The Effect of Pruning on Growth and Flowering of *Lantana strigocamara* 'Balandrise' as a Landscape Groundcover. Part I.

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Abstract

Early-season, height-reduction pruning of *Lantana strigocamara* 'Balandrise' (Lucky™ Sunrise Rose) to 15 cm tall to assess whether plants could be maintained low and compact without loss of flowering performance had significant but mixed results. Pruned plants eventually grew taller and had more shoots with longer internodes but shoots initially were shorter and required more leaves before flower initiation while unpruned plants had fewer but initially longer shoots with shorter internodes and more leaves. On unpruned plants, lateral shoots were longer and had more leaves and longer internodes but required more leaves before flower initiation than tip shoots. The results suggest that early-season pruning can be initially growth limiting but later growth invigorating yet did not result in low, compact growth and enhanced flowering.

Introduction

Lantana is a genus of 50 to 150 species of perennial, flowering plants in the verbena family (Verbenaceae) mostly indigenous to the tropical and subtropical Americas but with some species in the old world tropics (Holloway and Neill 2005; Rueda 2012, 2015; Sanders 2001, 2006, 2012; Staples and Herbst 2005). The genus name is derived from the specific epithet of the wayfaring tree (*Viburnum lantana*) which *Lantana* superficially resembles (Holloway and Neill 2005).

Lantana strigocamara

Lantana strigocamara is the best known species of the genus worldwide. The former and still widely used name for this species was *L. camara*, but Sanders (2006) persuasively showed that the best and most appropriate name for this complex hybrid of cultivated origin, which is found worldwide and amply distinct from true *L. camara*, is *L. strigocamara*, and we use this latter name here. Indeed, nearly all the material cultivated worldwide and referred to as *L. camara* is *L. strigocamara*. Unfortunately, the horticultural world has yet to adopt this species name.

Introduced to the United States in the 1800s (Swearingen and Bargeron 2016) and to most parts of the tropics by 1900 (Howard 1969), *Lantana strigocamara* is a popular landscape plant for containers, hanging baskets, and as a landscape border, shrub, and groundcover (Arnold 2002, Czarnecki et al. 2014, Dirr 2011, Mugnai et al. 1999, Schoellhorn 2004, Starman and Lombardini 2006, Staples and Herbst 2005). It is continuously free-flowering on new growth during the growing season, from May to October in cold-winter areas (Dirr 2011), March to December in mild-winter areas, and year-round in tropical areas. It is much prized horticulturally for its showy, colorful, nearly everblooming flowers, which attract butterflies, honeybees, and hummingbirds (Goulson and Derwent 2004, Schemske 1976, Schoellhorn 2004, Winder 1980); handsome, dark green leaves; ease of propagation and with a short production cycle; low maintenance requirements; and tolerance of adverse environmental conditions, including drought, heat, aridity, and saline conditions (Arnold 2002, Czarnecki and Deng 2020, Parrish et al. 2021, Schoellhorn 2004, Staples and Herbst 2005).

Lantana strigocamara is also well known because it has escaped cultivation and naturalized to various extent in most of the tropical and subtropical world, hybridizing with local, indigenous species and cultivated exotic species and hybrids, where its only limitation is intolerance of cold winters (Sanders 2006). Introduced to more than 60 countries, this hybrid species has caused significant ecological and economic damage (Day et al. 2003), invading natural and agricultural land (FLEPPC 2023, Henderson 1969). It has been especially damaging in the Australia-Pacific and the India subcontinent (Holloway and Neill 2005, Sanders 2006), and is particularly troublesome and considered a noxious weed in South Asia, southern Africa, Australia, where some 5,000,000 ha of land has been invaded (QDAF 2016), Hawaii (Morton 1994, PIER 2024, Staples and Herbst 2005), and Florida (FLEPPC 2023, Hammer 2004, Morton1994). It is considered one of the 100 worst weeds in the world (Lowe et al. 2000).

Because of its landscape importance and popularity and its potential to be a noxious, invasive, damaging weed, development of sterile hybrids is a top priority for the horticultural industry (Czarnecki and Deng 2020, Czarnecki et al. 2014, Deng et al. 2020, Parrish et al. 2021).

Lantana strigocamara 'Balandrise'

Ball Horticulture Company, West Chicago, Illinois, U. S. A., developed *Lantana strigocamara* 'Balandrise' (originally as *L. camara* 'Balandrise') for use as a potted floral color product and landscape groundcover or shrub (**Figs. 1**–**2**). In doing so, the company extolled its virtues of bi-colored inflorescences featuring individual flowers that first emerge and open bright yellow-orange at the top of the inflorescence then later change to purple-pink as they age; medium vigor; excellent, semi-upright, branching habit with naturally low and more compact growth

1. *Lantana strigocamara* 'Balandrise' makes an outstanding mass planting or groundcover. All photographs taken at Lakewood, CA and © 2024 by D. R. Hodel.

2. *Lantana strigocamara* 'Balandrise' has handsome flowers emerging bright yellow-orange at the top of the inflorescence then later changing to purple-pink as they age.

leading to less pinching and reduced use of plant growth regulators; and tolerance of adverse environmental conditions, including heat, humidity, and drought (BFP 2024).

Leslie Heffron discovered *Lantana strigocamara* 'Balandrise' in 2005, selecting a seedling of the unpatented, self-pollinated *L. strigocamara* 'Simon Yellow', which originated in a controlled breeding program of Ball Horticultural Company in Arroyo Grande, California in 2004. The objective of the program was to develop plants of continuous flowering, dark green leaves, and well branched, vigorous growth. The parent plant, *L. strigocamara* 'Simon Yellow', was noted for its medium yellow flowers, dark green leaves, and semi-upright growth (PP 2008).

Lantana strigocamara 'Balandrise' was awarded a patent, PP19151, on 26 August 2008 (PP 2008). Part of its Lucky™ series, Ball Horticultural Company further evaluated and developed it at its Arroyo Grande, California and Illinois sites, later marketing it under the name Lucky™ Sunrise Rose. It differs from its parent primarily in flower color. It is actually most similar to the patented *L. strigocamara* 'Banta Rossa' (PP18148) (PP2007), which Goldsmith Seeds in Gilroy, California developed about a year before Ball Horticulture Company developed *L. strigocamara* 'Balandrise'. *Lantana strigocamara* 'Bante Rossa' differs in its wider inflorescences, slightly different flower color, and not so widely spreading plants (PP 2007). The description of the flower color of *L. strigocamara* 'Bantae Rossa' is similar to that of *L. strigocamara* 'Balandrise', purple-pink and yellow (PP 2007), although images of flowers on the web show them to be more pink than purple and other flowers to be distinctly yellow or orange.

In 2021, a median planting of *Lantana strigocamara* 'Balandrise' (Lucky™ Sunrise Rose) in Carlsbad, California north of San Diego caught co-author Hodel's attention for its relatively low and compact growth habit and profuse display of bright yellow-orange and deep purple-pink, nearly maroon flowers. He was so impressed with this cultivar that by the beginning of 2023 he had planted about 50 plants of it from 3.8-ℓ (1-gallon) containers in his front yard in Lakewood, California just north of Long Beach.

By April 15, 2024, the plants had been in the ground for well over a year and, after the second, consecutive, cool, moist, prolonged winter, had emerged from their winter stasis, were pushing out new growth, and beginning to flower. Because Hodel found the low, compact growth habit extremely pleasing, he was concerned that the plants' vigorous growth would eventually pile up on themselves and increase their height, losing their much desired low, compact habit.

Thus, Hodel severely pruned some of the plants, intending to compare the pruned and unpruned plants for growth and flowering response. Here we report on and illustrate this study, summarize its results, and discuss their impact on horticultural practices to optimize the low, compact growth habit and profuse flowering.

Previous Work

Little research exists for pruning *Lantana strigocamara*. Hodel and Pittenger (2002) reported that for vigorously growing shrubs and groundcovers like *Lantana*, controlling their growth is an ongoing maintenance task. Indeed, in tropical areas with year-round growth like Hawaii, keeping *L. strigocamara* in check requires nearly weekly pruning (J. R. Judd, III, pers. comm., 22 July 2024).

Pruning strategies for *Lantana* are consistent across numerous accounts (ASU 2024, Dirr 2011, Moser 2024, Neilson 2020, O'Callaghan 2007) and include these principles and practices for maintaining healthy growth and encouraging abundant flowering:

1. Prune lantanas hard in late winter or early spring to prevent development of excessive wood, pruning to about 15 to 30 cm from the ground;
2. Periodically throughout the season, prune lantana shoot tips back about 2.5 to 7.5 cm to remove spent flowers, stimulate new growth, and encourage flowering;
3. Prune back overgrown lantanas to about one-third of their height and spread;
4. Prune leggy or overgrown stems, pruning back to the desired shape;
5. Thin out dense areas, maintaining a balanced shape by removing crowded growth;
6. Prune out old, dead, diseased, or pest-infested growth;

These mostly general and fundamental pruning practices, which also apply to many plant species beyond *Lantana*, are meant to rein in excessively vigorous growth; encourage and maintain low, dense, compact growth; and still produce new shoot growth for flowers.

Hodel and Pittenger (1994, 1995, 2002) showed that *Lantana montevidensis*, if started early, could be effectively periodically mowed to control height with negligible effect on overall quality.

Matsoukis et al. (2003), who investigated how environmental factors and the plant growth regulator triapenthenol affected growth and flowering of *Lantana strigocamara*, found that minimum temperatures and photosynthetic photon flux were the most important factors in plant growth. Plants performed best in full sun and the most compact plants with full-sun exposure.

Materials and Methods

Description of *Lantana strigocamara* 'Balandrise'

Lantana strigocamara 'Balandrise' is a semi-woody, relatively low-growing, aromatic perennial with raspy-textured but attractive, dark green leaves handsomely contrasting with its showy, bright yellow-orange and purple-pink flowers in a bi-colored inflorescence (**Figs. 1**–**2**).

Plants are moderately vigorous, semi-upright, and attain about 40 cm in height (BFP 2024), which applies to containerized plants after the first growing season with frequent pinching (S. Hernández Swofford, pers. comm., 2 August 2024). After several years of cultivation in mild-winter areas, these plants will grow taller than 40 cm because they easily survive winters in these areas, remain evergreen, and stems tend to "pile up" on each other with time, a common feature of lantanas in such areas. We surmise that they will likely attain at least 80 cm in height without severe, remedial pruning every several years.

The paired, opposite, strongly aromatic if not pungent, dark green leaves are 5–9.2 × 2.5–5.7 cm, ovate-lanceolate, widest toward the base, margins serrate, apex acute, base truncate to obtuse (**Fig. 3**), and conspicuously scabrous-pubescent adaxially and mostly on the midrib and main veins abaxially (**Fig. 4**). Petioles are 5–16 × 1–2 mm, scabrous-pubescent. Young twigs are square-shaped and scabrous pubescent (PP 2008).

Like most lantanas, nearly all parts of the plant are scabrous-pubescent from glandular hairs, which can be irritating, especially to tender skin; thus, protective gloves and long sleeves and pants should be worn when working with this plant.

The inflorescence, about 2–2.5 cm long and 3.5–4.1 cm wide, on a scabrous-pubescent (rough, raspy textured from minute glandular hairs) peduncle ca. 3.1 cm long, and containing ca. 45 flowers (**Figs. 5**–**6**), all arising from an elliptic receptacle 10 × 5 mm at the end of the peduncle, has been described as a corymb (PP 2008) and umbel (Holloway and Neill (2005) but it does not seem to fit the description of either because the flowers are not in the same plane; it is more like a dense cylindrical spike (Rueda 2012, 2015) or a modified corymb, perhaps a racemose corymb (or a corymbose raceme).

Individual flowers are 1.5–1.8 × 0.8–1.2 cm, bisexual, asymmetric or zygomorphic, pubescent, salverform (an elongated, narrow corolla tube abruptly terminating at the apex with petal lobes bent outwards [**Fig. 6**]), sessile or nearly so, with 3–5 unequal petal lobes ca. 5 × 5 mm and the lower one ca. 6 × 9 mm. Flowers were noted as being fragrant but we did not detect a fragrance or, if one was present, the strongly aromatic leaves and twigs probably masked it. The green calyx is 2–3 × 1–1.2 mm, pubescent, tubular, and with two, broadly acute tips (**Fig. 6**). A lanceolate, pubescent bract, ca. 4 × 1 mm, subtends each flower. The androecium is composed of 4 stamens, each ca. 2 mm long and adnate to the corolla tube at its midpoint, and each with an ovoid, bi-lobed anthers nearly 1 mm long. The gynoecium is ca. 4 mm long with a 2-locular ovary ca. 1 mm long, a style ca. 3 mm long, and a funnel-shaped stigma ca. 1 mm long (PP 2008).

The bi-colored inflorescences of *Lantana strigocamara* 'Balandrise' are a striking and redeeming character, featuring individual flowers that first emerge and open bright yellow-orange at the top of the inflorescence then later change to purple-pink as they age and "move downward" in the

3. Leaves of *Lantana strigocamara* ‘Balandrise’ are dark green and conspicuously scabrous-pubescent adaxially, with finely toothed margins distally.

4. Leaves of *Lantana strigocamara* ‘Balandrise’ are paler abaxially and conspicuously scabrous-pubescent on the midrib and main veins.

5. The inflorescence of *Lantana strigocamara* 'Balandrise' is held on a scabrous-pubescent peduncle. Note the long corolla tube with a green calyx at its base.

6. The inflorescence of *Lantana strigocamara* 'Balandrise' holds about 45 flowers.

inflorescence (**Figs. 7**–**8**). The bright yellow-orange and dark purple-pink flowers make a pleasing color combination. Small, one-seeded, purple black fruits are rarely formed.

Lantana strigocamara 'Balandrise' is described as free-flowering from spring through autumn (Dirr 2011, PP 2008) in cool- and cold-winter areas, where it is typically treated as an annual, and nearly year-round in mild-winter subtropical regions and year-round in tropical areas and greenhouses where it is treated as a perennial. In addition to its desirable, relatively low-growing habit and colorful and floriferous floral display, its tolerance of adverse environmental conditions is a much admired horticultural feature.

Study Site

We conducted this study in Lakewood, California, about 27 km south-southeast of downtown Los Angeles and 11 km north of the Pacific Ocean coast at Long Beach. The site is classified as a Mediterranean climate, with long, warm, rainless summers and cool, moist winters. Average winter day/night temperatures are 19/7.5 C while summers are 29.5/18 C. Hottest days rarely exceed 38 C while coldest nights rarely go below 0 C. Average annual precipitation is about 300 mm, nearly all occurring from November through March. The soil is a deep, alluvial sandy to very sandy loam laid down by the nearby San Gabriel River over tens of thousands of years.

Methods

In late 2022 and early 2023, Hodel planted about 50 3.8-ℓ (1-gallon) containers of *Lantana strigocamara* 'Balandrise' purchased from several local retail nurseries. He planted them in unamended site soil and did not apply mulch or fertilizer during the study. The winters of 2022–2023 and 2023–2024 were unusually wet, with about 635 and 500 mm of precipitation, respectively. The plants were not irrigated during these times. Beginning April 1 of 2023 and through November, Hodel irrigated the plants with about 20 mm of water once per week via drip irrigation, which is about 50% of ETo during this period (Snyder et al. 2012).

The plants grew well and attained about 30 cm tall and 60 cm wide by late 2023. On April 15, 2024, as the plants were emerging from their winter stasis and beginning to grow and flower (**Fig. 9**), Hodel divided the planted area into north and south sections of about 25 plants each. He pruned the 25 clumps in the south section to 15 cm tall (**Fig. 10**). He also pruned these plants lightly for width control but then only to make them symmetrical and uniform. The 25 plants in the north section were not pruned.

About eight weeks later, on June 12, Hodel selected six plants each from the north and south sections; plants in each section were of similar size and appearance. On each of the 12 plants, Hodel:

7. Inflorescences of *Lantana strigocamara* 'Balandrise' are a striking and redeeming feature, with newly emerging bright yellow-orange flowers at the top that later change to purple-pink as they age and "move downward" in the inflorescence.

8. The bright yellow-orange and dark purple-pink flowers of *Lantana strigocamara* 'Balandrise' make a pleasing color combination.

9. By April 15, 2024, plants of *Lantana strigocamara* 'Balandrise' were emerging from their winter stasis and beginning to grow and flower.

10. On April 15, 2024, the 25 clumps of *Lantana strigocamara* 'Balandrise' in the south section were pruned to 15 cm tall.

1. counted the quantity of shoots per a 15 × 15-cm area;
2. counted the quantity of inflorescences with open flowers per a 15 × 15-cm area;
3. selected 10 shoots from each plant and noted whether they were tip (= 1) or lateral (= 2) shoots;
4. measured these 10 shoots for length (cm);
5. counted leaf pairs on each of the 10 shoots;
6. counted the quantity of leaf pairs until inflorescences formed on each of the 10 shoots.

Data were entered into a spreadsheet to determine:

1. mean quantity of shoots per plant;
2. mean shoot length per plant;
3. mean shoot length for tip and lateral shoots;
4. mean leaf pairs per shoot;
5. mean leaf pairs per tip and lateral shoots;
6. mean leaf pairs per shoot until inflorescence formed;
7. mean leaf pairs per shoot until inflorescence formed on tip and lateral shoots;
8. mean internode length of shoots;
9. mean internode length on tip and lateral shoots;

About two weeks later, on June 27, Hodel measured the overall height of 15 plants each of pruned and unpruned plants.

Because pruning removed all tip shoots on the plants in the south section when they were pruned to 15 cm tall, these plants produced only lateral shoots during the study (**Fig. 11**) while the unpruned plants in the north section produced a combination of tip and lateral shoots (**Fig. 12**); however, we could still compare all growth characters, including tip and lateral shoots, because we based the analyses on a model that accounted for pruned and unpruned plants and tip and lateral shoots, which allowed us to estimate differences between treatment effects. Because Hodel measured the quantity of inflorescences per 15 × 15-cm area at peak flower, which differed significantly by about ten weeks between pruned and unpruned plants, we were unable to compare means for this growth character.

Statistical Analyses

Data were analyzed using R (R Core Team 2021). We estimated least-squares means for each treatment or character to determine estimated means using the emmeans statistical package (Lenth 2024). All variables except for mean quantity of shoots utilized all plants available and were analyzed using a model that accounted for the effects of pruning and of shoots being either lateral or tip. In the case of mean quantity of shoots per area, we analyzed only 12 plants (one

per clump) to avoid any confounding. This variable was analyzed with a model that accounted for plants being pruned or not.

Results and Discussion

Pruning significantly affected plant growth and flowering. After eight weeks, pruned plants had significantly more but slightly shorter shoots, longer internodes (**Fig. 13**), and fewer leaves per shoot but required more leaves per shoot until inflorescences were formed (**Table 1**). However, after 10 weeks, pruned plants, which initially had shorter shoots than unpruned plants, had surpassed unpruned plants in overall height (**Table 2**), which attests to the eventual and sustained, rapid rate of growth of pruned plants.

Pruned Plants

Pruned plants responded with vigorous growth of new lateral shoots. Within two weeks of the April 15 pruning (study initiation), latent, subapical buds began to initiate growth (**Fig. 14**). Within five weeks of pruning and after a mean of 2.7 leaf pairs produced per shoot (**Fig. 15**) and inflorescences began to emerge (**Fig. 16**). Plants attained peak flower about 10 weeks after pruning with mean shoot growth of 13 cm and a mean height of 44.3 cm (**Fig. 17**).

Unpruned Plants

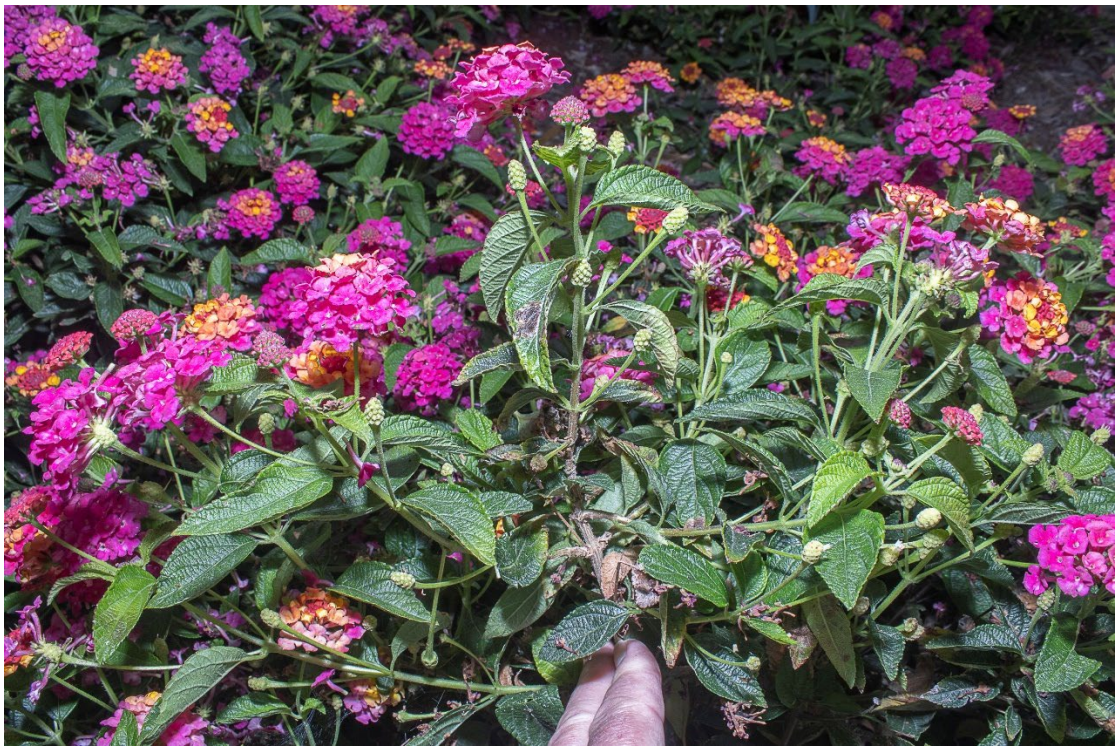
About 3.5 weeks after the study initiated, unpruned plants, whose inflorescences had already been initiated before the study, grew moderately and attained peak flower (**Fig. 18**). At that time mean shoot length was 16.6 cm. About 10 weeks after the study was initiated, unpruned plants had a mean height of 37.2 cm.

On unpruned plants, a comparison of tip versus lateral shoots showed that lateral shoots were significantly longer, had more leaves and longer internodes, and required more leaves produced until flowers formed.

That growth characters varied between pruned and unpruned plants is not too surprising considering that pruning can be an invigorating as well as a growth-retarding practice (Cappiello 2019, Cutler 2003, Downer 2023, Fair 2020, Harris et al. 2004). Whether pruning will invigorate, retard, or do both depends on several factors, including species, species condition, pruning severity, and time of year.

Pruning can invigorate when it removes shoot tips where auxins (plant growth regulators) are produced that normally suppress growth on lower lateral shoots and buds to maintain dominance of the apical shoot tips (Cappiello 2019, Cutler 2003, Downer 2023, Wade and Westerfield 2022). Pruning off the shoot tip allows these lateral shoots and buds to grow and

11. Pruned plants of *Lantana strigocamara* 'Balandrise' produced only lateral shoots during the study. Note the pruned tip at the right.



12. Unpruned plants of *Lantana strigocamara* 'Balandrise' produced a combination of tip (center) and lateral shoots (left and right) during the study.

13. Pruned plants of *Lantana strigocamara* 'Balandrise' (left) had shoots with fewer leaves and longer internodes than those of unpruned plants (right).

14. Two weeks after pruning *Lantana strigocamara* 'Balandrise' (study initiation), latent, subapical buds began to initiate growth.

Table 1. The effect of pruning on growth and flowering of *Lantana strigocamara* 'Balandrise' (Lucky™ Sunrise Rose), Lakewood, California, April 15 through June 12, 2024.

Treatment or Character	Mean Quantity of Shoots per 15 × 15-cm area	P Value
Pruned	16.2	
Unpruned	11.5	<0.01
	Mean Shoot Length (cm)	
Pruned	13.0	
Unpruned	16.6	<0.01
	Mean Shoot Length, Tip vs. Lateral (cm)	
Tip	11.2	
Lateral	18.4	<0.001
	Mean Quantity of Leaf Pairs per Shoot	
Pruned	4.4	
Unpruned	6.9	<0.001
	Mean Quantity of Leaf Pairs per Shoot, Tip vs. Lateral	
Tip	5.4	
Lateral	6.0	<0.01
	Mean Quantity of Leaf Pairs per Shoot Until Flowers Formed	
Pruned	2.7	
Unpruned	2.3	<0.01
	Mean Quantity of Leaf Pairs per Shoot Until Flowers Formed, Tip vs. Lateral	
Tip	1.4	
Lateral	3.7	<0.01
	Mean Internode (cm)	
Pruned	3.1	
Unpruned	2.4	<0.01
	Mean Internode, Tip vs. Lateral, (cm)	
Tip	1.4	
Lateral	3.7	<0.01

Table. 2. The effect of pruning on overall height of *Lantana strigocamara* 'Balandrise' (Lucky™ Sunrise Rose), Lakewood, California, April 15 through June 27, 2024.

Treatment	Height (cm)	P Value
Pruned	**44.3**	
Unpruned	**37.2**	**<0.01**

develop. Also, pruning off shoots allows the root system to supply the remaining shoots, buds, and leaves with more water and mineral nutrients, which can lead to increased growth (Cappiello 2019, Harris et al. 2004, Wade and Westerfield 2022). Pruning off shoots can allow more light to reach lower shoots and buds, also enhancing their growth (Wade and Westerfield 2022). Pruning can affect the carbohydrate-nitrogen balance in the plant and impact growth. Pruning decreases carbohydrates stored in shoots and stems and produced in leaves, which can increase nitrogen and lead to more growth (Cutler 2003).

Conversely, pruning can retard growth simply because shoot and leaf removal reduce photosynthetic activity, which generates carbohydrates for plant growth (Cappiello 2019, Cutler 2003, Downer 2023, Harris et al. 2004).

Severity of pruning can affect whether pruning will invigorate or retard growth. A vigorous shoot needs heavier pruning to reduce its growth while a less vigorous shoot needs lighter pruning (Harris et al. 2004). Frequent, heavy pruning can stunt growth, even leading to death while light, frequent pruning will limit plant growth without exacting a negative response (Downer 2023, Harris et al. 2004).

Timing can affect whether pruning will be invigorating of retarding growth. Generally, pruning just prior to periods of naturally rapid growth leads to vigorous regrowth while pruning done after most growth is complete for the season reduces subsequent growth and plant size (Cappiello 2019, Cutler 2003, Downer 2023, Fair 2020, Harris et al. 2004)

Excessively severe and early pruning can increase growth and with no thinning of resulting regrowth, shoots can be crowded, stretched out or lanky, and spindly (Fair 2020, Harris et al. 2004).

In our study, *Lantana strigocamara* 'Balandrise' seemed to be a well behaved, moderate grower when unpruned but once pruned its behavior changed to become a slightly more vigorous grower. The year before the study it grew continuously from late March through November and flowered on this new growth during the same period. The plant seemed to "shutdown" during mid-winter from December into early March, not producing new growth or flowers but remaining green.

15. Five weeks after pruning *Lantana strigocamara* 'Balandrise', plants had grown substantially.

16. Five weeks of pruning *Lantana strigocamara* 'Balandrise', shoots had produced 2.7 mean leaf pairs and inflorescences began to emerge.

17. Ten weeks after pruning, plants of *Lantana strigocamara* 'Balandrise' had mean new shoot growth of 13 cm and attained peak flower.

18. Unpruned plants of *Lantana strigocamara* 'Balandrise', which already had inflorescences when the study initiated, attained peak flower 3.5 weeks later.

Several of the pruning principles described above seem to apply to *Lantana strigocamara* 'Balandrise' in our study. Pruning invigorated growth in some instances. It removed shoot tips, increasing the quantity of lower, lateral shoots, and lengthening their internodes, eventually increasing the overall height of the plants, resulting in crowded, lanky, taller growth. Pruning also opened up the plant, allowing more light to reach the lower, newly invigorated lateral shoots, enhancing their development and elongation. The increased shoot density with longer internodes on pruned plants is due to the invigoration of lateral shoots and buds, so many in a given area that crowding and insufficient light resulted in their stretched out, lanky nature. Even now, nearly ten weeks after the end of the study, the pruned plants are still showing their invigoration (data not included); they are taller, wider, rangier, and lankier than the more subdued and compact, unpruned plants. However, pruning also retarded growth, leading to initially shorter shoots with fewer leaves, which can probably be attributed to a reduction in photosynthetic activity.

Also, that lateral shoots were significantly greater in all growth characters (shoot length, quantity of leaves per shoot, quantity of leaves to flower, and internode length) than tip shoots, supports the invigorating nature of pruning in this instance.

Severity and timing of pruning might have affected the plant response, especially related to its invigorated nature. We pruned early, just as growth was commencing for the year, and severely, reducing the plants by nearly 50%, both of which can lead to vigorous regrowth. Also, Hodel did no thinning of the resulting dense, invigorated lateral shoots, which can enhance their lanky nature.

Although we were unable to compare them directly because they occurred about 10 weeks apart, at peak flower pruned plants averaged 9.8 inflorescences per 15 × 15-cm area while unpruned plants averaged 17 inflorescences per 15 × 15-cm area. If this measurement later proves to be significantly different, it would support the principle that excessive vegetative growth is often at the expense of flowering.

Conclusions and Future Work

We conclude that severe, early season pruning did not result in our objective of lower, more compact growth and enhanced flowering of *Lantana strigocamara* 'Balandrise'. Perhaps periodic, lighter pruning throughout the growing season and/or late-season pruning after growth has peaked might be more effective in achieving and maintaining desirable, low, compact, and floriferous plants. We want to investigate the effects of periodic light pruning and a late-season pruning in a future study.

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