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## Determination of the quality and stability of coconut oil extracted by a modified extraction process

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The most popular edible oil used by Sri Lankans from ancient days in the preparation of meals and in Ayurvedic medicines for both internal and external applications is coconut oil obtained by expelling oil from coconut kernels dried in a kiln, known as copra. A number of reviews are available for different types of extraction and processing methods for the preparation of coconut oil, such as dry processing, wet processing, enzymatic process, solvent extraction etc.

Before eighties coconut oil was used in Europe and USA for frying foods without apparent medical complaints. In early eighties, Centre for Science in the Public Interest of USA (CSPI) launched a campaign to discourage the use of all saturated vegetable oils including coconut oil, claiming that all saturated oils are unhealthy. Hence, even doctors, dieticians and health professionals were in ambiguity as to whether coconut oil is safe to be prescribed as a healthy food. However, even very early reports indicate that short and medium chain fatty acids such as lauric acid present in coconut oil are healthier than their long chain counterparts. Recent studies also indicate that virgin coconut oil and some other types of coconut oil have beneficial effects on lipid parameters. Due to these recent research findings, coconut oil is gaining popularity again in the local as well as foreign markets.

However, the nutritional quality of coconut oil heavily depends on method of extraction of coconut oil. Hence, there is a need for the doctors and dieticians to identify harmful chemical components present in edible oils commonly available in Sri Lankan markets and to look for modified extraction methods to improve the quality of coconut oil.

Most of the white coconut oils available in the market having SLS mark, are either produced by traditional method or some of them are further refined by chemical means. A reputed edible oil manufacturing company in Sri Lanka recently gave publicity in news papers to a new dehumidifying device they developed to dry coconut kernels by maintaining the temperature below 40 °C to produce physically extracted white oil. Further, they refine this oil by bleaching with 0.5% of activated bleaching earth and deodorizing the oil at the

temperature of 180 °C, which is a much lower temperature than the boiling point of coconut oil, under the vacuum of less than 0.5 mmHg. No chemicals involve in this process for refining. By using this relatively low temperature and high vacuum, harmful peroxide (PV), free fatty acid (FFA) and other impurities can easily be removed. Due to the extremely high thermal stability of coconut oil, the damage to the structure of the lauric acid ester and the possibility to produce radicals within the process are negligible at the used temperature. Further, they claim that the white coconut oil extracted by this Modified Extraction Method (MWCO) is devoid of tar contamination caused by smoke drying copra, or of dangerous fungal-derived aflatoxins. Due to the dehumidifying process used in this modified extraction method the possibility of (Poly Aromatic Hydrocarbons) PAH contamination of MWCO is also minimum.

To verify these claims by the producers we analyzed quality parameters of the coconut oil produced by the modified method. The samples directly taken from the online process and after three months from the production were compared and the stability of coconut oil was also tested under frying conditions. There are many number of standards available in the world for the determination of quality of coconut oil, such as Ceylon –Standards ; CS 32:1968, Indian –Standard; IS : 6220-1971 and Codex Standards for coconut oil.

According to the results obtained, there is a no significant deviation of the results of the online analyses of samples and the variation between the quality parameters of online samples and three months old samples was extremely low. Analysis of the results of coconut oils made by the modified process at low temperature and high vacuum, suggests that MWCO may be far more health safe compared to white oils available in the market. Hence coconut oil manufactured through this modified extraction method is very much safe for human consumption.

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## Comparative Chemical Analysis of Composition of Edible Oils, Particularly Coconut oil, Available in Sri Lankan Market

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The most popular edible oil used by Sri Lankans from ancient days in the preparation of meals and in Ayurvedic medicines for both internal and external applications is coconut oil obtained by expelling oil from coconut kernels dried in a kiln, known as copra.

The doctors and dieticians and health professionals were in ambiguity as to whether coconut oil is safe or harmful to health. Most of the doctors in Sri Lanka and in Asia did not recommend heart patients to have even a little coconut oil in their meals. Hence, there was a need for the doctors and dieticians to identify harmful chemical components present in edible oils commonly available in Sri Lankan markets for the benefit of the people.

A reputed edible oil manufacturing company in Sri Lanka recently gave publicity in news papers to a new dehumidifying devise they developed to dry coconut kernels by maintaining the temperature below 40 °C to produce physically extracted white oil. They claimed that harmful peroxide (PV), free fatty acid (FFA) and Poly

Aromatic Hydrocarbon (PAH) values of this oil are extremely low compared to white coconut oil available in the market, mostly with SLS mark, produced by the well known traditional process starting from copra. Some of which are further refined by chemical means to bleach the yellow colour and also to eliminate the odour. Further, they claimed that the oil produced by this physical process is devoid of tar contamination caused by smoke drying copra and of dangerous fungal-derived aflatoxins.

This research program was carried out to analyze the presence of peroxides, free fatty acid levels and chemical residues in edible oils in the market made by both the physical refining process and by the traditional RBD process; some of which are even chemically refined, and sold in super markets in Sri Lanka with the SLS mark. Further, the levels of those parameters in coconut oil made available to village consumers in contaminated steel drums, which are most of the time kept in the hot sun in open shop yards, were also subjected to this survey.

Table 01: Analysis results of various coconut oil samples collected from local market

Test Unit	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F	Sample G	Sample H	Sample I	Sample J
Aflatoxin B1	1.2	Not Detected	1.7	Not Detected	1.4	Not Detected	Not Detected	1.0	Not Detected	1.1
Aflatoxin B2	Not Detected	Not Detected	Not Detected	Not Detected	1.9	Not Detected	Not Detected	Not Detected	1.0	1.4
Aflatoxin G1	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Aflatoxin G2	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected



According to the results obtained in this project, there is a definite variation in the FFA values, PV values, pH and aflatoxin values in coconut oil samples selected for testing. Further the results indicated that, in the case of samples of coconut oils made by the physical process at low temperature, values obtained for the above parameters for the oil samples were very low. The quality of coconut oil available in village shops in contaminated metal drums is far inferior to the quality of even RBD oils and hence they carry a greater health risk to consumers. Our results also showed the presence of a fair amount of tar and chemical residues in RBD oils, which were not present in physically extracted oils.

Further, it was observed from these results that the samples which are claimed to be made by the physical refining process are health wise low risky than the RBD oils.

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