Dikegulac Alters Growth and Flowering of Kalanchoe

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Abstract. Foliar applications of 750, 1500, and 2250 ppm dikegulac-sodium [sodium 2,3:4,6-di-O-isopropylidene-2-keto-L-gulonate] generally decreased plant height, increased number of inflorescences, and improved the marketable quality of Kalanchoe (Kalanchoe x spp.). There were marked cultivar differences in response.

Dikegulac (Atrinal) is currently being tested to determine its possible commercial use as a growth retardant and/or chemical pinching agent for ornamental crops. Dikegulac is systemic in its action, reduces or eliminates apical dominance, and induces growth of axillary buds (1, 2, 3, 6). Foliar applications of dikegulac have been shown to be effective in reducing growth of several woody species (4). Dikegulac acts selectively on meristematic cells of the apex and developing leaf primordia and minute amounts are sufficient to affect changes in apical development (1). This mode of action makes its application more effective in the control of shoots hidden by foliage than hand pinching or the use of chemicals completely dependent on point of contact control (3, 5). Dikegulac as a postshearing treatment of azaleas increased axillary shoot production and increased the number of flowers.

The objective of this experiment was to determine the influence of dikegulac applied as foliar sprays on 6 cultivars of Kalanchoe x spp. Two cultivars of the Aztec series, 'Goddess' and 'Montezuma', and 4 Swiss cultivars 'Rotkappchen', 'Korall', and 'Feuerzauber' were received as rooted cuttings. Plants were shifted to 13.4 cm plastic pots using a growing medium of equal parts by volume of peat and perlite. The 6 cultivars were used in factorial combination with 4 concentrations of dikegulac (0.0, 750, 1500, ad 2250 ppm). Ten single plant replications of each cultivar-concentration combination were arranged on a greenhouse bench in a randomized complete block design. In 2 weeks, when plants were established, they were pinched and the treatments applied as a spray using about 15 ml per plant. The plants were grown in the greenhouse environment at 20°C nights under natural short days until flowering.

Plant response data were determined at full bloom or about 13 weeks after treatment date. Measurements of plant height, diameter, and number of inflorescences were taken at this time. A regression analysis was preformed to determine the relationships between each of the 3 variables and the concentration of dikegulac. These relationships were then compared across the 6 cultivars.

The relationship between the concentrations of dikegulac and the number of inflorescences generally was linear in nature (Fig. 1). A significant (P < 0.05) linear relationship was present for the cultivars 'Montezuma', 'Feuerball', 'Korall', and 'Feuerzauber', with R² values of 0.70, 0.43, 0.24, and 0.23, respectively. The fitted lines had positive slopes which indicated that increased concentrations of dikegulac are associated with a larger number of inflorescences. The slope for 'Montezuma' was significantly larger than the other 3 slopes as indicated by the increased concentrations than were the other 3 cultivars. 'Goddess' and 'Rotkappchen' had very different behavior. The number of inflorescences for Goddess increased with increasing concentrations up to about 1000 ppm and then declined with further increases in the concentration. The fitted line was quadratic with R² = 0.56.
Fig. 1. A plot of the fitted regression lines relating number of inflorescences to the levels of concentration of dikegulac for each of the 6 cultivars. The plotted points are the average ($N = 10$) number of inflorescences for each of the 6 cultivars at each of the 4 concentrations.

Fig. 2. A plot of the fitted regression lines relating plant height to the levels of concentration of dikegulac for each of the 6 cultivars. The plotted points are the average ($N = 10$) plant heights for each of the 6 cultivars at each of the 4 concentrations.
The slope of the line for 'Rotkappchen' was essentially 0; hence, the number of inflorescences remained essentially constant across the 4 concentrations.

Although all 6 cultivars had decreasing plant height with increasing concentrations of dikegulac (Fig. 2), there were 3 distinct patterns of behavior. 'Montezuma' and 'Feuerball' had significant ($P < 0.05$) quadratic relationships between height and concentration, with $R^2$ values of 0.72 and 0.59. There was essentially no decline in height from 0 to 750 ppm, but from 750 to 2250 ppm, the average height declined rapidly. 'Feuerzauber', 'Korall', and 'Goddess' had significant ($P < 0.05$) linear relationships with negative slopes and $R^2$ values of 0.62, 0.14, and 0.86, respectively. There was a uniform decline in height as the concentrations were increased. The rate of decrease for 'Goddess' and 'Feuerzauber' was significantly ($P < 0.05$) greater than the change for 'Korall.' 'Rotkappchen' did not have a significant difference in plant height at the 4 concentrations.

The lines relating concentration of dikegulac to plant diameter demonstrated a different behavior (Fig. 3) than was found in the analysis of the plant height and number of inflorescences data. Only 'Feuerball' had a significant linear fit, but its $R^2$ value was only 0.15. There was a significant decrease in diameter from 0 to 750 ppm, but no further decline when the concentration was increased to 1500 and 2250 ppm. 'Rotkappchen' had a significant increase in diameter from 0 to 750 ppm, but the diameter declined to the 0 level diameter when the dikegulac concentration was increased further. The behavior for the remaining 4 cultivars was erratic, with no discernable pattern in the plant diameters across the dikegulac concentrations. Overall, it appears that dikegulac had little effect on plant diameter.

The results obtained in this work indicate that dikegulac appears to have a place in the production of improved quality Kalanchoe plants.

**Literature Cited**