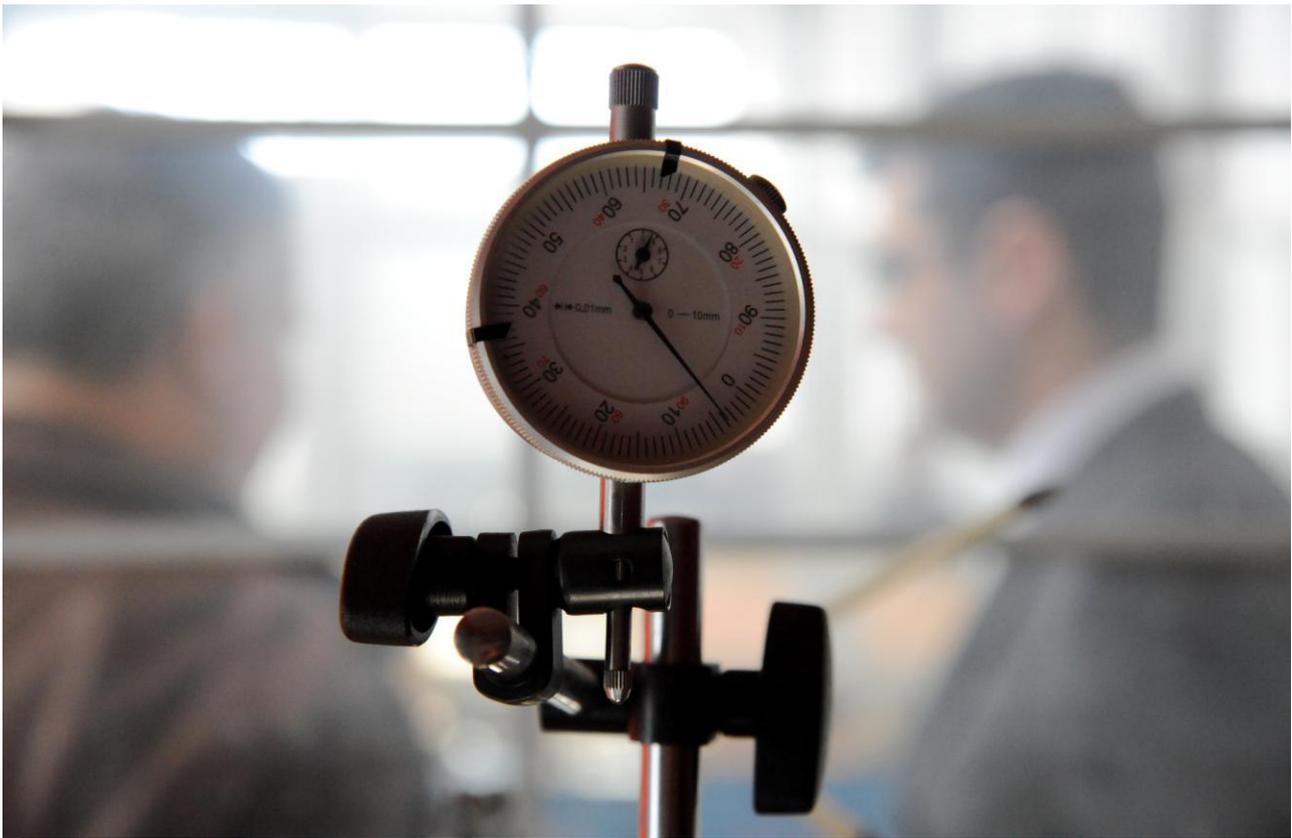


Technical Inputs



National Standard of People's Republic of China

GB5497-85

Inspection of grain and oilseeds

Methods for determination of moisture content

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GB 5497-85

Inspection of grain and oilseeds

Methods for determination of moisture content

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The standard is applicable to determination of moisture content in commodity grain and oilseeds.

1. 105°C burning constant weight method

1.1 Apparatus

- 1.1.1 Electric thermostatic box;
- 1.1.2 Analytical balance: precision is 0.001 g;
- 1.1.3 Electric or manual grinder used in laboratory;
- 1.1.4 Sieve;
- 1.1.5 Desiccator with an allochroic silicagel (the allochroic silicagel could not be used if it turns red. It could be used after it is baked at the temperature between 130-140°C and turns into blue);
- 1.1.6 Aluminum box: diameter 4.5 cm, height 2.0 cm.

1.2 Test sample preparation

To choose some samples from the average samples, and prepare by the following methods:

List of sample preparation methods

Grain type	Quantity, g	Preparation methods
Granular unprocessed grain or processed grain	30~50	Remove big foreign matter and mineral substances, grinding fineness sieve through 1.5mm hole no less than 90%
Soybean	30~50	Remove big foreign matter and mineral substances, grinding fineness sieve through 2.0mm hole no less than 90%
Peanuts, etc.	About 50	Take clean kernels and use manual grinder or small knife to cut them into slices which are less than 0.5mm
Peanut, tea seed, seed of tung tree, seed of castor, shiny-leaved yellowhorn, etc.	About 100	Take clean kernels (seeds) and remove the shell, weight them separately to calculate the percentage of kernel and shell; grated the shell; cut the kernels into slices
Cotton seed, sunflower seed, etc.	About 30	Take clean seeds and cut them or crack them
Rapeseed, sesame, etc.	About 30	Remove the big foreign matter
Sweet potato slices	About 100	Take clean slices then grinding into the same size with granular grains
Sweet potato silk, sweet	About 100	Take clean silk, strip then grinding into the same size with granular grains

potato strip		
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1.3 Operation methods

- 1.3.1 Set temperature: put the mercury ball of the thermometer which is in the drying box 2.5 cm away from the drying net, set the temperature at $105 \pm 2^\circ\text{C}$.
- 1.3.2 Dry the aluminum box: take a clean aluminum box, put it on the drying net below the thermometer's mercury ball in the drying box. Heat the aluminum box for 30min to 1 hour then take it out. Put it into the desiccator and cool it down. Take it out and weigh it, reheat it for 30min. If the weight difference between two results is no more than 0.005 g, such weight shall be regarded as constant weight.
- 1.3.3 Weigh the sample: heat the aluminum box (W_0) to constant weight and put 3 g sample into the box. The samples of oilseeds which are in husk can be weighed by the proportion of kernels and shells, or the samples of kernels and shells can be weighed separately.
- 1.3.4 Dry the sample: put the aluminum cover under the bottom of the aluminum box. Put it on the drying net around the thermometer in the drying box, heat the aluminum box for 3 hours (90min for oilseeds) at 105°C and take it out of the drying box, put on the cover, let it cool down in the desiccator then weight it. Repeat the process in every 30min till the weight difference is less than 0.005 g between two results. If the second weight is heavier than the first one, then calculate the water content by the first weight (W_2).

1.4 Result calculation

The water content of grain and oilseed is calculated by formula (1):

$$\text{Water content (\%)} = \frac{W_1 - W_2}{W_1 - W_0} \times 100 \dots \dots \dots (1)$$

Where:

W_0 --- weight of aluminum box, g

W_1 --- sample before heating and weight of aluminum box, g

W_2 --- sample after heating and weight of aluminum box, g

If the water content of the kernels and shell of the oilseed in husk is determined separately, the water content of oilseeds in husk is calculated by formula (2):

$$\text{Water content (\%)} = M_1 \times A + M_2 \times (1 - A) \dots \dots \dots (2)$$

Where:

M_1 --- water percentage in kernels, %

M_2 --- water percentage in shells, %

A ---percentage of total kernels, %

If the acceptable difference between two test results is no more than 0.2%, the average of the two results should be regarded as the determination

result, which keeps 1 bit behind the decimal point. If other methods are taken to measure the water content, the difference between the two results should not be more than 0.5%.

2. Constant time and temperature drying method

2.1 Instrument and appliance: same with 1.1

2.2 Sample preparation: same with 1.2

2.3 Calculate the constant sample: quantitative samples are used in this method. Firstly, calculate the bottom area of the aluminum box. Then, calculate the quantity of samples by 0.126 g/square centimeter (bottom area \times 0.126). If aluminum box with diameter of 4.5 cm is used, the quantity of samples is 2 g; if aluminum box with diameter of 5.5 cm is used, the quantity of samples is 3 g.

2.4 Operation methods

Use the aluminum box which has already been heated to constant weight to calculate constant sample (precise to 0.001 g). After the temperature of the drying box reaches 135~145°C put the aluminum box with samples in it on the drying net around the thermometer in the drying box. Turn the temperature in the drying box to 130 \pm 2°C in 5min and start counting. After 40min, take the aluminum box out of the drying box and put it into the desiccator. Calculate its weight after it cools down.

2.5 Result calculation: same with 1.4

3. Tunnel drying box method

3.1 Apparatus

3.1.1 Tunnel drying box

3.1.2 Stopwatch

3.2 Sample preparation: same with 1.2.

3.3 Operation methods

3.3.1 Setting temperature: Level the instrument. Put the thermometer into the drying box and let the mercury ball be 1 cm away from the entry of the drying box, turn on power and set the temperature.

3.3.2 Weigh the sample in the drying box: Put three clean drying boxes into the drying room, put one more in after 10min. So, the first drying box will be pushed out of the tunnel. Put this drying box on the weighing pan and add a 10 g weight. Adjust the screws on the quadrant balance and make the pointer pointing at 0. Take off the weight in the drying box and put some samples in it to make the pointer pointing at 0 again. Then, level the sample in the drying box evenly and put it into the drying room. Close the left door and start timing.

3.3.3 Dry the sample: if the samples are heated at 160°C for 20min, put a drying box with sample in it into the drying room every 6min and 40s. If the samples are heated at 130°C for 30min, put a drying box

with samples in it into the drying room every 10min. When the fourth sample box is put in, the first sample box has already finished heating. Then, weigh the first box, observe the number to which the pointer points. The number is the water percentage measured.

The difference between the two test results shall be no more than 0.5%.

4. Twice drying method

If the moisture of grain is more than 18%, bean and sweet potato slices 14%, oil moisture 13%, twice drying method could be used.

4.1 First drying: weigh sample of complete kernel for 20 g (W_1 accurate to 0.001), put it into a drying box with diameter of 10 or 15 cm, and height of 2 cm and level the sample. Heat for 30~40min at 105°C for grain and at 70°C for bean and oilseeds. Take out the drying box, let it cool down to constant weight, the result will be the weight of first drying (W_1).

4.2 Second drying: sample preparation and operation methods are the same as 1.2 and 1.3.

4.3 Result calculation

Calculation of water content by twice drying method should follow the formula (3):

$$\text{Moisture content (\%)} = \frac{W \times W_2 - W_1 \times W_3}{W \times W_2} \times 100 \dots \dots \dots (3)$$

Where:

W =weight before first drying, g;

W_1 = weight after first drying, g;

W_2 = weight before second drying, g;

W_3 = weight after second drying, g.

The difference between two test results should be no more than 0.2%. The average of the two test data will be regarded as the test result, which keeps 1 bit behind the decimal point.

Additional information

The standard is proposed by Ministry of Business of the People's Republic of China¹.

The standard is drafted by Ministry of Business of the People's Republic of China Bureau of Grain Storage and Transportation.

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¹ Replaced by the present Ministry of Commerce of the People's Republic of China

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