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STUDY OF PHYSICAL AND MECHANICAL PROPERTIES OF SEEDS OF DESERT FODDER PLANTS DRIED IN A VACUUM-DRYING PLANT

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Abstract
The article discusses the features of seeds of forage grasses as an object of drying and provides an analysis of the physical and mechanical properties of seeds of desert forage plants. The names of the seeds of forage plants desert looking for phytomelioration pastures. Shows the recommended modes of the drying process the seeds of forage plants and selection of the most effective ones for use as a drying facility in drying facilities, as well as major technological properties as seed material drying.

Keywords: seeds, drying, physical and mechanical properties, desert forage plants, phytomelioration, pastures, regime, process, drying object, drying installations, technological properties of seeds.

Introduction

The relevance of the issue is determined by the Decree of the President of the Republic dedicated to additional measures to strengthen the stimulation of increasing the number of animals in personal subsidiary farms, dehkan and farms and expanding the production of livestock products [1,2], in pursuance of the Decree of the President, which, in particular, touched upon the issues of improving pastures by sowing desert fodder plants, such as saxaul, circassian, kandym, chogon, teresken, keireuk, izen, wormwood, camphorosma and etc., as well as its intersectoral nature, since the new technology for the production and drying of seeds of desert fodder plants is the subject of the agricultural industry, and the technical means for its implementation is the agricultural machinery industry.
Therefore, providing the republic with the necessary, vital goods, primarily through the organization of its own production, is one of the key tasks of national security, sustainability and stability. This has not only a purely economic, but also a political significance..." [1,2]. In the problems of providing the population with livestock products, an important role is assigned to farms located in semi-desert and desert zones. The area of natural pastures of the

steppe and desert zones of the Republic of Uzbekistan is about 20 million hectares. Unfortunately, the productivity of fodder plants is low [2,3,5].

In this regard, the problem of providing animals with feed becomes the most important.

Improving pastures with desert crops will significantly strengthen the fodder base and significantly increase livestock production. The solution to this problem is associated with the production of seeds of desert plants that are promising for phyto-reclamation of pastures, which in turn requires the organization of work on the cultivation, harvesting and post-harvest treatment of seeds [4,6,7,8].

To improve desert and semi-desert pastures, which are the main fodder base for pasture cattle breeding, up to 400 tons of seeds of izen, keireuk, camphorosma, chogon, wormwood, black saxaul, teresken and other plants were produced annually in Uzbekistan alone. Taking into account the pastures of other republics of Central Asia and Kazakhstan, the need for seeds of fodder plants is more than 3000 tons per year. Therefore, issues related to the harvesting and post-harvest processing of these seeds are of great economic importance for the economy of Uzbekistan. Of particular importance is the drying of seeds as the main condition for preserving their sowing qualities and, consequently, a guarantee of obtaining stable yields [5,7,8,9,11,12].

The technology of production of seeds of fodder plants includes a number of stages. Sowing of fodder plants is carried out in the pre-winter and winter periods (November-January). The optimal time for harvesting seeds of izen and chogon is the second half of October, and keireuk, camphorosma and black saxaul is the beginning of November. During this period, as a rule, precipitation falls, which predetermines the need to dry the collected seed heap.

Due to the lack of technical means, the seed heap of fodder plants is dried in a natural way on racks, asphalt sites and directly in the field. Such drying requires a lot of manual labor, a lot of time and money and does not guarantee the preservation of the quality of seeds, especially in adverse weather conditions. The sowing qualities of seeds when drying on racks are reduced by at least 20%, and when drying on asphalt sites with shoveling - up to 50%. Preventing a decrease in seed germination during drying, as we can see, promises great economic benefits.

Speaking about the technologies for drying seeds of desert fodder plants, it should be noted that the technology that provides for drying seeds after their preliminary cleaning, as a method associated with the least energy consumption, has become predominant. However, with high humidity, the seed heap, in order to avoid loss of seed germination from self-heating, is dried without cleaning, although this is more energy-intensive.

At present, a number of installations for drying seeds and testes of vegetable crops have been created. However, they are energy-intensive and it is difficult to regulate the temperature of the drying agent in the layers of the seed heap, which is very important when drying the seed heap of desert fodder plants [8,9,10].

For the correct organization of the drying process and the choice of the most effective modes of operation of drying plants, it is necessary to know the basic technological properties of seeds as a drying material.

Features of fodder grass seeds as an object of drying

The moisture content of seeds is the most important factor affecting their stability during storage. Wet seeds breathe intensively, releasing moisture, carbon dioxide and heat. At high humidity and temperature, microorganisms begin to develop on the surface of the seeds.

Increased respiration of seeds and microflora leads to the release of even more heat. At the same time, due to the poor thermal conductivity of seeds, they self-warm, which sharply reduces their sowing qualities.

At optimal harvesting times, the moisture content of the testicles is 40% or more. The moisture content of the seeds of isen and camphorosma is especially high. Therefore, it is necessary to remove a large amount of water during drying.

The quality and efficiency of drying directly depend on the physical and mechanical properties of the drying object, such as porosity, bulk mass, angle of natural repose, flowability coefficient and coefficient of static friction.

The physical and mechanical properties of grass seeds were determined at the following purity: izen 35...40 %, camphorosma 35...42 %, keireuk and chogon about 50 %, i.e. at the purity characteristic of the conditioned material.

Porosity (the ratio of the volume of air space to the total volume of the seed heap) characterizes the gas permeability of the object of drying. The porosity of the layer depends on their type of seed heap, layer height, humidity and composition of the seed heap. With an increase in porosity, the resistance of the seed layer to the air flow decreases, which has a favorable effect on the drying process.

The analysis of the physical and mechanical properties of the seeds showed that porosity is insignificantly dependent on the moisture content of the seeds. As the humidity decreases, plant inclusions (remnants of stems, leaves, winged seeds) become more rigid. This strengthens the skeleton of the layer and somewhat delays its shrinkage, which causes a slight increase in porosity with a decrease in humidity [3,4,10]. This gives reason to assume the presence of a stable drying regime.

Based on the study of the physical and mechanical properties of grass seeds, it can be concluded that the seed heap layer of desert fodder plants has a relatively high porosity. This makes it possible to use commercially produced centrifugal and axial fans to supply the drying agent to the heap bed. A relatively small change in porosity and bulk mass under the influence of humidity makes it possible to maintain a stable mode of blowing the layer during the entire drying period. At the same blowing rate, the thickness of the seed layer of keireuk and chogon should be 2-3 times greater than that of isen and camphorosma.

This data can also be used to calculate the size and capacity of drying plants.

Bulk weight is an important characteristic that determines the size and capacity of the plant, the method of loading and unloading seeds, as well as their drying modes.

The seeds of desert and semi-desert fodder grasses (isen keireuk, camphorosma, chogon, etc.) are characterized by a relatively small volume weight (0.1-0.15 t/m3) and loose laying in the embankment.

The high porosity and low volume weight of keireuk and chogon seeds necessitate the use of larger drying chambers compared to isen and camphorosma seeds.

The flowability of seeds is determined by the angle of natural repose, flowability and static friction coefficients. An increase in the angle of natural slope, flowability and friction coefficients indicates a decrease in the flowability of seeds.

The flowability coefficient tends to decrease with a decrease in humidity, and in the seeds of isen and camphorosma to a greater extent than in keireuca and chogon.

With a decrease in humidity, the coefficient of static friction increases (for all surfaces) except for chogon seeds, where there is no clear dependence.

Very low seed flowability values significantly complicate the mechanization of the drying process and, in particular, the use of continuous dryers. In addition, the low flowability of seeds requires control of the condition of the bed during drying, especially at high blowing speeds. Due to the uneven distribution of the heat carrier over the dryer area (which happens, for example, when the seeds are unevenly stacked in the drying chamber), it is impossible to form through channels in the layer, which leads to leakage of the heat carrier.

Heat resistance of seeds. However, the heating temperature should not exceed a certain value, after which the germination of seeds may decrease. The maximum permissible temperature of seeds depends on their humidity and the time of heat exposure.

Moisture-giving capacity of seeds. According to the ability to evaporate moisture during drying, the seeds of fodder grasses can be divided into two groups: relatively fast and relatively slow. The first group includes keireuk and chogon, the second - izen and camphorosma. Low moisture loss of seeds of the second group is explained by the presence of a visually distinguishable film on them, limited moisture permeability.

Analysis of the process of storing seeds of desert fodder plants has shown that a necessary condition for preserving the quality of seeds during storage is high-quality drying. Unfortunately, the existing methods of drying are energy-intensive and do not meet the requirements of seeds of desert fodder plants [3,4]. One of the reasons for this is the uncontrollability of drying parameters in a dense bed. As the authors' studies have shown, for drying the seed heap of desert fodder plants, the most acceptable is step-by-step drying, which allows the use of solar energy, as well as a vacuum drying unit with a liquid coolant with infrared radiation. This reduces the energy intensity of the process and allows you to adjust the drying parameters of the seed heap.

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