Managing Annual Ryegrass as a Cover Crop

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Reasons to Use Cover Crops

- Improved soil tilth
- Increase Organic Matter
- Increase soil biological activity
- Improve soil structure
- Increase soil moisture holding capacity
- Add nitrogen
- Cycle nutrients

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Annual Ryegrass

- Winter annual forage grass
- Used as a lawn grass for new lawns
  - Easy to establish
  - Quick greenup
- Used as summer and winter forage
- Used in critical area seedings for quick cover

What does it look like?

Growth Characteristics

- Winter annual
  - Planted in fall
  - Grows all winter
  - Matures in May
  - Dies in June
- Biennial- can act like one but isn't
  - Planted in spring
  - Grows vegetatively all year
  - Matures following spring

Uses of Annual ryegrass as a mulch

Ryegrass benefits

- Small ryegrass decomposes readily
- provides mulch/weed control
- works for most crops
- easy to establish broadcast
- good root mass, adds SOM,adds tilth
- reasonable cost $0.40 to $0.65/ lb.
- Tolerates wet soil
- Stores excess nitrogen (can uptake 300-500#/a)
- Excellent livestock feed value

Residue Quality

Common index (C:N)

Residue < 20 C:N decompose fast >N levels

young ryegrass C:N 12:1 (depends on N available)

C:N >30 decreases N available in soil

Soybeans	15-25:1
Corn	30:1
Corn stalks	60:1
Wheat straw	80:1

Example of picking up excess nitrogen after corn

Nitrogen Uptake

Example of holding Nitrogen

- Corn after Corn
- 200#N/a = 215 bu/A.
- Jan7th = 3642 #/A. annual ryegrass
- 2” of water leached

  84 #/a of available Nitrogen from ryegrass

Ryegrass Management

- Plant dates
- Seeding rates 8-25#/a
- Spring kill before grass joints for quick decomposition
  - Use tillage or plastic to smother
- Ryegrass can retiller/resprout if not killed
- Combine with grazing system
  - Will reduce rooting
  - Make plant easier to control

Ryegrass

- Seeding method
  - broadcast after harvest
  - drilled
  - does best if September seeded
  - Arial seeded early September
- Seeding rate
  - broadcast 15-20 #/acre
  - drilled 8 – 15 #/acre

Date of Planting

- South I-70 seed before Oct. 15th
- North of I-70 seed before Oct. 1
- Dormant seeding
  - December – March 1
- Later seeding requires addition of:
  - Manure
  - 30-50#/a of nitrogen

  To improve stand/ survivability

Seeding annual ryegrass with rolling harrow

Date of Planting

Ryegrass September 15 seeded vs mid October ….11” vs 2” on Nov 4th

Seeded Sept 15
on Sept. 30th

13#/a seeding

Sept. 15 seeded as of Jan. 6th
12+” height and 3642# dry matter/acre
Roots to 20”

Grazing value from Jan. 6th test

- 21 % Protein level
  - This level can be higher if excess nitrogen is found in soil
  - In heavy manure applications, excess nitrogen raised protein level to 28%
- Relative feed value of 191
  - Better than corn or alfalfa

Variety selection

Sept. 30th seeding 20#/a 2 different varieties

Competition of winter annuals with ryegrass

Is not competitive if winter annuals present at seeding

Annual Ryegrass Control

- Tillage very effective
- Mowing after bloom/before complete seed development
  - Variable success
  - Some seed may be produced
- Plastic mulch smothered
  - Smaller easier to control
  - Has fumigant qualities on root knot nematode
    - Others?

Intense ryegrass pressure will injure crops, cause nitrogen deficiency

Problem with escaped ryegrass in wheat,
Very competitive

Soil pit investigation of cover crop site

Rooting Depth

- December 10th ryegrass roots 14”
- April 9th to 51”

- Corn roots on Claypan soil
  - September 4th to 75”
- Soybean roots on Claypan soil
  - September 4th to 48”

April 9 in silt loam soil

Roots April 9th at 12” depth; third year of ryegrass cover
Note soil structure and worm holes

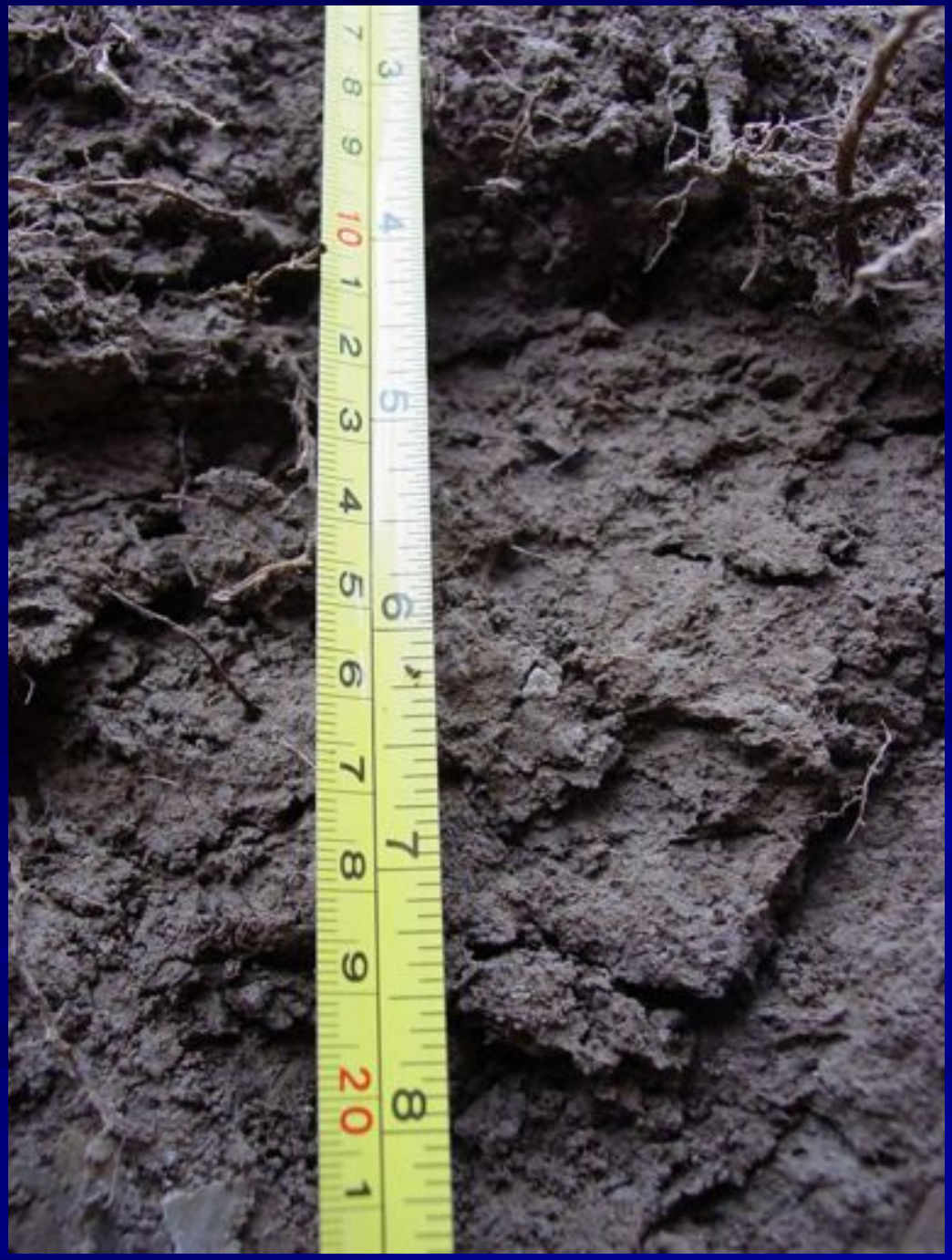
Corn root mass in silt loam clay pan soil under vetch/ryegrass cover crop

Intensive tillage can destroy soil structure

tilled soil with a line of compaction at 7”

Note root growth restricted to 4 ½” in chisel disk system

Note compacted platy soil below 5”



Tilled compacted area below 4”

20 To 23”

37 to 43”

23 to 28”

46 to 50”

6 years cover crops/ corn root development

Soil profile changes

- Noted movement down of topsoil depth and color (organic matter)
- Noted significant decrease in silt fragipan deposition layer after 3 years !!!!!
- Significant increase in subsoil root –allows for crop root expansion

Notice white silt deposits

Shows fragipan layer is decreasing with increased

SOM and increased rooting after 6 years of cover crops

Cover crop rooting depth compared

Cereal rye	18.4”
Annual ryegrass	30.6” *

first year cover crop, planted Oct.1

roots measured April 9th

* Significant .05

Soil Density
all no-tilled 9+ years

	Ryegrass cover crop 7 years	No cover crop
10”	1.49 g/cc	1.66 g/cc
16”	1.58	1.54
24”	1.48	1.65

Soybean Yield

	Bare	Cereal Rye	Ryegrass
Sw	48.2	52.3	60.6*
NW	51.2	53.8	55.7*

3 replications, each location

* Significant .05

Nematode Properties

- Research shows nematode suppression
  - Strawberries < root knot nematodes- MAFRA
  - Incorporation reduces soybean cyst nematodes --Rigor, Welacky, Anderson

Nematode suppression

Table 2. Effect of root exudates originating from different plant species, on hatching of *Heterodera glycines* eggs.

	Egg hatching (%)
Echinochloa crusgalli	17.9±1.3*
Glycine max	31.3±3.9*
Lespedeza capitata	22.9±1.4*
Lupinus perennis	16.9±1.8*
Medicago sativa	19.9±2.7*
Melilotus officinalis	18.7±1.8*
Trifolium hybridum	24.9±1.9*
Trifolium repens	37.8±2.1*†
Vicia villosa	19.0±1.7*
Control water (perlite)	7.3±1.2

Anderson,Welakey,Rigor Can. J. of Plant Pathology

Nematode suppression

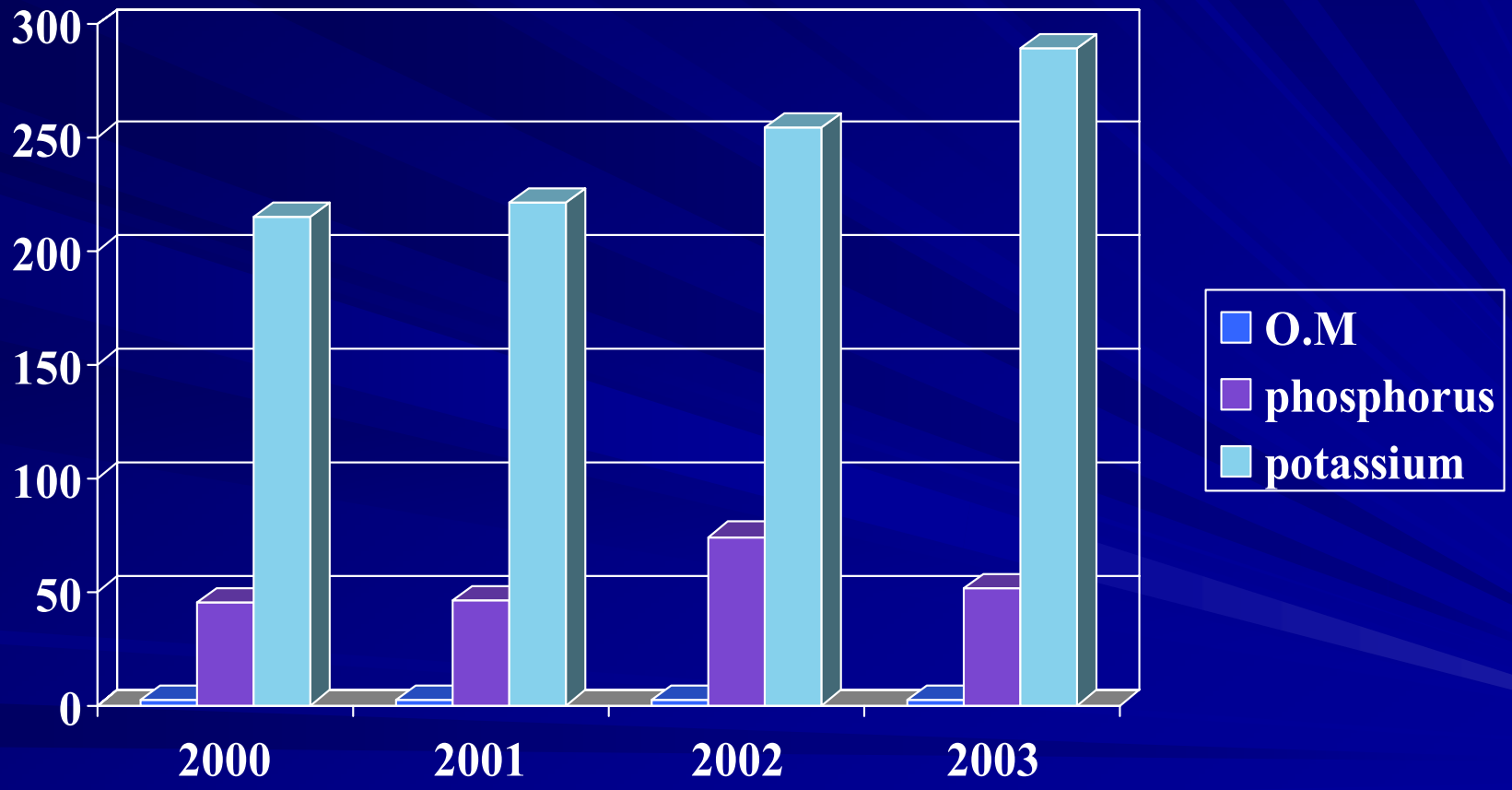
Table 1. Effect of plant residues incorporated into soil on *Heterodera glycines* numbers in soil and roots of greenhouse grown soybeans.

	Common name	Nematodes/g soil	Nematodes/g root
Avena sativa L.	Japanese oats cv. Saia	1.69±0.31 (17)	6.19±1.71* (13)
Brassica juncea (L.) Coss	Oriental mustard cv. Domo	9.78±0.06 (24)	18.97±4.02 (20)
Brassica napus L. var. *napus*	Rapeseed cv. Glacier	2.36±0.52 (19)	2.98±1.03* (10)
Desmodium canadense (L.) DC†	Showy tick trefoil	0.87±0.14 (12)	16.01±2.87 (19)
Echinochloa crusgalli (L.) Beauv. var. *frumenticea* (Roxb.) Link	Japanese millet	2.16±0.39 (18)	1.95±0.28* (6)
—	Fairway B Lawngrass mixture	0.41±0.04* (5)	1.93±0.31* (5)
Lespedeza capitata Michx†	Round-headed bushclover	0.42±0.06* (7)	1.30±0.45* (3)
Lespedeza hirta (L.) Hornem†	Hairy bushclover	0.51±0.07* (8)	2.35±0.59* (7)
Lespedeza intermedia (S. Wats.) Britt†	Wand-like bushclover	0.56±0.08* (9)	0.94±0.04* (1)
Lolium perenne (L.)	Perennial ryegrass	0.39±0.09* (4)	7.03±1.16* (15)
Lupinus perennis L.†	Perennial lupine	0.75±0.17* (11)	6.94±2.39* (14)
Medicago sativa (L.)	Alfalfa cv. Apollo Supreme	0.31±0.11* (3)	2.47±0.65* (8)
Melilotus officinalis (L.) Lam.	Yellow sweet clover	0.25±0.08* (1)	2.60±0.55* (9)
Pisum sativum L. var. *arvense* Poir	Field peas	0.62±0.08* (10)	11.60±4.38* (16)
Raphanus sativus L.	Oilseed radish	3.48±0.72 (21)	19.49±4.38 (22)
Trifolium hybridum (L.)	Alsike clover	1.39±0.43 (15)	1.56±0.49* (4)
Trifolium pratense (L.)	Red clover cv. Double Cut	0.41±0.09* (6)	13.57±3.31* (18)
Trifolium repens (L.)	White clover cv. Ladino	0.93±0.23 (13)	3.20±0.99* (11)
Triticum aestivum	Soft wheat cv. Freedom	9.24±3.02 (23)	17.67±3.89 (21)
Vicia villosa (Roth)	Hairy vetch	7.83±2.36 (22)	3.62±1.23* (12)
Zea mays	Hybrid corn RR	2.49±0.67 (20)	11.74±1.97* (17)
Control *Heterodera glycines* without plant residues	Soybean cyst nematode	1.09±0.08 (14)	29.47±3.11 (24)

Soil Fertility Changes

- Take good samples
- Keep good records of changes
- Cover crops can pull fertility from subsoil
- Sample same time and moisture content

TA plot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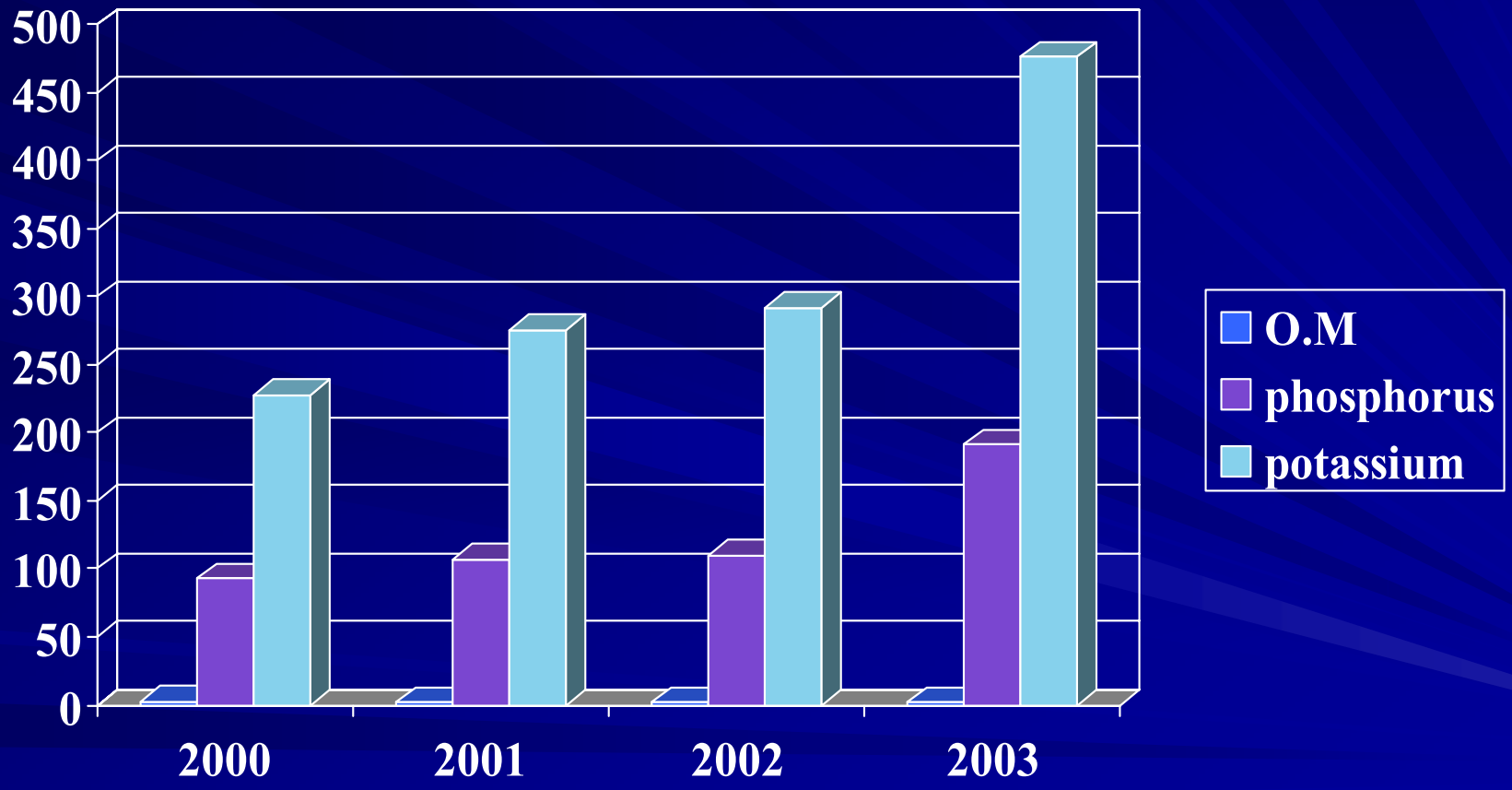
O.M
phosphorus
potassium

BI plot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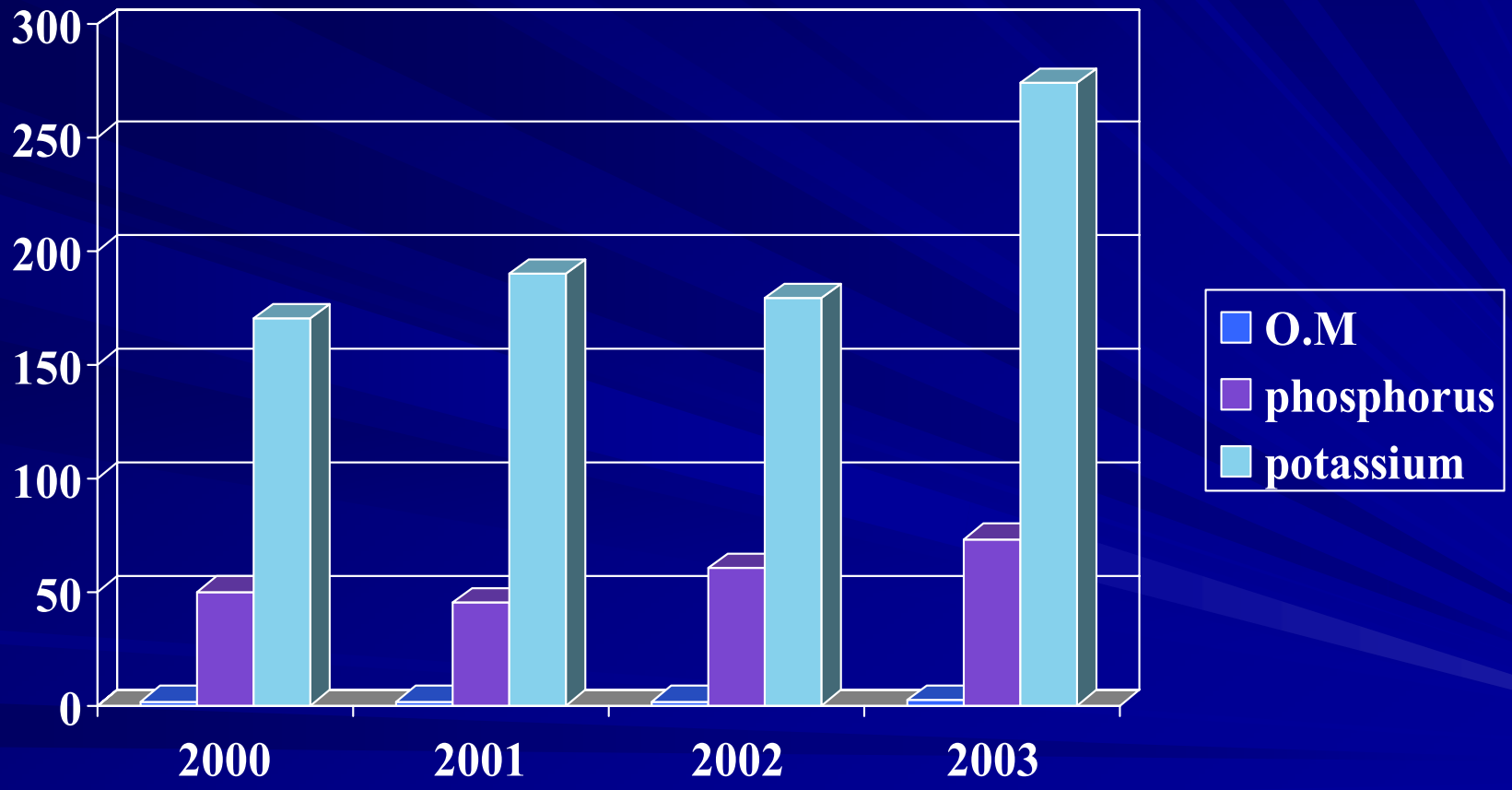
MS plot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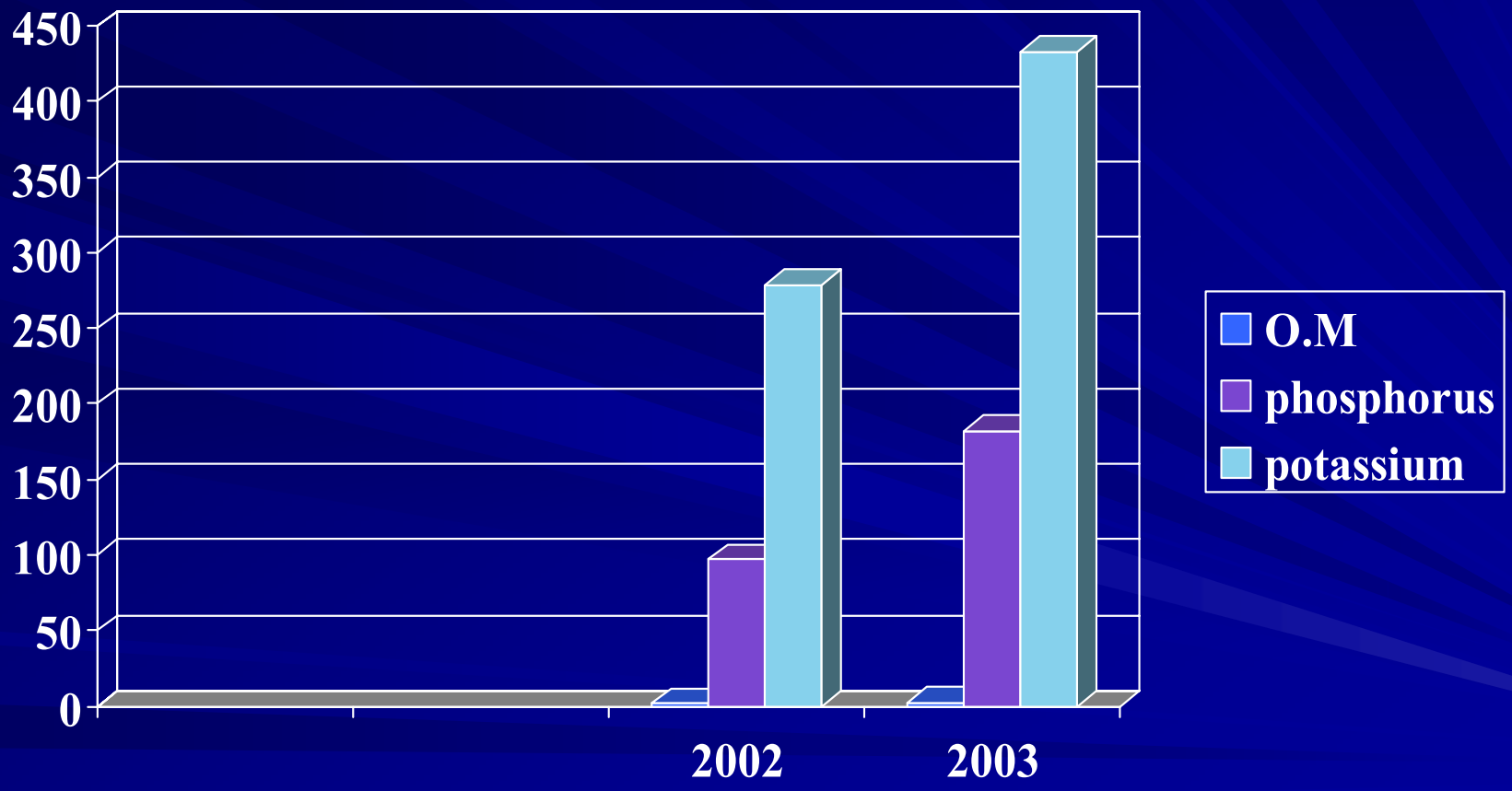
potassium

HD plot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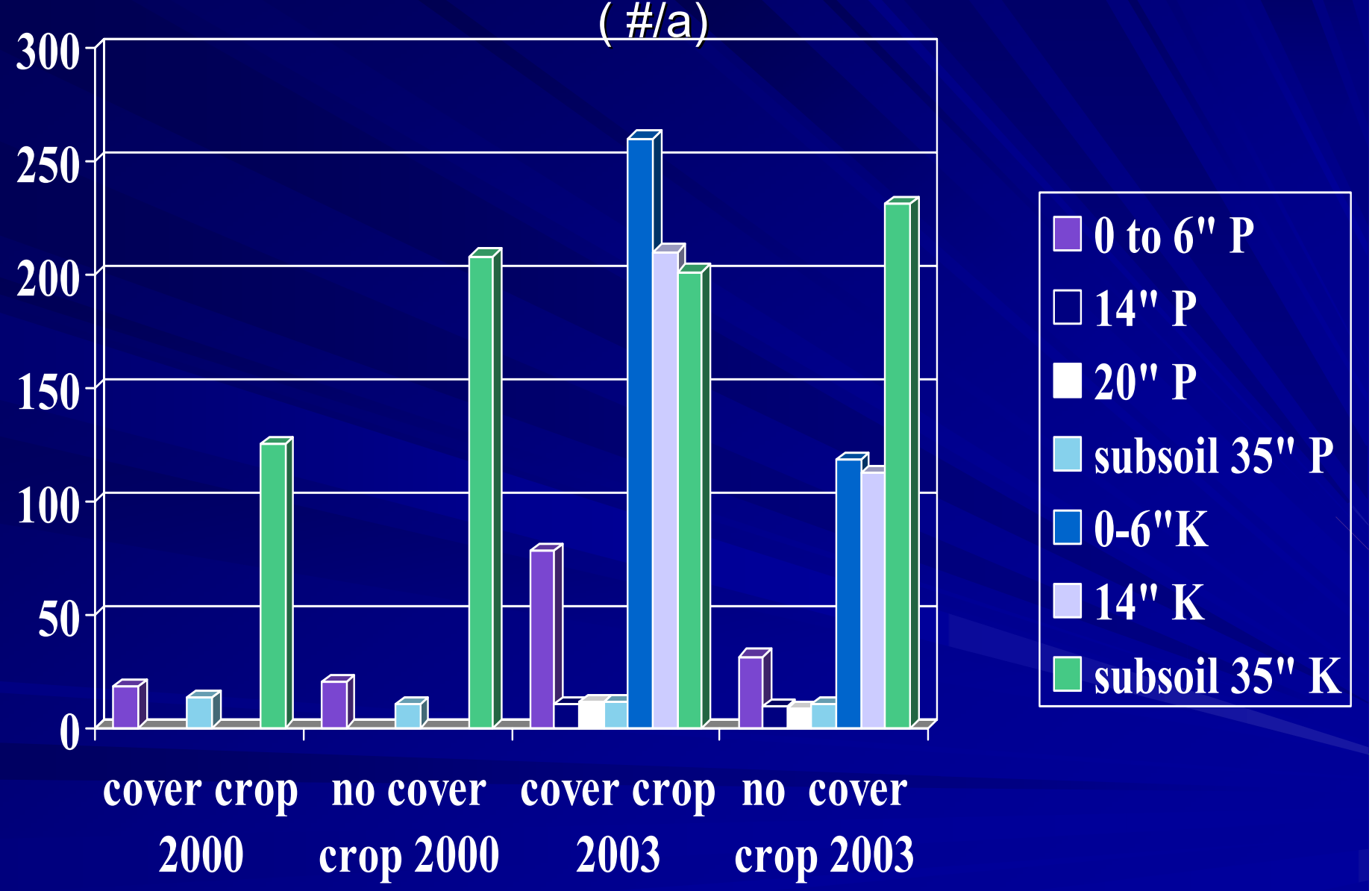
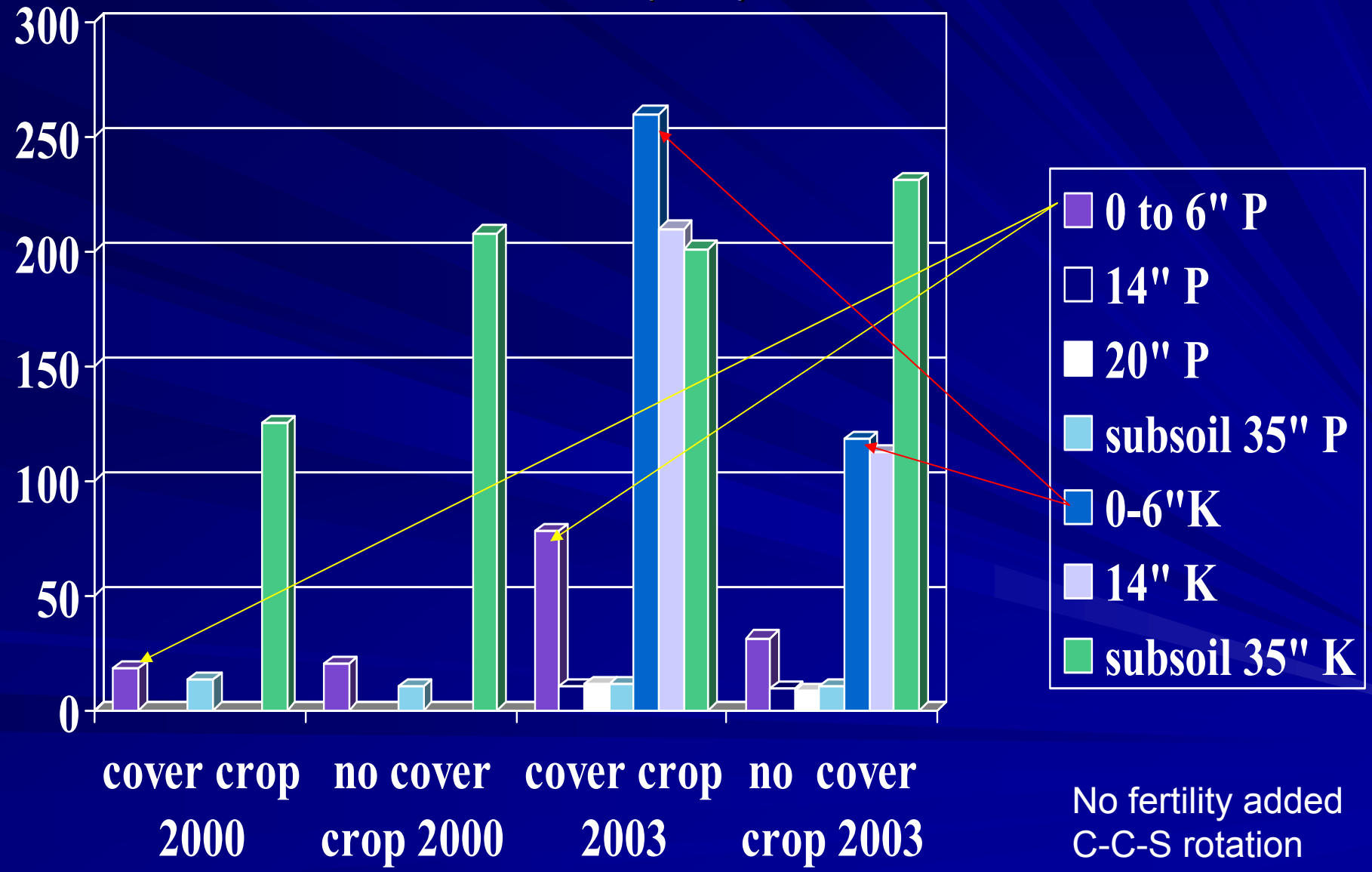
Soil Tests in ryegrass Cover Crop



No fertility added

Soil Tests in Cover Crop

(#/a)



No fertility added
C-C-S rotation

Ryegrass Fertility Impacts

- Cover crops can move nutrients
  - From subsoil to surface
  - Will decrease subsoil levels
- Increased SOM will store nutrients
- Cove crop can store nitrogen for later release
- Cover crop can tie up nutrients if allowed to mature

Ryegrass

- Provides specific benefits
- Requires high level of management
- Can be highly beneficial

- All cover crops are weeds in Growing Crops
- Manage accordingly

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