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NEW GUINEA IMPATIENS PRODUCTION

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Introduction: Since the introduction of New Guinea impatiens into the United States in 1972, the popularity of this crop has steadily increased. New Guinea impatiens have flowers that are large, produced in profusion and are often vividly colored. In addition, leaf color can vary from dark green to maroon and can be solid in color or variegated.

Cultural requirements are relatively easy and consistent across cultivars. However, growers do experience difficulties. These difficulties most often occur when these plants are treated like other potted bedding plants. This article will emphasize proper culture of New Guinea impatiens and will show how their culture differs from that of other plants. Cultural information for northern climates will be emphasized.

History: New Guinea impatiens were originally collected by H.F. Winters and J.J. Higgins in 1970. At that time 25 distinctly different plants were collected. Of those collected, the cultivars available today were developed from *Impatiens herzogii*, *I. schlecteri*, *I. linearifolia* and *I. hawkeri*. All of these species are native to the Australian New Guinea subtropical highlands (see following article for more detail).

Table 1. *Ecke's Pure Beauty and Paradise New Guinea impatiens cultivars.*

Pure Beauty Series

Cultivar Name	Flower Color	Foliage Color
Aglia	Hot Pink	Green/yellow variegation
Anaea	Red	Green
Apollon	Deep Pink/Lilac	Dark Green
Aurore	Orange	Dark Red/Green with slight variegation
Celerio	Pink/Lilac Bicolor	Red/Green with slight variegation
Celsia	Silvery Pink	Dark Olive Green
Delias	Medium Pink	Green
Eurema	Soft Salmon Orange	Green/Yellow variegation
Flambe	Pink/Red Bicolor	Olive Green with slight variegation
Jasius	White	Green
Marpesia	Orange/Red	Dark Bronze/Green
Melissa	Deep Coral Pink	Deep Coral Pink
Mimas	Bright Lilac	Dark Red/Green
Octavia	Lilac/Red Bicolor	Dark Olive Green
Saturnia	Soft Lavender	Bronze/Green
Sesia	Soft Coral Pink	Bronze/Green with slight variegation
Thecla	Pink with Light Eye	Dark Red/Green
Vulcain	Light Pink/Dark Red Bicolor	Glossy Dark Purple with slight variegation

Paradise Series

Cultivar Name	Flower Color	Foliage Color
Antigua	Orange/Red	Green
Aruba	Purple	Dark Green
Barbados	Orange	Green
Bora-Bora	Violet Orchid	Green
Fiji	Pastel Pink with Red Eye	Green
Lanai	Red	Green
Maui	Orange/Red	Dark Bronze/Green
Papete	Fuchsia	Green
Samoa	White with Pink Blush	Green
Tahiti	Pastel Pink with Red Eye	Green
Tobago	Soft Coral	Dark Bronze/Green
Tonga	Lavender Pink/Purple Bicolor	Dark Bronze/Green
Trinidad	Fuchsia	Dark Bronze/Green

Currently, almost all commercially grown New Guinea impatiens are vegetatively propagated from cuttings.

In the United States, the primary propagators are Mikkelsens and Paul Ecke Ranch, Inc.

Cultivars: The original New Guinea impatiens cultivar introductions were tall and somewhat not suited for pot culture. Since that time, breeding has concentrated on

1) developing shorter plants
2) developing more variation in flower color and size
3) variation in foliage color,
4) developing cultivars which can be produced 'true' and uniformly from seed

Table 2. *Mikkelsens Lasting Impressions New Guinea impatiens cultivars.*

Cultivar Name	Flower Color	Foliage Color
Ambrosia	Bright fluorescent orange	Dark green with purplish cast
Blazon	Deep crimson red	Deep green with trace of cream variegation
Cameo	Salmon-pink	Deep green with trace of cream variegation near midrib
Charade	Salmon-orange	Dark green with purplish cast
Escapade	Bright orange	Bright deep green
Heathermist	Clear lavender	Dark green with red midrib and purplish cast
Illusion	Light pink with white blush center	Dark green with red midrib and slight purplish cast
Impulse	Bright pink with small carmine eye	Deep green with trace of cream variegation near midrib
Innocence	White	Deep bright green with cream variegation
Rhapsody	Deep purple	Deep green with reddish midrib
Rosetta	Pink	Dark green with a slight purplish cast
Serenade	Distinct light lavender	Green

New Guinea impatiens are susceptible to a number of root rot diseases as well as tomato spotted wilt virus (TSWV).

5) with a shorter production time, and more recently with
6) greater tolerance for heat and water stress.

Currently, almost all commercially grown New Guinea impatiens are vegetatively propagated from cuttings. In the United States, the primary propagators are Mikkelsens and Paul Ecke Ranch, Inc. Both propagators have an active domestic and/or foreign breeding program. There is also interest in developing commercially viable tissue cultured New Guinea impatiens.

The vegetatively propagated cultivars which are currently available and a description of some of their characteristics are shown in Tables 1 and 2.

As mentioned previously, there is interest in producing sexually propagated (seed propagated) New Guinea impatiens which are 'true to seed'. The original introductions were somewhat non-uniform and tall in their growth habit. However, newer introductions are shorter and more suitable for bedding plant production in pots.

Cuttings: Inspect cuttings when they arrive. New Guinea impatiens are susceptible to a number of root rot diseases as well as tomato spotted wilt virus (TSWV). TSWV infection may not be immediately obvious, therefore, cuttings made be propagated from infected plants without realizing it. The symptomology for each of these diseases is described in the Diseases section of this article.

Do not fertilize cuttings in the plug tray.

Place cuttings in a well lit area of a greenhouse maintained at temperatures ranging from 65-75°F. Avoid placing cuttings in direct sun if possible, especially in unshaded glass greenhouses in late spring. It is often best to transplant cuttings as soon as possible as cuttings can easily dry out and stretch due to crowding. Do not fertilize cuttings in the plug tray. Do not apply growth retardants. If insects are present apply the appropriate compound shown under the Insect Pests section.

Do not propagate New Guinea impatiens yourself unless you are a licensed propagator.

Do not propagate New Guinea impatiens yourself unless you are a licensed propagator. Some New Guinea impatiens cuttings are sold with a tag which allows propagation of 1 cutting. The appear-

New Guinea impatiens are primarily grown in 4" pots and 8-10" baskets.

Table 3. *Recommended final spacing for New Guinea impatiens.*

4 inch pot	7"-8" on center
6 inch pot	10"-12" on center
8 inch basket	16"-20" on center

ance of the original plant will likely be poor after pinching unless the plant is pinched again. Such plants are best used in baskets or large pots instead of 4" pots.

Pinching New Guinea impatiens does not increase breaking as New Guinea impatiens are free branching when they have adequate space.

Pot Size: New Guinea impatiens are primarily grown in 4" pots and 8-10" baskets. Finished spacing of New Guinea impatiens pots are shown in Table 3. In general, a single cutting is placed in a 4 or 5" pot, one to two cuttings are placed in a 6" pot. Three to four cuttings are placed in 8" pot or basket and three to five cuttings in 10" baskets.

Pinching New Guinea impatiens does not increase breaking as New Guinea impatiens are free branching when they have adequate space. In most cases, pinching a crop will delay finishing the crop by 2-3 weeks.

It is easy to overwater New Guinea impatiens early in development as they do not use water rapidly.

Media: New Guinea impatiens prefer a well aerated media. For this reason, artificial media are often best, and high percentage soil based media are not recommended. The use of a 100% sphagnum peat media is not suggested as it tends to retain too much water after irrigation. In addition, 100% peat media is often difficult to re-wet when dry. Expanded polystyrene beads improve aeration and reduce water holding of the mix, but do not improve the rewetting ability. Many common commercial peat based media containing peat, vermiculite, perlite and/or bark are acceptable. Addition of trace elements to the media is not recommended.

Watering: Medium should be moistened prior to transplanting. It is easy to overwater New Guinea impatiens early in development as they do not use water rapidly. In fact, plants seem to perform best if they are allowed to dry out slightly between waterings. Plants should not be allowed to dry out to the point of severe wilting.

Do not let the pH of the media drop below 5.8. This is especially important if manganese and/or iron levels in the media are average to high (3.0 to 5.0).

pH: Media pH should be maintained at 5.8-6.4. Do not let the pH of the media drop below 5.8. This is especially important if manganese and/or iron levels in the media are average to high (3.0 to 5.0). New Guinea impatiens are very sensitive to elevated levels of micronutrients in the tissue. Low pH results in a high availability of iron and manganese in the media resulting in the potential for micronutrient toxicity.

Nutrition: New Guinea impatiens have a relatively low nutritional requirement. Do not overfertilize. New Guinea's are very sensitive to elevated soluble salts of any kind. For this reason, little if any fertilizer should be applied to plants for the first 3 weeks after transplanting. Do not fertilize plants while in the plug tray. Fertilizer can be applied through the constant liquid fertilizer program after roots have reached the edge of the pot.

Table 4. *Recommended University of Minnesota soil test (Spurway) (line1) and Saturated Media (paste) soil test (line 2) for New Guinea impatiens grown in a soilless medium.*

pH	SS	NO_3	NH_4	P	K	Ca	Mg	Na	Fe	Mn	Zn	B
6.2-6.5	60-80	75-100	0-5	5-10	30-40	80-120	30-40	1-10	0.1-0.5	0.1-0.5	0.1-0.5	0.1-0.5
6.0-6.5	1.5-2.25	75-125	0-10	5-10	75-125	100-200	30-70	<10% total SS	0.3-3.0	0.02-3.0	0.3-3.0	0.05-0.5

Table 5. *Recommended tissue analysis standards for New Guinea impatiens.*

Nitrogen (%)	2.5-4.5
Phosphorus (%)	0.3-0.8
Potassium (%)	1.9-2.7
Calcium (%)	1.0-2.0
Magnesium (%)	0.3-0.8
Iron (ppm)	150-300
Manganese (ppm)	100-250
Zinc (ppm)	40-85
Copper (ppm)	5-10
Boron (ppm)	50-60

Over fertilization of young plants will result in a general reduction of root growth, burning of the leaf edge and/or cupping or rippling of the leaf surface. Cultivars which are extra sensitive to high soluble salts include 'Delias', 'Saturnia' and 'Sylvine'. These cultivars are, therefore, useful as indicator plants.

Under fertilizing New Guinea impatiens results in

1) generalized reduction of growth, i.e. shorter plants with smaller leaves
2) purple-leafed cultivars will have a reddish appearance
3) green leafed cultivars will show a slight chlorosis or yellowing. The chlorosis is usually most obvious on the lower leaves.

Constant liquid fertilization programs with overhead watering systems should have nitrogen levels which range from 100-150 ppm. Nitrogen rates higher than 250 ppm should be avoided as they often damage or burn plants. Potassium levels should be the same rate in solution, i.e. 150-0-150, 200-0-200. Phosphorus should be added at the time of soil mixing. If it is not, a single application of a 'starter' fertilizer (9-45-15) is often sufficient for the crop. Often phosphorus application is not needed at all since phosphoric acid is being used to acidify irrigation water. This is especially true in the north central region of the U.S. where phosphoric acid is regularly added to control water pH. Do not use slow release fertilizers with New Guinea impatiens under most circumstances because of the high soluble salts potential.

If fertilizer is not applied continuously, then single applications of 300-350 ppm nitrogen can be made every other watering. Continuous fertilization through irrigation is preferred.

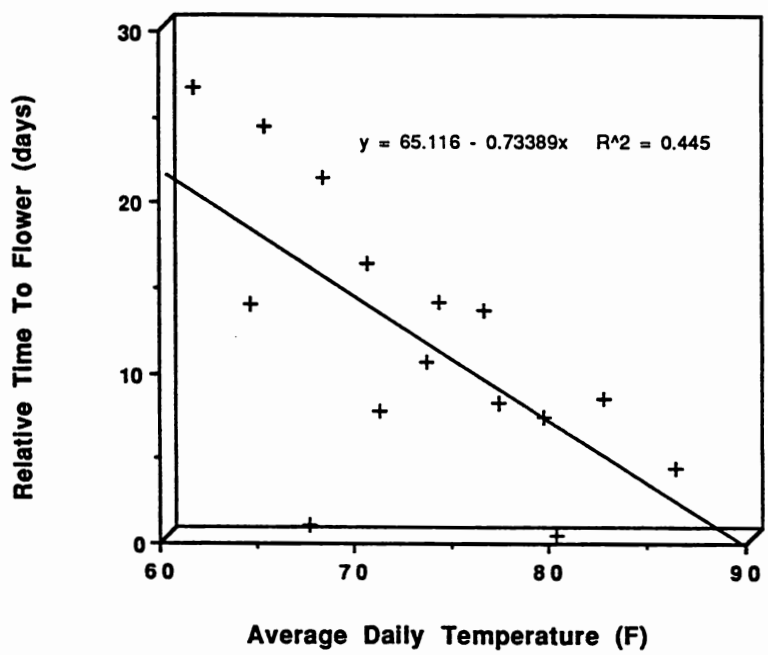

Figure 1. *The effect of average daily temperature (ADT) on New Guinea impatiens cv. Mimas relative time to flower. Relative time to flower was calculated by determining the average increase in time to flower relative to the most rapid flowering day/night treatment.*

New Guinea impatiens have a relatively low nutritional requirement.

New Guinea's are very sensitive to elevated soluble salts of any kind.

Over fertilization of young plants will result in a general reduction of root growth, burning of the leaf edge and/or cupping or rippling of the leaf surface.

Continuous fertilization through irrigation is preferred.

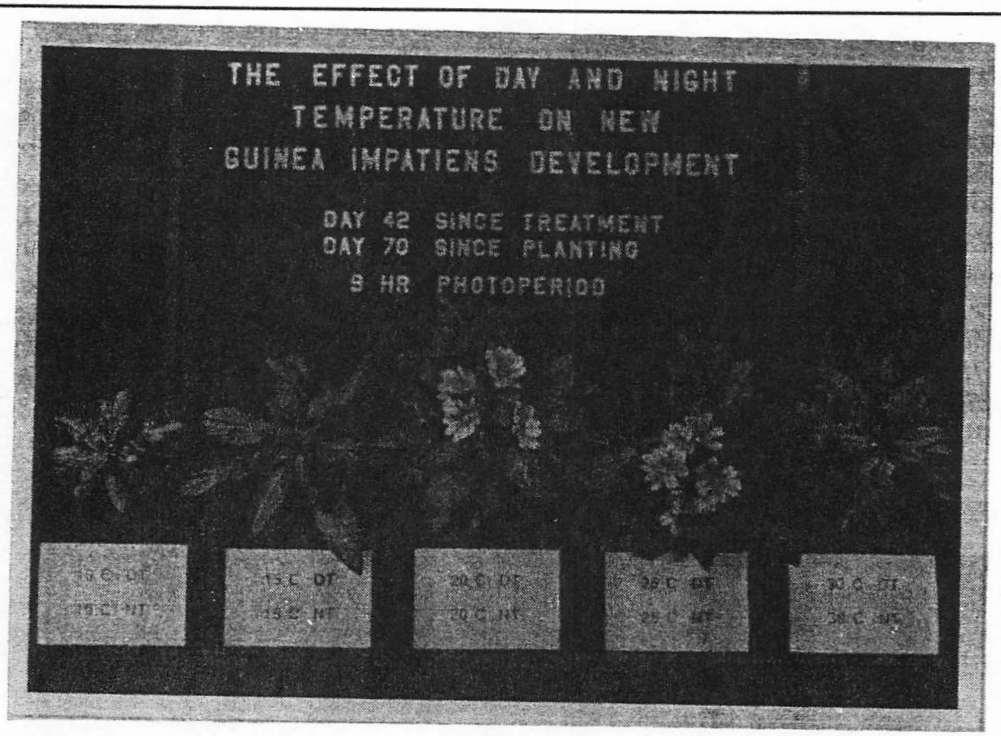

Figure 2. *Photograph showing constant temperature effect on New Guinea impatiens cv. Mimus flowering.*

If soluble salts damage occurs, leach to remove as much of the excess salts, or fertilizer, as possible.

If soluble salts damage occurs, leach to remove as much of the excess salts, or fertilizer, as possible. You may want to follow this with a fungicide application, as New Guinea impatiens often can acquire 'root rot' in soluble salts damaged roots.

Micronutrients should be added sparingly, if at all.

Recommended soil test results for medium for growing New Guinea impatiens production for growers who use the University of Minnesota soil testing service, or a service using a saturated media test is shown in Table 4.

Micronutrients should be added sparingly, if at all. New Guinea impatiens are very sensitive to elevated levels of micronutrients. In particular, high iron and/or manganese can severely damage New Guinea impatiens growth. Iron and/or manganese toxicity symptoms include

1) necrosis of lower leaves or the edges of leaves

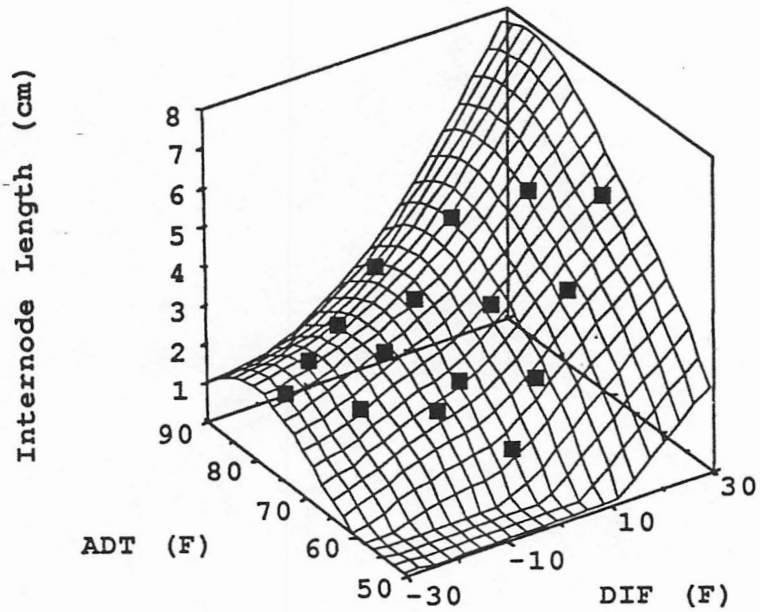

Figure 3. *The effect of DIF and ADT on New Guinea impatiens cv. Mimas internode length.*

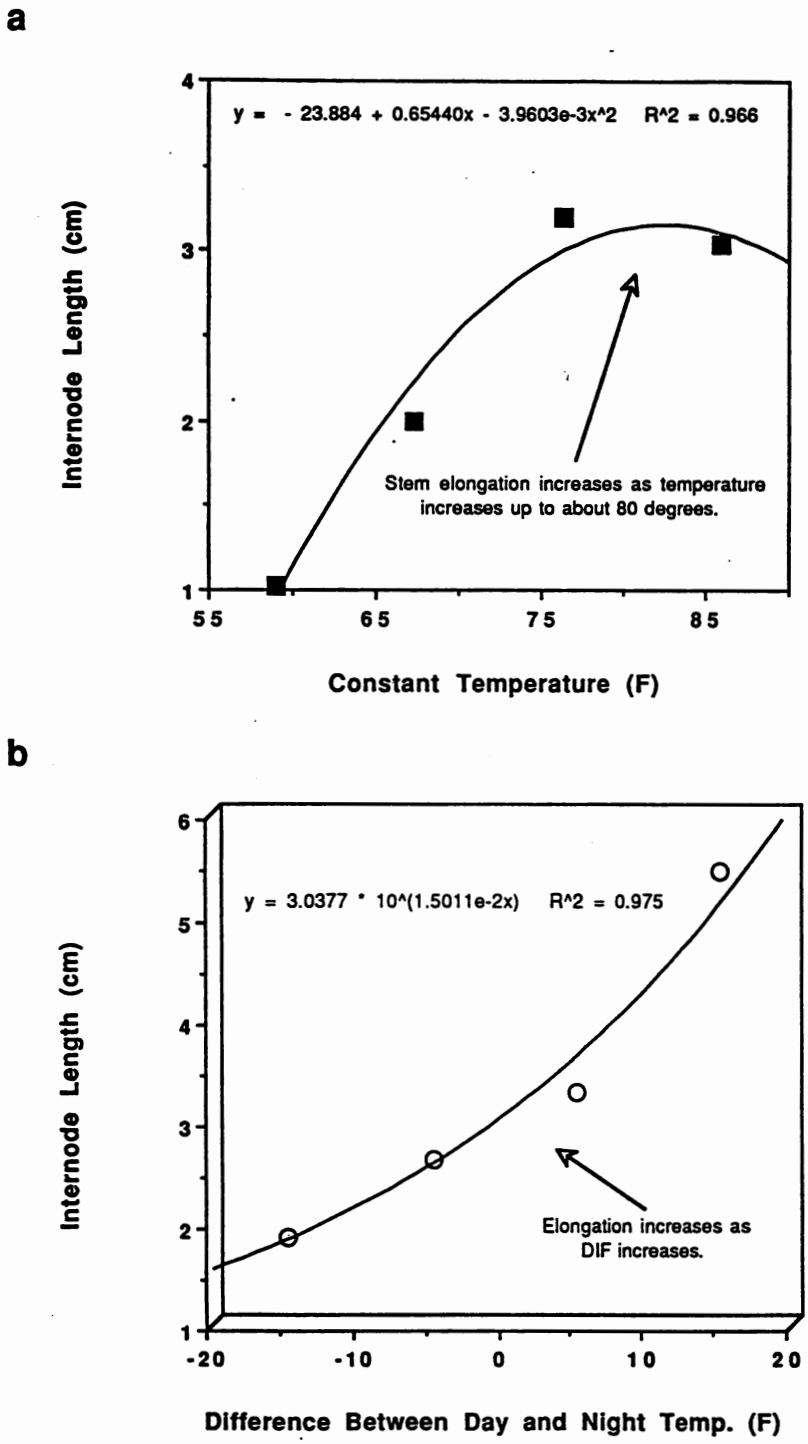

Figure 4. *The effect of temperture (a) and the difference between day and night temperature (DIF) (b) on New Guinea impatiens cv. Mimas internode length.*

2) shoot tip die back, and/or
3) distortion, stunting and cupping of the upper leaves.

For this reason, trace elements should not be added regularly as part of a continuous feed program on New Guinea impatiens. If micronutrient toxicity is suspected, conduct a tissue test to confirm whether manganese and iron levels in the tissue are excessive. Recommended tissue nutrients levels are shown in Table 5.

If micronutrient toxicity is suspected, conduct a tissue test to confirm whether manganese and iron levels in the tissue are excessive.

Magnesium deficiency is a common problem in New Guinea impatiens production. Magnesium sulfate (Epsom salts) should be added monthly as a separate drench. Apply 8 oz. of epsom salts per 100 gallons of water. On a small scale this translates into 1 teaspoon epsom salts per gallon water.

Temperature: New Guinea impatiens have a relatively narrow range of temperatures in which they grow well.

New Guinea impatiens have a relatively narrow range of temperatures in which they grow well.

Plant development rate increases as temperature increases from 60° to 77°F (Figures 1 and 2). Plants grown at constant 63°F require 1 week longer to first flower than plants grown at constant 73°F. Plant growth is severely depressed on young plants when night temperatures drop below 65°F. However, night temperatures can drop to 60°F on

Plant growth is severely depressed on young plants when night temperatures drop below 65°F.

New Guinea impatiens stem elongation is affected by the ADT plants are grown under and the difference (DIF) between day and night temperature (day temperature - night temperature).

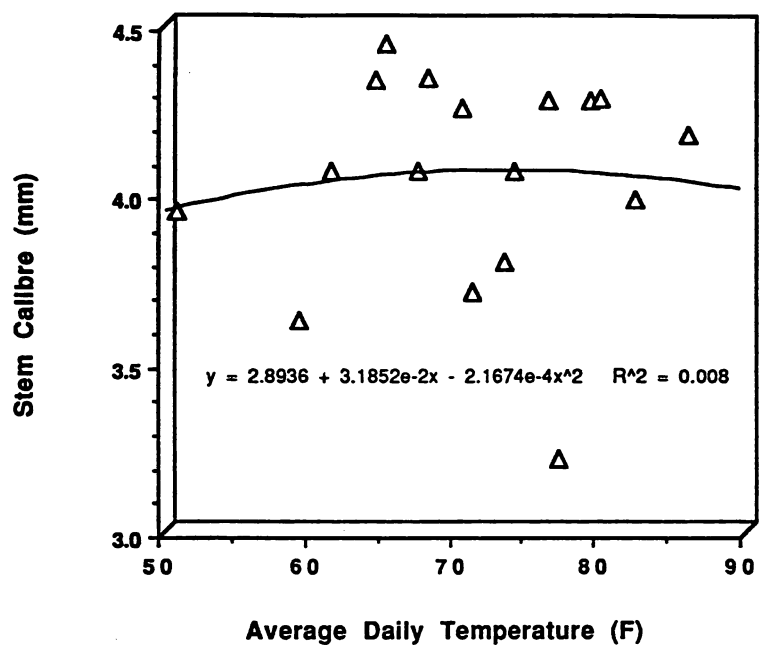

Figure 5. *The effect of average daily temperature on New Guinea impatiens cv. Mimas stem calibre.*

night to an equal day and night temperature regime. For instance, internode length was 3.84 cm on 'Mimas' plants grown with a 77°F day and 59°F night temperature. 'Mimas' plants grown at constant 68°F had internodes only 2.0 cm in length.

Stem calibre is unaffected by temperature (Figure 5). However, stem dry weight increases significantly as day temperature increases relative to night temperature, i.e. as DIF increases (Table 6).

Stem elongation increases as temperature increases up to approximately 80°F. Increasing temperature above 80°F reduces stem elongation.

older plants without significant detrimental effects.

New Guinea impatiens stem elongation is affected by the ADT plants are grown under and the difference (DIF) between day and night temperature (day temperature - night temperature) (Figure 3).

Stem elongation increases as temperature increases up to approximately 80°F (Figure 4a). Increasing temperature above 80°F reduces stem elongation.

New Guinea stem elongation also increases as DIF increases.

New Guinea stem elongation also increases as DIF increases (Figure 4b). Stem elongation can be significantly reduced if the day/night temperature environment is shifted from a higher day than

Flower size is greatest when day and night temperatures are 68°F (Figure 6). If either day or night temperature

Flower size is greatest when day and night temperatures are 68°F.

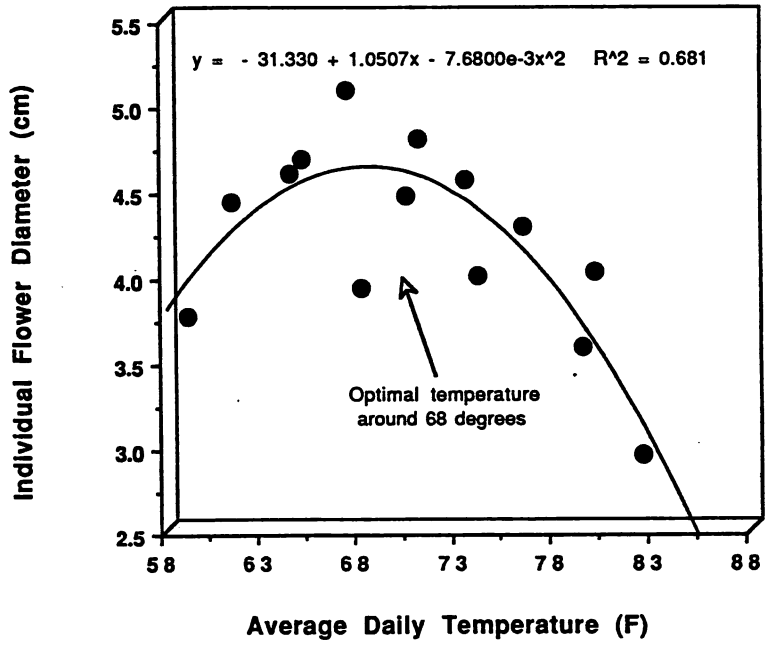

Figure 6. *The effect of average daily temperature on New Guinea impatiens cv. Mimas individual flower diameter.*

increases or decreases from 68°F, flower number and size is reduced.

Both leaf number and individual leaf area are affected by the average daily temperature plants are grown under.

Leaf number per node increases from 4 to approximately 7 as average temperature increases from 50° to 75°F (Figure 7). Increasing temperature above 75°F will reduce leaf number per node.

Individual leaf area responds similarly to temperature as leaf number per node (Figure 8). Leaf area increases as average temperature increases to 75°F, then decreases as temperature increases.

Carbon partitioning to flowers decreases and partitioning to stem and/or leaves increases. Carbon partitioning to stems is greatest when plants are grown with a large positive DIF, i.e. 76°F day and 63°F night temperature. Total shoot dry weight (stem+leaves+flowers) is highest when plants are grown with a 76° day and 63°F night temperature.

Photoperiod and Light Intensity:

New Guinea impatiens are not photoperiodic. In other words, the length of the day or night does not stimulate flowering. However, flowering increases as the total amount of light which a plant is exposed to increases. Therefore, brighter

Leaf number per node increases from 4 to approximately 7 as average temperature increases from 50° to 75°F.

Leaf area increases as average temperature increases to 75°F, then decreases as temperature increases.

Carbon partitioning to flowers is greatest at 68°F.

New Guinea impatiens are not photoperiodic.

Table 6. *The effect of day and night temperature on leaf, stem, flower and total above ground dry weight of New Guinea impatiens cv. Mimas. Plants were grown under a 9 hr photoperiod.*

Night Temperature (°C)	Day Temperature (°C) 10	15	20	25	30
			Leaf		
10	0.47	-	-	-	-
15	-	2.69	3.87	4.46	4.41
20	-	2.88	3.28	4.29	4.49
25	-	3.30	3.71	4.16	4.95
30	1.61	2.26	3.67	3.71	3.37
			Stem		
10	0.05	-	-	-	-
15	-	0.06	1.02	1.28	1.43
20	-	0.07	0.86	1.14	1.42
25	-	0.07	0.83	1.08	1.30
30	0.03	0.04	0.72	0.82	0.83
			Flowers		
10	0.05	-	-	-	-
15	-	0.08	1.38	1.34	0.87
20	-	1.60	2.12	1.29	0.87
25	-	1.30	1.33	1.05	0.59
30	0.03	0.03	0.38	0.18	0.04
			Total Plant Dry Weight		
10	0.57	-	-	-	-
15	-	4.09	6.27	7.08	6.73
20	-	5.15	6.66	6.73	6.78
25	-	5.29	5.87	6.30	6.76
30	1.90	2.94	4.77	4.71	4.24

New Guinea impatiens prefer bright light in the greenhouse.

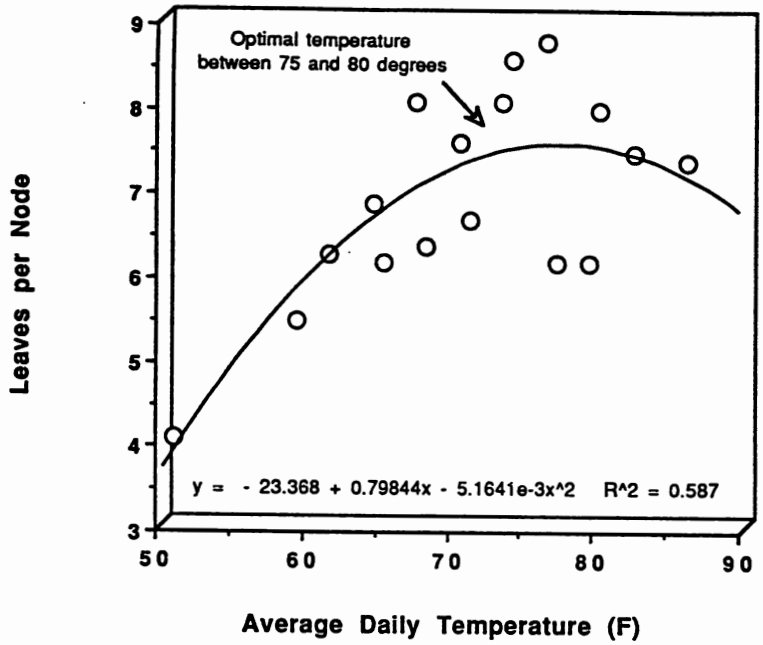

Figure 7. *The effect of average daily temperature on the number of leaves per node of New Guinea impatiens cv. Mimas.*

bright but not direct sunlight. Ideally, plants should receive direct morning sun only, outside.

Keep in mind that light heats the plant. Under high light intensities flowering may be reduced simply because the plant temperature exceeds 76°F.

Light intensities during the middle of the day of 500-600 *u*mol $s^{-1}m^{-2}$ (2,500-3000 foot-candles) are recommended.

conditions and/or longer days may result in more flowering due to the greater total amount of light which the plant receives during a day/night cycle.

New Guinea impatiens prefer bright light in the greenhouse. Light intensities during the middle of the day of 500-600 *u*mol $s^{-1}m^{-2}$ (2,500-3000 foot-candles) are recommended. If light intensities should exceed 600 *u*mol $s^{-1}m^{-2}$ (3000 foot-candles) regularly, shading may be required. Plants which are grown in the greenhouse and transferred outside to brighter conditions may turn a darker and/or purple leaf color which is only temporary in nature. Finished plants outdoors should always be grown in

New Guinea impatiens usually do not need any growth retardant applications.

Growth Retardants: New Guinea impatiens usually do not need any growth retardant applications. This is fortunate since Cycocel, B-Nine and A-Rest have relatively little effect on New Guinea impatiens stem elongation. Bonzi has, however, been shown to be effective at a rate of 30 ppm.

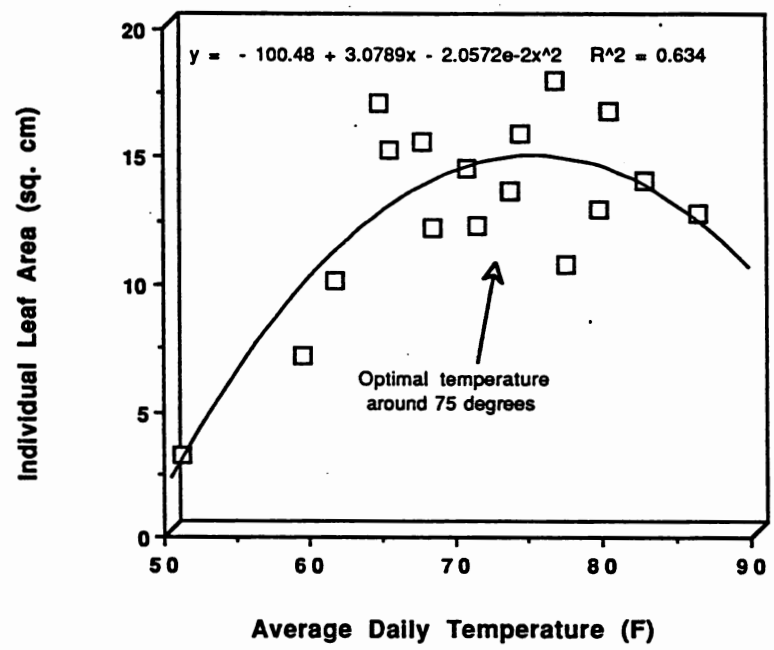

Figure 8. *The effect of average daily temperature on New Guinea impatiens cv. Mimas individual leaf area.*

Table 5. *New Guinea Impatiens federal pest control chart.*

Pests	Materials	Form	Dose/100 Gal	General Remarks
Aphids	Dursban	50 W	8 oz.	Foliar spray.
	Dymet	EC	2-3 quarts	Foliar spray.
	Mavrik	Aquaflow	2-5 fl. oz.	Foliar spray.
	Orthene	Aerosol		Follow directions on label.
	Safer Insecticidal Soap	Concentrate	2 gallons	Follow directions on label.
	Sumethrin	Aerosol		Follow directions on label.
	Talstar	10 WP	6-16 oz.	Foliar spray.
	X-clude	Aerosol		Follow directions on label.
	Zectran	2 E	1.5-2 quarts	Foliar spray.
Fungus Gnats	Gnatrol		8 to 64 oz.	Follow directions on label.
	Resmethrin	Aerosol		Follow directions on label.
	X-clude	Aerosol		Follow directions on label.
Mealybugs	Enstar	5 E	6 to 20 oz.	Follow directions on label.
	Orthene	Aerosol		Follow directions on label.
	Safer Insecticidal Soap	Concentrate	2 gallons	Follow directions on label.
	Sumethrin	Aerosol		Follow directions on label.
	Talstar	10 WP	6-16 oz.	Foliar spray.
	Turcam	76 WP	12-20 oz.	
	X-clude	Aerosol		Follow directions on label.
	Zectran	2 E	1.5-2 quarts	Foliar spray.
Spider Mites	Avid	0.15 EC	4 fl. oz.	Foliar spray.
	Dursban	50 W	8 oz.	Foliar spray.
	Dymet	EC	2-3 quarts	Foliar spray.
	Mavrik	Aquaflow	5-10 fl. oz.	Foliar spray.
	Pentac	50 WP or	8 oz.	Foliar spray.
		Aquaflow	8 fl. oz.	Foliar spray.
	Safer Insecticidal Soap	Concentrate	2 gallons	Follow directions on label.
	Sumethrin	Aerosol		Follow directions on label.
	Talstar	10 WP	6-16 oz.	Foliar spray.
	Vendex	50 WP	8-16 oz.	Foliar spray.
		or		
		4 L	8-16 oz.	Foliar spray.
	X-clude	Aerosol		Follow directions on label.
	Zectran	2 E	1.5-2 quarts	Foliar spray.
Thrips	Avid	0.15 EC	4 fl. oz.	Foliar spray.
	Dursban	50 W	1 lb.	Foliar spray.
	Dycarb (Turcam)	76 WP	12-20 oz.	Foliar spray.
	Dymet	EC	2-3 quarts	Foliar spray.
	Lannate	L	1-2 pts.	Restricted use.
	Resmethrin	Aerosol		Follow directions on label.
	Thiodan	50 WP	16 oz.	Follow directions on label.
	Vydate	L	1-4 pts.	Follow directions on label.

NOTE: Follow the label as approved in each state. Before using a pesticide on a crop for the first time or on a new cultivar, treat a few plants and check for phytotoxicity.

Control of stem elongation of New Guinea impatiens with temperature. Use of DIF and/or a cool morning drops in temperature to reduce stem elongation.

Control of stem elongation of New Guinea impatiens with temperature. Use of DIF and/or a cool morning drops in temperature to reduce stem elongation. The degree to which stem elongation is reduced is not as great as is seen on most other crops.

The best methods to achieve height control on New Guinea impatiens is to simply

1) space plants adequately
2) grow plants in adequate light intensities and
3) use of DIF and/or a cool morning drops in temperature to reduce stem elongation.

The most common pests of New Guinea impatiens are the two-spotted mite, cyclamen mite, aphids, fungus gnats and the Western flower thrips.

Insect Pests: The most common pests of New Guinea impatiens are the two-spotted mite, cyclamen mite, aphids, fungus gnats and the Western flower thrips. Spider mites and thrips are probably the most important of these.

Western flower thrips have become a severe problem for New Guinea impatiens production throughout the U.S. Although thrips can damage the plant directly, the greatest danger with Western flower thrips is its ability to transmit tomato spotted wilt virus (TSWV). If thrips are detected

1) immediately develop a systematic and regular control program and
2) have a sample of plants from where the thrips were discovered tested for TSWV.

Recommended pesticides for control of various pests of New Guinea impatiens are shown in Table 5. Check with your state entomologist to be sure that a pesticide is registered for use on New Guinea impatiens in your state before you make an application.

The most common diseases of New Guinea impatiens are root and stem rots (*Pythium*, *Rhizoctonia* and *Phytophthora*), *Botrytis* and tomato spotted wilt virus (TSWV).

Diseases: The most common diseases of New Guinea impatiens are root and stem rots (*Pythium*, *Rhizoctonia* and *Phytophthora*), *Botrytis* and tomato spotted wilt virus (TSWV). Overwatering, unsterilized media and/or media which drain poorly can result in root rot. Identification of root rot can be made by simply examining the roots. Roots which do not have actively growing white tips may have root rot. If this is the case, you should send a plant to a local plant disease testing laboratory for positive identification. Root rot problems are controlled by

1) using sanitary practices such as planting into a sterilized media, growing plants on clean benches etc. etc.
2) applying fungicides as part of a regular monthly program and
3) not overwatering plants and/or growing in a media which does not drain well.

Botrytis (gray mold) attacks the upper portion of the plant, i.e. leaves, flowers, and on cuttings the stem itself. The potential for a *Botrytis* outbreak is greatest under cool, (55-65°F) moist conditions. The best control measure is to ventilate your greenhouse to reduce humidity. This is effective because *Botrytis* spores require a moist surface to germinate on. Under humid conditions, *Botrytis* spores germinate freely on moist leaf and flower surfaces. Under well ventilated conditions, spores will be unable to germinate.

In addition to ventilating the greenhouse, removal of any dead tissue in the greenhouse is very helpful. Dead leaves an flowers often will initiate a *Botrytis* problem.

Chemical controls are shown in Table 6. TSWV is a major problem in New Guinea impatiens production. Unfortunately there are no chemical means to control the virus. Therefore, the only control method is to control the means by which the virus spreads, i.e. Western flower thrips or propagating from infected plant material. Do not propagate your own cuttings unless you are positive that your material is not infected with TSWV. The only way to insure this is to have your material tested regularly.

Table 6. *New Guinea Impatiens federal disease control chart.*

Disease	Materials	Form	Dose/100 Gal	General Remarks
Botrytis	Benlate	50 DF	0.5 lb.	Foliar spray.
	Chipco 26019	50 WP	1-2 lb.	Foliar spray.
	Exotherm Termil		1 can/1000 ft^2	Thermal dust.
	Ornalin	50 WP	0.5-1 lb.	Foliar spray.
	Zyban	75 WP	1.5 lb.	Foliar spray.
Phythium/ Phytophthora	Banol	66.5%	20 oz.	Drench.
	Banrot	40 W	4-12 oz.	Drench then irrigate immediately.
		or		
		8 G	8-16 oz/yd^3 potting mix	Incorporate in potting mix.
	Subdue	2 E	0.5-2 fl. oz.	Drench. Do not apply rates of 1.5-2 fl. oz. more than every 6 weeks.
	Truban	30 WP	4-12 oz.	Drench then irrigate immediately.
		or		
		25 EC	3-8 fl. oz.	Drench them irrigate. immediately.
		or		
		5 G	5-10 oz/yd^3 potting mix	Incorporate in potting mix.
Rhizoctonia	Banrot	40 W	4-12 oz.	Drench then irrigate immediately.
		or		
		8 G	8-16 oz/yd^3 potting mix	Incorporate in potting mix.
	Benlate	50 DF	1 lb.	Drench.
	Chipco 26019	50 WP	1-2 lb.	Foliar spray for aerial web blight.
	Terrachlor	75 W	13.3 oz.	One time only.
	Zyban	75 WP	1.5 lb.	Foliar spray for aerial web blight.

Tomato spotted wilt virus (TSWV) is another disease of New Guinea Impatiens. The symptoms of TSWV are many and varied. On New Guinea Impatiens the symptoms can include stunting, black ringspot, leaf midrib and stem blackening or necrosis, and total plant collapse.

The virus is spread by several species of thrips with the Western Flower Thrips, *Frankiniella occindentalis* being the primary vector in greenhouses. Both the virus and the thrips have wide host ranges. Once a plant has the virus it can't be eliminated by pesticides. Tomato spotted wilt virus can only be controlled by controlling the thrips vector. A good thrips control program should include inspection of all incoming plant material, regular monitoring of the greenhouse, screening on doors and vents, and pesticide applications as needed.

NOTE: Follow the label as approved in each state. Before using a fungicide on the crop for the first time or on a new cultivar, treat a few plants and check for phytotoxicity.

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The most common symptoms seem to be blackening of the leaf midvein and stunting of new shoot growth.

Symptoms of TSWV on New Guinea impatiens vary with cultivar and time of year. In general, early signs of TSWV include

1) spotting of foliage with concentric rings radiating out from the spot into the foliage
2) blackening of the leaf midvein
3) shoot tip die-back and
4) stunting of overall growth.

The difficulty in detection of TSWV is that all or one of these symptoms may be apparent on a crop. The most common symptoms seem to be blackening of the leaf midvein and stunting of new shoot growth. If you suspect TSWV contact your state pathologist and send a plant to a local disease testing laboratory for verification.

Scheduling: The time to produce a New Guinea impatiens can vary considerably based on the environmental conditions which plants are grown under and the original condition and size of the cutting.

Most Common Problems

The time to produce a New Guinea impatiens can vary considerably based on the environmental conditions which plants are grown under and the original condition and size of the cutting.

High Soluble Salts:

Symptom: Burning of leaf edges and the lower leaves. Wilting of crop even when the media is moist. General lack of vigor of young rooted cuttings after transplant.

Solution: If you have this problem you should leach. Do not let your SS (soluble salts) reading on the Univ. of Minnesota soil test exceed 80. Fertilize New Guinea impatiens little if at all during the first 2-3 weeks. Allow the roots to reach the side of the pot prior to starting a regular continuous liquid feed program.

Micronutrient Toxicity:

Symptom: Burning of the leaf edges and lower leaves. Cupping of the new young expanding leaves. Shoot tip die-back.

Solution: Leach. Stop applying any materials which contain micronutrients. Micronutrient toxicity is most common when the media pH is between 5.2-6.0. Under these conditions the New Guinea impatiens is a manganese and iron 'sponge'. Even though the levels of manganese and iron may be in the acceptable range on the soil test, the actual levels in the tissue may be excessive. For this reason we would recommend that no micronutrients be applied to a crop for 2-3 weeks after transplanting.

Too Cool or Hot Temperature:

Symptom: Very slow growth or rapid growth with few small flowers.

Solution: The New Guinea impatiens has a relatively narrow range of temperatures in which it does well. In general, the acceptable range for New Guinea growth is between 57° and 77°F. As either day or night temperature rises above 77°F plant quality is reduced by reducing flower number and size. If average daily temperatures exceed 82°F growth will slow. If temperatures drop below 57°F growth will stop.

Root Rot:

Symptom: Reduced growth. No white root tips. Wilting on sunny days even though the media is moist.

Solution: After transplanting, New Guinea impatiens require little watering. Plants should be watered sparingly to maintain moist media. Early in development this may be very little. Let plants dry slightly (not wilt).

Tomato Spotted Wilt Virus:

Symptom: Spotting of foliage with concentric rings radiating out from the spot into the foliage. Blackening of the leaf midvein. Shoot tip die-back. Stunting of overall growth. The difficulty in detection of TSWV is that all or one of these symptoms may be apparent on a crop. The most common symptoms seem to be blackening of the leaf midvein and stunting of new shoot growth. If you suspect TSWV contact your state pathologist and send a plant to a local disease testing laboratory for verification.

Solution: Unfortunately there are no chemical means to control the virus. Therefore, the only control method is to control the means by which the virus spreads, i.e. Western flower thrips or propagating from infected plant material. Do not propagate your own cuttings unless you are positive that your material is not infected with TSWV. The only way to insure this is to have your material tested regularly. Remove any weeds in your greenhouse or around your greenhouse which may be a host of the Western flower thrips.

Information in this article was assembled from research which I conducted with Royal Heins while at Michigan State University as well as the following articles and culture sources:

Grueber, G. 1992. Secrets to success with New Guinea impatiens. Floriculture Indiana, 6(1):4-6.

Judd, L. and D. Cox. 1992. New Guinea impatiens: Watch out for soluble salts. Greenhouse Grower. Feb. 1992.

Kasperski, M. and W. Carlson. 1989. New Guinea impatiens production. Mich. State Univ. Ext. Bull. No. E-2179.

Mikkelsens, Inc. 1989. Cultural information for Mikkel Sunshine New Guinea impatiens. Mikkelsens, Inc. Pub., Ashtabula, Ohio.

Paul Ecke Ranch. 1989. New Guinea impatiens: Cultural information. Paul Ecke Ranch Pub., Encinitas, CA.

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