

BRIEFING DOCUMENT

Tropane alkaloids

Reviewed September 2021

Summary

Tropane alkaloids (TAs) are chemicals produced naturally by plants of several plant families, which if ingested in high enough quantities, can be poisonous. There have been at least two cases of food contamination in Europe with these alkaloids but the toxicity and occurrence of TAs in food requires more research. In 2016, EFSA commissioned a pan-European survey, for which UK Flour Millers member companies provided samples of wholemeal flour. Of the 17 samples submitted by UK Flour Millers member companies, none contained detectable amounts of TAs. A worldwide review of tropane alkaloid contamination also found no incidents for wheat flours. Tropane alkaloid contamination in wheat flour is unlikely as the plant species responsible do not grow in UK agricultural fields.

Background

Tropane alkaloids are a group of chemicals that occur naturally in a number of plant families such as Erythroxylaceae (including coca) and Solanaceae (including mandrake, henbane, deadly nightshade, Datura, potato, and tomato), among others. The alkaloids are often extracted and used as medicines or antidotes. Over 200 TAs have been identified but the most common are hyoscyamine, scopolamine and atropine. The alkaloid concentration in each plant varies depending on genetic and environmental factors. Analysis of TA levels in food is done by using mass spectrometry.

Tropane alkaloid poisoning leads to disruption of neurotransmission resulting in dryness of the digestive and respiratory tracts, constipation, pupil dilation, hallucinations, changes in heart rate, central nervous system effects and in severe cases death. Following a 2012 tropane alkaloid contamination incident in France there has been increased interest from the statutory authorities and some flour customers have also sought more information.

Data on TA toxicity and occurrence in food and feed are currently lacking. In 2017, the European Food Safety Authority (EFSA) conducted a risk assessment on the two most common TAs and proposed an acute reference dose of 0.016µg/kg body weight. In addition they also discovered that young children (toddlers) may be at risk of exceeding the acute reference dose.

Tropane alkaloid presence

TAs can be present in food when toxic plant materials are accidentally mixed with crops during harvest or processing. This happened in France when Datura flower buds were mixed in with canned green beans. A species of Datura called 'Jimson weed' is widely distributed in temperate and tropical regions and its seeds have been found in linseed, soybean, millet, sunflower and buckwheat. However, it is unlikely that milling wheat would be contaminated with TA-containing plant material since it is rare to find any of these species growing within agricultural fields in the UK. Additionally, analysis of wheat flours worldwide have not detected TAs, indicating it is unlikely to find TA-containing plants in wheat fields.

Research

EFSA commissioned a study to examine the occurrence of these materials in foods and a contract was awarded to a consortium of four EU research institutes including FERA in the UK. The purpose of the call was to gather occurrence data of TAs in foods (those most likely to be contaminated), including wheat, buckwheat, barley, rye, oats, maize, soya, millet, linseed, sunflower, berries and green beans from different geographic regions in Europe. UK Flour Millers member companies provided samples of wholemeal flour for this study, and the results were published in November 2016.

Seventeen samples of wholemeal flour were submitted by UK Flour Millers for analysis of the presence of twenty-four TAs. No samples contained detectable amounts of TAs.

A Fera review of published tropane alkaloid contamination incidents worldwide (2015-16) reported that millet, corn and sorghum flours were most likely to be contaminated with tropane alkaloids. There were no contamination incidents for wheat or rye flours.

Future work

UK Flour Millers will continue to monitor relevant developments and inform members.