



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada



# Science behind Seeding Date

Yantai Gan  
Agriculture & Agri-Food Canada  
Swift Current, Saskatchewan

Canada

# Outline

**1.Importance of Seeding Date**

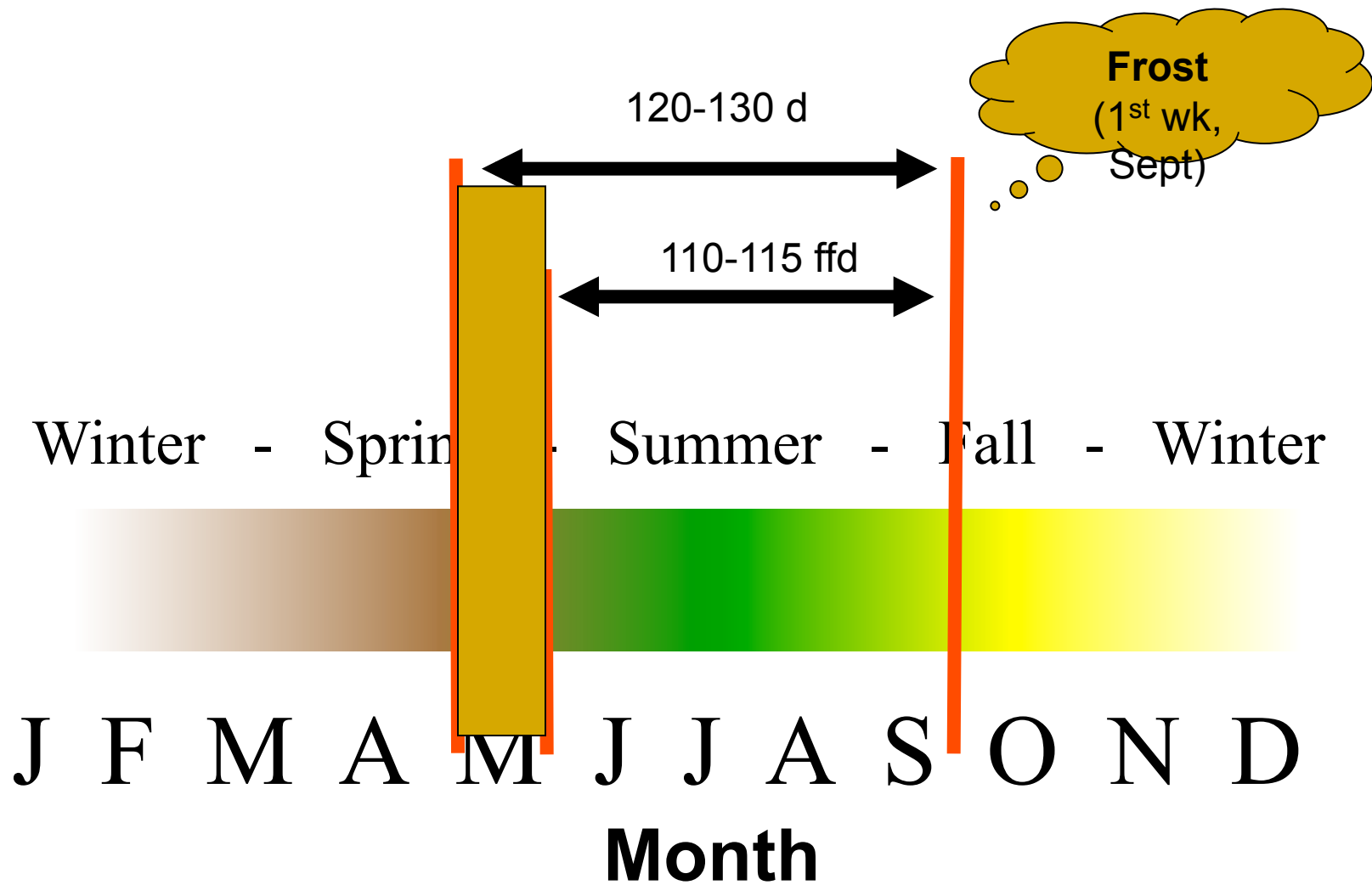
**2.Relative Response of Various Crops**

**3.Effects of Seeding Date**

- 1) Crop establishment and yield
- 2) Water use
- 3) Heat stress
- 4) Weed control options
- 5) Early-fall frost

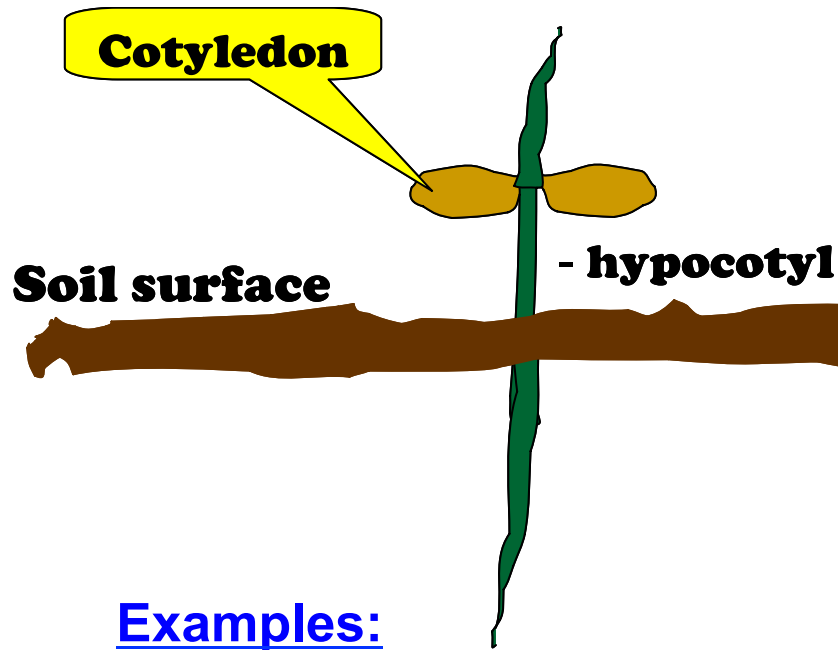
**4.Best management practices for early seeding**

# Growing Season



# Emergence type vs. Seeding date

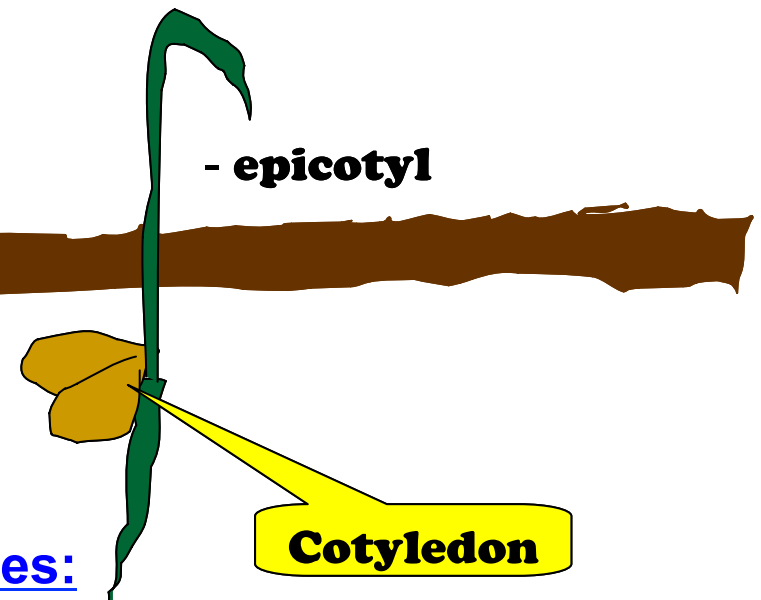
## Epigeal Emergence:



### Examples:

Soybean, dry bean  
Sunflower, flax  
Sweet clover  
Canola/mustard

## Hypogeal Emergence:



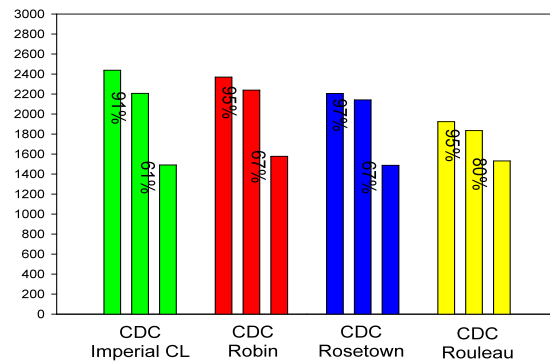
### Examples:

Wheat, oat, barley  
Lentil, Field pea  
Chickpea  
Canary seed

# Seed Development vs Seeding Date

- Apr-seeded canola **flowered** 15 days earlier than May-seeded canola (Kirkland & Johnson 2000)
- Early-seeded canola **matured** 10-15 d earlier than late-seeded canola (Clayton et al. 2004)
- Apr-arrived canola seeds had 15% greater **germination** at 8°C than May-arrived canola seeds (Gusta et al. 2004)

# Seeding date and Lentil seed yield (Saskatoon 2006-2008)



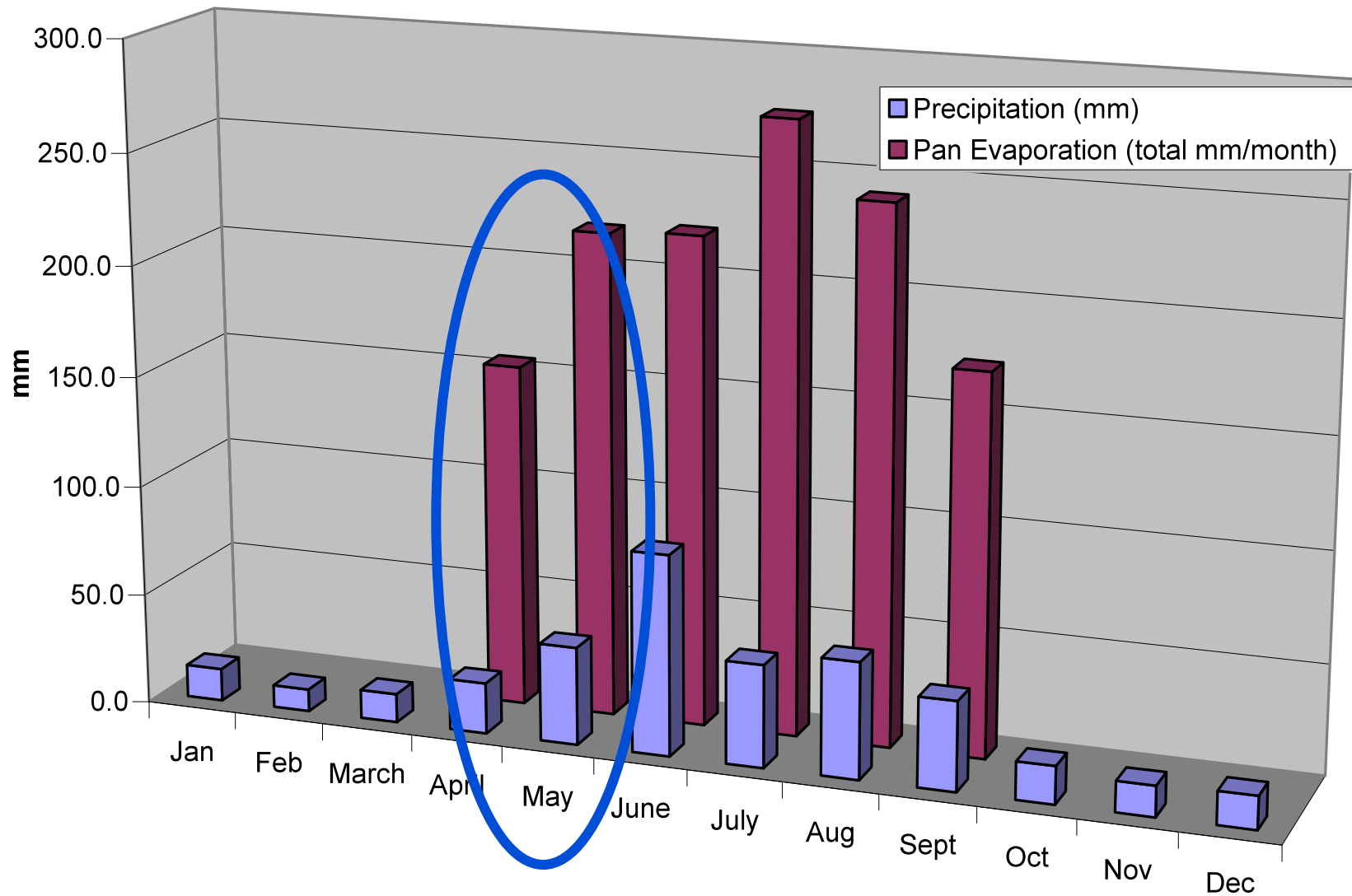
Early: May 1-6; Normal: May 11-15; Later: May 20-30

# Yield loss due to delayed seeding (Swift Current)

	Seed yield (kg ha <sup>-1</sup> )			Yield loss (%)	
	Early	Normal	Late	Late/Early	Late/Normal
Canary seed	1390	1260	990	-29	-21
Spring wheat	2911	2741	2601	-11	-5
Field pea	3011	2921	2451	-19	-16
Desi chickpea	2510	2380	2160	-14	-9
Lentil	1790	1720	1320	-26	-23
Oriental mustard	1530	1520	1220	-20	-20
Yellow mustard	1560	1270	1061	-32	-16
<i>Brassica rapa</i>	1580	1491	1140	-28	-24
<i>Brassica napus</i>	1410	1250	1180	-16	-6
Sunflower	1390	1240	1260	-9	2

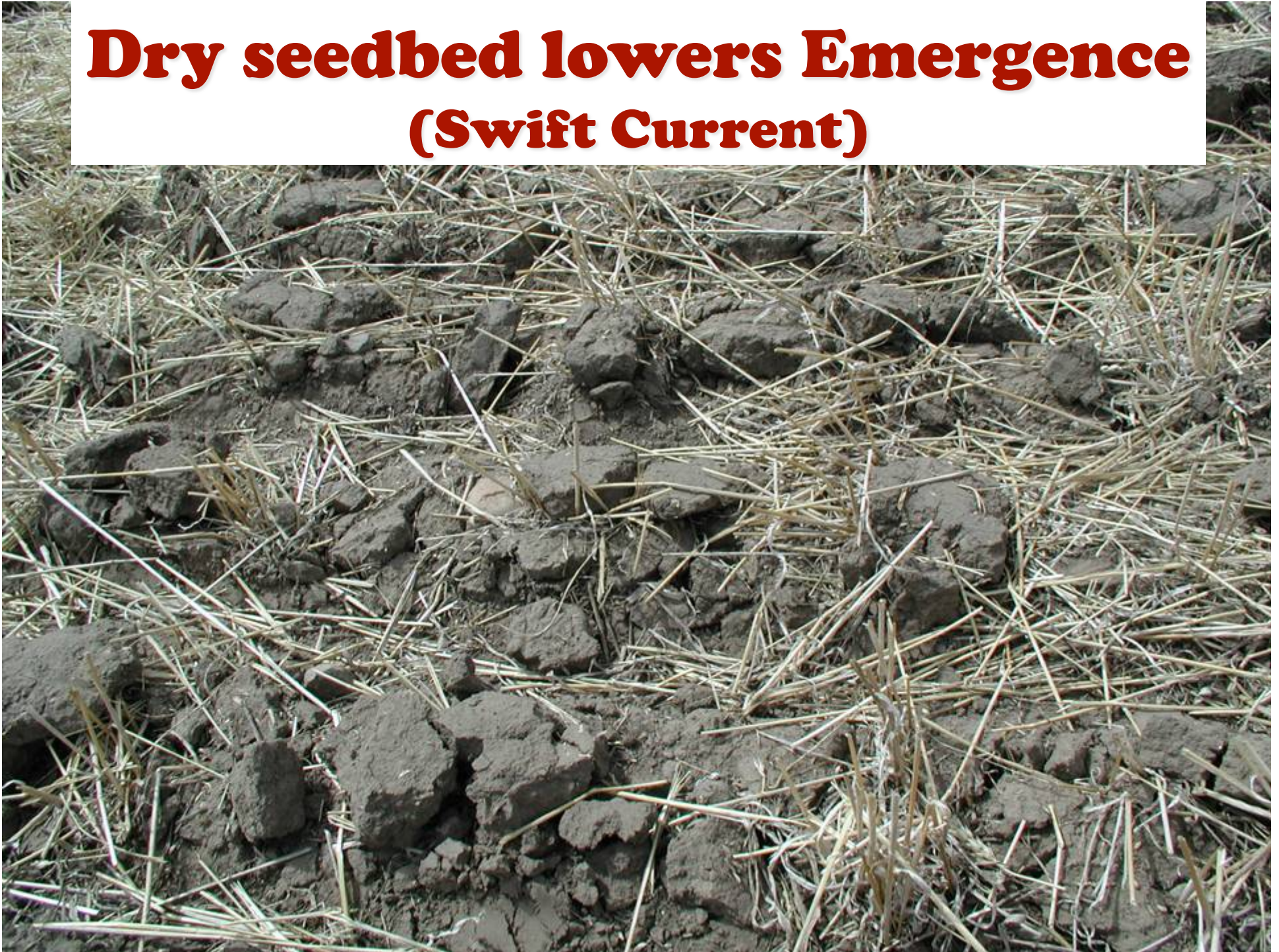
(Gan et al. 2000)

# Precipitation and evaporation In Apr-May, Swift Current

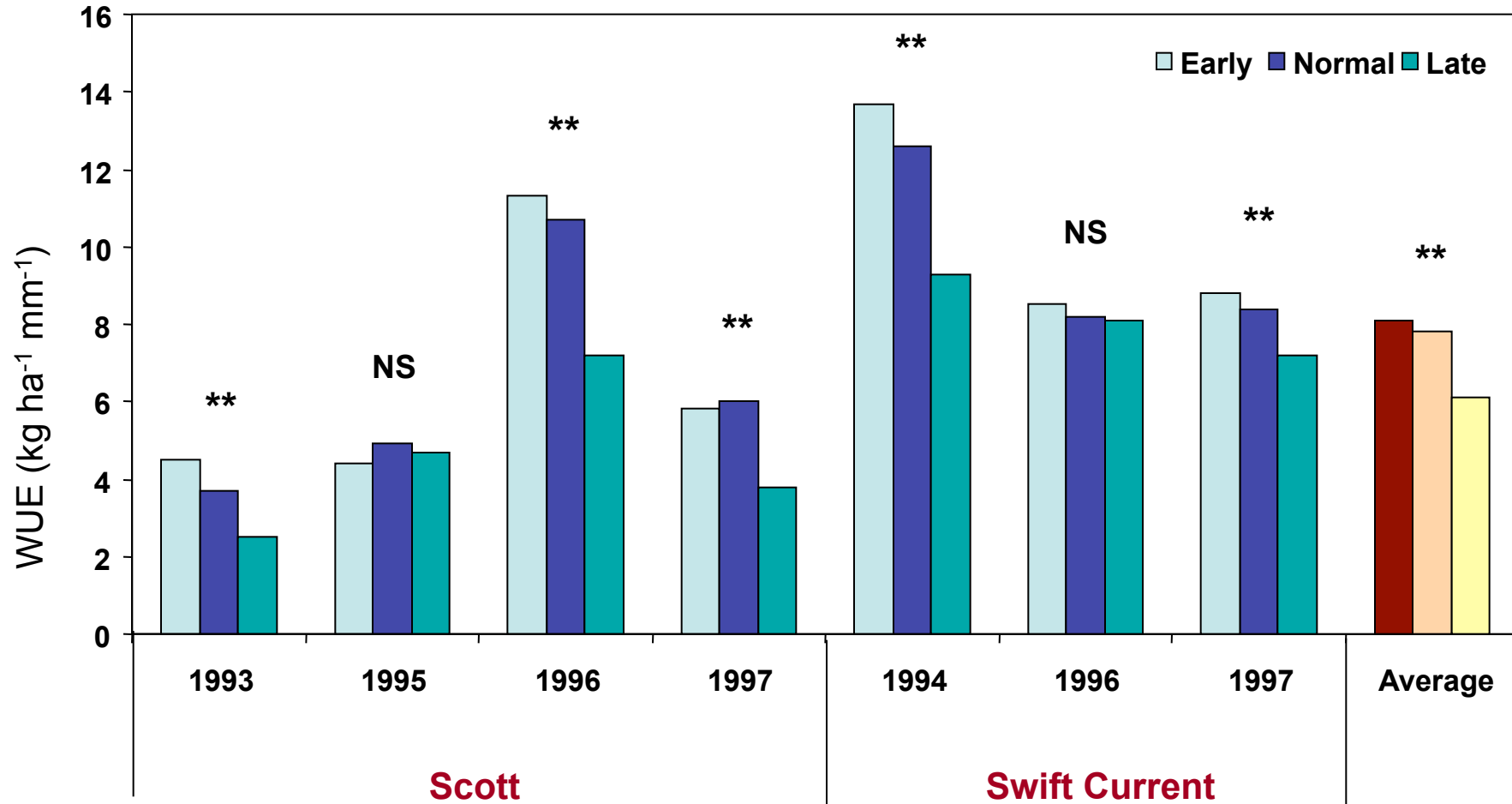




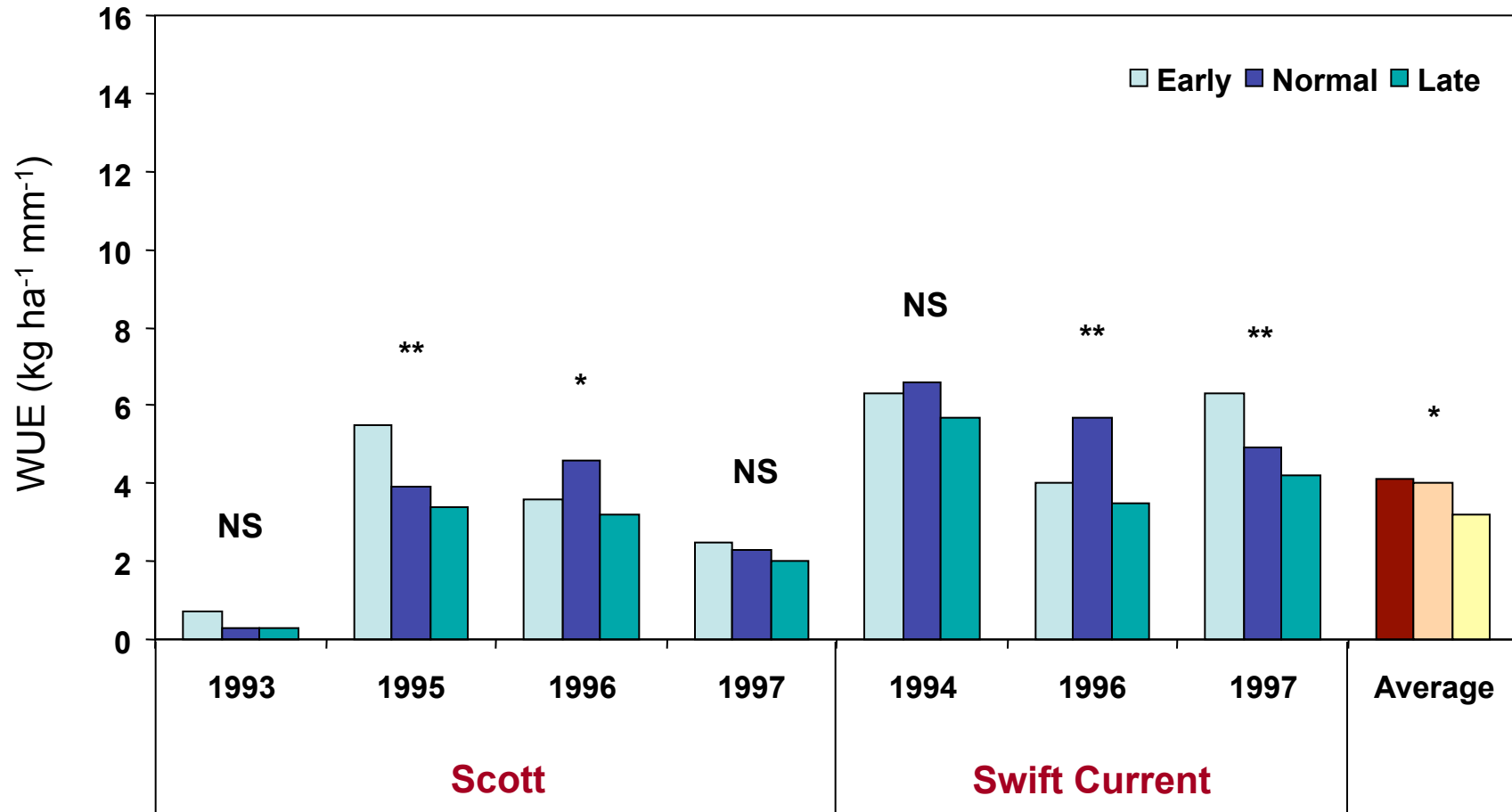
# **Dry seedbed lowers Emergence (Swift Current)**



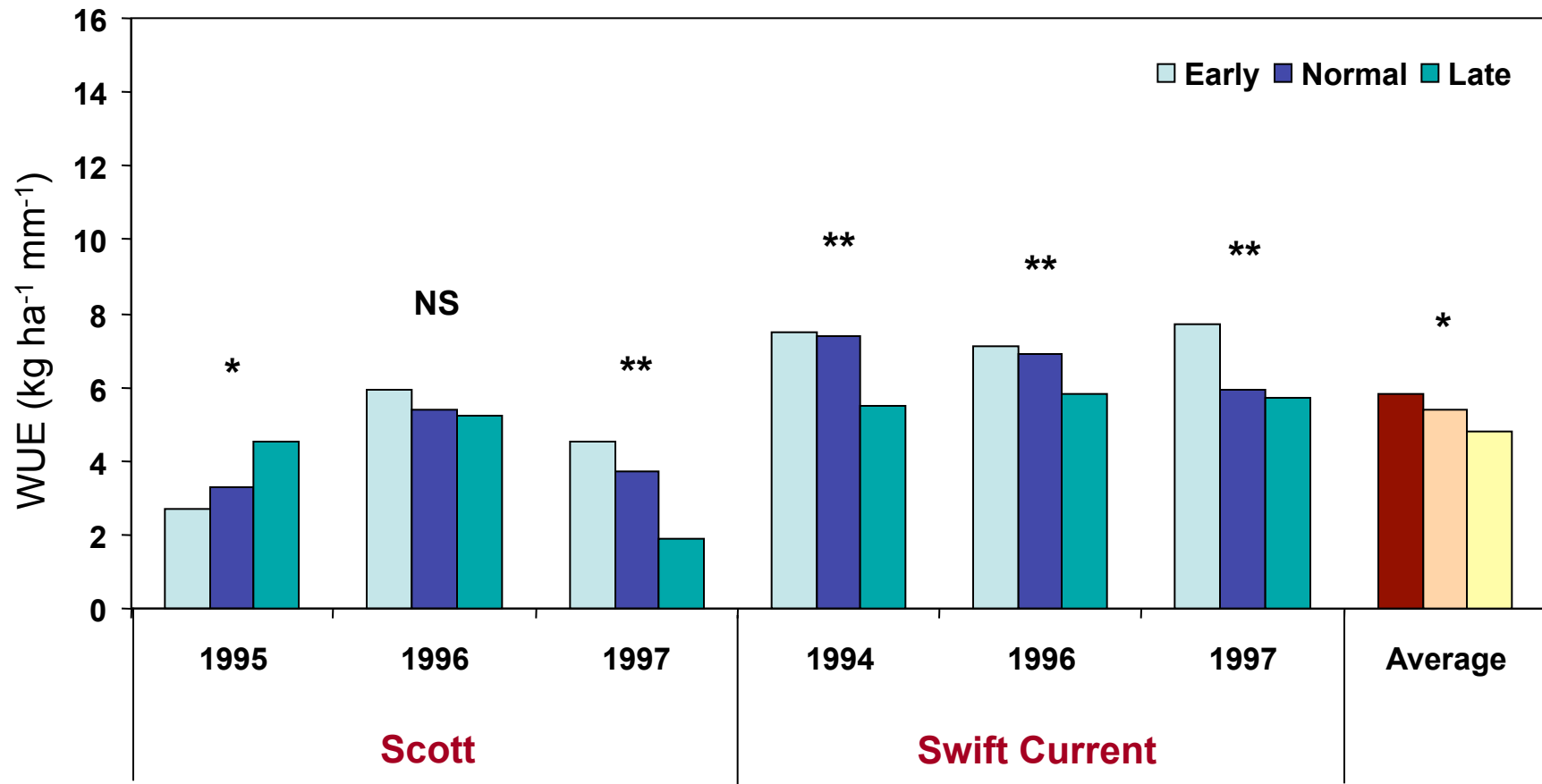
# Field pea seeding date and water use efficiency



# Lentil seeding date and water use efficiency



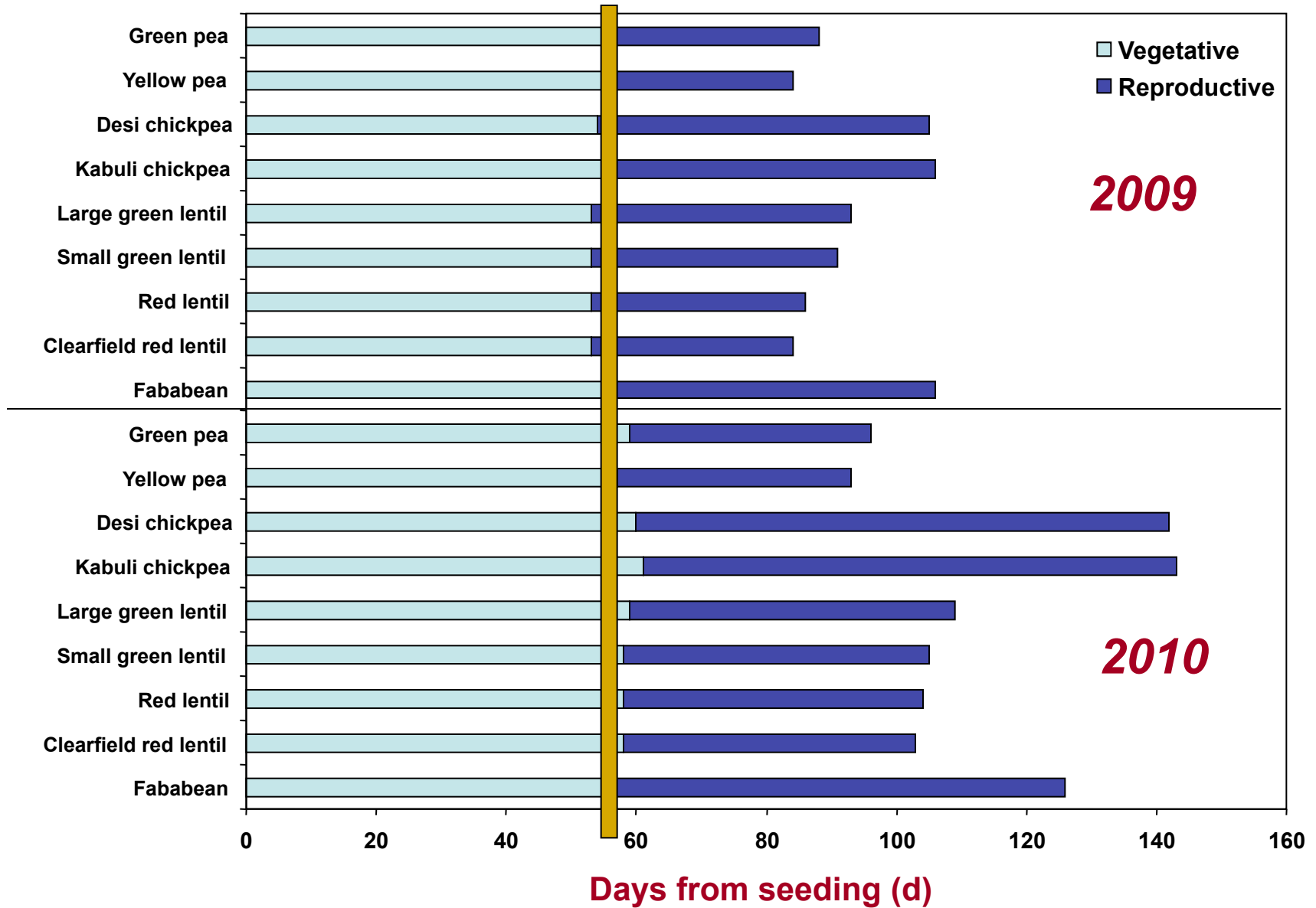
# Chickpea seeding date and water use efficiency



# Water use efficiency

Crop	Year	WUE (kg ha <sup>-1</sup> mm <sup>-1</sup> )		Difference (%)
		Early	Late	Late/Early
Chickpea	1998	5.0	4.7	<b>-6</b>
	1999	8.4	7.3	<b>-13</b>
	2000	10.7	9.1	<b>-15</b>
Pea	1998	11.6	8.5	<b>-27</b>
	1999	15.7	14.4	<b>-8</b>
	2000	17.1	14.8	<b>-14</b>

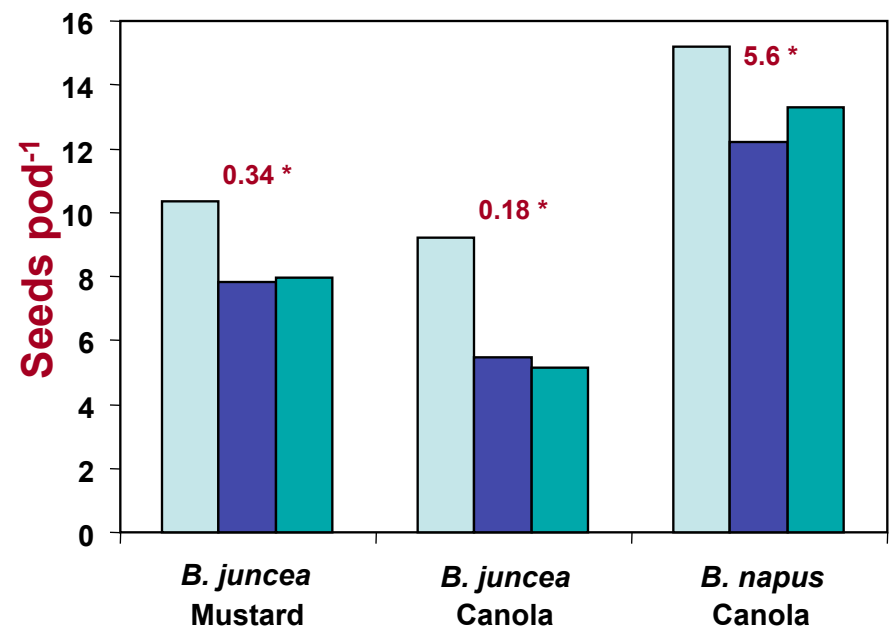
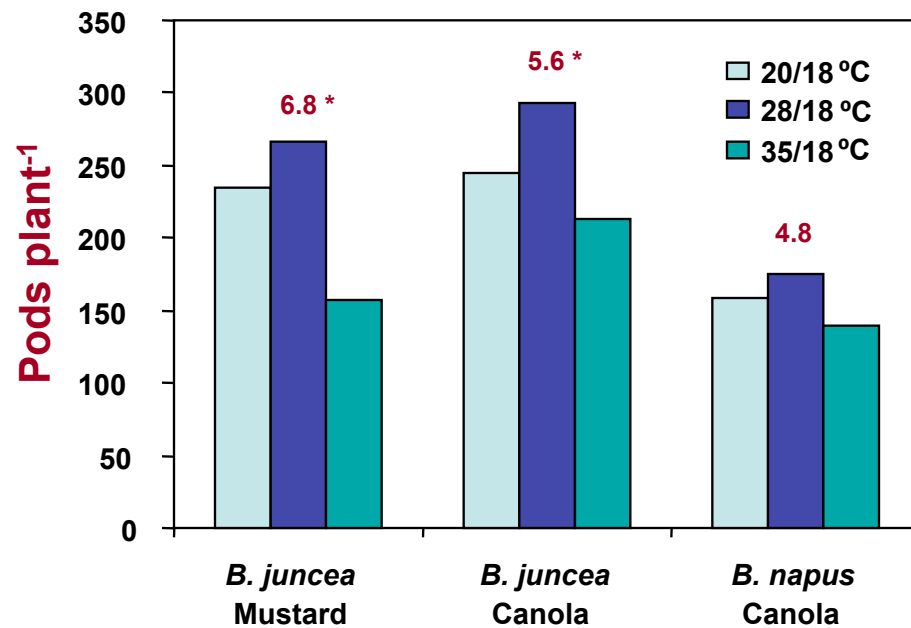
# Duration of growth period



# Heat stress causes flower abortion



# Heat stress and yield components (*Brassica* spp.)

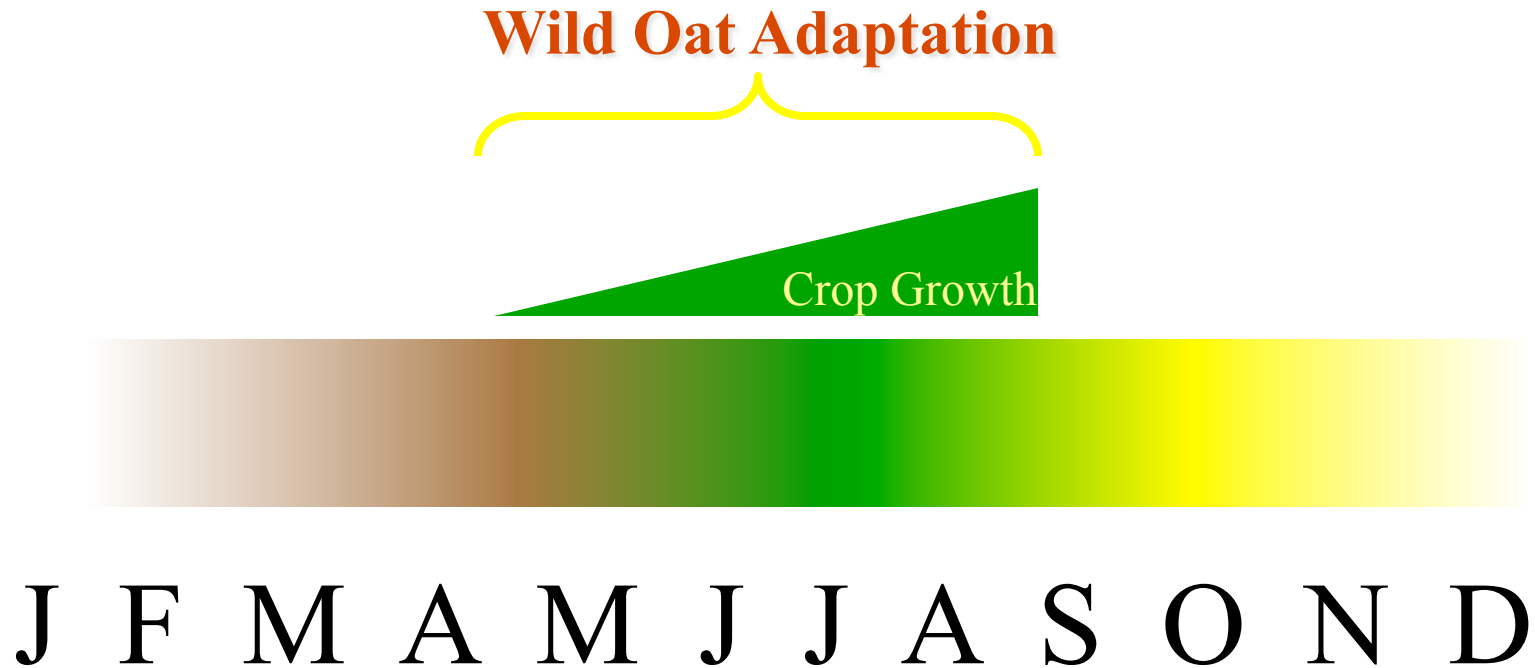


LSD at P < 0.05

(Gan et al. 2004)



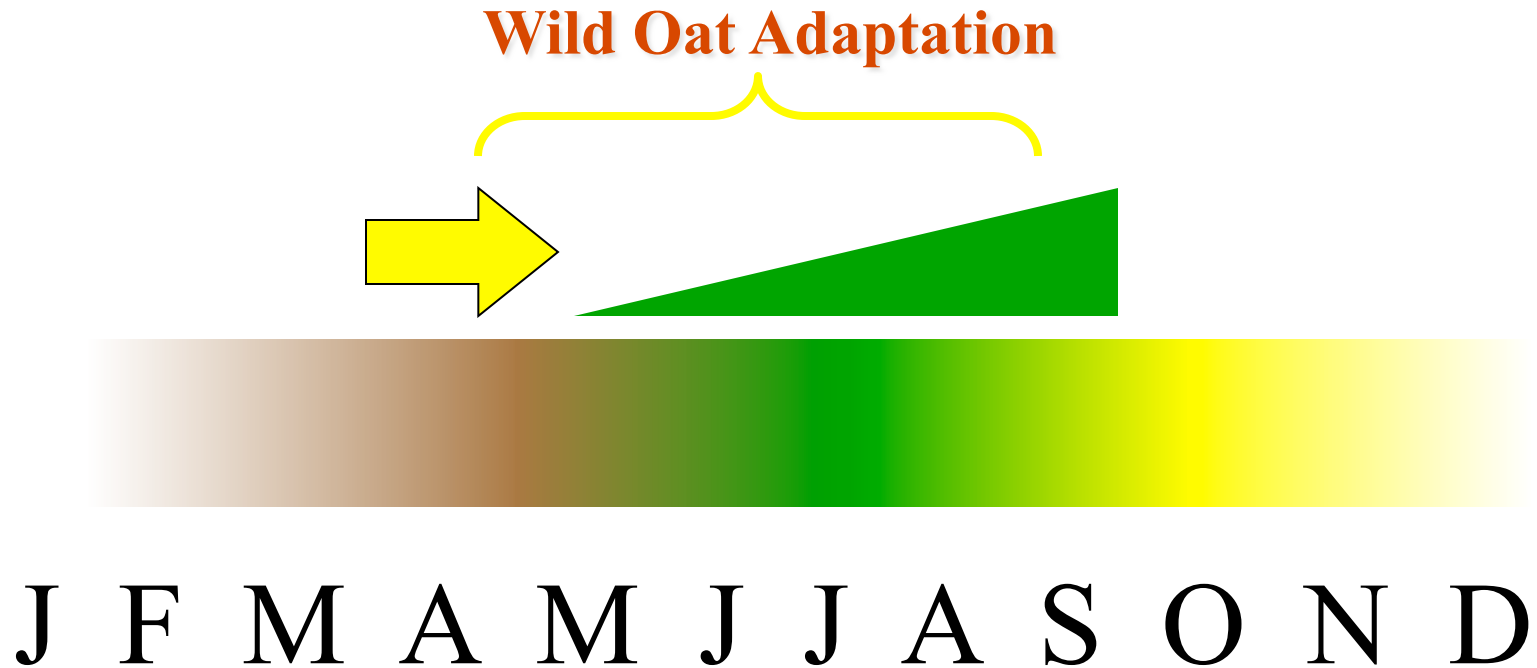
# Crop and annual weeds compete for growth resources



(Harker 2007)

# Crop and annual weeds compete for growth resources

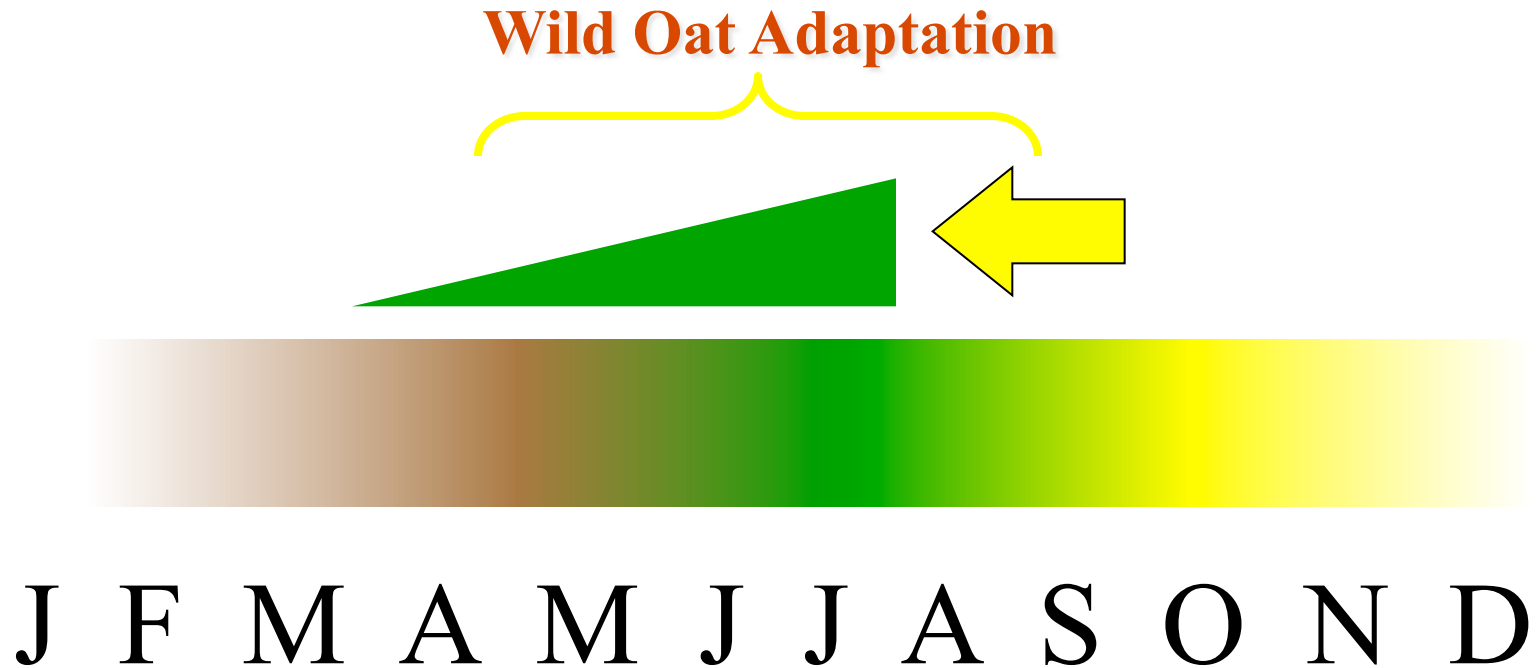
- Delayed crop seeding



(Harker 2007)

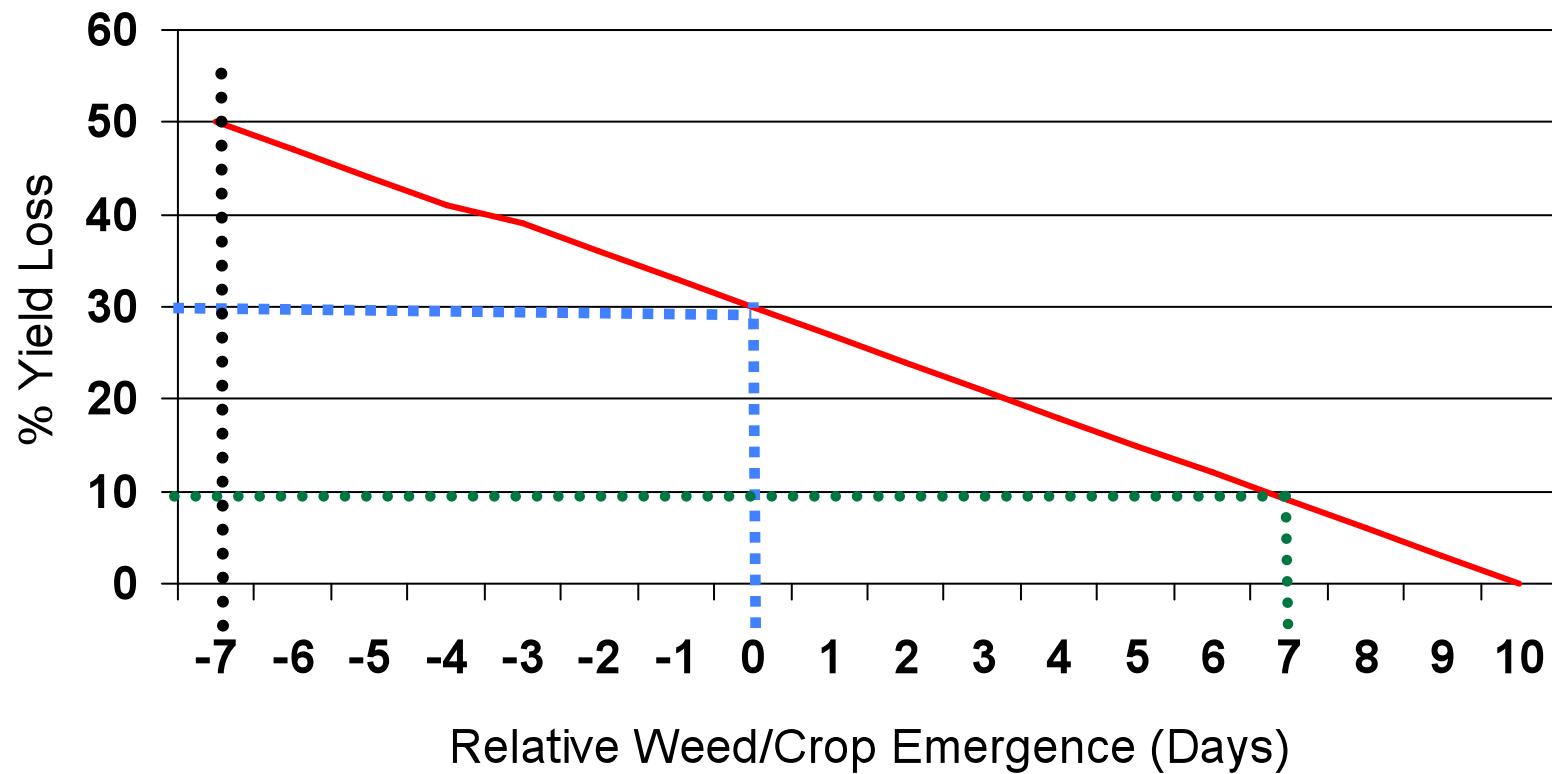
# Crop and annual weeds compete for growth resources

- Early seeding



(Harker 2007)

# Crop Competitiveness with Wild Oat – yield loss



(O'Donovan et al. 1985)

# Weeds are not favored under diverse seeding systems

I  
N  
V  
I  
G  
O  
R

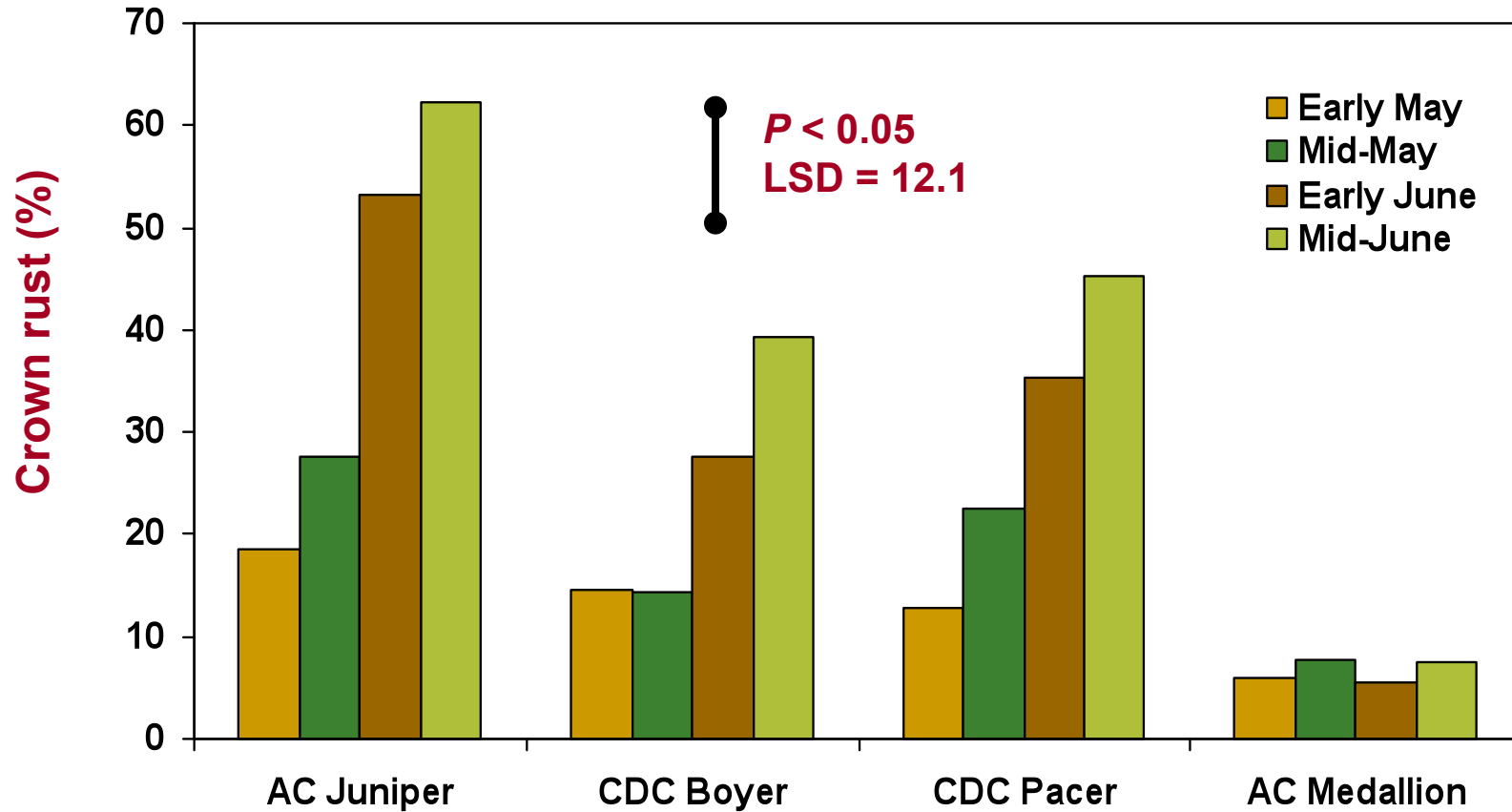


2  
1  
5  
3



(Clayton et al. 2004)

# Seeding Date vs. Crown Rust in Oat



(May et al. 2004)

**Late - seeded fababeans damaged  
by Blister beetle (Swift Current, 2008)**



# **Best Management Practices For early seeding**

## **1. Measure soil temperature**

- 15 cm soil surface**
- Noon soil temperature  $>8^{\circ}\text{C}$**





# **Best Management Practices For early seeding**

- 2. Use uniform & shallow seeding depth:**
- 1-2 cm for small-seeded crops
  - 2-4 cm for large-seeded crops



# **Best Management Practices For early seeding**

## **3. Apply seed treatment – essential**

- Cold soil prolongs germination duration
- More opportunity for fungal diseases
- Irregular root development



# **Best Management Practices For early seeding**

- 4. Select varieties with frost-tolerant traits**
  - seedlings subject to frost damage
  - degree of damage varies w/variety



**Thank you!**

