



Croptime

Growth Stage Guide

<http://smallfarms.oregonstate.edu/croptime>



First edition

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VEGETABLE CROP DEVELOPMENT DATA COLLECTION & THE GROWTH STAGE GUIDE

These descriptions of vegetable growth stages were adapted from the 2nd edition of “Growth stages of mono- and dicotyledonous plants: BBCH Monograph”, edited by Uwe Meier (2001). The Croptime Growth State Guide describes vegetable growth stages for use when collecting crop development data to contribute to degree-day models in collaboration with the Croptime project: <http://smallfarms.oregonstate.edu/croptime>.

When collecting data for Croptime degree-day models:

1. Print Croptime Growth Stage Notes for collecting field data (pp 5-6).
2. Record the growth stage of 11 plants. Avoid plants clearly affected by environmental stress. Record median growth stage reached by the sixth most developed plant, except when noted otherwise.
3. True leaves are considered fully unfolded when they have unfurled (no longer cupping) and the next leaf is visible, but they have not necessarily reached full size.
4. Start recording the next physiological growth stage as soon as it becomes apparent. Be sure to read the next expected growth stages when visiting a site. For example, a common mistake is to keep counting leaves when the beginning of the reproductive stage should be noted.
5. Please overlap measurement of two growth stages by one site visit. For example, continue recording number of true leaves for one week (or one visit) after you start recording crown diameter of parsnip or flower bud emergence in cucumber.
6. When measuring diameter of a plant part, measure 2 diameters at 90° angle, and record the average diameter. 

Entering and submitting data:

1. Enter data using the OSU Croptime spreadsheet template available from your Croptime advisor or Nick Andrews.
2. Save worksheet using crop and variety name.
3. Send the completed spreadsheet and a copy of your original field data sheet to your Croptime advisor or Nick Andrews.

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OSU CROPTIME GROWTH STAGE NOTES Data set # (assigned by modelers): _____

Farm & contact info:		Researcher & contact info¹:		Irrigation type:
Location:		Year:		Mulch or row cover?²
Elevation or lat/long:				
Weather stn:		Organic, conventional, etc.?		Pruning, training, etc.:²
Crop:		Variety:		Strain or seed lot #:
Growth habit (i.e. determinate):				
Obs. Date	Median BBCH #	Median Growth Stage	Notes³ (i.e. range of growth stages, pests, water stress, row covers, etc.)	Camera & photo #

¹ Send this form to your Croptime advisor or nick.andrews@oregonstate.edu when complete.
² Record any practices that may affect temperature and humidity conditions such as mulching, pruning or training, plant density, or other practice that may modify the micro-climate of the crop.
³ Please note the range of growth stages when you think this might help modeling efforts, and factors such as water stress, pest pressure, etc. that may affect development rates.

OSU CROPTIME GROWTH STAGE NOTES

Data set # (assigned by modelers): _____

Obs. Date	Median BBCH #	Median Growth Stage	Notes ³ (i.e. range of growth stages, pests, water stress, row covers, etc.)	Camera & photo ID

¹ Send this form to your Croptime advisor or nick.andrews@oregonstate.edu when complete.
² Record any practices that may affect temperature and humidity conditions such as mulching, pruning or training, plant density, or other practice that may modify the micro-climate of the crop.
³ Please note the range of growth stages when you think this might help modeling efforts, and factors such as water stress, pest pressure, etc. that may affect development rates.

AMARANTHACEAE

SPINACH

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 & 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Number of true leaves	100	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded.
First harvest	406-412	Plants have reached typical size for harvest. For bunching spinach this occurs at about 6 or more true leaves, or when 10-12 plants form a marketable bunch. 406 = 6 true leaves, 412 = 12 true leaves
End of harvest period	501	501 = Main shoot begins to elongate, flower buds become visible and leaves are no longer marketable. Stop here unless modeling seed production.
Senescence	902	Leaves begin to discolor and are no longer marketable.

AMARANTHACEAE

SPINACH



100: Cotyledons completely unfolded



102: Two true leaves unfolded



104: 4 true leaves unfolded



407: 8 true leaves unfolded; harvest



407: 8 true leaves unfolded; harvest



501: End of harvest; main shoot begins to elongate, flower buds

APIACEAE

CARROT

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001-009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Number of true leaves	100-109	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded. The first few leaves are unifoliate. Starting about the fourth leaf they become multifoliate. Unifoliate and multifoliate leaves each count as one true leaf. Don't count individual leaflets.
Root diameter	401-420	Measure root diameter across the widest point on the crown starting when the crown begins to expand at 5-7 true leaves (i.e. ½" root diameter). Record median root diameter. 405 = .50" root diameter, 410 = 1", 415 = 1.5" root diameter.
Harvest	408-415	Record the date and crown diameter at harvest. First harvest varies by variety. Harvestable crown size is approximately ¾ -1½" diameter.
Ongoing harvest	415	Continue to note crown size in diameter if multiple harvests.
End of harvest	420	90% of roots have greater than or equal to 1 ½" diameter.

APIACEAE

CARROT



100: Cotyledons completely unfolded



101: First true leaf unfolded



103: 3 true leaves unfolded



106/405: 6 true leaves unfolded, 0.5 inch root diameter at crown



405: Root diameter at crown 0.5 inches



410: Harvest root diameter at crown 1 inch

APIACEAE

PARSNIP

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001-009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Number of true leaves	100-109	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded. The first few leaves are unifoliate. Starting about the fourth leaf they become multifoliate. Unifoliate and multifoliate leaves each count as one true leaf. Don't count individual leaflets.
Root diameter	401-425	Measure root diameter across the widest point on the crown starting when the crown begins to expand at 5-7 true leaves (i.e. ½" root diameter). Record median root diameter. 405 = .50" root diameter, 415 = 1.5", 420 = 2" root diameter.
Harvest	420-425	Record the date and crown diameter at harvest. First harvest varies by variety. Harvestable crown size is approximately 2-2½" diameter.
Ongoing harvest	415	Continue to note crown size in diameter if multiple harvests.
End of harvest	420	90% of roots have greater than or equal to 2 ½" diameter.

APIACEAE

PARSNIP



100: Cotyledons completely unfolded



101: First true leaf unfolded



103: 3 true leaves unfolded



105/410: 5 true leaves unfolded, 1.0 inch root diameter at crown



425: Root diameter at crown 2.5 inches



425: Harvest root diameter at crown 2.5 inches

ASTERACEAE

LETTUCE

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001-009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Transplant	102-104	Record the transplanting date and the number of true leaves at transplanting if appropriate.
Number of true leaves	100-114	Count number of fully unfolded true leaves. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 110 = 10 true leaves unfolded.
Number of true leaves	105-109	Count number of fully unfolded true leaves. 109 = 9 or more true leaves unfolded.
Rosette	110-114	Distinct circular cluster of leaves. Approximately 10-14 leaves.
Cupping	401	Tips of inner leaves begin to curl inwards on the edge, two youngest leaves do not unfold. ¹
Heading	402-409	Cupped leaves begin to overlap and cover the growing point of the plant forming a head. 402 = 20% of expected head size reached, 403 = 30%, etc. determine from harvest. 409 = typical size, form and firmness of heads reached.
First harvest		Record date at first harvest. The head reaches marketable size for the variety and leaves have not started to become bitter, 408-500.
End of harvest period	501-590	Main shoot inside head begins to elongate, flower buds become visible and heads become unmarketable. Stop here unless modeling seed production. 550 = 50% flowering, 590 = 90% flowering.

¹ Head lettuce

ASTERACEAE

LETTUCE



103: Transplant 3 true leaves unfolded



105: 5 true leaves unfolded



110: 10 true leaves/rosette



401: Rosette to cupping



402: Cupping to early heading



500: Harvest romaine




500: Harvest head lettuce



500: Harvest leaf lettuce

BRASSICACEAE

BROCCOLI AND CAULIFLOWER

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from the soil, estimate percent of crop emerged.
Transplant	102-104	Record the transplanting date and the number of true leaves at transplanting if appropriate.
Number of true leaves	100-114	Count number of fully unfolded true leaves. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 110 = 10 true leaves unfolded.
Cupping	150	The innermost heart leaves curve around the growing tip where the head will initiate. The innermost heart leaves, which are still growing in an upright fashion, are concealed by the larger, older leaves surrounding them. Approximately 12-16 leaves.
Head initiation	400	The harvestable head is visibly initiating on median plant. Head can be felt without destroying leaves (1/2" diameter). Head initiation can be detected destructively at a smaller diameter by cutting away leaves. Head initiation normally occurs at about 14-18 true leaves and earlier in broccoli than cauliflower.
Head development	401-409	Measure the diameter across the main head on each plant you examine. Use the average diameter from two  measurements at a 90° angle to each other, for example: Record median head diameter. 402 = 2" diameter, 406 = 6" diameter.
First harvest	424-428	Record date and head diameter at first harvest. First harvest varies by variety. 424 = first harvest with 4" median head diameter, 428 = first harvest with 8" head diameter.
Ongoing harvest	460	Harvest continues after first harvest and head diameter is no longer measured.
End of harvest period	501-590	Beginning of flower emergence, development pattern varies by variety. Heads become unmarketable. 501 = branches of inflorescence begin to elongate, 550 = 50% flowering 590 = 90% flowering

BRASSICACEAE

BROCCOLI



100: Cotyledons completely unfolded



103: 4 true leaves unfolded



107: 7 true leaves



401: Cupping



402: Head initiation



500: Head development



500: Harvest



500: Early flowering

BRASSICACEAE

BROCCOLI AND CAULIFLOWER

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from the soil, estimate percent of crop emerged.
Transplant	102-104	Record the transplanting date and the number of true leaves at transplanting if appropriate.
Number of true leaves	100-114	Count number of fully unfolded true leaves. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 110 = 10 true leaves unfolded.
Cupping	150	The innermost heart leaves curve around the growing tip where the head will initiate. The innermost heart leaves, which are still growing in an upright fashion, are concealed by the larger, older leaves surrounding them. Approximately 12-16 leaves.
Head initiation	400	The harvestable head is visibly initiating on median plant. Head can be felt without destroying leaves (1/2" diameter). Head initiation can be detected destructively at a smaller diameter by cutting away leaves. Head initiation normally occurs at about 14-18 true leaves and earlier in broccoli than cauliflower.
Head development	401-409	Measure the diameter across the main head on each plant you examine. Use the average diameter from two measurements at a 90° angle to each other, for example: ⊕ Record median head diameter. 402 = 2" diameter, 406 = 6" diameter.
First harvest	424-428	Record date and head diameter at first harvest. First harvest varies by variety. 424 = first harvest with 4" median head diameter, 428 = first harvest with 8" head diameter.
Ongoing harvest	460	Harvest continues after first harvest and head diameter is no longer measured.
End of harvest period	501-590	Beginning of flower emergence, development pattern varies by variety. Heads become unmarketable. 501 = branches of inflorescence begin to elongate, 550 = 50% flowering 590 = 90% flowering

BRASSICACEAE

CAULIFLOWER



100: Cotyledons completely unfolded



104: 4 true leaves unfolded



116/150: 16 true leaves unfolded/cupping



401: Head initiation, 1/2" diameter



404: Head development, 4" head diameter



427: Harvest, head diameter 7"

BRASSICACEAE

CABBAGE

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from the soil, estimate percent of crop emerged.
Transplant	102-104	Record the transplanting date and the number of true leaves at transplanting if appropriate.
Number of true leaves	100-114	Count number of fully unfolded true leaves. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 110 = 10 true leaves unfolded.
Pre-cupping	130	Approximately 10-12 leaves. The innermost heart leaves are growing in an upright fashion and begin to curve inwards. They are visible without moving any of the surrounding leaves. By the end of this stage the base of the stem and the bases of all leaves are concealed when the plant is viewed from above.
Cupping	150	Approximately 12-16 leaves. The innermost heart leaves, which are still growing in an upright fashion, are concealed by the larger, older leaves surrounding them. All visible leaves will later become the frame leaves (leaves not touching the mature head) of the mature plant.
Early head formation	401-403	Record the diameter across the head. A distinct head can easily be felt when squeezing, about 1-3" head diameter. 401 = 1" diameter, 403 = 3" diameter.
Head fill	404-412	Measure the diameter across the head on each plant you examine. Use the average diameter from two measurements at a 90° angle to each other, for example: ⊕ Record median head diameter. 404 = 4" diameter, 410 = 10" diameter.
First Harvest		Record date and head diameter at harvest. First harvest varies by variety (i.e. 407-412).
End of harvest period	501	Early maturing heads in the field are starting to split. More than 20% of the heads in the field have started to split.

BRASSICACEAE

CABBAGE



100: Cotyledons unfolded



103: 8 true leaves unfolded



107: 7 true leaves



401: Cupping



402: Early head formation, 2 inch head



404: Head fill, 4 inch head diameter



402: Harvest, 7.5 inch head diameter



404: End of harvest period, head split

BRASSICACEAE

KALE

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from the soil, estimate percent of crop emerged.
Transplant	102-104	Record the transplanting date and the number of true leaves at transplanting if appropriate.
Number of true leaves	100-114	Count number of fully unfolded true leaves. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 110 = 10 true leaves unfolded.
Stem elongation	305-319	Note beginning of stem elongation. For example, 305 = 5" visible stalk from the ground to the top growing point, 315 = 15" stalk length.
First harvest	401	Leaves have reached typical size and shape for harvest for that variety. (i.e. 10-12 leaves) If monitoring a variety trial, strip the lower leaves of about 5 plants to mimic ongoing harvest.
Ongoing harvest		Harvest continues
End of harvest period	501	Beginning of flower emergence. 501 = main shoot visible between uppermost leaves, 550 = 50% flowering, 590 = 90% flowering.

BRASSICACEAE

KALE



3 true leaves



5 true leaves



7 true leaves



Ongoing harvest, 15 true leaves

CUCURBITACEAE

CUCUMBER AND SUMMER SQUASH

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Transplant	101-103	Record the transplanting date and the number of fully unfolded true leaves at transplanting if appropriate. 101= 1 true leaf unfolded, 103 = 3 true leaves unfolded.
Number of true leaves	100-109	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded.
Flower bud development	501-509	Female flower buds are developing (elongated ovaries are visible on main stem). 501 = 1 st female flower bud visible, 505 = 5 th female flower bud visible.
Flowering	601-609	Female flowers open. 601 = 1 st open female flower, 605 = 5 th open female flower.
Fruit development	701-719	Measure developing fruit length. 701 = 1", 705 = 5" long fruit. Note any early fruit culling.
First harvest	745-747	Record the date and largest fruit length at harvest. First harvest varies by variety. 745 = harvest with 5" fruit, 747 = harvest with 7" fruit.*
Ongoing harvest	760	Harvest continues after first harvest and fruit length is no longer measured.
End of harvest	901	901 = Plants decline and fruit is no longer harvested.

*pickling = 742-744, slicing = 745-749, summer squash = 745-459

CUCURBITACEAE

CUCUMBER



100: Cotyledons completely unfolded



102: 2 true leaves unfolded



Male flower bud development



501: 1st female flower bud visible



Male flower open



601: 1st open female flower



702: Fruit development, 2 inch fruit



748: Harvest, 8 inch fruit length

CUCURBITACEAE

CUCUMBER AND SUMMER SQUASH

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Transplant	101-103	Record the transplanting date and the number of fully unfolded true leaves at transplanting if appropriate. 101= 1 true leaf unfolded, 103 = 3 true leaves unfolded.
Number of true leaves	100-109	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded.
Flower bud development	501-509	Female flower buds are developing (elongated ovaries are visible on main stem). 501 = 1 st female flower bud visible, 505 = 5 th female flower bud visible.
Flowering	601-609	Female flowers open. 601 = 1 st open female flower, 605 = 5 th open female flower.
Fruit development	701-719	Measure developing fruit length. 701 = 1", 705 = 5" long fruit. Note any early fruit culling.
First harvest	745-747	Record the date and largest fruit length at harvest. First harvest varies by variety. 745 = harvest with 5" fruit, 747 = harvest with 7" fruit.*
Ongoing harvest	760	Harvest continues after first harvest and fruit length is no longer measured.
End of harvest	901	901 = Plants decline and fruit is no longer harvested.

*pickling = 742-744, slicing = 745-749, summer squash = 745-459

CUCURBITACEAE

SUMMER SQUASH



009: Cotyledons emerge from soil



102: 2 true leaves unfolded



Flower bud and side shoot development



502/702: Flower bud development (2nd female flower bud visible)/ Fruit development, 2 inch fruit length



746: Harvest, 6 inch fruit length



760: Ongoing harvest

CUCURBITACEAE

WINTER SQUASH

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Transplant	101-103	Record the transplanting date and the number of fully unfolded true leaves at transplanting if appropriate. 101= 1 true leaf unfolded, 103 = 3 true leaves unfolded.
Number of true leaves	100-109	Count number of fully unfolded true leaves on main stem. 100 = cotyledons completely unfolded, 101 = first true leaf unfolded, 105 = 5 true leaves unfolded.
Flower bud development	501-509	Female flower buds are developing (elongated ovaries are visible on main stem). 501 = 1 st female flower bud visible, 505 = 5 th female flower bud visible.
Flowering	601-609	Female flowers open. 601 = 1 st open female flower, 605 = 5 th open female flower.
Fruit development	701-731	Record the length of the earliest developing fruit. 705 = largest fruit is 5" long, 715 = 15" long. Note any early fruit culling.
Fruit ripening	801-808	801 = 10% of fruits show typical fully ripe color, 802 = 20%, etc.,
Harvest	809	Fruit has reached typical harvest size, color and form for variety. Record first harvest date and fruit length at harvest. 809 = Fully ripe: fruits have typically fully ripe color.
Plant senescence	901	Vines are dying back (i.e. due to powdery mildew). This may occur before harvest.

CUCURBITACEAE

WINTER SQUASH



100: Cotyledons completely unfolded



102: 2 true leaves unfolded



105: 5 true leaves



501-601: Flower bud development and flowering



703-808: Fruit development and fruit ripening



809: Harvest, record fruit length and date

FABACEAE

SNAP BEANS

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = cotyledons emerge from soil, estimate percent of crop emerged.
Cotyledons unfolded	100	Cotyledonous seedlings are emerging from the soil and completely unfolded, growing point or true leaf initial visible. Estimate percent unfolded cotyledons.
Unifoliolate leaves	102	First 2 full leaves completely unfolded (first leaf pair).
Number of trifoliolate leaves	103-109	Count number of trifoliolate leaves. 103 = 3 rd true leaf (first trifoliolate leaf) unfolded, 105 = 5 th true leaf (2 nd trifoliolate leaf) unfolded.
Flower bud development	501-509	First flower buds visible. 501 = first flower buds visible, 505 = first flower buds enlarged, 509 = first petals visible.
Flowering	601	First flowers open
Pod development	701-70	Record length of most developed pod. 705 = .5", 710 = 1", 715 = 1.5".
Pod filling	705	First pods are filling as seed develops.
First harvest	707	Record date and harvest one bean pod from each of 10 plants. Remove one seed from the middle of each pod. Line the 10 seeds up tip to tip. Variety is ready to harvest when length measures 3.5-4".
Ongoing harvest (fresh market only)	710	Harvest continuing.
End of harvest	901	901 = Plants decline and remaining pods become over-mature for snap bean (i.e. hard, inedible pods)

FABACEAE

SNAP BEANS



100: Cotyledons completely unfolded



102: Unifoliate leaves, first leaf pair



103: 1st trifoliate leaf unfolded



501: 1st flower buds visible



502, 504, 601, 702, 710: (Left to right) First flower buds visible, first flower buds enlarged, flowers open, pod development < .25 inch length, pod development 1 inch length



720: Fruit development, 2 inch fruit



710: Ongoing harvest, 5 inch fruit length

POACEAE
SWEET CORN

Growth Stage	BBCH #	Description
Direct Seed	000	Note the seeding date if direct seeded in the field.
Germination	001 - 009	001 = seed can imbibe water due to soil moisture, irrigation or priming (this may be the same as direct seed date), 009 = coleoptile emerges from the soil. Estimate the percent of emergence.
Transplant	101-103	Record the transplanting date and the number of fully unfolded true leaves at transplant.
Number of true leaves	101-119	Count number of fully unfolded true leaves.* 101 = first leaf unfolded, 109 = ninth leaf fully unfolded.
Tassel development	501-509	Tassel develops at the top of plant. 501 = beginning of tassel emergence (tassel detectable at top of stem), 503 = tip of tassel visible, 505 = middle of tassel begins to separate, 509 = end of tassel emergence: tassel fully emerged and separated.
Ear and silk development	610-690	Ears emerge in leaf sheaths and silk develops. 610 = tip of ear emerging from leaf sheath, 630 = tips of first silk (i.e. 5%) visible, 650 = silk fully emerged, 670 = silk drying, 690 = silk completely dry.
Kernel development	701-709	Kernels fill to the tip of the ear and develop to milk and early dough. 701 = kernels at tip still at blister stage, 705 kernels at tip are full, 709 = kernels begin to dry to early dough.
Fresh market harvest	705	Cobs are mature with full kernels at tip; milk stage and sweet to taste, about 80% moisture content.
Processing market harvest	709	Kernels meet requirements for processing. Percent moisture: 72-73% for sugary types and 75-76% for sh2. Processor calls pick date.
Senescence	907	907 = plants dead

*leaf unfolded when tip of next leaf is visible

POACEAE

SWEET CORN



009: Coleoptile emerges from soil

101: First leaf unfolded

102: Two leaves unfolded



105: 5 true leaves unfolded



503: Tip of tassel visible

505: Tassel begins to separate

509: Tassel fully emerged



640: Silk emerging (75% visible)



670: silk drying



705: Fresh market harvest

SOLANACEAE

PEPPER

Growth Stage	BBCH #	Description
Transplant	104-107	Record the transplanting date and the number of fully unfolded true leaves.* Note if flowers are present.
Transplant shock		Note any leaf senescence that occurs. Also note when new growth begins indicating that transplant shock is over.
Number of true leaves	105-109	Count number of fully unfolded true leaves and leaf scars. 105 = 5 leaf scars and true leaves unfolded, 109 = 9 leaf scars and true leaves unfolded.
Side shoots	201-209	Optional: you can count number of side shoots instead of true leaves. 209 = 9 side shoots visible.
Flower bud emergence	501	First flower bud visible.
Bud development	502-509	Buds are present but flowers have not opened. 509 = flower buds visible.
First flowering	601-609	First flower open, record percentage of plants with first flower open. 601 = first flower open, 603 = 3 rd flower open.
Fruit set	620	First fruitlets visible but very small, i.e. < 1" diameter.
Fruit growth	621-629	First fruit expanding, estimate percent of full size for that variety. 621 = first fruit is 10% of typical full sized fruit, 625 = 50% of full size, 628 = 80% of full size.
Fruit development	701-719	Record the number of full-sized fruit that are still green. Typical fruit size varies with variety. For example, Sweet Italian types = 5-7" long, Bell types = 4-5".
First green harvest		If green fruit is harvested record the date and number of full-sized fruit at harvest. First green harvest varies by variety (i.e. about 704 for bell types).
Fruit color change	720-729	Most mature fruit is developing ripe color (i.e. red). For example, 720 = first fruit is breaker (first color change), 723 = first fruit is partially red, 729 = first fruit fully red.
Fruit ripening	801-809	Record the number of fruit that show typical ripe color. 801 = 1 st fruit is ripe, 804 = 4 th fruit is ripe.
First ripe harvest		Record the date and number of ripe fruits at harvest. First ripe harvest varies by variety (i.e. about 804 for bell types).
Ongoing harvest	820	Harvest continues after first harvest and ripe fruit no longer counted.
Senescence	901-907	901 = Plants decline and fruit is no longer harvested., 907 = plants dead.

*count number of leaf scars and fully unfolded true leaves before planting

SOLANACEAE

PEPPER



107: Transplant, 7 fully unfolded true



206: 6 side shoots visible



509: 9 flower buds visible



601: 1st flower open



623: First fruit is 30% of full size



626: First fruit is 60% of full size



706: First green harvest, 6 inch fruit



806: First ripe harvest, 6 fruit ripe color

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Growth Stage	BBCH #	Description
Transplant	104-107	Record the transplanting date and the number of fully unfolded true leaves.* Leaves are compound and multi-foliate, be sure not to count individual leaflets. Note horizontal or vertical planting and whether it was planted deep or shallow. Note if flowers are present.
Transplant shock		Note any leaf senescence that occurs. Also note when new growth begins indicating that transplant shock is over.
Number of true leaves	105-109	Count number of fully unfolded true leaves and leaf scars. 105 = 5 leaf scars and true leaves unfolded, 109 = 9 leaf scars and true leaves unfolded.
Side shoots	201-209	Optional: you can count number of side shoots instead of true leaves. 209 = 9 side shoots visible.
Pruning		Note any pruning
Flower bud emergence	501	First inflorescence visible (first bud erect).
Bud development	502-519	Buds are present but flowers have not opened. 509 = 9 inflorescences visible.
First flowering	601	First inflorescence: first flower open. Record percentage of plants with first flower open.
Flowering	602-609	Inflorescence with first flower open. 609 = 9 th inflorescence: first flower open.
Fruit set	620	First fruitlets visible but very small (<1" diameter). Period of cell division.
Fruit growth	621-629	First fruit on the first fruit cluster is expanding (>1" diameter). Estimate percent of full size for that variety. 621 = first fruit is 10% of typical full sized fruit, 625 = 50% of full size, 628 = 80% of full size.
Fruit development	701-719	Record the number of full-sized fruit that are still green. 701 = first fruit has reached typical size, 705 = 5 th fruit is full size.
Fruit color change	720-729	Most mature fruit is developing ripe color (i.e. red). For example, 720 = first fruit is breaker (first color change), 723 = first fruit is pink, 729 = first fruit fully red.
Fruit ripening	801-809	Record the number of fruit that show typical ripe color. 801 = 1 st fruit is ripe, 804 = 4 th fruit is ripe.
First harvest		Record the date and number of ripe fruits at harvest. First ripe harvest varies by variety (i.e. about 804 for slicing tomatoes).
Ongoing harvest	820	Harvest continues after first harvest and ripe fruit no longer counted.
Senescence	901-907	901 = Plants decline and fruit is no longer harvested. 907 = plants dead.

*count number of leaf scars and fully unfolded true leaves before planting

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105: Transplant, 5 fully unfolded true



208/508: 8 side shoots visible/ 8 unfolded



509: Flower bud development,



601: 1st inflorescence with flowers open



620: Fruit set



628: Fruit growth, first fruit is 80% of full



720-728: Fruit color change



802: Fruit ripening ,2nd fruit is ripe

Croptime

Growth Stage Guide

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Extension Service

