

Adaptation of Vegetable Crops in Climatic Regions

Vegetable crops come from a wide range of plant families and regions of origin, so it is natural that some vegetables are better suited to a given location than others. Adaptability is affected by when the crop can be planted, temperatures during the growing season, and the length of the growing season. The attached table lists ranges of soil temperatures for germination, growing temperature ranges, and days from seeding or transplanting to harvest, and can serve as a guide in determining the which vegetables fit a particular area.

Some vegetables are adapted to a wide range of conditions, and can be grown in most agricultural regions. Many crops where leaves, bulbs, or roots are eaten, such as cabbage, collard, kale, mustard, onion, radish, spinach, turnip, beet, carrot, and lettuce are can germinate at lower temperatures and still produce well when soil and air temperatures are high.

Vegetables that are grown for floral parts, fruits, or seeds are often more temperature sensitive. Broccoli and cauliflower, for example, can grow under conditions similar to cabbage, but the floral heads they produce are much more sensitive to high temperatures, and cool temperatures while the plants are small may cause them to bolt, ruining the heads. Seed-producing plants like peas and beans have narrower temperature ranges, and can fail to produce seeds if temperatures are too high during the blooming period. Fruiting vegetables, such as vine crops, tomatoes, eggplant, pepper, and okra generally require warm soil and air temperatures, although air temperatures near their maximum by also prevent fruit set. It is important to compare acceptable temperature ranges for individual vegetables to the local conditions.

Another consideration is the length of the growing season. Many warm-season crops such as cantaloupe, watermelon, eggplant, peppers, and even tomatoes require a long growing season. High night temperatures in lower latitudes or long days in higher latitudes may compensate somewhat for length of season. Nevertheless, comparing the number of days a location is within the acceptable temperature range for growth to the days-to-harvest is important for success.

Areas with short growing seasons can expand the available range of crops by artificially altering the growing environment. Growing transplants in greenhouses or other protected areas before soil temperatures reach minimum levels can shorten the time to harvest by 2-3 weeks, as indicated in the table. Likewise, plastic mulches, hot caps, or other coverings that warm the soil and protect the plants from frost and wind can extend the effective growing season.

A Guide to Planning Vegetable Gardens

Type	Tolerance to Cold Temperatures (1)	Planting Depth (cm)	Space Between Rows (cm)	Space Between Plants (cm)	Soil Temperature (2) for Germination	Approximate (3) Days to Germination	Approximate (3) Days to Maturity
Bean	Intolerant	2.5-3.75	60-90	5-7.5	15-35 (30)	6-14	55-65
Beet	Tolerant	1.25	37.5-60	5	4-35 (29)	7-12	50-70
Broccoli (T)	Very Tolerant	0.7	60-90	35-60	4-35 (29)	5-12	60-90
Brussels Sprouts (T)	Very Tolerant	0.7	60-90	35-60	4-35 (29)	5-12	90-110
Cabbage (T)	Very Tolerant	0.7	60-90	35-60	4-35 (29)	6-12	60-100
Carrot	Tolerant	0.7	35-60	5	4-35 (29)	12-20	75-90
Melon	Very Tolerant	2.5	150-200	60-90	18-40 (35)	5-10	90-110
Cucumber	Very Intolerant	2.5	120-180	60-90	16-40 (35)	6-10	60-80
Head Lettuce	Very Tolerant	0.7-1.25	45-60	30-45	0-24 (24)	6-12	70-80
Leaf Lettuce	Very Tolerant	0.7-1.25	37.5-45	5-7.5	0-24 (24)	6-12	40-55
Onion	Very Tolerant	1.25	37.5-60	7.5	0-35 (27)	8-15	90-120
Pea	Very Tolerant	5	45-90	5	4-29 (24)	7-14	60-90
Pepper (T)	Very Intolerant	0.7	60-90	45-60	16-35 (29)	14-21	60-90
Radish	Tolerant	1.25	35-50	2.5	4-35 (27)	4-10	30-40
Spinach	Very Tolerant	1.8	35-50	7.5-10	0-24 (21)	6-14	45-60
Summer Squash	Intolerant	2.5	90-150	45-90	18-40 (35)	5-12	60-70
Winter Squash / Pumpkin	Very Intolerant	2.5	150-240	60-120	18-40 (35)	7-12	85-100
Tomato (T)	Intolerant	1.25	60-90	45-90	10-35 (27)	7-14	75-90
Watermelon	Very Intolerant	2.5	60-240	90-180	90-150	5-12	80-100

(T) Transplanting Suggested

(1) Tolerance to Cold Temperatures

Very Tolerant – Plant outside from 4 to 6 weeks before last frost.

Tolerant – Plant outside from 1 to 3 weeks before last frost.

Intolerant – Plant outside after last frost.

Very Intolerant – Plant outside when soil has warmed

(2) The optimal soil temperature is shown in parenthesis.

(3) Days to germination and maturity will vary with seed type and conditions.