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**Inspection of Grain and Oils - Determination of Moisture
Content of Grain - Waterlogged Suspend Method**

粮油检验 粮食水分测定 水浸悬浮法

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Inspection of Grain and Oils - Determination of Moisture Content of Grain - Waterlogged Suspend Method

1 Scope

This Standard specifies the principle, instruments and equipment, operation method and repeatability requirements of the determination of moisture content of grain with the waterlogged suspend method.

This Standard is applicable to the quick determination of grain moisture, especially to the determination of moisture in high-moisture and frozen grains.

2 Normative References

The clauses of the following documents become clauses of this Standard through the normative references in this Standard. In terms of references with a specified date, all subsequent amendments (excluding errata content) or revisions do not apply to this Standard. However, the various parties that reach an agreement in accordance with this Standard are encouraged to explore whether the latest versions of these documents are applicable. In terms of references without a date, the latest versions apply to this Standard.

GB 5491 Inspection of Grain and Oilseeds - Methods for Sampling and Sample Reduction

LS/T 3705 Technical Requirements and Test Method for Quick Moisture Content Tester of Waterlogged Suspend

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 waterlogging suspend method

Waterlogging suspend method refers to the method, in which, the object to be determined is completely immersed in water and suspended for weighing.

4 Principle

Weigh-take a certain amount of pulverized specimen into a constant-mass measuring vessel, fill it with water to fully infiltrate the sample; completely immerse an airtight measuring vessel in water, and weigh its mass. In accordance with the principle of buoyancy method, the obtained mass is the dry matter of the sample and the mass of the measuring vessel, and the moisture

content of the specimen can be obtained through calculation.

5 Instruments and Equipment

5.1 Quick Moisture Content Tester of Waterlogged Suspend

The schematic diagram of the instrument structure and the master drawings of the main components are shown in Appendix A. The instrument shall comply with the requirements of LS/T 3705 and be accompanied by the following parts:

5.1.1 Water tanks: hold clear water (the water quality is clean fresh water), and the water quality and temperature in each tank shall remain consistent.

---Operating tank: used for soaking the measuring vessel and water filling, etc. A transparent plastic tank with a length of 240 mm, a width of 170 mm and a height of 150 mm.

---Weighing tank: used for the suspended weighing of the measuring vessel. A transparent plastic tank with a diameter of 130 mm and a height of 150 mm.

5.1.2 Measuring vessel: an aluminum alloy container with a loading inlet (with a diameter of 21 mm) at the top and a water injection port with a one-way valve, equipped with a sealing cover for the loading inlet, an inner diameter of 32 mm, an inner height of 45 mm and a wall thickness of 2 mm.

5.1.3 Sample weighing dish: open on one side, and capable of holding about 10 g of specimen.

5.1.4 Stirring rod: made of stainless steel, with a diameter of 2 mm and a length of about 85 mm.

5.1.5 Water injector: 20 mL medical syringe.

5.1.6 Mortar: capable of holding about 100 g of sample.

5.2 Hammer-type Electric Pulverizer

Attached with round-hole sieves with diameters of 1.5 mm and 2.5 mm. During operation, the temperature of the pulverizer shall not be greater than 25 °C.

6 Operation Method

6.1 Instrument Preparation

In accordance with the instruction manual of the moisture content tester, prepare the instrument.

Place the moisture content tester (5.1) on a stable operating table, and fill the two water tanks (5.1.1) with clean water (the water surface reaches the water level). Put the measuring vessel

(5.1.2) and the sealing cover of the measuring vessel into the operating water tank for soaking; put the weighing water tank under the lower scale hook of the moisture content tester (see Figure A.1 of Appendix A).

Use the water injection hose to inject clean water with the same temperature as the water in the water tank into the water storage tank of the moisture content tester; observe the water level mark, make the water level reach the marked line, then, remove the water injection hose.

Adjust the weighing device to horizontal and turn on the power. Use the standard weight provided with the instrument and in accordance with the instruction manual of the instrument, calibrate the weighing device. In accordance with the type of the sample to be tested, select the measurement mode of the corresponding grain type on the operation panel of the host machine.

If the moisture content tester is not used for a long time or continuously used for more than 100 times, it shall be calibrated in accordance with LS/T 3705.

6.2 Constant-mass Measuring vessel

6.2.1 Use the water injection suppression clamp to clamp the water injection port of the soaked measuring vessel, press the “water filling” key on the instrument panel to suppress once, so as to discharge the air in the water injection port of the measuring vessel.

6.2.2 In the operating tank, fill the measuring vessel with clean water (there shall be no air bubbles), then, use a sealing cover to properly seal the measuring vessel. Use the water injection pressure clamp to clamp the water injection port of the measuring vessel, press the “water filling” key on the instrument panel to suppress once.

6.2.3 Loosen the water injection suppression clamp, remove the measuring vessel, hang the water-filled measuring vessel on the lower scale hook at the bottom of the weighing device, suspend it in the weighing tank for weighing; record the stable weighing data displayed by the weighing device. Repeat the operation of 6.2.1 ~ 6.2.3, until the mass difference between the two weighing before and after is not greater than 3 mg, i.e., the constant mass is achieved. Store a larger data in the constant-mass measuring vessel interference of the moisture content tester as the constant-mass data (refer to the instruction manual of the moisture content tester) and record it as m_1 .

6.2.4 During the determination, the difference between the water temperature and the ambient temperature of the laboratory shall not exceed 3 °C. When the difference between the ambient temperature and the water temperature exceeds 3 °C, operate in accordance with 6.2.1 ~ 6.2.3 again.

6.3 Specimen Preparation

6.3.1 Sampling and sample reduction

Comply with GB 5491.

6.4.5 On the instrument determination interface, if the estimated moisture content of the sample is not greater than 19%, select the “dry sample mode” for weighing; if the estimated moisture content of the sample is greater than 19%, select the “wet sample mode” for weighing.

6.4.6 Loosen the water injection suppression clamp, remove the measuring vessel, hang the measuring vessel on the lower scale hook at the bottom of the weighing device, suspend it in the weighing tank for weighing. After the displayed weighing indication becomes stable, store the data in the column of determination value on the determination interface (refer to the instruction manual of the moisture content tester) and record it as m_2 .

6.4.7 In accordance with the determination result, if the moisture content of the sample is consistent with the estimated content before the sample is pulverized (if the determination result is that the estimated moisture content is greater than 19%, 0.5 percentage points shall be subtracted), then, the determination result is valid; otherwise, in accordance with 6.3.2 ~ 6.4.6, re-operate it, and pay attention to select the correct sample pulverization mode and determination mode (i.e., dry sample mode or wet sample mode).

6.5 Result Calculation

The moisture content tester automatically calculates the moisture content determination result in accordance with the weighing data m , m_1 and m_2 , displays the moisture content of the sample being tested. Or the determination results can also be printed out and output by a printer, and the determination data can be saved. In accordance with Formula (1), calculate:

$$X = 100\% - \frac{k(m_2 - m_1)}{m} \times 100\% \quad \dots\dots\dots (1)$$

Where,

X ---the moisture content (mass fraction) of the sample;

m ---the sample mass, expressed in (g);

m_1 ---the mass of the water injection measuring vessel in water, expressed in (g);

m_2 ---the mass of the water injection measuring vessel and the dry matter of the sample in water, expressed in (g);

k ---the conversion coefficient (2.8 for corn and wheat; 2.7 for unhusked rice and other grain varieties).

7 Repeatability

Under repeatability conditions, the same sample shall be subject to parallel determination twice, and the absolute difference between the two determination results shall not be greater than 0.2%. Take the arithmetic mean of the two determination results as the moisture content of the specimen.

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