

Stability of Blended Fats: What's in the Market?

Introduction

Kemin offers customers the ability to analyze their fat and oil samples for oxidative parameters. These parameters allow estimations of the current degree of oxidation present and the potential for future oxidation. Over the years, a large variability in oxidative parameters has been noted in animal fats and vegetable oils.

Oxidation occurs when unsaturated fatty acids are degraded and secondary products are formed, which can decrease animal performance¹⁻⁴. Oxidation is initiated by the presence of oxygen, metal ions, heat, enzymes and light. The oxidation process degrades fatty acids and fat soluble vitamins leading to a reduction in energy and availability of important nutrients.

Materials & Methods

A summary of samples analyzed by Kemin Customer Laboratory Services (CLS) from January 2010 through July 2014 was conducted. The summary includes 26 samples labeled as yellow grease (13), animal vegetable blend (7), generic 'grease' (5) and generic 'fat blend' (1). Parameters included peroxide value, secondary oxidatives (hexanal + 2, 4-decadienal) and oxidative stability index (OSI). Not all samples were tested for all parameters in the summary. Samples treated with an antioxidant by Kemin CLS or labeled as containing an antioxidant were not included in the data. Antioxidant inclusion was not tested to determine if any of the included samples contained an unknown antioxidant.

Results

The variability of the current state of oxidation was measured as peroxide value and total secondary oxidatives (Figure 1). As oxidation takes place, peroxides are formed and consumed. Secondary oxidatives form as peroxides break down and are consumed as oxidation takes place. As a general guideline, fats and oils should contain a peroxide value less than 5 meq/kg and a total secondary oxidative value less than 50 ppm⁵. This is indicated in Figure 1 by the shaded box. The average peroxide value and secondary oxidative value of the samples was 2.0 meq/kg and 76.1 ppm respectively. The maximum values of the samples were 10.4 meq/kg and 364.0 ppm, the minimum values were 0 meq/kg and 0 ppm (< Limit of Quantification).

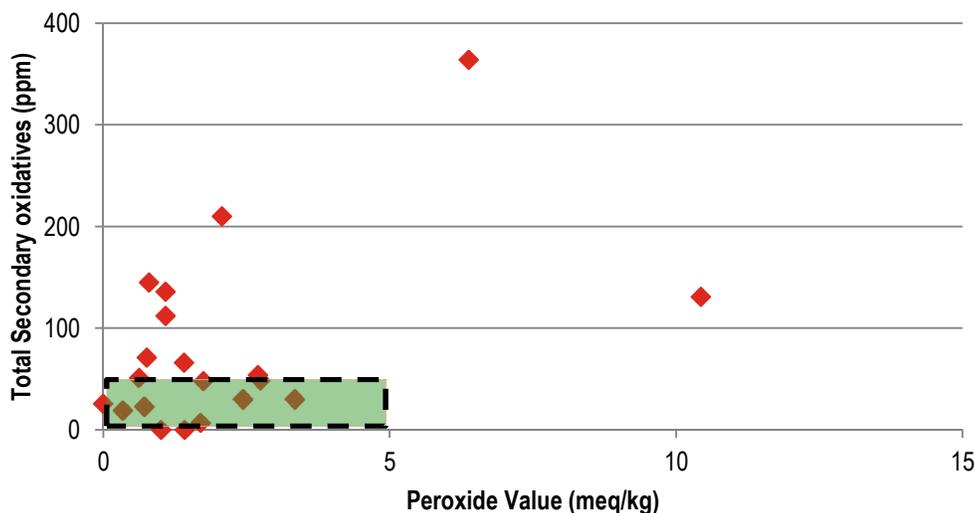


Figure 1. Peroxide value and total secondary oxidatives value for animal vegetable fat blends analyzed by Kemin CLS from 2010 - 2014 (n=21)⁶.

The potential for oxidation (stability) of the oil was measured using OSI (Figure 2). A longer OSI time represents a delay in onset of oxidation and can be interpreted to represent a more stable product. The animal vegetable blend samples showed a large variability in OSI times with an average of 11 hours (maximum of 43.2 hours and a minimum of 0.12 hour). The majority of the samples, 52%, had an OSI time of less than five hours.

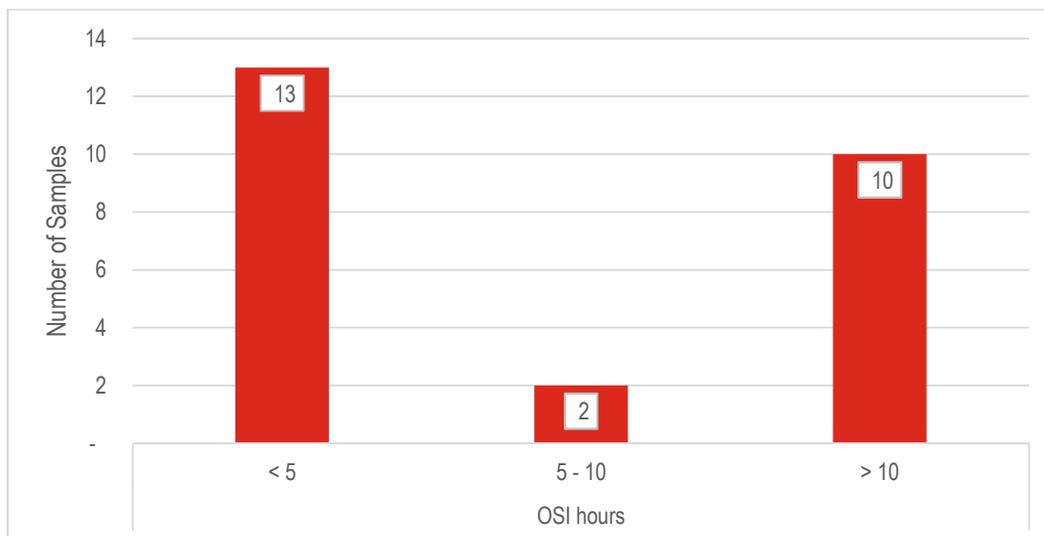


Figure 2. Number of samples initiating oxidation at different times, analyzed by oxidative stability index (OSI) at 100° C (n=25)⁶.

Conclusion

Samples of animal vegetable blends received and tested by Kemin CLS had a large variability in current oxidative status and future potential for oxidation. An antioxidant may be used to increase the stability of fats prone to oxidation. Reducing the variability of oils used for livestock feed may ultimately have a positive impact on livestock performance.

References

1. DeRouchey, J.M., Hancock, J.D., Hines, R.H., Maloney, C.A., Lee, D.J., Cao, H., Dean, D.W., and Park, J.S. 2004. Effects of rancidity and free fatty acids in choice white grease on growth performance and nutrient digestibility in weanling pigs. *J. Anim. Sci.* 82:2937-2944.
2. Boler, D.D., Fernandez-Duenas, D.M., Kutzler, L.W., Zhao, J., Harrell, R.J., Campion, D.R., McKeith, F.K., Killefer, J., and Dilger, A.C. 2012. Effects of oxidized corn oil and a synthetic antioxidant blend on performance, oxidative status of tissues, and fresh meat quality in finishing barrows. *J. Anim. Sci.* 90:5159-5169.
3. Tavarez M.A., D.D Boler, K.N. Bess, J. Zhao, F. Yan, A.C. Dilger, F.K. McKeith, and J. Killefer. Effects of antioxidant inclusion and oil quality on broiler performance, meat quality, and lipid oxidation. *Poultry Science* 90:922-930, 2011.
4. McGill J., E. McGill, A. Kamyab, and J.D. Firman. Effect of high peroxide value fats on performance of broilers in a normal immune state. *International Journal of Poultry Science* 10 (3): 241-246, 2011.
5. Verleyen T. 2010. Oxidation key issue in use of oils and fats for feed. <http://www.allaboutfeed.net/article-database>.
6. Kemin Internal Document, 15-00054.