

Pollinators in Soybeans

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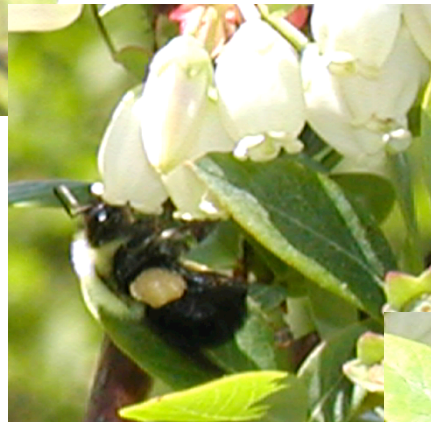
Why pollinators matter to soybeans.

- Regulatory issues
 - Non-target impacts
 - Gene escape
- Production
 - Development of hybrid soybeans.
 - Yield impact?

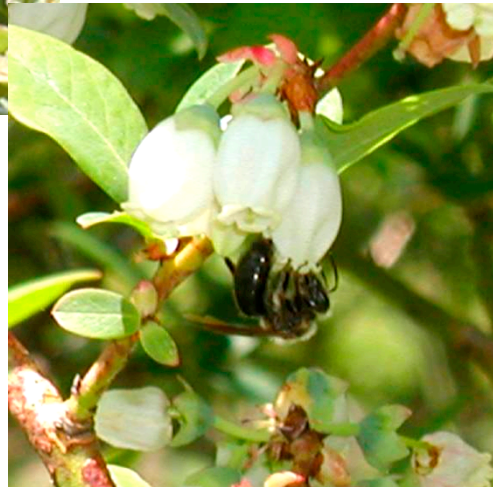
Pollinators



Approx. 240,000 flowering plants
More than 210,000 pollinated by insects



Many crops require insect pollination
(tomato, apple, blueberry, melon)



15-30% of US diet a
result of pollination

Pollination syndromes

- Cantharophily – beetle
- Myophily- flies
- Psycophily-butterflies
- Phalaenophily-moths
- **Melittophily- bees**



Pollinators in soybeans

- Hymenoptera (bees and wasps)
 - Social
 - Honey bees (*Apis mellifera*)
 - Bumble bees (*Bombus* sp.)



Social bees as pollinators

Photo: R. Manning, Agriculture Western Australia



Insects and Ecosystem Services

Insect ecosystem service	Estimated value*
Pest control	~\$4.5 billion
Pollination	
Honey bees	\$8-\$16.4 billion
Native bees	\$3.1 billion



*Losey and Vaughan Bioscience 2006.

Pollinators in soybeans

- Diptera (flies)



Syrphidae



Pollinators and soybeans

2011 Field Study

- What insect pollinators are in soybeans?
- How should they be collected?
- Are these pollinators visiting soybean flowers?

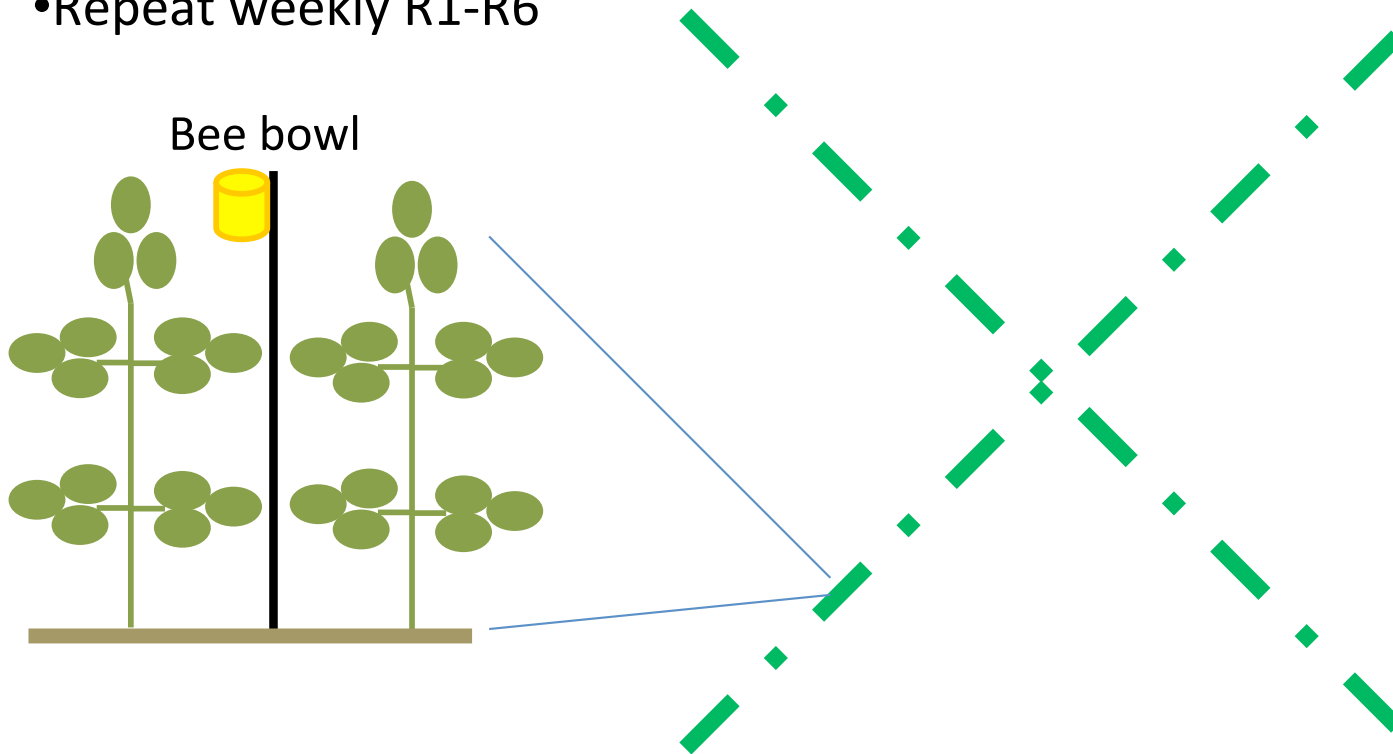
How should pollinators be collected?



How should pollinators be collected?



- 4 locations
- 2 transects (50 m long) per location
- Sweep net once a week
- Yellow sticky cards deployed for 5 d
- 15 bee bowls per transect (30 per location)
 - Deployed for 24 h
- Repeat weekly R1-R6





What insect pollinators are in soybeans? Organized by trap

Pollinator type	Bee bowls	Yellow sticky traps	Sweep net
Bees (Hymenoptera)	1120	26	0
Social bees	7		0
Native bees	1113	26	0
Fly (Diptera)	428	727	40
Syrphids	391	602	9
Total individuals	1939	1355	42

How should they be sampled?

Pollinators by bee bowl color

Pollinator type	Blue	Yellow	White
Bee (Hymenoptera) Social and Solitary	559	307	253
Fly (Diptera)	77	171	181
Syrphids	93	175	123
Total individuals	729	653	557

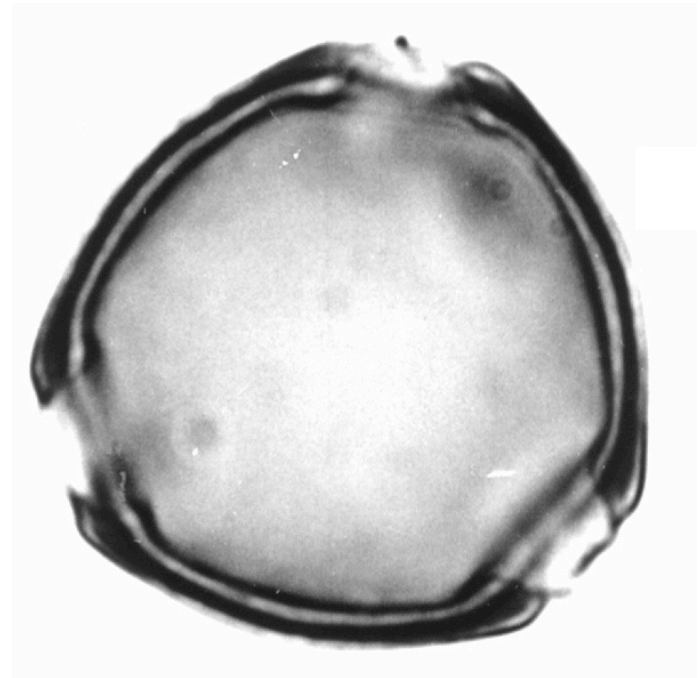
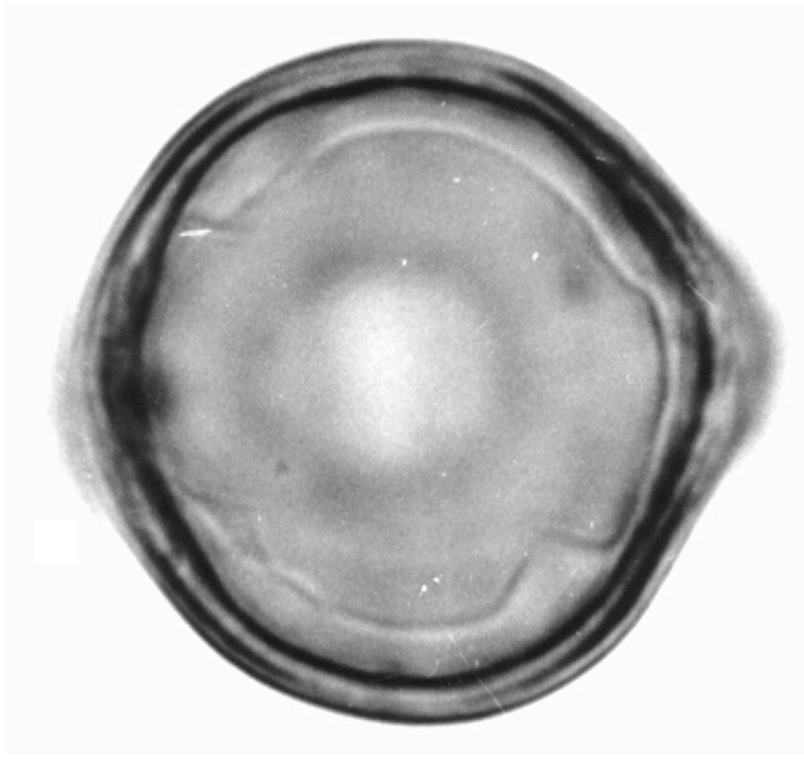
Where are the pollinators?

- Flies found throughout field
- Bees mostly at edge of field

Location	Total		Bee		Flies		Syrphids	
	F-value	P	F-value	P	F-value	P	F-value	P
Story	1.97	0.04	1.92	0.03	1.11	0.34	0.91	0.55
Boone	2.20	0.03	1.95	0.06	0.61	0.75	0.86	0.53
Dallas	2.31	0.01	2.69	0.001	0.57	0.88	0.90	0.56
Polk	0.77	0.69	0.78	0.69	0.77	0.69	0.94	0.52

Are bees visiting soybean flowers?

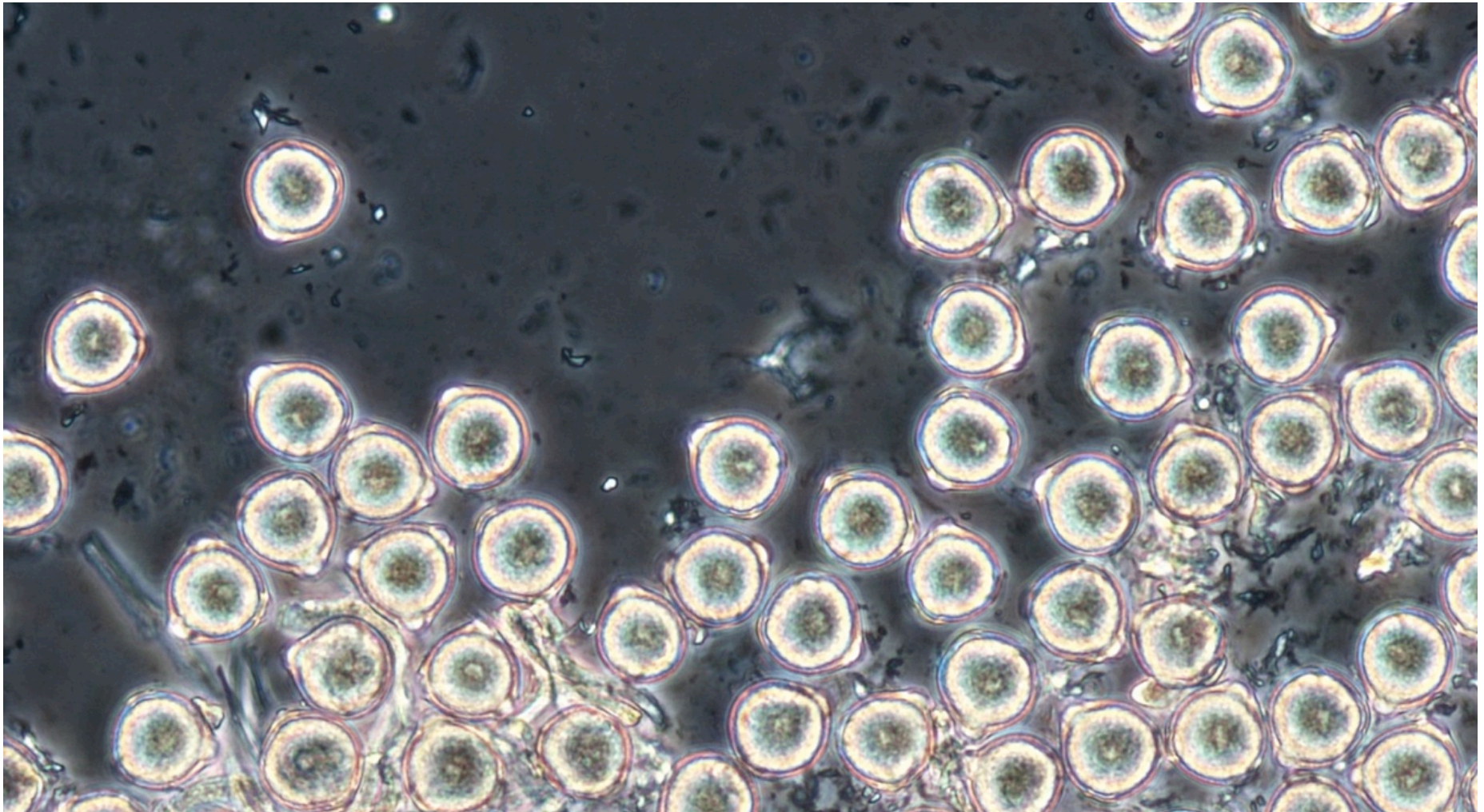
- *Glycine max* pollen
- Examined 30 of the five most abundant bees*



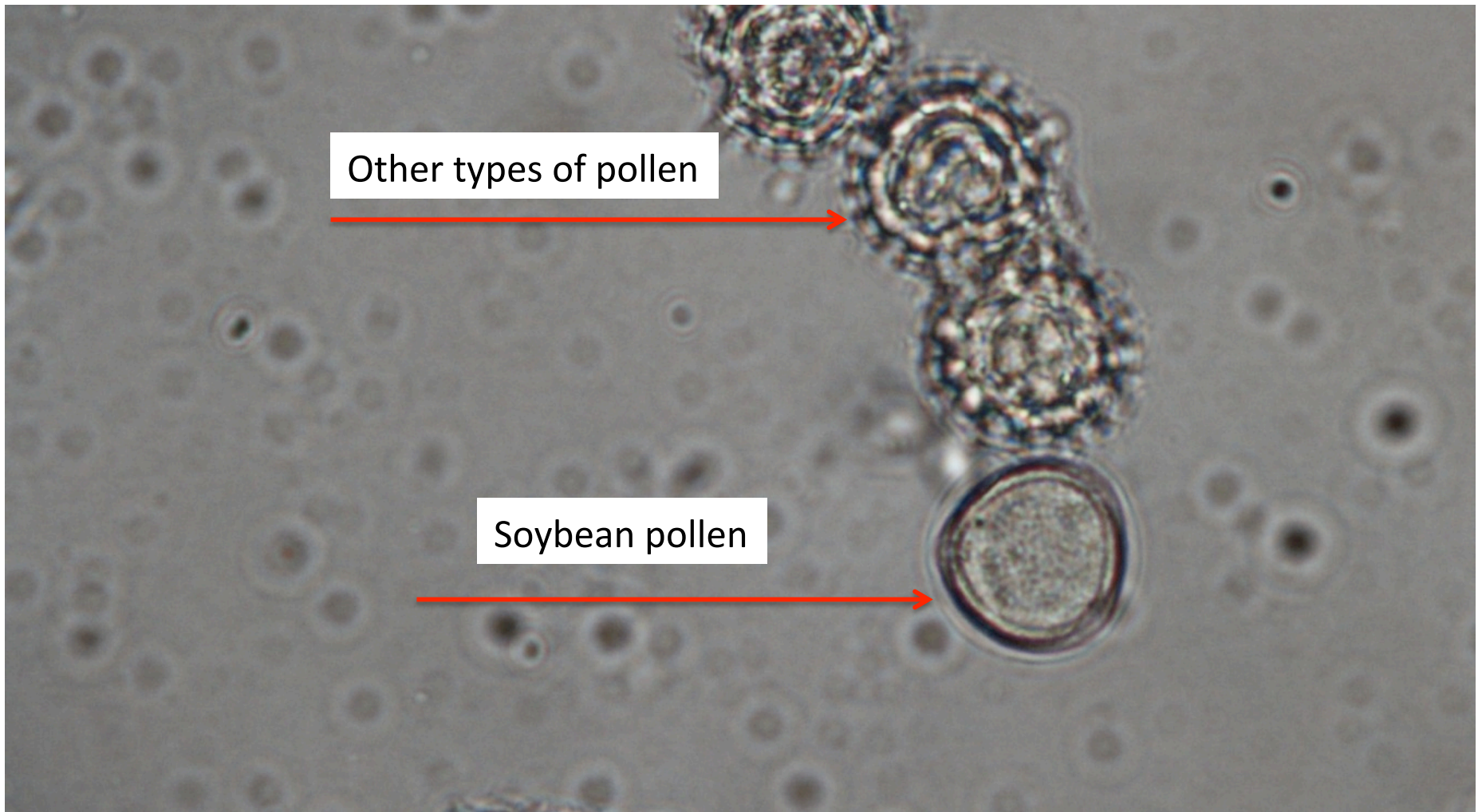
http://pollen.usda.gov/Light_Micrographs/Fabaceae/Glycine%20max.html

Glycine max pollen

Removed from soybean flowers at our research sites and slide mounted for reference



Agapostemon virescens



Melissodes bimaculata



Agapostemon virescens (female)



Are bees visiting soybean flowers?

Species	Pollen present	Soybean pollen present
<i>Melissodes bimaculata</i>	13	4
<i>Agapostemon virescens</i>	51	12
<i>Augochlorella aurata</i>	2	0
<i>Halictus confusus</i>	1	1
Dialictus spp.	16	7

Melissodes bimaculata



Agapostemon virescens



What insect pollinators are in soybeans?

- 33 species found in central Iowa
 - Diptera (flies)
 - Hymenoptera (bees and wasps)
 - Very few social bees
 - Honey bees (*Apis mellifera*)
 - Bumble bees (*Bombus* sp.)
 - Primarily solitary bees
 - Several species (> 20)
 - Mostly ground nesting species

How should they be sampled?

- Bee bowls of all 3 colors



Are these pollinators visiting soybean flowers?

- Yes.
- Are they pollinating soybean flowers?
 - That is a different question.
- Is there 1 bee species that we should study?
 - What is the ‘best’ soybean pollinator?
 - ‘Best pollinator likely not in the US.
 - 2012 Expedition to China.

Acknowledgements

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