# The effect of 6-benzylaminopurine, a cytokinin, on bud-forcing of twelve oak species©

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## INTRODUCTION

Oaks (*Quercus* L.) are globally iconic trees, prized economically, ecologically, and aesthetically. However, despite their importance, many species of *Quercus* are under threat from a wide range of global issues (Oldfield and Eastwood, 2007). One method of saving threatened oak species is micropropagation using young, newly flushed shoots collected immediately after emergence in the spring (Kramer and Pence, 2012). This is a narrow and somewhat unpredictable time window for obtaining explants. However, forcing bud break of cuttings can increase the time range to collect young shoot explants and allow for shoot development in a controlled, clean environment (Vieitez et al., 1994). The objective of this experiment was to determine the effectiveness of 6-benzylaminopurine (BAP), a cytokinin (hormone that promotes cell division), on bud break in 12 *Quercus* species.

## MATERIALS AND METHODS

Dormant cuttings of 1- and 2-year-old wood were collected from 12 different species of *Quercus*: *alba, bicolor, cerris, falcata, imbricaria, macrocarpa, macrocarpa* var. *macrocarpa* (syn. for *macrocarpa*), *pagoda, palustris, rubra, texana,* and *variabilis*. Cuttings of 10-33 cm in length with 5-25 buds each (depending on species) were collected in Kennett Square, Pennsylvania, in mid-February. The experiment was a factorial design with 12 species, three BAP treatments (0, 100, and 500 ppm), and three replications, giving a total of 108 cuttings. The cuttings were placed into Erlenmeyer flasks with distilled water and placed in a greenhouse with a heat set point of 20°C and a cooling set point of 26.5°C. Cuttings were evaluated weekly and rated on a bud development scale of 0-4 with 0 = no development, 1 = slight bud swelling and elongation, 2 = moderate bud swelling and elongation with visible green coloration, 3 = bud break with partially visible leaf and/or inflorescence tips, 4 = at least one newly emerged leaf fully visible (target stage for shoot tip micropropagation).

## RESULTS AND DISCUSSION

Results indicate that overall, the BAP treatment had significant effects on the *Quercus,* but responses varied by species (Figure 1). BAP treatment at 100 or 500 ppm significantly increased the rate of bud break and shoot elongation for four of the *Quercus* species: *imbricaria* (Figure 2)*, macrocarpa*, *pagoda*, and *variabilis*, while significantly decreasing the rate in *Q. falcata*. There was no significant effect from BAP application on the remaining seven species (Figure 3 for *Q. rubra*). All *Quercus* species except *alba*, *bicolor*, and *pagoda* reached Stage 4 with all treatments.

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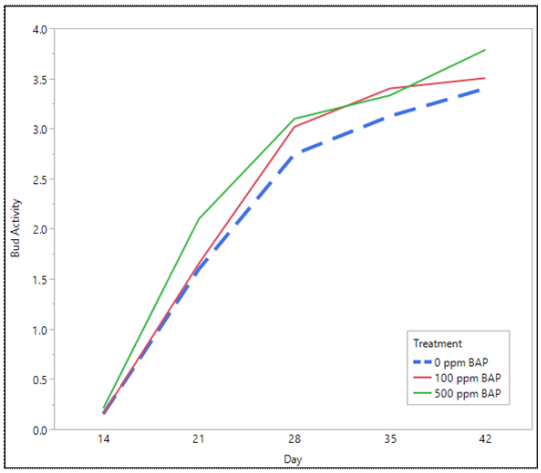


Figure 1. All *Quercus* species — mean bud activity.

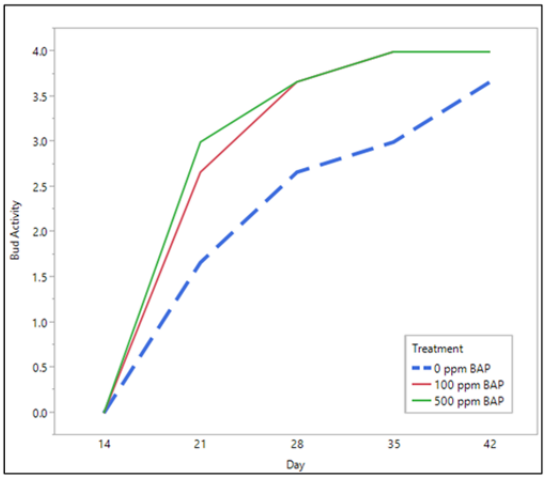


Figure 2. *Quercus imbricaria* (as an example species significantly affected by BAP treatment) — mean bud activity.

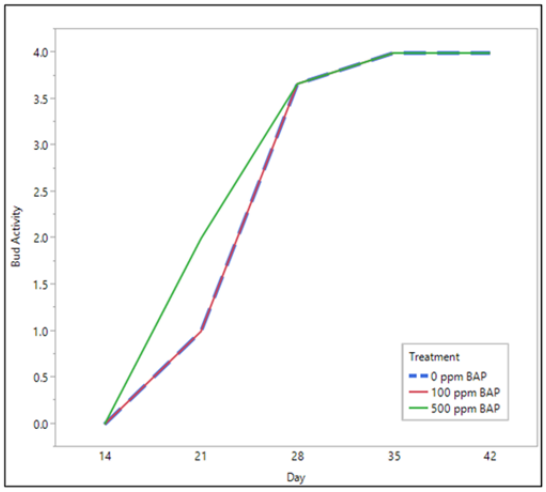


Figure 3. *Quercus rubra* (as an example species not significantly affected by BAP treatment) — mean bud activity.

## CONCLUSION

The effect of the cytokinin, BAP, on *Quercus* bud-forcing varied by species and a majority of the species reached Stage 4 with all treatments. This indicates that forcing bud break without BAP application is a viable option, but the rate may be enhanced with some oak species by the application of BAP.

## Literature cited

Kramer, A.T., and Pence, V. (2012). The challenges of ex-situ *c*onservation for threatened oaks. Intl. Oak J. *23*, 91–108.

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Vieitez, A.M., Ballester, A., Amo-Marco, J., and Sanchez, M.C. (1994). Forced flushing of branch segments as a method for obtaining reactive explants of mature *Quercus robur* trees for micropropagation. Plant Cell Tissue Organ Cult. *37*, 287–295.