DETERMINATION OF 3-MCPD ESTERS IN AN OIL MATRIX

RAZNIM ARNI ABD RAZAK; AINIE KUNTOM and RABEAH HUSSEIN

586

MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2011 MPOB TS No. 105

This test method describes a procedure using a gas chromatographic mass selective detector (GC-MSD) for the determination of 3-monochloropropane-1,2-diol (3-MCPD) esters in an oil matrix.

The 3-monochloropropane-1,2-diol (3-MCPD) is one of the food-processing contaminants under the chloropropanols group (*Figure 1*). Zelinkova *et al.* (2006) showed that the formation of 3-MCPD esters in oils is linked to the preliminary heat treatment of oilseeds and to the process of oil refining.

For the last few years, researchers have studied the formation of 3-MCPD esters in refined oils/fats; however, no real hypothesis has been developed on the ester formation. Detection of 3-MCPD esters was originally carried out using the German Fat Science Society (DGF) apparent method. Since then, a number of methods have been developed, such as methods by the Federal German Institute for Risk Assessment (BfR) and Archer Daniels Midland Company (ADM). Currently, no standard method has been identified for the detection of esters in an oil matrix. MPOB has tested the BfR Method 008 and found it to be suitable for determining 3-MCPD ester content in vegetable oils.

Source: ILSI Europe Report Series, 2009.

Figure 1. Chemical structure of 3-MCPD and its corresponding fatty acid ester.

PRINCIPLE

The BfR Method 008 is based on the indirect determination of 3-MCPD esters in refined edible oils/fats. Cleavage of the ester bond is performed by acid hydrolysis, and fatty acids and free 3-MCPD are formed. Sample derivatisation is carried out using phenylboronic acid (PBA), and quantification is by means of gas chromatography with a mass selective detector (GC-MSD) (*Figure 2*).

Figure 2. Gas chromatography with a mass selective detector (GC-MSD) instrumentation system.

RESULTS

Method verification was carried out by determining the linearity of and percentage recovery by the method. The results showed that R^2 for the method was 0.999 (*Figure 3*), whilst the recovery was in the range of 85%-110%. The standard deviation (SD) was < 10%. The limit of detection (LOD) was 0.25 mg kg^{-1}, while the limit of quantification (LOQ) was 0.5 mg kg^{-1}.

SERVICES OFFERED

- Transfer of the method of analysis (plus one-week of training).
- Analysis of the samples.

ISSN 1511-7871
9 771511 787001

Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia
P. O. Box 10620, 50720 Kuala Lumpur, Malaysia. *Tel:* 03-8769 4400 *Fax:* 03-8925 9446 *Website:* www.mpob.gov.my

MPOB

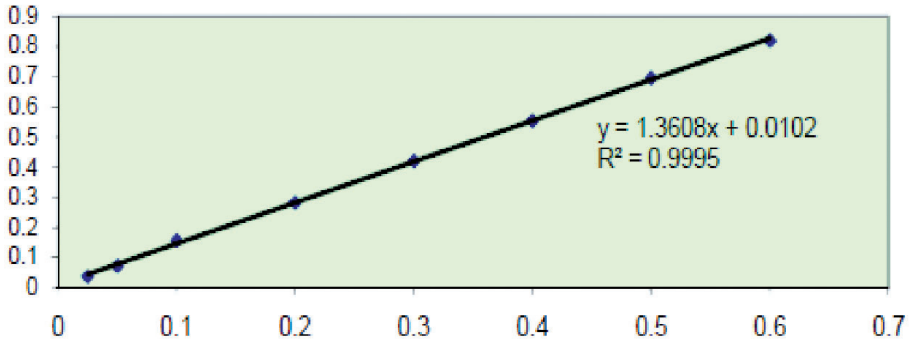

Figure 3. Calibration curve of the area ratio of 3-MCPD and d_5-3-MCPD against the concentration.

COST

Depends on the type of services required.

CLIENTS

Refiners and millers in Peninsular Malaysia, Sabah and Sarawak.

CONCLUSION

The GC-MSD instrument can be maintained easily; hence, this method can be applied in routine analyses.

REFERENCES

ZELINKOVÁ, Z; SVEJKOVSKÁ, B; VELÍŠEK, J and DOLEŽAL, M (2006). Fatty acid esters of 3-chloropropane-1,2 diol in edible oils, *Food Addit. Contam., 23 (12)*: 1290-1298.

ILSI EUROPE REPORT SERIES (2009). *3-MCPD esters in food products*. February 2009. International Life Sciences Institute, Brussels, Belgium.

For more information, kindly contact:

Director-General
MPOB
P. O. Box 10620
50720 Kuala Lumpur, Malaysia.
Tel: 03-8769 4400
Fax: 03-8925 9446
www.mpob.gov.my