Update on Sources of Host Resistance

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TAN

RB

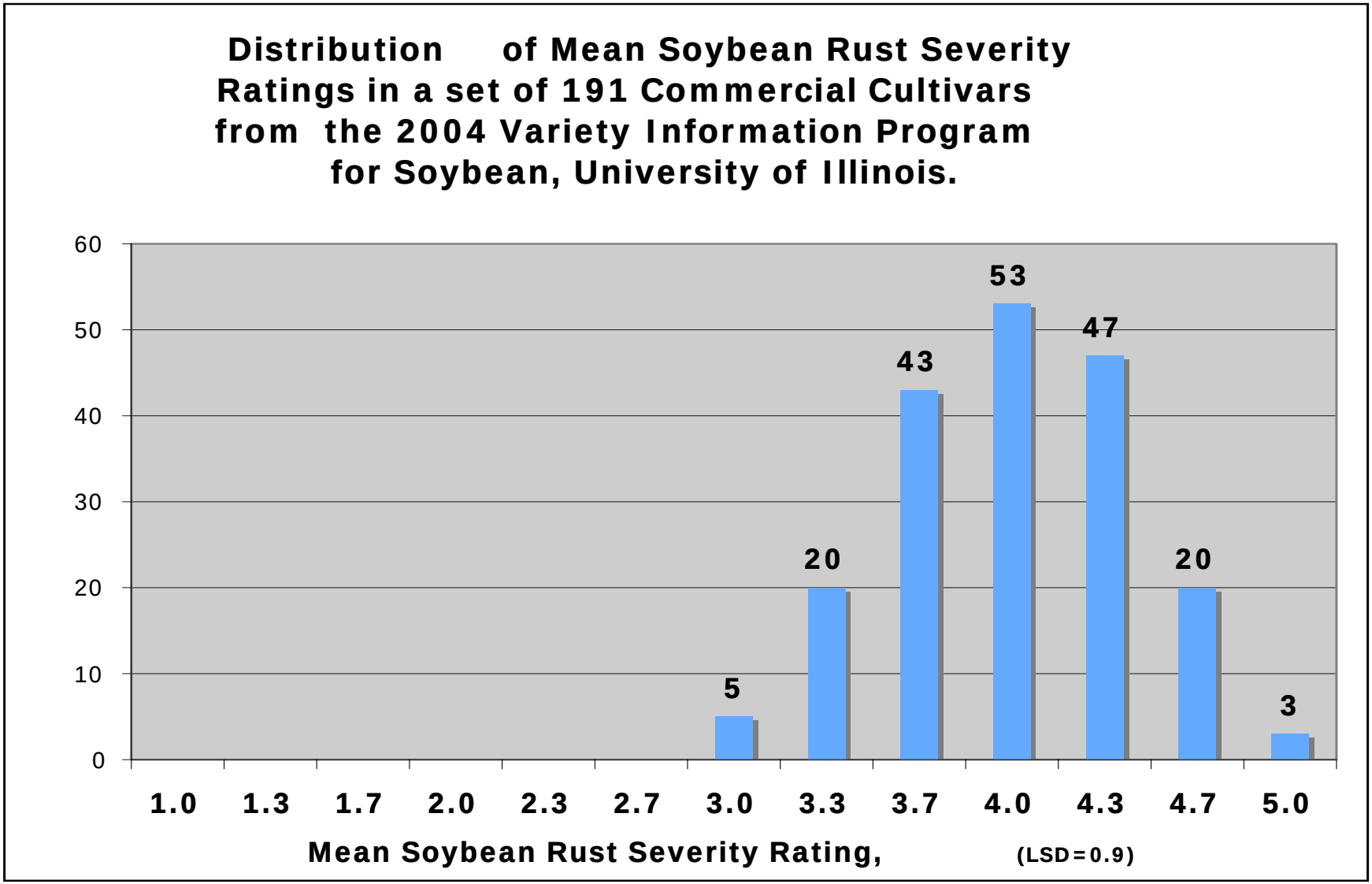
IMMUNE

Initial Screening of Germplasm

- **Initial studies**
  - **1961 ≈ 2,800 accessions screened in Taiwan (U.S collection)**
  - **1970 ≈ 4,000 accessions screened in India (U.S. collection)**
  - **1975 ≈ 1,675 accessions (MG V-X) screened in Taiwan (AVRDC)**
- **From these studies, sources of resistance were found and the inheritance of resistance was characterized**

Gene	Accession	Found	Ineffective
Rpp_1	PI200492	1960-62	1966
Rpp_2	PI230970	1972-74	1978
Rpp_3	PI462312	1973-75	1977
Rpp_4	PI459025	1980-83	2004

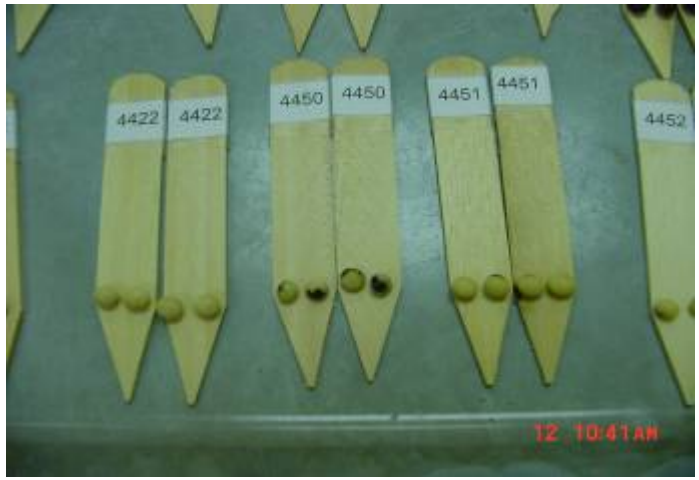
HOST : SOYBEANS ARE SUSCEPTIBLE



Monte R. Miles, USDA-ARS

Searching soybean germplasm for resistance to soybean rust.

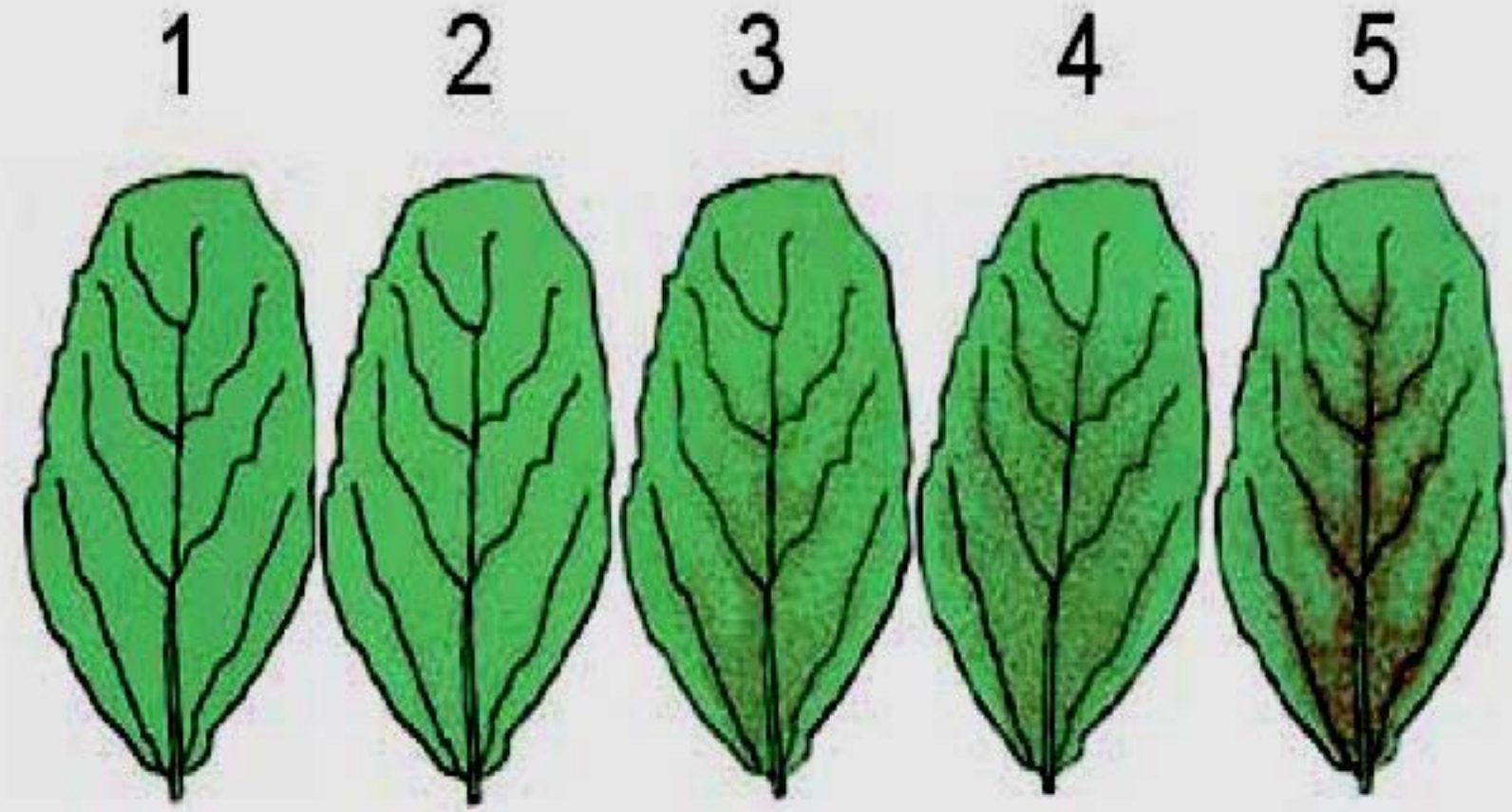
Seed on a stick.



Inoculation, dew chamber, greenhouse and evaluation

Inoculation with a mixture of isolates

Soybean Rust Severity



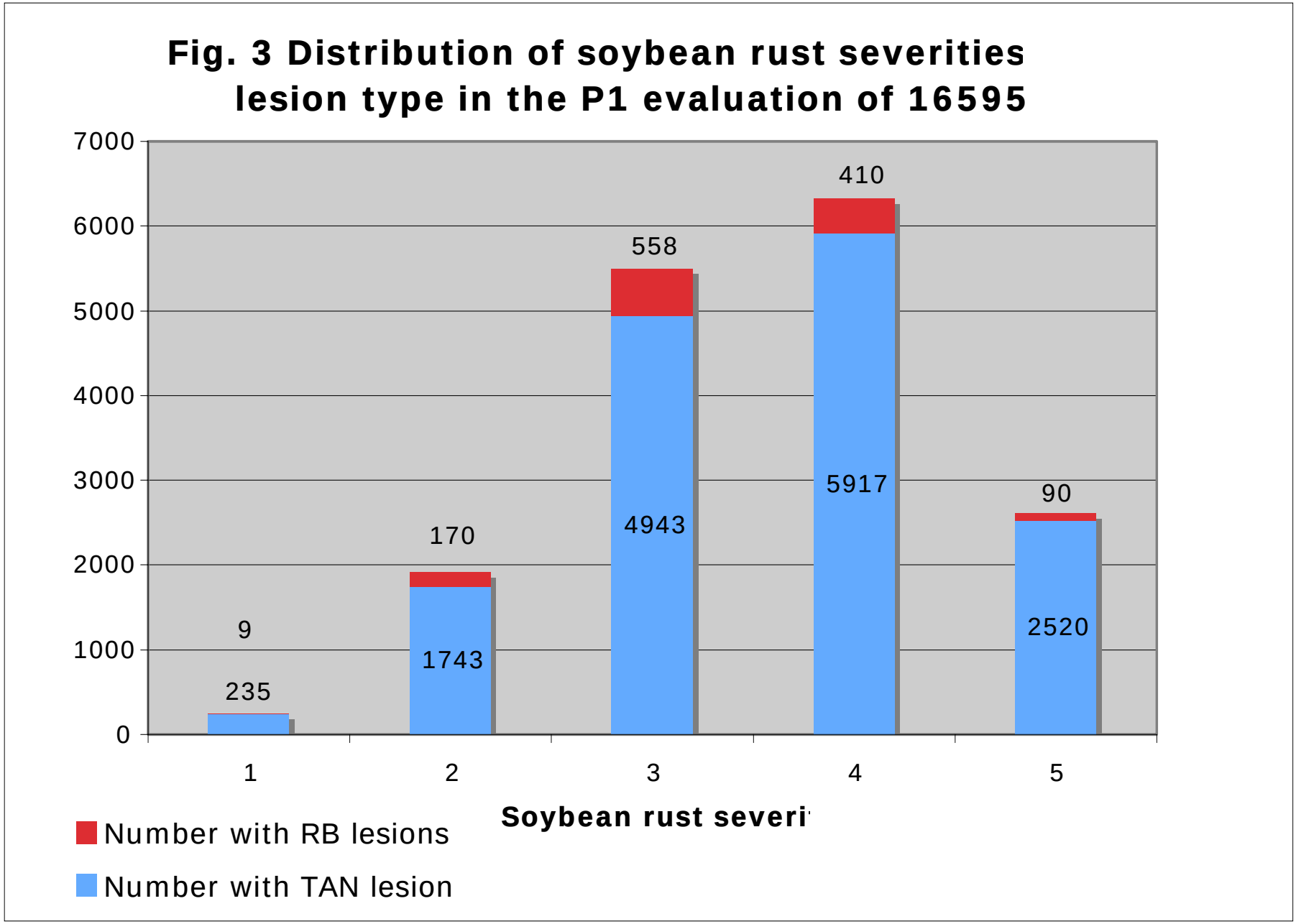
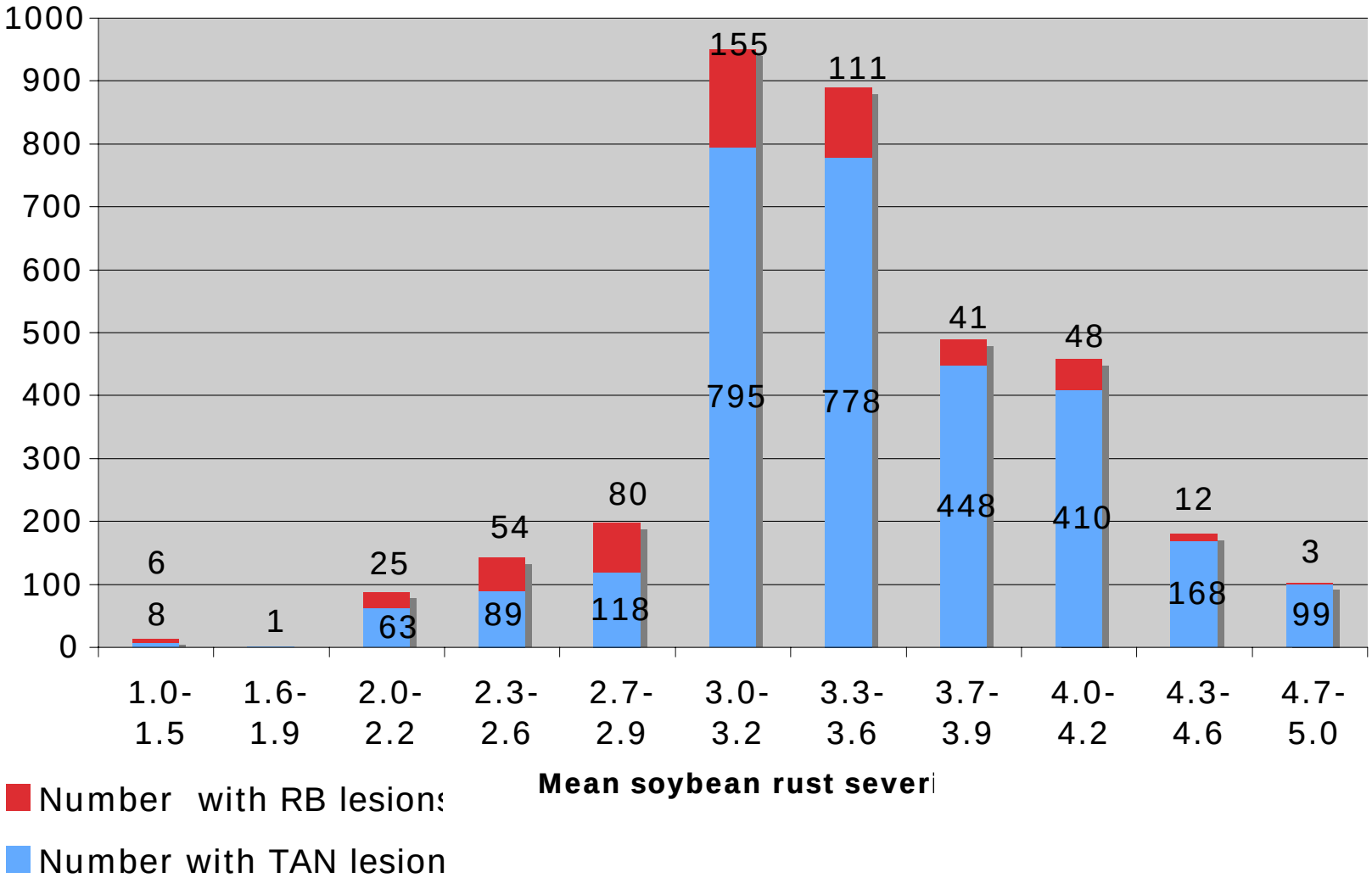


Fig. 3 Distribution of soybean rust severities
lesion type in the P1 evaluation of 16595
7000
6000
5000
4000
3000
2000
1000
0
9
235
170
1743
558
4943
410
5917
90
2520
1
2
3
4
5
Soybean rust severi
Number with RB lesions
Number with TAN lesion

Fig. 4 Distribution of mean soybean rust severities and
type in the P2 evaluation of 3512 accessions



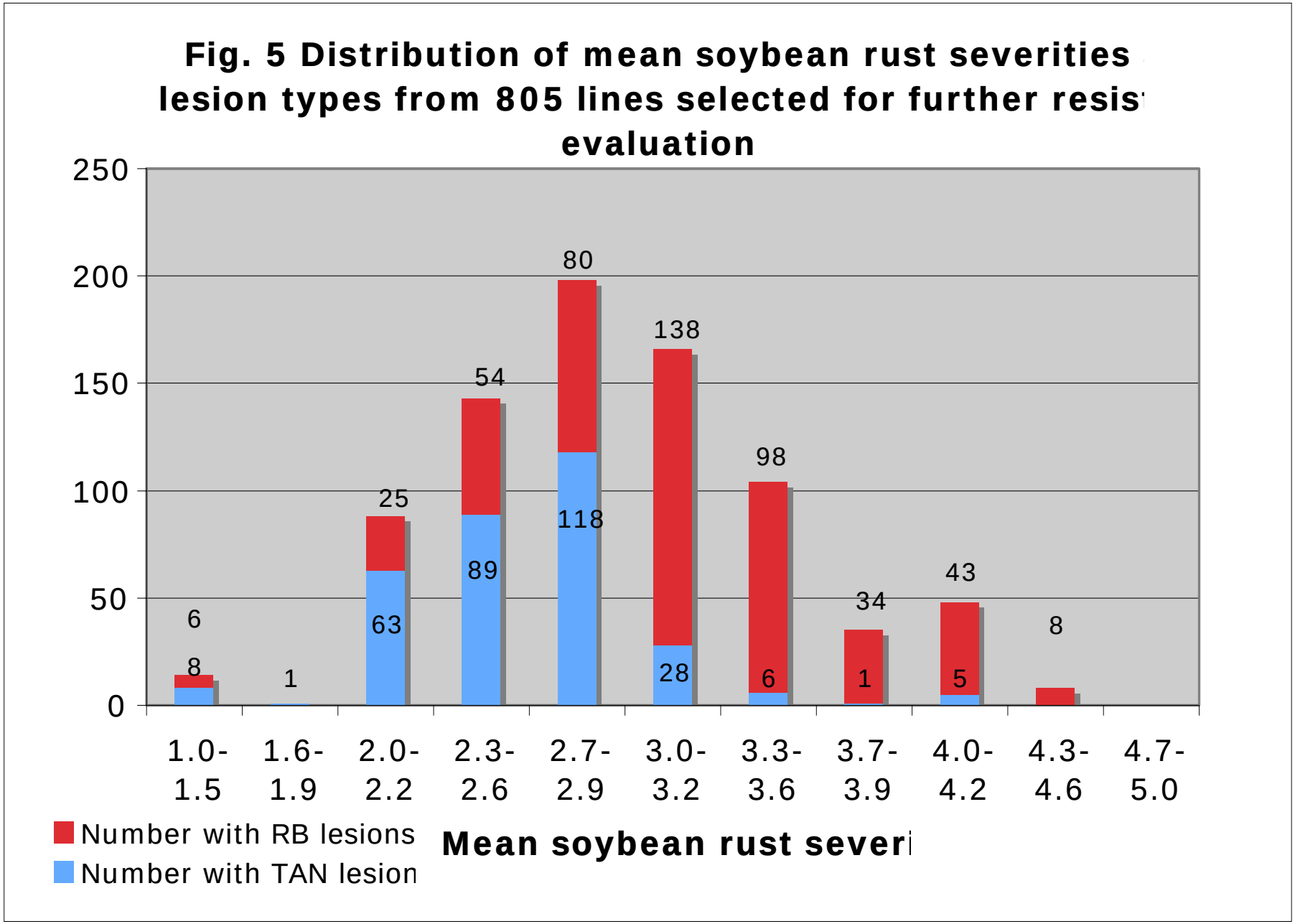


Fig. 5 Distribution of mean soybean rust severities
lesion types from 805 lines selected for further resis
evaluation
250
200
150
100
50
0
6
8
1
25
63
54
89
80
118
138
28
98
6
34
1
43
5
8
1.0-1.5
1.6-1.9
2.0-2.2
2.3-2.6
2.7-2.9
3.0-3.2
3.3-3.6
3.7-3.9
4.0-4.2
4.3-4.6
4.7-5.0
Number with RB lesions
Number with TAN lesion
Mean soybean rust severi

Intermediate germplasm evaluation

- Single isolate seedling screens

  Brazil, Paraguay, Thailand,

  Zimbabwe from 2001

  Taiwan 1972 and 1980

  US isolate LA from 2004
- Adult plant field evaluations in US and international locations

Example of differences sceen among a set of 40 lines evaluated in seedling screens using individual isolates of soybean rust

Accession	Isolate				Mean AUDPC Lesion counts (log10)	Rank
	BZ01-1	PG01-2	TH01-1	ZM01-1		
PI 594538A	RB	RB	RB	RB	0.2	2.3
PI 561356	Tan/RB	RB	Tan/RB S	RB	0.3	2.8
PI 230970	RB/Tan	RB	RB	RB	0.9	6.8
PI 417012	Tan	Tan	Tan	Tan	1.2	11.3
PI 459025F	RB	RB	RB	Tan	1.3	13.0
PI 459025B	RB	RB	RB	RB	1.3	13.3
PI 437663	Tan/RB	Tan/RB	RB	RB	1.4	16.0
PI 423972	RB/Tan	Tan/RB	RB	RB	1.4	17.8
PI 547875	Tan/RB S	Tan	Tan	Tan	1.6	19.3
PI 081765	Tan/RB	Tan/RB	RB	RB	1.6	20.5
PI 200492	Tan	Tan/RB	Tan	Tan	1.6	21.8
G 7955	Tan/RB	Tan/RB	Tan	Tan	1.7	22.5
PI 507716	Tan	Tan	Tan	Tan	1.7	23.3
PI 196528	Tan	Tan	Tan	Tan	1.7	23.5
PI 164885	Tan/RB	Tan	Tan	Tan	1.7	24.3
PI 165914	Tan	Tan/RB	Tan	Tan/RB	1.7	24.3
PI 081773	Tan/RB	Tan/RB	RB	RB	1.7	24.8
PI 417560	Tan	Tan	Tan	Tan	1.9	27.5
PI 548484	Tan	Tan	Tan	Tan	1.9	27.8
PI 084674	Tan	Tan	Tan	Tan	1.9	28.0
Wms 82	Tan	Tan	Tan	Tan	2.2	35.5
PI 189402	Tan	Tan	Tan	Tan	2.3	37.8

INTERNATIONAL SCREENING LOCATIONS

- **Brazil - EMBRAPA SOJA**
- **Paraguay - CRIA**
- **South Africa - Pannar**
- **Zimbabwe - Commercial Farmers Union**
- **Thailand - Dept of Agr.**
- **China - China Agricultural University**
- **Vietnam - VASI**
- **Nigeria - IITA**

Example of soybean rust severity ratings from 45 soybean accessions previously reported to have resistance to soybean rust when evaluated at five locations in the 2002-2003 growing season.

USDA accession number	Local name of the cultivar	Mean soybean rust severity rating for each location with a note on presence of Red Brown (RB) or mixed (M) lesion types				
		Thailand	Paraguay	China	Brazil	Maryland
PI 548463	Laredo	3	2 M	3 R	3	2.8
PI 548484	Ralsoy	2	3 M	2 R	5	2.7
PI 084946-2	(Kandokon)	2	2 M	3 T	1	4
PI 548195	T204	3	1 RB	3 R	2	4
PI 200451	Amakusa Daizu	2	2 M	2 R	2	4
PI 200455	Aso No. 1	2	1 RB	2 R	2	2.5 M
PI 200456	Awashima Zairai	2	3 M		2	2.5 M
PI 518674	Fayette	2	2	4 T	4	4
PI 200466	Gaku Bun	1	2 RB	4 R	2	3 M
PI 200474	Hikage Daizu	2	2 RB	4 R	2	4 M
PI 200490	Kiwami	2	0	2 R	1	5
PI 471904	Orba	1	1	3 R	1	3 M
PI 371609	Red China VV 3	1	3	2 R	4	4
PI 262180		2	4 M	2 R	3	4.3 M
PI 159322		2	2 M	2 R	5	4

Next step -

1. **Adult plant evaluations in field screens, to further reduce the number of potential sources**
2. **Single isolate evaluations on seedlings for race specificity of resistance sources**
3. **Evaluate partial resistance in adult plants in greenhouse trials**
4. **Development of a differential set**

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