muscari is to let it green up (weather permitting) outside for a few days. Then force it in the greenhouse at 14 to 15 degrees Celsius. This allows Muscari leaves to open up and the flower is visible right away and thus ready for packing and shipping.

Daffodils and Tete a Tete:

When potting Tete a Tete we advise you to plant with the nose of the bulb above the soil level. In previous years there have been problems with penicillium. This occurs when there is too much water or moisture in the pot and the bulbs are planted beneath the soil or buried. Water and moisture will seep into the nose of the bulb during cold storage and penicillium will start to grow. This will ultimately give major problems during the greenhouse phase. Plants will not grow. Labor and waste will be created fixing up the pots. Therefore we advise the following:

- Plant the nose of the bulb above ground
- Use a good aerated well balanced growing mix
- Do not over water before placing pots in cooler.
- Water content in soil should be moist to dry.
- Place some soil in your palm and you should not quite be able to squeeze water out; if you do, it is too wet.