

1



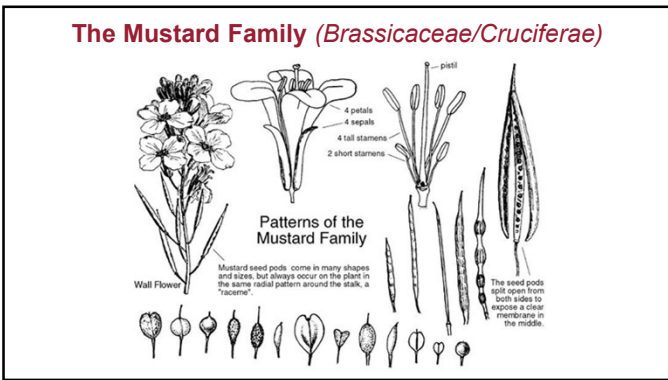
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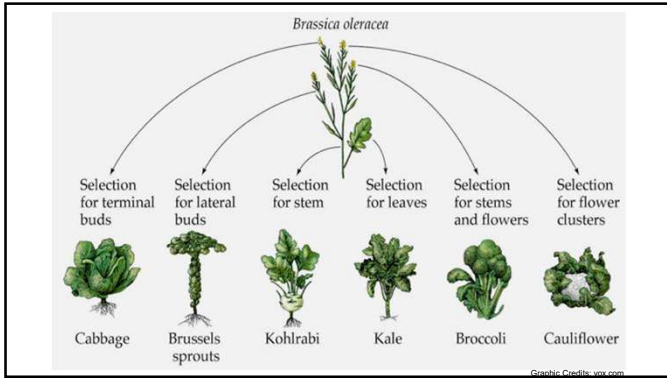
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Brassicaceae Includes Many Vegetables

- Arugula (*Eruca vesicaria* and *Diplotaxis tenuifolia*)
- Broccoli (*Brassica oleracea*)
- Brussels sprouts (*Brassica oleracea*)
- Cabbage (*Brassica oleracea*)
- Cauliflower (*Brassica oleracea*)
- Collards (*Brassica oleracea*)
- Horseradish (*Armoracia rusticana*)
- Kale (*Brassica oleracea*)
- Kohlrabi (*Brassica oleracea*)
- Mustard greens (*Brassica juncea*)
- Pac Choi (*Brassica rapa*)
- Radish (*Raphanus sativus*)
- Rutabaga (*Brassica napus*)
- Sea kale (*Crambe maritima*)
- Turnip (*Brassica rapa*)

Photo Credit: Sue Kraemer

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Understand Your PNW Climate
Most Brassicas are considered cool crops

- We have 2 short growing seasons for cool crops (greens, brassicas, radishes, carrots). Be aware of microclimates.
- Generally a wide variety of soils with a low pH
- We have a dry season that can last from June to September.

USDA Plant Hardiness Zone Map
Northwestern U.S.

Average Annual Extreme Minimum Temperature 1976-2005

4 to 5	30 to 37.2	4 to 5	20 to 27.8
5 to 6	27.2 to 34.4	6 to 7	17.8 to 25
6 to 7	24.4 to 31.7	7 to 8	14.7 to 22
7 to 8	21.7 to 29	8 to 9	11.7 to 19
8 to 9	18.7 to 26	9 to 10	8.7 to 16
9 to 10	15.7 to 23	10 to 11	5.7 to 13
10 to 11	12.7 to 20	11 to 12	2.7 to 10
11 to 12	9.7 to 17	12 to 13	-0.3 to 7
12 to 13	6.7 to 14	13 to 14	-3.3 to 4
13 to 14	3.7 to 11	14 to 15	-6.3 to 1
14 to 15	0.7 to 8	15 to 16	-9.3 to -2
15 to 16	-2.3 to 5	16 to 17	-12.3 to -5
16 to 17	-5.3 to 2	17 to 18	-15.3 to -8
17 to 18	-8.3 to -1	18 to 19	-18.3 to -11
18 to 19	-11.3 to -4	19 to 20	-21.3 to -14
19 to 20	-14.3 to -7	20 to 21	-24.3 to -17
20 to 21	-17.3 to -10	21 to 22	-27.3 to -20
21 to 22	-20.3 to -13	22 to 23	-30.3 to -23
22 to 23	-23.3 to -16	23 to 24	-33.3 to -26
23 to 24	-26.3 to -19	24 to 25	-36.3 to -29
24 to 25	-29.3 to -22	25 to 26	-39.3 to -32
25 to 26	-32.3 to -25	26 to 27	-42.3 to -35
26 to 27	-35.3 to -28	27 to 28	-45.3 to -38
27 to 28	-38.3 to -31	28 to 29	-48.3 to -41
28 to 29	-41.3 to -34	29 to 30	-51.3 to -44
29 to 30	-44.3 to -37	30 to 31	-54.3 to -47
30 to 31	-47.3 to -40	31 to 32	-57.3 to -50
31 to 32	-50.3 to -43	32 to 33	-60.3 to -53
32 to 33	-53.3 to -46	33 to 34	-63.3 to -56
33 to 34	-56.3 to -49	34 to 35	-66.3 to -59
34 to 35	-59.3 to -52	35 to 36	-69.3 to -62
35 to 36	-62.3 to -55	36 to 37	-72.3 to -65
36 to 37	-65.3 to -58	37 to 38	-75.3 to -68
37 to 38	-68.3 to -61	38 to 39	-78.3 to -71
38 to 39	-71.3 to -64	39 to 40	-81.3 to -74
39 to 40	-74.3 to -67	40 to 41	-84.3 to -77
40 to 41	-77.3 to -70	41 to 42	-87.3 to -80
41 to 42	-80.3 to -73	42 to 43	-90.3 to -83
42 to 43	-83.3 to -76	43 to 44	-93.3 to -86
43 to 44	-86.3 to -79	44 to 45	-96.3 to -89
44 to 45	-89.3 to -82	45 to 46	-99.3 to -92
45 to 46	-92.3 to -85	46 to 47	-102.3 to -95
46 to 47	-95.3 to -88	47 to 48	-105.3 to -98
47 to 48	-98.3 to -91	48 to 49	-108.3 to -101
48 to 49	-101.3 to -94	49 to 50	-111.3 to -104
49 to 50	-104.3 to -97	50 to 51	-114.3 to -107
50 to 51	-107.3 to -100	51 to 52	-117.3 to -110
51 to 52	-110.3 to -103	52 to 53	-120.3 to -113
52 to 53	-113.3 to -106	53 to 54	-123.3 to -116
53 to 54	-116.3 to -109	54 to 55	-126.3 to -119
54 to 55	-119.3 to -112	55 to 56	-129.3 to -122
55 to 56	-122.3 to -115	56 to 57	-132.3 to -125
56 to 57	-125.3 to -118	57 to 58	-135.3 to -128
57 to 58	-128.3 to -121	58 to 59	-138.3 to -131
58 to 59	-131.3 to -124	59 to 60	-141.3 to -134
59 to 60	-134.3 to -127	60 to 61	-144.3 to -137
60 to 61	-137.3 to -130	61 to 62	-147.3 to -140
61 to 62	-140.3 to -133	62 to 63	-150.3 to -143
62 to 63	-143.3 to -136	63 to 64	-153.3 to -146
63 to 64	-146.3 to -139	64 to 65	-156.3 to -149
64 to 65	-149.3 to -142	65 to 66	-159.3 to -152
65 to 66	-152.3 to -145	66 to 67	-162.3 to -155
66 to 67	-155.3 to -148	67 to 68	-165.3 to -158
67 to 68	-158.3 to -151	68 to 69	-168.3 to -161
68 to 69	-161.3 to -154	69 to 70	-171.3 to -164
69 to 70	-164.3 to -157	70 to 71	-174.3 to -167
70 to 71	-167.3 to -160	71 to 72	-177.3 to -170
71 to 72	-170.3 to -163	72 to 73	-180.3 to -173
72 to 73	-173.3 to -166	73 to 74	-183.3 to -176
73 to 74	-176.3 to -169	74 to 75	-186.3 to -179
74 to 75	-179.3 to -172	75 to 76	-189.3 to -182
75 to 76	-182.3 to -175	76 to 77	-192.3 to -185
76 to 77	-185.3 to -178	77 to 78	-195.3 to -188
77 to 78	-188.3 to -181	78 to 79	-198.3 to -191
78 to 79	-191.3 to -184	79 to 80	-201.3 to -194
79 to 80	-194.3 to -187	80 to 81	-204.3 to -197
80 to 81	-197.3 to -190	81 to 82	-207.3 to -200
81 to 82	-200.3 to -193	82 to 83	-210.3 to -203
82 to 83	-203.3 to -196	83 to 84	-213.3 to -206
83 to 84	-206.3 to -199	84 to 85	-216.3 to -209
84 to 85	-209.3 to -202	85 to 86	-219.3 to -212
85 to 86	-212.3 to -205	86 to 87	-222.3 to -215
86 to 87	-215.3 to -208	87 to 88	-225.3 to -218
87 to 88	-218.3 to -211	88 to 89	-228.3 to -221
88 to 89	-221.3 to -214	89 to 90	-231.3 to -224
89 to 90	-224.3 to -217	90 to 91	-234.3 to -227
90 to 91	-227.3 to -220	91 to 92	-237.3 to -230
91 to 92	-230.3 to -223	92 to 93	-240.3 to -233
92 to 93	-233.3 to -226	93 to 94	-243.3 to -236
93 to 94	-236.3 to -229	94 to 95	-246.3 to -239
94 to 95	-239.3 to -232	95 to 96	-249.3 to -242
95 to 96	-242.3 to -235	96 to 97	-252.3 to -245
96 to 97	-245.3 to -238	97 to 98	-255.3 to -248
97 to 98	-248.3 to -241	98 to 99	-258.3 to -251
98 to 99	-251.3 to -244	99 to 100	-261.3 to -254
99 to 100	-254.3 to -247		

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Understand Your PNW Climate Most Brassicas are considered cool crops

The Seattle Times
Science My Account

New hardiness zone map will help US gardeners keep pace with climate change

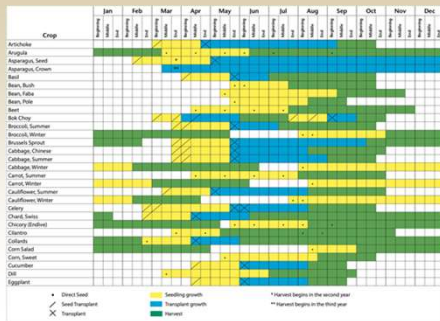
Nov. 18, 2023 at 5:58 am | Updated Nov. 18, 2023 at 6:37 pm

- Seattle is now in 9a
- Download new maps at <https://planthardiness.ars.usda.gov/pages/map-downloads>



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Planning



Detailed chart in Home Vegetable Gardening in Washington, #EM057E

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Choosing a Garden Site

Your site needs:

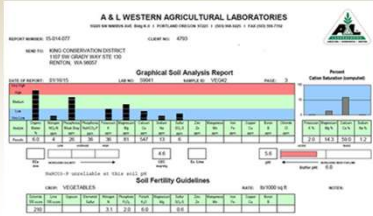
- Sunlight
- Access to water
- Level soil
- Good drainage



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Preparation-Soil

- Have a soil test completed. King Conservation District gives residents a limited number of free soil tests.
- Follow amendment directions in the report to address nutrient issues.



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Preparation-Soil

- WSU Fact Sheet #FS123E: [Organic Soil Amendments in Yards and Gardens: How Much is Enough](#)
- Types of Amendments
 - Compost
 - Manures
 - Biosolids
- For new garden, add 1-3 inches and mix with 6-8 inches soil
 - Will vary depending on condition of existing soil
 - Soil test results will help guide you



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Preparation



Photo credits Sue Kraemer

Start Some Varieties Indoors & Prepare Outdoor Beds

- Indoors:
- Heated mats not necessarily needed for cool weather crops
 - Grow lamps
- Outdoors:
- Direct sow under row cover







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Kale
(*Brassica oleracea*)

- Kale
 - Winterbor
 - Redbor
 - Red Russian
 - Dwarf Green Curled
 - Dwarf Scotch Curly
 - Lacinato
 - Dazzling Blue
 - Scarlet
 - Wild Kales

		
		
Red Russian (<i>B. napus</i>)	Lacinato	Wild Kales (<i>B. napus</i>)

17

Perennial Kale

Seakale (*Crambe Maritima*)

- Buy transplants in spring
- Grown by Thomas Jefferson
- Hardy to -5°F

Photo Credits: <https://www.monterioshop.org/>

Kosmic (*Brassica Oleracea*)


- Transplant root cuttings in spring
- Does not flower
- Hardy to 10°F

18


Collards
(*Brassica oleracea*)


- Collard Greens
 - Champion
 - Flash
 - Old Timey Blue
- Perennial Collards
 - Purple Tree Collards
 - Buy transplants in spring

Champion




Flash





Old Timey Blue



Purple Tree

19

Kale and Collards
(*Brassica oleracea* and *Brassica napus*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4"	5-17	12-24"	18-36"	3 years

from Territorial Seeds

- Start indoors February to May for April to mid-July transplanting
- Direct seed March to mid-July for summer to winter harvest (row cover recommended)
- Direct seed or transplant in August for winter harvest




Photo Credit: Sue Kraemer

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Kale and Collards

- One of the most cost-effective vegetables!
- Harvest leaves from the bottom up at any size
- Cool weather and frost bring out best flavor
- Stores well in refrigerator
- Nutritional value: low fat; high in calcium, vitamins K, A, and C
- Source of glucosinolates (phytochemicals)




Photo Credit: sunset.com

<https://www.mayoclinichealthsystem.org/hometown-health/speaking-of-health/the-many-types-and-health-benefits-of-kale>
<https://www.sciencedirect.com/topics/biochemistry/genetics-and-molecular-biology/glucosinolate>

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Kale can survive our winters



Photo Credits: Sue Kraemer

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Kale and Collards
Biennial: lateral buds in spring



Photo Credits: Sue Kraemer

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Kale and Collards
(*Brassica oleracea* and *Brassica napus*)

- Edible flowers the next spring!
- Early pollen for bees




Photo Credits: Sue Kraemer

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Mustard Greens *(Brassica juncea)*

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
40-75°F	1/4"	2-15	6-18"	9-18"	3 years


- Direct seed early spring or late summer
- Very easy to grow!
- Avoid heat to prevent bolting (considered annual)
- Harvest young leaves or full heads



Green Wave



Mustard Mix



Tatsoi

25

Mustard Seeds *(Brassica juncea)*

- Leave a little extra room when planting
- Harvest pods when they turn brown
- Dry pods in paper bag for couple weeks






26


Pac Choi *(Brassica rapa)*

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
45-75°F	1/4"	2-15	12-18"	18-36"	3 years

- Best in spring and fall
- Direct sow after danger of frost
- Start indoors 4 weeks before transplanting in spring or fall
- Avoid heat to prevent bolting
- Harvest as soon as mature to avoid bolting



Joi Choi



Bopak

27

Arugula

- Direct seed early spring or fall
- Best directly sown
- Most tolerate moderate frosts
- Harvest frequently and when young
- Flowers are edible!

Roquette (*Eruca vesicaria*)



Wild (*Diplotaxis tenuifolia*)



Photo Credits: commons wikimedia

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Why is My Kale Tough and Bitter?



massage kale with lemon juice or vinegar

Kale Salad



Kale, olive oil, lemon juice, bacon, and Feta cheese

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Favorite Recipes

Kale pasta



Photo Credits: cookpad.com

Kale, bacon, and sun-dried tomatoes

Arugula salad




Photo Credits: foodnetwork.com

Arugula, olive oil, lemon juice, and Parmesan cheese

30

Growing Brassicaceae for Buds, and Flowering Heads

BROCCOLI, BRUSSEL SPROUTS, CABBAGE, and CAULIFLOWER




31

Broccoli
(Brassica oleracea)

- Broccoli
 - Umpqua
 - Thompson
 - Waltham
 - Green Magic
 - Emerald Jewel

- Brokai or sprouting broccoli
 - Atlantis
 - Apollo



Umpqua



Apollo

32

Broccoli
(Brassica oleracea)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4"	5-17	12-24"	18-36"	3 years

- Direct seed April through June (row cover recommended)
- Start indoors 4 – 6 weeks before transplant in April through June
- Start autumn overwintering varieties May-July for transplanting June-August
- Start overwintering sprouting broccoli from mid-May to June, transplant by end of July-September

33

Broccoli
(*Brassica oleracea*)



- Harvest when heads are tight and dense
- Cut side shoots to promote production
- Stores well in refrigerator

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Cabbage
(*Brassica oleracea*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4"	5-17	18-24"	2-4'	3 years

- Direct seed March – June (not recommended for fall planting)
- Start indoors 4 – 6 weeks before transplant in March through June



Charmant

Ruby Ball

35

Cabbage
(*Brassica oleracea*)

- Early types grow fast, so harvest promptly
- Include 2 or 3 wrapper leaves when cutting heads
- Early types store for 1-2 months at 36°F
- Later types up to 6 months at 36°F





Photo Credit: fugakustate.com

36

Cauliflower
(*Brassica oleracea*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4"	5-17	12-24"	18-36"	3 years



- Direct seed April – June (not recommended for fall planting)
- Start indoors 4 – 6 weeks before transplant
- Blanching for some varieties: to ensure completely white heads, tie the inner leaves around the head when it starts to form

Snow Crown Graffiti

37

Cauliflower
(*Brassica oleracea*)



- Harvest heads when florets are tight and dense
- Overmature florets will separate
- Stores well refrigerated

38

Brussels Sprouts
(*Brassica oleracea*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4"	5-17	24"	18-36"	3-4 years

- Direct seed: not recommended
- Start indoors 4 – 6 weeks before transplant
- Start May-June for transplanting June-August for fall crop
- Timing is important: follow variety specific instructions

Rubine Hestia

39

Brussels Sprouts (*Brassica oleracea*)

- Best after couple of frosts
- Mature buds will be about 1 to 1½ inches
- Harvest from the bottom up
- Or, mature entire stock by cutting off top at growing point
- Store refrigerated



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Favorite Recipes

Sauteed Cabbage



Photo Credits: wellplated.com

Cabbage, thyme, olive oil, butter, cider vinegar, hot pepper flakes

Broccoli Orzo Salad



Photo Credits: Sue Kraemer

Orzo, Broccoli, yellow peppers, feta, sun dried tomatoes, olive oil and balsamic vinegar

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Growing Brassicaceae Root Crops

RADISHES, RUTABAGAS, AND TURNIPS



42

Turnips and Rutabagas
(*Brassica rapa* and *Brassica napus*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/4-1/2"	5-17	6-8"	12-16"	3 years

- Direct seed spring through summer
- Sow turnips July-early Sept for fall/winter crop
- Sow rutabagas in July for fall/winter crop
- Thin when form two true leaves
- Harvest when small for sweetness
- Pick young turnip greens
- Store refrigerated



Purple top turnip (*B. rapa*) Joan rutabaga (*B. napus*)

43

Radish
(*Raphanus sativus*)

Soil Temp for Germ.	Seed Depth	Days to Emergence	Thin Plants To	Row Spacing	Seed Life
55-75°F	1/2"	4-11	1-2"	8-12"	4 years

- Direct seed spring to early summer
- Direct sow mid-August to early September for fall crop
- Extend harvest by planting every two weeks
- Thin promptly when form two true leaves
- Avoid dry or crowded conditions (slow growth, pithy, hot)
- Harvest young
- Let a few bolt: green seed pods are edible
- Remove tops before refrigerating

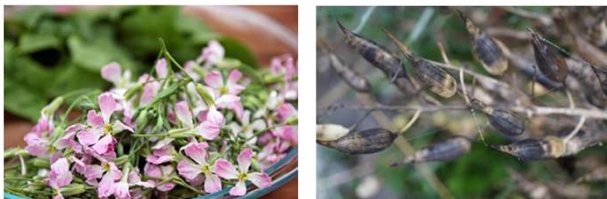


Cherry Belle Daikon

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Radishes

- Let flower and reseed over winter
- Flowers and young leaves are edible



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Radishes

- Highly nutritious
 - Antioxidants
 - Vitamin C
 - High fiber
- Can be roasted or braised!

Braised Red Radishes



<https://cooking.nytimes.com/recipes/149-braised-red-radishes>

46

Horseradish *(Armoracia rusticana)*



- Perennial for years of harvest
- Fertilize top 3-4 inches of soil and dig shallow trench
- Space 1 to 2 feet apart and cover with 2 inches soil
- Will grow fast and spread
- Harvest in fall and winter after leaves have died back

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Brassicaceae Pests and Diseases



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Integrated Pest Management (IPM)

- **Identify** pests
- **Prevent** problems before they start
- **Monitor** with careful observation
- **Control** with mechanical and biological practices first (not eradicate)



Photo Credit: Wikipedia

Braconid wasp *Aleiodes indiscretus* laying eggs in a caterpillar



Photo Credit: Sue Kraemer

49

Clubroot

- **Affected Crops:** all members of the family
- **Prevention and Control**
 - Rotate crops
 - Check pH: above 6.8
 - Provide adequate calcium and magnesium
 - Provide drainage
 - Remove weeds




Photo Credit: agric.wa.gov.au




Photo Credit: articles.extension.org

50

Downy Mildew

- **Affected Crops:** broccoli, Brussels sprouts, cabbage, cauliflower, and kale
- **Prevention and Control**
 - Rotate crops
 - Avoid overhead watering
 - Give plants plenty of space
 - Remove diseased plants and plant parts (don't place in home compost!)




Photo Credit: wsu.edu




Photo Credit: territorial seeds

51

Aphids

- **Affected Crops:** all members of the family
- **Prevention and Control**
 - Remove plant debris
 - Avoid high levels of nitrogen
 - Encourage natural enemies
 - Spray off with water hose
 - Control honeydew collecting ants



Photo Credit: Sue Kraemer

52

Cabbage Maggot

- **Affected Crops:** Brussels sprouts, cabbage, cauliflower, broccoli, mustards, radish, and turnip
- **Prevention and Control**
 - Rotate crops
 - Reduce weeds
 - Row covers



Photo Credits: wsu.edu and territorial seeds

53

Flea Beetle

- **Affected Crops:** all family members
- **Prevention and Control**
 - Reduce weeds
 - Row covers



Photo Credits: wsu.edu

54

Cabbage Worm

- **Affected Crops:** all family members
- **Prevention and Control**
 - Use row covers
 - Remove debris
 - Attract beneficial insects



55

Pests and Diseases

Mystery four-legged creature!



Physical barrier: "blackberry defense"

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Growing Brassicaceae Saving Seeds Notes



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Make Sure You Know

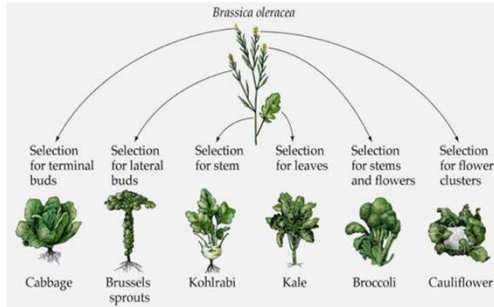
- Species name
- How your plants pollinate
- Market maturity vs seed maturity
- If your plants are hybrids



<https://www.seedsavers.org/saving-seeds-for-beginners>

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Varieties of the Same Species Can Cross Pollinate



59

Brassicaceae Includes Many Species

- Arugula (*Eruca vesicaria* and *Diplotaxis tenuifolia*)
- Broccoli (*Brassica oleracea*)
- Brussels sprouts (*Brassica oleracea*)
- Cabbage (*Brassica oleracea*)
- Cauliflower (*Brassica oleracea*)
- Collards (*Brassica oleracea*)
- Horseradish (*Armoracia rusticana*)
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- Mustard greens (*Brassica juncea*)
- Pac Choi (*Brassica rapa*)
- Radish (*Raphanus sativus*)
- Rutabaga (*Brassica napus*)
- Sea kale (*Crambe maritima*)
- Turnip (*Brassica rapa*)



Photo Credit: Sue Kraemer

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Hybrid Parent Plants

- Let flower and reseed over winter
- Hybrids will give you surprises!



Photo Credit: Sue Kraemer



Photo Credits: Sue Kraemer

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Books on Seed Saving



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Great Work Going On!



<https://seedalliance.org/>



<https://www.seedcentral.net/>

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Resources

- Home Vegetable Gardening in Washington, #EM057E
- WSU Fact Sheet #FS123E: [Organic Soil Amendments in Yards and Gardens: How Much is Enough](#)
- Radish Fact Sheet #FS127E
- Mustard Seeds: <https://boulder.extension.colostate.edu/wp-content/uploads/sites/7/2020/04/August-2019-Community-Garden-Newsletter.pdf>
- HortSense: <https://hortsense.cahnrs.wsu.edu/>
- Territorial Seeds: www.territorialseed.com
- Seed Savers Exchange: www.seedsavers.org






Photo Credit: Sue Kraemer

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Spring Series Presentations



2024 Growing Groceries Classes and BDG Garden Workshops

Date	Class
Wed, March 27	Grow Kale, Broccoli, and Related Cole Crops
Wed, April 10	Grow Tomatoes, Peppers, and Other Edible Nightshades
Wed, April 24	What Loves Heat? Cucumbers, Squash, Beans and Melons
Sat, May 4	BDG Workshop – Irrigation and Effective Water Management
Wed, May 8	Savoring What You Sow: Roots and Herbs
Sat, May 18	BDG Workshop – Beneficial Insects

More info: <https://kingcounty.mastergardenerfoundation.org/education/gg/>

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Master Gardener Resources



Ask a Master Gardener

Send a messages with questions and photos to: ask-a-mastergardener@live.com

Or use the online form at <https://extension.wsu.edu/king/ask-a-master-gardener>

Become a Master Gardener

For information on King County Master Gardener training, visit <https://extension.wsu.edu/king/gardening/become-a-master-gardener>

Applications for the 2025 class will open in September 2024

This institution is an equal opportunity provider. Please report violations through your local Extension office.

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Thank you!



is brought to you by



King County Master Gardener Program
<https://extension.wsu.edu/king/gardening>

- Demonstration Gardens
- Plant Clinics
- Education Outreach
- Science-based Publications



Master Gardener Foundation of King County
<http://www.mgfk.org>

- Fundraising for these programs

More information about growing groceries:
<https://kingcounty.mastergardenerfoundation.org/education/gg/>

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