

COMPATIBILITY, TEMPERATURE GUIDELINES & ETHYLENE SENSITIVITY

COMPATIBILITY, TEMPERATURE GUIDELINES

Source: United States Department of Agriculture (USDA)

Load Compatibility Groups¹

Group 1

Apples	Grapes ² (see groups 2 and 6a)
Apricots	Peaches
Berries (except cranberries)	Pears
Cherries	Persimmons
Figs (not with apples, danger of odor transfer to figs; also see group 6a)	Plums and prunes
	Pomegranates
	Quinces

Recommended Transit Conditions:

- **Temperature:**
32° to 34° F (0° to 1.5° C)
- **Relative humidity:**
90 to 95 percent
- **Atmosphere:**
Normally used on berries and cherries only
10 to 20 percent CO²
- **Ice:**
Never in contact with commodity.

Note: Most members of this group are not compatible with group 6a or 6b because ethylene production by group 1 can be high, and thus harmful to members of group 6a or 6b.

¹ Taken from USDA Marketing Research Report No. 1070, Compatibility of Fruits and Vegetables During Transport in Mixed Loads, by W.J. Lipton and J.M. Harvey, 1977.

² Grapes: Compatible with other commodities only if the grapes are not fumigated with sulfur dioxide (SO²) in vehicle and if no chemicals that release SO² are included in packages.

Group 2

Avocados	Honey Dew
Bananas	Persian
Eggplants (also see group 5)	Olives, fresh
Grapefruit ³	Papayas
Guava	Pineapples (not with avocados, danger of avocados odor absorption)
Limes	Tomatoes, green
Mangoes	Tomatoes, pink (also see group 4)
Muskmelons, other than cantaloupes	Watermelons (also see groups 4 and 5)
Casaba	
Crenshaw	

Recommended Transit Conditions:

- **Temperature:**
55° to 65° F (13° to 18° C)
- **Relative humidity:**
85 to 95 percent
- **Ice:**
Never in contact with commodity

³ Citrus Fruits : Oranges and tangerines compatibility depends on source. Florida or Texas grown oranges are shipped at 32° to 34° F (0.0° to 1.1° C), but oranges grown in California and Arizona are shipped at 38° to 48° F (3.3° to 8.8° C).

Group 3

Cantaloupes
Cranberries
Lemons (adjust temperature to other commodity)
Lychees (also see group 4)
Oranges
Tangerines

Recommended Transit Conditions:

- **Temperature:**
36° to 41° F (2.5° to 5.0° C)
- **Relative humidity:**
90 to 95 percent; cantaloupes about 95 percent
- **Ice:**
In contact only with cantaloupes

Group 4

Beans, snap
Lychees (also see group 3)
Okra
Peppers, green (not with beans)
Peppers, red (if with green peppers, temperature adjusted toward top of range)
Squash, summer
Tomatoes, pink (also see group 2)
Watermelons (also see groups 2 and 5)

Recommended Transit Conditions:

- **Temperature:**
40° to 45° F (4.5° to 7.5° C)
- **Relative humidity:**
About 95 percent
- **Ice:**
Never in contact with commodity

Group 5

Cucumbers
Eggplants (also see group 2)
Ginger (not with eggplants, also see group 7)
Grapefruit, Florida (after January 1), and Texas
Potatoes (late crop)
Pumpkin and squashes, winter
Watermelons (temperature adjusted for other members of groups; also see groups 2 and 4)

Recommended Transit Conditions:

- **Temperature:**
40° to 55° F (4.4° to 13° C); ginger not below 55° F
- **Relative humidity:**
85 to 90 percent
- **Ice:**
Never in contact with commodity

COMPATIBILITY, TEMPERATURE GUIDELINES

Source: United States Department of Agriculture (USDA)

Group 6a

Artichokes	Mushrooms
Asparagus	Parsley
Beets, red	Parsnips
Carrots	Peas
Endive and escarole	Rhubarb
Figs (also see group 1)	Salsify
Grapes (also see group 1)	Spinach
Greens	Sweet corn
Leeks (not with figs or grapes)	Watercress
Lettuce	

This group, except for figs, grapes, and mushrooms, is compatible with group 6b.

Recommended Transit Conditions:

- *Temperature:*
32° to 34°F (0° to 1.1°C)
- *Relative humidity:*
95 to 100 percent
- *Ice:*
Never in contact with asparagus, figs, grapes, or mushrooms

Group 6b

Broccoli
 Brussels sprouts
 Cabbage
 Cauliflower
 Celeriac
 Horseradish
 Kohlrabi
 Onions, green (not with rhubarb, figs, grapes, mushrooms, or sweet corn)
 Radishes
 Rutabagas
 Turnips

This group is compatible with group 6a, except for figs, grapes, and mushrooms.

Recommended Transit Conditions:

- *Temperature:*
32° to 34°F (0° to 1.1°C)
- *Relative humidity:*
95 to 100 percent
- *Ice:*
Contact acceptable for all

Group 7

Ginger (also see group 5)
 Potatoes, early crop (temperatures adjusted for others)
 Sweet potatoes

Recommended Transit Conditions:

- *Temperature:*
55° to 65°F (13° to 18°C)
- *Relative humidity:*
85 to 90 percent
- *Ice:*
Never in contact with commodity

Group 8

Garlic
 Onions, dry

Recommended Transit Conditions:

- *Temperature:*
32° to 34°F (0° to 1.5°C)
- *Relative humidity:*
65 to 75 percent
- *Ice:*
Never in contact with commodity

ETHYLENE SENSITIVITY

Compatibility Chart for Fruits & Vegetables

Source: University of California — Davis

Compatible produce for long distance transport. Produce in the same temperature section can be mixed safely. Ethylene-sensitive vegetables should not be mixed with ethylene-producing fruits and vegetables. Dry vegetables can be mixed with other fruits and vegetables on trips lasting less than about one week.

Ethylene-sensitive vegetables

(32-36° F)

arugula	herbs
asparagus	leek ⁸
Belgian/endive	lettuce
broccoli	mustard greens
Brussels sprouts	parsley
cabbage ¹	snow peas
carrot ^{1,3}	spinach
cauliflower	sweet peas
celery ^{1,3,9}	turnip greens
collard	watercress
escarole	
green onion ⁹	

(45-50° F)

chayote	cucumber
eggplant ⁵	okra
squash, summer	

(55-65° F)

squash: pumpkin, winter, yam	sweet potato
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Not sensitive to ethylene vegetables (55-65° F)

dry onion ⁹	ginger ⁵
jicama	melon: bitter
potato	tomato

Ethylene-producing (very low) fruits and melons (32-36° F)

apple ^{1,3,9}	grape ^{6,7,8}
apricot	loquat
avocado (ripe)	nectarine
berries	peach
cantaloupe	pear ^{1,9}
cherry	plum
coconut	plumcot
currant	pomegranate
date	prune
fig ^{1,7,8}	quince

Ethylene-sensitive fruits (45-50° F)

grapefruit ^{4,9}	lemon ^{4,9}
lime ^{4,9}	

Not sensitive to ethylene vegetables

(32-36° F)

alfalfa sprouts	mint
amaranth	mushroom ⁷
anise	parsnip
artichoke	radicchio
beans: fava, lima	radish
bean sprouts	rhubarb ⁷
beet	rutbaga
bok choy	shallot
garlic	sweet corn ⁷
horseradish	water chestnut
kale	

(45-50° F)

basil	beans: green, snap ¹⁰
cowpea	pepper: bell, chili ¹⁰
tomatillo	

Not sensitive to ethylene fruits

(45-50° F)

avocado (unripe)	orange ^{4,9}
cactus pear ^{1,9}	passion fruit
cranberry	pineapple ^{2,10}
guava	tamarillo
kumquat	tamarind
mandarin ^{4,9}	tangelo ^{4,9}
olive	watermelon

(55-65° F)

banana	breadfruit
jackfruit	mango
melon: casaba, crenshaw, honeydew	papaya
Persian	rambutan
plantain	
soursop	

Notes:

- ¹ Odors from apples and pears are absorbed by cabbage, carrots, celery, figs, onions, and potatoes.
- ² Avocado odor is absorbed by pineapple.
- ³ Celery absorbs odor from onion, apple, and carrot.
- ⁴ Citrus absorbs odor from strongly scented fruits and vegetables.
- ⁵ Ginger odor is absorbed by eggplant.

- ⁶ Sulfur dioxide released from pads used with table grapes will damage other produce.
- ⁷ Green onion odor is absorbed by fig, grape, mushroom, rhubarb, and corn.
- ⁸ Leek odor is absorbed by fig and grape.
- ⁹ Onion odor is absorbed by apple, celery, pear, and citrus.
- ¹⁰ Pepper odor is absorbed by beans, pineapple, and avocado.