

Popcorn Production in Indiana

Rachel Foley, M.S.
Conagra Brands



Popcorn

- Popcorn production in the U.S. and Indiana
- FAQs
- Agronomics of popcorn



The History of Popcorn

- Early History- was cultivated by Native Americans in the Southwest and into Mexico. Popcorn ears were found in a cave estimated at 4,000 years old.
- Recent History- 1890s through the Great Depression became a cheap, popular snack food at events and movie theaters
- Microwave popcorn became available in the 1980s
- Today- Ready to Eat is very popular



popcorn.org

Popcorn in the U.S.

- Americans produce and eat more popcorn than any other country
- COVID-19 had an impact on both grocery sales(+) and foodservice(-)

Pounds of Processed Popcorn Sold ^(a)		
	2019	2020
US/ Canada	950,946,104	826,259,160
Exported	212,631,528	199,923,211

^(a) The Popcorn Board, 2020

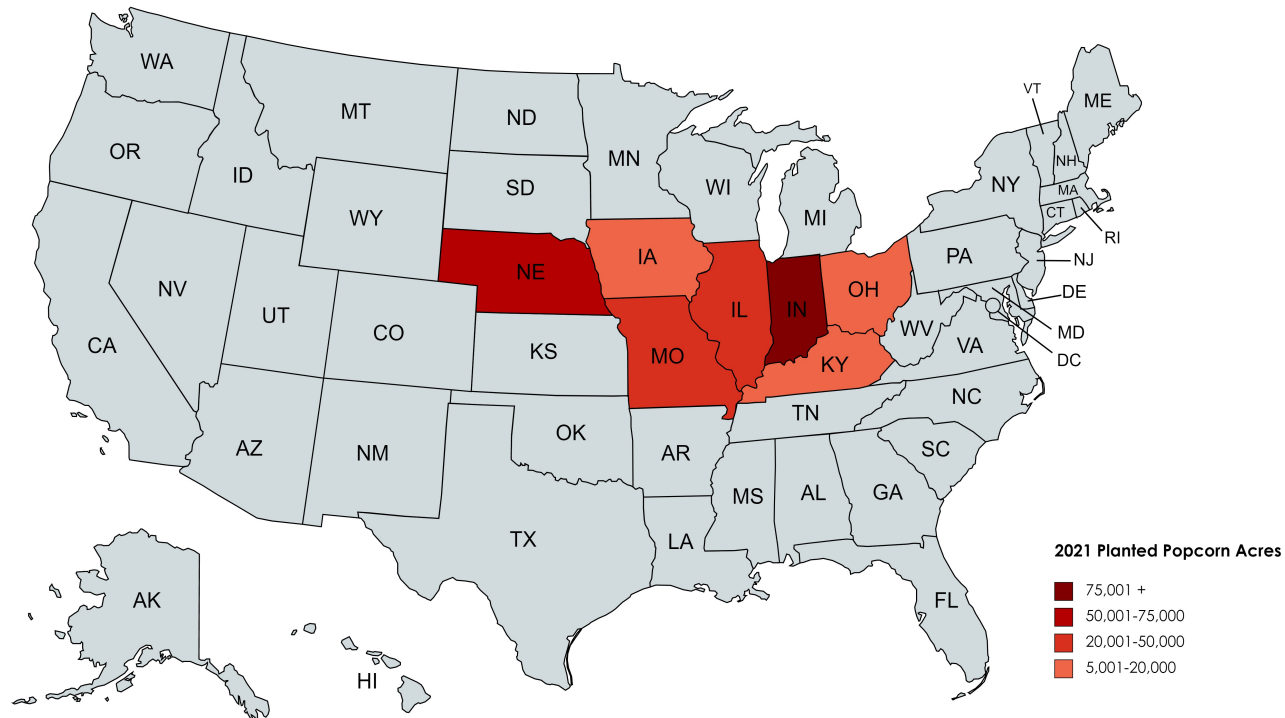
Popcorn vs Dent Corn in the U.S.

- 2021- 88,908,533 acres of dent corn planted ^(a)
- 2021- 243,437 acres of popcorn planted ^(a)



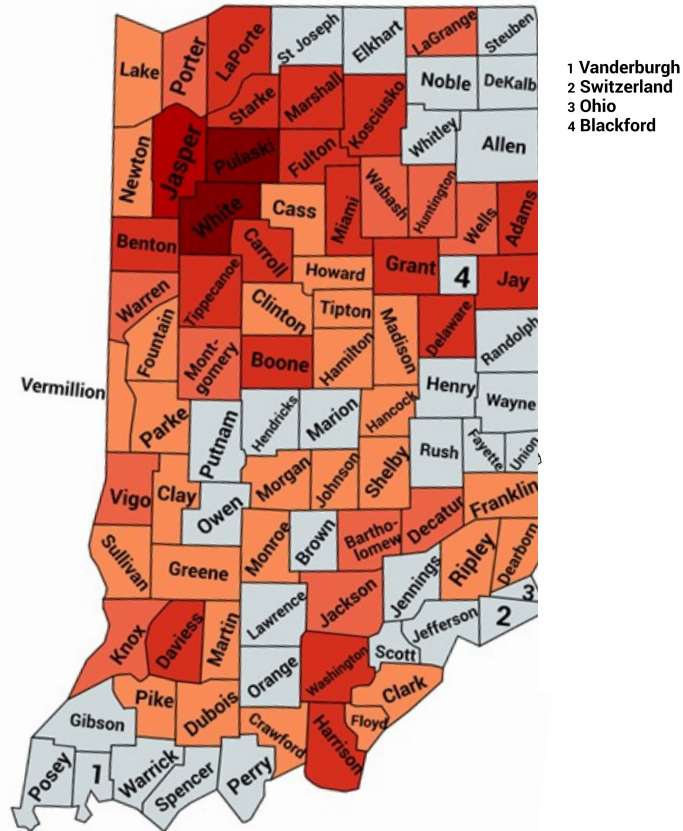
^(a) fas.usda.gov

Major Popcorn Producing States



Data Source: fsa.usda.gov

Indiana Popcorn Production



Data Source: fsa.usda.gov

The Popcorn Board

- USDA-AMS and FAS oversight
- Non-profit organization founded in 1998
- Paid for by popcorn processors
- Organic exemption
- Promotes American grown popcorn both domestically and internationally
- Publishes the Popcorn Agri-Chemical Handbook (popcorn.org/handbook)



Popcorn FAQs

- All U.S. grown popcorn is non-gmo
- Must use conventional corn growing techniques
- Customers both domestically and internationally like the non-gmo label
- USDA Organic popcorn



Types of Popcorn

- Yellow Butterfly
- White Butterfly
- Mushroom
- Specialty (red, black, purple)



BUTTERFLY

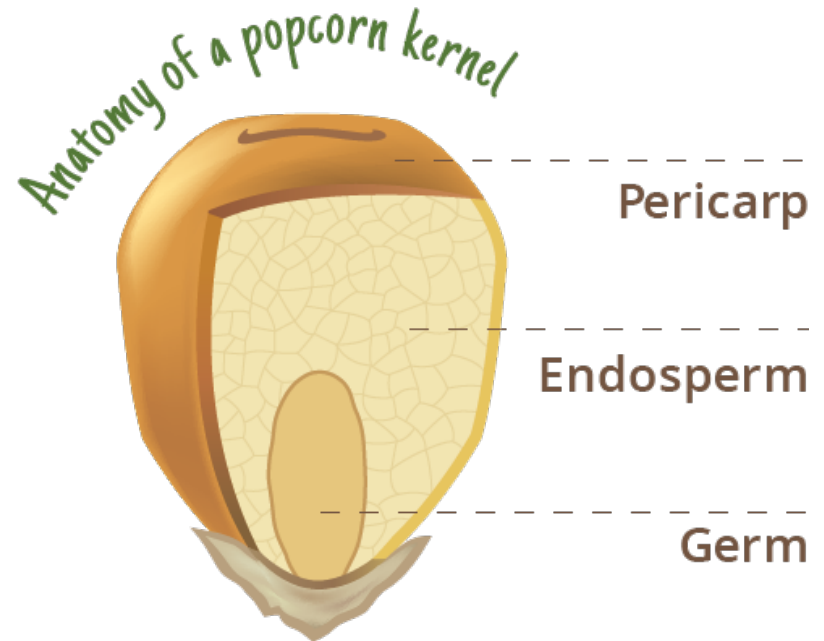


MUSHROOM

Popcorn Popping

13-14% Grain Moisture

Heat to 400-460°F



www.popcorn.org

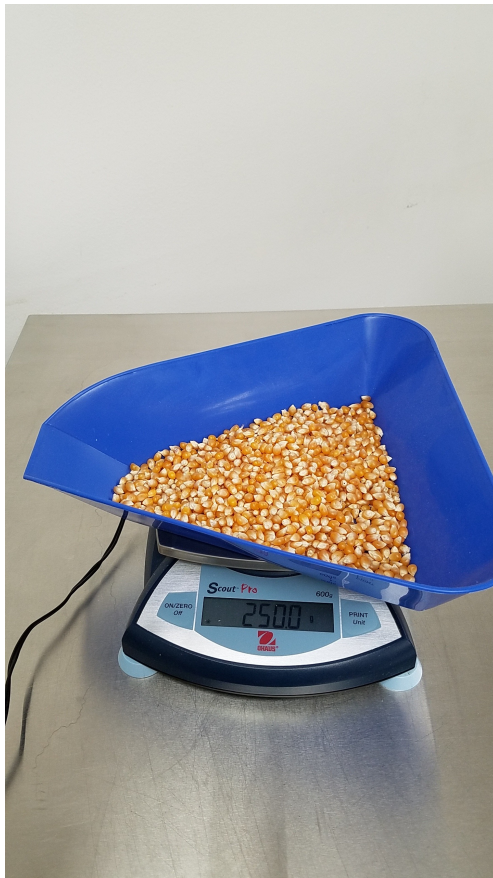
Pop Volume

- Industry standard to test on Cretors MWVT popper
- Metric Weight Volume Tester
- 250g/cc



Pop Volume (MWVT)

- Step 1)

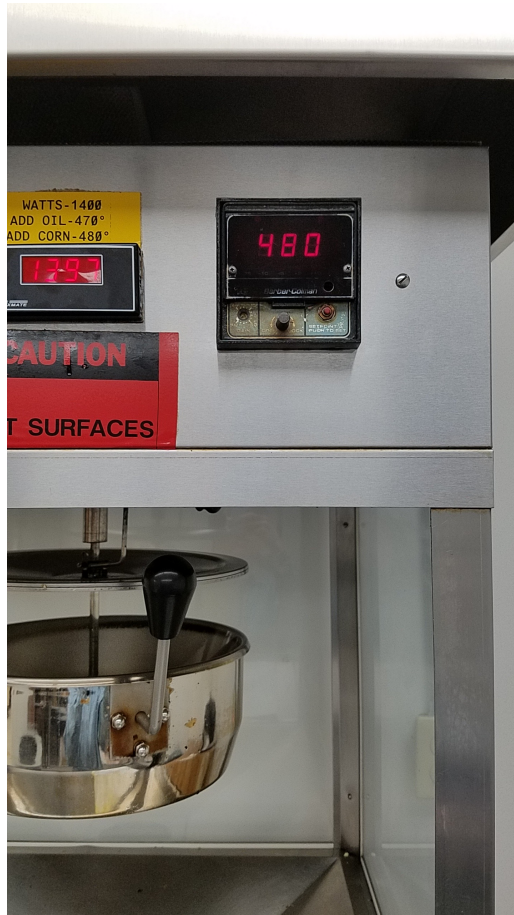


- Step 2)



Pop Volume (MWVT)

- Step 2)



- Step 3)



Pop Volume (MWVT)

- Step 4)



Typical MWVT range is 30-50 cc/g
depending upon hybrid

Popcorn Typical Yields

- Yield varies depending upon hybrid (aka pop volume)
- We use lbs. or cwt. instead of bushels for harvested grain
- Typical popcorn yields are 4,500 to 6,500 lbs./acre
- Popcorn is a heavy grain, test weights are 65 to 70 lbs./bu.
- Popcorn can be a very good fit for some growers

Contracted Popcorn

- Most popcorn is raised under contract for a processor
- Processors typically contract acres based on their demand for a given year
- Produce for end use, not just yield
- Most companies offer some type of quality and/or moisture bonus



Popcorn Pricing

- Not openly traded commodity
- Price is based on No. 2 yellow dent corn
- Company dependent- variable or fixed pricing
- Variable pricing example:

Hybrid Type	Multiplier	Price of Dent Corn Per bushel	Price of Popcorn Per cwt.
Low yield (4800-5000 lbs/ acre)	4.370	\$5.75	\$25.1275
Moderate yield (5100-5600 lbs/acre)	4.140	\$5.75	\$23.8050
High yield (5700 + lbs/acre)	3.500	\$5.75	\$20.1250

Popcorn vs Dent Corn

	Avg. Price	Yield	Gross Dollars
Dent Corn ^(a)	\$5.75 / bu	194 bu / acre	\$1,115.50
Popcorn	\$23.805 / cwt.	5,500 lbs / acre (81 bu/ac)	\$1,309.00



^(a) USDA estimates for Indiana

Sanitation of Equipment

- Planter
- Seed tender
- Bins
- Combine
- Auger cart
- Trailers



Crop Insurance for Popcorn

- Available through USDA-RMA in 49 counties in Indiana
- Yield protection, revenue protection, or revenue protection with harvest price exclusion
- New grower must use county yield average until establishment of APH
- MPCl endorsements (wind/hail) are available



Other common Popcorn FAQs

- Does a grower need special equipment?
- Isolation from other corn (*Ga1-s*)?
- We use natural air for dry down
- Grain bins need additional flooring support and fans designed for 1 cfm/bu

Agronomics of Popcorn

- Tillage
 - Conventional
 - No-Till
 - Strip-till
- Cover crops can be higher risk
 - Must get a good kill
- Crop Rotation
 - Soybean-Popcorn
 - Popcorn-Popcorn



Agronomics of Popcorn

- **Fertilizer**

- 75-90% of dent corn applications rates
 - 150-175 lbs of N
- N applications
 - Best = Side dress
 - Pre-plant, fall, urea over the top
- Keep K and P at optimal soil test levels
- Starter- helpful in cool, wet springs
- Sulfur



Pesticides- What is approved?

- Popcorn Agri-Chemical Handbook
 - <https://www.popcorn.org/Handbook>
- For labeling purposes, “corn” includes “popcorn”. If a product’s label says that the product is approved for use on “corn” or “corn grain”, that approval includes popcorn unless the label expressly excludes popcorn grain. “Field corn” or “sweet corn” on a label is specific to those varieties.
- Food grade product we want our product to be safe

Label Example-Corn


Page 1 of 28

RESTRICTED USE PESTICIDE (GROUND AND SURFACE WATER CONCERNS) FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION, AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION. THIS PRODUCT IS A RESTRICTED USE HERBICIDE DUE TO GROUND AND SURFACE WATER CONCERNS. USERS MUST READ AND FOLLOW ALL PRECAUTIONARY STATEMENTS AND INSTRUCTIONS FOR USE IN ORDER TO MINIMIZE POTENTIAL FOR ATRAZINE TO REACH GROUND AND SURFACE WATER.	
GROUP	5 HERBICIDE
ATRAZINE 4L	
HERBICIDE	
For season-long weed control in corn, sorghum, and certain other crops.	
Sale, use, and distribution of this product in Nassau and Suffolk Counties in the State of New York is prohibited.	
Active Ingredient:	
Atrazine: 2-chloro-4-ethylamino-6-isopropylamino-s-triazine41.9%	
Related Compounds1.1%	
Other Ingredients:57.0%	
Total:.....100.0%	
This product contains 4 lbs. active ingredients per gallon.	
Shake well before using.	
KEEP OUT OF REACH OF CHILDREN	
CAUTION	
SEE BOOKLET FOR ADDITIONAL PRECAUTIONARY STATEMENTS, COMPLETE DIRECTIONS FOR USE, WARRANTY DISCLAIMER AND LIMITATION OF LIABILITY	
FIRST AID	
If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• Do not induce vomiting unless told to do so by a poison control center or doctor.• Do not give anything by mouth to an unconscious person.
If in eyes	<ul style="list-style-type: none">• Hold eye open and rinse slowly and gently with water for 15-20 minutes.• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.

Label Example

Sale, use, and distribution of this product in Nassau and Suffolk Counties in the State of New York is prohibited. PULL HERE TO OPEN ►

GROUP 5 HERBICIDE



syngenta.

Herbicide

For weed control in certain crops

Active Ingredient:

Simazine: 2-chloro-4,6-bis (ethylamino)-s-triazine	41.9%
<i>Other Ingredients:</i>	58.1%
<i>Total:</i>	100.0%

Princep 4L contains 4 lbs. active ingredient per gallon.

KEEP OUT OF REACH OF CHILDREN.

CAUTION

See additional precautionary statements and directions for use inside booklet.

4L and Surflan labels.

FIELD CROPS

Corn (Field and Sweet)

Apply a maximum of 2 qt Princep 4L per acre (2.0 lb ai/A) as a single preemergence application on soils that are not highly erodible or on highly erodible soils, as defined by the Natural Resources Conservation Service, if at least 30% of the soil is covered with plant residues. If a second treatment is required following an earlier herbicide application, the total simazine applied may not exceed 2.5 lb ai/A per calendar year.

If the soil is highly erodible and covered with <30% plant residues, apply a maximum of 1.6 lb ai/acre as a single preemergence application. For highly erodible soils and is covered with <30% plant residue, do not apply more than one application of Princep 4L and not more than 1.6 lb ai/A (1.6 qt/A).

Pre-grazing/pre-harvest interval for field corn: 60 days.

Pre-grazing/pre-harvest interval for sweet corn: 45 days.

Nitrogen solution or complete liquid fertilizer may replace all or part of the water in the spray. Determine the physical compatibility of Princep 4L with fertilizer before use. Refer to the **Product Information** section of this label for a compatibility test procedure. Do not apply after corn has emerged, as there is danger of liquid fertilizer causing crop injury. Use a minimum of 10 gallons of spray mixture per acre.

Preemergence: Apply before weeds and grass emerge. Use the specified rate stated above.

Label Example- Yellow Popcorn



Grower Chemical Treatment Report

POPCORN CHEMICAL TREATMENT REPORT CONAGRA FOODS PACKAGED FOODS, LLC.

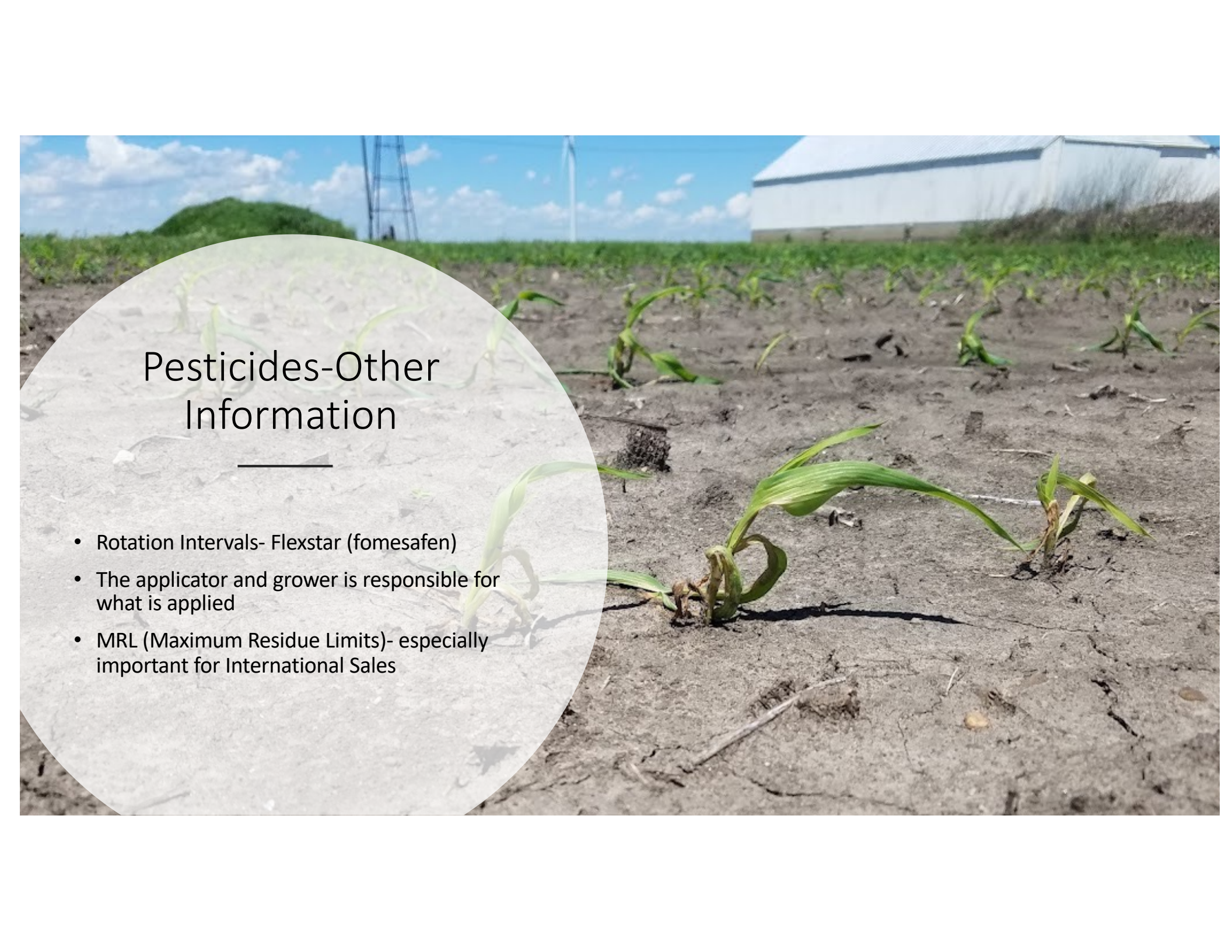
Grower Name <u>Joe Robinson</u>											Crop Year: <u>2020</u>		
Chemical Vendor Name & Address: <u>Good Chemical Company Lafayette, IN</u>											Chemical Vendor Phone Number: <u>(765) 380-2940</u>		
Contract #	Variety	Dates of Treatment		Number of Acres Treated	How Applied Air or Ground	Pesticide Common Name or Trade Name	Dry Formulations			Liquid Formulations			Applicator Name
		Start	Finish				Percent Active Ingredient	Lbs. of Pesticide Per Acre	Pounds Active Ingredient Per Acre	Lbs. Per Gallon Active	Amt. of Pesticide Per Acre	Pounds Active Ingredient Per Acre	
12345	V4P111	5/1	5/3	100	G	Force 36	3%	4.6	0.138				Joe
12345	V4P111	5/1	5/3	100	G	Atrazine				4 lbs.	1 qt.	1.0	Joe
12345	V4P111	5/1	5/3	100	G	Acuron				3.44	3 qt.	2.58	Joe

PESTICIDE: Under United States law, a pesticide is any substance or mixture of substances intended for: preventing, destroying, repelling, or mitigating any pest including plant regulators, defoliants, or desiccants.
 PESTS: Include: insects, mice and other animals, weeds, disease (fungi, bacteria, and viruses).
 NAMES: Include: Insecticides, Herbicides, Fungicides, & Fumigants.

DATE: 8/5/2020 GROWER'S SIGNATURE: Joe Robinson
 DATE: _____ FIELD REP SIGNATURE: _____

ALL TREATMENTS MUST CONFORM TO LABELED USES/RATES AND COMPLY WITH ALL STATE AND FEDERAL REGULATIONS.

White - ConAgra White - ConAgra Green - Grower



Pesticides-Other Information

- Rotation Intervals- Flexstar (fomesafen)
- The applicator and grower is responsible for what is applied
- MRL (Maximum Residue Limits)- especially important for International Sales

Misapplications



Drift



Popcorn Pests

- Weeds
 - Grass
 - Palmer/Waterhemp
 - Burcucumber
 - Morning Glory





Typical Herbicide Programs

- Pre-Emerge Herbicide
- Post Application around V4-V6
- Second Post Application- V8-V10???
- Grass needs to be controlled upfront

Popcorn Pests- Insects

- Rootworm
- Armyworm- Cover crops
- Corn borer
- Western Bean Cutworm



Insect Management

- Most growers apply in furrow insecticide labeled for popcorn
- IPM approach to the rest of the season



Popcorn Pests- Disease

- Grey leaf spot
- Northern corn leaf blight
- Tar spot
- Goss's Wilt
- Rust



Disease Management

- Much like dent corn
- Most fungicides are labeled for popcorn
- Fungicide pays off sometimes
- Typically, fungicide applied popcorn harvest moisture is wetter



Popcorn Pests- Ear rots

- Aspergillus
- Gibberella
- Diplodia



Aspergillus on Dent Corn
Cropprotectionnetwork.org

Seed Treatments

- Fungicide
 - Maxim Quatro
 - Vibrance
 - Vortex
 - And more
- Insecticide
 - Neonic Seed Treatment (Poncho, Cruiser, Gaucho, etc.)
 - Fortenza



<https://bee-health.extension.org/>

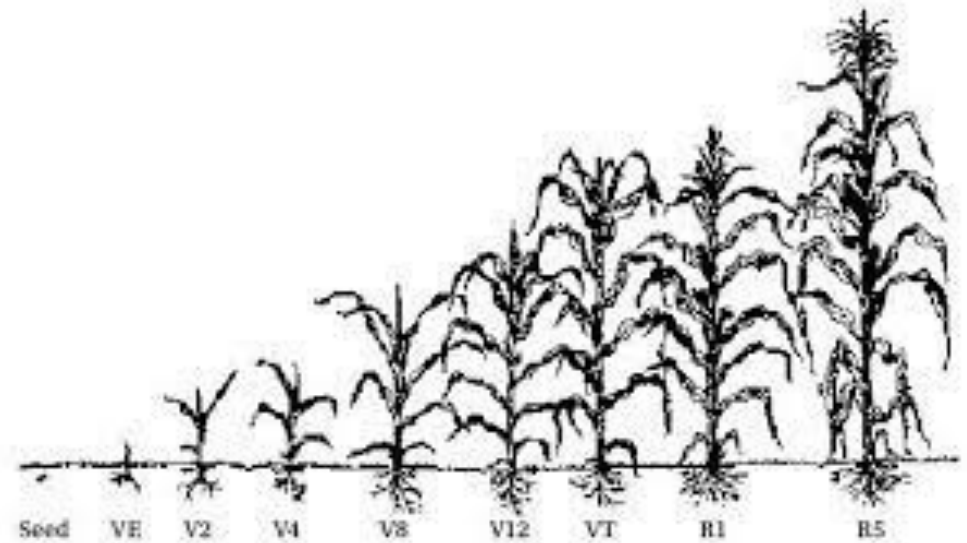
Plant Architecture

- Small seed
- Smaller plant-overall
- Early growth stages = lighter green
- Large, floppy tassel
- Anthocyanins = red silk



Plant Maturity

- We use relative days of maturity
 - Early (101-105 days)
 - Mid (106-110 days)
 - Full/Late (111 days +)
- Ideally like to reach 15% grain moisture to start harvest
- Weather major contributor to dry down



Weather Extremes

- Wind
- Drought
- Cold planting temps
- Too much rain
- Hot weather during pollination



Summary

- Has been grown in Indiana for a long time
- It is about more than just yield
- Can be more sensitive to agronomic issues, but is a rewarding crop to grow



Thank you!

- Rachel Foley
- 162 E 900 S
- Brookston, IN 47923
- Rachel.foley@conagra.com

