



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 31642-2016

Replacing NY/T 1573-2007; NY/T 2211-2012; SN/T 2910.1-2011

**National Food Safety Standard -- Determination of Irradiated
Foods -- Electron Spin Resonance Spectroscopy**

食品安全国家标准 辐照食品鉴定 电子自旋共振波谱法

(English Translation)

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Table of Contents

- Foreword
- 1 Scope
- 3 Instruments and equipment
- 4 Step, analysis
 - 4.1 Sample Preparation
 - 4.2 Spectrometer reference condition
- 5.2 Results found

Foreword

Instead of the standard NY/T 1573-2007 "irradiation bone-derived food animal identification -ESR method", NY/T 2211-2012 "containing Cellulose irradiated food identification electron spin resonance "and SN/T 2910.1-2011" outlet irradiated food testing - Part 1.

Electron spin resonance spectroscopy. " this standard NY/T 1573-2007, NY T 2211-2012 and SN/T 2910.1-2011 compared main changes/are as follows.

--- Added "electron spin resonance" and the scientific definition of "electron spin resonance spectroscopy," the;

--- optimized conditions of use "of electronic spin resonance spectrometer".

National Food Safety Standard Identification of irradiated food electron spin resonance spectroscopy

1 Scope

This standard specifies the bone containing foods and cellulose-containing foods are received identification method detects irradiation.

This standard applies Yu Fuzhao food containing cellulose and identification of food containing bone, involving products, including dried fruit, spices, fresh fruits and vegetables, cereal Bone-containing animal products thereof and the like.

Principle 2

When the foodstuff ionizing radiation, will produce a certain amount of free radicals. Freedom Ji Shijia certain external magnetic field, were excited electron spin Zhen. Detecting electron spin resonance spectrometer electron spin resonance, electron spin resonance spectroscopy and recording line. Produced after big food irradiation Most

short-lived free radicals, react with each other will quickly disappear by free radicals. Electron spin resonance dependence on the long-lived radical electronic Spin resonance spectrum analysis. Cellulose-containing radical diffusion difficulties and bone-containing foods generally have a longer life for the electronic Detecting spin resonance. When it is determined based on a typical asymmetrical signal (split peak) appears on the ESR spectra can be accepted as a food irradiation.

3 Instruments and equipment

3.1

electron spin resonance spectrometer (ESR spectrometer). comprising a magnet system, microwave system (microwave frequency 8750 MHz ~ 9650MHz), field modulation, and signal detection system, resonant cavity.

3.2

electron spin resonance sample tube (ESR sample tube). 4mm inner diameter quartz tube.

3.3

a vortex.

3.4

vacuum drying oven.

3.5

freeze dryer.

3.6

electric grinder.

3.7

Electronic balance. a sense of the amount of 1mg.

4.1.1 Animal food containing bone

Fascia completely removed meat and bone sample surface, to knock the bone into pieces, bone marrow is removed, if necessary, water or methanol - ether solution (4:1, volume ratio) washing, cleaning and clean so that the bones. After washing, the bone was placed in a vacuum oven dried (vacuum degree. 180Pa, frozen Temperature. -45 °C, drying time. 12h). The dried sample was pulverized to an average particle diameter of the bone about 1mm particles weighing 100mg, placed ESR sample tube to be tested.

4.1.2.1 Dry Foods

Extraction with a suitable tool from the rind 50mg ~ 100mg sample was charged ESR sample tube to be tested.

4.1.2.2 Spice food

A sample 150mg ~ 200mg, ESR sample tube was placed and dried, the test.

4.1.2.3 Berry fruits

Take appropriate berry a 50mL plastic tubes, vortex mix. The sample was mixed into the large beaker, 500mL go Deionized water, stirring and blending glass rod. After the natural grain precipitation to remove excess water and pulp. Repeat the above steps to sufficiently remove residual fruit Pulp. The grain is spread on a filter paper to absorb excess water off, and then placed into a freeze dryer or a vacuum oven (40 °C) and dried 4h. Weigh 150mg ~ 200mg Full Grain mounted on ESR sample tube to be tested.

Note: The berries should be preserved grain, grinding and other operations will weaken the electromagnetic signal and may change the shape of the ESR spectrum.

4.2.1 Animal food containing bone

Microwave frequency. 9.5GHz, power 5mW ~ 12.5mW.

Field. Center field 348mT, sweep width 5mT ~ 20mT.

Signal channels. modulation frequency 50kHz ~ 100kHz, modulation amplitude 0.2mT ~ 0.4mT, the time constant of 50ms ~ 200ms, sweep 71.448 --- conversion coefficient;

v --- microwave frequency in gigahertz (GHz);

--- magnetic induction B, in units of milli-tesla (mT).

Results retention to three decimal places.

Calculated g values need to measure the frequency and field location A.2 strong arrows in FIG.

5.1.2 Cellulose-containing foods

Center signal C (see Figure A.3) appear only ESR spectrum of the non-irradiated sample; in the ESR spectrum of the irradiated samples, the center signal C intensity is increased, and occurs in both the left and right split peak signal C1 and C C2, the distance between the two peaks $6.05\text{mT} \pm 0.05\text{mT}$ (See Figure A.4).

5.2.1 Animal food containing bone

When $g_1 = 2.002 \pm 0.001$, when $g_2 = 1.998 \pm 0.001$, samples were subjected to irradiation treatment can be determined (as shown in FIG A.2, g_1 and g_2 min Do not appear on the asymmetrical signal indicative of ESR spectrum).

When $g = 2.005 \pm 0.001$, can not determine whether the sample after the irradiation treatment.

5.2.2 Cellulose-containing foods

When the left and right both sides of the center signal C $6.05\text{mT} \pm 0.05\text{mT}$ split peak distance can be determined through a sample irradiation treatment;

When the left and right sides of the center signal C peak no split, it is impossible to determine whether the samples after irradiation.

Appendix A

The non-irradiated and irradiated samples ESR spectra of FIG.

A.1 unirradiated ESR spectra of FIG chops ESR spectra of non-irradiated pork shown in Figure A.1.

FIG A.1 ESR spectrum of FIG unirradiated pork chops

A.2 ESR spectra of irradiated pork 1.0kGy FIG.

ESR spectra of irradiated pork chops 1.0kGy shown in Figure A.2.

Figure A.2 ESR spectra of irradiated pork 1.0kGy FIG.

A.3 non-irradiated happy husk of ESR spectrogram Happy husk unirradiated ESR spectra is shown in Figure A.3.

Figure A.3 non-irradiated happy husk of ESR spectrogram

A.4 irradiation 4.0kGy happy Nutshell ESR spectroscopy map Irradiation happy Nutshell ESR spectroscopy map 4.0kGy in Figure A.4.

Description.

C1 --- left peak;

C --- center signal;

C2 --- the right peak.

Figure A.4 irradiation 4.0kGy happy Nutshell ESR spectroscopy map