

Introduction

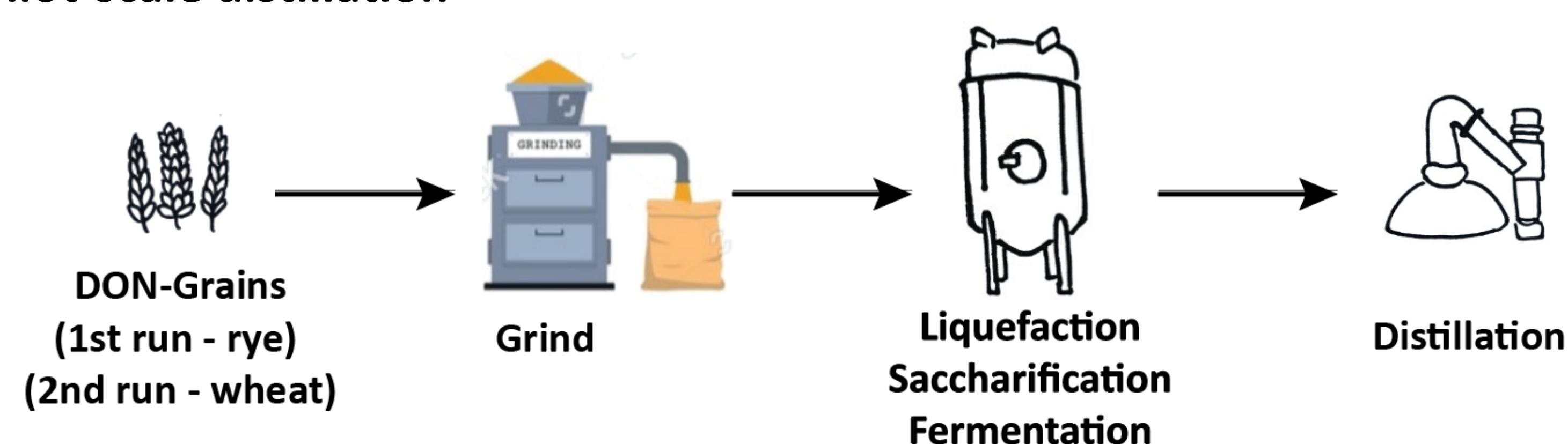
- **DON in grain**
 - Deoxynivalenol (DON) is a barrier to North-Central Region grain production.
 - Limited cleaning methods are available at small and mid-size scales to remove DON-infected kernels from a lot of grain.
- **Distilling could be a potential alternative use**
 - The brewing process starting distillation can impact DON levels both through increases and decreases during processing steps.
 - Bio-ethanol can be effectively produced from aflatoxin-contaminated corn.
- **Objectives**
 - Explore distillation as a high-value alternative for utilizing DON-contaminated grain.
 - Assist growers in overcoming a major food safety barrier to high-value wheat production.

Materials & Methods

Grain sources

- Two types of natural DON-contaminated grain were used for two runs.
 - DON-contaminated Danko rye, Clarksville, Ohio.
 - DON-contaminated AC Walton wheat, Waterford, Vermont.

Pilot-scale distillation



Sample collection

- Ground wheat and rye
- Semi-liquid
 - Pre-fermented mash after adding ground grain to water
 - Fermented mash
 - Post-distillation mash
- Distilled spirit
 - Fractionated samples, n = 29
 - Pooled samples, n = 6
 - First 5 pooled samples contain 5 fractionated samples
 - Final pooled sample contains 4 fractionated samples

Sample testing

- Enzyme-Linked Immunosorbent Assay kit
- LOD = 0.01 ppm and LOQ = 0.05 ppm



Results

DON stayed in the mash during fermentation and distillation

Table 1. DON concentration in the ground grain, pre-fermented mash, fermented mash, and post-distillation mash

Sample description	DON concentration (ppm)	
	Rye	Wheat
Ground grain – milling the rye or wheat	3.62	2.69
Pre-fermented mash – adding ground grain into water	0.56	0.61
Fermented mash – fermenting for 6 days	0.62	0.52
Post-distillation mash	0.81	0.51

- DON present in rye and wheat persisted in the mash throughout 6 days of fermentation
- DON present in fermented mash remained in the mash during distillation

DON had a minimal carryover into distilled spirits

Table 2. DON concentration in fractionated and pooled distilled spirit

Sample description	Rye		Wheat	
	Temperature (°C)	DON concentration (ppm)	Temperature (°C)	DON concentration (ppm)
Fraction sample 1	79.2 – 93.1	0.10	75.7 – 93.6	0.12
Fraction sample 2	93.1 – 93.4	0.06	93.6 – 93.9	0.01 < X < 0.05
Fraction sample 3	93.4 – 93.6	0.01 < X < 0.05	93.9 – 94.2	0.01 < X < 0.05
Fraction sample 4	93.6 – 93.9	0.01 < X < 0.05	94.2 – 94.3	< 0.01
Fraction sample 5	93.9 – 94.2	0.01 < X < 0.05	94.3 – 94.5	0.01 < X < 0.05
Pooled sample 1	79.2 – 94.2	0.10	75.7 – 94.5	0.05
Pooled sample 2	94.2 – 95.3	0.01 < X < 0.05	94.5 – 95.7	< 0.01
Pooled sample 3	95.3 – 96.5	0.01 < X < 0.05	95.7 – 96.6	< 0.01
Pooled sample 4	96.5 – 97.3	< 0.01	96.6 – 97.4	< 0.01
Pooled sample 5	97.3 – 97.8	< 0.01	97.4 – 97.9	< 0.01
Pooled sample 6	97.8 – 98.0	< 0.01	97.9 – 98.3	< 0.01

- Distilled liquor from DON contaminated mash had at most a very low level of DON

Conclusions

- From a food safety perspective, considering DON-contaminated grain as an ingredient for distilled spirits appears viable.
- The practicability needs to be further evaluated.

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