

Effect of planting date, latitude and environmental factors on the choice of maturity group in mid-south soybean production



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Montse Salmeron**



**Mid-South Soybean Board
Stoneville, MS. 16 July 2013**

Outline

- ✓ **Brief description of research**
- ✓ Results 2012
 - ✓ Yield
 - ✓ Phenology
 - ✓ Seed quality: germination, damaged seeds, oil and protein
- ✓ Progress 2013

New locations
for 2013

Columbia, MO
Felix Fritschi,
Bill Wiebold

Portageville, MO
Earl Vories

Martin, TN
Eric Walker

Fayetteville, AR
M. Salmeron

Keiser, AR
Max Wyss

Milan, TN
Dave Verbree

Rohwer, AR
Larry Earnest

Verona, MS
Normie Buehring

Stoneville, MS
Bobby Golden

College Station, Tx
Travis Miller

St. Joseph, LA
Josh Lofton

Experimental design

- ✓ 10 locations.
- ✓ Four planting dates.
- ✓ Four maturity groups (3, 4, 5, & 6).
- ✓ Four varieties within a MG.
- ✓ Four replications.



All locations irrigated

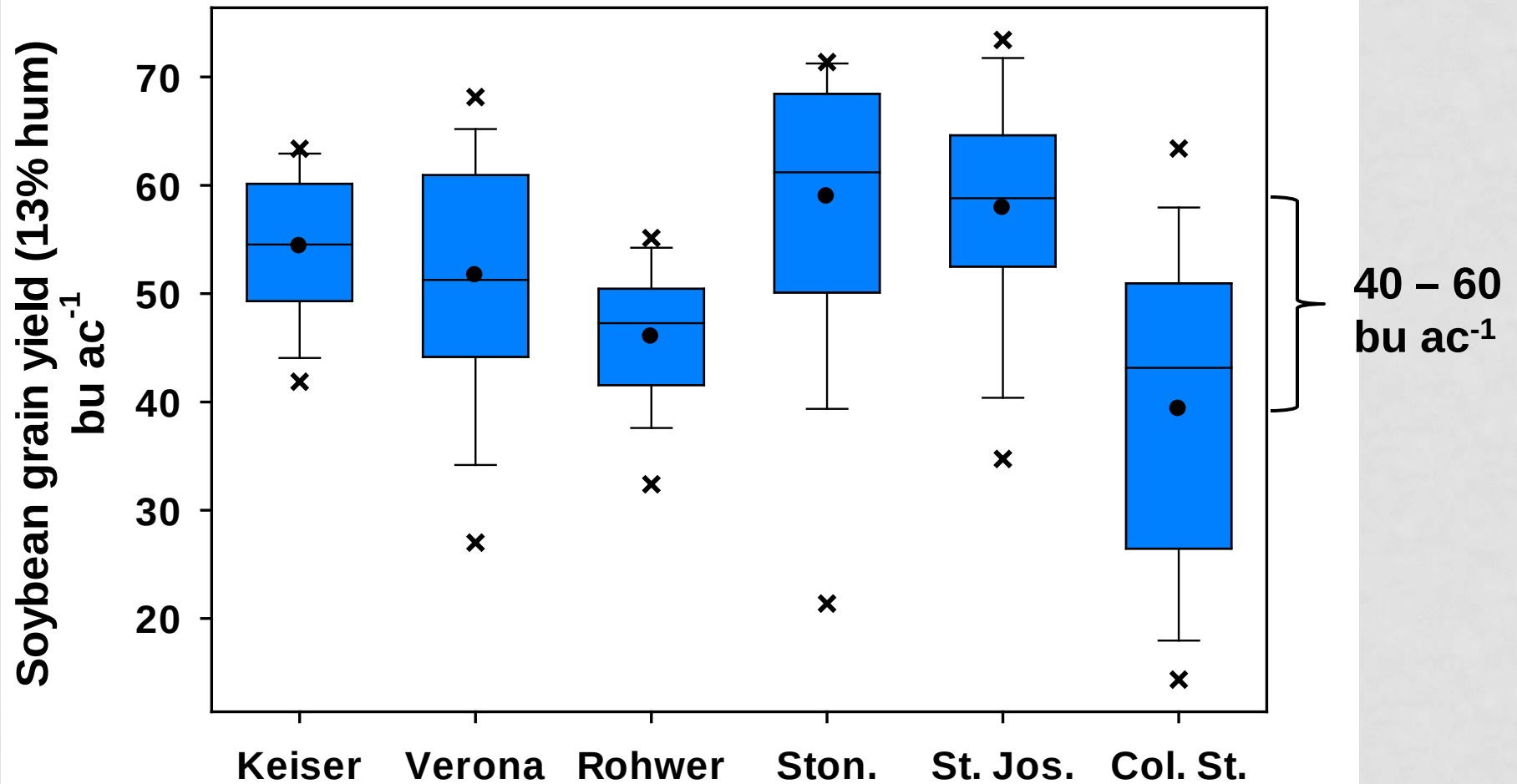
Selection of varieties:

Maturity Group	Company	Varieties 2012	Varieties 2013
III	Mycogen	5N342R2	5N342R2
	Morsoy	RT 3644	R2 36X82N
	Pioneer	P93Y72	P93Y72
	Pioneer	P93Y92	P93Y92
IV	Armor	42-M1	42-M1
	Pioneer	P94Y40	P94Y40
	Asgrow	AG4732	AG4732
	Terrell Norris	REV49R11	REV48R33
V	Asgrow	AG5332	AG5332
	Asgrow	AG5532	AG5532
	Pioneer	P95Y50	P95Y50
	Progeny	P5811Y	P5711RY
VI	Stine	6202-4	6202-4
	Pion/Asgrow	P96M60	AG6132
	Asgrow	AG6732	AG6732
	HBK/Pion	HBKR7028	P6710RY

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RESULTS: Soybean grain yield



Maximum yield and yields not significantly lower (bu ac ⁻¹)
Yields significantly lower (bu ac ⁻¹)

ST JOSEPH, LA		Maturity Group			
Planting					
Date		III	IV	V	VI
1		35	59	71	65
2		53	67	73	58
3		62	63	63	52
4		48	57	56	43

VERONA, MS		Maturity Group			
Planting					
Date		III	IV	V	VI
1		45	61	58	48
2		60	67	64	44
3		64	57	50	37
4		52	49	42	27

STONEVILLE, MS		Maturity Group			
Planting					
Date		III	IV	V	VI
1		21	49	47	71
2		49	68	60	60
3		71	69	65	54
4		67	61	61	69

KEISER, AR		Maturity Group			
Planting					
Date		III	IV	V	VI
1		44	54	60	46
2		56	62	56	42
3		60	63	53	49
4		53	55	51	63

ST JOSEPH, LA		Maturity Group			
Planting					
Date		III	IV	V	VI
1		35	59	71	65
2		53	67	73	58
3		62	63	63	52
4		48	57	56	43

ROHWER, AR		Maturity Group			
Planting					
Date		III	IV	V	VI
1		51	50	54	51
2		59	55	54	47
3		47	43	41	45
4		32	43	48	47

COLLEGE ST, TX		Maturity Group			
Planting					
Date		III	IV	V	VI
1		47	52	49	43
2		56 ab	63	54	33
3		43	44	27	-
4		28	26	19	-

STABILITY ANALYSIS

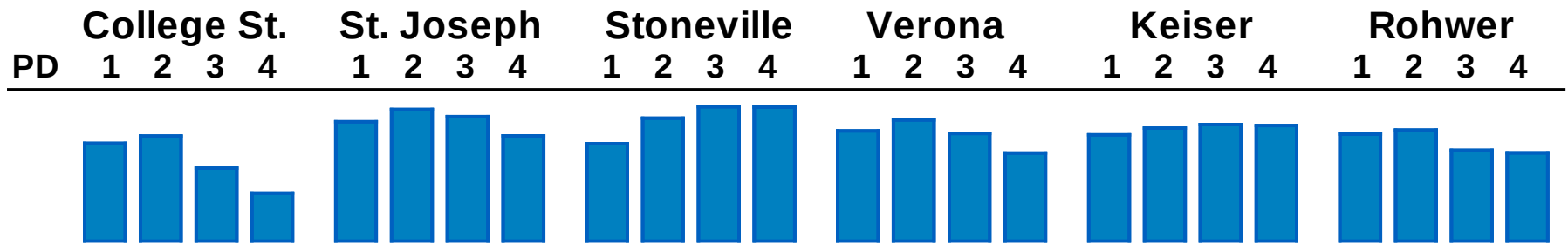
- ✓ Indicates how stable a trait is across a range of environments.
- ✓ Can we find soybean varieties with a more stable yield across the environments studied (location x PD)?

Average yield for 2012
across all:

- Varieties
- Locations
- planting dates

Grand mean
45.2 bu ac⁻¹

Environments = Locations x Planting dates combinations



Environmental Index
(bu ac⁻¹)

=

Average yield at
each environment
bu ac⁻¹

-

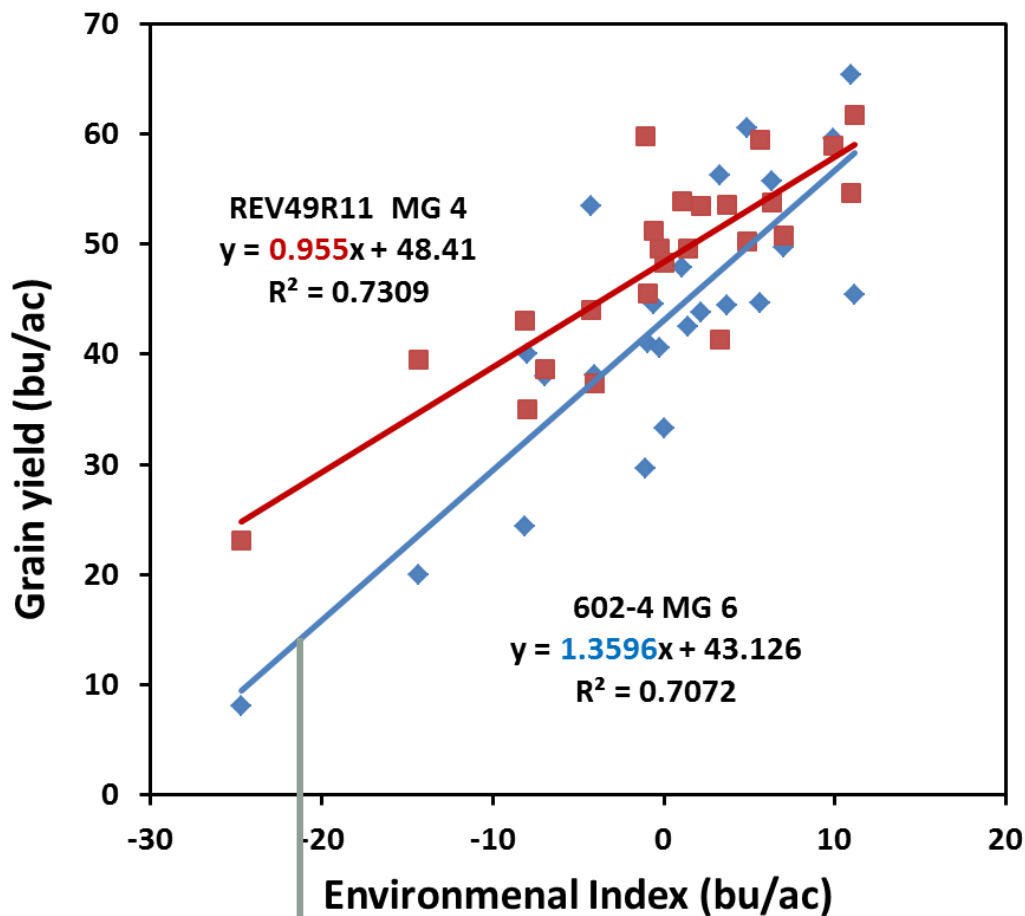
Grand mean
45.2 bu ac⁻¹

Regression

Location	Planting date	PD x Location Mean bu ac ⁻¹	Environmental Index Mean – Grand mean	Yield Variety 1 bu ac ⁻¹	Yield Varietty 2 bu ac ⁻¹
College St.	1	41.1	-4.1	38.1	37.4
	2	44.2	-1.1	29.6	59.8
	3	30.9	-14.3	20.0	39.5
	4	20.5	-24.8	8.1	23.1
St. Joseph	1	41.0	-4.2	53.5	44.1
	2	51.6	6.4	55.7	53.7
	3	56.4	11.2	45.4	61.7
	4	56.2	11.0	65.4	54.6
Stoneville, MS	1	46.3	1.1	47.9	53.9
	2	50.8	5.6	44.7	59.4
	3	45.2	0.0	33.3	48.4
	4	37.1	-8.1	24.4	43.0
Verona, MS	1	50.1	4.8	60.6	50.2
	2	55.2	10.0	59.6	58.9
	3	52.2	7.0	49.7	50.8
	4	44.3	-0.9	41.0	45.5
Keiser, AR	1	44.6	-0.6	44.6	51.2

Regression

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Stoneville, MS	1	46.3	1.1	47.9	53.9
	2	50.8	5.6	44.7	59.4
	3	45.2	0.0	33.3	48.4
	4	37.1	-8.1	24.4	43.0
Verona, MS	1	50.1	4.8	60.6	50.2
	2	55.2	10.0	59.6	58.9
	3	52.2	7.0	49.7	50.8
	4	44.3	-0.9	41.0	45.5
Keiser, AR	1	44.6	-0.6	44.6	51.2

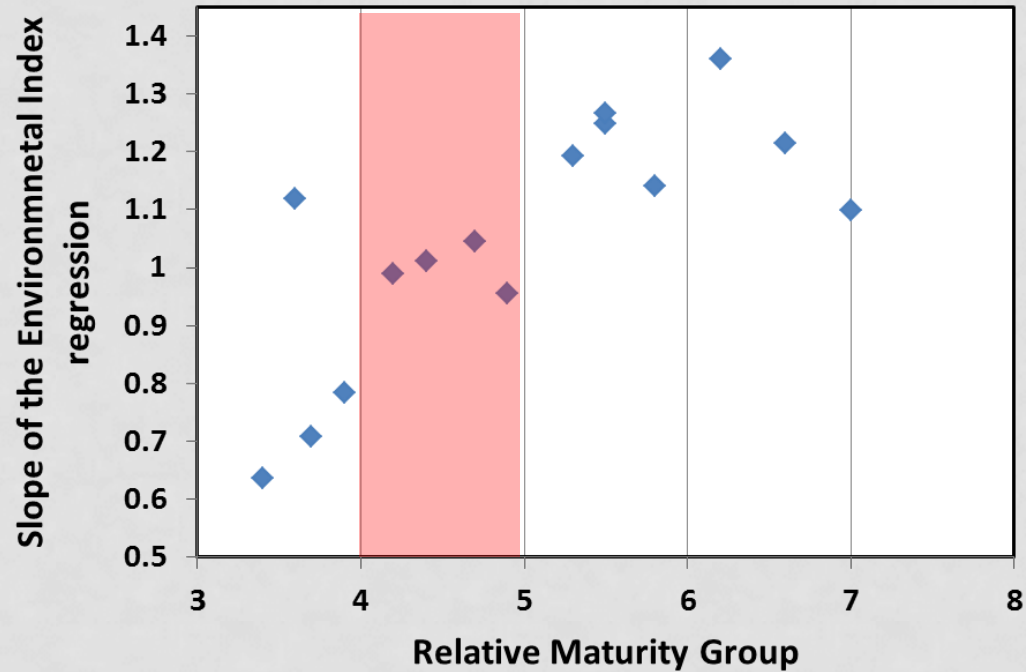


Slopes closer to
1:

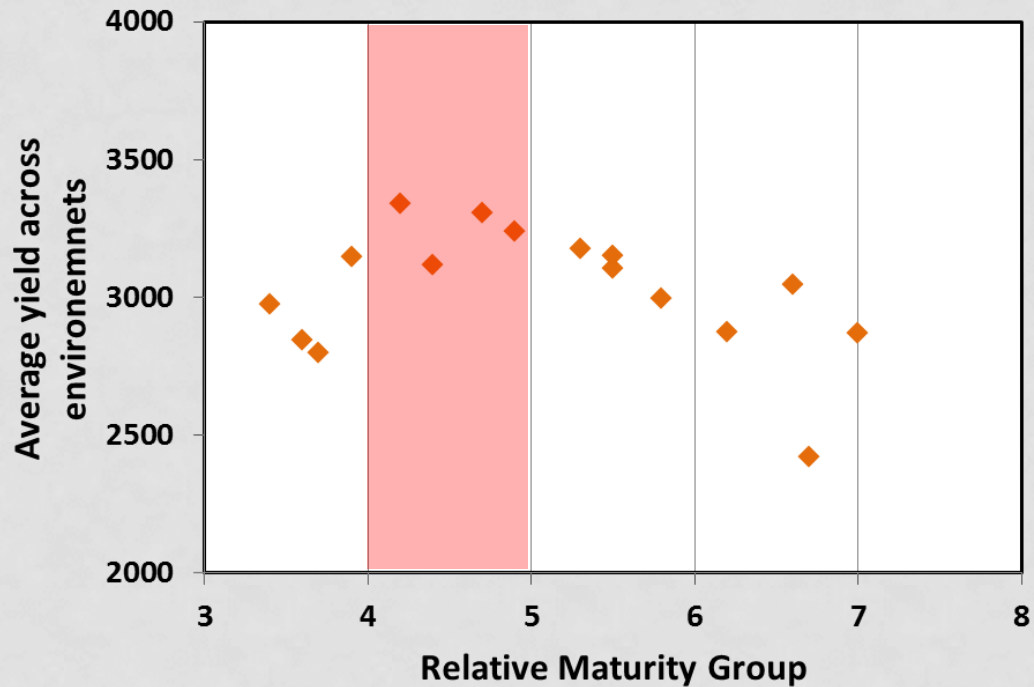
**MORE STABLE
VARIETIES**

Yields lower under less favorable environments with this variety

Slopes of the environmental index regression closer to 1 in MGs 4



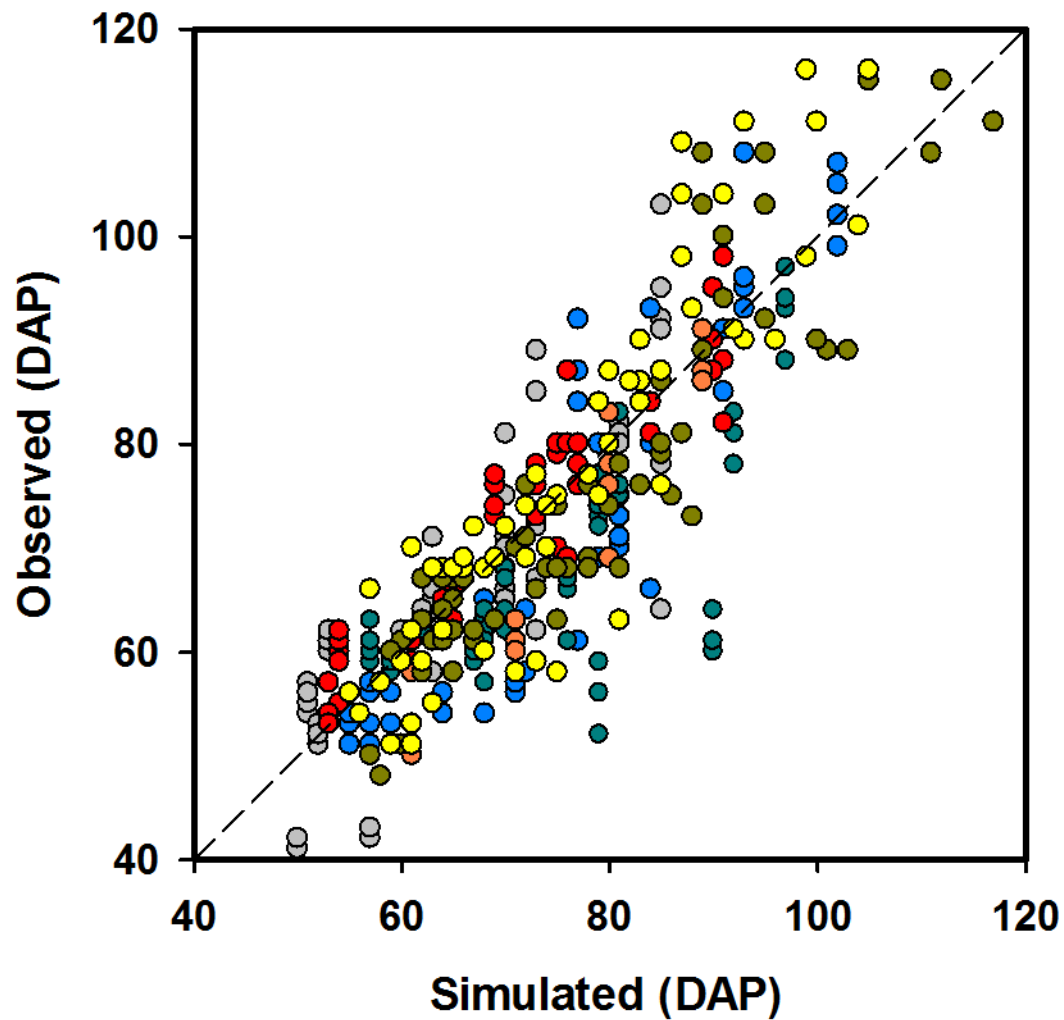
Higher yields averaged across environments for MGs 4



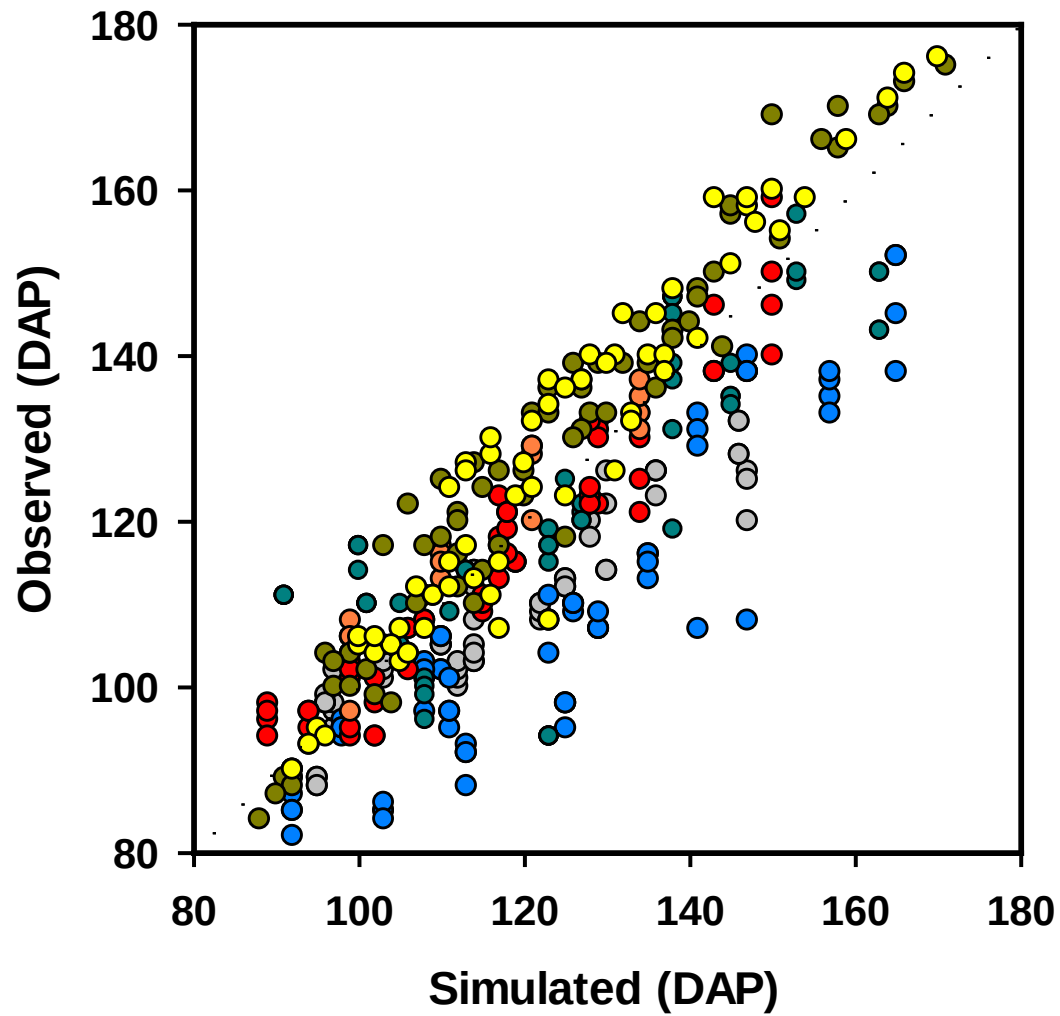
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Beginning seed filling - R5



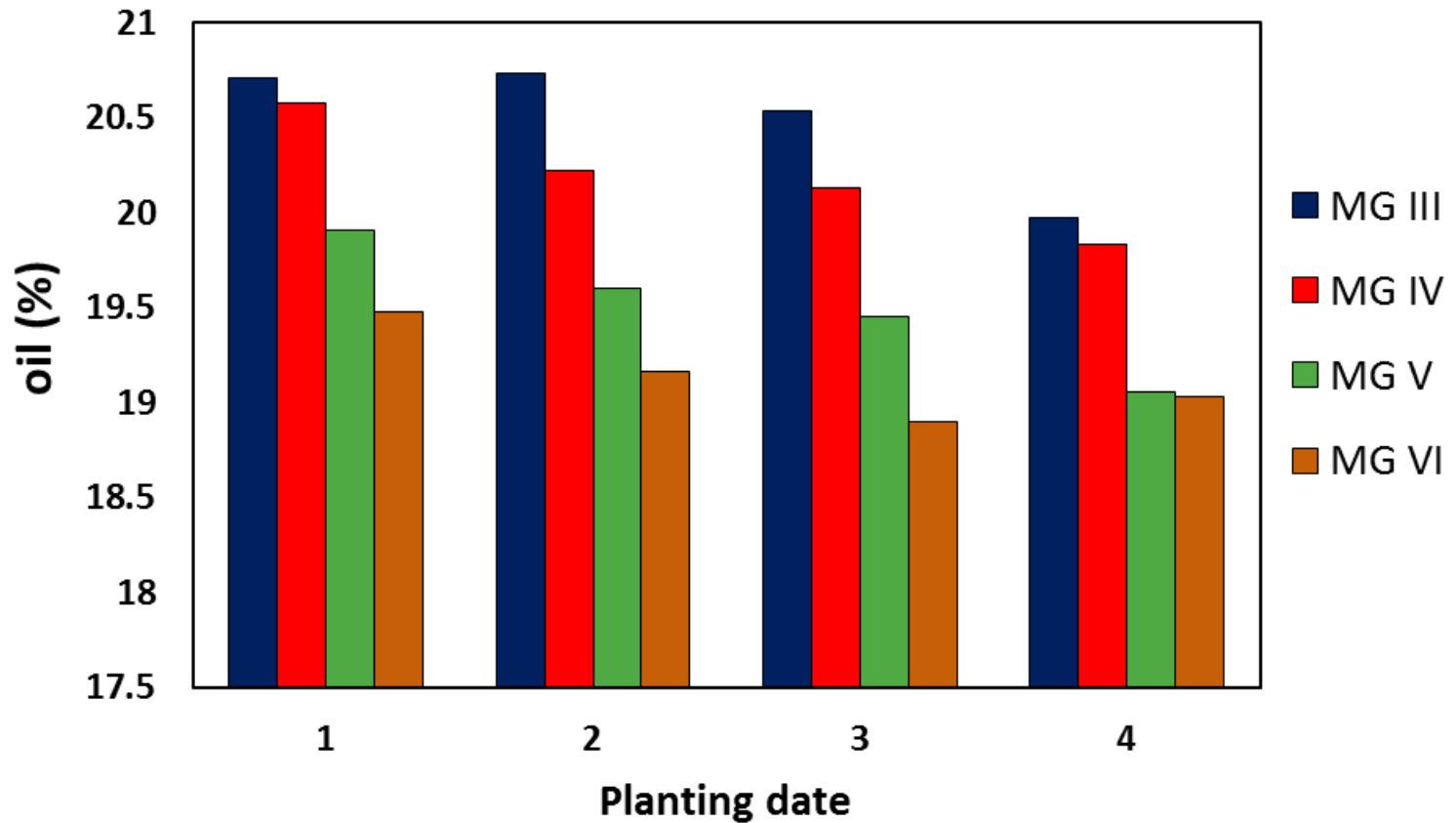
Physiological maturity - R7

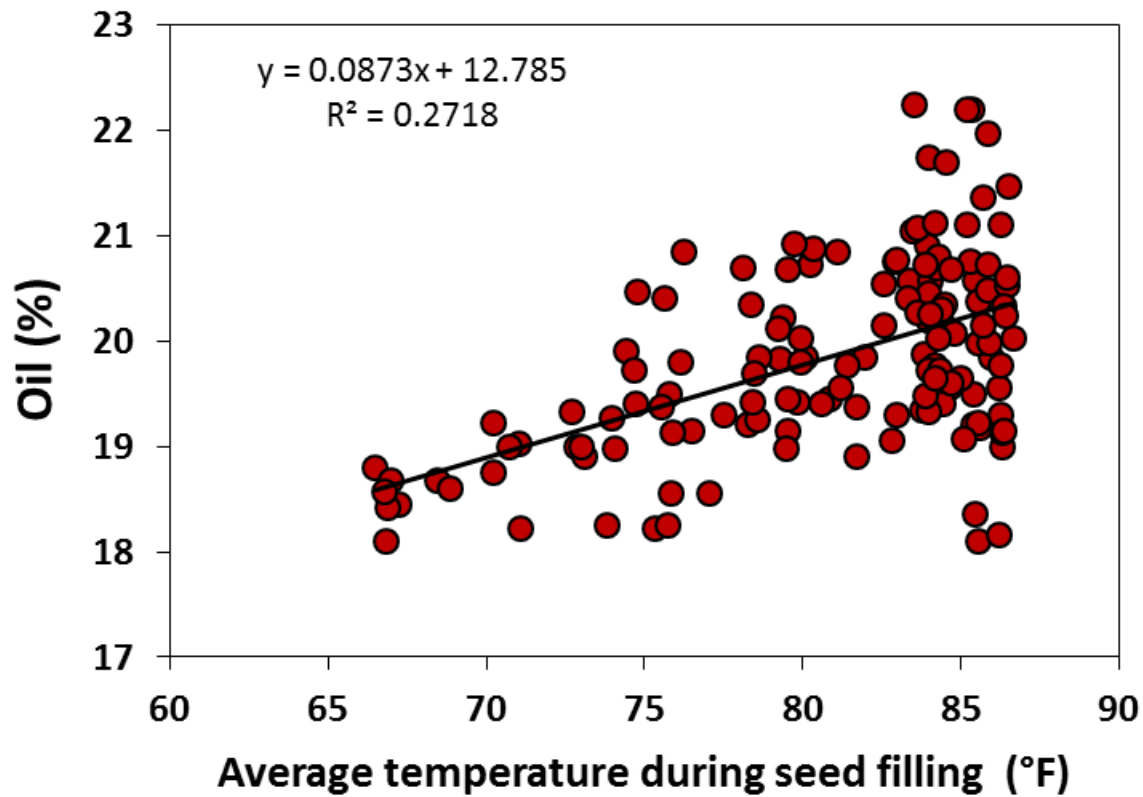


Outline

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 - ✓ Yield
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 - ✓ **Seed quality: germination, oil and protein, damaged seeds.**
- ✓ Progress 2013

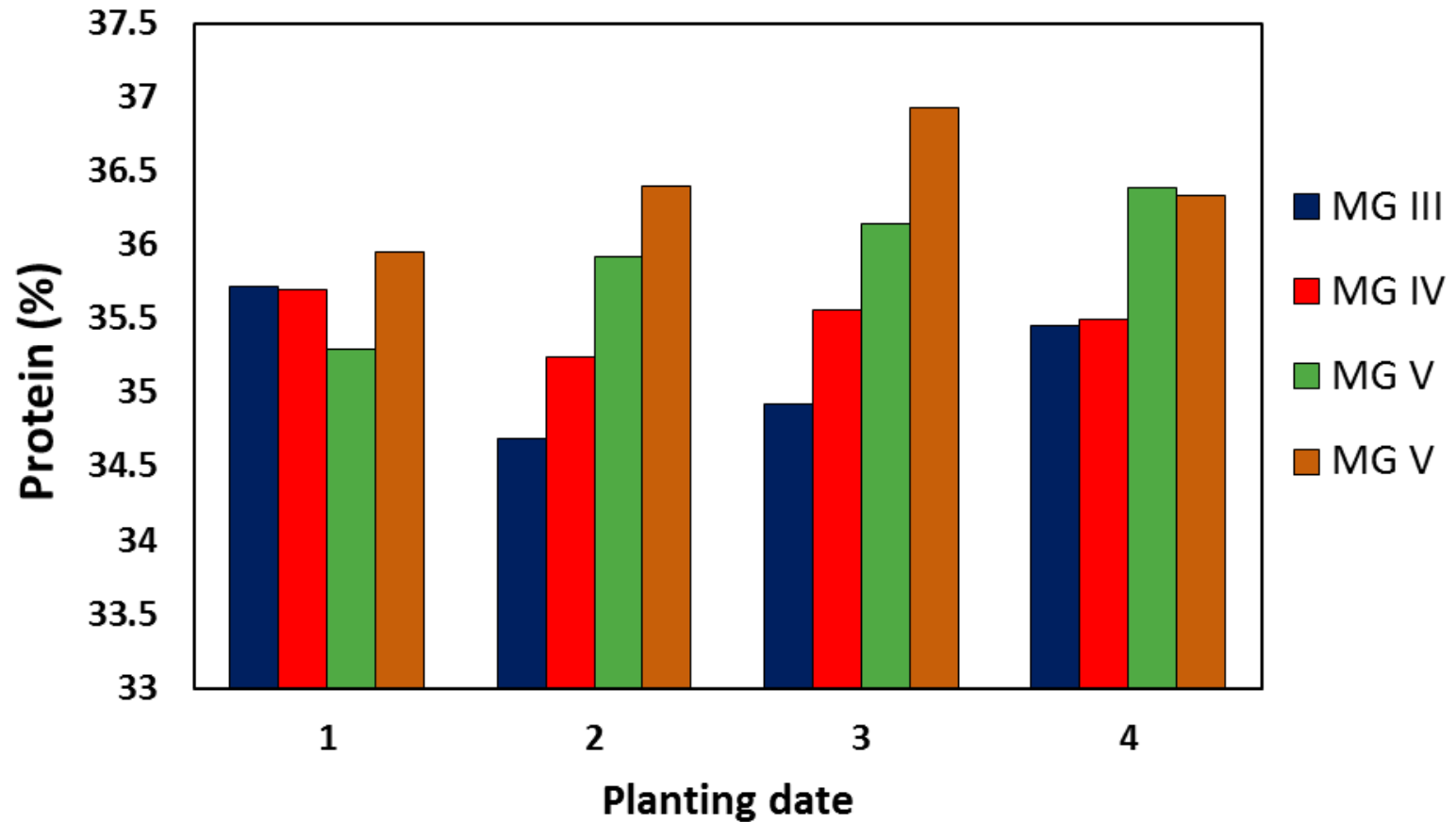
OIL concentration in soybean seed

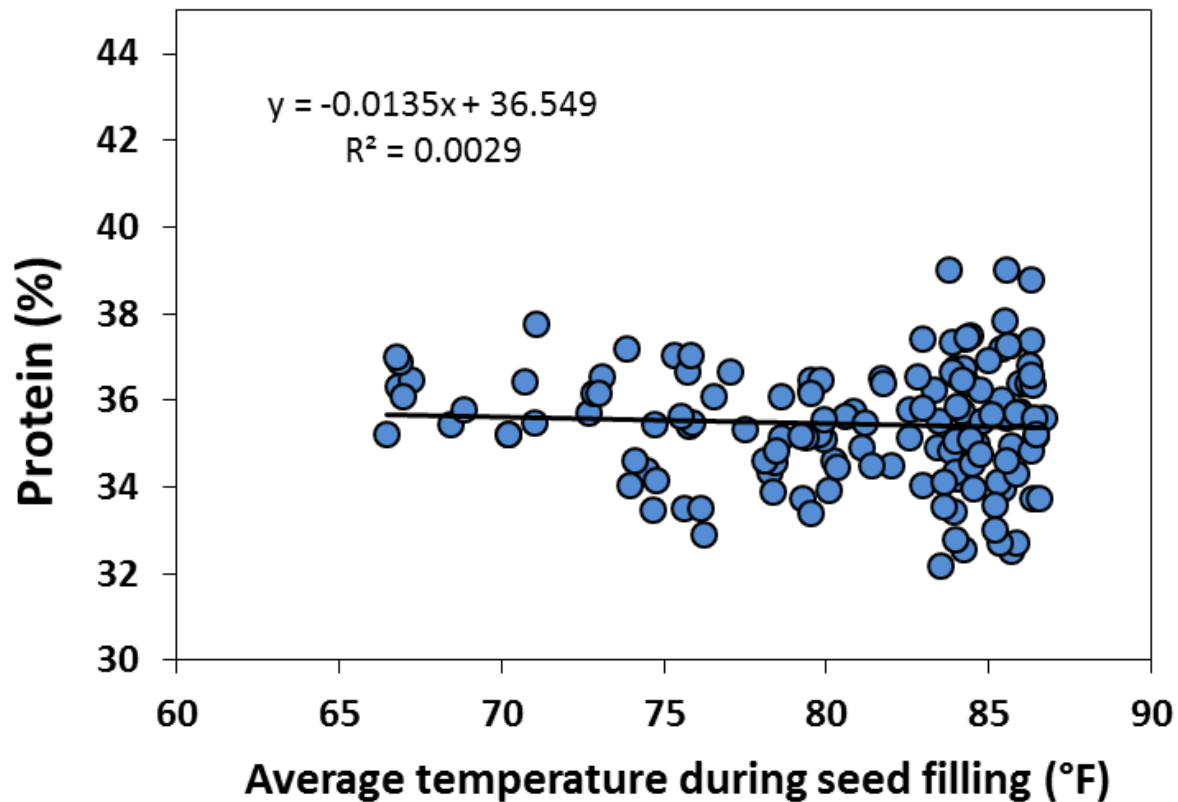




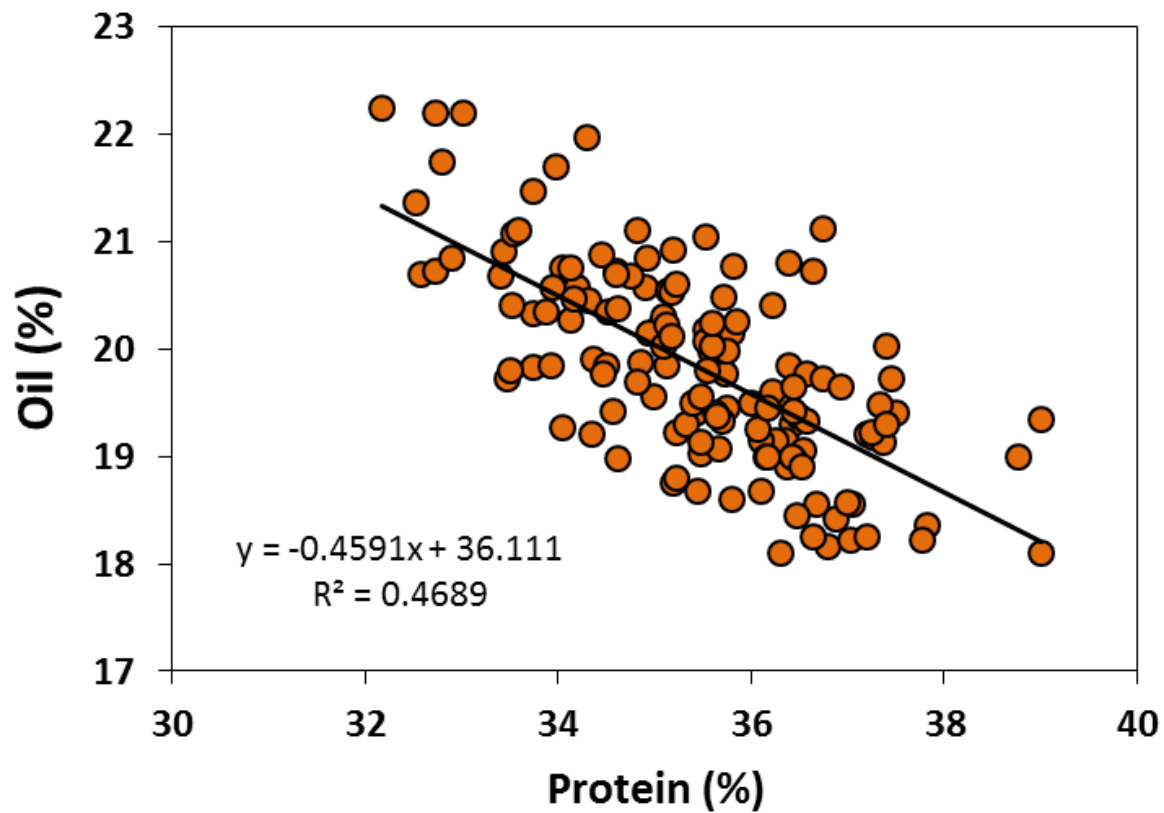
Temperature effect on seed oil concentration

PROTEIN concentration in soybean seed





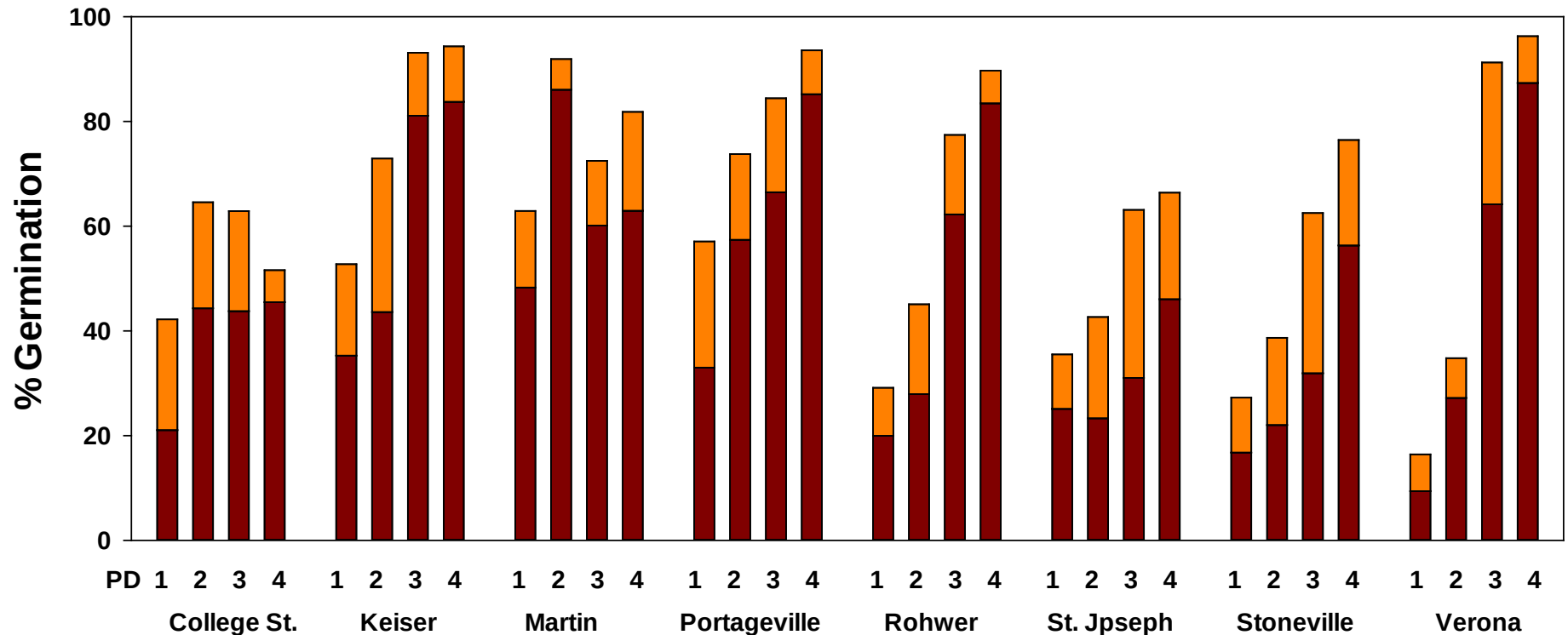
Unaccounted variation in protein (%) might be due to photoperiod, high temperatures during seed filling, some water stress.



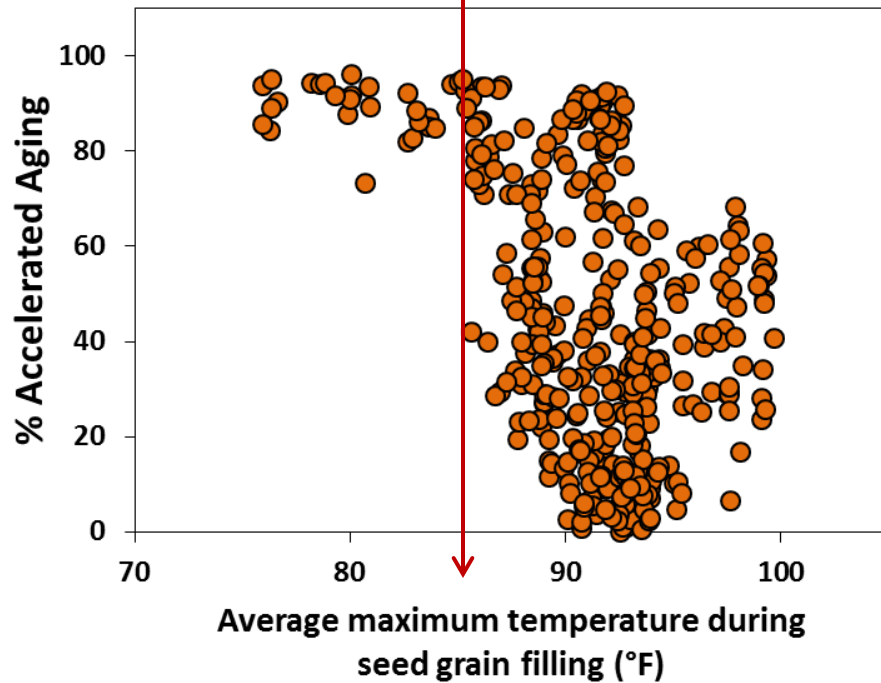
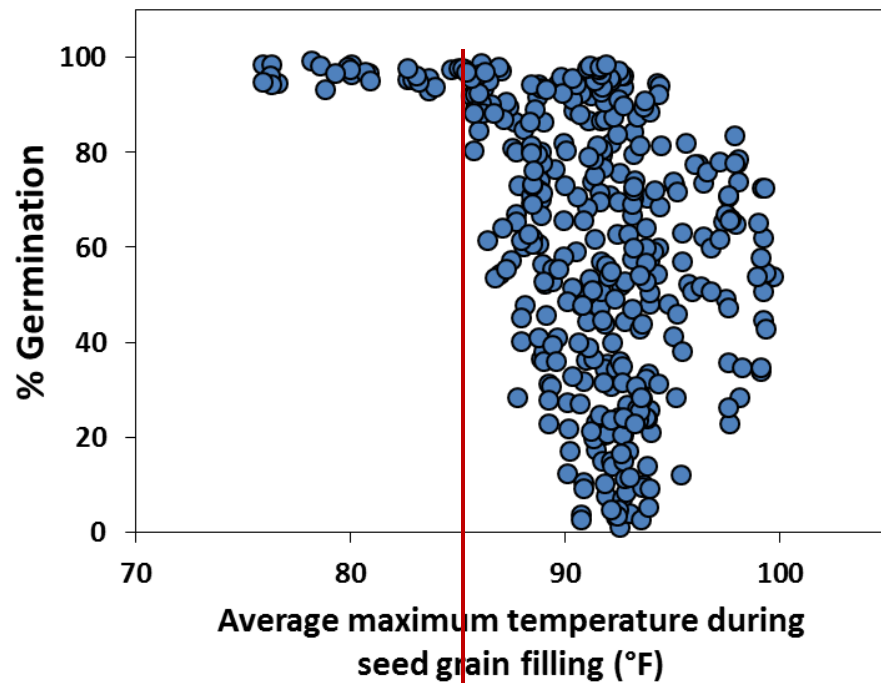
Inverse relationship between oil and protein.

Seed quality: % Germination

Accelerated aging
Standard germination



% germination in standard conditions and after accelerated aging increases as planting date is delayed



Reduction in germination with maximum temperatures above 86 °F.

Seed grading

- Rohwer, AR
- 2110 samples in total

US. Seed grade N. 1, 2, 3 or 4.

Grade requirements:

- Test weight
- Damaged seeds
- Foreign material
- Splits
- Soybeans of other colors
- Other materials



Grades U.S. Nos.
1
2
3
4
>4

Portageville, MO				
Planting				
Date	III	IV	V	VI
1	3	>4	3	2
2	4	4	3	1
3	2	2	1	1
4	1	1	1	2

Rohwer, AR				
Planting				
Date	III	IV	V	VI
1	3	4	4	>4
2	>4	3	4	3
3	4	4	4	2
4	4	2	2	2

Martin, TN				
Planting				
Date	III	IV	V	VI
1	4	3	4	4
2	3	4	3	4
3	3	4	4	3
4	2	2	3	3

Stoneville, MS				
Planting				
Date	III	IV	V	VI
1	>4	>4	>4	>4
2	4	4	>4	>4
3	4	4	>4	>4
4	4	4	4	3

Keiser, AR				
Planting				
Date	III	IV	V	VI
1	4	>4	4	1
2	3	4	2	1
3	2	2	1	1
4	2	1	1	1

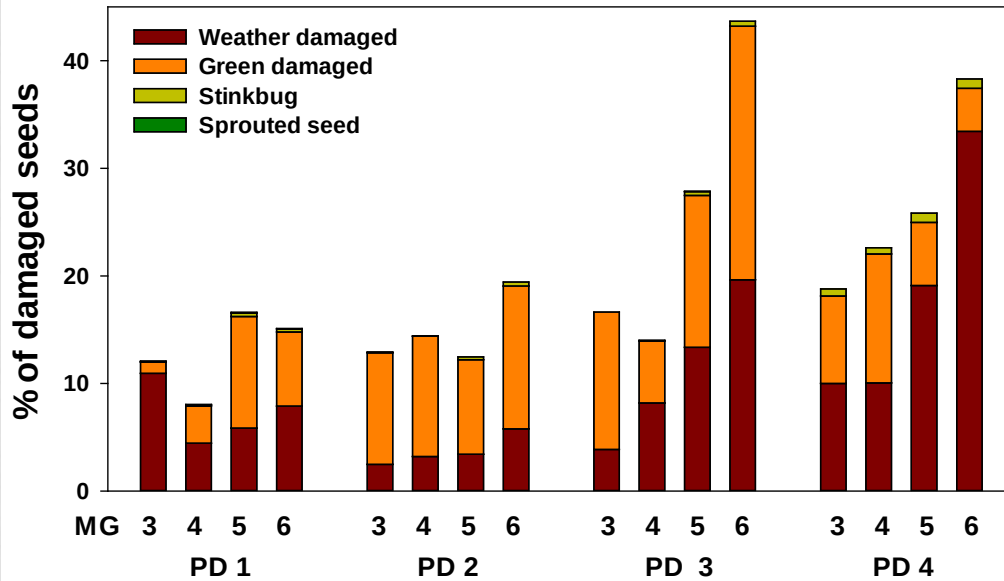
St. Joseph, LA				
Planting				
Date	III	IV	V	VI
1	>4	>4	>4	>4
2	>4	>4	>4	>4
3	>4	>4	4	4
4	>4	4	4	>4

Verona, MS				
Planting				
Date	III	IV	V	VI
1	4	4	>4	>4
2	3	4	4	4
3	2	2	3	2
4	3	3	2	2

COLLEGE ST, TX				
Planting				
Date	III	IV	V	VI
1	>4	4	>4	>4
2	>4	>4	>4	>4
3	>4	>4	>4	>4
4	>4	>4	>4	>4

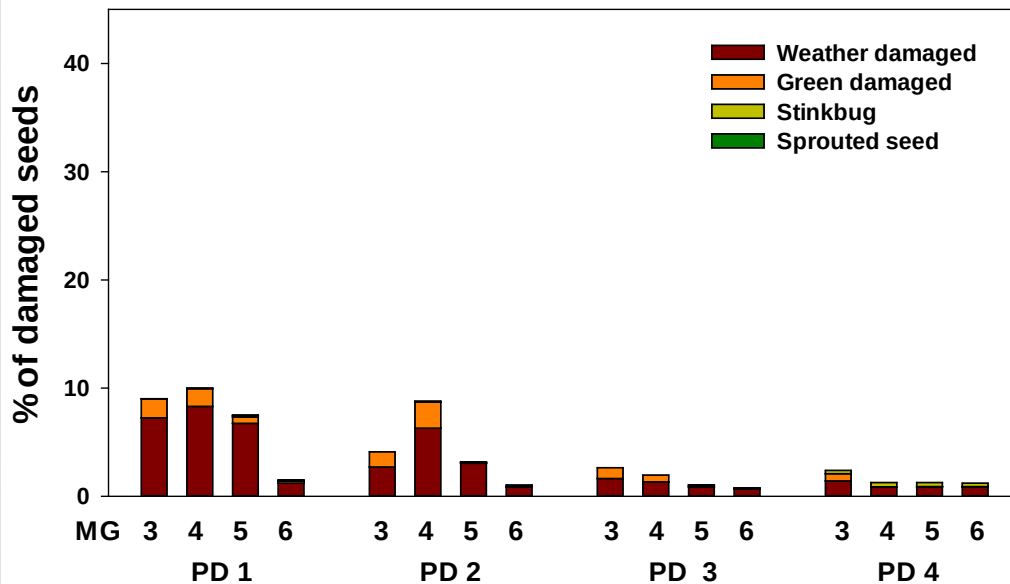
Planting				
Fayetteville, AR				
Date	III	IV	V	VI
4	2	1	1	1

College Station, TX



TYPES OF DAMAGED SEED

Keiser, AR



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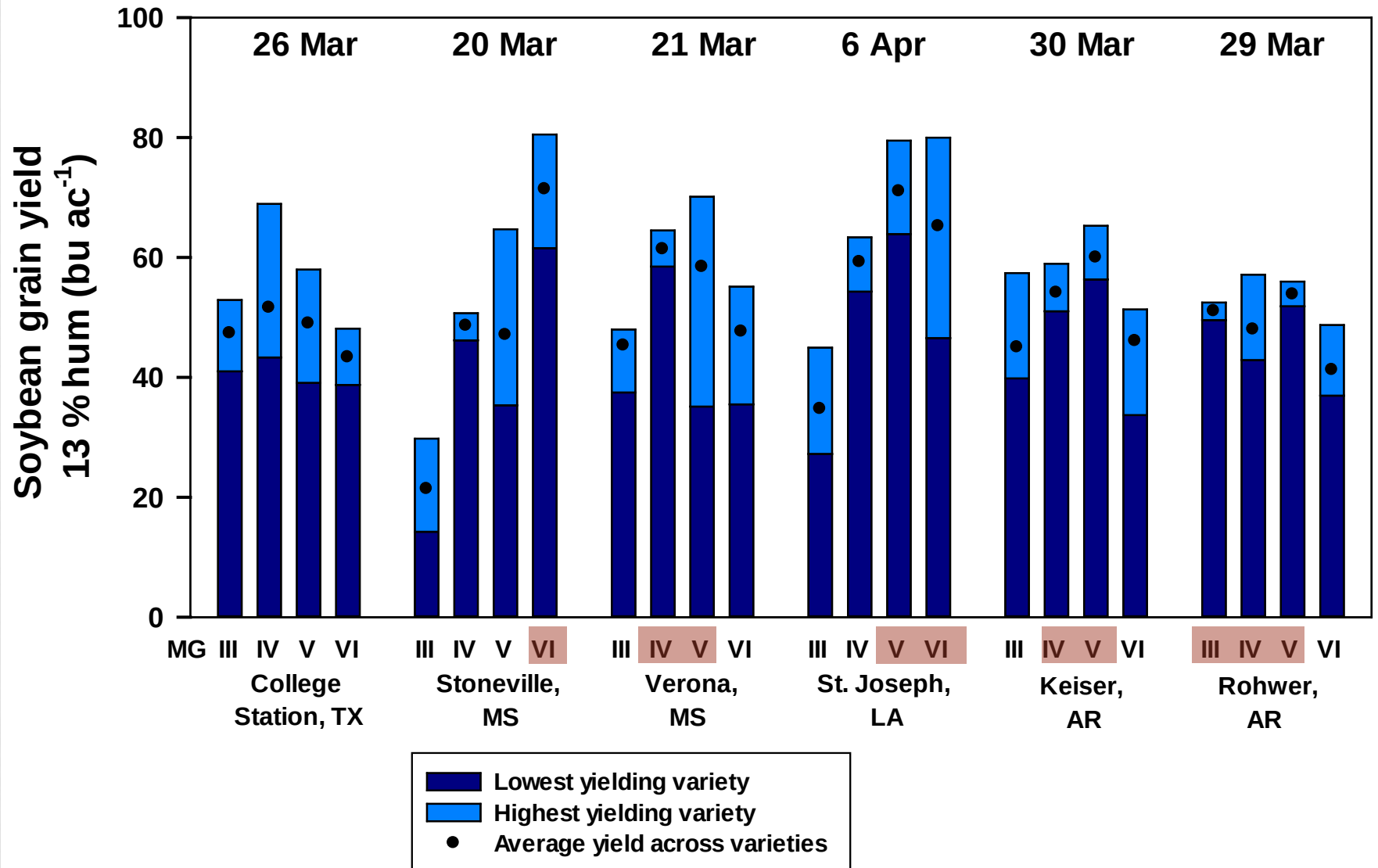


Planting dates established at all locations

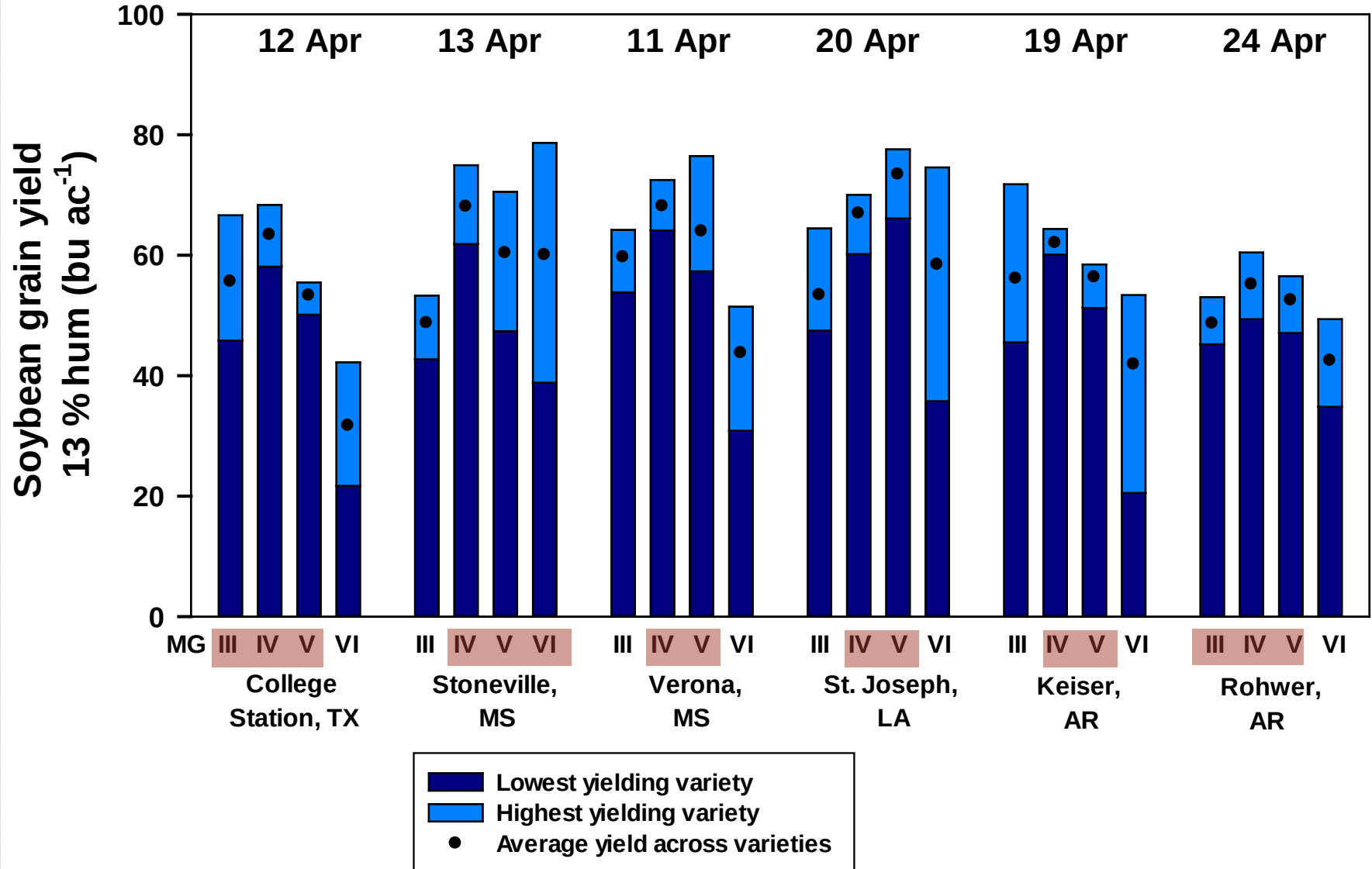
2012 **2013**

<u>Location</u>	<u>Planting date 1</u>	<u>Planting date 2</u>	<u>Planting date 3</u>	<u>Planting date 4</u>
College Station, TX	26- Mar 09-Apr	12- Apr 26-Apr	04-May 13-May	25-May 30-May
St. Joseph, LA	06-Apr 30-Apr	20-Apr 13-May	15-May 27-May	01-Jun 12-Jun
Stoneville, MS	20-Mar 18-Apr	13-Apr 31-May	10-May 12-Jun	07-Jun 08-Jul
Rohwer, AR	29-Mar 26-Apr	24-Apr 20-May	15-May 10-Jun	26-Jun 28-Jun
Verona, MS	21-Mar 23-Apr	11-Apr 15-May	17-May 30-May	07-Jun 17-Jun
Keiser, AR	30- Mar 11-Jun	19-Apr 26-Jun	16-May 08-Jul	08-Jun 17-Jul
Portageville, MO	02-Apr 09-Apr	17-Apr 09-May	10-May 29-May	12-Jun 20-Jun
Milan, TN	22-Apr	09-May	05-Jun	25-Jun
Columbia, MO	22-Apr	14-May	04-Jun	21- Jun?
Fayetteville, AR	06-Jun 08-Jun	-	-	-

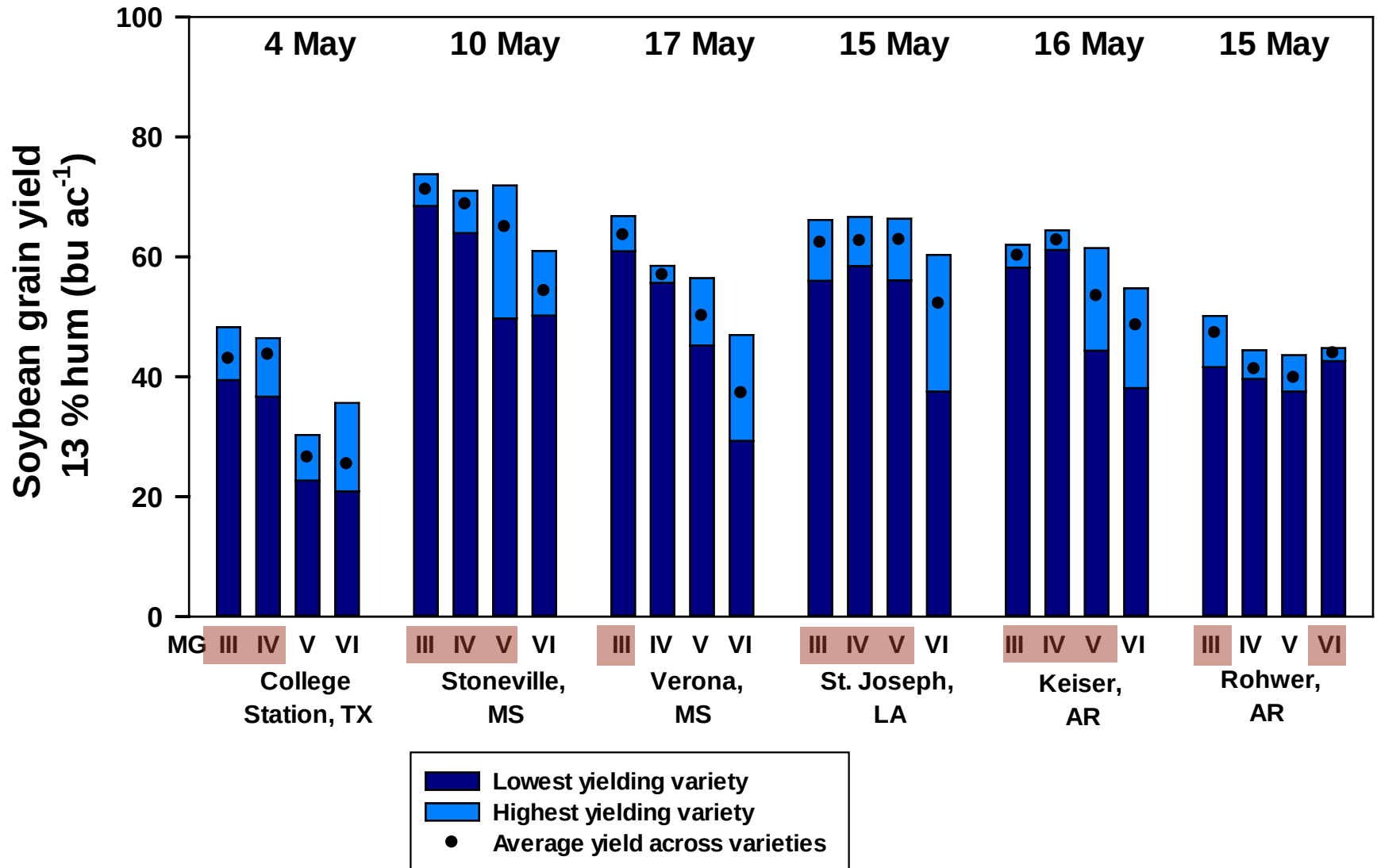
Planting date 1: 20 Mar - 15 Apr



Planting date 2: 11 Apr - 11 May



Planting date 3: 4 May - 31 May



Planting date 4: 25 May - 26 Jun

