Polymer Seed Coatings for Early Planting of Hybrid Corn in Indiana?

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Risks of Early Planting of Corn

- Emergence variability
- Pests Attacks
- Late Killing Frost

Low Populations
Variable Plant Development

Low Yields

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# Expected Grain Yield Due to Various Planting Dates and Final Plant Populations

<table>
<thead>
<tr>
<th>Planting Date</th>
<th>Plants (000 acre⁻¹)</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>10-Apr</td>
<td>85</td>
<td>94</td>
</tr>
<tr>
<td>15-Apr</td>
<td>88</td>
<td>97</td>
</tr>
<tr>
<td>20-Apr</td>
<td>90</td>
<td>99</td>
</tr>
<tr>
<td>25-Apr</td>
<td>92</td>
<td>100</td>
</tr>
<tr>
<td>30-Apr</td>
<td>92</td>
<td>100</td>
</tr>
<tr>
<td>5-May</td>
<td>91</td>
<td>99</td>
</tr>
<tr>
<td>10-May</td>
<td>89</td>
<td>97</td>
</tr>
<tr>
<td>15-May</td>
<td>87</td>
<td>95</td>
</tr>
<tr>
<td>20-May</td>
<td>83</td>
<td>91</td>
</tr>
<tr>
<td>25-May</td>
<td>79</td>
<td>87</td>
</tr>
<tr>
<td>30-May</td>
<td>73</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: Nafziger (1994)
Temperature-activated Polymers behave in two ways

*Intelimer® Technology*

**Crystalline**
- Impermeable to $\text{H}_2\text{O}$

**Amorphous**
- Permeable to $\text{H}_2\text{O}$
Early Plant™ Technology

It knows when to grow!

Below 55°F
- Coating Barrier
- Water is Repelled
- Seed

Above 55°F
- Coating Changes
- Water is Allowed to Permeate
- Seed Absorbs the Water
“Pollinator Plus” Male Parent Delay
Corn Producer Profile for Early Plant Option?

1. Variable drainage and in Central or Eastern Corn Belt
2. No-till production system
3. Acreage expanding, but planting capability limited
4. Risk adverse to high rainfall in optimum planting period
5. Determined to plant soybean early, and harvest corn early
Results in Year 2000
Experimental Design in Year 2000

Planting Date

UTC (Control)

Coating A
2 % of seed weight

Coating B
3 % of seed weight

March 28
Hybrid 8509
Hybrid 9307

April 14
Hybrid 8509
Hybrid 9307

May 16
Hybrid 8509
Hybrid 9307

UTC (Control)

Coating A
2 % of seed weight

Coating B
3 % of seed weight

March 28
Hybrid 8509
Hybrid 9307

April 14
Hybrid 8509
Hybrid 9307

May 16
Hybrid 8509
Hybrid 9307
Emergence Profile (2000)

Planting Date: March 28

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Emergence Profile  (2000)

Planting Date: March 28

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Emergence Profile 2000

Planting Date: April 14

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Polymer Coatings and Yield 2000

Lafayette, IN

Bu/acre

8509/UTC  8509/A  8509/B

3/28/00  4/14/00  5/16/00

Planting Date

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Polymer Coatings and Yield (2000)

Lafayette, IN

Bu/acre

3/28/00  4/14/00  5/16/00

Planting Date
Results in Year 2001

Killing Frosts on April 17 and 18
Emergence Profile based on Surviving Seedlings (2001)

Planting Date: April 2

- 9307/UTC
- 9307/C
- 9307/D

Days after planting

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Hybrid 9307/UTC

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Emergence Profile based on Surviving Seedlings (2001)

Planting Date: April 2

- **8509/UTC**
- **8509/D**

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## Final Plant Populations (Lafayette, IN)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Plant Population (Plants/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planting Date</td>
</tr>
<tr>
<td></td>
<td>Year 2000</td>
</tr>
<tr>
<td>9307/UTC</td>
<td>27200</td>
</tr>
<tr>
<td>9307/A</td>
<td>28700</td>
</tr>
<tr>
<td>9307/B</td>
<td>29000</td>
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<tr>
<td>8509/UTC</td>
<td>31300</td>
</tr>
<tr>
<td>8509/A</td>
<td>30900</td>
</tr>
<tr>
<td>8509/B</td>
<td>30400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9307/UTC</td>
<td>17400 b</td>
<td>28500 a</td>
<td>30500 a</td>
</tr>
<tr>
<td>9307/C</td>
<td>24300 a</td>
<td>26000 b</td>
<td>28400 b</td>
</tr>
<tr>
<td>9307/D</td>
<td>23300 a</td>
<td>28200 a</td>
<td>30600 a</td>
</tr>
<tr>
<td>8509/UTC</td>
<td>25000 b</td>
<td>25700</td>
<td>30000</td>
</tr>
<tr>
<td>8509/D</td>
<td>29100 a</td>
<td>27400</td>
<td>30400</td>
</tr>
</tbody>
</table>

Means separation within planting date and hybrid by Duncan range test, 5% level.

Treatment code: UTC, control, A,B,C, and D are polymer coatings.

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Polymer Coatings and Yields 2001

Lafayette, IN

![Bar graph showing yields for different dates and varieties](image)

- **8509/UTC**
- **8509/D**

Yield in Bu/acre:
- 4/2/01: 200 Bu/acre
- 4/19/01: 180 Bu/acre
- 5/11/01: 160 Bu/acre

(Plants were planted on different dates and the yield was measured accordingly.)
Polymer Coatings and Yields in 2001

Valparaiso, IN

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Coating Effects on Yield in 2002
(average of 3 hybrids at West Lafayette, IN)
Coatings and Emergence Time in 2003 (average of 3 hybrids at West Lafayette)
Maximum and Minimum Soil Temperatures after Planting 2003 (West Lafayette)

First planting March 27

Second planting April 3

Third planting April 23

Temperature (F)

25 35 45 55 65 75 85

28-Mar 4-Apr 11-Apr 18-Apr 25-Apr 2-May 9-May 16-May
Comparison of early versus late planting in 2003

Planting date: <4/15 early, >4/15 late

Emergence, %

Replicated Plot Trials: 6 locations, IN, IL, OH, MO

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Coating Effects on Population in 2003
(Average of 3 hybrids and 3 planting dates at Wanatah, IN)

Population as affected by coating treatments

<table>
<thead>
<tr>
<th>Coating Type</th>
<th>Population (Plants/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coat A</td>
<td>31150</td>
</tr>
<tr>
<td>Coat B</td>
<td>30450</td>
</tr>
<tr>
<td>Uncoated</td>
<td>29700</td>
</tr>
</tbody>
</table>
Coating Effects on Corn Yield in 2003 (mean of 3 hybrids at West Lafayette)
Source: Dr. E. Nafziger
Corn Planting Date/Seed Coating, Urbana, IL
2002

Source: Dr. E. Nafziger

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DeKalb Intellicoat Trial, 2003
Planted April 1

Source: Dr. E. Nafziger

T.J. Vyn, Purdue University©
DeKalb, IL 2003

Yield, bu/acre

- Uncoated
- Coated

Source: Dr. E. Nafziger
Maximum and minimum soil temperatures after planting,
Polymer Corn Study, Wanatah, 2003

First planting April 3
Second planting April 15
Third planting April 28

Temperature (F)
Polymer Coatings for Hybrid Corn

- Corn emergence a function of “trigger” soil temperatures; delays were often as small as 1 day, but could be as much as 5 days

- Higher corn populations resulted with very early planting plus inclement weather

- Considerable interaction with hybrids (emergence delay, population influence, yield effect, etc.)

- No corn yield benefit relative to planting during normal planting period.

- No negative yield effects when planting delayed

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Recommendations

- Needs to provide an economic advantage to become widely adopted. More research and on-farm evaluation required.

- Employ coatings on corn hybrids with high seedling vigor and early cold tolerance.

- Planter adjustment even more important (uniform seeding depth).

- Population determination for early plant?
Acknowledgments

- Landec Ag (Monticello and Oxford, Indiana)
- Purdue Research Foundation
- Technical assistants and farm superintendents
Q & A
Seed Coatings

Temperature-activated Polymers

Monomers

Length

Number

Polymers with Different Melting Points

(0 - 90 °C)

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Emergence Profile 2001

Planting Date: April 19

T.J. Vyn, Purdue University©
Planting Date: April 19

Emergence Profile 2001

9307/UTC
9307/C
9307/D

Days after planting

Plants/acre x 1000