Evaluating the Susceptibility to Aphid Transmitted Viruses

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Snap Bean Viruses
A Recurring Problem Since 2000

Chronology

- **2000** - Oostburg, Belgium and Cambria - High incidence of virus-like symptoms
- **2001** – 1° areas along Lake Michigan near Manitowoc; scattered incidence elsewhere; losses less than 2000
- **2002** - Late plantings in eastern WI along Lake MI – late appearance of soybean aphids

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Chronology

- **2003** - Wide distribution along Lake Michigan, Cambria, central and southern WI
  - Aphid pressure early and heavy
  - 100% virus infection in many fields
  - Losses due to reduced yields and pod quality

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Chronology

- **2004** – Minimal losses throughout state
  - Cool and wet conditions for early summer
  - Aphid pressure late and light
  - Scattered symptomatic plants in fields
  - Minimal effects on yield
  - Few reports of pod symptoms

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- Viruses identified in symptomatic plants each year (alone and in combination) include:
  - cucumber mosaic virus (CMV)
  - alfalfa mosaic virus (AMV)
  - clover yellow vein virus (CYVV)
- All transmitted by aphids in a non-persistent stylet-borne manner
- Soybean aphid appears to be the primary vector of virus complex

Snap Bean Virus Complex – Research History

- **2001**
  - Evaluated 50 lines
  - West Madison, 2 planting dates
  - CMV-Inoculated half of each plot
  - Heavy infection – throughout trials
- **2002**
  - Evaluated 150 lines
  - West Madison, 2 planting dates + Manitowoc (commercial field, 1 planting)
  - No inoculation
  - Good distribution of virus through trials by aphids

Snap Bean Virus Complex – Research History

- **2003**
  - Evaluated 50 lines
  - West Madison, 2 planting dates + Manitowoc (commercial field, 1 planting)
  - No inoculation
  - Heavy aphid pressure especially at W. Madison
  - Distribution of virus throughout plots by aphids
- **2004**
  - Evaluated 38 lines
  - West Madison, Fox Lake, Oostburg
  - Very light aphid pressure
  - Symptomatic plants throughout W. Madison and Fox Lake plots, almost no symptoms at Oostburg

Snap bean variety trial – virus evaluation 2004

Three locations:

- **West Madison Agricultural Research Station**
- **Two commercial fields**

Arrangement:

- **2-row plots (UW breeding lines 1-row), 20’ long**
- **3 replicates**

Data collected for each trial:

- **Leaf samples for ELISA virus assay - composite sample of 10 leaves/replicate from each trial, analyzed for AMV, CMV ClYVV.**
- **Two ratings for foliar symptom severity**

		Fox Lake	West Madison	Oostburg
Planted		7/2/04	7/13/04	7/15/04
Leaf sample 1 collected		8/17	8/23	8/24
Leaf sample 2 collected		8/31	9/7	9/8
Visual rating	#1	8/17	8/23	8/24
	#2	8/31	9/7	9/8

Symptoms include mosaic, leaf malformation, leathery leaf

Single symptomatic plants surrounded by healthy plants

Leaflet malformation

Leaf puckering

Leathery texture

Mild symptoms include chlorosis and leaf rolling

Some plot entries were free of symptoms at all sites and ratings

Burr Cucumber – Mosaic symptoms

Recovered squash mosaic virus

Field Corn – Source of corn aphids early in season

Typical Field Edge – Potential source of viruses

Leaf chlorosis

Yellow mottling of leaflets

Snap bean variety trial – virus evaluation 2004

Trt	Source Company	Entry Name	Previous trials?
1	Harris-Moran	Hystyle	2002 2003
2	Harris-Moran	Trueblue	No
3	Harris-Moran	Arras (MV-185)	2002 2003
4	Seminis	Romano Gold (08190506)	2002 2003
5	Seminis	15330733	No
6	Seminis	R00.11142	No
7	Seminis	08120670	No
8	Seminis	R00.35558	No
9	Syngenta/ Rogers	SYNMV 85	No
10	Syngenta/ Rogers	Lexus	2002 2003
11	Syngenta/ Rogers	Redon	No
12	Syngenta/ Rogers	Mayon	2002 2003
13	Syngenta/ Rogers	Sirio	2002 2003
14	Brotherton	Orion	2002 2003
15	Brotherton	#835	No
16	Brotherton	HS 906	No
17	Del Monte	IDC IX	No
18	Del Monte	IDB 374	No
19	Del Monte	IDA 555	No

Snap bean variety trial – virus evaluation 2004

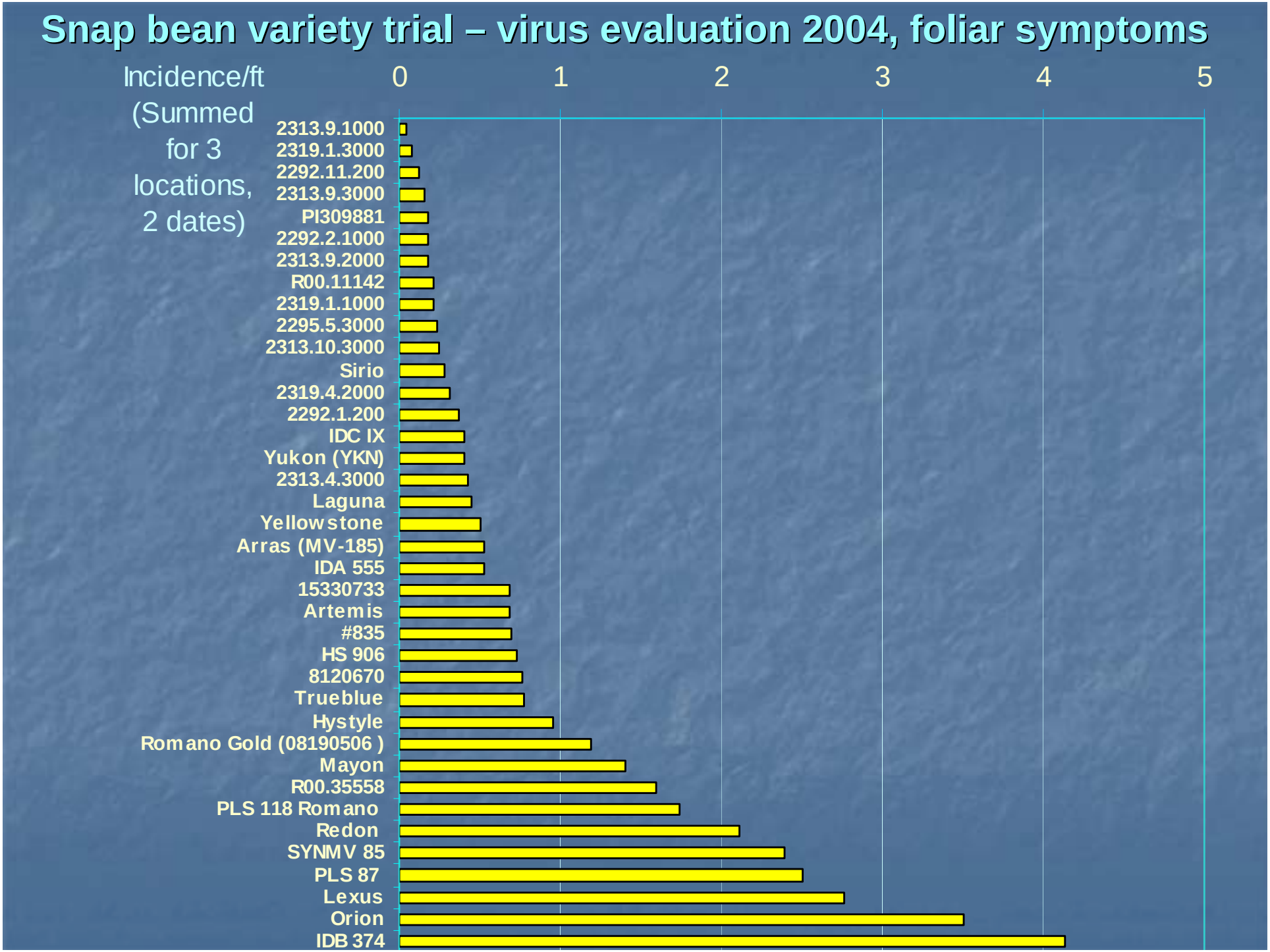
Trt	Source Company	Entry Name	Previous trials?
20	Pure Line Seeds	PLS 87	2002 2003
21	Pure Line Seeds	PLS 118 Romano	2002 2003
22	Pop Vriend	Yellowstone	No
23	Pop Vriend	Yukon (YKN)	2002 2003
24	Pop Vriend	Artemis	No
25	Pop Vriend	Laguna	No
26	UW Hort	2292.1.200	No
27	UW Hort	PI309881	No
28	UW Hort	2292.2.1000	No
29	UW Hort	2292.11.200	No
30	UW Hort	2319.1.1000	No
31	UW Hort	2313.9.3000	No
32	UW Hort	2313.9.1000	No
33	UW Hort	2313.4.3000	No
34	UW Hort	2313.9.2000	No
35	UW Hort	2313.10.3000	No
36	UW Hort	2319.1.3000	No
37	UW Hort	2319.4.2000	No
38	UW Hort	2295.5.3000	No

Snap bean variety trial – virus evaluation 2004, detection of virus in leaf samples

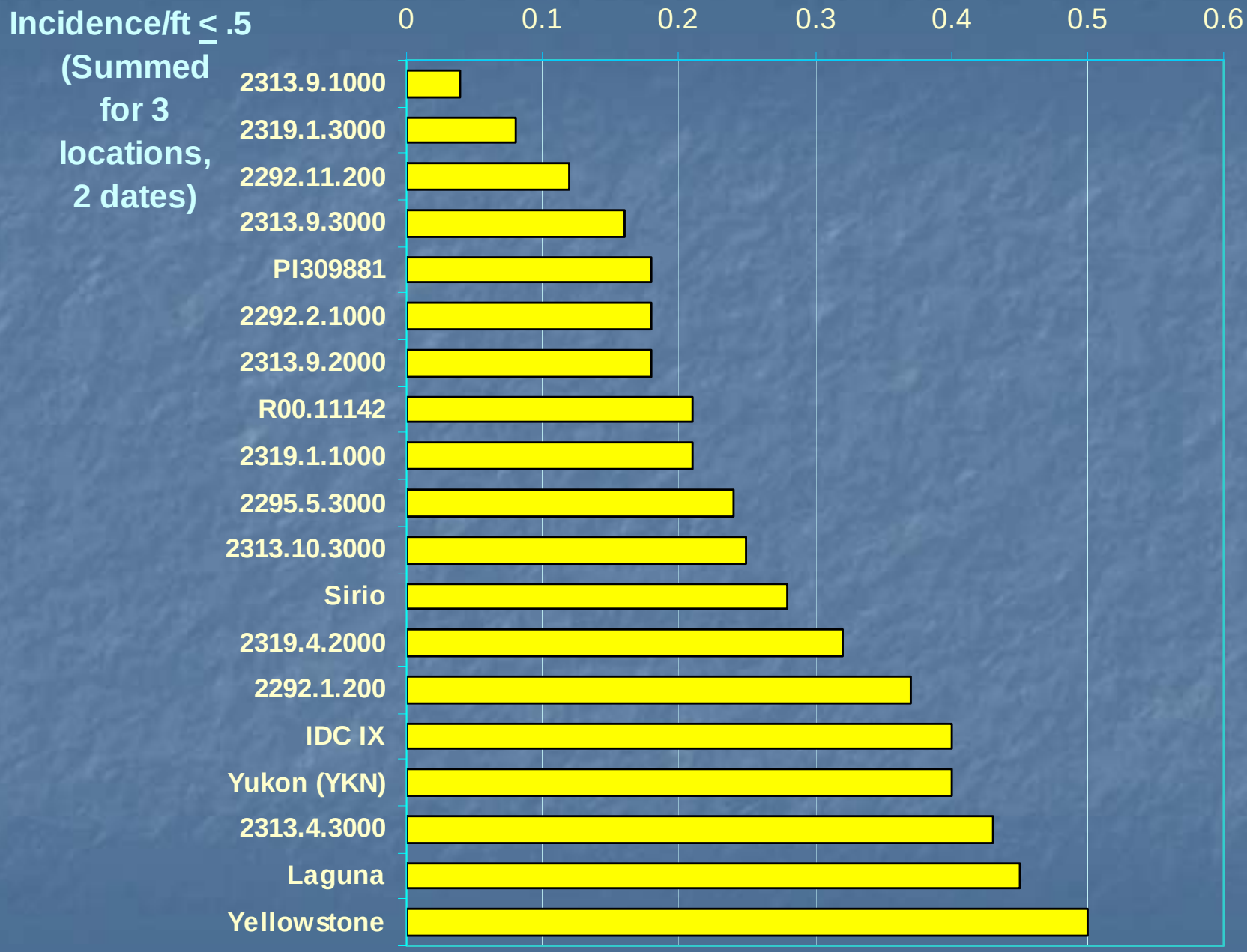
AMV, ClYVV, CMV not detected in either leaf sample from any location

4	Romano Gold (08190506)	30	2319.1.1000
7	08120670	31	2313.9.3000
8	R00.35558	32	2313.9.1000
11	Redon	33	2313.4.3000
20	PLS 87	34	2313.9.2000
25	Laguna	35	2313.10.3000
26	2292.1.200	36	2319.1.3000
27	PI309881	37	2319.4.2000
28	2292.2.1000	38	2295.5.3000
29	2292.11.200		

Snap bean variety trial – virus evaluation 2004, foliar symptoms



Snap bean variety trial – virus evaluation 2004, foliar symptoms



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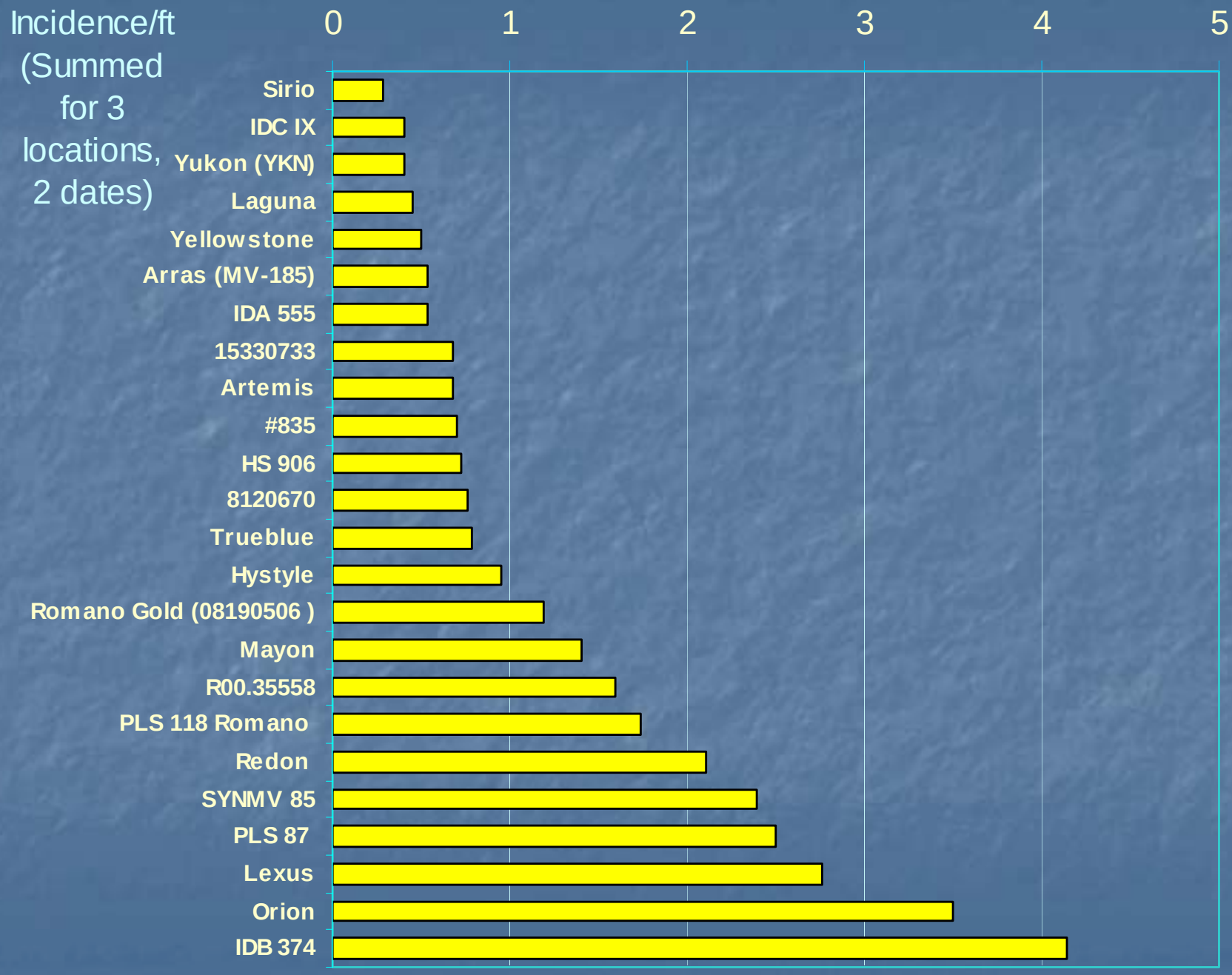
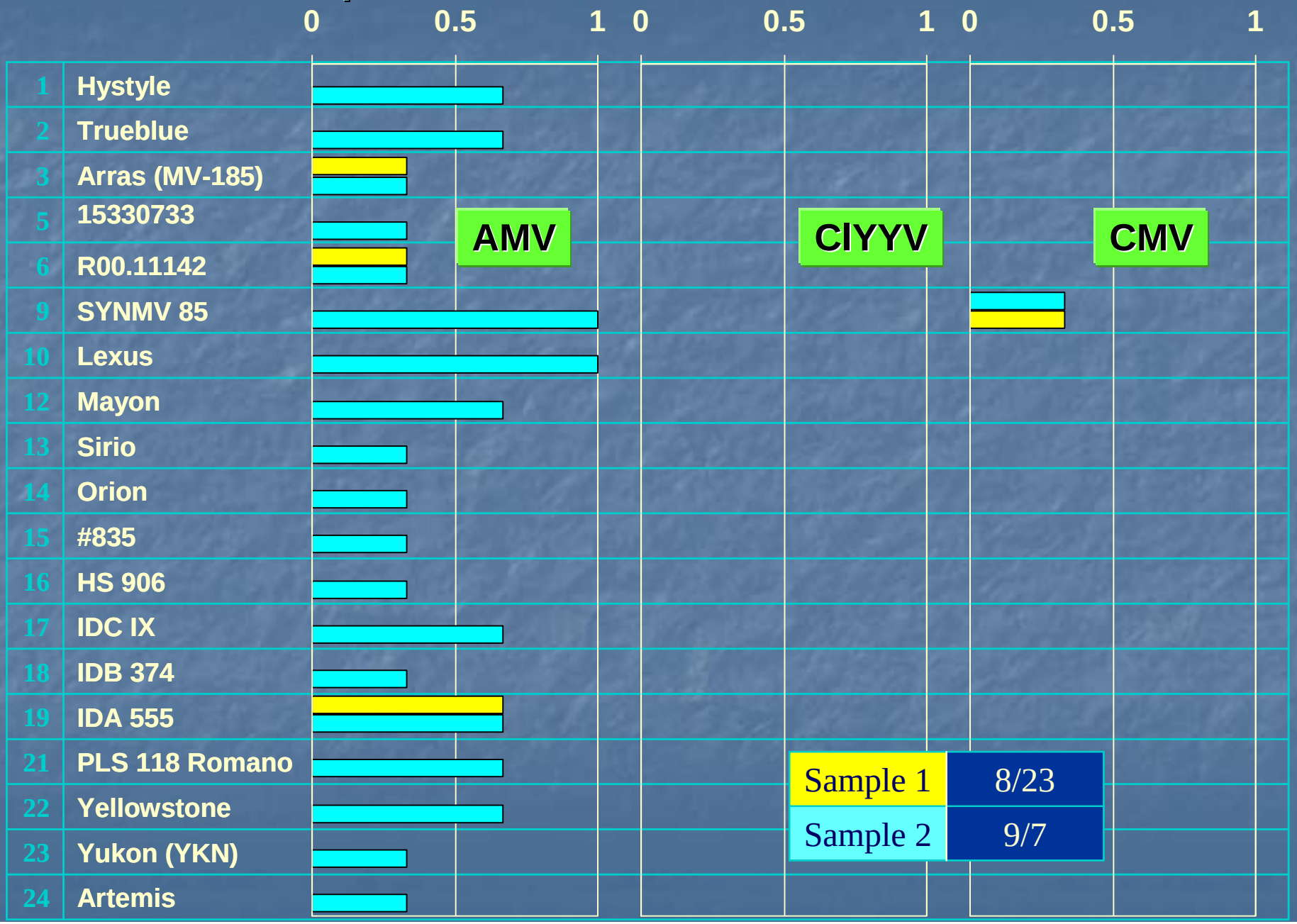
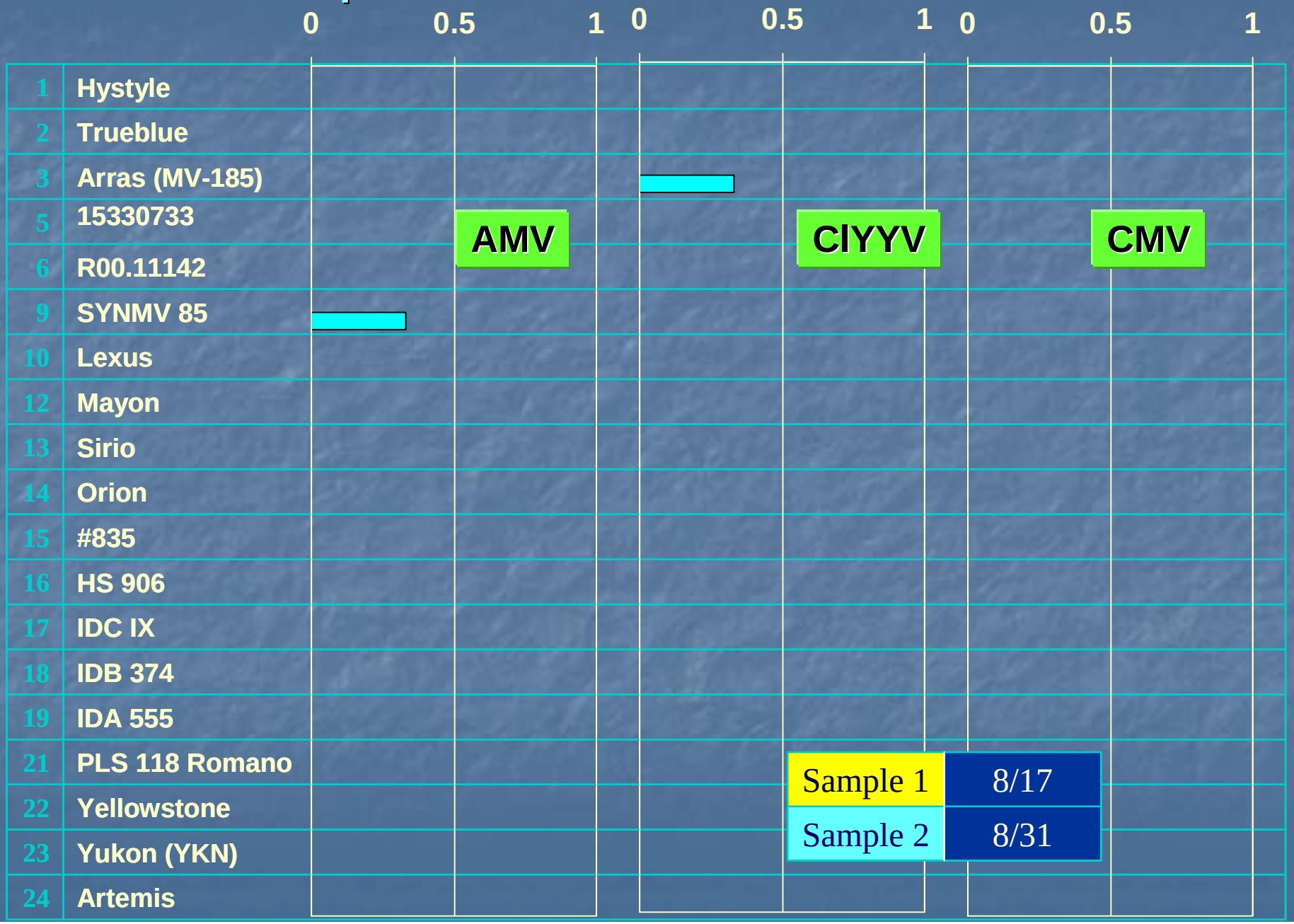


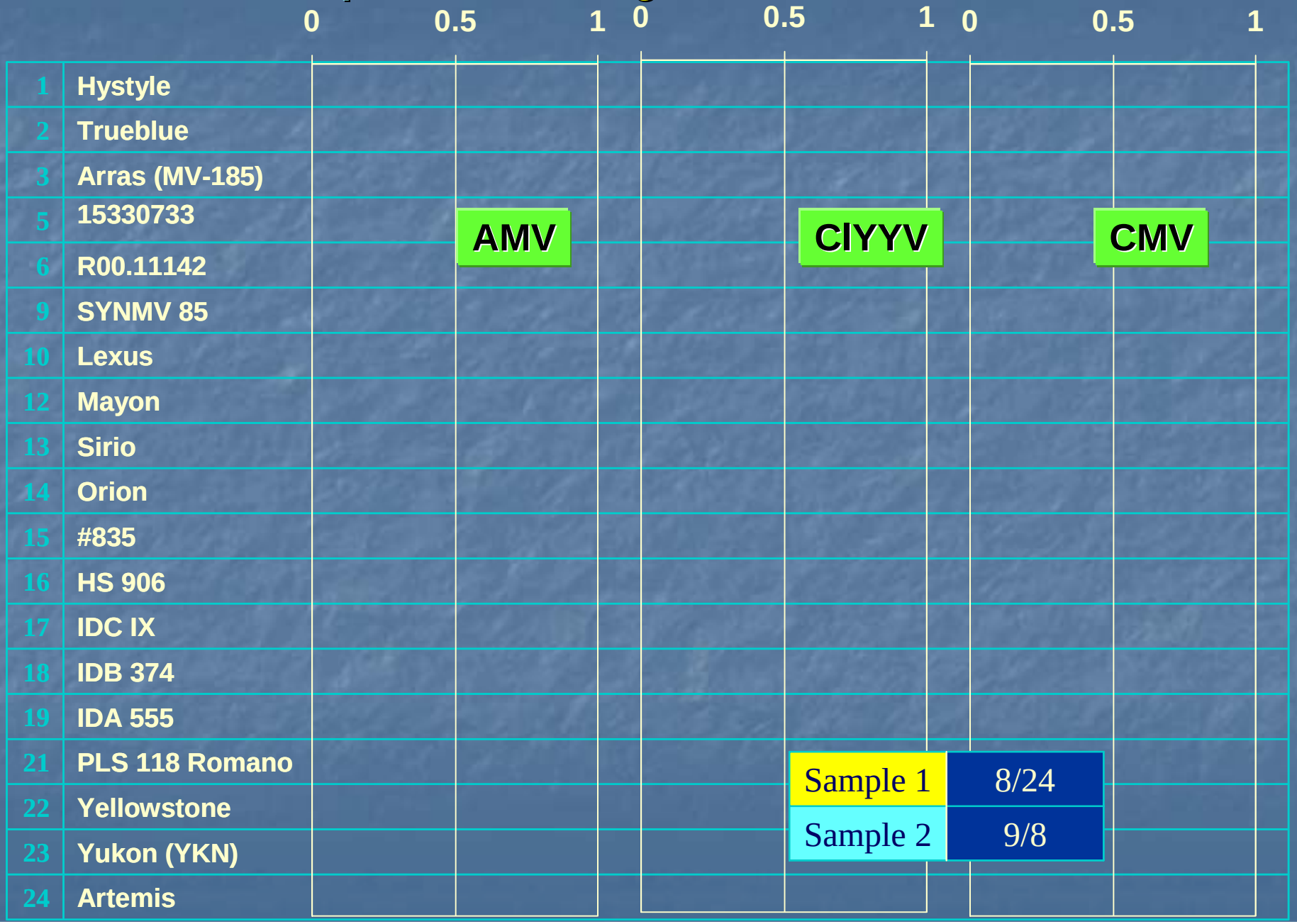
Snap bean variety trial – virus evaluation 2004, detection of virus in leaf samples – West Madison



Snap bean variety trial – virus evaluation 2004, detection of virus in leaf samples – Fox Lake



Snap bean variety trial – virus evaluation 2004, detection of virus in leaf samples – Oostburg



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Where Are We At?

- Distribution of virus problem appears to relate to how early and how many soybean aphids are moving through area
- Focus continues on CMV (cucumber mosaic virus), AMV (alfalfa mosaic virus) and CYVV (Clover Yellow Vein Virus) – BUT – in the absence of CMV, AMV and CYVV, there are still symptomatic plants in commercial fields.
- Likely additional components in virus complex

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Where Are We At?

- There are several snap bean cultivars and breeding lines that appear to have resistance to the virus complex
- Several cultivars and breeding lines are among plot entries with lowest symptom severity for up to three years
- Aphid pressure will likely be variable from year to year, but always a threat
- Plant resistance is likely to provide most reliable control of this virus complex

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Plans for 2005

- Field trial sites
  - W. Madison
  - Fox Lake
  - Oostburg – Manitowoc
- Planting date – early to mid July
  - Need to time bud stage with peak aphid flight
- Plant Material
  - Continue with best lines from ’03 and ’04
  - Interest in adding promising lines from breeding programs – seed companies, university programs