Continuing Studies on an Unknown Virus of Sunflower in Nebraska

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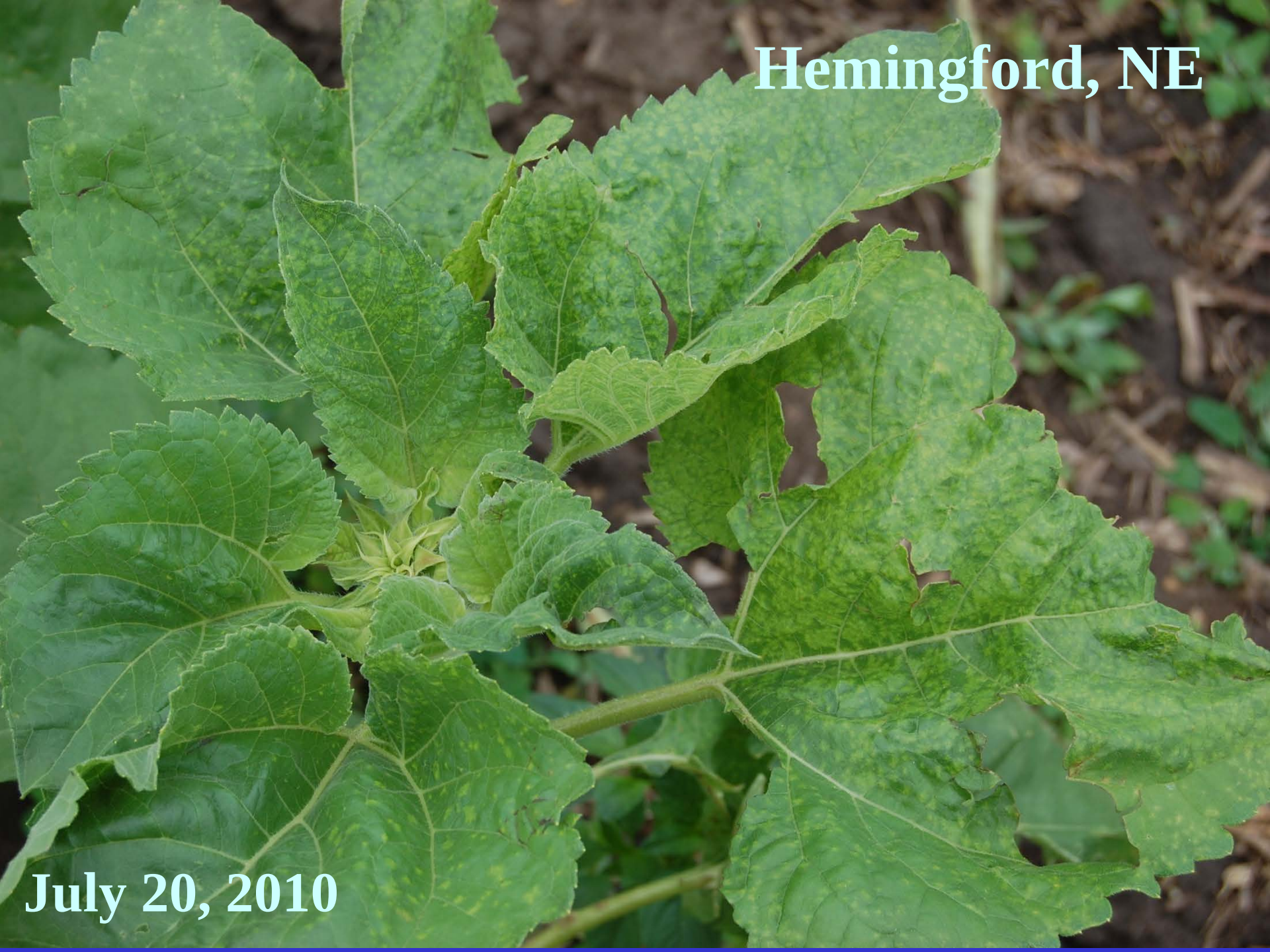
Unknown Virus Disease Summary

- Plants with virus-like symptoms were observed in 2010, 2011, and 2014 consisting of stunting, ringspots, and mosaic or mottle-type symptoms
- Symptoms were first observed each year in early to mid-July from commercial fields except 2014 – but faded over time
- Late in the 2011 and 2014 seasons, leaf symptoms on field-infected plants exhibited bright yellow ringspots on upper leaves
- Similar symptoms seen in greenhouse

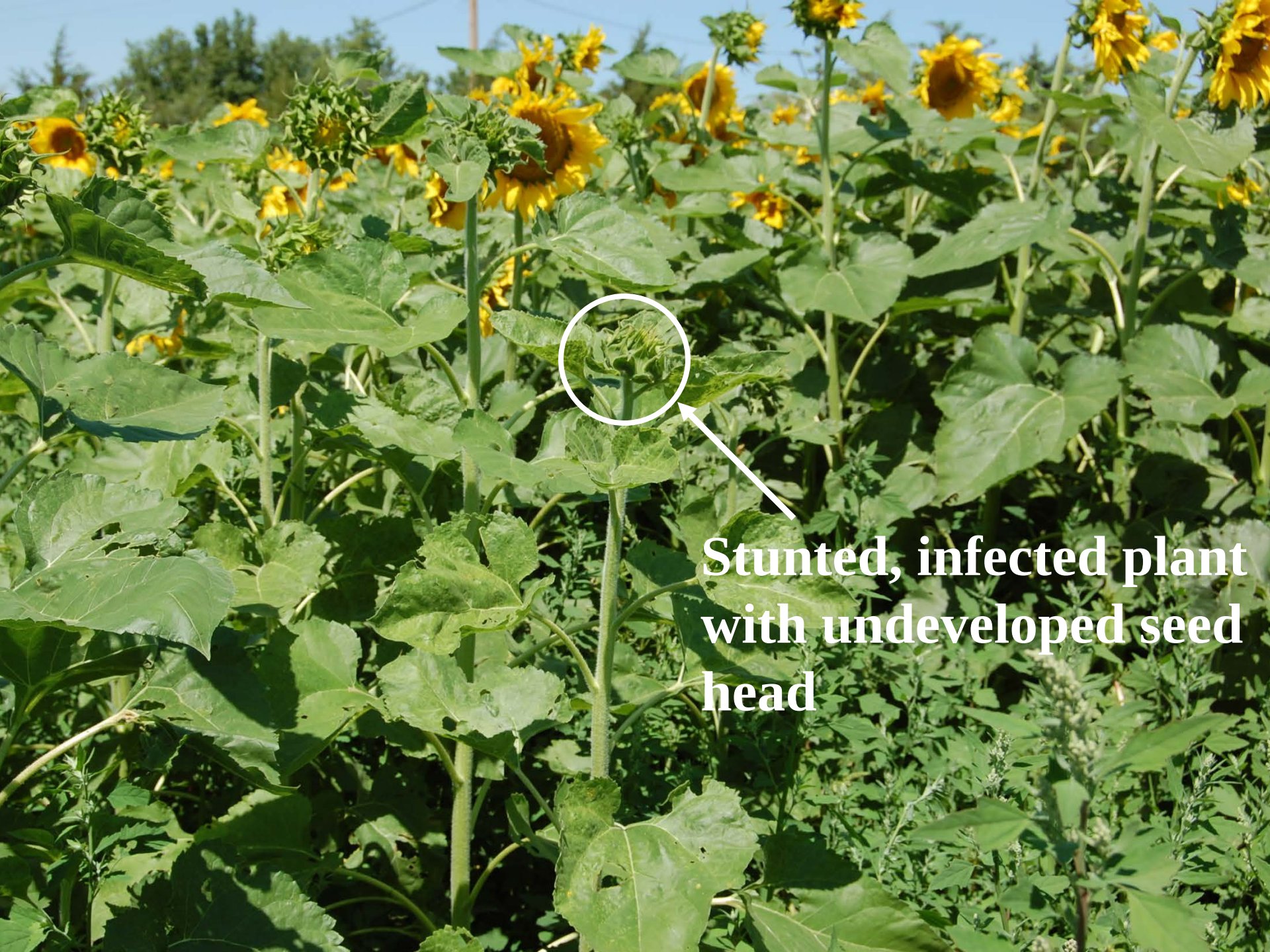

Hemingford, NE
July 20, 2010


July 27, 2011


September 7, 2011

Greenhouse Inoculations

- Mechanical transmission was successfully performed multiple times from infected field plants to seedlings in the greenhouse in both years
- New symptoms on inoculated seedlings appeared 10-15 days after inoculation, and began as small chlorotic spots followed by ring spots in some inoculated plants
- Greenhouse symptoms tended to fade over time like those of the field symptoms


Stunted, infected plant with undeveloped seed head

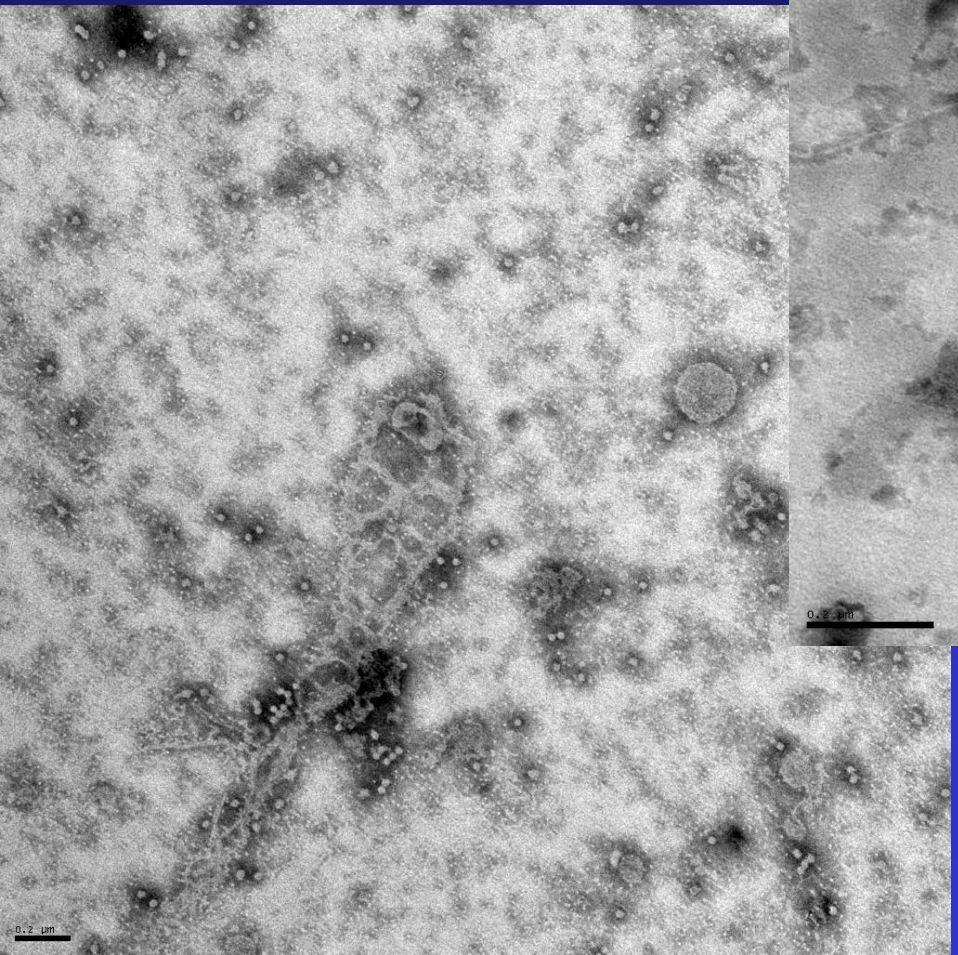
Yield Reduction Potential - 2011

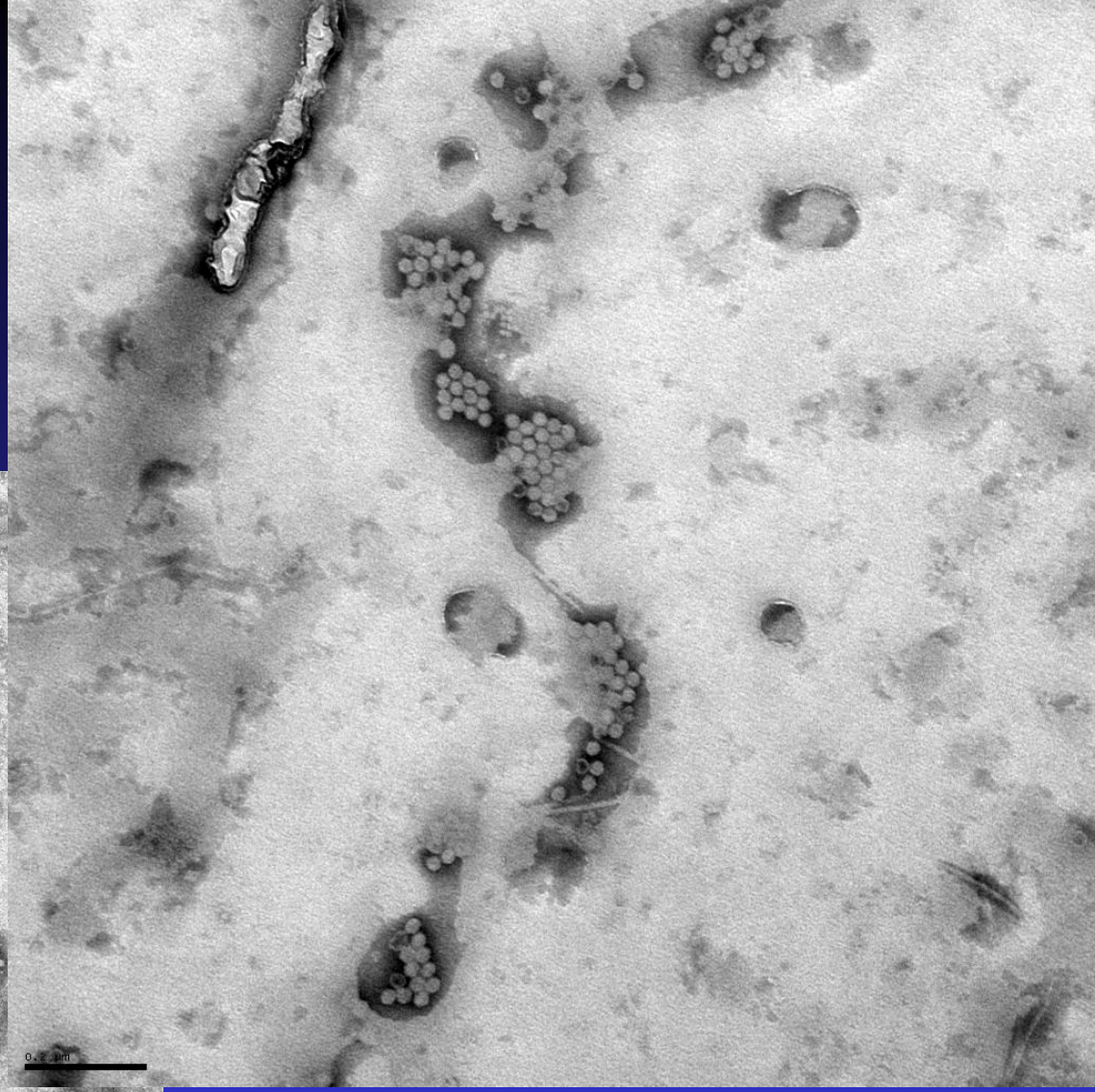
Diagnostic Efforts

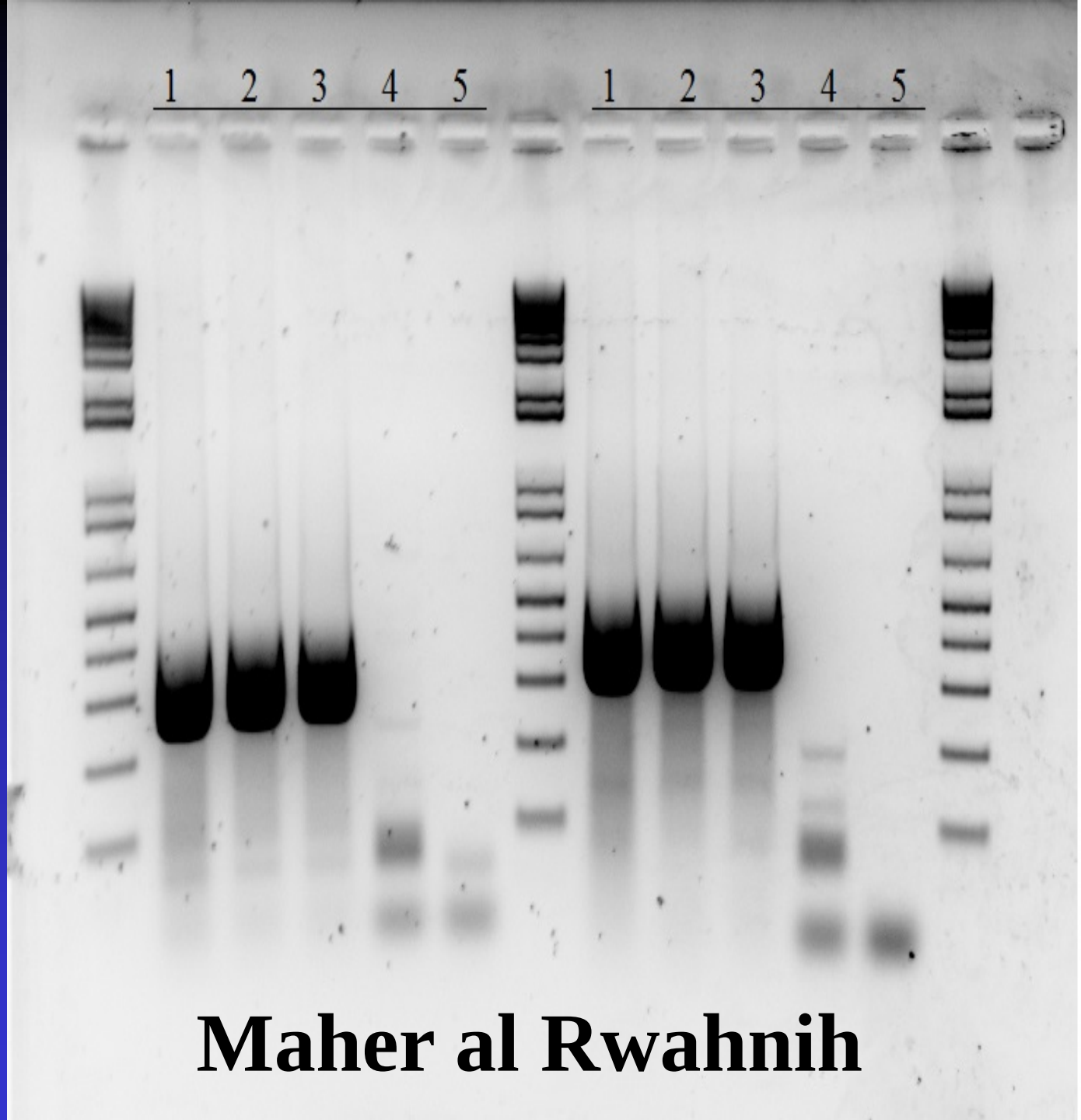
- Flexuous rod particles observed in EM from initial samples collected from 2010 field but negative for SuMV with serological (ELISA) and DNA (RT-PCR) methods (A. Karasev, University of Idaho, Moscow, ID)
- Inoculated samples from 2011 field also tested negative for SuCMoV by collaborators in Argentina (S. Lenardon)
- Lost these two cultures in the greenhouse

September 2014

Tongyan Tian







Key

1: Original Sunflower Sample

2: Plant Inoculated on 8/23

3: Plant Inoculated on 9/24

4: Uninfected Healthy Control

5: Water

Maher al Rwahnih

Virus Culture Maintenance

2015

2014


What We Know

- Infectious agent – easily mechanically transmitted
- Fortunately was not economically damaging overall – small areas of fields affected
- Severe reductions were observed on affected plants – severe stunting and reduced seed head sizes
- Symptoms tended to fade over time – yet still remained infective

What We Know

- Polyhedral virus – (Tongyan Tian) - EM
- Next generation sequencing PCR – (Maher al Rwahnih) - the virus has been determined to be in the family tombusviridae
  - Soilborne viruses with no known vectors
- New virus never before reported
- Similar symptoms from alley – never transmitted in greenhouse and did not match with field samples (something different?)

Future Investigations

- Characterize new virus pathogen
- Mechanism for spread-
  - Seedborne?
  - Insect vector?
  - Survival?
- Virus complex – two (or more) different pathogens?

Thank you! Questions?