Growing Something Besides Corn and Soybean:

Production Issues With Alternative Crops

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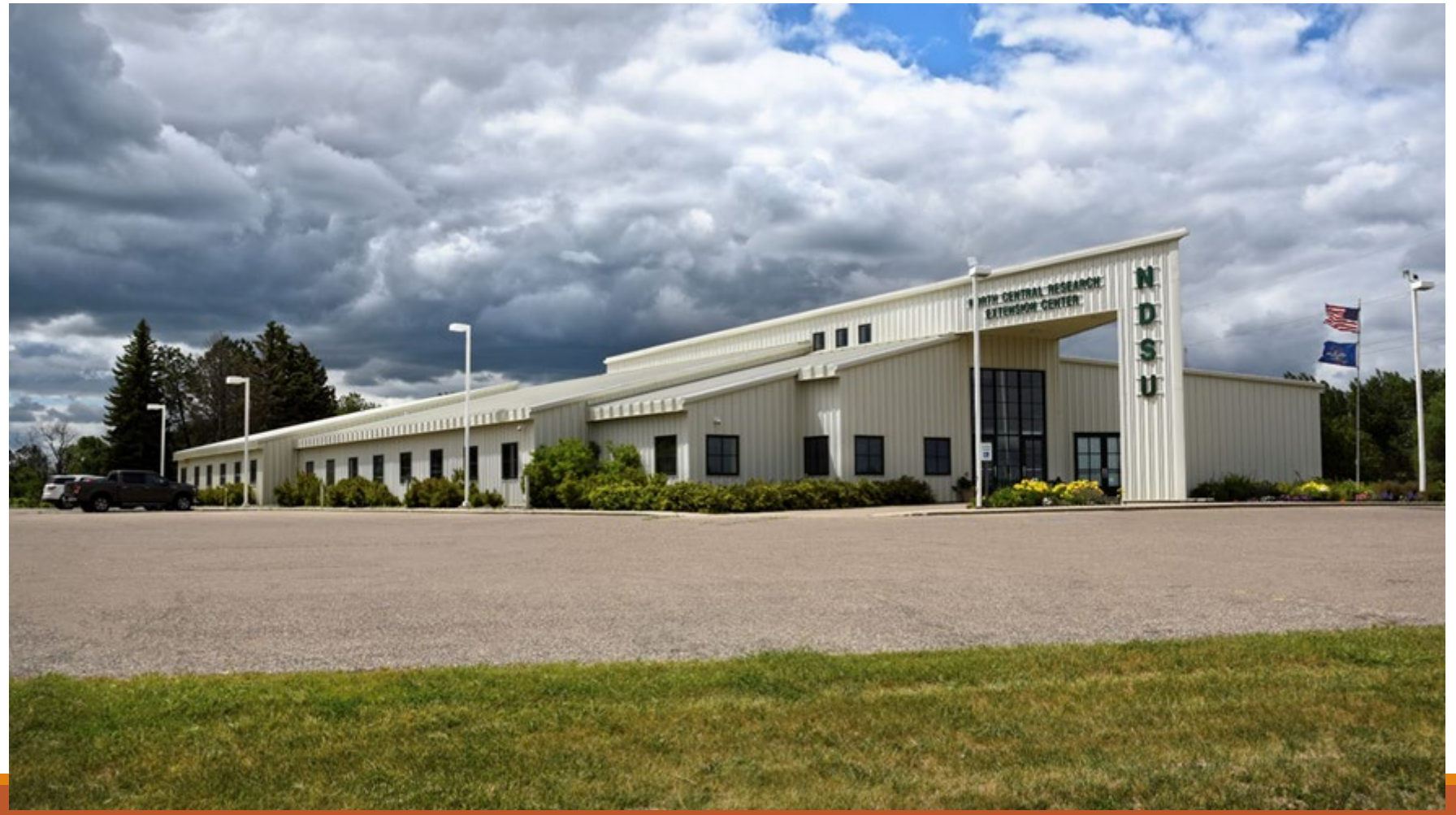

For your consideration…..

Marketing

Plant/harvest equipment

Seed and inoculant

Crop insurance

Herbicide carryover

Crop rotations

Residue management

Limited tolerance for glyphosate

Soil fertility

Transportation

Weed control

Heavy reliance on PRE or PPI

Quality discounts

Disease control

Planting date

Seed treatments

Insects

Field selection

RMA Rotation Requirements for oilseed crops as of January 2019

CANOLA

Insurance will not attach to any acreage on which canola, crambe, chickpeas, dry beans, mustard, rapeseed, or sunflowers have been planted in either of the preceding two crop years (three year rotation) Exception: Black leg Resistant variety

MUSTARD

In accordance with section 8 of the Mustard Crop Provisions, insurance will not attach to any acreage on which crambe, mustard, canola, chickpeas, dry beans, rapeseed or sunflowers have been planted in the preceding crop year.

SUNFLOWER

Insurance will not attach to any acreage on which sunflowers, canola, crambe, dry beans, safflowers, mustard, or rapeseed was planted in the previous crop year.

Canola tolerance to Spartan (sulfentrazone)

BRIAN JENKS, NDSU

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ED DAVIS, MSU

DAVE GRAFSTROM, MN

Background

- Canola growers rely solely on postemergence herbicides (Glyphosate, Liberty)
- Spartan is a soil-applied herbicide that controls broadleaf weeds
- Have observed previously that Spartan is weak on mustard species
- Spartan is not labeled for use in canola
- Current rotation restriction to canola is 12-24 months depending on label
- If safe on canola, Spartan could control some Gly-resistant weeds, such as kochia
- Could help canola growers not be so reliant on postemergence herbicides
- Even if a label is not achievable, the data may be useful to modify rotation restriction to canola

Spartan activity in soil

- Spartan is more active (most injury) in soils with:
  - High pH
  - Low organic matter
  - Light texture (e.g., sandy loam)

- High organic matter can serve as a buffer and reduce crop injury in high pH soils.

Objectives

- Determine canola tolerance to Spartan at different stages (PRE and early POST)
- Evaluate two rates (2 and 4 fl oz)
- Four environments (Langdon and Minot, ND; Roseau, MN; Bozeman, MT)

Canola tolerance to Spartan (sulfentrazone)

Treatment	Rate	Timing	Yield (lb/A)			
			Langdon	Roseau	Minot	Bozeman
No Spartan			3270	2846	1792	1602
Spartan	2 oz	PRE	3139	---	1782	1451
Spartan	4 oz	PRE	3221	---	1720	1060
Spartan	2 oz	Cracking	3048	2712	1684	1281
Spartan	4 oz	Cracking	2673	2467	1582	1282
Spartan	2 oz	1-leaf	3195	2806	1490	1587
Spartan	4 oz	1-leaf	3073	2780	1401	1618
Spartan	2 oz	2-3 leaf	3049	2753	1610	1674
Spartan	4 oz	2-3 leaf	3218	2610	1550	1622
LSD (0.05)			284	223	NS	224
CV			6.3	5.6	9.8	10.5
			Loam pH 6.7 OM 4.8	Loam pH 8.3 OM 4.5	Loam pH 7.2 OM 3.2	Silt Loam pH 7.0 OM 2.6

Results and Discussion

- Spartan caused some visible injury at all locations.
- Injury was generally greater with 4 oz compared to 2 oz
- We observed a “rep effect” at Minot and Bozeman, with more injury as pH increased. In other words, one rep had a higher pH than another rep.
- Yield was reduced slightly by Spartan in some treatments
- Langdon and Roseau data showed how higher OM can reduce crop injury
- Canola can tolerate Spartan in fields with the right soil characteristics, but unfortunately, soil characteristics vary even within a field.
- Conditions were generally very dry in 2018. We plan to repeat the study in 2019 and hope for more rainfall to evaluate canola tolerance under wetter conditions. Timing of rainfall may influence crop tolerance.

2018 Intercropping Trials-NCREC
E. Eriksmoen

Long history of intercropping world wide

Current interest in intercropping from soil health and cover crop movement

Anecdotal reports of disease control and synergistic effects

Flax with Chickpea or Lentil

Canola with Pea or Faba

Carinata with Pea or Faba

Safflower with Chickpea

Chickpea with Flax or Safflower

Lentil with Flax

Pea with Canola or Carinata

2018 Intercropping Trials-NCREC
E. Eriksmoen

Canola

Intercropping Combination	Visual Stand	Canola Population	Disease	Maturity Date	Plant Height	Test Weight	Oil Content	Canola Yield
	%	plants/A	%	August	inches	lbs/bu	%	lbs/A
Monoculture Canola	93 a	145,506 a	0 a	6 a	37 a	51.0 a	41.0 a	2361 a
Canola + Dry Pea	81 a	138,169 a	0 a	6 a	37 a	51.0 a	41.0 a	1409 b
Canola + Faba Bean	80 a	117,994 a	0 a	7 a	34 a	50.9 a	40.4 b	1370 b

Values followed by different letters are statistically different ($p<0.05$)

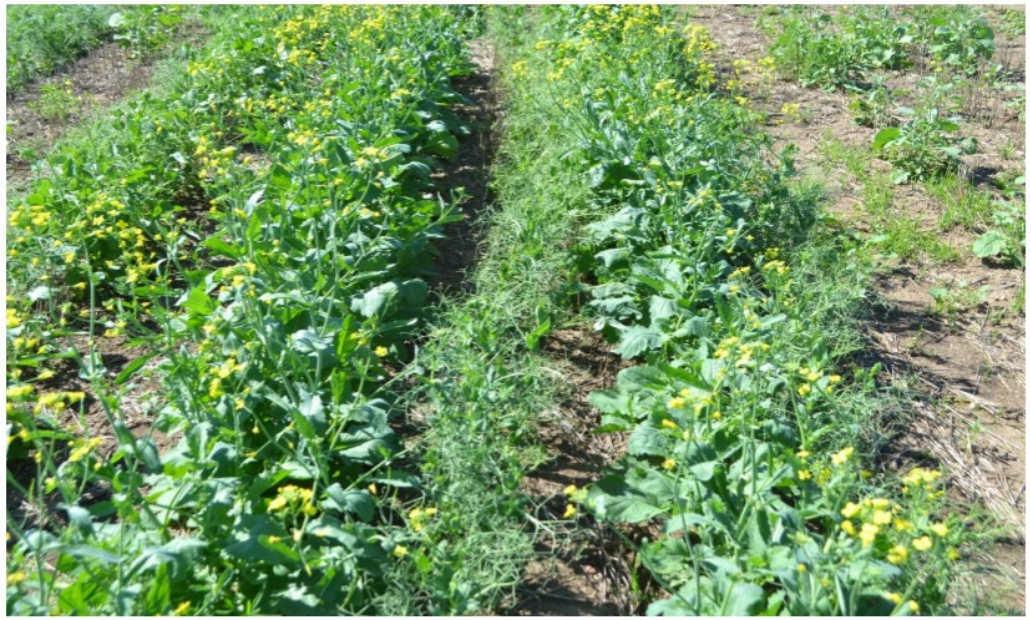
Planting Date: May 10 Harvest Date: August 28

Variety: Invigor 140P Planting Rate: 400,000 seeds/A

Economic Return-Intercropping

Gross Financial Return Per Acre

Monoculture Flax	$122
Monoculture Canola	$366
Monoculture Safflower	$141
Monoculture Chickpea	$232
Monoculture Dry Pea	$179
Monoculture Faba Bean	$76
Monoculture Lentil	$54
Flax + Chickpea	$192
Flax + Lentil	$92
Canola + Dry Pea	$308
Canola + Faba Bean	$259
Safflower + Chickpea	$143



RMA Rotation Requirements for pulse crops as of January 2019

PEA AND LENTIL

Short Version: 2-years out if peas or lentil were planted the previous year and 1-year out if chickpeas or lentils or pea were planted the previous year. Applies to peas, lentils, and chickpeas in cover crop mixes.

CHICKPEA

Short Version: 3-years out if chickpeas were planted the previous year. Applies to chickpeas in cover crop mixes.

FAVA

Short Version: 2-years out if fava beans were planted the previous year and 1-year out if any peas, lentils, or chickpeas were planted the previous year. Applies to fava beans, lentils, peas, and chickpeas in cover crop mixes.

Enhancing Pea Protein thru Management

M. Ostlie CREC

Treatments:

Control

Inoculant (300K)

Inoculant (175K)

Inoculant (425K)

40 lb N +inoculant

100 lb N + inoculant

Inoculant + post bloom

Inoculant + post bloom (twice)

Enhancing Pea Protein thru Management

M. Ostlie CREC

Treatment	Phytotoxicity	Stand	PM	Test Weight	Yield	Protein	KWT
	%	plants/a	days	lb/bu	bu/a	%	g/1000
Check (no inoculant)	0.0	334887.2	81.3	65.3	59.6	27.58	216.9
inoculant only (300 k plant/a)	0.0	356588.3	81.8	65.4	59.9	27.27	220.5
inoculant 175k plant/a	0.0	265719.7	82.2	65.4	61.0	27.60	222.5
inoculant 425 k plant/a	0.0	445365.5	80.3	65.2	64.6	27.78	208.8
40 lb N + inoculant	0.0	341792.1	81.8	65.3	59.4	27.35	216.2
100 lb N + inoculant	0.0	387167.1	81.3	65.5	59.7	27.38	215.6
40 lb N + inoc. + Post bloom N	0.0	351656.3	81.7	65.4	60.3	28.32	214.3
Desiccation	0.0	379769.0	81.3	65.4	62.2	27.63	210.2
Mean		357868.1	81.5	65.4	60.8	27.6	215.6
LSD (0.05)		64116.0	1.4	NS	NS	0.44	8.9

Why Enhance Pea Protein?

ADM 2019 Pea Contracts Highlights

- 30 bu ‘Act of God’ contract
- On farm pickup
- Certified seed purchase required
- Option to purchase > 30 bu
- Premium for high protein
- Glyphosate-free during/after
- Rotation requirements

ADM 2019 Pea Contracts

Approved Varieties

CDC Meadow

Agassiz

Durwood

Korando

Salamanca

Spider

Protein Premium

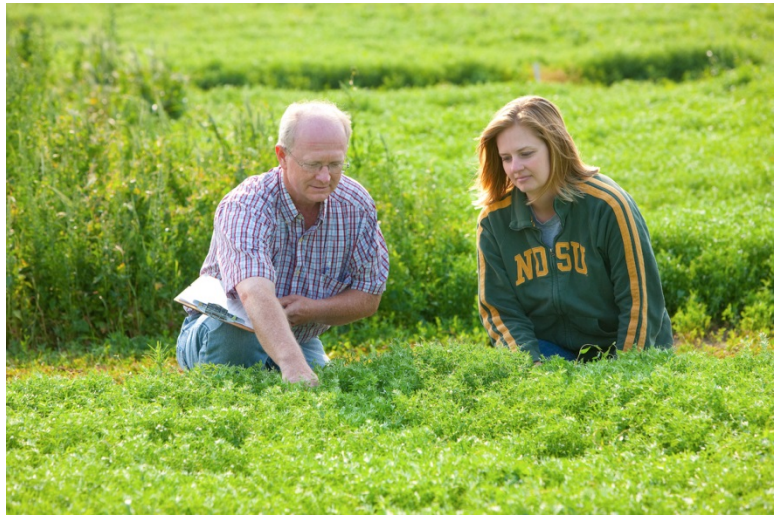
Basis 24%, a 4.5% premium of contract price (C/P) each 1% over 24.0 to 28.0 prorated each tenth.

Herbicides in Pulse Rotation

Pulse crops are not competitive

Generally, pulse crops have limited POST options

Rely heavily on PPE and burndown



Effect of Seeding Rate, Date, and Herbicides on Lentil

- Jenks, et.al
- Every herbicide causes some lentil injury
- Injury may be chlorosis, stunting, stand reduction
- Can we compensate for stand reduction by increasing seeding rate?

Impact of Herbicides and Seeding Rate on Lentil Yield and Quality

Table. Impact of herbicides and seeding rate on lentil yield and quality (1119)

			Lentil				
			Injury		Height	Yield	TW
Treatment[ab]	Rate	Timing	9-Jul	17-Aug	4-Aug	15-Sep	
12 Plants per ft^2			----------%----------		cm	lb/A	lb/bu
Sharpen + Prowl H2O	1 fl oz + 3 pt	PRE	23	5	33.7	1068	62.8
Prowl	3 pt	PRE	17	5	33.3	1182	62.8
Sharpen + KIH-485	1 fl oz + 0.15 lb	PRE	16	8	34.2	1254	62.5
KIH-485	0.15 lb	PRE	15	6	35.1	1233	62.3
Sharpen + Spartan	1 fl oz + 3 fl oz	PRE	24	15	31.7	799	62.8
Spartan	3 fl oz	PRE	11	7	32.4	1124	62.8
Handweeded			10	3	33.8	1160	62.4
18 Plants per ft^2							
Sharpen + Prowl H2O	1 fl oz + 3 pt	PRE	17	2	33.5	1214	62.2
Prowl	3 pt	PRE	14	2	35.8	1373	62.2
Sharpen + KIH-485	1 fl oz + 0.15 lb	PRE	16	3	33.7	1282	61.6
KIH-485	0.15 lb	PRE	10	3	34.3	1358	61.6
Sharpen + Spartan	1 fl oz + 3 fl oz	PRE	20	7	34.3	1336	62.1
Spartan	3 fl oz	PRE	19	5	35.3	1677	62.6
Handweeded			0	0	35.3	1592	62.1
LSD (0.05)			5	5	NS	NS	NS
CV			24	64	5.2	23	1.4

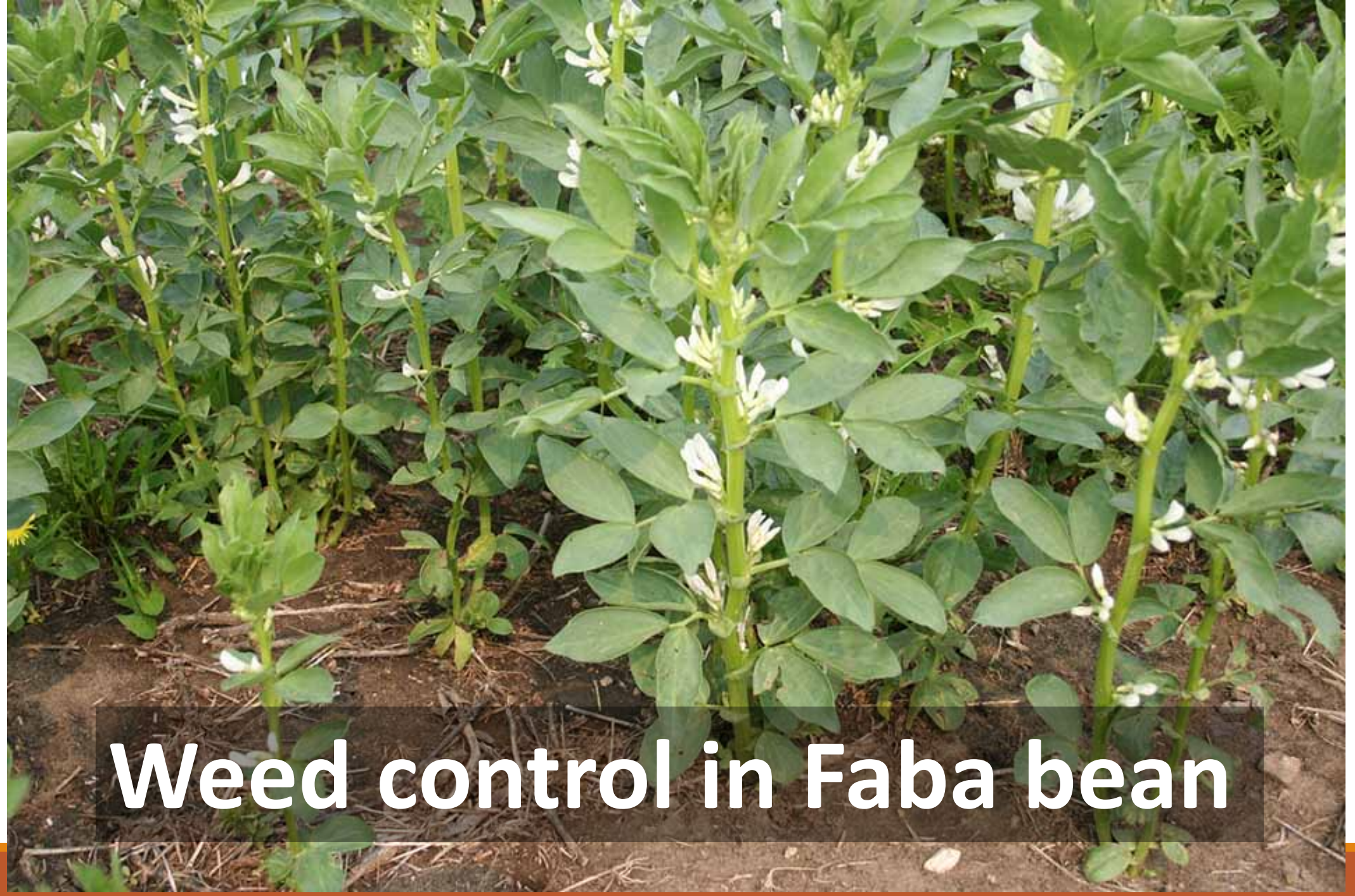
[a] *Sharpen applied with MSO (1%) + AMS (2.5%); Beyond applied with NIS (0.25%) + 28% N (2.5%)*

[b] *Beyond (4 fl oz) applied POST to all treatments*

Dry pea, lentil, and sunflower tolerance to fall-applied 2,4-D and dicamba

Treatment	Rate	Timing	Lentil Injury
			Aug-9
Untreated			0
2,4-D-ester	1 pt	Sep-28	0
	1 pt	Oct-13	0
	1 pt	Oct-25	0
2,4-D-ester	2 pt	Sep-28	15
	2 pt	Oct-13	13
	2 pt	Oct-25	12
Dicamba	4 oz	Sep-28	15
	4 oz	Oct-13	28
	4 oz	Oct-25	40
Dicamba	8 oz	Sep-28	42
	8 oz	Oct-13	53
	8 oz	Oct-25	75
LSD (0.05)			18.3


Untreated
Tough + COC
1.5 pt + 1.25 pt



Weed control in Faba bean

Herbicides registered in Faba bean

Soil-applied

Spartan Charge
Spartan Elite
Prowl H2O
Dual Magnum
Sonalan
Treflan

POST-applied

Basagran
Varisto
Select
Assure II

Desiccants

Gramoxone
Roundup

Faba bean tolerance to PRE and POST herbicides.

Treatment	Rate	Timing	Injury		
			Jun-14	Jul-16	Aug-2
			——————%——————		
Untreated			0	0	0
Sharpen	2 oz	PRE	0	0	0
Spartan	4 oz	PRE	0	0	0
Spartan + Sharpen	4 oz + 1 fl oz	PRE	0	0	0
Authority MTZ	12 oz	PRE	30	25	26
BroadAxe	25 oz	PRE	0	0	0
Metribuzin	0.5 lb	PRE	60	51	52
Prowl H2O	3 pt	PRE	0	0	0
Valor	2 oz	PRE	0	0	0
Fierce	3 oz	PRE	0	0	0
Prowl H2O / Basagran + COC	2 pt / 2 pt + 1.5 pt	PRE / POST	9	8	8
Prowl H2O / Raptor[a]	2 pt / 4 fl oz	PRE / POST	35	22	24
Prowl H2O / Basagran + Raptor[b]	2 pt / 1 pt + 4 fl oz	PRE / POST	9	6	6
Tough	1.5 pt	POST	65	49	53
LSD (0.05)			6.2	12.0	12.1

[a]Applied with MSO (1.5 pt) and 28% N (2.5%)
[b]Applied with MSO (1.5 pt)

What about rotation after pulses?

Spartan Charge (carfentrazone+sulfentrazone)

- Canola, flax, oat, safflower, sugarbeet

BroadAxe (metolachlor+sulfentrazone)

- Canola, crambe, oat, sugarbeet

Pursuit (imazethapyr)

- Canola, crambe, flax, safflower, sunflower, sugarbeet

Raptor/Beyond (imazamox)

- Barley, canola, crambe, flax, safflower, sugarbeet

Pulse Benefits to Succeeding Crops

Nitrogen contribution to succeeding crops

- Increase yield and protein of cereals
- N fixation
- N released through decomposition

Non-nitrogen benefits

- Breaks up weed, disease, insect cycles

Economic benefits

- Year/price dependent

Questions