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Self-Heat of Freshly Harvested Grain

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Abstract*:*
A powerful form of self-heating. The temperature rises to 50oC and above. The fluidity of the grain mass decreases. A strong blurring of the grain occurs. Some grains become moldy and start to rot. The grain has a strong rotten or unpleasant smell. Spontaneous heating of grain with low moisture during long storage. In practice, self-heating was observed as a result of long-term storage of grain mass with a moisture content lower than the critical moisture content.

Keywords: Grain, Barn, Grass, Temperature, Dry, Grain, Moisture, Heat, Oats, Condensation, Grain Beetle.

Introduction

The self-heating process of freshly harvested grain does not differ by its nature from the self-heating processes occurring in the mass of grain under other conditions. During the storage of freshly harvested grain mass in temporary field conditions (in the fields or primary harvest warehouses), the self-heating process is very fast. The reason for the rapid progress of the process is that the fresh grain breathes rapidly, the external temperature is high, and the grain contains a large number of compounds with high moisture content. As a result of the sufficient influence of such factors, the grain mass heats up by itself. The spontaneous heating of newly harvested grain can be divided into two groups.

1) Spontaneous heating of grain mass with low or normal moisture.

2) Spontaneous heating of grain mass with high or very high (above the limit condition) moisture content.

In the territory of Uzbekistan, the situation of self-heating according to the first group is appropriate. When storing grain mass with a large amount of various mixtures in conditions with high temperature, the grain begins to breathe rapidly. As a result, moisture and heat are released. The air in the space between the grains is heated and moistened, and it moves to the top and side sections. Donny is mostly self-heating.

To prevent this situation, it is necessary to ventilate and cool the grain mass in time.

In the process of self-heating, the following quality indicators of grain change:

1) purity (brightness, color, smell, taste);

2) technological, nutritional and fodder properties decrease;

3) seed quality (germination energy and bluing) deteriorates.

Grain darkens. The reason for this is the rapid development of micrococci and various bacteria in the grain, as well as fungi belonging to the mold family.

In general, the self-heating process can be interpreted as follows in terms of the rate of transition.

1. The initial period of self-heating. The temperature reaches 24-30oC. A warehouse smell occurs. The color of the grain is preserved, but fungi appear on the grain surface, and some

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parts of the grain become cloudy. There is a tendency to decrease the germination energy.
2. The period of development of spontaneous heating. The temperature reaches 34-38^{0}C (within 3-7 days). Grain fluidity is significantly reduced. Don sweats. The smell of grass and bread comes out when it is closed. Wheat and rye grains darken a little, and the skin of oat and barley grains changes from pale yellow to orange.

A powerful form of self-heating. The temperature rises to 50oC and above. The fluidity of the grain mass decreases. A strong blurring of the grain occurs. Some grains become moldy and start to rot. The grain has a strong rotten or unpleasant smell. Spontaneous heating of grain with low moisture during long storage. In practice, self-heating was observed as a result of long-term storage of grain mass with a moisture content lower than the critical moisture content. When wheat grain with a moisture content of 12-14% was stored in a warehouse for 3-5 years, spontaneous heating occurred in the third and fourth years of storage without any external influence. This condition develops in the second half of summer at a depth of 0.5-0.8 m from the upper layer of the grain mass, more precisely, from the surface of the heap. A slow increase in temperature toward autumn ends with a rapid development of the process in a long period (one to two months).

Spontaneous heating of the dry grain mass leads to compaction of the upper layers. According to the results of observations, it was found that the moisture in the heated layers of grain mass is 1.5-2.5% higher than the moisture in other layers, and sometimes even more. Gypsum floors, but not yet self-heating, will have a high (1-2%) moisture content.

The reason for the self-heating condition in the dry grain mass is that (mainly in the upper layer) this condition occurs due to the seasonal temperature difference. Outside air of different temperatures enters the upper layer with mixing and condensation of moisture.

Complete self-heating of grain mass. The reasons for this situation are given below.

a) Condition of grain mass. The temperature, humidity, physiological activity and composition of microflora of grain are important here. The graph below shows the process of temperature change of grain mass depending on moisture and storage period.

b) When storing grain in warehouses and elevators, the terms waterproofing and thermal insulation are of great importance. The floor, wall, and roof of storage warehouses should be sufficiently damp and heatproof.

c) The composition of the grain mass in the warehouse and the conditions of maintenance of this grain mass also affect the state of self-heating. It is recommended to store seeds in the warehouse at a height of more than 3 m. [5].

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Observations on the development of the microflora on the surface of the grain mass during the four years from the day of receiving the batch of wheat grain into storage to the period of self-heating fully confirm the above opinion. The average moisture content of the grain mass for the entire storage period was 13.8-14.2%. The moisture content of the upper (later heating) layer increased from 13.4% to 16.5% in some periods, and up to 17.9% during self-heating. The practice of long storage of grain shows that in some cases the development of mites and grain-eating beetles was observed in self-heating layers.

Conclusion: During storage of freshly harvested grain mass in temporary field conditions (fields or primary harvest warehouses), self-heating process is very fast. The reason for the rapid progress of the process is that fresh grain breathes rapidly, the temperature of the external environment is high, and the grain contains a large number of compounds with high moisture content. As a result of the sufficient influence of such factors, the grain mass heats up by itself.

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