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DETERMINING THE SUITABILITY OF NEW ZEALAND EXTRA VIRGIN OLIVE OIL FOR FRYING AND COOKING

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Extra virgin olive oils (EVOO) are extracted solely by mechanical means from olives picked at the optimum time from a healthy tree (*Olea europaea L.*), which retains naturally present phenolic compounds and high content of monounsaturated fatty acid (MUFA) which provide better oxidative stability. However, as the relatively poor quality imported EVOOs produce smoke during high heat processes, the use of EVOO for cooking and frying is thought to be not suitable and perceived as an indication of negative health effects to the consumers. The aim of this project was to show whether high quality, fresh NZ EVOO is ideal for frying and cooking.

EXPERIMENTAL METHODS

Three olive oil samples were from New Zealand and two samples were imported.

Oxidative stability index (OSI)

The oxidative stability of oil samples were characterised by induction time. Induction time of the sample was obtained using a Rancimat, which provided accelerated oxidation conditions[1]. Samples were heated up to 110°C with the air flow of 20L/hr.

Total Phenolic assay

Folin-Ciocalteu reagent was added to extracted phenolic components and incubated for 90 minutes for reaction to occur. The concentration of total phenolics was quantified through the colorimetric assay[2] by measuring the absorbance at 720nm.

Simulated frying

Oil samples was heated at 180^0 for 10 hours. P-anisidine and total polar compounds (%) were measured every 2 hours.

- P-Anisidine

P-Anisidine value was measured using official method AOCS Cd18-90[3].

- Total polar compound (TPC%)

Total polar compound was measured using a Testo 270[4] (Figure 1).

Figure 1. Testo 270 [4]

RESULTS AND DISCUSSION

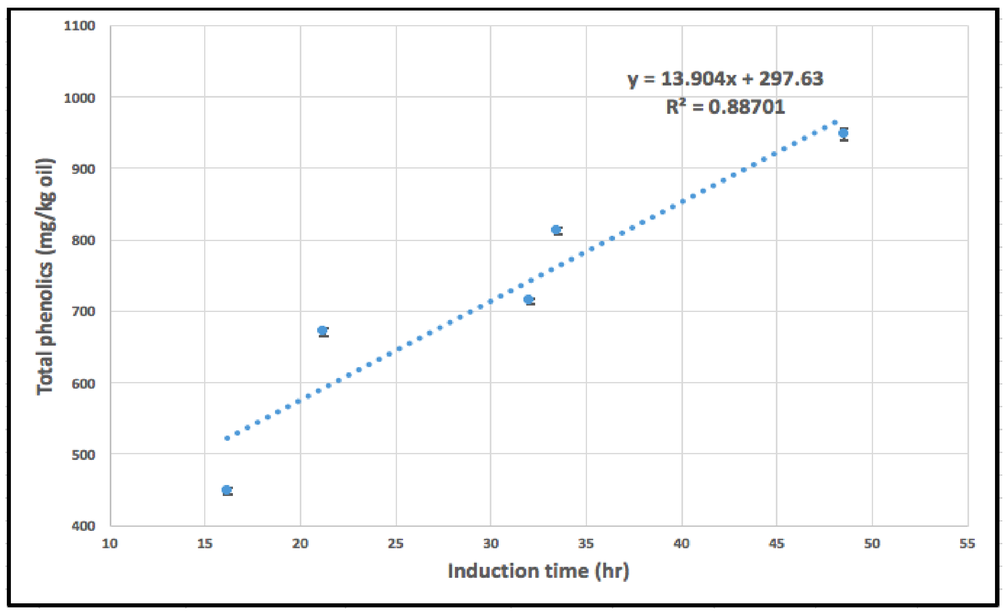

Figure 2. Correlations between total phenolic with the induction time in EVOO samples from New Zealand, Australia and imported. The values are the means of triplicate Rancimat measurements and duplicates of total phenolic content.

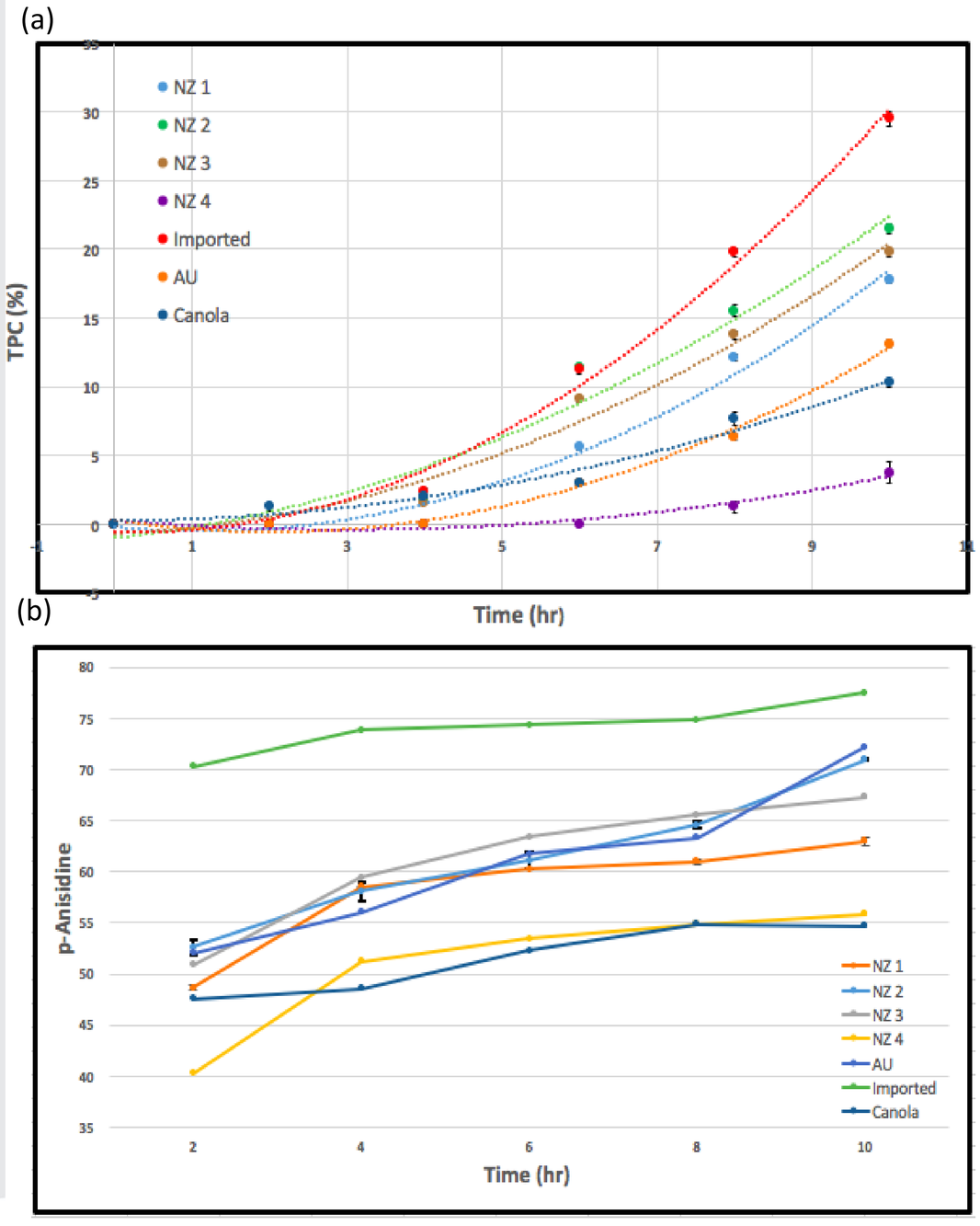

Figure 3. Change in TPC (%) (a) and p-Anisidine value (b) different frying time (hr.) The values are means of triplicate TPC (%) and p-anisidine measurements and error bars indicate standard error of the measurements.

Correlation between induction time and total phenolic concentration

- Oils containing higher concentrations of total phenolics showed longer induction time indicating better oxidative stability as shown in Figure 2.
- The strong correlation suggests that the radical scavenging activity of phenolic compounds protects oil under thermal stress, by donating hydrogen to reactive oxygen in the termination stage of oxidation, which breaks the cycle of new radical generation [5].

Change in TPC (%) over 10 hour frying time

- TPC increased as the frying time increased as shown in Figure 3(a).
- TPC of imported EVOO was 29.50%, which have exceeded the maximum TPC limit of 27%[6].
- TPC of NZ EVOO samples after 10 hours of frying ranged from 3.80% to 19.80%, indicating relatively better thermal stability of NZ EVOOs as compared to imported EVOO.

Change in p-Anisidine value over 10 hour frying time

- Initially, p-Anisidine increased at the faster rate for NZ EVOOs as compared to imported EVOO, due to oleic and linoleic acid present in high amount in NZ EVOOs, the main types of unsaturated fatty acids being oxidized[6].
- However, the highest p-Anisidine value was obtained from imported EVOO after 10 hours of frying (Figure 3 (b)).

CONCLUSION

The higher amount of total phenolics present in the oil provides better oxidative stability. NZ EVOOs are relatively more stable under frying condition as compared to imported EVOOs. Therefore, it is recommended to use NZ EVOOs for frying and cooking purposes.

ACKNOWLEDGEMENT

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REFERENCES

[1] Metrohm. (2018). 892 Professional Rancimat. In Metrohm (Ed.), *Metrohm*. [2] Singleton, V. L., Orthofer, R., & Lamuela-Raventos, R. M. (1998). Anlaysis of total phenols and ther oxidation substates and antioxidant by means of folin-ciocalteu reagents. *Methods in Methodology, 299*, 152-178. [3] AOCS. (1997). Cd 18-90 p-Anisidine Value. In *Official methods and recommended practices of the AOCS* (5th ed.). Champaign, Illinois: American oil Chemists' Society. [4] Testo. (2010). Testo 270 Deep-frying oil tester instruction manual. Testo (Asia) Ltd. In *Testo*. Shatin, Hongkong. [5] Pereira, D. M., Valentao, P., Pereira, J. A., & Andrade, P. B. (2009). Phenolics: From chemistry to Biology. *Molecules, 14*, 2202-2211. [6] Farhoosh, R., Khodaparast, M. H. H., Sharif, A., & Rafiee, S. A. (2013). Effect of initial quality and compositional parameters on total polar compounds formation during continuous heating of olive oil. *Department of Food Science and Technology, 15*, 527-535. [6] Lee, C. Y., Zhou, B., & Bansal, G. (2001). Determination of the Aldehyde Levels in Frying Oil Using p-Anisidine Test. *Journal of the American Oil Chemists' Society, 76*, 945-947.