Potato Breeding and Genetics
NDSU 2013 Summary

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Potato Improvement at NDSU…

- Goal of releasing exceptional, multi-purpose cultivars that meet the needs of potato producers and the industry in North Dakota, Minnesota, the Northern Plains, and beyond

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Objectives

- Develop potato (*Solanum tuberosum* Group Tuberosum L.) cultivars for North Dakota, the Northern Plains, and beyond, using traditional hybridization and biotechnological techniques as appropriate, that are genetically superior for yield, market-limiting traits, and processing quality.

- Identify and introgress into adapted potato germplasm, genetic resistance to major disease, insect, and nematode pests causing economic losses in potato production in North Dakota and the Northern Plains.

- Identify and develop enhanced germplasm with resistance to environmental stresses and improved quality characteristics for adoption by consumers and industry.

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Hybridizing

- 364 families were created
- 152 parental genotypes were used
- New families…
  - 61% included late blight resistance breeding
  - 27% Colorado potato beetle (CPB) resistance breeding
  - 26% chip processing
  - 23% frozen processing with cold sweetening resistance breeding

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Seed Production - 2013

- Absaraka
  - Seed Maintenance
- Baker, MN
  - Seed Maintenance and Increases
- Langdon
  - Seedling Nursery and Increase (34) Lots

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Langdon…

- 39,266 seedlings were planted
- Represented 277 families
  - Cold sweetening, late blight, and Colorado Potato Beetle resistance, among many other traits
- 677 seedlings retained for 2014 evaluation
- Increases
  - Nuclear
  - G1

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Research Trial Locations - 2013

- Crystal
  - Fresh Market, NCRPVT Fresh, Preliminary Fresh
- Grand Forks
  - CPB Defoliation Trials (4)
- Hoople
  - Chip Processing, NCRPVT Chip, NCPT Replicated and Unreplicated, PreChip , Out-of-State Seedlings
- Inkster
  - NCRPVT Trials, Chip, Verticillium
- Larimore
  - Processing, NCRPVT Processing, PreProcessing, NFPT, Out-of-State Seedlings, Out-of-State Mainenance
- Oakes
  - Processing
- Park Rapids
  - Processing and PreProcessing
- Williston
  - Processing

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Evaluations

- Agronomic Characteristics
- Yield and Grade Components
- Quality Parameters
  - Specific gravity
  - Chipping
  - French frying
  - Bruise evaluations
  - Sucrose rating

Screening and Development Trials

- Disease Screening
  - Bacterial Ring Rot
  - Pink Rot and *Pythium* Leak
  - Late Blight
  - *Fusarium* Dry Rot
  - *Verticillium* Wilt
  - Tuber Blemish Diseases
- Insect Resistance Screening
  - Colorado Potato Beetle
- Stress Resistance
  - Cold Sweetening
  - Sugar End
- Cultural Management
  - Herbicide Tolerance
  - Plant Population
  - Nitrogen, Potassium Requirements

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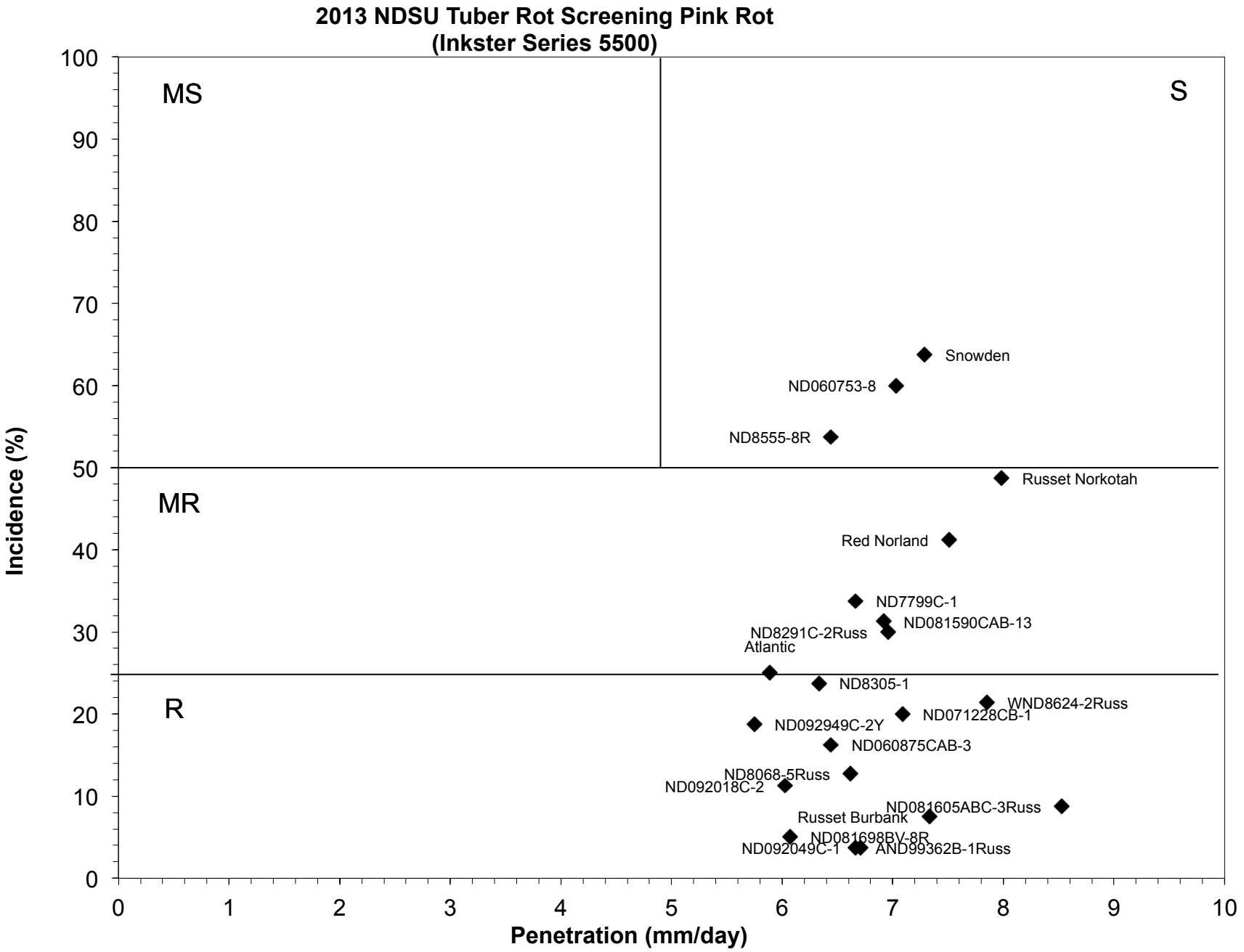
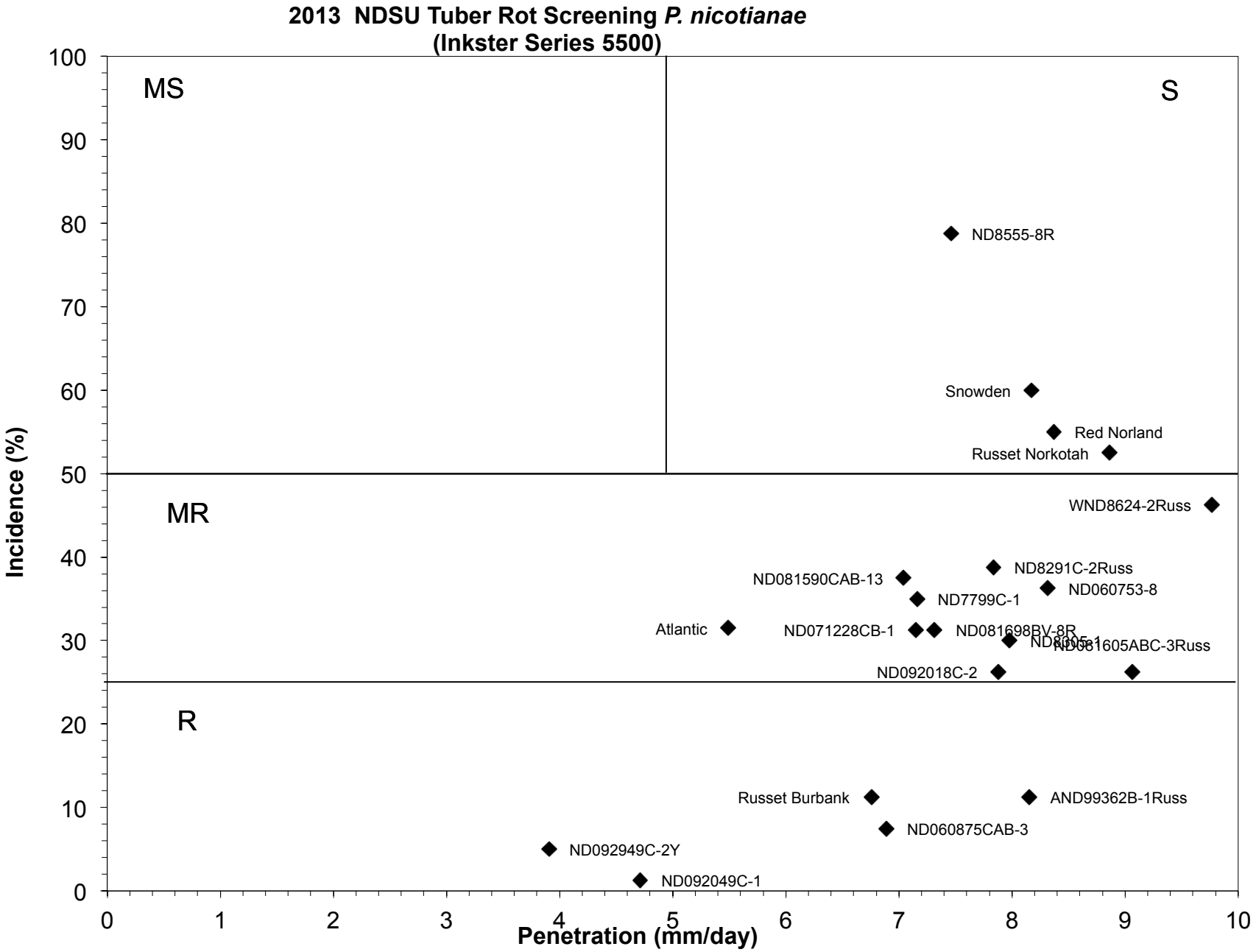
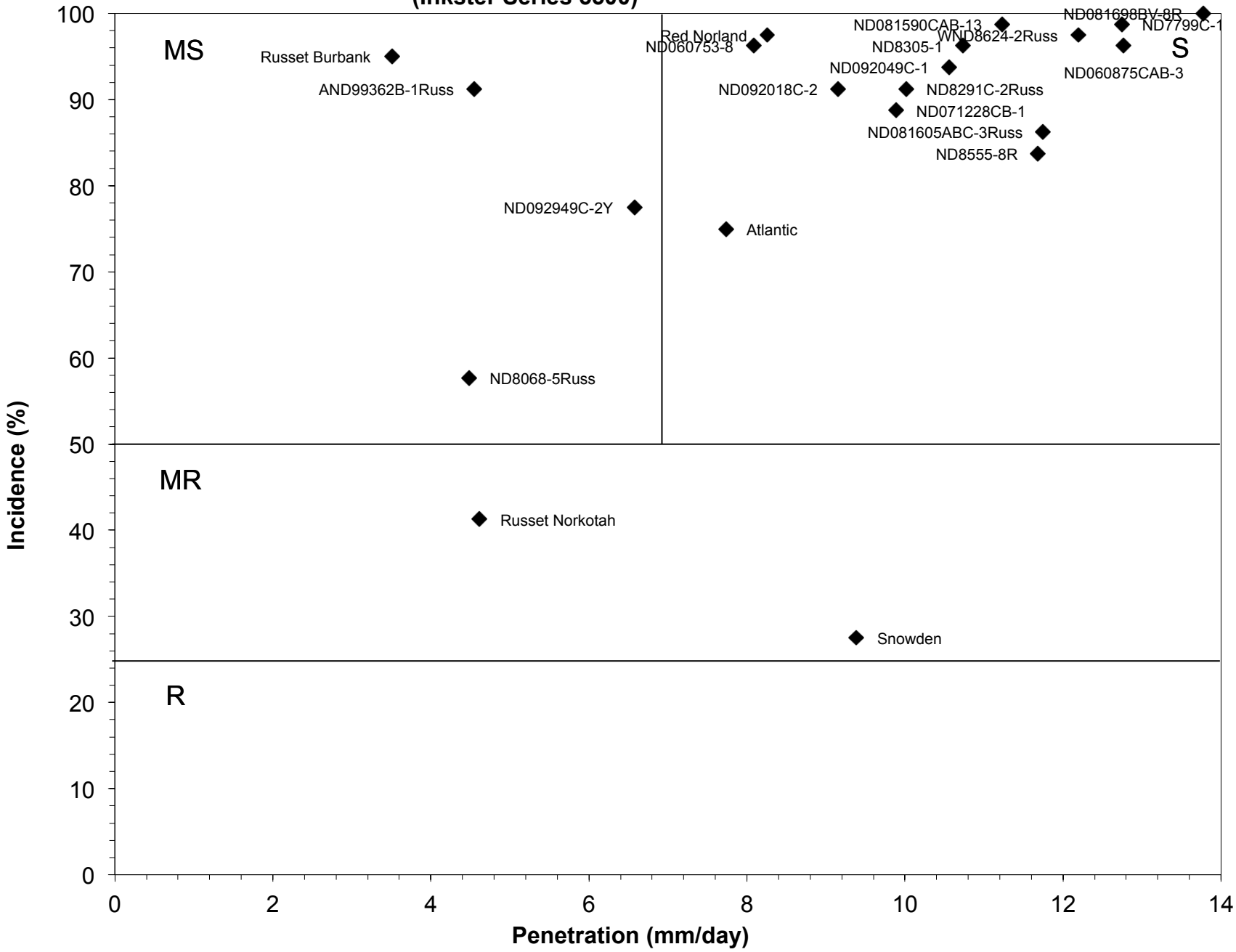

2013 NDSU Tuber Rot Screening Pink Rot
(Inkster Series 5500)
MS
S
MR
R
Incidence (%)
Penetration (mm/day)
Snowden
ND060753-8
ND8555-8R
Russet Norkotah
Red Norland
ND7799C-1
ND081590CAB-13
ND8291C-2Russ
Atlantic
ND8305-1
WND8624-2Russ
ND071228CB-1
ND092949C-2Y
ND060875CAB-3
ND8068-5Russ
ND092018C-2
ND081605ABC-3Russ
Russet Burbank
ND081698BV-8R
ND092049C-1
AND99362B-1Russ


2013 NDSU Tuber Rot Screening P. nicotianae
(Inkster Series 5500)
MS
S
MR
R
Incidence (%)
Penetration (mm/day)
ND8555-8R
Snowden
Red Norland
Russet Norkotah
WND8624-2Russ
ND8291C-2Russ
ND081590CAB-13
ND060753-8
ND7799C-1
Atlantic
ND071228CB-1
ND081698BV-8R
ND081605ABC-3Russ
ND092018C-2
Russet Burbank
AND99362B-1Russ
ND060875CAB-3
ND092949C-2Y
ND092049C-1


2013 NDSU Tuber Rot Screening Leak
(Inkster Series 5500)
Incidence (%)
Penetration (mm/day)
MS
MR
R
S
Russet Burbank
AND99362B-1Russ
ND8068-5Russ
ND092949C-2Y
Russet Norkotah
Snowden
Atlantic
Red Norland
ND060753-8
ND092018C-2
ND092049C-1
ND8305-1
ND081590CAB-13
WND8624-2Russ
ND081698BV-8R
ND7799C-1
ND060875CAB-3
ND8291C-2Russ
ND071228CB-1
ND081605ABC-3Russ
ND8555-8R
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14

Verticillium Wilt Resistance

- 21 clones evaluated across market types
- Twice weekly rating
- qPCR technique of Pasche et al.
- Preliminary results
  - S - ND8068-5Russ
  - M - Russet Norkotah
  - R - Bannock Russet, Dakota Trailblazer, AND99362B-1Russ, and ND060761B-3Russ

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Graduate Students

- Colorado Potato Beetle
  - Glycoalkaloid mediated resistance
  - Glandular trichome mediated resistance
- PVY

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Advancing Selections…

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AND97279-5Russ

- A92001-2 x Ranger Russet
- Medium-large vine size
- Medium-late vine maturity
- Medium to high yield potential
- Dual-purpose
- High specific gravity (about 1.087 across ND and MN irrigated locations)
- Good storability with low sugar accumulation and good frozen processing quality
- Early in evaluation process for cultivar specific management information, including fertility rates, with-in row spacing and disease resistance evaluations.

ND8068-5Russ

- ND2667-9Russ x ND4233-1Russ
- Medium vine size
- Very early vine maturity
- Medium to high yield potential
- Dual-purpose
- High specific gravity
- Good storability with low sugar accumulation and excellent frozen processing quality after 7 months storage
- Russet Norkotah fertility regime

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Dakota Russet x Dakota Trailblazer Hybrids

- Hybrids include ND049546B-10Russ, ND049546B-15Russ, ND049546b-27Russ, ND050032-4Russ, ND060735-3Russ, and ND060735-4Russ
- Yield potential for all is medium to high
- Maturity is medium for all
- Specific gravity is midpoint between parents
- All are dual-purpose
- All have excellent French fry quality and low sugar accumulation in storage
- Early in evaluation process for cultivar specific management information

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ND070927-2Russ

- AH66-4x ND860-2
- Medium vine size
- Medium-late vine maturity
- Medium to high yield potential
- Dual-purpose
- High specific gravity
- Good storability with low sugar accumulation and good French fry processing quality
- Early in evaluation process for cultivar specific management information, including fertility rates, with-in row spacing and disease resistance evaluations

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ND071079-2Russ

- ND6242-10Russ x Dakota Russet
- Medium-large vine size
- Medium-late vine maturity
- High yield potential
- Dual-purpose
- High specific gravity
- Good storability with low sugar accumulation and excellent processing quality
- Early in evaluation process for cultivar specific management information, including fertility rates, with-in row spacing and disease resistance evaluations

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WND8624-2Russ

- W2699-1rus x B1004-8rus
- Medium-large vine size
- Medium-late vine maturity
- Medium to high yield potential
- Dual-purpose
- Medium specific gravity (+1.080 across ND and MN irrigated locations)
- Good storability with low sugar accumulation and good frozen processing quality after 7 months storage
- Early in evaluation process for cultivar specific management information, including fertility rates, with-in row spacing and disease resistance evaluations

WND8625-2Russ

- W2699-1Russ x Silverton Russet
- Medium-large vine size
- Medium vine maturity
- Medium to high yield potential
- Dual-purpose
- High specific gravity (+1.087 across ND and MN irrigated locations)
- Good storability with low sugar accumulation and good frozen processing quality after 7 months storage
- Early in evaluation process for cultivar specific management information, including fertility rates, with-in row spacing and disease resistance evaluations

AND00272-1R

- MN17922 x A92653-6R
- Suited for the fresh market
- Medium vine with red-purple flowers
- Medium-late maturity
- Medium yield potential
- Bright red, round to oval, tubers with white flesh, shallow eyes and smooth tuber type.
- Low to medium specific gravity
- No outstanding disease or pest susceptibilities
- Stores well

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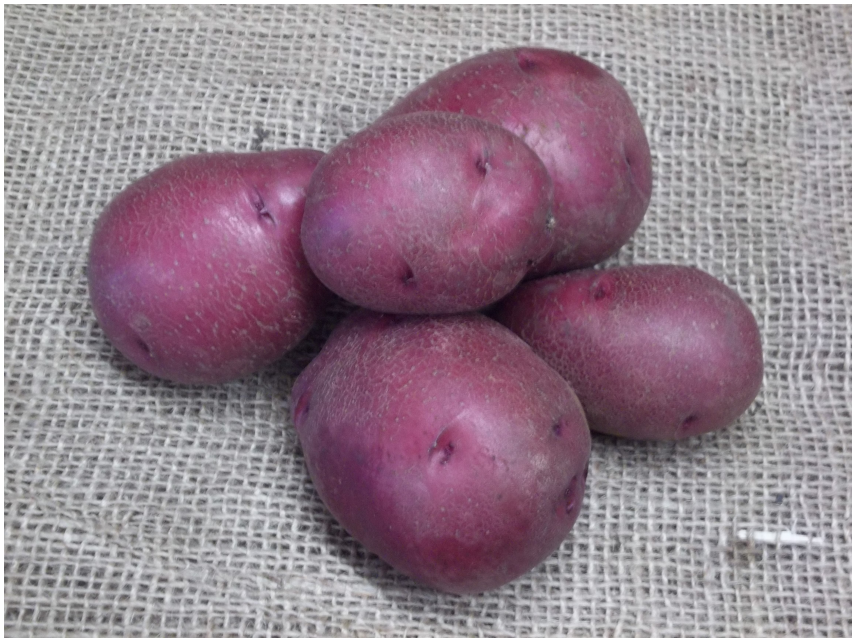
ND4659-5R



- NorDonna x ND2842-3R
- Suited for the fresh market
- Medium vine with red-purple flowers
- Medium maturity
- Medium yield potential
- Bright red, round, smooth tubers with white flesh and shallow eyes
- Medium specific gravity
- No outstanding disease or pest susceptibilities
- Stores well

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ND6002-1R

- NorDonna x Bison
- Medium sized vine
- Medium maturity
- Medium yield potential
- Round, smooth, bright red tubers with smooth eyes and bright white flesh
- Medium specific gravity
- Early in evaluation process. Some silver scurf noted.

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ND7132-1R

- ND5002-3R x ND5438-1R
- Medium maturity
- Medium yield potential
- Bright red skinned, oval to oblong tubers with white flesh
- Early in evaluation process

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ND8555-8R

- ND7188-4R x ND5256-7R
- Suited for the fresh market
- Medium maturity
- Medium-large vine size
- High yield potential
- Bright red, round, smooth tubers with white flesh and shallow eyes
- Very uniform tuber size profile
- Medium specific gravity
- Stores well

ND7519-1

- ND3828-15 x W1353
- Medium sized vine
- Medium-late maturity
- High yield potential
- High specific gravity (+1.090 average in ND)
- Chips from 42F storage

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ND8304-2

- ND860-2 x ND7083-1
- Medium early maturity
- Small to medium sized vine
- Medium yield potential
  - Nice tuber type, smaller size profile
- High specific gravity
- Chips from 42F storage
  - Excellent cold chipping selection

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ND7799c-1

- Dakota Pearl x Dakota Diamond
- Medium vine size
- Medium-late maturity
- High yield potential
  - Nice tuber type and tuber size profile
- Medium to high specific gravity (1.086 average)
- Chips from 42F storage

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Thanks to:
Northern Plains Potato Growers Association
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The North Dakota Agricultural Experiment Station
Departments of Plant Sciences, Plant Pathology and Entomology, NDSU
US Potato Board
North Dakota State Seed Department
Minnesota Department of Agriculture
Potato Producers and Industry Representatives
Cooperative Researchers and Their Staffs


HOP TO HOOPLE JULY 18-20, 2014
FOR THE 125TH CELEBRATION
NORTH
HOOPLE
8 MILES
TATER TOWN, U.S.A.