



The levels of heavy metals such as arsenic, lead, copper, tin, zinc, mercury and cadmium in edible oils and fats have been monitored because of their toxicity. The maximum permissible limit of these metals in edible oils and fats are stated in the Malaysian Food Regulations and Codex.

THE IMPORTANCE OF DETECTION OF ARSENIC IN EDIBLE OILS

Drinking of water containing arsenic above its permissible limit over a long period results in various health effects including skin problems, skin cancer, cancers of the bladder, kidney and lung, and diseases of blood vessels. Due to the toxicity of arsenic, its content in edible oils and fats has to be monitored.

The maximum permissible limit of arsenic in edible oils and fats is 0.1 ppm as stated in both Codex and Malaysian Food Act, 1983.

ARSENIC TESTING SERVICES

The current method of detecting arsenic in vegetable oils is an EPA (Environmental Protection Agency, USA) method 3052 (1996), microwave assisted acid digestion of siliceous and organically based matrices, analysis of heavy metals including arsenic in various matrices including oil. However, this method employs microwave acid digestion sample preparation for the extraction of arsenic from the matrix. Then the arsenic is detected by either flame AAS-hydride generation, graphite furnace AAS (*Figure 1*) or ICP-MS. This method requires an additional microwave digester and a longer time of analysis - as the sample needs to

be pre-treated prior to detection by AAS. In order to increase the analysis productivity and to reduce the equipment cost, there is a need to simplify this EPA method.

A new method of detecting arsenic in vegetable oils has been developed with a direct injection of sample into AAS without sample pre-treatment. This method has several advantages as follows:

- simple;
- fast; and
- lower cost of equipment.

MPOB wishes to offer the service of detecting arsenic in vegetable oils using the new developed method to the industry at the cost of RM 65 sample.

Companies needing this service are requested to deliver their samples (about 25 g) with a written instruction stating the test required. All samples received will be checked to ensure that they are in good condition for the analysis. The results of analysis in the form of certificate of analysis will be ready in three days.

The invoice will be sent together with the certificate of analysis. The company can use the results of analysis to monitor the level of arsenic in their oil, one of quality parameters as stated in the Malaysian Food Regulations (2000).

PRINCIPLE OF THE TEST

Sample is dissolved in methyl iso-butyl ketone, then it is injected into a graphite furnace atomic absorption spectrometer (AAS) with electrode-less discharge arsenic lamp. A matrix



modifier has to be used and should be injected first prior to sample injection.

Recoveries at 0.1 ppm arsenic (the maximum permissible limit of arsenic in vegetable oils) in vegetable oils such as refined, bleached, deodorized palm oil (RBDPO), refined, bleached,

deodorized palm kernel oil (RBDPKO), crude palm oil (CPO), crude palm kernel oil (CPKO), corn, soyabean, sunflower, olive and coconut oils are good ranged from 82.5% to 113.6%. Recoveries at 0.2 ppm arsenic in these oils are also good, from 90.0% to 120.0% (Table 1).



Figure 1. Graphite furnace atomic absorption spectrometer for the detection of arsenic in edible oils.

TABLE 1. RECOVERY OF ARSENIC AT 0.1 ppm AND 0.2 ppm IN EDIBLE OILS

Sample	Recovery (%)	
	0.1 ppm	0.2 ppm
RBDPO	94.4	105.0
RBDPKO	97.7	95.0
CPO	104.7	105.0
CPKO	113.5	120.0
Refined corn oil	94.7	90.0
Refined soyabean oil	82.5	90.0
Refined sunflower oil	113.6	90.0
Refined coconut oil	102.6	115.0
Refined olive oil	96.6	90.0

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