Plug Postproduction: Some Helpful Tips

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During the past 20 years, there has been a considerable amount of research on various plug growing issues — nutrition, water quality, media, seed physiology, and growth regulation. It's only been within the last decade that the topic of greenhouse postproduction handling of plugs has been emphasized. During this time, several questions have been asked: How should I tone the plant before media, seed physiology, and growth regulation. It's only been within the last decade that the topic of greenhouse postproduction

storage for certain species in either lighted or complete dark conditions.

**Petunia.** They store satisfactorily for up to five weeks from 32 to 50 degrees F in the dark; in the light, you can store them up to five weeks at 32 to 54 degrees F. This is one of the easier species to hold.

**Pansy.** They store satisfactorily for up to six weeks from 32 to 50 degrees F in the dark; in the light, you can store them up to 10 weeks at 32 to 50 degrees F. Optimum storage temperature is 32 to 37 degrees F. This is the most cold temperature-tolerant species.

**Geranium.** They store satisfactorily for up to four weeks from 32 to 45 degrees F in the dark; in the light, you can store them up to four weeks at 32 to 50 degrees F. Optimum storage temperature is 35 to 37 degrees F. This species can be handled like petunia.

**Fibrous Begonia.** They store satisfactorily for up to four weeks from 37 to 50 degrees F in the dark; in the light, you can store them up to six weeks at 37 to 50 degrees F. Optimum storage temperature is 41 to 45 degrees F. Leaf spotting and chilling injury may occur at temperatures less than 35 degrees F.

**Marigold.** They store satisfactorily for up to three weeks from 41 to 45 degrees F in the dark; in the light, you can store them up to five weeks at 41 to 50 degrees F. Do not hold this species for more than three weeks in the dark.

**Salvia.** They store satisfactorily for up to four weeks from 41 to 50 degrees F in the dark; in the light, you can store them up to six weeks at 41 to 50 degrees F. Optimum storage temperature is 45 degrees F. Handle these two species similarly.

**Impatiens.** They store satisfactorily for up to four weeks from 45 to 50 degrees F in the dark; in the light, you can store them up to six weeks at 45 to 54 degrees F. Optimum storage temperature is 45 degrees F. Do not store this species below 40 degrees F. High light intensities may cause plant damage.

**Cyclamen.** They store satisfactorily for up to six weeks from 37 to 41 degrees F in the dark or light. Plants stored for more than four weeks in the dark may experience flowering delay.

**Vinca.** Optimum storage temperature is 45 to 54 degrees F. Adding light will increase acceptable storage duration time. Do not store this species below 40 degrees F.

There are several ways plugs can be held in a low-temperature area. Many growers are simply reducing temperatures in the greenhouse
where the crop was grown. This may be fine for more short-term holding or where space is not critical. Others have used open benches in lower priority greenhouses, cold frames, open walkways, carts, and even headhouses. Those who continually need long-term storage use refrigerated storage units. These may be either lighted or non-lighted coolers.

A key to successful storage is to provide ample irrigation and good air circulation. If plugs are to be stored for more than a couple of weeks, they should be checked for dryness periodically and irrigated with plain tap water if needed. Irrigate just enough to wet the cell. Plug trays being brought into a warm greenhouse from cold temperature storage should be placed in a low light area and irrigated to avoid wilt. Good air circulation during storage will eliminate the chances for foliar diseases such as Botrytis. Some crops, such as impatiens, are particularly sensitive to attack by these organisms.

Toning Plants to Improve Postproduction Life

A well-toned plug is the key to successful shipping and postproduction handling. Toned plugs are those that are relatively compact with short internodes and a good stem caliper. You want to plug to have a well-developed root system, but not one that is loaded with soft, watery roots. Soft roots can be easily damaged (especially with automatic transplanters), leading to poor establishment and disease problems. Foliage color is also key — you need to keep the plant green, but not to the point where it’s a shiny, dark green. That’s an indication that the plug has been grown too soft.

How do you grow a nice hard plug? Well, there are a combination of factors that contribute to good, overall toned growth. These include fertilizer rate and formulation, irrigation practices, light intensity, and temperature.

Keeping plants under a high nitrate feed throughout their life cycle will produce toned growth. At Texas A&M, we’ve had very good results using some of the specially formulated plug blends. These contain primarily potassium, calcium, and magnesium nitrate. The plugs are stockier and more compact than those produced using general purpose fertilizers, such as 20-10-20, 15-16-17, or 20-20-20. Many growers will run their plants lean, especially toward the end of production or if they anticipate holding their plugs. Running plugs too lean during their active growth stages, however, can lead to nutrient deficiencies and poor root and shoot development. Coming in periodically with an ammonium nitrate/ammonium phosphate fertilizer, such as 20-10-20, normally will green the plants up and provide sufficient growth.

A good plug is one that has been grown under careful irrigation management. We think a healthy, full root system is very much determined by watering practices. Most of the successful plug growers run their plugs a little on the dry side. This prevents the soft growth you’ll get on both roots and shoots when keeping the media constantly wet. It also helps produce the short, well-branched plug that will handle well during shipping. Several growers have successfully managed fertilizer and irrigation practices to the point where they have drastically minimized growth retardant applications.

Providing the optimum intensity and maximum duration of light for plugs is another important factor leading to toned growth and successful postproduction. Glass, acrylic, and polycarbonate houses allow for maximum light transmission. Many successful growers in northern climates will provide up to 20 hours of supplemental lighting during the winter or under cloudy growing conditions. Others maximize light intensities by placing stage 4 plugs on benches that can be rolled out of the greenhouse and placed in direct sunlight. This provides for overall tone and vigor while minimizing heat buildup due to the greenhouse effect.

Lastly, temperature control in the greenhouse is a management tool that plug growers can use to control the growth of their plants. Many bedding plant species are responsive to DIF (difference between day and night temperature), and this can be used to maintain compactness of the plug. Keeping early morning temperatures cool will lead to shorter and more toned plants. Unfortunately, DIF can be hard to implement in the southern growing areas of the United States, or where environmental control in the greenhouse cannot be maintained. There has also been evidence to suggest that cooling plugs prior to shipping will improve their postharvest condition when they reach their final destination. This procedure can be analogous to the cooling of fruits and vegetables immediately after harvest to remove field heat. Removing the heat prevents loss of quality during the shipping process.

These suggestions should help growers extend the postproduction life of plugs. Growers should evaluate their own situation and use a combination of management practices to provide a high quality product to their customers.