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THEORETICAL BACKGROUND OF THE DRYING PROCESS OF PELLATED SEEDS FOR THE OSCILLATING MODE

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Annotation

In the article in the technology of preparing cotton seeds for sowing, the drying rate in the process of drying seeds in a convective way, the temperature of the material rises greatly, and after reaching equilibrium humidity, it is equal to the temperature of the air (cooler) surrounding the material, with a decrease in the drying rate to an equilibrium state, the material balance equation is obtained dryers.

Keywords: seeds, drying, technology, process, temperature, liquid, gas, air, oscillating, convective

It is known that the seeds of agricultural crops, depending on their physical and mechanical properties, differ from each other in geometric dimensions, mass, density, shape, configuration, windage, flowability, etc. In this regard, the preparation technologies differ significantly from each other. sowing material of seeds of agricultural crops. For example, at present, to improve the sowing qualities of agricultural seeds, they are sorted by mechanical, aerodynamic, liquid and electrical methods, treated with laser beams, concentrated sunlight, and placed in an electric and magnetic field [1–7]. All these methods improve the quality of sowing seeds, increase their laboratory and field germination, stimulate the growth and development of plants, and ultimately increase the yield of fields. However, the above methods do not give the seeds of agricultural crops the necessary flowability.

Based on the foregoing, the goal is to improve the technology and technical means for the preparation of pubescent cotton seeds with various protective and nutritional shells, giving them increased flowability and durability, allowing them to be sown in the early stages both under a film and without it, in an accurate way or a small rate. To do this, the pubescent seeds must first be carefully sorted according to the most important features on a dielectric device, where physiologically mature and biologically homogeneous seeds are selected, and then the sorted seeds are fed into the pelleting device and soaked with a liquid adhesive solution and a stimulating substance against soil pathogens, after which they are enveloped in powdered neutralized lignin, and then dried in a drying plant in a continuous technological process and packed in bags.

At the end of the technological cycle, seeds are obtained with an additional artificial protective and nutritious shell, which have increased flowability and improved agrobiological properties, which make it possible to ensure their accurate sowing or with low norms. Thanks to an additional artificial protective and nutritious shell, such seeds have the properties of increased resistance to adverse weather conditions and they can be sown at an earlier date both under the film and without it. Before sowing, such seeds are not subjected to pre-sowing moisture due to the high adsorption capacity of the additional protective-nutrient shell, which quickly absorbs soil moisture into itself and, as a result, early and full-fledged shoots are provided on natural moisture under identical conditions. In addition, a low dose of a pesticide and its presence under an artificial shell can improve the sanitary and hygienic working conditions of workers and the ecological state of the soil and the environment as a whole. Features of the process of drying coated cotton seeds, in contrast to the drying of seeds of other agricultural crops, are that the main part of their moisture is in the shell. In this regard, the convective method is most suitable for drying coated seeds, which must be improved to reduce the drying time and improve the quality of the finished product. Drying of materials by the convective method is most widely used due to the simplicity of design and operation. During convective drying, the material is in the air flow, directly in contact with it and transferring heat to it. Due to this, the air perceives the moisture removed from the material. The transition of moisture heated to the evaporation temperature into the surrounding material air, in addition to evaporation, consists of several more stages:

- penetration of moisture from the bulk of the material to the surface;
- evaporation of moisture from the surface of the dried material under the influence of heat received from air (coolant);
- diffusion of moisture from the surface of the material into the surrounding air.

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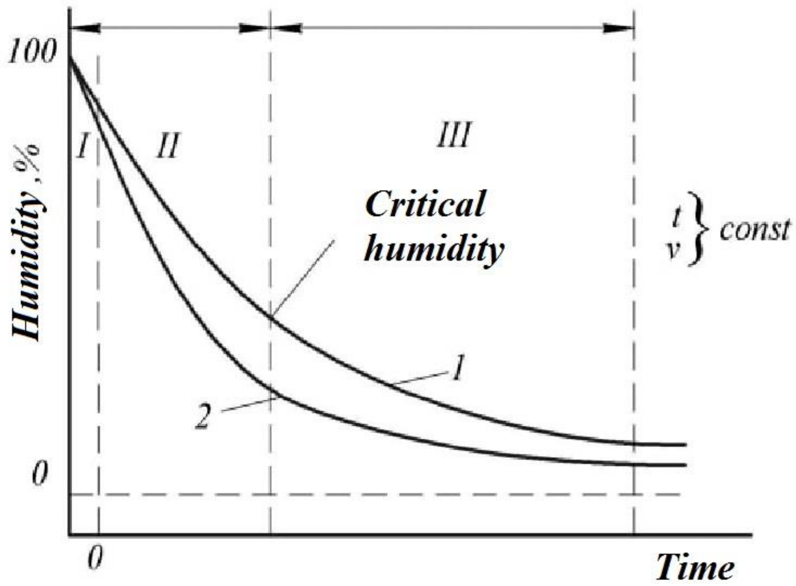
Its driving force is the difference between the vapor pressure of the material and the surrounding air, due to the temperature gradient of the surface of the dried material and its inner layers.

The vapor pressure of dried materials with a high moisture content during the initial drying period is equal to or approximately equal to the saturated vapor pressure. During the drying process, the vapor pressure of the material decreases until, in the end, an equilibrium state occurs, at which the return of moisture to the material does not stop.

Most of the materials that serve as feedstock for drying are capillary-porous bodies. In such materials, the transfer of moisture to the surface of the body, which is one of the stages of the drying process, is a complex process that depends on the forms of water bonding with the dry matter of the material, the diffusion of liquid and gas, and the movement of moisture through capillaries.

With constant drying parameters, i.e. at the inlet air temperature (I), air flow velocity (V), the change in the moisture content in the dried substance depending on the drying time is depicted using the drying curve, which is shown in Figure 1. By studying the drying curve, it can be established that the drying process is essentially divided into three periods [8,9]:

- the heating period, which in the case of drying the ground material has a very short duration;



Picture 1 - Change in the moisture content of the dried material depending on the duration of drying:

1-with convective drying method; 2-with oscillating drying mode.

- a period of constant drying rate, when mainly mechanically bound moisture is removed (closer to the surface), and moisture from inside the material moves to its surface mainly in the liquid phase;
- a period of decreasing or variable drying rate, when moisture, bound by physical and mechanical means, is mainly removed, and its movement inside the material occurs in a vapor state through capillaries.

The period of constant drying rate ends at a time when the influx of moisture from the inner layers of the material cannot compensate for its loss due to evaporation from the surface of the material.

In the area of decreasing drying rate (after the critical point), the temperature of the material increases strongly and, upon reaching equilibrium humidity, becomes equal to the temperature of the air (coolant) surrounding the material. At the same time, the drying rate decreases to an equilibrium state.

In this regard, to disturb the equilibrium state of the heat balance, i.e. temperature of the dried material and the heat agent, it is necessary to create an oscillating mode, i.e. accelerating the technological process of drying the material, in particular, coated seeds.

Humidity and condition of the dried material during the drying process changes. The moisture content of a material can be calculated in relation to its total amount (G) and in relation to the amount of dry matter contained in it (Gсух):

$$G = G_{сух} + G_{вл} \tag{2.1}$$

from here

$$G_{вл} = G - G_{сух}, \tag{2.2}$$

Where $G_{вл}$ – the amount of moisture contained in the material.

When considering the material balance of the dryer, the income will be everything that enters the dryer, and the consumption will be everything that leaves it. Then if P is considered the air flow rate of the heater and formula (2.1) is taken into account, we obtain an equation for the material balance of the dryer:

$$P + G = H + (G_{сух} + G_{вл}) \tag{2.3}$$

from here

$$P + G = (P_{вл} + G_{вл}) + G_{сух}, \tag{2.4}$$

Where $P_{вл}$ – wet air;

$G_{сух}$ – dry finished material

From the foregoing, it follows that in order to accelerate the drying process of materials and, in particular, coated seeds, it is necessary to introduce an oscillating mode into the technological process of convective drying.

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