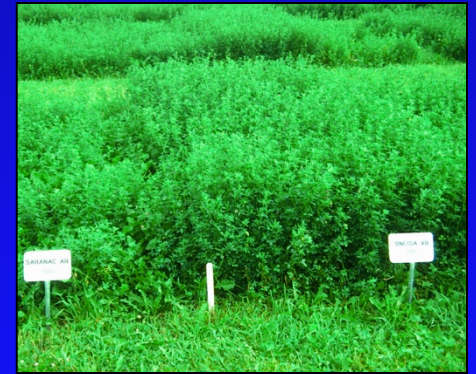


Varieties, Maturity Measures, and Seed Certification

Certified Crop Advisor Training



Margaret E. Smith
Julie Hansen



Plant Breeding and Genetics



Cornell University
College of Agriculture and Life Sciences



Topics to cover:

- The nature of crop varieties
- Choosing varieties
- Seed certification



What is a “variety”? (pages 11-12)



- Biological definition:
 - A subdivision of a species
 - An agricultural variety:

A group of similar plants that by structural features and performance can be identified from other varieties within the same species



What is a “variety”?

(pages 11-12)

- Legal definition:
 - Used when granting plant breeders rights under PVPA, UPOV
 - The variety must be:
 - 1) New
 - 2) Distinct
 - 3) Uniform
 - 4) Stable



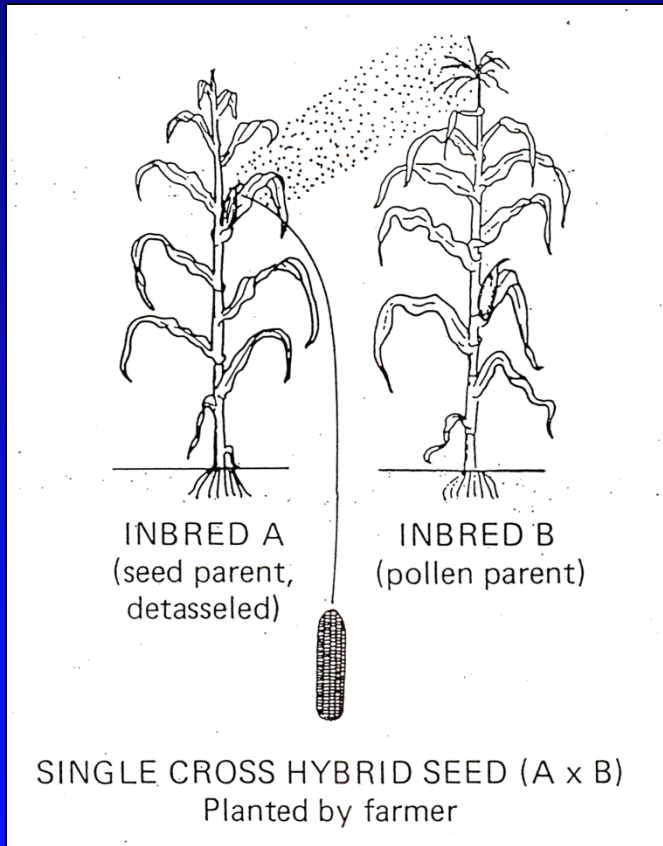
What is a “hybrid”?

(pages 11-12)

- The first generation offspring of a cross between two individuals differing in one or more genes
- Can be single cross (2 parents) or more complex crosses involving more parents
- Often has better vigor (size, maturity, yield) than parents



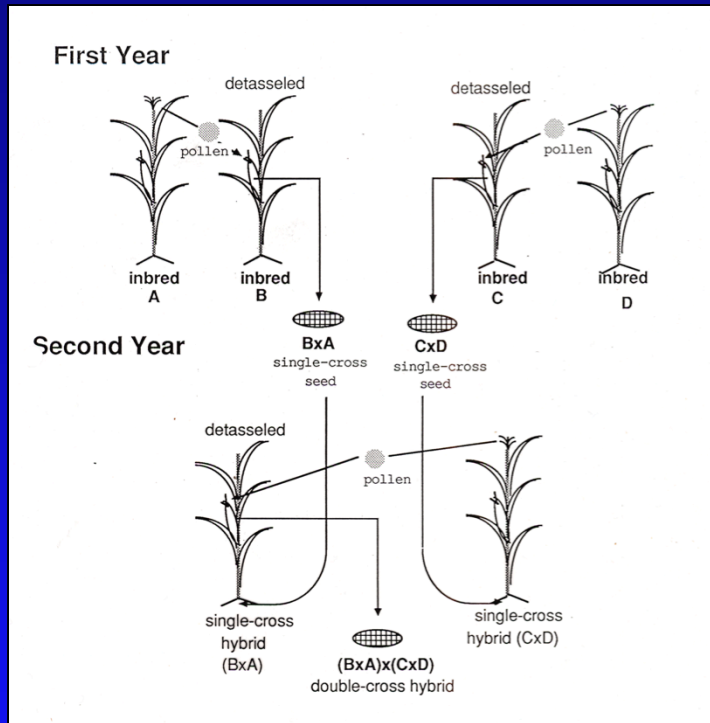
Types of corn hybrids



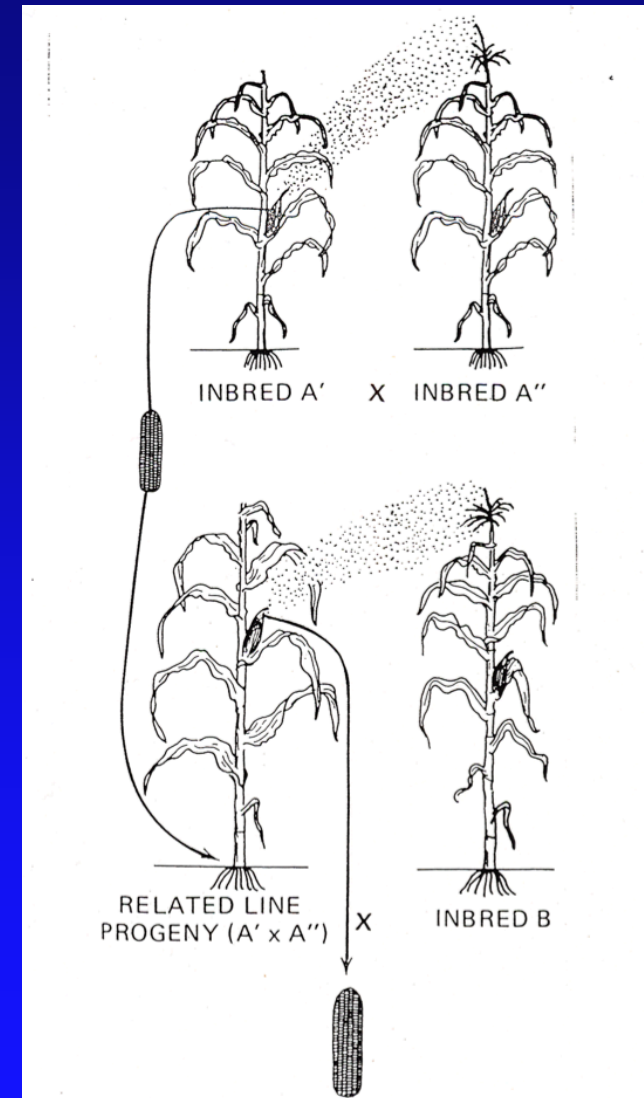
Single Cross Hybrid



Other types of corn hybrids



Double Cross Hybrid

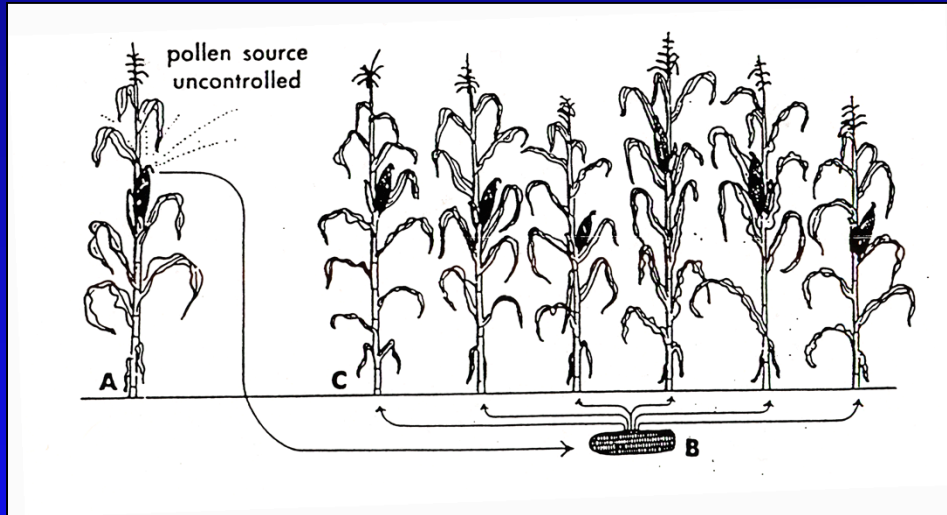


Modified Single Cross

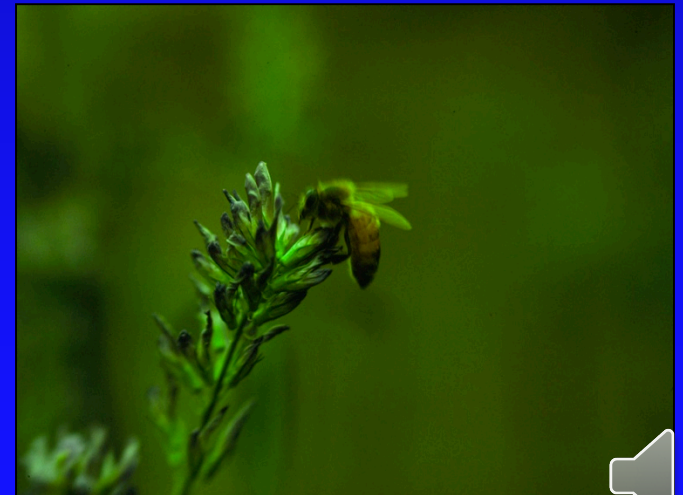


Types of corn and alfalfa varieties

(pages 12-13)



Open Pollinated Variety



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Types of wheat and soy varieties



Pure line or homozygous varieties



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Choosing varieties

(pages 12-13)

- Appropriate testing
- Traits of critical importance
- Genetically engineered or not?



Corn variety choice (pages 12, 27-28)

- Maturity is critical
 - Days to relative maturity (DRM)
 - A relative assessment done in Minnesota
 - Basis = “days needed to mature”
 - Growing degree days (GDD)
 - Limits are 86° and 50° F
 - Difference between average of daily max and min and base of 50°
 - Don't count above 86° or below 50°



Crop Growth and Development

GDD examples (pages 27-28)

- If high temperature is 60°, low is 40°:
Substitute 50° for the low
Average $(60+50)/2 = 55$
GDD = $55-50 = 5$
- If high temperature is 96°, low is 66°
Substitute 86° for the high
Average $(86+66)/2 = 76$
GDD = $76-50 = 26$



GDD and Environmental Effects

(page 28)

- Sunny and/or dry weather speeds corn maturity
- Cloudy and/or wet weather slows corn maturity



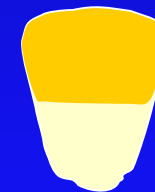
Kernel Milk Line

(pages 28-29)

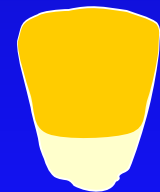
- Half milk line occurs at about 35% dry matter
- If August-Sept. are:

Hot and Dry - early $\frac{1}{2}$ milk line, less water at $\frac{1}{2}$ milk line

Cool and Wet - late $\frac{1}{2}$ milk line, more water at $\frac{1}{2}$ milk line



1/2



3/4



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Photo credit: E. Larson, Mississippi State University Extension



Factors in corn variety choice in addition to MATURITY (page 12)

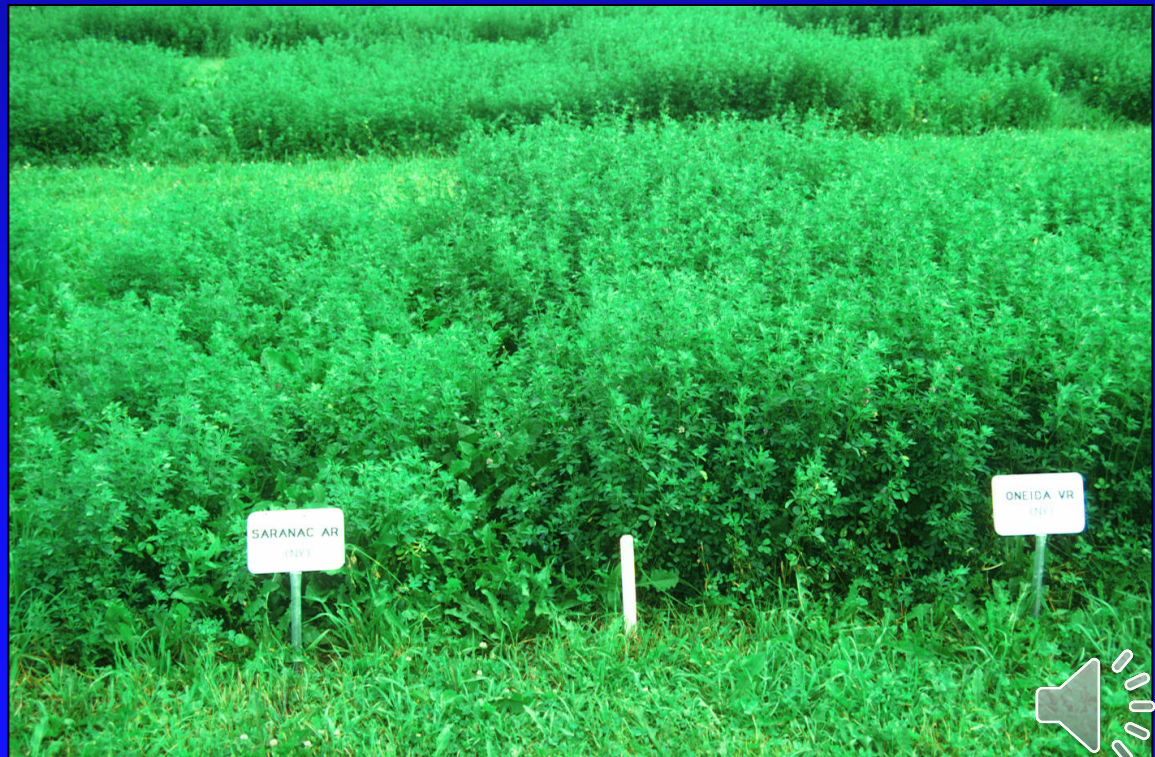
- Corn for grain:
 - Grain yield
 - Strong stalk and roots
 - High test weight
- Corn for silage:
 - Silage tonnage yield
 - Digestibility



Factors in alfalfa variety choice

(page 13)

- Disease Resistance
- Winter hardiness
- Fast recovery
- Yield
- Quality



Alfalfa variety choice

(page 13)

- Disease resistance is key

| <u>Category</u> | <u>% Resistant Plants</u> |
|-----------------|---------------------------|
|-----------------|---------------------------|

| | |
|----|--------|
| HR | > 50 % |
|----|--------|

| | |
|---|-----------|
| R | 31 - 50 % |
|---|-----------|

| | |
|----|-----------|
| MR | 15 - 30 % |
|----|-----------|

| | |
|----|----------|
| LR | 5 - 15 % |
|----|----------|

| | |
|---|---------|
| S | 0 - 5 % |
|---|---------|



Variety testing

- Replicate - to account for field variation

| | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 |
| 1 | 2 | 3 | 4 | 5 |



Variety testing

- Replicate - to account for field variation
- Randomize - to account for neighbor effects and field trends

| | | | | |
|---|---|---|---|---|
| 5 | 4 | 2 | 1 | 3 |
| 3 | 1 | 5 | 2 | 4 |
| 1 | 2 | 3 | 4 | 5 |



Variety testing

- Replicate - to account for field variation
- Randomize - to account for neighbor effects and field trends
- Multiple locations / years - to account for genotype x environment interaction
- Use typical management

| | | | | |
|---|---|---|---|---|
| 3 | 1 | 5 | 2 | 4 |
| 4 | 3 | 1 | 5 | 2 |
| 5 | 4 | 2 | 1 | 3 |

| | | | | |
|---|---|---|---|---|
| 5 | 4 | 2 | 1 | 3 |
| 3 | 1 | 5 | 2 | 4 |
| 1 | 2 | 3 | 4 | 5 |

| | | | | |
|---|---|---|---|---|
| 2 | 5 | 3 | 4 | 1 |
| 5 | 4 | 2 | 1 | 3 |
| 3 | 1 | 5 | 2 | 4 |





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Oat Summary Table

| Variety | Grain Yield, bu/A | | Test Weight, lb/bu | Lodging, 0-9 score* | Heading Date | Plant Height, cm |
|-----------|----------------------|------|-----------------------|------------------------|--------------|---------------------|
| | 6 Yr | 5 Yr | 2 Yr | 2 Yr | 2 Yr | 2 Yr |
| Ogle | 84 | 81 | 36.2 | 1.7 | 6/23 | 79 |
| Corral | 94 | 83 | 40.1 | 1.2 | 6/24 | 73 |
| IL02-8658 | | 91 | 38.8 | 1.9 | 6/21 | 79 |
| MN05119 | | 89 | 39.0 | 1.1 | 6/26 | 89 |



Alfalfa Summary Table

Sown May 2014

| Released And Experimental Varieties | 2017 Total | 3-Yr Total | PLH Avg. Damage Score 2-Aug-17 |
|---|---------------|---------------|--------------------------------------|
| - - tons per acre dry matter - - | | | |
| 55H94 | 6.60 | 16.83 | 1.0 |
| 5312 | 6.42 | 16.83 | 3.1 |
| ONEIDA VR | 6.50 | 16.16 | 3.4 |
| VERNAL | 6.32 | 16.02 | 3.6 |
| SW 315LH* | 5.72 | 15.97 | 1.2 |
| <i>Trial Mean</i> | <i>5.91</i> | <i>15.85</i> | Damage Score: |
| <i>LSD(0.05)</i> | <i>0.47</i> | <i>0.85</i> | 1=none |
| <i>CV(%)</i> | <i>6.1</i> | <i>4.2</i> | 5=severe |



Multiple Range Test Example

| Treatment | Mean yield (kg/ha) | DMRT |
|----------------|--------------------|------|
| T ₁ | 2127 | bc |
| T ₂ | 2678 | a |
| T ₃ | 2552 | ab |
| T ₄ | 2128 | bc |
| T ₅ | 1796 | c |
| T ₆ | 1681 | cd |
| T ₇ | 1316 | d |



Seeding Factors - Seed Certification

(pages 8-9)

- An independent, third party means of quality control for seed
- Ensures varietal identity
 - Field and seed lot inspection
- Evaluates seed purity, germination
 - Laboratory testing
 - Can calculate seeding rate



Generations of Certified Seed

(page 8)

- Breeder seed (developed by breeder)
- Foundation seed
- Registered seed
- Certified seed




Seed testing determines:

(page 9)

- Germination percent
- Weed seed content
 - Objectionable
 - Noxious (seed number / lb.)



Noxious Weeds in Seed

| | | CT | ME | MA | NH | NY | RI | VT |
|----------------------|-----------------------------|----|----|----|----|---|----|----|
| Annual bluegrass | <i>Poa annua</i> | | | | | ✓  | | |
| Bedstraw | <i>Galium spp.</i> | ✓ | | | ✓ | ✓ | | ✓ |
| Bindweed | <i>Convolvulus arvensis</i> | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Canada thistle | <i>Cirsium arvense</i> | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Corncockle | <i>Agrostemma githago</i> | | | | | ✓ | | |
| Dodder | <i>Cuscuta spp.</i> | ✓ | | | | ✓ | | |
| Horsenettle | <i>Solanum carolinense</i> | ✓ | | | | ✓ | | |
| Leafy spurge | <i>Euphorbia esula</i> | | | | | ✓ | | |
| Perennial sowthistle | <i>Sonchus arvensis</i> | ✓ | | | | | | |
| Quackgrass | <i>Agropyron repens</i> | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Russian knapweed | <i>Centaurea repens</i> | ✓ | | | | ✓ | | |
| Serrated tussock | <i>Nassella trichotoma</i> | | | | | | ✓ | ✓ |
| Velvetleaf | <i>Abutilon theophrasti</i> | | | | ✓ | | ✓ | ✓ |
| Wild onion | <i>Allium spp.</i> | | | | | ✓ | | |
| Woundwort | <i>Stachys palustris</i> | | ✓ | | | | | |
| Yellow nutsedge | <i>Cyperus esculentus</i> | ✓ | ✓ | | | | ✓ | |

 in lawn seed



Seed testing determines:

(page 9)

- Germination percent
- Weed seed content
 - Objectionable
 - Noxious (seed number / lb.)
- Other crop seed content
- Inert material content
 - Chaff, dirt, broken seed, etc.



Germination testing

(page 9)

- A laboratory test
- Classifies seed as normal vs. dead
 - “Abnormals” are assigned to one category or the other based on the seed analyst’s experience
- Does not tell:
 - How many plants will establish in the field
 - How many plants will have harvestable product



Seed certification legislation

(page 9)

- U.S. Federal Seed Act sets minimum standards
 - Delegates certification responsibility to State Departments of Agriculture
 - NYS Dept. of Agriculture and Markets
- Individual state seed laws must meet at least these minimum standards



Seed certification in New York

(page 9)

- Delegated to NYS College of Agriculture and Life Sciences
 - Department of Plant Breeding
 - New York Seed Improvement Project (NYSIP)
- Official testing by NYS Seed Testing Laboratory





Seed tag information

(page 9)

- Kind (crop)
- Variety or hybrid name
- Seed test results and date
- State or country of origin
- Seed producer or seed company
- Any restrictions on use of seed or crop



PREFERRED SEED CO., INC.
575 Kennedy Road Buffalo, NY 14227
(716) 895-7333

Variety: 361HY
Pure Seed: 99.92
Crop Seed: .02
Inert Matter: .04
Weed Seed: .02
Weeds: None Found
Net Weight: 50lbs 22.68kg
Tested: 3/2005

Kind: Hybrid Alfalfa
Lot No: 5093AN
Total Germ & Hard Seed: 90
Germination: 80
Hard Seed: 10
Origin: 42%WY 36%ID
22%OR

Treated with Apron XL™ LS
and Nitragin Gold™

75%-95% Hybrid Seed
NOT FOR HUMAN OR ANIMAL CONSUMPTION AMS-5061

So how much “pure live seed” is in that bag? (page 9)

- Pure seed does not include:
 - Weed seed, other crop seed, inert material
- Pure seed content is:
 - 100 % minus % of other stuff listed above
- Pure live seed is:
 - % pure seed x % germination



| | | | |
|--|-------------------------------|--------------------|--------|
| LESCO INC., 1385 East 36th Street, Cleveland, OH 44114 | | | |
| Product: | TALL FESCUE SELECT SEED BLEND | | |
| LOT NUMBER: | M123M-11-916 | Item: | 056625 |
| % PURITY | Component | % GERM | ORIGIN |
| 36.52 | Padre Tall Fescue | 90 | OR |
| 32.66 | Biltmore Tall Fescue | 90 | OR |
| 29.56 | Compete Tall Fescue | 90 | OR |
| % OTHER INGREDIENTS: | | NOXIOUS WEED SEEDS | |
| 0.00 OTHER CROP SEEDS | | NONE FOUND | |
| 1.26 INERT MATTER | | | |
| 0.00 WEED SEED | | | |
| DATE TESTED: | Sep-11 | | |
| IN AZ/CO/CA/MN/NH/NJ/NV/NY/OH/PA/VT: SELL BY 12/12 | | | |
| Net Weight: | 50 lbs | | |
| AMS: 635 | MM | | |

$100\% - 1.26\% = 98.74\%$ pure seed

$0.9874 \text{ pure seed} \times 0.90 \text{ germ} = 0.889$ or 88.9%
pure live seed

$0.889 \times 50 \text{ lb.} = 44.43 \text{ lb.}$ pure live seed



Crop seeds certified in New York

(page 10)

- Oats
- Wheat
- Barley
- Buckwheat
- Some grasses
- Soybeans
- Dry beans
- Alfalfa
- Potato
- Some corn varieties

Crop seeds certified in Maine

- Alfalfa
- Some grasses



Selling non-Certified seed

- Must meet minimum standards for sale
- Some varieties can ONLY be sold as Certified seed

N.D. Seed Company Fined for Seed Law Violations

2/21/2017 3:25:00 PM / Categories: **General News, Today's Top 5, Grains, Ag Issues**

The Gold ND flax seed was not legally labeled for sale.

The North Dakota State Seed Department has settled a case concerning state and federal North Dakota seed producer for the illegal sale of a protected variety in 2016.

The company was fined \$11,000 for illegally selling 956 bushels of Gold ND flax, a North D
The variety is protected under the Plant Variety Protection Act (PVPA) and Title V of the Fe

2 farmers settle illegal seed sales case with Syngenta

Illegal sale involved AgriPro Jackpot wheat seed; farmers agree to cease and desist from all sales or attempted sales.

Feb 28, 2017



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Thank you!



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