GRAINS

HORSE BEAN, PEA, LUPINE, BUCKWHEAT, VETCH

water content determination

An important quality-related parameter of grains is their moisture. Too high water content in the grain results in unfavorable biochemical and microbiological changes that shorten its safe storage time. Too low water content in turn causes the grain to be more susceptible to damage while it is processed by the threshing unit, cleaned and transported. On the other hand the information on the grain moisture is a key parameter required for proper designing of the drying process. This process is energy-consuming so its optimization substantially reduces the grain growing costs. A quick analysis of the water content in grains is possible with the use of the validated method that involves the use of MA/R and MA/X2 moisture analyzers by Radwag.

The application note includes basic information for validation of the grains drying method with the use of MA/R and MA/X2 moisture analyzers series by Radwag Wagi Elektroniczne. The application note may be the basis for elaborating own drying method with special regard to distinctive features of the product in question.

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TERMS

ACCURACY of determining water / dry matter content is the difference between the result of the water / dry matter content received in the moisture analyzer method and the result of the water / dry matter content received while drying the same sample through a reference method.

PRECISION is a degree of compliance between independent results of the test, received in specific conditions. The measure of precision is a standard deviation from a series of several measurements.

REFERENCE METHOD

The reference method parameters are usually specified in standards or other discipline-specific documents as the so-called guides. If such documents are unavailable, the drying temperature that does not cause the sample to change colors is used. Such an approach applies also to such leguminous plants as horse bean, pea, lupine, buckwheat, vetch.

SAMPLE PREPARATION

Mechanically fragment into small pieces. For very hard samples, grinding may be divided into two stages. At the first stage – mechanically fragment samples with the use of the so-called grain mill. At the second stage (if necessary) – use an electric grinder.

ACCESSORIES

Laboratory dryer, grain mill, glass weighing vessels with a lid, AS 220.X2 analytical balance, laboratory spoon.

METHOD DESCRIPTION

Place the sample with a mass of ca. 5 g in pre-dried glass weighing vessels. Specify the real mass of the sample in question with the use of the balance whose weighing accuracy is 0.1 mg (AS 220.X2). Put weighing vessels with the sample and lids in the temperature-controlled laboratory dryer. Dry samples at the temperature of 130°C for 2 hours. After this period, remove vessels and put into the desiccator until they cool down and weigh afterwards. Place samples in the laboratory dryer again and keep on drying them for 30 minutes. Cool them down and weigh again. Repeat the procedure until you obtain a stable sample mass or record the sample mass growth after drying.

RESULTS

Sample name	HORSE BEAN	PEA	LUPINE	BUCKWHEAT	VETCH
Water content (%)	15.46	14.11	11.92	16.93	16.73
Standard deviation (%)	0.02	0.02	0.01	0.01	0.03

GRAINS – WATER CONTENT ANALYSIS WITH THE MOISTURE ANALYZER

The water content testing with the use of the moisture analyzer (IR radiation) entails two phenomena: convection and radiation. The sample temperature rises from outer layers to the bottom of the sample. The temperature gradient in the sample structure minimizes through optimization of the thickness of the dried sample and drying temperature.

SAMPLE PREPARATION

Mechanically fragment into small pieces. For very hard samples, grinding may be divided into two stages. At the first stage – mechanically fragment samples with the use of the so-called grain mill. At the second stage (if necessary) – use an electric grinder.

ACCESSORIES

MA/R or MA/X2 moisture analyzer, laboratory spoon, disposable aluminum weighing pans.

METHOD DESCRIPTION

Set drying parameters presented below. Distribute a thin layer of the sample with a mass of ca. 5 g throughout the weighing pan. Lock the drying chamber manually or automatically.

DRYING PARAMETERS / RESULTS

Sample name	HORSE BEAN	PEA	LUPINE	BUCKWHEAT	VETCH
Drying profile	Standard				
Drying temperature	130°C				115°C
Sample mass (g)	~ 5			~ 3	~ 5
End of analysis	Auto 3				Auto 2
Water content (%)	15.44	14.18	11.82	16.85	16.75
Standard deviation (%)	0.03	0.02	0.05	0.06	0.13
Analysis time $\acute{x}$ (min)	16	14	21	8	8

ACCURACY OF THE MA/R ÷ MA/X2 METHOD

Sample name	HORSE BEAN	PEA	LUPINE	BUCKWHEAT	VETCH
Water content Ref. (%)	15.46 ± 0.02	14.11 ± 0.02	11.92 ± 0.01	16.93 ± 0.01	16.73 ± 0.03
Water content MA R/X2 (%)	15.44 ± 0.03	14.18 ± 0.02	11.82 ± 0.05	16.85 ± 0.06	16.75 ± 0.13
Analysis accuracy (%)	|0.02|	|0.07|	|0.10|	|0.08|	|0.02|

RESERVATION

The method in question has been verified by the Research Laboratory, yet the results do not include factors arising from diversity of tested samples, operators' personal skills as well as measuring capability used by moisture analyzer users. For this reason Radwag shall not be held responsible for drying parameters but they can be used to elaborate own drying method.