Chapter 5: Diagnostic Guide

1. Pre-emergence to emergence: Growth stages 1 & 2

WHAT TO LOOK FOR	WHAT TO DO	
1. Pre-emergence to emergence: Growth stages 1 & 2 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW** ▼	**NEXT TIME AROUND** ▼
POOR STAND REGULAR PATTERN Seeder problems	–	• Maintain seeder and check often for plugged runs • Make sure shovels, knives and discs are levelled before seeding
IRREGULAR PATTERN OR PATCHES Do not find seed *Low seeding rate*	–	• Use suggested seeding rate for local growing conditions
Deep seeding	–	• Use suggested seeding rate and depth for local growing conditions
Wireworms	–	• See Field Insect Pests
Cutworms	• Apply recommended insecticide if >4-5/m^2 • Determine if infestation limited to patches or over entire field	• See Field Insect Pests
Find adequate seed *Evidence of insect activity* *Wireworms*	–	–
Cutworms	• Apply recommended insecticide if >4-5/m^2	–
No evidence of insect activity ADEQUATE GERMINATION Normal seedlings –cold soil	–	• Plant a little later, especially in a cold spring • Use treated seed
–deep seeding	–	• Plant at 2.5-4 cm (1-1.5 in.) deep into firm moist soil
–soil crusting	• Use a harrow or packer bar to break up crust	• Leave more crop residue on soil surface • Adopt 0-till to build soil organic matter long-term • Avoid soils that crust easily • If irrigation is possible, sprinkle to soften crust
–untreated seed	–	• Buy certified seed • If you use farm-produced seed, slow down combine cylinder and/or open concave to reduce cracking
–seeding implement did not clear field trash properly	–	• Do a better job of spreading and chopping trash from previous crop
Abnormal seedlings –cracked or poor quality seed	–	• Buy certified seed • If you use farm-produced seed, slow down combine cylinder to reduce cracking
POOR GERMINATION Pre-emergent herbicide –trifluralin damage	–	• Apply trifluralin in fall only • Plant certified seed, shallow into firm, moist seedbed
No Pre-emergent herbicide –herbicide residues	–	•Check previous year's herbicide for residual characteristics
–adequate moisture • poor seed quality	–	•Buy certified seed
• fertilizer burn	–	•Band some or all fertilizer away from seed
• treated seed stored too long	–	•Treat seed as needed
• saline soils	• Provide proper fertility levels	• Use soil tests to choose land that is suitable for flax
–low moisture • too much spring tillage	• Use a packer to improve the seedbed	• Apply trifluralin and/or fertilizer in the fall • Avoid sandy land
• loose, unpacked soil	• Pack the soil	• Pack the soil • Adopt 0-till seeding
• treated seed stored too long	–	• Treat seed as needed

WHAT TO LOOK FOR	WHAT TO DO	
2. Seedling: Growth stages 3 & 4 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW** ▼	**NEXT TIME AROUND** ▼
YELLOWING LEAVES GENERAL OR UNIFORM GRADIENT OR PATTERN Chlorosis	–	• Plant more tolerant varieties
Herbicide drift injury from cyanazine	–	• Watch wind speed and direction when applying herbicides
Herbicide injury *Typical result of herbicide application*	–	• Separate grass and broadleaf weed control under hot, humid conditions
Stressful environmental conditions	• Spray in the evening or very early in the morning, or wait until the stressful conditions pass	• Spray in the evening or very early in the morning, or wait until the stressful conditions pass
IRRIGULAR PATTERNS OR PATCHES Wet or saturated soil	• Improve drainage on the field	• Improve drainage on the field • Plant crops that improve the water infiltration capacity of the soil • Adopt 0-till
Nutrient deficiency	• See Environmental Disorders • Improve drainage on the field • Do a plant tissue analysis test • Use a comparative soil plus tissue test from a good area in the field compared to a soil plus tissue test from a poor area within the same field	• See Environmental Disorders • Improve drainage on the field
Seedling blight and root rot	–	• Use treated, uncracked seed • Use seeder with on-row packing • Follow at least a three-year flax rotation • Avoid legumes or sugar beets as previous crops • For breakdown of quackgrass patches, spray in fall
WILTED PLANTS CUTWORMS	• Apply recommended insecticide if >4-5/m^2	–
HEAT CANKER	–	• Plant early at a high seeding rate
FROST DAMAGE	–	• Plant late to avoid spring frost
FUSARIUM WILT	–	• Plant resistant varieties and practise recommended crop rotations
STUNTED OR SHORT PLANTS COLD, WET WEATHER	–	–
HERBICIDE INJURY Bromoxynil/MCPA	–	• See Environmental Disorders • Separate grass and broadleaf weed control under hot humid conditions
Inappropriate rates of pre-emergent herbicides for soil type	–	• Read and follow label precautions, check levels of organic matter in the soil
Flax plants presensitized from pre-emergent herbicide	–	• Use post-emergent herbicides cautiously especially under stressful environmental conditions (e.g. cold and wet soils)
FERTILIZER BURN ESPECIALLY IN DRY SOIL CONDITIONS	–	• Follow the guidelines for safe rates of fertilizer applied with the seed • Apply low level of starter fertilizer with the seed and band the rest of the fertilizer in side or mid-row bands
ASTER YELLOW DISEASE AND CRINKLE DISEASE	–	• See Diseases • Seed early to avoid migrating leafhoppers
STUNTED OR SHORT PLANTS Quackgrass	• Apply a post-emergent graminicide (e.g. clethodim, Poast ® Ultra, quizalofop) • Apply a pre-harvest treatment (e.g. glyphosate)	• Apply pre-harvest or post-harvest treatment (e.g. glyphosate) to the previous crop (if registered on that crop)
Wild oats and volunteer cereals	• Apply a post-emergent graminicide (e.g. clethodim, Poast® Ultra, quizalofop)	• In areas where it is recommended, use fall tillage to encourage germination of volunteers • Apply a pre-emergent herbicide (e.g. Avadex®, Eptam 8-E®, trifluralin or Fortress®) • Use spring tillage to destroy the first flush of weeds and volunteers
Annual broadleaf weeds (no or few thistles or dandelions)	• Apply a post-emergent herbicide (e.g. Basagran® Basagran Forte®, bromoxynil and/or MCPA) • Check the crop 5-10 days after spraying for regrowth of weeds; re-spray if necessary	• Apply a pre-emergent herbicide (e.g. Authority®, trifluralin,Eptam 8-E®, Fortress®)
Canada thistle and sow thistle	• Apply post-emergent herbicide (e.g. Basagran®, bromoxynil/MCPA, Curtail M®, Lontrel®, MCPA) • Apply a pre-harvest, post-harvest treatment (e.g. glyphosate) • Check the crop 5-10 days after spraying for regrowth of weeds; re-spray if necessary	• Apply a pre-harvest, post-harvest treatment (e.g. glyphosate) in the previous crop (if registered on that crop)
Other perennials (e.g. Toadflax, dandelion)	• Apply a pre-harvest, post-harvest treatment (e.g. glyphosate)	• Apply a pre-harvest, post-harvest treatment (e.g. glyphosate) in the previous crop (if registered on that crop
All weeds		• Use a higher seeding rate and/or a seeding implement with a narrower row spacing and/ or wider seed spread pattern to increase in-crop crop competition for late emerging weeds

Weed Control Options In Flax

WEED CONTROL OPTIONS IN FLAX	RIGHT NOW			NEXT TIME AROUND		
	Action	Crop stage	Weed stage	Action	Crop stage	Weed stage
Quackgrass	Quizalofop	82 days*	2-6 leaf	Glyphosate	pre-harvest	4-5 green leaf
	Poast Ultra®	60 days*	1-3 leaf	Glyphosate	post-harvest	3-4 actively growing leaf
	Clethodim	60 days*	2-6 leaf		pre-plant	3-4 actively growing leaf
Wild oats, green and yellow foxtail, and volunteer cereals	Quizalofop	82 days*	2-early tillering	Fall tillage	post-harvest	post-emergent
	Poast Ultra®	60 days*	1-6 leaf (GF, YF),1-4 leaf (WO, vol. cereals)	Spring tillage	pre-plant	post-emergent
	Clethodim	60 days*	2-6 leaf	Glyphosate	pre-plant	post-emergent
				Eptam 8-E® (not in SK)	spring or fall pre-plant	pre-emergent
Wild oats, green and yellow foxtail				Trifluralin or Fortress®	pre-plant	pre-emergent
					pre-plant	pre-emergent
Wild oats only				Avadex®	fall or spring pre-plant	pre-emergent
Annual broadleaf weeds – Lamb's Quarters, Redroot Pigweed, Smartweed, Wild Mustard, Russian Thistle	Basagran®/ Basagran Forte®	>5 cm (>2 in.)	See Herbicide label	Authority®	Pre-plant (spring only)	pre-emergent (LQ, Pigweed only)
	Bromoxynil	5-10 cm (2-4 in.)	1-4 leaf,1-8 leaf (LQ)	Glyphosate	Pre-plant	post-emergent
	Bromoxynil/ MCPA	5cm (2 in.) to early bud, 5-10 cm (2-4 in.) best	<4 leaf, <8 leaf (LQ, W. Mustard)	Trifluralin	pre-plant (fall only)	pre-emergent (LQ, Pigweed, R.Thistle only)
	Curtail M®	5-15 cm (2-6 in.)	1-4 leaf (not R. Thistle)	Eptam 8-E® (not in SK)	pre-plant	pre-emergent (LQ, Pigweed only)
	MCPA	5cm (2 in.) to prebud, 5-10 cm (2-4 in.) best	2-4 leaf (LQ, W. Mustard only)	Fortress®	fall or spring pre-plant	pre-emergent (suppress LQ, Pigweed, R.Thistle only)
Annual broadleaf weeds – Kochia, Wild Buckwheat	Bromoxynil	5-10 cm (2-4 in.)	1-4 leaf (Kochia), 1-8 leaf (W.Buckwheat)	Authority®	pre-plant (spring only)	pre-emergent
	Bromoxynil/ MCPA	5cm (2 in.) to early bud, 5-10cm (2-4 in.) best	<4 leaf (Kochia), <8 leaf (W.Buckwheat)	Fortress®	fall or spring pre-plant	pre-emergent
	Curtail M®	5-15cm (2-6 in.)	1-4 leaf (W.Buckwheat only)	Glyphosate	pre-plant	post-emergent (W.Buckwheat only)
	Lontrel 360®	5-10cm (2-4 in.)	Young and actively growing (W.Buckwheat only)	Trifluralin	pre-plant (fall only)	pre-emergent (W.Buckwheat only)
Canada thistle	Basagran®/ Basagran Forte®	>5 cm (>2 in.)	15-20 cm (6-8 in.)			
	Bromoxynil/ MCPA	5 cm (2 in.) to early bud, 5-10cm (2-4 in.) best	top growth	Glyphosate	Pre-harvest	Bud and beyond
	Curtail M®	5-15cm (2-6 in.)	1-4 leaf	Glyphosate	Post-harvest	20-25cm (8-10 in.) or actively growing
	Lontrel 360®	5-10 cm (2-4 in.)	rosette to pre-bud stage			
	MCPA/MCPA K	5cm (2 in.) to pre-bud, 5-10cm (2-4 in.) best	2-4 leaf			

***pre-harvest interval, **plus above herbicides, CAUTION! Always read and follow label directions.**

2. Seedling: Growth stages 3 & 4 (cont'd)

WHAT TO LOOK FOR	WHAT TO DO	
2. Seedling: Growth stages 3 & 4 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	RIGHT NOW	NEXT TIME AROUND
WEEDS ARE NOT CONTROLLED		
STRESSFUL ENVIRONMENTAL CONDITIONS		
Temperature extremes (hot and cold)	–	• Read and follow label cautions relating to environmental conditions
Drought	–	• Read and follow label cautions relating especially to environmental conditions
RAIN TOO SOON AFTER APPLICATION OF HERBICIDE	• Wait to see if control symptoms appear before respraying	• Spray only when rain not imminent
INCORRECT APPLICATION RATE	–	• Read and follow label directions, especially under stressful environmental conditions
INCORRECT WATER VOLUMES	–	• Use recommended water volume and pressure, especially with contact herbicides
SURFACTANT NOT ADDED AS NEEDED	–	• Add all recommended components of a herbicide for maximum efficiency
INADEQUATE SOIL INCORPORATION OF PRE-EMERGENT HERBICIDES		
Incorporation delayed too long after application	–	• Incorporate according to the manufacturers' directions
Incorrect incorporation depth	–	• Incorporate according to the manufacturers' directions
Incorrect number or direction of incorporation passes	–	• Incorporate according to the manufacturers' directions
ANTAGONISTIC HERBICIDE TANK MIX	–	• Use only registered tank-mixes
INCORRECT WEED STAGE	–	• Identify weeds, then read and follow label directions for leaf stages for each weed
NOT ENOUGH DAYS BETWEEN TWO HERBICIDE APPLICATIONS	–	• Allow recommended number of days between non-tankmixable herbicides
RESISTANCE OF WEEDS TO A HERBICIDE OR HERBICIDE GROUP	–	• Rotate between herbicide groups (see provincial guides) • Use integrated weed-control strategies (cultural, biological, physical, and chemical control)
UNSUITABLE WATER USED TO MIX WITH HERBICIDES	–	• Use water known to produce good results when mixed with herbicides
NOT ENOUGH IN-CROP COMPETITION FROM FLAX	–	• Use a higher seeding rate and/or a seeding implement with a narrower row spacing and/or wider seed spread pattern to increase in-crop competition for late emerging weeds.

3. Stem extension and tillering: Growth stages 5

WHAT TO LOOK FOR	WHAT TO DO	
3. Stem extension and tillering: Growth stages 5 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW**	**NEXT TIME AROUND**
LEAF FEEDING BERTHA ARMYWORM	• Monitor the problem and spray with a recommended insecticide if feeding is extensive or before boll feeding begins	–
ARMY CUTWORM	• Monitor and spray with a recommended insecticide when larvae populations reach 4-5/m^2	–
ZEBRA CATERPILLAR	• Not normally a significant problem in flax	–
LEAF SPOTS RUST	–	• Practise recommended crop rotations • Use rust-resistant varieties
LEAF LOSS PASMO DISEASE	–	• Use treated seed early at recommended rates, use lodge resistant varieties, control weeds and practise recommended crop rotation • Foliar application of fungicide at early flowering
DEFORMED OR PUCKERED LEAVES CRINKLE	–	• See Diseases
ASTER YELLOWS	–	• See Diseases • Plant as early as possible to reduce incidence and severity of the disease
REDUCED TILLERING CRINKLE	–	• See Diseases
TOO HEAVY SEEDING RATE AND PLANT STAND	–	• See Seed and Seeding Practices • Plant at recommended seeding rate for local soil type and moisture conditions
Bending stem (S shaped) HERBICIDE INJURY FROM MCPA, ESPECIALLY IN HOT HUMID WEATHER	–	• Delay application of MCPA to evening or early morning if hot conditions persist

4. Top branching, bud formation and early flowering: Growth stages 6-8

WHAT TO LOOK FOR	WHAT TO DO	
4. Top branching, bud formation and early flowering: Growth stages 6-8 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW**	**NEXT TIME AROUND**
LODGING TOO HEAVY SEEDING RATE AND PLANT STAND	–	• Plant varieties more tolerant to lodging • Plant at recommended seeding rate for local soil type and moisture conditions
TOO MUCH NITROGEN	–	• Soil test and apply fertilizer according to a realistic target yield
ROOT ROT	–	• See Diseases • Practise recommended crop rotations • Use a recommended seed treatment • Avoid legumes or sugar beets as previous crops
STEM BREAK AND BROWING DISEASE	–	• Use disease-free, certified seed • Use a recommended seed treatment • Practise recommended crop rotations
REDUCED FLOWING OR NO FLOWERS Lygus bug damage to growing tips of plants	• Monitor with a sweep net • Economic thresholds not developed	–
DIEBACK OF TERMINAL BUDS Soil too high in lime	–	• Soil test and add nutrients to correct the imbalance in the soil
Wet or saturated soils	• Improve surface drainage on the field	• Practise recommended crop rotation for local soils
Chlorosis	–	• Practise recommended crop rotation for local soils • Use chlorosis resistant varieties
EXCESSIVE BRANCHING FROM LOWER STEMS WET OR SATURATED SOILS	• Improve surface drainage on the field	• Practise recommended crop rotation for local soils
LOW PLANT DENSITY	–	• Use suggested seeding rate for local growing conditions

5. Flowering and boll formation: Growth stages 9, 10 & 11

WHAT TO LOOK FOR	WHAT TO DO	
5. Flowering and boll formation: Growth stages 9, 10 & 11 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW** ▼	**NEXT TIME AROUND** ▼
EGGS IN FLOWERS FLAX BOLLWORM	• Economic infestations not common	–
SMALL GREEN INSECTS ON STEMS AND LEAVES APHIDS Note: Juvenile Lygus bugs are also small green insects but are very active compared to aphids	• Apply a recommended insecticide if 3 or more aphids are found on a stem at full flower, or 8 or more at green boll stage	–
DEFORMED FLOWERS ASTER YELLOWS	–	• Seed as early as possible to avoid migrating leafhoppers in mid to late season
HOLES IN BOLL FLAX BOLLWORM	• Economic infestations not common	–
BOLLS MISSING GRASSHOPPERS Note: Bertha armyworm can also clip bolls in flax	• If damage is from grasshoppers, apply a recommended insecticide when populations exceed 2/m^2	• Plant trap crop around field
PASMO DISEASE ALONG WITH STRONG WINDS AND RAIN	–	• Practise recommended crop rotations
PREMATURE RIPENING PASMO DISEASE	–	• See Diseases • Practise recommended crop rotations
DEAD PLANTS IN PATCHES ESPECIALLY IN LODGES AREAS PASMO DISEASE	–	• See Diseases • Practise recommended crop rotations
WILTED PLANTS ESPECIALLY ON WARM DAYS ROOT ROT	–	• See Diseases • Practise recommended crop rotations

6. Mature: Growth stage 12

WHAT TO LOOK FOR	WHAT TO DO	
6. Mature: Growth stage 12 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW** ▼	**NEXT TIME AROUND** ▼
LOW YIELD LOW SOIL PHOSPHORUS LEVELS	–	• Soil test to determine P level. Apply safe rate of phosphate with the seed and side or mid-row band any additional amounts needed • Apply additional phosphorus to the crop previous to flax
LOW NITROGEN LEVELS	–	• Soil test and apply fertilizer according to a realistic target yield
DESICCATED CROP TOO EARLY	–	• Apply desiccant when 75% of bolls have turned brown
ROOT ROT	–	• See Diseases • Use treated, uncracked seed • Use seeder with on-row packing • Follow at least a three-year flax rotation • Avoid legumes or sugar beets as previous crops
LATE PLANTED CROP	–	• Do some or all seedbed preparation the previous fall • Seed earlier, if possible
TOXIC EFFECTS FROM CANOLA/MUSTARD STUBBLE ESPECIALLY IN UNSPREAD SWATH	–	• Use a chaff spreader and a fine-cut straw chopper on the combine • Practise recommended crop rotation • Do not seed flax on canola/mustard stubble
BOLLS MISSING OR SCATTERED ON THE GROUND HIGH WINDS	–	• Plant varieties more tolerant to boll drop • Harvest the crop at the appropriate stage of maturity, especially if a desiccant has been used
LOW BUSHEL WEIGHT DESICCATED CROP TOO EARLY	–	• Apply desiccant when 75% of bolls have turned brown
SWATCH BLOWS EASILY CROP CUT TOO LOW	–	• Leave 10-15 cm (4-6 in.) of stubble • Straight harvest flax • Consider use of a swath roller
SWATH TAKES A LONG TIME TO DRY CROP CUT TOO LOW	–	• Leave 10-15 cm (4-6 in.) of stubble to keep swath off ground and facilitate drying

6. Mature: Growth stage 12

WHAT TO LOOK FOR	WHAT TO DO	
6. Mature: Growth stage 12 The colour box corresponds to the growth stages in Figure 4-1, pages 16-17	**RIGHT NOW** ▼	**NEXT TIME AROUND** ▼
SWATHER GUMS UP CUTTING KNIVES TOO OLD AND DULL	• Replace cutting knives	• Replace worn cutting knives • If knives are OK, lubricate the cutting bar with light oil
DELAYED MATURITY HERBICIDE INJURY FROM MCPA, BROMOXYNIL	–	• Read and follow label cautions relating especially to environmental conditions • Plant earlier maturing varieties
EXCESS NITROGEN	–	• Soil test and apply fertilizer according to realistic target yield
CRACKED OR DAMAGED SEED COMBINE CYLINDER SPEED TOO HIGH	• Reduce cylinder speed	• Reduce cylinder speed
COMBINE CONCAVE SET TOO TIGHT	• Increase concave clearance • REFER TO OWNERS' MANUAL TO DETERMINE THE CORRECT COURSE OF ACTION FOR CHANGING COMBINE SETTINGS	• Increase concave clearance • REFER TO OWNERS' MANUAL TO DETERMINE THE CORRECT COURSE OF ACTION FOR CHANGING COMBINE SETTINGS
SEED TOO DRY	• Adjust combine during day to adjust for changes in temperature and humidity	• Adjust combine during day to adjust for changes in temperature and humidity
HIGH DOCKAGE UNCONTROLLED WEEDS IN FIELD	–	• Recheck fields for weeds after control measures have been taken • Increase crop competition by increasing the seeding rate and/or decreasing the row spacing and/or increasing the seed spread in the row
VOLUNTEER CROPS IN FIELD	–	• In areas where suitable, use previous fall tillage to encourage volunteers to grow • Control crops with suitable herbicides • Increase in-crop competition by increasing the seeding rate and/or decreasing the row spacing and/or increasing the seed spread in the row
BROKEN SEEDS IN SAMPLE	• Slow down combine cylinder speed, open cylinder, open bottom sieve	• Slow down combine cylinder speed, open cylinder, open bottom sieve
EARTH PELLETS	• Raise the combine pickup	• Leave a 10-15 cm (4-6.) stubble to keep the swath off the ground • Raise the combine pickup
EXCESS DOCKAGE IN HOPPER	• Close bottom sieve	• Close bottom sieve
EXCESS DOCKAGE IN HOPPER AND LOW SHOE LOSS OUT OF REAR OF COMBINE	• Increase fan speed	• Increase fan speed
LOW GRADE LOW TEST WEIGHT	• Increase combine fan speed	• Leave at least a 10-15 cm (4-6 in.) stubble so swath does not touch ground • Raise combine pickup • Pack or roll the field after planting
STONES	• Raise combine pickup	• Leave at least a 10-15 cm (4-6 in.) stubble so swatch does not touch ground • Raise combine pickup • Pack or roll the field after planting
INSEPARABLE SEEDS (e.g. LADIES THUMB OR GREEN SMARTWEED)	–	• Check fields after weed control and re-spray if necessary • Plant varieties with larger seed size
Occasionally small wild oats, mustard, canola	–	• Check fields for weeds often and after using a control method
BROKEN SEEDS	• Slow down the combine cylinder speed, open cylinder, open bottom sieve	• Slow down the combine cylinder speed, open cylinder, open bottom sieve

NOTE:

RIGHT NOW—means this year
NEXT TIME AROUND—means the next time you plant flax

CAUTIONARY NOTE:

This Diagnostic Guide describes many commonly observed flax production problems. Because the guide is written for general information only, it is recommended that the reader obtain the opinion of professionals such as provincial Agrologists, crop consultants, or manufacturers' representatives to confirm specific field problems.

Weed control recommendations for flax are published annually by provincial departments of agriculture. For these publications and for the latest information and specific recommendations for your area, consult your provincial Agrologists, crop consultants, pesticide company rep or weed supervisor.