SCHIZANTHUS × WISETONENSIS

En. Butterfly flower, Poor man's orchid; Ge. Spaltblume

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INTRODUCTION

The genus *Schizanthus* (Solanaceae) contains 11 species, all showy, erect annual plants native to Chile. The species most often used as an ornamental plant is *S.* × *wisetonensis*, an alleged hybrid of *S. pinnatus* × *S. retusus* cv Grahamii. In appearance, it is intermediate between the two parents, the flowers most resembling the latter parent in outline. *S.* × *wisetonensis* is normally grown as an annual in gardens in temperate zones, but occasionally also is used as a spring flowering pot plant. The literature on flowering response of *S.* × *wisetonensis* is very limited.

MORPHOLOGY

Schizanthus × *wisetonensis* is an erect 30 to 50 cm high and heavily branched, annual herb with attractive light-green foliage. The alternate fern-like leaves are broadly lanceolate in outline, but much divided, often pinnatisect with segments incised or dentate. The flowers, appearing in large, branched clusters, are rather unlike most Solanaceae flowers. The deeply cut asymetrical corolla resembles two widespread lips varying in color from white through bluish and pink to carmine. The middle lobe of the upper lip is always bright yellow and variously blotched independent of petal color. The corolla tube is shorter than the 5-clefted, almost 5-parted calyx. The style and the 2 stamens are usually rather short-exerted. The fruit is a many-seeded capsule. The irregular shape and winglike petals may resemble butterflies or mini orchids and has inspired the common name. The generic name *Schizanthus* (schizo = divided) refers to the deeply cut corolla[2,7].

The plants branch freely and both apical and lateral terminals develop flowers in the axils of each leaf. At full bloom, the upper part of the plant is completely covered with flowers. Some more compact garden hybrids have been introduced, but their genetic variation is very pronounced.

VEGETATIVE GROWTH

Schizanthus × *wisetonensis* is propagated from seed, although vegetative propagation would be desirable to overcome the genetic variation. To be grown commercially on a large scale, uniform clones with large and bright-colored flowers need to be selected and maintained as stock plants for cutting production. However, although vegetative propagation is possible and the cuttings root very easily (7 to 10 days), they seldom develop into flowering plants, due to an early induced senescence. LD or continuous light delays senescence[11] but does not create continuous vegetative growth. Pinching is also ineffective in maintaining vegetative growth. *S.* × *wisetonensis* is a temperature-tolerant plant which will develop at any temperature above 10°C, but lower temperatures delay growth and consequently flowering. High temperatures accelerate senescence strongly and, at 25°C, flowering is terminated in a few weeks and the plants die.[10] Seeds germinate in less than a week at 18 to 20°C and the seedlings are ready for transplanting 2 weeks later. Temperature should be lowered to 15 to 18°C during the day and slightly lower at night to avoid excessive elongation. However, a night temperature as low as 10°C delays growth relative to 15°C,[6] but might improve color

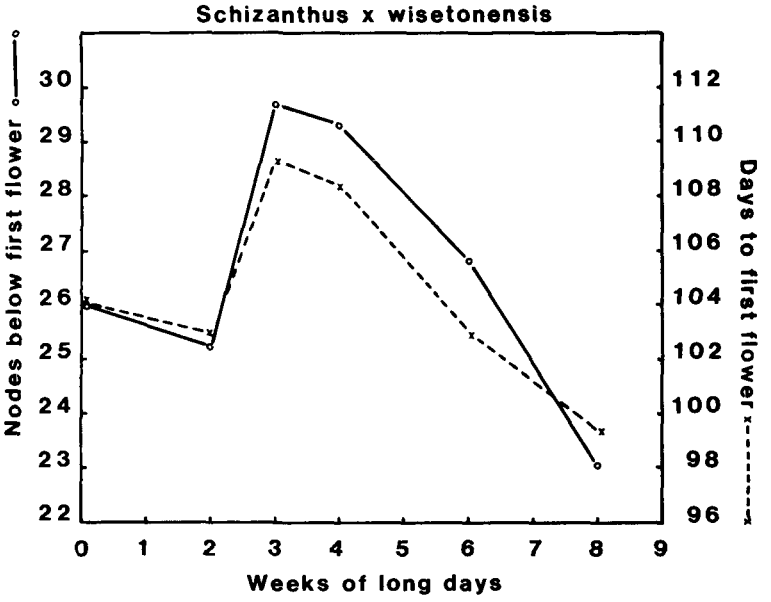

FIGURE 1. The effect of duration of LD treatment on number of nodes below the 1st flower (full drawn curve) and the number of days to 1st flower (dashed curve). The CV was Star Parade, planted December 9, potted December 23, drenched January 13. LD treatment started December 16. Day temperature 15°C, night temperature minimum 5°C. Natural daylength from 10.5 to 13.2 hr.

of the flowers. The terminal shoot reaches flowering in 70 to 110 days, depending on the environmental conditions, and the lateral shoots 10 to 14 days later. Photoperiod does not influence the number of flowering shoots,[11] but more serrated leaves are developed under SD.

PHOTOPERIODIC EFFECT

Schizanthus × *wisetonensis* responds to photoperiod because LD enhances flowering during autumn.[1] However, *Schizanthus* has failed to respond to photoperiod when grown as a spring crop[11] or flowering has even been delayed slightly.[1] The cause of the inconsistent results is not known but one possibility is the existence of an optimum daylength which promotes flowering.

Incandescent light is more effective in enhancing flowering than fluorescent light[1] which is in agreement with earlier findings for LD plants and has been discussed in detail in the literature[5,13]. For most LD plants, stem elongation is an integral part of the flowering process and incandescent light with a low R/FR ratio promotes stem elongation. However, the enhancement of flowering and shortening of the vegetative growing period might counteract the elongation effect of LD in *Schizanthus*.

Onset of LD treatments 1 or 2 weeks after potting affects flowering in a similar way, but LD treatments initiated later have less effect on flowering[1] indicating that LD treatment for promotion of flowering should be applied as early as possible. The effect of the duration of LD is more complex. LD treatment (2 weeks) had no effect on flowering relative to normal daylength (of approximately 11 hr), and 3 to 6 weeks of LD delayed flowering relative to natural day (controls). Only 8 weeks and more of LD enhanced flowering relative to control (Figure 1). The delay in flowering after 3 weeks of LD may be ascribed to an early FI of the terminal bud, which is then aborted when the plant is exposed to SD again. Two weeks

of LD are apparently insufficient to achieve FI and therefore flowering time is similar to plants grown under natural daylength. The diminishing delay in flowering at 4 or more weeks of LD relative to 3 weeks may be ascribed to a promotive effect on the flowering of the lateral shoots. The conclusion of these data is that in order to get promotion of flowering, at least 8 weeks of LD should be applied, starting soon after emergence.

The number of nodes developed below the 1st flower is affected by the LD treatments in a similar way to flowering time (Figure 1), while height is much less affected.[1]

EFFECTS OF GROWTH RETARDANTS

Schizanthus × *wisetonensis* responds to a number of growth retardants, and both growth and flowering are influenced. The effect of growth retardants is rather complex and the results are sometimes inconsistent. Ancymidol has been reported to reduce time to flowering by 10 to 20 days, while chlormequat and daminozide are less effective.[6] However, others reported only little effect of daminozide on flowering time.[8] Paclobutrazol (Bonzi) ([2*RS*,3*RS*]-1-[4-chlorophenyl]-4,4-dimethyl-2-[1*H*-1,2,4-triazol-1-yl]pentan-3-ol] enhances flowering when applied during autumn, but delays flowering during spring.[1] Similar seasonal responses have been reported for *Bougainvillea*[9] and *Samolus parviflorus*[3] when treated with chlormequat, which, like paclobutrazol, acts as an inhibitor of GA biosynthesis. Since flowering in most LD plants is assumed to be partly dependent on the GA level, the inhibition of the GA biosynthesis could delay flowering as found in spring treatments. This theory could also explain the less pronounced effect of daminozide, as this chemical does not act as an inhibitor of the GA biosynthesis. However, the acceleration of flowering by treatment during the autumn cannot be explained by the GA inhibition theory. Paclobutrazol had the same effect on retarding vegetative growth when applied in autumn and spring, but promoted flowering only during the autumn, which indicates that the effect of the retardant on growth and flowering are not necessarily related. The complexity of this process is not completely understood but a possibility is an interaction with light intensity at the time of application of the growth retardant. It has been reported that chlormequat enhanced flowering in geranium when applied at high light intensity but was without effect at low light intensity.[12]

Paclobutrazol applied to *S.* × *wisetonensis* seedlings as a spray at 80 and 160 ppm to run-off delayed flowering relative to 40 ppm, while application of rates from 0.25 to 1.0 mg per plant as a soil drench delayed flowering 4 days relative to untreated plants and independent of photoperiod during the treatment.[1]

Paclobutrazol has a distinct effect on the growth of *S.* × *wisetonensis*, since rates from 0.25 to 1.0 mg per plant applied as a soil drench reduced plant height by 50% (Figure 2) and caused a darker green color of the foliage.[1] Paclobutrazol has a greater effect when the chemical is applied to the stem than on the leaves,[4] presumably because of the limited mobility of paclobutrazol within the plants.

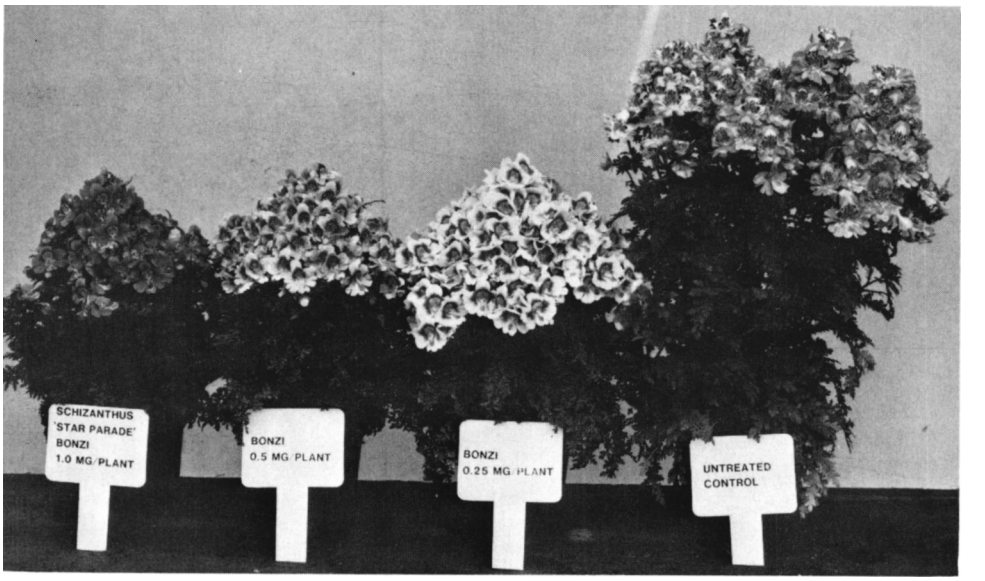

FIGURE 2. The picture shows the effect of paclobutrazol on *Schizanthus* × *wisetonensis* 'Star Parade' when applied as a soil drench in rates of (from left) 1.0, 0.5, and 0.25 mg per plant and untreated control. Plants were potted December 23, and drenched January 13. Photograph was taken March 25. (Author photograph.)

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