Grain Research Laboratory Technical Bulletin

Title	Effects of mineral oil application on wheat test weight, milling performance, flour characteristics and dough rheology
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Summary

This study was conducted to examine the impact of mineral oil on wheat test weight (a grading factor), milling performance, flour quality and dough characteristics. No meaningful difference in quality parameters was observed between the control (untreated) base wheat and those sprayed with mineral oil at levels of 0.02, 0.04, and 0.06% by weight (w/w).

Goals and objectives

Application of food grade mineral oil can effectively suppress the dust during grain loading. To understand the impact of mineral oil on wheat functionality and grading, this study investigated the impact of the addition of mineral oil (CAS 8042-47-5) at the proposed maximum application level of 0.02% w/w and at higher levels (0.04 and 0.06%) on the test weight, milling performance, flour characteristics and dough rheology.

Materials and methods

Five 4-kg Canada Western Red Spring wheat samples, representing a wide range of test weight (83.4 - 75.7 kilograms per hectoliter [kg/hL]), were used to determine the change in test weight upon addition of the mineral oil at 0.02 and 0.04% relative to the checks. Each sample was divided into two 2-kg subsamples using a Boerner divider. Mineral oil was applied to the duplicate samples at 0.02 and 0.04% w/w.

A 16-kg cargo composite of No. 1 Canada Western Red Spring was divided into eight 2-kg subsamples with a Boerner divider. Two subsamples were used as replicate control. Mineral oil was applied to the duplicate samples at 0.02, 0.04 and 0.06% w/w. Wheat samples were tempered to 16% moisture overnight before being milled on a Buhler laboratory test mill. All flour streams were collected and weighed to calculate the milling yield on a clean wheat basis. Flour and dough analysis were conducted using flour samples with a constant extraction of 74%, which were prepared by blending the most refined flour streams until 74% extraction was reached.

Results

Table 1 shows the effect of the application of mineral oil on wheat test weight. No meaningful change was observed on five different wheat samples, ranging from 75.7 kg/hL to 83.5 kg/hL in test weight, when treated with mineral oil at levels of 0.02 or 0.04% w/w.

Table 2 demonstrates the impact of the application of mineral oil at various levels on wheat milling yield, flour properties and rheological parameters.

No meaningful difference in mill yield was observed between the control sample and wheat samples sprayed with mineral oil up to 0.06% w/w. Treating wheat with mineral oil had no detectable impact on kernel hardness as indicated by particle size index (PSI).

No meaningful difference was detected in flour color parameters; flour brightness, redness or yellowness, as determined by a Minolta colorimeter. No change was detected in flour ash, damaged starch, protein and wet gluten contents. The farinograph parameters water absorption, dough

development time and stability indicated no effect of mineral oil addition at any level on dough mixing properties. Extensograph parameters demonstrated little change in dough strength due to the addition of mineral oil.

Conclusion

Application of mineral oil up to 0.06% w/w has no meaningful impact on wheat test weight, milling performance, flour characteristics and dough rheology.

References

AACC International, American Association of Cereal Chemists. Approved Methods of Analysis, 11th Edition.

International Association for Cereal Science and Technology (ICC): ICC Standards: Standard Methods of the International Association for Cereal Science and Technology, 7th supplement, 1998.

Appendix

Table 1 Effects of mineral oil addition on wheat test weight

	Control		0.02%		0.04%	
	Repeat A	Repeat B	Repeat A	Repeat B	Repeat A	Repeat B
Sample 1	83.4	83.5	83.2	83.2	83.0	83.1
Sample 2	80.6	80.4	80.5	80.4	80.4	80.4
Sample 3	79.3	79.2	79.2	79.3	79.2	79.3
Sample 4	76.2	76.3	76.2	76.2	76.2	76.4
Sample 5	75.7	76.0	75.2	75.4	76.0	75.7

Table 2 Effects of mineral oil addition on wheat physical properties, milling performance, flour characteristics and dough rheology

Parameters	Control		0.02%		0.04%		0.06%	
	Repeat A	Repeat B	Repeat A	Repeat B	Repeat A	Repeat B	Repeat A	Repeat B
Wheat								
Test weight, kg/hL	83.4	83.5	83.2	83.2	83.0	83.1	83.0	83.1
Particle size index, %	50	50	50	51	50	49	50	50
Milling yield (clean wheat basis), %	76.6	77.0	76.2	76.9	76.1	76.4	76.5	76.4
Flour								
Protein, %	13.2	13.3	13.2	13.2	13.1	13.2	13.2	13.2
Wet gluten, %	37.3	37.3	37.0	37.1	37.1	36.7	36.7	36.8
Ash content, %	0.42	0.42	0.41	0.41	0.43	0.40	0.42	0.42
Damaged starch, %	8.9	8.8	8.8	8.8	8.9	8.9	8.9	9.0
Brightness, CIELAB L*	91.1	91.1	91.0	91.1	91.0	91.1	91.1	91.1
Redness, CIELAB a*	0.53	0.51	0.53	0.50	0.52	0.51	0.52	0.50
Yellowness, CIELAB b*	9.6	9.6	9.7	9.5	9.7	9.6	9.7	9.6
Farinograph								
Absorption, %	67.5	67.6	67.4	67.4	67.3	67.3	67.2	67.3
Dough development time, minutes	6.75	6.75	8.00	7.75	7.00	7.75	7.50	7.00
Mixing tolerance index, BU[a]	25	25	30	25	15	20	25	20

Stability, minutes	9.5	9.5	9.0	10.5	10.5	10.5	10.0	10.0
Extensograph								
Length, cm	21.1	20.9	20.5	19.9	18.8	19.5	19.5	20.0
Max. resistance, BU[a]	536	494	547	534	519	504	513	505
Area, cm^2	141	129	142	135	122	123	127	127

[a] Brabender units