

Progress Report

Enhancing Protea Flowering in Hawaii

Dr. Richard A. Criley

University of Hawaii

Department of Tropical Plant & Soil Sciences

Honolulu, HI USA 96822

Report Period: September 2012 (Final Report)

Funded by the Joseph H. Hill Memorial Foundation, Inc.

ICFG-HILL, P.O. Box 99, Haslett, MI 48840

ICFG.HILL@yahoo.com

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Richard A. Criley, Dept. Plant & Soil Sciences, University of Hawaii

The objective of the study was to determine if the advance pruning and cytokinin treatments found effective to manipulate flowering on the protea cultivar Cardinal in South Africa could be extended to other cultivars or species in the genus. To this end, 11 protea varieties growing at the University of Hawaii research station on the Island of Maui were pruned at three times in the fall and winter of 2010-2011 (September, November, January). The pruned stems were cut back to a whorl about 1 cm in diameter and tagged to allow us to follow regrowth development. Growth was followed until two or three flushes had developed on stems stimulated by the pruning; at this time 500 ppm of cytokinin (N-6-benzylaminopurine = N-6-BA) was applied to the growing point. Data were collected every two months on the status of the terminals: still vegetative, multiple by-passing shoots, or initiation of an inflorescence.

Protea 'Mayday' After the first pruning in September 2010, plants declined and this cultivar was dropped from the study.

Protea neriifolia. Several cultivars were used: 'Green Ice,' 'Rose Mink,' 'Red Mink,' 'White Owl', and 'Late Mink.' Cultivar differences were apparent in terms of responsiveness to the cytokinin with 'Rose Mink' and 'Green Ice' setting few to no buds on treated shoots, but developing many lateral shoots following N-6-BA treatment. 'White Owl' mostly produced only 2 flushes following any of the pruning dates, and only a few 3-flush shoots were treated with cytokinin, and these did not produce by-passing shoots or early flower buds. Still, flower buds were produced on non-treated shoots by May 2012, with more found at the August 2012 reading. Shoot by-passing and bud abortion were frequent. On 'Red Mink' and 'Late Mink' more than 50% of shoots initiating terminal flower buds were in the N-6-BA treatment. Earlier budding (May 2012) on the treated shoots was observed for 'Red Mink' than on non-treated shoots of the September 2010 pruning, but for November 2010 and January 2011 return stems, budding was not evident until August 2012 for both treated and non-treated shoots. For 'Late Mink' treated shoots and non-treated shoots both showed budding in August 2012. In terms of the effect of time of year for pruning, 'Green Ice' and 'Rose Mink' reached the 3-flush stage in August 2012 for all three pruning times, while 'Red Mink' reached 3 flushes in May 2012 for the September and November 2012 prunings, and August for the January 2011 pruning. Only the September 2010 pruning had reached 3 flushes in August 2012 for 'Late Mink', but several shoots from the November 2010 pruning set flower buds in response to cytokinin treatments applied to 2-flush stems. Even though flower buds were mostly evident at the normal time in late summer, it may be worthwhile to follow up this study in the *P. neriifolia* group of cultivars since some response to cytokinin was evident. A lower cytokinin concentration should be considered. Three cultivars, 'White Owl', 'Red Mink' and 'Late Mink' appeared to be capable of initiating inflorescence buds in spring rather than waiting until fall.

Protea obtusifolia In response to the November 2010 and January 2011 prunings, natural budding was observed in March 2012, but most of these buds aborted. Shoots from any of the pruning times that received N-6-BA responded with multiple axillary bud break and no flower bud initiation. Flower buds on non-treated 3-flush shoots were evident in August 2012. Since this is the normal time for flower bud initiation, little impact of the cytokinin can be inferred.

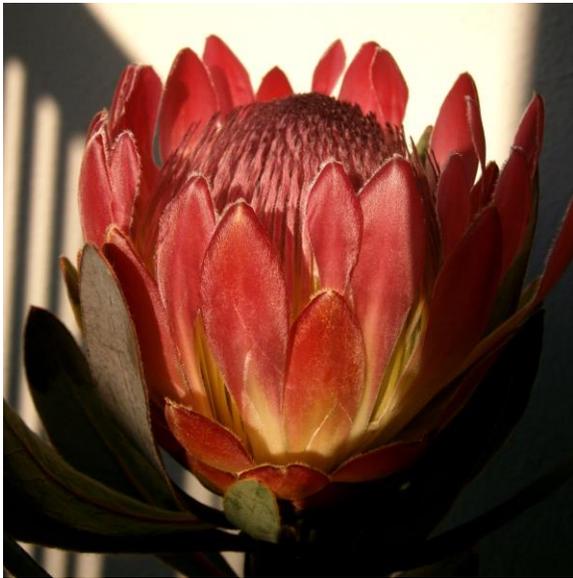
Protea lorifolia Two separate accessions were involved in the pruning and cytokinin treatments. The most vigorous return growth occurred on the November 2010 pruned plants. On one accession cytokinin treatment did not stimulate early flower bud initiation, but natural bud initiation occurred in August 2012. On the other accession, the cytokinin treatment of January 2011 shoots that had reached 3 flushes resulted in flower bud initiation in May 2012 with several flowering out by August 2012. Flower buds developed on non-treated stems from all three pruning dates by August 2012. Thus, it seems that *P. lorifolia* may respond to the cytokinin treatment with slightly earlier flowering than is normal for the species. On the more vigorous accession, which responded best to the cytokinin, strong 2-flush shoots were evident by December 2011, suggesting that manipulation of flowering time may be possible.

‘Sylvia’ is a hybrid between *Protea eximia* and *P. susannae*. It is a strong grower and return growth from all three pruning dates had reached 3 flushes by October 2011, with a few at three flushes as early as July 2011. Cytokinin treatment in July and October 2011 apparently stimulated flower bud initiation by December 2011. Most of the buds flowered out by March 2012. However, control shoots from the same pruning times also set flower buds, but somewhat later—March 2012. No by-passing shoots were observed on cytokinin-treated shoots. Natural flower bud development occurs between May and August, so the cytokinin treatments appeared to be effective in stimulating early flower bud initiation. Grower experience suggests that ‘Sylvia’ has a much longer blooming season than many other commercial cultivars. This hybrid cultivar should be examined with a larger population of cutback shoots as only 10 bearer shoots were pruned (September and November 2010), although cytokinin application was made in December 2011 to additional 3-flush non-pruned shoots and 85% of those shoots set a flower bud and were harvested by August 2012.

‘Niobe’ is listed in the International Protea Registry as an F₂ hybrid with no species designations. It is a strong grower and shoots produced from all three pruning dates reached 2 flushes, with occasional 3 flushes by October 2011, and nearly all shoots had 3 or 4 flushes a year later. Cytokinin treatment of 3 flush shoots tended to stimulate by-passing growth and a few flower buds by December 2011. Some of these flowered out and were harvested in March 2012. Deshooting of the multiple laterals led to flower bud development in March and May 2012.

Summary

Proteas in the *P. neriifolia* group and ‘Sylvia’ and ‘Niobe’ appear to be responsive to cytokinin treatment in terms of stimulating early flower bud initiation. *P. lorifolia* and *P. obtusifolia* showed little response. In Hawaii, pruning in September led to a single flush of growth before winter, if any, and did not lead to earlier 2-flush production. The November and January pruning times, in most cases, gave a good return shoot growth such that by the following October two, and sometimes 3 flushes were produced. The objective of stimulating flower development for spring harvests was not achieved, but late summer flowering (earlier than the normal fall production period) was demonstrated. The hybrids, ‘Niobe’ and ‘Sylvia’ may offer the best possibilities for early flowering to meet spring markets.



Protea ‘Sylvia’



Protea ‘Niobe’ bud in spring 2012 following treatment with 500 ppm N-6=BA in December 2011.