TABLE 2-1

Photoperiodic response for flowering of numerous floriculture plant species. Photoperiodic response listed is primarily for cultivated species and hybrids; individual cultivars within a species and other species not commonly cultivated with a genus may have different responses from that listed. With many species the response listed is for unvernalized plants. Many species can flower under any day length if first given a cold treatment. For several species the photoperiod requirement changes with the production temperature and light level.

Crop Species	Photoperiodic Response
Abutilon ×hybridum	Day neutral
Achillea species	Day neutral to obligate LD
A. aegyptiaca 'Taygetea'	Facultative LD
A. clypeolata ×'Taygetea' 'Anthea,' 'Moonshine'	Facultative LD
A. filipendulina 'Cloth of Gold'	Obligate LD
A. filipendulina 'Gold Plate'	Facultative LD
A. filipendulina ×clypeolata 'Coronation Gold'	Facultative LD
A. millefolium ×'Taygetea' 'Appleblossom,' 'Fireland,' 'Galaxy,' 'Hope,' 'Paprika,' 'Terra Cotta'	Facultative LD
A. millefolium ×'Summer Pastels'	Obligate LD
A. ptarmica 'The Pearl'	Facultative LD
A. tomentosa 'King Edward VIII'	Day neutral
Achimenes hybrids	Day neutral
Acroclinium roseum	Obligate LD
Agastache ×'Blue Fortune'	Facultative LD
Ageratum houstonianum	Facultative LD
A. houstonianum 'Blue Danube,' 'Tall Blue Horizon'	Facultative LD
Agrostemma githago	Obligate LD
Alcea rosea	Facultative LD
Alstroemeria hybrids	Facultative LD
Amaranthus caudatus	Facultative SD
A. hybridus 'Pygmy Torch'	Day neutral
Ammi majus	Obligate LD
Anemone coronaria	Day neutral to obligate LD
A. hupehensis	Obligate LD
Anethum graveolens 'Mammoth'	Obligate LD
Anigozanthos species and hybrids	Day neutral to facultative SD or LD
A. flavidus	Facultative LD
A. manglesii	Facultative SD
A. rufus, A. pulcherrimus, A. flavidus ×manglesii	Day neutral
Anthurium species	Day neutral
Antirrhinum majus	Facultative LD
A. majus 'Floral Showers Crimson,' 'Spring Giants'	Facultative LD
Aquilegia species	Day neutral to facultative LD
Armeria ×hybrida 'Dwarf Ornament Mix'	Day neutral
A. latifolia	Day neutral
Asclepias tuberosa	Obligate LD
Asperula arvensis 'Blue Mist'	Obligate LD
Aster species	Day neutral to facultative LD followed by facultative SD
A. alpinus 'Goliath'	Day neutral
A. dumosus	Facultative LD followed by facultative SD
A. ericoides	Facultative LD followed by facultative SD
A. novi-belgii	Facultative LD followed by facultative SD
A. pilosus	Obligate SD

Information was collated from Anderson (2002), Armitage (1994), Armitage and Laushman (2003), Cameron et al. (2000), Clough et al. (1999), Dole, unpublished, Erwin et al. (2002), Fausey et al. (1999), Karlsson and Werner (2002), Nausieda et al. (2000), Pallez et al. (2002), Runckle et al. (1996, 1998), and Whitman et al. (1998).

TABLE 2-1 (continued)

Crop Species	Photoperiodic Response
Astilbe ×arendsii	Day neutral to facultative LD
Baptisia australis	Day neutral
Begonia ×hiemalis	Obligate to facultative SD
B. Semperflorens-Cultorum cultivars	Day neutral
B. Tuberhybrida cultivars	Facultative LD
Bougainvillea spectabilis	Facultative SD
Calceolaria Herbeohybrida cultivars	Facultative LD
Calendula officinalis	Obligate to facultative LD
C. officinalis 'Calypso Orange'	Facultative LD
Calibrachoa 'Colorburst Violet,' 'Liricashowers Rose'	Facultative LD
Callistephus chinensis	Obligate to facultative LD followed by facultative SD
Campanula species	Day neutral to obligate LD
C. 'Birch Hybrid'	Facultative LD
C. isophylla	Obligate to facultative LD
C. medium	Obligate SD followed by obligate LD
C. medium 'Champion'	Obligate LD
C. carpatica 'Blue Clips'	Obligate LD
C. fragilis	Obligate LD
C. grandiflorus 'Sentimental Blue'	Facultative LD
C. leucophylla	Obligate LD
C. persicifolia	Day neutral
C. poscharskyana	Obligate to facultative LD
Capsicum annuum	Day neutral
Carpanthea pomeridiana 'Golden Carpet'	Day neutral
Carthamus tinctorius 'Lasting Yellow'	Facultative LD
Caryopteris incana	Facultative SD
Catananche caerulea 'Blue'	Obligate LD
Catharanthus roseus	Day neutral
Cattleya hybrids	Facultative SD
Celosia argentea	Facultative to obligate SD
C. argentea 'Chief Mix'	Facultative SD
C. argentea plumosa group "Flamingo Feather Purple"	Obligate SD
Centaurea species	Facultative to obligate LD
C. cyanus 'Blue Boy'	Obligate LD
Centranthus macrosiphon	Day neutral
Chrysanthemum coccineum 'James Kelway'	Obligate LD
Cirsium japonicum	Day neutral
Clarkia amoena	Day neutral to obligate LD
Clematis ×jackmanii	Facultative LD
Cleome hassleriana	Day neutral to facultative LD
C. hassleriana 'Pink Queen'	Facultative LD
C. hassleriana 'Rose Queen'	Day neutral
C. spinosa	Facultative SD
Clerodendrum thomsoniae	Facultative SD
C. ×speciosum	Facultative SD
Cobaea scandens	Day neutral
Collinsia heterophylla	Facultative LD
Consolida ambigua	Facultative LD
Convolvulus tricolor 'Blue Enchantment'	Day neutral

TABLE 2-1 *(continued)*

Crop Species	Photoperiodic Response
Coreopsis grandiflora	Facultative to obligate LD
C. grandiflora 'Early Sunrise'	Obligate LD
C. grandiflora 'Sunray'	Facultative LD
C. verticillata 'Moonbeam'	Obligate LD
Corydalis lutea	Day neutral to facultative LD
Cosmos atrosanguineus	Facultative LD
C. bipinnatus	Facultative to obligate SD
C. bipinnatus 'Early Wonder,' 'Diablo,'	
'White Sensation'	Facultative SD
C. sulphureus	Obligate SD
Crossandra infundibuliformis	Day neutral
Cyclamen persicum	Day neutral
Dahlia cultivars	Facultative SD
Delphinium elatum 'Blue Mirror'	Day neutral
Dendranthema ×*grandiflorum*	Obligate to facultative SD
Dianthus species	Day neutral to facultative LD
D. carthusianorum	Day neutral to facultative LD
D. caryophyllus	Facultative LD
D. chinensis 'Ideal Cherry Picotee'	Facultative LD
D. deltoides 'Zing Rose'	Day neutral
Dimorphotheca aurantiaca	Day neutral to obligate LD
D. aurantiaca 'Mixed Colors'	Day neutral
D. aurantiaca 'Salmon Queen'	Obligate LD
Dolichos lablab	Obligate SD
Echinacea purpurea	Facultative to obligate LD
E. purpurea 'Bravado'	Obligate LD
Echinops bannaticus	Facultative LD
Eschscholzia californica 'Sundew'	Facultative LD
Euphorbia marginata	Obligate SD
E. pulcherrima	Obligate SD
Eustoma grandiflorum	Day neutral to facultative LD
Exacum affine	Day neutral
Freesia ×*hybrida*	Day neutral
Fuchsia hybrids	Day neutral to obligate LD
F. 'Dollar Princess'	Obligate LD
F. 'Gartenmeister'	Day neutral
Gaillardia grandiflora 'Goblin'	Obligate LD
Gaura lindheimeri 'Whirling Butterflies'	Facultative LD
Gazania rigens 'Daybreak Red Stripe'	Obligate LD
Geranium dalmaticum	Facultative LD
Gerbera jamesonii	Facultative SD
Gomphrena globosa	Day neutral to facultative SD
G. globosa 'Bicolor Rose'	Facultative SD
Gynura aurantiaca	Facultative LD
Gypsophila elegans, G. paniculata	Facultative to obligate LD
G. paniculata 'Snowflake'	Obligate LD
Hatiora gaertneri	Facultative SD followed by facultative LD
Helianthus annuus	Day neutral to facultative SD
H. annuus 'Big Smile,' 'Elf,' 'Pacino,' 'Sunbright,'	
'Sunrich Orange,' 'Sunspot,' 'Teddy Bear'	Facultative SD
H. annuus 'Sundance Kid'	Day neutral
H. debilis 'Vanilla Ice'	Facultative LD

TABLE 2-1 *(continued)*

Crop Species	Photoperiodic Response
Heliconia species	Day neutral, facultative LD or SD
Helipterum roseum	Obligate LD
Heuchera sanguinea 'Bressingham Hybrids'	Day neutral
Hibiscus moscheutos	Obligate LD
H. moscheutos 'Disco Belle Mixed'	Obligate LD
H. rosa-sinensis	Day neutral
Hosta cultivars and species	Obligate LD
H. 'Fortunei Hyacinthina,' 'Francee,' 'Golden Scepter,' 'Golden Tiara,' 'Lancifolia,' 'Royal Standard,' 'Tokudama' gold, 'Tokudama' green, 'Undulata Variegata'	Obligate LD
H. montana	Obligate LD
H. plantaginea	Obligate LD
Hydrangea macrophylla	Day neutral to facultative SD
Hylotelephium (Sedum spectabile ×telephium) 'Autumn Joy'	Obligate LD
Hypericum species	Facultative LD
Iberis sempervirens 'Snowflake'	Day neutral
Impatiens balsamina	Obligate SD
I. hawkeri	Day neutral
I. walleriana	Day neutral
Ipomoea ×multifida 'Scarlet'	Facultative SD
I. species	Facultative SD
Ipomopsis rubra 'Hummingbird Mix'	Obligate LD
Kalanchoe blossfeldiana	Obligate SD
Lathyrus odoratus 'Royal White'	Obligate LD
Lavandula angustifolia 'Hidcote Blue'	Obligate LD
Lavatera trimestris 'Silver Cup'	Obligate LD
Legousia speculum-veneris	Obligate LD
Leptosiphon hybrida	Obligate LD
Leucanthemum ×superbum	Facultative to obligate LD
L. ×superbum 'Snowlady'	Facultative LD
L. ×superbum 'Snowcap'	Obligate LD
Lewisia cotyledon	Day neutral
Liatris spicata	Facultative LD
Lilium longiflorum	Facultative LD
L. hybrids	Facultative LD
Limnanthes douglasii	Obligate LD
Limonium sinuatum	Facultative LD
L. sinuatum 'Fortress Deep Rose,' 'Heavenly Blue'	Facultative LD
Linaria maroccana	Day neutral to facultative LD
Linum perenne	Day neutral to obligate LD
L. perenne 'Sapphire'	Day neutral
Lobelia erinus	Day neutral to obligate LD
L. erinus 'Crystal Palace'	Obligate LD
L. ×speciosa	Facultative LD
L. ×speciosa 'Compliment Scarlet'	Facultative LD
Lobularia maritima	Day neutral
Lupinus hartwegii 'Bright Gems'	Facultative LD
Lycopersicon esculentum	Day neutral
Lysimachia clethroides	Obligate LD

(continued)

TABLE 2-1 *(continued)*

Crop Species	Photoperiodic Response
Matthiola hybrids	Facultative LD
M. longipetala 'Starlight Scentsation'	Day neutral
Mimulus × hybridus 'Magic'	Obligate LD
Mina lobata	Obligate SD
Mirabilis jalapa	Day neutral to obligate LD
Nemophila maculate 'Pennie Black'	Day neutral
N. menziesii	Day neutral
Nicotiana alata	Day neutral to facultative LD
N. alata 'Domino White'	Day neutral
Nierembergia caerulea	Obligate LD
Nigella damascena 'Miss Jekyll'	Obligate LD
Ocimum basilicum	Facultative SD to facultative LD
Oenothera fruticosa	Facultative LD
O. missouriensis	Obligate LD
O. pallida 'Wedding Bells'	Obligate LD
Orchidaceae, most species	Day neutral
Origanum vulgare	Day neutral
Osteospermum hybrids	Facultative LD
Oxalis crassipes 'Rosea'	Obligate LD
Papaver rhoeas	Day neutral
Pelargonium species	Day neutral
P. × domesticum	Day neutral
P. × hortorum	Day neutral
P. peltatum	Day neutral
Pennisetum setaceum 'Rubrum'	Facultative LD
Penstemon digitalis	Day neutral
P. digitalis 'Husker Red'	Day neutral
Pentas lanceolata	Day neutral
Petunia × hybrida	Facultative SD to obligate LD
P. × hybrida 'White Storm,' 'Cascadia Improved Charlie,' 'Doubloon Blue Star,' 'Marco Polo,' 'Petitunia Bright Dream'	Facultative LD
P. × hybrida 'Fantasy Pink Morn,' 'Purple Wave'	Obligate LD
P. × hybrida 'Cascadie Charme'	Facultative SD
Phacelia campanularia	Day neutral
P. tanacetifolia	Facultative LD
Pharbitis 'Violet'	Facultative SD
Phlox paniculata	Obligate LD
P. subulata	Day neutral
Physostegia virginiana 'Alba'	Facultative LD
Platycodon grandiflorus	Day neutral
Platystemon californicus	Obligate LD
Polemonium viscosum	Obligate LD
Polianthes tuberosa	Day neutral
Primula malacoides	Day neutral to facultative SD
P. obconica 'Libre Light Salmon'	Day neutral to facultative LD
P. veris 'Pacific Giants'	Day neutral
Reseda alba	Facultative LD
Rhododendron hybrids	Facultative SD
Rosa hybrids	Day neutral to facultative LD
Rudbeckia hirta 'Indian Summer'	Obligate LD
R. fulgida 'Goldsturm'	Obligate LD
Saintpaulia ionantha	Day neutral

TABLE 2-1 (continued)

Crop Species	Photoperiodic Response
Salpiglossis sinuata	Facultative LD
Salvia farinacea 'Strata'	Facultative LD
S. leucantha	Obligate SD
S. splendens	Day neutral to facultative LD or SD
S. splendens 'Vista Red'	Day neutral to facultative LD
S. ×superba 'Blue Queen'	Facultative LD
Sanvitalia procumbens	Facultative SD
Saxifraga ×arendsii	Facultative LD
S. ×arendsii 'Triumph'	Facultative LD
Scabiosa atropurpurea	Facultative LD
S. caucasica 'Butterfly Blue'	Day neutral
Schlumbergera truncata, S. ×buckleyi	Obligate SD to day neutral
Silene armeria	Obligate LD
S. armeria 'Elektra'	Obligate LD
Sinningia speciosa	Day neutral
Solanum pseudocapsicum	Day neutral
Solenostemon scutellarioides	Facultative SD
Solidago canadensis	Obligate SD
S. graminifolia	Obligate SD
S. nemoralis	Obligate SD
S. rugosa	Obligate LD
×Solidaster luteus	Facultative LD
Stephanotis floribunda	Day neutral
Stokesia laevis 'Klaus Jelitto'	Facultative intermediate
Strelitzia reginae	Day neutral
Streptocarpus ×hybridus	Day neutral
S. nobilis	Day neutral to facultative SD
Tagetes erecta	Day neutral to obligate SD
T. patula	Day neutral
T. tenuifolia	Obligate SD
Thunbergia alata	Day neutral
Tithonia rotundifolia	Facultative LD to SD
T. rotundifolia 'Fiesta Del Sol'	Facultative LD
T. rotundifolia 'Sundance'	Facultative SD
Trachelium caeruleum	Facultative LD
Tweedia caerulea 'Blue Star'	Day neutral
Verbascum phoeniceum	Day neutral
Verbena ×hybridum	Facultative LD
Veronica longifolia 'Sunny Border Blue'	Day neutral
V. spicata 'Blue'	Day neutral
Viguiera multiflora	Facultative LD
Viola ×wittrockiana	Facultative LD
Zantedeschia species	Day neutral
Z. aethiopica	Day neutral
Z. albomaculata	Day neutral
Z. elliotiana	Day neutral
Z. rehmannii	Day neutral
Zinnia species and cultivars	Day neutral to facultative LD or SD
Z. angustifolia	Day neutral
Z. elegans 'Benary Giant Deep Red'	Facultative LD
Z. elegans 'Exquisite Pink,' 'Peter Pan Scarlet,' 'Oklahoma'	Facultative SD

TABLE 3-1

Greenhouse production night temperatures for floriculture species: **cold**: 50°F (10°C) or lower; **cool**: 50 to 58°F (10 to 14°C); **moderate**: 58 to 65°F (14 to 18°C); and **warm**: 65 to 72°F (18 to 22°C). Many species can be grown cooler than the indicated temperature range but crop time may be excessively long. In addition, lowering the temperature at the end of the crop cycle is recommended for some species. Note that higher temperatures might be recommended immediately after planting some species to encourage establishment. In addition, numerous species require specific temperature regimes for flower initiation and development.

Scientific Name	Common Name	Night Temperature
Abelmoschus esculentus	Okra	Moderate
A. moschatus	Annual hibiscus	Moderate
Abutilon ×hybridum	Chinese bellflower	Moderate
Acaena microphylla	Scarlet bidi bidi	Warm
Acanthus mollis	Bear's breech	Moderate
Achillea filipendulina	Fernleaf yarrow	Cool to moderate
A. millefolium	Common yarrow	Cool to moderate
A. ptarmica	Sneezeweed	Cool to moderate
A. tomentosa	Woolly yarrow	Cool to moderate
Achimenes hybrids	Achimines	Warm
Aconitum napellus	Aconite	Cool
Acroclinium roseum	Strawflower	Cool
Adenophora liliifolia	Ladybells	Cool
Adiantum species	Maidenhair fern	Warm
Aethionema coridifolium	Stonecress	Cool
Agastache foeniculum	Giant hyssop	Moderate
Ageratum houstonianum	Ageratum	Moderate
Agrostemma githago	Agrostemma	Cool
Agrostis nebulosa	Cloud grass	Cool
Alcea rosea	Hollyhock	Cool
Alchemilla mollis	Lady's mantle	Cool
Allium cepa	Onion	Cool
A. porrum	Leek	Moderate
A. schoenoprasum	Chives	Moderate
A. tuberosum	Garlic	Moderate
Alonsoa warscewiczii	Maskflower	Cool
Aloysia triphylla	Lemon verbena	Moderate
Alstroemeria hybrids	Peruvian lily	Cold to cool
Alternanthera dentata	Alternanthera	Moderate
A. ficoidea		Moderate
Alyssoides uticulata	Bladderpod	Cool
Amaranthus caudatus	Amaranthus	Warm
A. tricolor		Warm
Amberboa moschata	Sweet sultan	Cool
Amethysteya caerulea	Amethysteya	Moderate
Ammi majus	Lace or bishop's flower	Moderate
Ammobium alatum	Everlasting flower	Moderate
Anacyclus depressus	Atlas daisy	Moderate
Anagallis arvensis	Pimpernel	Cool
Anaphalis margaritacea	Pearly everlasting	Cool
Anchusa azurea	Italian bugloss	Cool
A. capensis	Anchusa	Cool
Anemone coronaria	Anemone	Cold
Anethum graveolens	Dill	Cool to moderate
Angelica archangelica	Angelica	Moderate
Angelonia angustifolia	Angelonia	Warm
Anigozanthus hybrids	Kangaroo paw	Cool

TABLE 3-1 *(continued)*

Scientific Name	Common Name	Night Temperature
Anoda cristata	Anoda	Cool
Antennaria dioica	Everlasting	Moderate
Anthemis tinctoria	Hardy marguerite	Cool
A. tinctoria cv. Kelwayi	Anthemis	Moderate
Anthurium species	Anthurium	Warm
Antirrhinum majus	Snapdragon	Cold to cool
Aphelandra squarrosa	Zebra plant	Warm
Apium graveolens var. dulce	Celery	Moderate
Aquilegia hybrids	Columbine	Cool
Arabis alpina	Rockcress	Cool
Arctotis fastuosa	African daisy	Moderate
A. venusta	African daisy	Cool
Arenaria montana	Sandwort	Cool
Argeranthemum frutescens	Marguerite daisy	Cold to cool
Armeria maritima	Thrift	Cool
Artemisia dracunculus	Russian tarragon	Cool
A. schmidtiana	Silver mound	Warm
Aruncus dioicus	Aruncus sylvester	Moderate
Asarina scandens	Twining snapdragon	Moderate
Asclepias curassavica	Blood flower	Moderate to warm
A. incarnata	Swamp milkweed	Moderate
A. tuberosa	Butterfly weed	Moderate to warm
Asparagus densiflorus cv. Myers	Asparagus fern	Warm
A. densiflorus cv. Sprengeri		Warm
A. setaceus		Warm
Asperula orientalis		Moderate
Asphodeline lutea	King's spear	Moderate
Aster alpinus	Michaelmas daisy	Moderate
A. novae-angliae	England aster	Moderate
A. novi-belgii	New York aster	Moderate
Astilbe ×arendsii	False spirea	Moderate
Astrantia major	Masterwort	Moderate
Atriplex hortensis	Salt brush	Cool
Aubrieta deltoidea	False rockcress	Warm
Aurinia saxatilis 'Compacta'	Alyssum	Cool
Banksia species	Banksia	Cool
Baptisia australis	False indigo	Warm
Bassia scoparia	Burning bush	Cool to moderate
Begonia (Interspecific cross)	Dragon wing	Moderate
B. grandis	Hardy begonia	Moderate
B. ×hiemalis	Hiemalis begonia	Moderate
B. Rex Cultorum hybrids	Rex begonia	Moderate to warm
B. Semperflorens-Cultorum hybrids	Wax begonia	Moderate
B. Tuberhybrida hybrids	Tuberous begonia	Moderate
Belamcanda chinensis	Blackberry lily	Moderate
Bellis perennis	English daisy	Cold to cool
Bergenia cordifolia	Heartleaf bergenia	Cool
Beta vulgaris	Beet	Cool
B. vulgaris var. cicla	Swiss chard	Cool
Bidens ferulifolia	Tickseed	Moderate to warm
Boltonia asteroides	Boltonia	Cool
Borago officinalis	Borage	Moderate

(continued)

TABLE 3-1 *(continued)*

Scientific Name	Common Name	Night Temperature
	Bougainvillea	Cold to cool
Bougainvillea species	Swan river daisy	Cool
Brachycome species	Strawflower	Cool to moderate
Bracteantha bracteata	Flowering cabbage/kale	Cool
Brassica oleracea	Cole crops	Cool
B. oleracea	Kale	Cool
B. oleracea (acephala)	Collard	Cool
B. oleracea var. acephala	Cauliflower	Cool
B. oleracea var. botrytis	Cabbage	Cool
B. oleracea var. capitata	Brussels sprouts	Cool
B. oleracea var. gemmifera	Kohlrabi	Cool
B. oleracea var. gongylodes	Broccoli	Cool
B. oleracea var. italica	Quaking grass	Moderate
Briza maxima	Short quaking grass	Moderate
B. minima	Browallia	Moderate
Browallia speciosa	Bush violet	Moderate
B. viscosa	Angel's trumpet	Moderate
Brugmansia arborea	Butterfly bush	Moderate
Buddleia davidii	Oxeye daisy	Moderate
Buphthalmum salicifolium	Thoroughwax	Moderate to warm
Bupleurum rotundifolium	Caladium	Warm
Caladium bicolor	Calandrinia	Moderate
Calandrinia umbellata	Calathea	Warm
Calathea species	Calceolaria	Cold to cool
Calceolaria Herbeohybrida group		Cool
C. integrifolia		Cold
Calendula officinalis	Calendula	Moderate
Calibrachoa hybrids	Calibrachoa	Moderate
Callistephus chinensis	Aster	Moderate
Calonyction	Moonflower	Moderate
Camellia japonica	Camellia	Cool to moderate
Camissonia bistorta	Camissonia	Moderate
Campanula carpatica	Carpathian harebells	Cool to moderate
C. elatines	Campanula	Cool
C. glomerata	Clustered bellflower	Cool
C. isophylla	Campanula	Cool to moderate
C. medium	Canterbury bells	Cool to moderate
C. poscharskyana	Campanula	Warm
Canna ×generalis	Canna	Moderate to warm
Capsicum annuum	Pepper	Moderate
Carlina acaulis	Carlina	Cool to warm
Carthamus tinctorius	Safflower	Moderate to warm
Caryopteris incana	Blue spirea	Moderate to warm
Cassia alata	Christmas candle	Moderate
Catananche caerulea	Catananche	Moderate
Catharanthus roseus	Vinca	Warm
Cattleya hybrids	Cattleya orchid	Moderate
Celosia argentea Plumosa group	Plume celosia	Warm
C. argentea Cristata group	Crested celosia	Warm
C. argentea Spicata group	Wheat celosia	Warm
Centaurea americana	American basket flower	Cool to moderate
C. cyanus	Bachelor's button	Cool
C. montana	Perennial cornflower	Cool to moderate

TABLE 3–1 *(continued)*

Scientific Name	Common Name	Night Temperature
Centauridia drummondii	Centauridia	Warm
Centranthus ruber	Red valerian	Moderate
Cerastium tomentosum	Snow-in-summer	Cool
Chamaedorea elegans	Parlor palm	Warm
Chenopodium botrys	Feather geranium	Moderate
Chlorophytum comosum	Spider plant	Warm
Chrysalidocarpus lutescens	Areca palm	Warm
Cirsium japonicum	Japanese thistle	Cool to moderate
Citrullus lanatus	Watermelon	Warm
Clarkia amoena	Satin flower	Cool
Clematis species and hybrids	Clematis	Moderate
Cleome hassleriana	Cleome	Warm
Clerodendrum thomsoniae	Tropical bleeding heart	Warm
C. ugandense	Tropical bleeding heart	Warm
Clitoria ternatea	Blue pea	Moderate
Cobaea scandens	Cobaea	Cool
Codiaeum variegatum	Croton	Warm
Coffea arabica	Coffee	Warm
Coix lacryma-jobi	Job's tears	Moderate
Coleostephus myconis	Chrysanthemum	Moderate
Collinsia bicolor	Chinese houses	Moderate
Consolida ambigua	Larkspur	Cool
Convallaria majalis	Lily-of-the-valley	Moderate to warm
Cordyline terminalis	Ti plant	Warm
C. indivisa	Dracaena	Warm
Coreopsis grandiflora	Tickseed	Cool
Coriandrum sativum	Chinese parsley	Cool to moderate
Cortaderia selloana	Pampas grass	Moderate
Cosmos bipinnatus	Cosmos	Moderate
C. sulphureus	Cosmos	Moderate
Cotula barbata	Brass buttons	Moderate
Craspedia uniflora	Craspedia	Moderate to warm
Crepis rubra	Hawk's beard	Moderate
Crocus vernus	Crocus	Cool to moderate
Crossandra infundibuliformis	Crossandra	Warm
Cucumis melo var. *reticulatis*	Muskmelon	Warm
C. sativus	Cucumber	Moderate
Cucurbita maxima	Pumpkin	Moderate
C. maxima	Squash	Moderate
Cuphea hyssopifolia	Mexican heather	Moderate
C. ignea	Cuphea	Moderate
Cyclamen persicum	Cyclamen	Cool to moderate
Cymbidium hybrids	Cymbidium	Cold
Cynara scolymus	Artichoke	Cool
Cynoglossum amabile	Cynoglossum	Moderate
Dahlia hybrids	Dahlia	Cool to moderate
Datura metel	Thorn apple	Moderate
Daucus carota var. *sativus*	Carrot	Cool
Delphinium grandiflorum var. *chinense*	Delphinium	Cool
D. ×*belladonna*		Cool
D. ×*cultorum*		Cool
Dendranthema ×*grandiflorum*	Chrysanthemum	Moderate

(continued)

TABLE 3-1 *(continued)*

Scientific Name	Common Name	Night Temperature
Dendrobium hybrids	Dendrobium	Cool
Dianthus barbatus	Sweet William	Cold to moderate
D. carthusianorum	Pot carnation	Cool to moderate
D. caryophyllus	Cut carnation	Cool
D. chinensis	Dianthus	Cold to cool
D. deltoides	Maiden pinks	Cool
D. plumarius	Cottage pinks	Cool
D. knappii	Yellow flowered pinks	Cool
Diascia hybrids	Diascia	Cool
Dichondra repens	Dichondra	Moderate
Dieffenbachia hybrids	Dumb cane	Moderate to warm
Digitalis purpurea	Foxglove	Cool to moderate
Dimorphotheca sinuata	Rain daisy	Moderate
Dionaea muscipula	Venus' flytrap	Warm
Doronicum columnae	Leopard's bane	Cool
Dorotheanthus species	Mesembryanthemum	Moderate
Dracaena species	Dracaena	Warm
Dyssodia tenuiloba	Dahlberg daisy	Warm
Echinacea purpurea	Purple coneflower	Moderate
Echinops bannaticus	Globe thistle	Moderate
Echium vulgare	Viper's bugloss	Cool
Emilia coccinea	Tassel flower	Moderate to warm
E. javanica cv. Lutea	Tassel flower	Moderate to warm
Epipremnum aureum	Pothos	Warm
Episcia species	Episcia	Warm
Eragrostis tenella	Love grass	Moderate
Eremurus species and hybrids	Foxtail lily	Cool
Erigeron karvinskianus	Fleabane	Moderate
Eryngium planum	Sea holly	Cool
Erysimum cheiri	Wallflower	Cool
E. linifolium	Alpine erysimum	Cool
Eschscholzia caespitosa	Tufted California poppy	Moderate
E. californica	California poppy	Moderate
Eucalyptus species	Gum tree	Moderate
Eucharis ×*grandiflora*	Amazon lily	Moderate to warm
Euphorbia lathyris	Gopher plant	Moderate
E. marginata	Snow-on-the-mountain	Moderate
E. myrsinites	Myrtle euphorbia	Cool
E. polychroma	Cushion spurge	Cool
E. pulcherrima	Poinsettia	Moderate to warm
Eustoma grandiflorum	Lisianthus	Moderate
Evolvulus glomeratus	Evolvulus	Moderate
Exacum affine	Persian violet	Moderate to warm
Fatsia japonica	Fatsia	Warm
Felicia heterophylla	Blue daisy	Cool
Festuca amethystina	Amethyst fescue	Moderate
F. ovina var. *glauca*	Blue fescue	Moderate
Fibigia clypeata	Fibigia	Cool
Ficus species	Fig	Warm
Foeniculum vulgare	Sweet fennel	Cool
Fragaria species	Strawberries	Moderate
Freesia species	Freesia	Cool

TABLE 3-1 (continued)

Scientific Name	Common Name	Night Temperature
Fuchsia ×hybrida	Fuchsia	Moderate
Gaillardia ×grandiflora	Blanket flower	Cool
G. pulchella	Annual gaillardia	Cool
Gardenia jasminoides	Gardenia	Moderate
Gaura lindheimeri	Gaura	Cool
Gazania rigens	Gazania	Cool
Gentiana species	Gentian	Moderate
Geranium sanguineum	Hardy geranium	Moderate
Gerbera jamesonii	Gerbera	Moderate
Geum quellyon	Geum	Cool
Gladiolus hybrids	Gladiolus	Moderate
Gomphrena globosa	Gomphrena	Warm
G. haageneana		Warm
Goniolimon tataricum	German statice	Cool
Gourds	Gourds	Moderate
Gypsophila elegans	Gypsophila	Cool
G. pacifica	Pink baby's breath	Cool
G. paniculata	Baby's breath	Moderate
G. repens	Creeping baby's breath	Cool
Hatiora gaertneri	Easter cactus	Moderate to warm
Hedera helix	English ivy	Warm
Helenium autumnale	Helenium	Cool
Helianthemum nummularium	Rockrose	Cool
Helianthus annuus	Sunflower	Cool to moderate
Helichrysum species	Strawflower	Moderate
Heliconia species	Heliconia	Warm
Heliopsis helianthoides	Oxeye daisy	Moderate
Heliotropium arborescens	Heliotrope	Moderate
Helipterum roseum	Acrolinium	Moderate
Hesperis matronalis	Sweet rocket	Cool
Heuchera micrantha	Alumroot	Cool
H. sanguinea	Coral bells	Cool
Hibiscus acetosella	Red shield	Moderate
H. moscheutos	Rose mallow	Moderate
H. rosa-sinensis	Hibiscus	Warm
Hippeastrum hybrids	Amaryllis	Warm
Hordeum jubatum	Squirrel's tail grass	Cool
Howea forsterianai	Kentia palm	Warm
Humulus lupulus	Hops	Moderate
Hunnemannia fumariifolia	Bush poppy	Cool
Hyacinthus orientalis	Hyacinth	Cool to moderate
Hydrangea macrophylla	Hydrangea	Moderate
Hypericum androsaemum	Hypericum	Warm
H. calycinum	St. John's wort	Cool
Hypoestes phyllostachya	Hypoestes	Moderate
Iberis amara	Candytuft	Cool
I. sempervirens	Hardy candytuft	Cool
I. umbellata	Globe candytuft	Cool
Impatiens balsamina	Balsam	Moderate
I. hawkeri	New Guinea impatiens	Moderate to warm
I. walleriana	Bedding impatiens	Moderate
Incarvillea delavayi	Hardy gloxinia	Moderate

(continued)

TABLE 3-1 *(continued)*

Scientific Name	Common Name	Night Temperature
Ionopsidium acaule	Violet cress	Cool
Ipomoea batatus	Ornamental sweet potato	Moderate
I. lobata	Spanish flag	Moderate
I. tricolor	Morning glory	Moderate
Ipomopsis rubra	Standing cypress	Cool
Iresine herbstii	Gizzard plant	Moderate
Iris × hollandica	Dutch iris	Cool
I. germanica	German iris	Moderate
Isotoma axillaris	Isotoma	Moderate
Jamesbrittania hybrids	Bacopa	Moderate
Kalanchoe blossfeldiana	Kalanchoe	Moderate to warm
Kniphofia uvaria	Red hot poker	Moderate
Koeleria glauca	Koeleria	Cool
Lablab purpureus	Hyacinthus bean	Moderate
Lachenalia species	Lachenalia	Moderate
Lactuca sativa	Lettuce	Cool
Lagerstroemia indica	Crape myrtle	Warm
Lagurus ovatus	Hare's tail grass	Moderate
Lantana hybrids	Lantana	Moderate
Lathyrus odoratus	Sweet pea	Cool
L. splendens	Perennial sweet pea	Cool
Lavandula angustifolia	English lavender	Moderate
L. dentata	French lavender	Moderate
Lavatera trimestris	Lavatera	Moderate
Layia platyglossa	Tidy tips	Cool
Leea coccinea	Leea	Warm
Leontopodium alpinum	Edelweiss	Cool
Leucanthemum lacustre	Shasta daisy	Cool
L. paludosum	Chrysanthemum	Moderate
Levisticum officinale	Lovage	Moderate
Liatris pycnostachya	Liatris	Cool
L. spicata	Gay feather	Moderate
Lilium hybrids	Asiatic/oriental lily	Moderate
L. longiflorum	Easter lily	Moderate
Limnanthes douglasii	Meadow foam	Cool
Limonium latifolium	Sea lavender	Cool
L. sinuatum	Common garden statice	Cool
L. perezii	Seafoam statice	Cool
Linaria maroccana	Toadflax	Cool
Linum grandiflorum	Flowering flax	Cool
L. perenne	Perennial flax	Moderate
Lobelia erinus	Lobelia	Cool to moderate
L. × speciosa		Moderate
Lobularia maritima	Sweet alyssum	Cool
Lonas annua	Lonas	Moderate
Lotus berthelotti	Parrot's beak	Cool
Lunaria annua	Honesty plant	Cool
Lupinus polyphyllus	Lupine	Cool
Lychnis chalcedonica	Maltese cross	Cool
L. coronaria	Rose campion	Cool
L. × haageana	Catchfly	Cool
Lycopersicon esculentum	Tomato	Moderate

TABLE 3-1 *(continued)*

Scientific Name	Common Name	Night Temperature
Lysimachia clethroides	Gooseneck loosestrife	Moderate
Machaeranthera tanacetifolia	Tohoka daisy	Cool
Malva moschata	Musk mallow	Cool
Maranta species	Prayer plant	Warm
Marrubium vulgare	Horehound	Cool
Matthiola incana	Stock	Cold to cool
Melampodium divaricatum	Melampodium	Moderate
Melica ciliata	Pearl grass	Cool
Melissa officinalis	Lemon balm	Cool
Mentha × piperita	Peppermint	Cool
M. spicata	Spearmint	Cool to moderate
Mimosa pudica	Mimosa	Warm
Mimulus × hybridus	Monkey flower	Cool to moderate
Mirabilis jalapa	Mirabilis	Moderate
Moluccella laevis	Bells of Ireland	Moderate
Monarda citriodora	Horsemint	Cool
M. didyma	Bee balm bergamot	Cool
Monstera deliciosa	Philodendron	Warm
Myosotis sylvatica	Forget-me-not	Cool
Narcissus pseudonarcissus	Daffodil	Moderate
N. tazetta	Paperwhite	Moderate
Nemesia strumosa	Nemesia	Cool
Nemophila maculata	Fivespot	Cool
N. menziesii	Baby blue eyes	Cool
Nepeta cataria	Catnip	Cool
Nicotiana alata	Nicotiana	Moderate
N. langsdorfii		Moderate
N. × sanderae		Moderate
N. sylvestris		Moderate
Nierembergia hippomanica	Nierembergia	Moderate
Nigella damascena	Nigella	Cool to moderate
Nolana paradoxa	Nolana	Moderate
Ocimum basilicum	Sweet basil	Moderate
Odontoglossum hybrids	Tooth-tongue orchid	Warm
Oenothera macrocarpa	Evening primrose	Cool
Oncidium hybrids	Dancing lady orchid	Moderate to warm
Origanum majorana	Sweet marjoram	Cool to moderate
O. vulgare	Oregano	Cool
Ornithogalum species	Ornithogalum	Moderate
Osteospermum ecklonis	Cape daisy	Cool to moderate
Oxalis adenophylla	Oxalis	Moderate
O. bowiei		Cool to moderate
O. braziliensis		Cool to moderate
O. corymbosa		Cool
O. hirta		Cool
O. purpurea		Cool
O. regnelli		Moderate
O. tetraphyllua		Cool to moderate
O. versicolor		Cool to moderate
Paeonia lactiflora	Peony	Cool to moderate
Papaver nudicaule	Iceland/arctic poppy	Cool
P. orientale	Oriental poppy	Cool

(continued)

TABLE 3-1   *(continued)*

Scientific Name	Common Name	Night Temperature
Paphiopedilium hybrids	Lady's slipper orchid	Cool
× *Pardancanda norrisii*	Candy lily	Moderate
Pelargonium × *domesticum*	Regal geranium	Cool
P. × *hortorum*	Seed/zonal geranium	Moderate
P. peltatum	Ivy geranium	Moderate
Pennisetum setaceum	Fountain grass	Moderate
P. villosum	Feathertop	Moderate
Penstemon gentianoides	Annual penstemon	Cool
Pentas lanceolata	Pentas	Moderate
Peperomia species	Peperomia	Warm
Pericallis × *hybrida*	Cineraria	Cool
Perilla frutescens	Perilla	Moderate to warm
Petroselinum crispum	Parsley	Moderate
Petunia × *hybrida* (single)	Petunia	Cool to moderate
P. × *hybrida* (double)		Cool to moderate
P. × *hybrida* (trailing)		Cool to moderate
Phalaenopsis hybrids	Moth orchid	Moderate to warm
Phalaris canariensis	Canary grass	Moderate
Phaseolus coccineus	Scarlet Runner Bean	Moderate
P. vulgaris var. *humilis*	Garden bean	Moderate
Philodendron bipinnatifidum	Philodendron	Warm
P. domesticum		Warm
P. lundii		Warm
Phlox drummondii	Phlox	Cool
P. paniculata	Summer phlox	Moderate
Phragmipedium hybrids	Lady's slipper orchid	Warm
Physalis alkekengi	Physalis	Cool
P. ixocarpa	Tomatillo	Moderate
Physostegia virginiana	Obedient plant	Cool
Pimpinella anisum	Anise	Moderate
Platycodon grandiflorus	Balloon flower	Moderate
Plectranthus species	Plectranthus	Moderate
Plumbago auriculata	Plumbago	Moderate
Polianthes tuberosa	Tuberose	Warm
Polygonum capitatum	Smartweed	Moderate
Portulaca grandiflora	Moss rose	Moderate to warm
P. oleracea	Purslane	Moderate to warm
Potentilla nepalensis	Potentilla	Cool
Primula malacoides	Fairy primrose	Cool to moderate
P. obconica	German primrose	Moderate
P. × *polyantha*	English primrose	Cool to moderate
P. vulgaris	English primrose	Cool to moderate
Psylliostachys suworowii	Russian statice	Cool
Ranunculus asiaticus	Ranunculus	Cold to cool
Rehmannia angulata	Chinese foxglove	Moderate
Reseda odorata	Evening stock	Cold
Rhodochiton species	Rhodochiton	Moderate
Rhododendron hybrids	Florist azalea	Moderate
Ricinus communis	Castor bean	Moderate
Rosa hybrids	Rose	Moderate
Rosmarinus officinalis	Rosemary	Moderate
Rudbeckia fulgida	Black-eyed Susan	Cool
R. hirta		Cool

TABLE 3-1 (continued)

Scientific Name	Common Name	Night Temperature
Rumorha adiantiformis	Leatherleaf fern	Warm
Saintpaulia ionantha	African violet	Warm
Salpiglossis sinuata	Salpiglossis	Cool
Salvia coccinea	Salvia	Moderate
S. farinacea	Salvia	Moderate
S. officinalis	Sage	Cool to moderate
S. patens	Salvia	Moderate
S. pratensis	Meadow clary	Cool
S. splendens	Scarlet sage	Moderate
S. ×superba	Salvia	Cool
S. viridis	Salvia	Moderate
Sanvitalia procumbens	Sanvitalia	Moderate
Saponaria ocymoides	Rock soapwort	Cool
Satureja hortensis	Summer savory	Moderate
Saxifraga ×arendsii	Mossy saxifrage	Moderate
Scabiosa atropurpurea	Scabiosa	Cool
S. caucasica	Pincushion flower	Cool
Scaevola aemula	Fan flower	Warm
Schefflera actinophylla (Brassaia)	Schefflera	Warm
S. arboricola	Schefflera	Warm
S. elegantissima (Dizygotheca)	Aralia	Warm
Schizanthus ×wisetonensis	Schizanthus	Cool
Schlumbergera hybrids	Holiday cactus	Cool to moderate
Sedum acre	Golden carpet	Moderate
S. spurium	Dragon's blood	Moderate
Sempervivum tectorum	Hens and chicks	Moderate
Senecio cineraria	Dusty miller	Moderate
S. maritimus		Moderate
Senna angulata	Christmas candle	Moderate
Sidalcea malviflora	Checkerbloom	Cool
Silene coelirosa	Silene	Cool
Sinningia speciosa	Gloxinia	Warm
Smithiantha zebrina	Smithiantha	Warm
Solanum melongena	Eggplant	Moderate
S. pseudocapsicum	Christmas cherry	Cool
S. tuberosum	Potato	Moderate
Solenostemon scutellarioides	Coleus	Moderate to warm
Solidago species	Goldenrod	Cool to moderate
Spathiphyllum floribundum	Peace lily	Warm
Stachys byzantina	Lamb's ears	Moderate
Steirodiscus tagetes	Steirodiscus	Cool
Stephanotis floribunda	Stephanotis	Warm
Stobilanthes dyerianus	Persian shield	Moderate
Stokesia laevis	Stokes' aster	Moderate
Strelitzia reginae	Bird of paradise	Warm
Streptocarpus ×hybridus	Cape primrose	Moderate
Sutera cordata	Bacopa	Cool to moderate
Syngonium podophyllum	Nephthytis	Warm
Tagetes erecta	African marigold	Moderate
T. erecta ×patula	Triploid marigold	Moderate
T. patula	French marigold	Moderate
T. tenuifolia	Signate marigold	Moderate

(continued)

TABLE 3-1 (continued)

Scientific Name	Common Name	Night Temperature
Talinum paniculatum	Jewels of Opar	Moderate
Tanacetum coccineum	Painted daisy	Cool
T. parthenium	Matricaria	Cool
T. ptarmiciflorum	Dusty miller	Moderate
Thalictrum species	Meadow-rue	Cool
Thunbergia alata	Thunbergia	Moderate
Thymophylla tenuiloba	Dahlberg daisy	Moderate
Thymus serphyllum	Mother of thyme	Moderate
T. vulgaris	Culinary thyme	Cool to moderate
Tithonia rotundifolia	Mexican sunflower	Cool
Torenia fournieri	Torenia	Cool
Trachelium caeruleum	Throatwort	Cool to moderate
Trachymene coerulea	Blue lace flower	Cool to moderate
Tradescantia × andersoniana	Spiderwort	Cool
Tripleurospermum inodorum	Scentless hayweed	Cool
Triteleia laxa	Brodiaea	Cool
Tropaeolum majus	Nasturtium	Warm
T. peregrinum		Warm
Tulipa gesneriana	Tulip	Moderate
Tweedia caerulea	Oxypetalum	Moderate
Vaccaria hispanica	Cow-coddle	Moderate
Verbascum phoeniceum	Purple mullein	Cool
Verbena bonariensis	Verbena	Moderate
V. canadensis		Moderate
V. × hybrida		Cool
V. rigida		Moderate
V. speciosa		Moderate
V. tenera		Moderate
Veronica incana	Woolly speedwell	Cool
V. repens	Creeping speedwell	Cool
V. spicata	Spike speedwell	Cool
Veronicastrum virginicum	Culver's root	Moderate
Viola cornuta	Horned violet	Cool
V. tricolor	Johnny-jump-up	Cool
V. × wittrockiana	Pansy	Cold to cool
Wahlenbergia species	Rock bell	Moderate
Xeranthemum annuum	Xeranthemum	Moderate
Yucca elephantipes	Yucca	Warm
Zantedeschia aethiopica	Calla lily	Cool
Z. hybrids		Moderate
Zea mays	Sweet corn	Moderate
Zinnia angustifolia	Zinnia	Moderate
Z. elegans		Moderate
Z. hybrida		Moderate

are delayed and quality reduced. Consequently, chrysanthemums have a relatively narrow optimum temperature range and a wide tolerable temperature range. For many plant species, the temperature is often dropped several degrees from the optimum temperature one to several weeks before the plants are marketed to enhance color and postharvest life.

The economics of greenhouse heating must often be considered when determining the temperature at which to grow a crop. When energy costs become high, producers lower
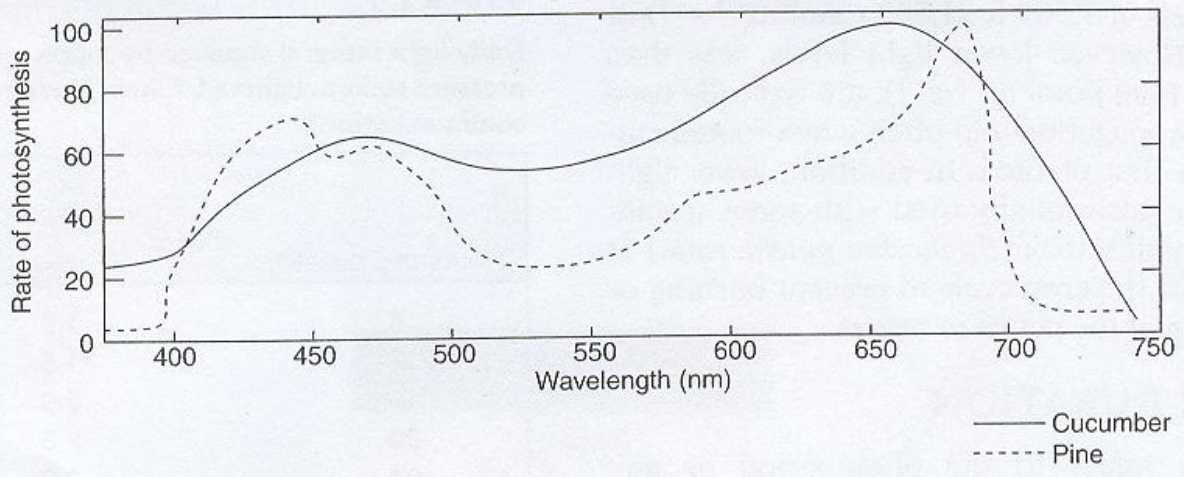
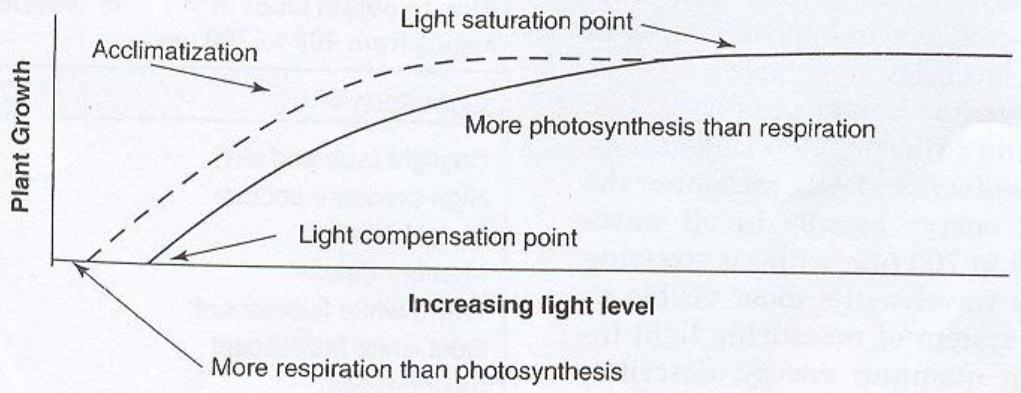**FIGURE 4-2** Response of photosynthesis to various light wavelengths.

FIGURE 4-3 Effect of acclimatization on the light saturation and light compensation points.

TABLE 4-3

Light levels for production and postharvest interiors for numerous foliage plant species (adapted from Conover, 1991; Conover and McConnell, 1981; Vladimirova et al., 1997).

Scientific Name	Common Name	Production Light Intensity (fc)	Production Light Intensity ($\mu mol \cdot m^{-2} \cdot s^{-1}$)	Interior Light Intensity Low	Interior Light Intensity Medium	Interior Light Intensity High
Adiantum species	Maidenhair fern	1200–1800	240–360		x	x
Aechmea fasciata	Silver vase	—	—		x	x
Aeschynanthus pulcher	Lipstick vine	4000–6000	800–1200			x
Aglaonema cultivars	Chinese evergreen	1000–2500	200–500		x	x
Ananas comosus	Pineapple	—	—		x	x
Anthurium species	Flamingo flower	1500–3600	300–720			x
Aphelandra squarrosa	Zebra plant	1000–1500	200–300			x
Araucaria heterophylla	Norfolk Island pine	4000–8000	800–1600		x	x
Ardisia crispa	Coral ardisia	1500–3000	300–600		x	x
Asparagus species	Asparagus fern	2000–4500	400–900		x	x
Aspidistra elatior	Cast-iron plant	2000	400	x	x	x
Asplenium nidus	Bird's-nest fern	1500–3000	300–600	x	x	x
Begonia Rex-Cultorum	Rex begonia	2000–2500	400–500		x	x
Bromeliaccae species	Bromeliads	2500–4000	500–800		x	x
Cactoceae species	Cactus	5000–8000	1000–1600			x
Calathea species	Prayer plant	1000–2000	200–400		x	x
Carissa macrocarpa	Natal plum	—	—			x
Chamaedorea elegans	Parlor palm	1500–3000	300–600	x	x	x
C. erumpens	Bamboo palm	3000–6000	600–1200		x	x
Chlorophytum comosum	Spider plant	1500–2500	300–500		x	x
Chrysalidocarpus lutescens	Areca palm	3500–6000	700–1200		x	x
Cissus species	Grape ivy	1500–2500	300–500		x	x
Citrofortunella microcarpa	Calamondin	—	—			x
Codiaeum variegatum	Croton	3000–8000	600–1600			x
Coffea arabica	Arabian coffee	4000	800			x
Cordyline terminalis	Ti plant	2500–4500	500–900		x	x
Crassula ovata	Jade plant	5000–6000	1000–1200		x	x
Cryptanthus species	Earthstars	—	—		x	x
Cyanotis kewensis	Teddy bear vine	—	—		x	x
Cyrtomium falcatum	Holly fern	—	—		x	x
Davallia fejeensis	Rabbits-foot fern	1200–1800	240–360		x	x
Dieffenbachia species	Dumbcane	1500–3000	300–600		x	x
Dracaena deremensis	Dracaena	2000–3500	400–700	x	x	x
D. fragrans	Corn plant	2000–4000	400–800	x	x	x
D. marginata	Marginata	3000–4000	600–800	x	x	x
D. sanderiana	Ribbon plant	2500–5000	500–1000		x	x
D.—other species	Dracaena	1500–3500	300–700	x	x	x
Episcia species	Episcia	2000–2500	400–500		x	x
Epipremnum aureum	Pothos	1500–3000	300–600	x	x	x
×*Fatshedera lizei*	Fatshedera	4000–6000	800–1200		x	x
Fatsia japonica	Japanese fatsia	4000–6000	800–1200		x	x
Ficus benjamina	Weeping fig	3000–6000	600–1200		x	x
F. elastica	Rubbertree	4000–6000	800–1200		x	x
F. lyrata	Fiddleleaf fig	4000–6000	800–1200		x	x
F. microcarpa	Cuban laurel	3000–6000	600–1200		x	x
Fittonia spp.	Nerve plant	1000–2500	200–500		x	x
Gynura aurantiaca	Purple passion vine	≤1150	≤230		x	x
Hedera helix	English ivy	1500–2500	300–500	x	x	x

(continued)

TABLE 4-3 *(continued)*

Scientific Name	Common Name	Production Light Intensity		Interior Light Intensity		
		(fc)	($\mu mol \cdot m^{-2} \cdot s^{-1}$)	Low	Medium	High
Howea forsteriana	Kentia palm	2500–6000	500–1200	x	x	x
Hoya carnosa	Wax plant	1500–2500	300–500		x	x
Maranta species	Prayer plant	1000–2500	200–500		x	x
Monstera deliciosa	Swiss cheese plant	3500–4500	700–900		x	x
Neoregelia carolinae	Striped bromeliad	—	—		x	x
Nephrolepis exaltata	Sword fern	1500–3500	300–700		x	x
Nolina recurvata	Ponytail palm	4000–6000	800–1200			x
Palmae species	Palms	1500–6000	300–1200		x	x
Peperomia species	Peperomia	1500–3000	300–600		x	x
Philodendron species	Philodendron	1500–5000	300–1000	x	x	x
Pilea species	Pilea	1500–3000	300–600		x	x
Pittosporum tobira	Japanese pittosporum	—	—		x	x
Platycerium bifurcatum	Staghorn fern	1500–3000	300–600		x	x
Plectranthus species	Swedish ivy	3000–4000	600–800		x	x
Podocarpus macrophyllus	Yew pine	—	—		x	x
Polyscias species	Aralia	1500–4500	300–900		x	x
Pteris ensiformis	Victoria table fern	1200–1800	240–360		x	x
Radermachia sinica	China doll	3000–3500	600–700		x	x
Sansevieria species	Snake plant	3500–5000	700–1000	x	x	x
Scindapsus pictus	Satin pothos	—	—		x	x
Schefflera (Brassaia) species	Schefflera	4000–6000	800–1200		x	x
S. elegantissima (Dizygotheca)	False aralia	2000–4000	400–800		x	x
Schlumbergera ×buckleyi	Christmas cactus	1500–3000	300–600		x	x
Spathiphyllum species	Peace lily	1500–2500	300–500	x	x	x
Synogonium podophyllum	Nephthytis	1500–3500	300–700		x	x
Tolmiea menziesii	Piggyback plant	3500–4000	700–800			x
Tradescantia zebrina	Wandering Jew	3500–4500	700–900		x	x
Yucca elephantipes	Spineless yucca	3500–4500	700–900			x
Zamioculcas zamiifolia	ZZ plant	1500–2500	300–500	x	x	x

should be constructed on the north to south axis. Gutter-connected greenhouses are generally constructed on the north to south axis regardless of the latitude. Also note which shadows from stationary gutters and other overhead objects move with the sun. Mobile shadows present little problem during production other than temporarily reducing the light received by the affected plants. Stationary shadows may require that shade-tolerant plants be grown in the affected areas.

PLANT SPACING

Plants will eventually fill the amount of available space on a bench during production. Therefore, increasing the number of plants on a bench will decrease the amount of light that each plant receives after a solid foliar canopy forms, decrease the amount of dry weight per plant, and may decrease plant quality (Fig. 4-5). Plant quality may be improved by increasing the amount of space per plant if light levels are low, such as during the winter. Unfortunately, increasing the space per plant decreases the number of plants that may be grown in a specific area, and economics typically dictate the final plant spacing.

The number of overhead hanging baskets should also be kept to a minimum because they block light. For example, one line of hanging baskets running the length of a 21-ft- (6.4-m)-wide bay will reduce the amount of light on the benches below by 4%, three lines will reduce light by 11%, and 6 lines by 19% (J. Faust, personal communication). Also,