



# RESEARCH NEWSLETTER



This Flower Bulb Research Program Newsletter is published by Anthos, Royal Dutch Trade Association for Nurserystock and Flowerbulbs in cooperation with Dr. Bill Miller of Cornell University.



Dept. of Horticulture Cornell University  
134 Plant Science Building  
Ithaca, NY 14853, USA  
Phone: + 1 0016072272780  
Fax: + 1 0016072559998  
wbm8@cornell.edu



Weeresteinstraat 10  
P.O Box 170  
2180 AD Hillegom  
Phone: +31 252 53 50 80  
Fax: +31 252 53 50 88  
secretariaat@anthos.org  
www.anthos.org

## Research Newsletter No. 37 Bill Miller, Cornell University

**How Deep Should You Plant Tulips? (Answer: not as deep as you think!)**

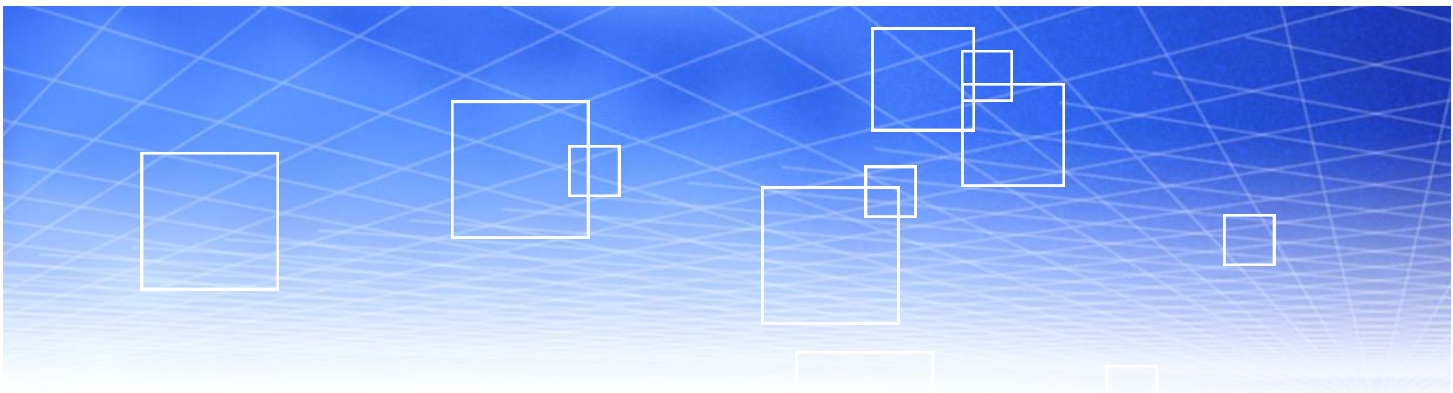
Tulips are great additions to the mid-spring garden. Everyone loves their vibrant color, long flowering season (when considering the range of bloom dates among the many groups available) in the spring landscape! Tulips are a bright and unmistakable sign of spring.

Tulips (and other spring bulbs) do require a certain amount of work on the part of the customer. They must buy them and take them home, and then (based on questions I get...) not forget to plant them! If they do remember to plant them, if they read many of our packages, they will be instructed to plant tulips in holes that are 8" (20 cm) deep. Furthermore, if you Google "How deep should I plant tulip bulbs", an answer immediately pops up directing you to plant them "8 inches deep". Perusing several of the top links from this search reveals most garden writers and bloggers that hold to the 8" depth rule, and one gets the feeling that "deeper is better". Publications from the IBC also mention to plant tulips into holes that are 8" deep. To avoid any misunderstanding, with planting depth we mean the depth from the soil surface to the bottom of the bulb

Why so deep? The main view is that "temperatures are more uniform deeper in the soil" and this is somehow good for the bulbs. What this fails to account for is that tulips are native to snow-covered gritty soils, moist cool springs and dry and generally hot summers. They certainly did not evolve under conditions of uniform soil temperature!

From the gardener's perspective, digging an 8" hole is not easy. Depending on the soil, digging an 8" deep hole for





15 or 20 bulbs is a major task. Many, perhaps most, gardeners will not do this. No doubt about it, gardening is good, healthy exercise, and avid gardeners enjoy being outside and the labor involved in planting bulbs. But, can we make bulb planting any easier? Can we come up with ways to make it easier for people and perhaps better for the bulbs? Can we find methods that might allow more people to plant more bulbs more often without sacrificing their long-term potential in the garden? Perhaps this newsletter, which highlights an “old method”, might offer at least one solution. I say “old method” because years ago Gus De Hertogh did trials on a similar “top planting” method, collaborating with a landscape architect in North Carolina.

Based on a meeting with dry-sale exporters in Holland in June 2008, it was decided to install long-term experiments to study planting and mulching depth on perennialization of tulips. Since then, we have done 6 experiments, installed in 6 different years, each one maintained for 3 years to follow perennialization (return and persistent flowering).

### **What We Did**

‘Negrita’ was used in all experiments, ‘Parade’ was used in experiments planted in 2013-2016. These cultivars were selected based on trials from North Carolina done by Paul Nelson that suggested both were “good perennializers”.

Before planting, the beds were tilled to 8” deep, and a slow release bulb food (Bulb Tone, 4-10-5) was incorporated at the recommended rate. After plants flowered each spring, they were allowed to continue growth, and held fallow over the summer. Flowers were allowed to wilt on the stem. Any seed pods that formed were left on the plant. Thus, it was a minimal maintenance situation. After all stems and leaves were totally dry they were removed and weeds managed by

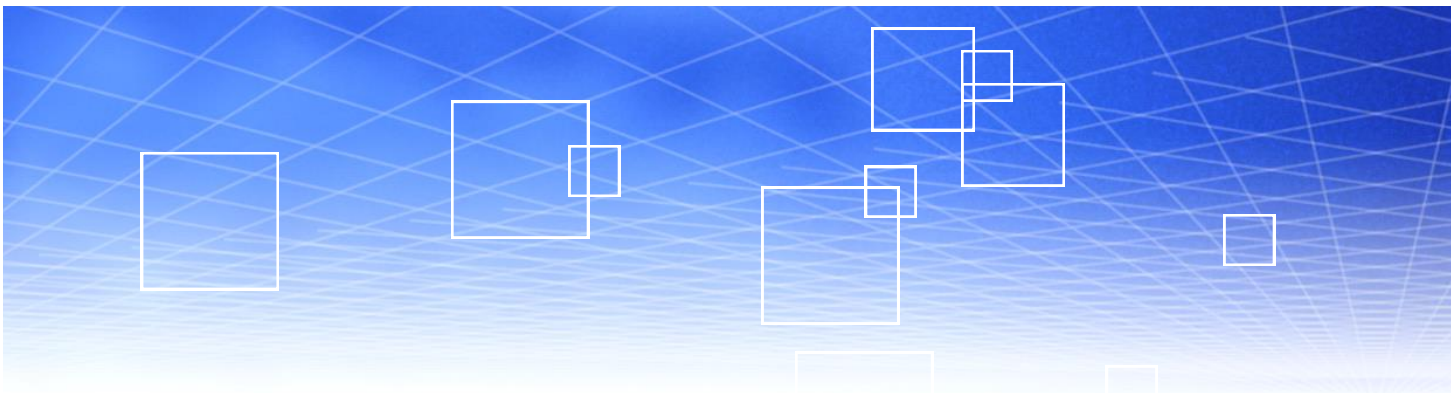
summer Round-Up (glyphosate) sprays. All water was from natural rainfall, no irrigation was used. In the fall, the mulch for each plot was reestablished to the original height (2, 4 or 6”) as needed. No additional fertilizer was applied.

Bulbs were planted in holes that were 1, 3, 6 or 8” deep (2, 7.5, 15 or 20 cm). After filling the holes, plots were covered with 0 or 4 inches (10 cm) of mulch for the 6 and 8” plots, and with 0, 2, 4 or 6 inches (0, 5, 10, 15 cm) of mulch for the 1” and 3” deep plots. Mulch was “double ground hardwood bark mulch”, as indicated by the supplier. Sixteen (16) bulbs were planted 5” apart in each plot. Plots were then mulched as above using 36” x 36” frames that were 2, 4 or 6” high to provide uniform mulch depth on the plots. In the first two years, each combination of planting depth and mulch had 2 replicate plots per cultivar. In the last 4 years, replication was increased to 5 replicate plots per treatment per cultivar each year. All told, nearly 600 plots make up the data presented in this newsletter.

Annually, for 3 growing seasons, data were collected on growth characteristics, including height, time of bloom and most importantly, the number of flowers per plot.

### **What we found**

In the first year of flowering, there were usually few differences in growth, other than the bulbs planted 1” deep with no mulch were nearly all dead, either from animal activity or direct freezing. Even so, unmulched bulbs in holes 1” deep, sometimes did survive the exposure of winter and flowered in year 1. By year 2, differences between treatments became more apparent. We’ll now focus on plant performance in the third year, which is a good. Bear in mind that “year 3” was a different calendar year, as plots were installed in 6 different years.



For year 3 flowering, averaged over all mulch depths, the deeper tulips were planted, the worse their performance (Fig. 1). This was very unexpected and immediately suggests the standard wisdom that “deeper planting is better”, or at least planting in 8” deep holes is incorrect.

Note that the number of flowers in the non-mulched plots are quite low, compared to mulched plots (see next section).

If we consider plots that were mulched to a depth of 4”, we see a very strong effect of planting depth. When plots were covered with 4” of mulch, deep planting is very detrimental to plant performance in the third year (Figs. 3 and 4). Given that most tulips are mulched, perhaps this information should be adopted for planting and package instructions.

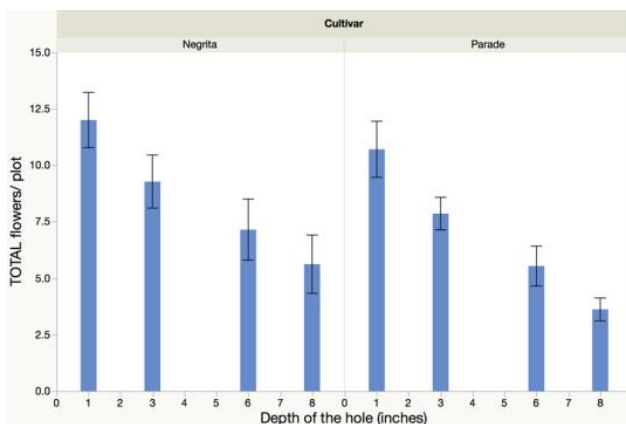


Fig. 1. Number of flowers per plot in the third year of flowering. Data are averaged over all planting depths and all mulch treatments, from plots of 16 bulbs each.

What if we do not mulch? In general, this would be an uncommon situation as most gardeners in North America mulch their gardens at some point in the season. Even so, planting depth had an effect on how tulips performed over three years. The data show that bulbs should not be planted any deeper than 6”, as deeper planting tended to reduce the number of flowers in year 3 (Fig. 2).

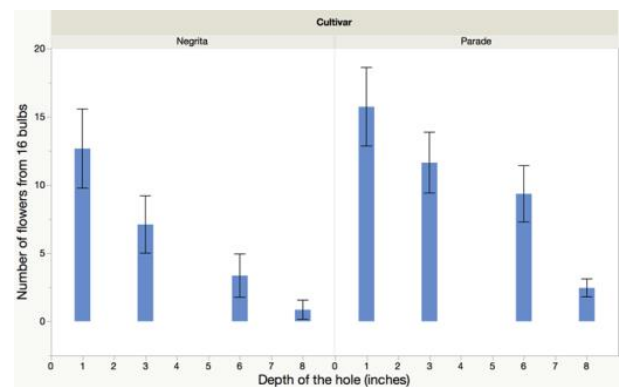


Fig. 3. Number of flowers from 16 bulbs in year 3, for plots that were covered with 4” of mulch.

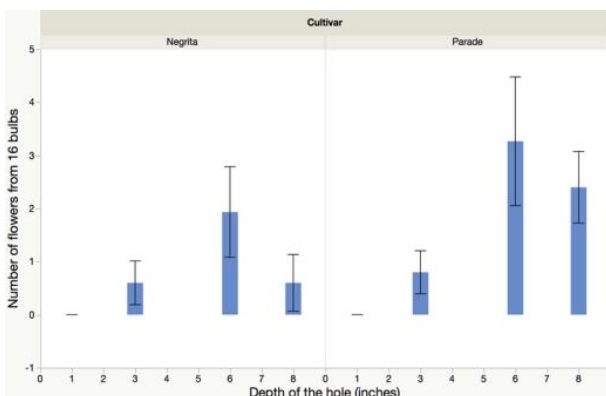
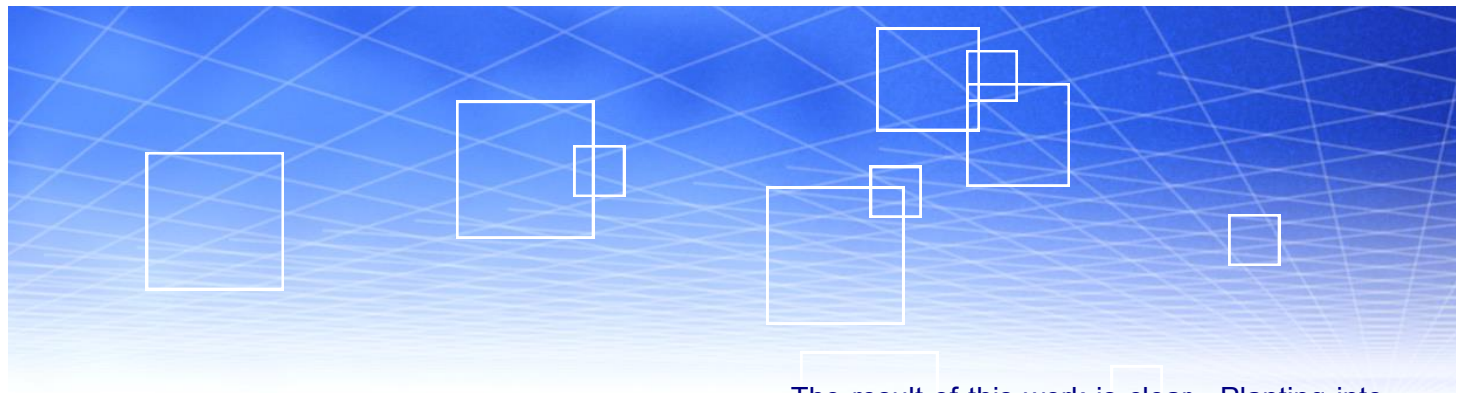


Figure 2. Number of flowers from 16 bulbs in year 3, for non-mulched plots.

Figures 5 and 6 show Negrita and Parade plots in the third year of flowering. For both, it is clear that planting bulbs into 8” deep holes, whether mulched or not, is highly detrimental to 3rd year survival and flowering. Planting into 6” deep holes is better than using 8” deep holes, but even so, much less flowering than when planted into 3” or 1” deep holes. For the two shallow depths, the greater the mulch depth, the better the performance in the third year, even to the point that a mulch depth of 6” is better than 4” dep mulch. From a practical view, 4” of mulch is sufficient, and just as people don’t want to dig 8” dep holes, they probably don’t want to pile up 6” of mulch.



The result of this work is clear. Planting into deep holes, as presently recommended on many dry sale packages, is detrimental to tulip perennializing. In fact, even in an annual planting system, deep planting would seem to have no benefit, as all planting depths performed well in the first flowering season.

We can wonder why we saw these results. Perhaps the mulch, as it decomposed, provided some nutrition to the bulbs. It is well known that fertilization is beneficial to bulb perennializing. It is also possible that planting deeper in the soil profile exposed the bulbs to wetter soil conditions, in both winter/spring, as well as summer, which can be presumed to be detrimental to the bulbs. The soil in this experiment is a clay loam and while reasonably well-drained, shallower planting would obviously be a better drained environment which should be beneficial. We plan to collect soil samples from the plots to see if there is any effect of mulch on soil nutrient profiles (at the level the bulbs are rooted).

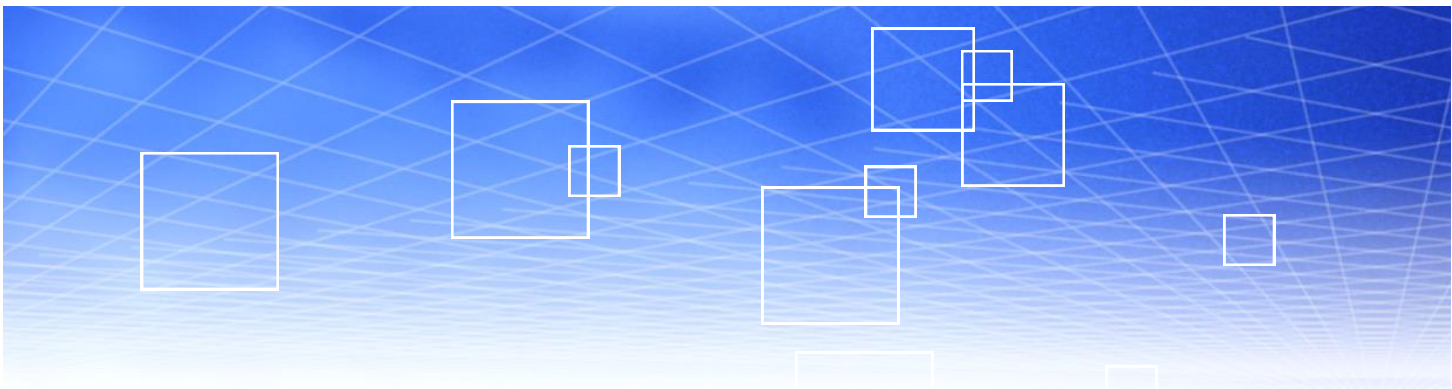
It should also be remembered this work was done in USDA climate zone 5b (which is cold). Perhaps different results would be found in different zones, but this work was inspired by trials Gus De Hertogh did in North Carolina (zone 7) so even in somewhat warmer climates, this method should work well. But what is especially interesting is that we saw no evidence of injury from ground freezing over the three years. Certainly, there were times when leaf tips were frozen after emergence, from late cold snaps and this happened in all plots (not related to planting treatment). But even shallow-planted bulbs, when covered with 2 or 4" of mulch did not freeze and performed well.

To summarize, it is clear that "top planting" with added mulch, is a good way to go and is physically much easier than deep planting as we currently recommend.



Figure 4. Effect of planting depth in year 3 for plots covered with 4" of mulch. Top: Negrita, bottom: Parade. ~~Left to right~~, bulbs planted into holes that were 8", 6", 3" or 1" deep. All plots had 4" of mulch, that was renewed annually. (photos 0348, 0349, 0342, 0351, 0344, 0353, 0346, and 0347, respectively).

Top to bottom



Here's what customers can do for large scale plantings.

- Till the area 3-4" deep with a rototiller. If possible, spread recommended bulb fertilizer and incorporate this by tilling.
- With a hand or a small garden spade, pull back soil in a single motion, 2-3" deep, and immediately place the bulb. When done, gently rake the area to smooth out the surface. This is similar to "Keukenhof planting".
- Cover with 2-4 inches of aged mulch or well-rotted compost.

For smaller scale plantings, or if a rototiller is not available, use a shovel to prepare holes to a depth of 3 inches, place the bulbs, cover, and then mulch with 2-4" of mulch.



Fig. 5. Representative plots of Negrita in the third flowering season. Top to bottom: planted in holes 8", 6", 3" or 1" deep. For the top two panels, 0 or 4" mulch (left to right). For bottom panels, 0, 2, 4, 6" mulch, left to right. (photos 0364, 0349, 0350, 0343).



Fig. 6. Representative plots of Parade in the third flowering season. Top to bottom: planted in holes 8", 6", 3" or 1" deep. For the top two panels, 0 or 4" mulch (left to right). For bottom panels, 0, 2, 4, 6" mulch, left to right. (photos 0344, 0353, 0346, 0347).