OCIA R&E 2022 Scholarship Recipient Report

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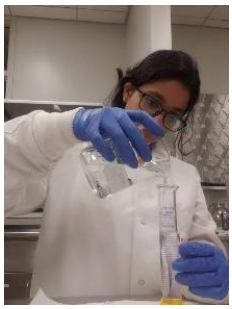
Oat is a highly valued food and feed crop. The nutritional benefits of oats have steeped its demand for human consumption. Although a large majority of the oats produced in US is covered with a hull, naked oats are of interest to organic producers and small-scale processors for marketing locally. Prior to processing oats in food products, covered oats must be dehulled. The dehulling process is followed by kilning, a heat treatment that is critical to inactivate lipolytic enzymes. These enzymes are responsible for the degradation of lipids in the kernel which reduces the quality and shortens the shelf life of the oats. Oats have the highest amount of lipid (3-11%) among the cereals, with an abundance of unsaturated fatty acid, making it vulnerable to developing rancidity during storage. One of the advantages of naked oats is that potentially the dehulling step could be skipped, however, it is necessary to determine if the absence of kilning would create issues with rancidity development during storage. My thesis research project is supported by USDA NIFA Organic Research and Extension Initiative (OREI) and aims at evaluating the extent of rancidity development in naked oat genotypes during storage.

Grain samples from seven naked oat genotypes (Streaker, Buff, Paul, Fuego, SD120622NO, SD160816NO, and ND040341) produced under organic management in 2021 and stored at room temperature following harvest, were used for the evaluation of rancidity development. Multiple tests were performed at one, six, nine, and twelve months after harvest to monitor rancidity development. Hydrolytic rancidity was estimated by measuring free fatty acid content while oxidative rancidity was estimated by determining peroxide value, hexanal content, and oxidative stability index. In addition, the lipid profile of the oat samples was determined to identify and monitor the content of each lipid components especially triglycerides and unsaturated fatty acid, the two major substrates for hydrolysis and oxidation respectively. Finally, total phenolics and antioxidant activity of each oat samples were measured. Oats have antioxidants and polyphenols compounds which are fundamental constituents that act against oxidation and thus can potentially increase the storability of the grain.

Free fatty acid content significantly increased at nine and twelve months after harvest for all genotypes, indicating the occurrence of lipid hydrolysis in the grain samples. Hexanal content and oxidative stability index also increased at nine and twelve months for some of the genotypes, revealing some lipid oxidation. Genotypes were significantly different for all tests (Total Fat, free fatty acid, peroxide value, hexanal, total phenolics, antioxidant activity, and oxidative stability index) performed, suggesting that the extent of lipid hydrolysis and oxidation differed among the genotypes evaluated however all constituents remained under acceptable limit after one year of storage at room temperature suggesting that the extent of rancidity development in the samples was low.



Total Phenolics Testing

Organic field trial of naked oats, Madison, SD

The project is currently in its second year where the same analysis will be repeated on organic naked oat samples produced in 2022.

I would like to convey my gratitude to OCIA for aiding me with the support via the 2022 OCIA Research & Education Graduate Scholarship and for providing this opportunity to highlight my research work and upcoming plans. I would also like to thank Charlie Johnson from Madison, SD, for his cordial assistance with our organic naked oat trial. I am honored with this recognition, and I would like to thank all the committee members for their patient review and encouragement.