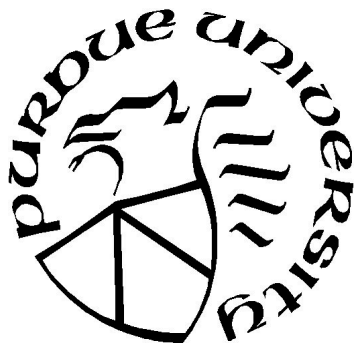


Genetic sources of increased sugar content in soybean

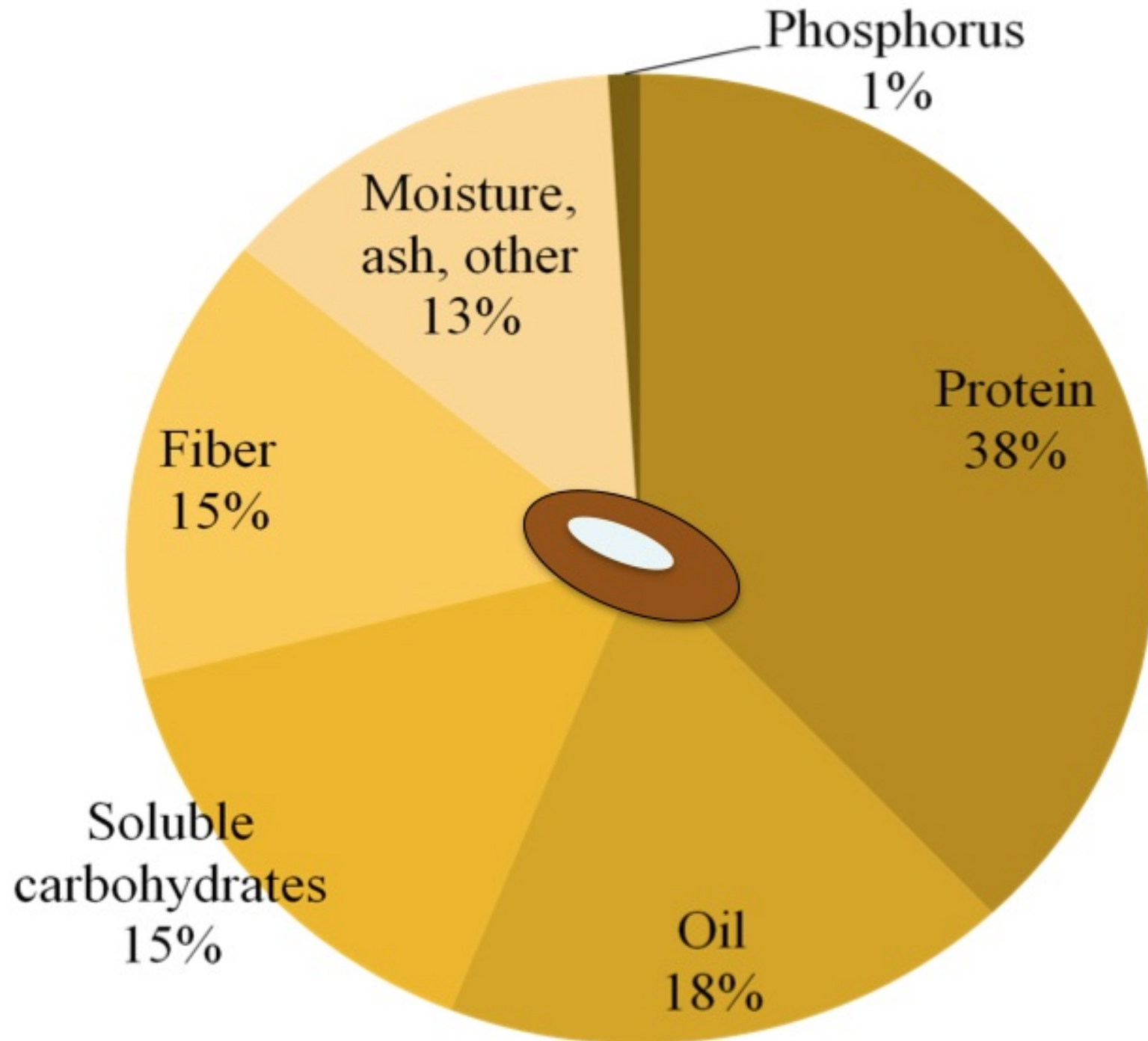


Katy Martin Rainey

Purdue University

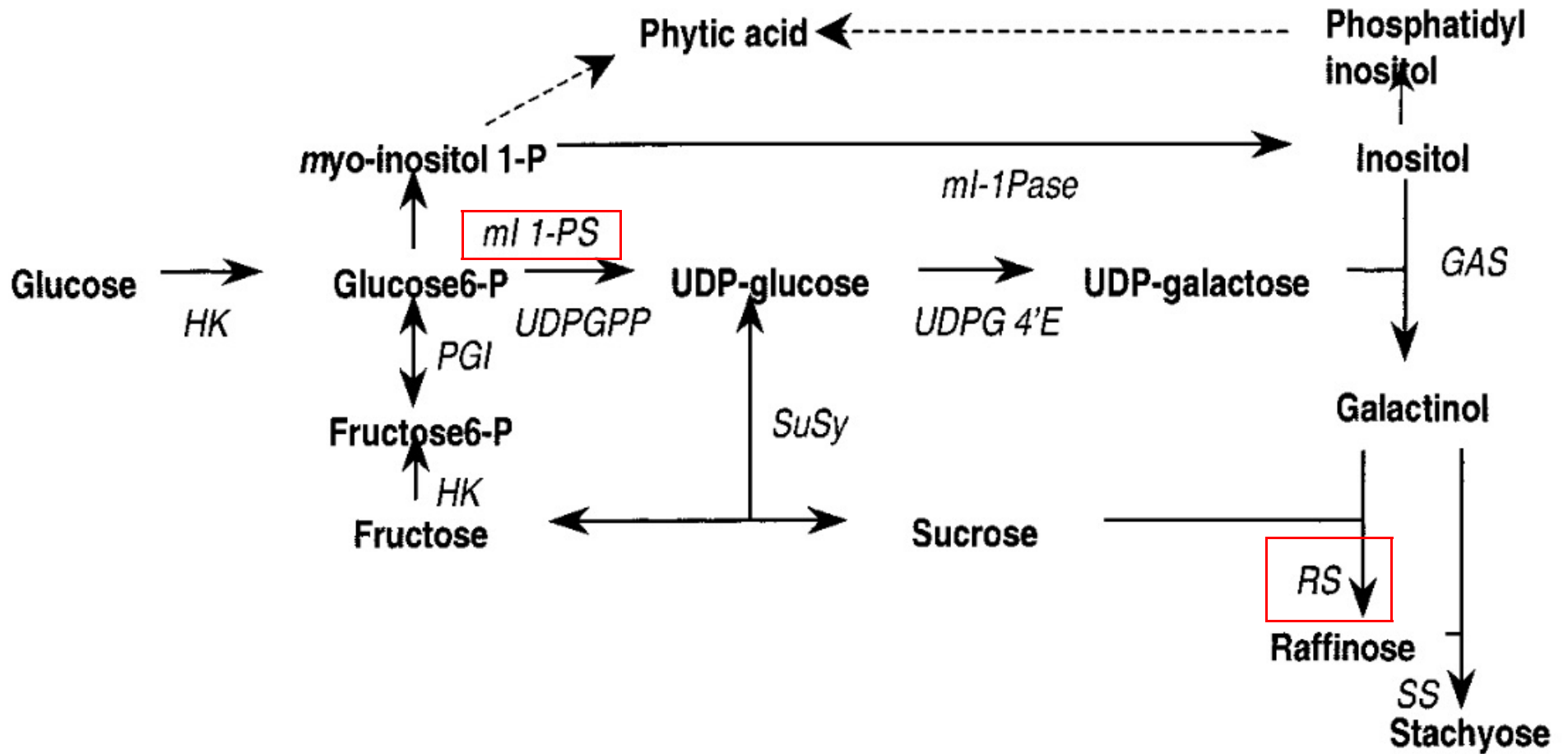
Feb 16, 2017

% Seed Composition, Typical Commodity Soybean



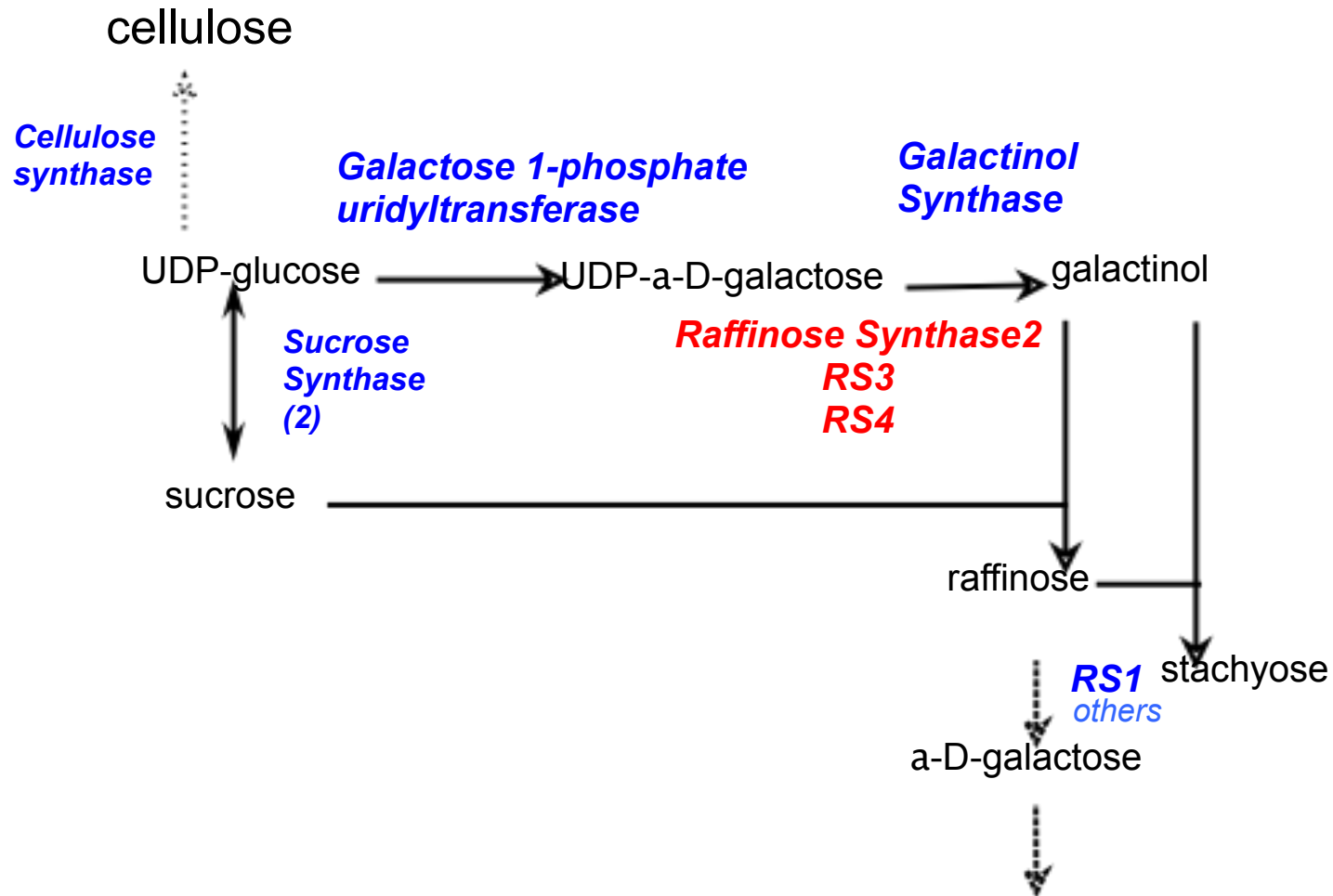
A schematic diagram of the interactions involved in conversion of carbon from glucose into either phytic acid or suc, raffinose, and stachyose.

Hitz *et al.*, Plant Physiology,
February 2002, Vol. 128



Soluble Carbohydrate Biosynthetic Pathway

Slide from Karen Hudson



Known Sources

RS2

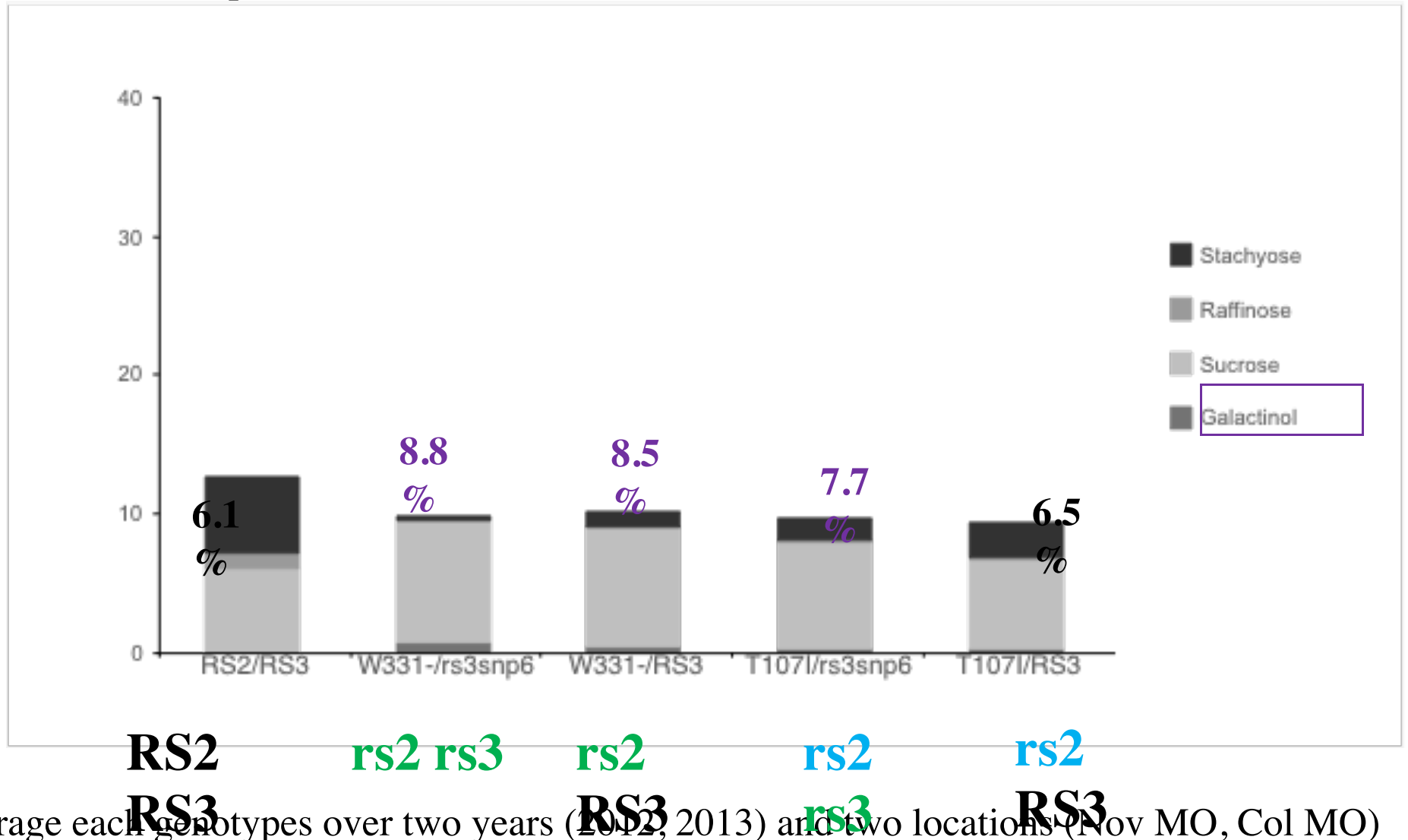
- PI 200508 (Kerr and Sebastian, 2000)
 - W331 allele (Dierking & Bilyeu, 2008)
- Mutant Williams 82
 - T107I allele (Dierking & Bilyeu, 2009)

RS3

- Mutant Williams 82
 - rs3SNP6 allele (Dierking & Bilyeu, 2009)
- Mutant Williams 82, Hudson lab, 2015

Bilyeu lab ENEM Research update

Slide from
Kristin Bilyeu



Average each genotypes over two years (2012, 2013) and two locations (Nov MO, Col MO)

Known Sources

RS2

-PI 200508 (Kerr and Sebastian, 2000)
W331 allele (Dierking & Bilyeu, 2008)

-Mutant Williams 82
T107I allele (Dierking & Bilyeu, 2009)

RS3

-Mutant Williams 82
rs3SNP6 allele (Dierking & Bilyeu, 2009)

-Mutant Williams 82, Hudson lab, 2015

RS2

-MG I
UMN W331
88% of yield check

-MG II and MG III
-IA State NILs W331
2104HS
3051HS

-Purdue Lines W331, T107I
in development

-MG IV
-MO several lines W331

RS3

-K. Bilyeu and K. Hudson

Known Sources, Sucrose QTL

Maughan *et al.* (2000): Chr 5, 7, 8, 13, 15, 19, and 20

Kim *et al.* (2006) Chr 2, 11, 12, 16 and 19

Skoneczka *et al.* (2009) Chr 6

Salari, Rainey *et al.*, in prep Chr 1, 3
10% and 22% of variance respectively
SoyNAM: IA3023 x LD02-4485

Known Sources, *sts*

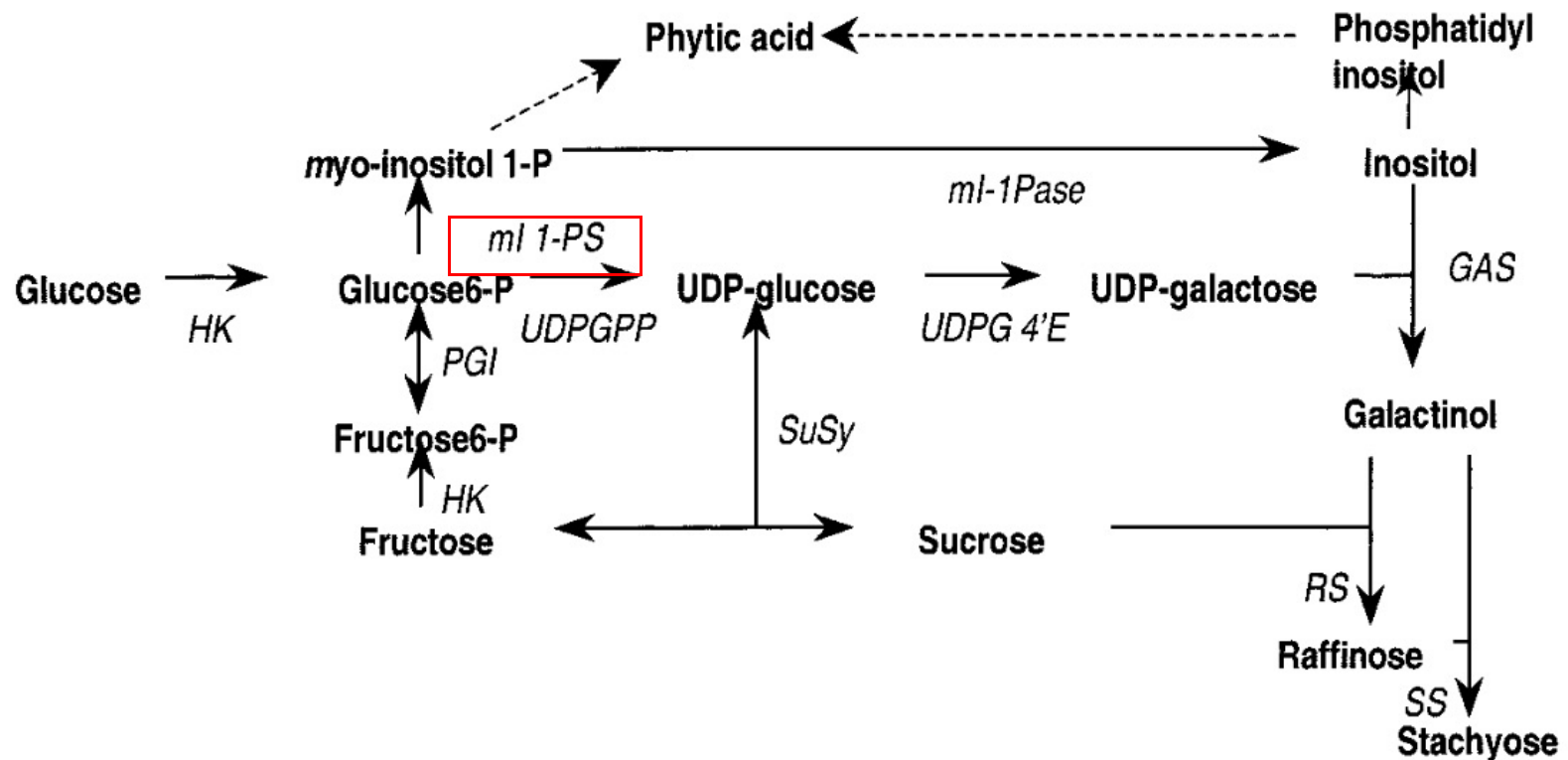
PI 603176A showed very low
stachyose content (<0.5%)
controlled by a single gene, *sts*

Reported by Tri Vuong and Henry Nguyen

Known Sources

MIPS

- LR33 (Hitz et al., 2002; Sebastian et al., 2000)
- Gm-lpa-TW-1 (Yuan et al., 2007)
- V99-5089 (Saghai Maroof and Buss, 2008)

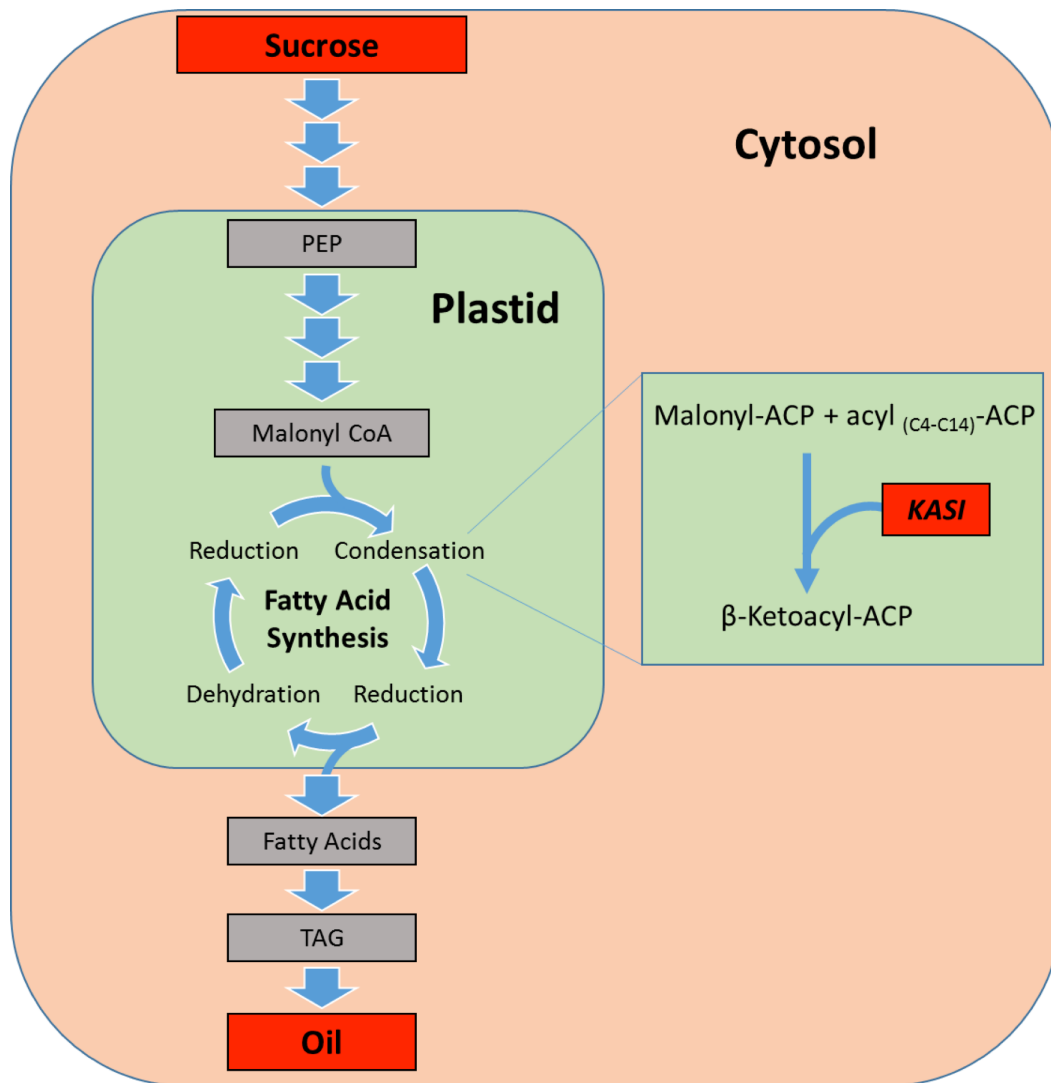


Potential New Sources, Accessions

Line	Sucrose	Raffinose	Stachyose
	(DW%)		
PI 229343	>8%	.	.
PI 417015	>8%	.	.
PI 536547B	7.7 - 8.1	0.9 - 1.2	0.9 - 1.6
PI 507449	7.9 - 8.6	1.1 - 1.4	1.5 - 1.7
PI 561288	7.8 - 8.5	1.0 - 1.2	1.2 - 1.6
PI 561292B	6.8 - 8.0	0.9 - 1.1	1.1 - 2.9

PI 603176A showed very low stachyose content (<0.5%) controlled by a single gene, *sts*

Potential New Sources, MN FN



-8% sucrose on a dry matter basis, about twice the sucrose level that we see in the population parent line 'M92-220'

-The sucrose phenotype is coupled to a low oil phenotype (8.5% on dry matter basis)

-Caused by a translocation between chromosomes 8 and 13

-This translocation broke a β -ketoacyl-[acyl carrier protein] synthase 1 (KASI) gene in half.

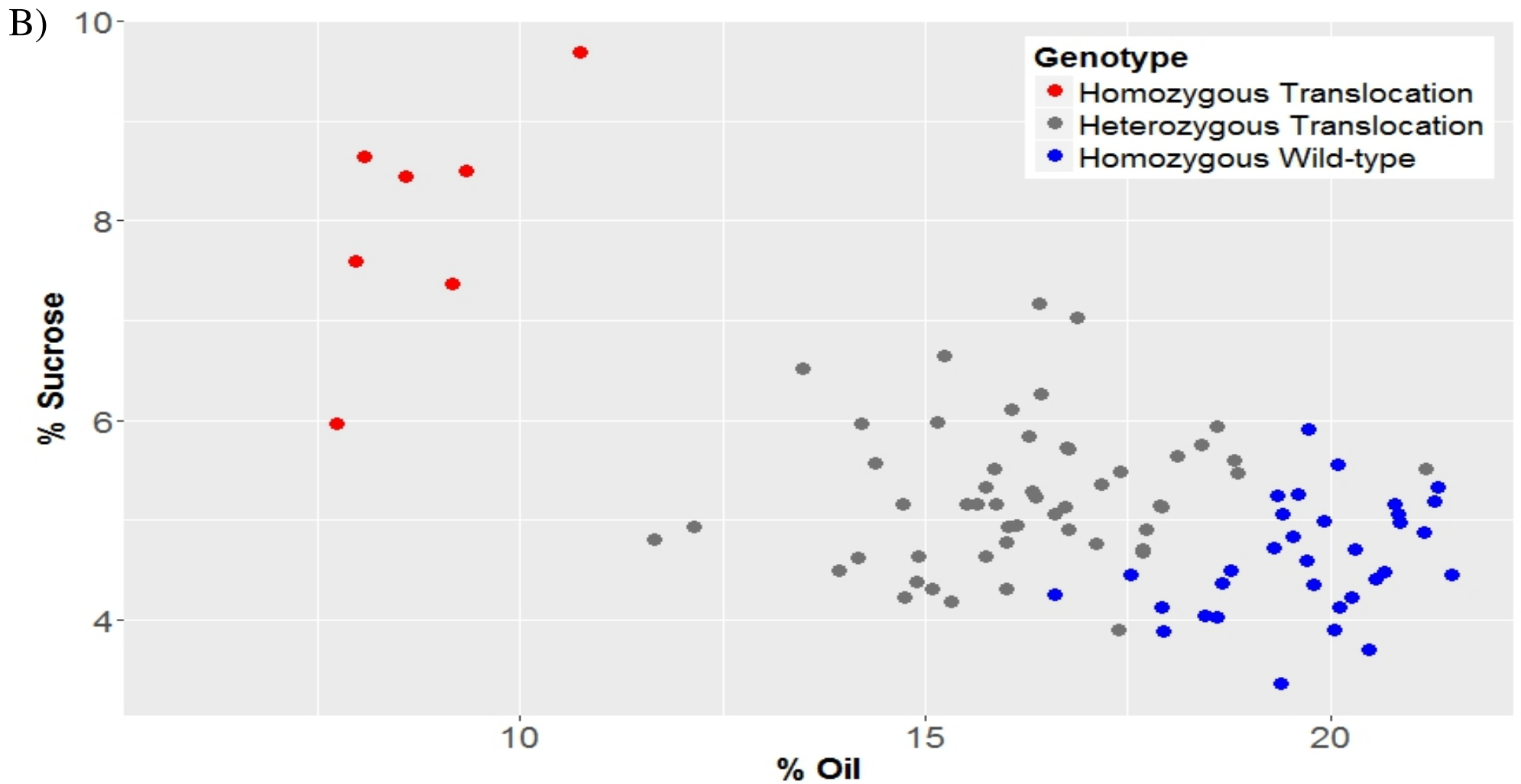
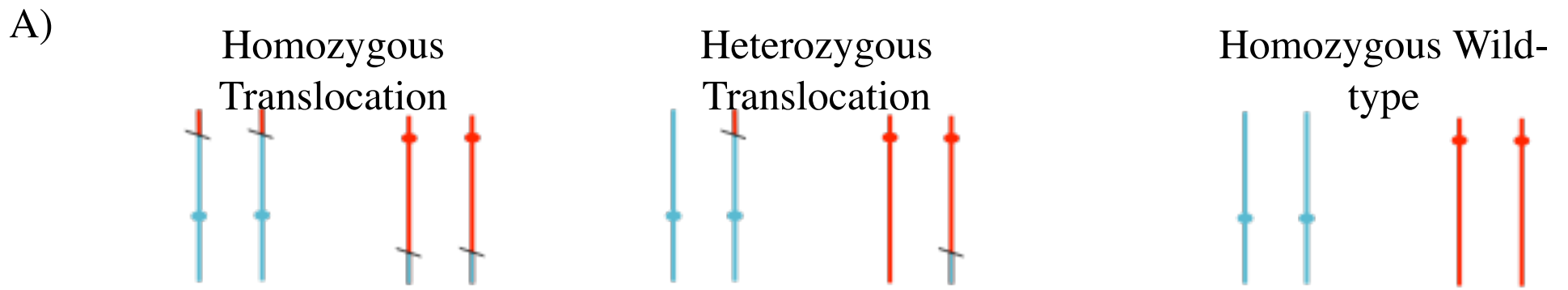


Figure from Bob Stupar

Figure 3

Potential New Sources, GA FN

Mutant line	Sucrose	Raffinose	Stachyose	Note
	(DW%)			
SN0142	8.6	1.4	0.9	H. sucrose, L. stachyose
SN0152	7.1	1.0	0.9	H. sucrose, L. stachyose
SN0414	8.1	0.5	0.5	H. sucrose, L. RFO's
SN0161	<0.4	<0.5	0.7	L. sucrose, L. RFO's
SN0164	<0.4	<0.5	0.6	L. sucrose, L. RFO's