The Impact of Flowers on Adventitious Root Formation in Chrysanthemum Cuttings

Carrie DeVier and Robert L. Geneve
Department of Horticulture University of Kentucky, Lexingtion, Kentucky 40546

It has been generally accepted that the removal of flower buds from cuttings is beneficial to the rooting of cuttings (Hartmann et al., 1990). The antagonistic interaction between flowering and rooting has been observed in a number of species including carnation, dahlia, fuchsia, geranium, and chrysanthemum (Selim, 1956; Woycicki, 1938). This study compared the rooting ability of mum cuttings from vegetative and flowering plants of similar chronological age and in similar growing conditions. In addition, an attempt was made to separate the flowering stimulus from the competition for resources as the mechanism for rooting inhibition.

Root formation in Dendranthema (chrysanthemum) cuttings was reduced as flowers developed on stock plants. The negative impact of flowering on root formation could be partly overcome by IBA (1 mM) in cuttings taken when buds began to show color. However, after flowers began to open rooting was dramatically reduced and IBA had little effect on improving rooting.

The negative impact of flowering on root formation was found in all 10 cultivars evaluated in this study. Not all cultivars were affected equally by the presence of flowers on the cuttings. There was also no apparent relationship between intensity of rooting during the vegetative stage and the ability of cuttings to root with flowers.

This observed effect could result from the presence of a rooting inhibitor produced during flowering. Roberts (1953) showed that flowering chrysanthemum plants produced an "anti-auxin" responsible for the inhibition of rooting. O'Rourke (1942), implied that the flowering response rather than the flowers themselves was responsible for the reduction in rooting of blueberry cuttings containing one or more flower buds. Removing buds from either vegetative or reproductive cuttings of mum prior to sticking reduced the number of roots per cutting. IBA could compensate for the loss of buds in vegetative cuttings but not in flowering cuttings. Preventing flower formation during stock plant development by continually removing buds as they became visible had a negative impact on subsequent rooting of those cuttings. The data suggests that both vegetative and flower buds have a stimulating effect on root formation. However, the data strongly suggests that the flowering stimulus associated with the short-day photoperiods during stock plant development was responsible for inhibiting root formation in flowering cuttings.

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Lagerstedt Hot Callusing Pipe

Don Cross
Cross Nurseries, Lakeville, Minnesota 55044

Hot callusing is a method used in grafting to expose the graft union to a higher temperature for a period of time to speed cell division in the graft union.

Aesculus glabra 'Homestead' grafts were made on 16 January 1992.

The callusing pipe was placed in a cold greenhouse on a sand bed. A central-heat pipe produces a constant temperature of 70F. Grafts were placed into the pipe slots (Fig. 1) with the graft union in the pipe slot. The rootstock roots are placed on sand and covered with a slightly moist sphagnum moss to prevent drying of the rootstocks.

The scions of the finished grafts are placed on sand and covered with burlap—this is to keep scion buds from swelling. Fourteen to 21 days were allowed for heat treatment. During this time, callusing begins but no bud swelling occurs.

By 14 February, 94% of the grafts were callused. At this time they are removed and placed in boxes and covered with slightly moist sawdust. One month later the grafts were planted into containers. Six weeks after potting we had a 91% success rate.

An evaluation of *Aesculus glabra* grafting over three seasons has shown that success overall is dependent more on root system quality and the timing of season than on the hot callusing pipe. We have found by experience that the period between early January and mid February is the better time to graft (Table 1).

Table 1. Hot callusing of *Aesculus* in 1993.

Grafts made	Off heat pipe	Success (%)
Jan. 11	Feb. 6	81
Feb. 10	Mar. 4	51
Mar. 6	Mar. 30	6

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