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New method of germinating capacity of seeds of corn

The purpose. To determine optimum regimen of germination and to improve method of cold germination of seeds of hybrids of corn depending on their biological singularities, qualities and field germination rate.

Methods. Laboratory-analytical, experimentally field, statistical.

Results. They gathered data on germination of seeds of hybrids of corn using different methods - standard (GSTU 4138), cold test, and also its modifications which were compared to field germination rate in conditions of 2011-2014.

Conclusions. With the purpose of selection of high-quality seeds of hybrids of corn and prediction of their field germination rate the new method is elaborated which provides 3-phasic sprouting at different temperatures. At sprouting on paper it is necessary to apply a correction factor - to reduce germination for 2-3%.

Key words: seeds of corn, germination, methods of determination.

Similarity refers to the main indicators that characterize the seed and yield properties of the seeds. It is proved that only sown seeds of high similarity, established by the standard for the corresponding culture, can get fast and friendly stairs and more productive plants. To determine the similarity of maize seeds use the current method, introduced by the standard DSTU 4138 [8]. According to the method, the seeds are germinated at a constant temperature of 25 ° C or alternating between 20 and 30 ° C for 7 days, seeds are inserted between layers of filter paper or wet sand. The method is quite simple and convenient, but the results often do not coincide with field similarity. In our experiments, the difference between the similarity of maize hybrids, determined by the laboratory method and obtained in the field, was 7 - 31% [4]. Known and other methods for determining the similarity - on the basis of coloring the living embryo of the seed, the degree of its electrical conductivity, the activity of swaying, germination in osmotic solutions [1 - 3, 5, 7, 9 - 11]. Their effectiveness, according to the test, to a large extent depends on the characteristics of a particular culture, its physiological and biochemical state. For thermophilic crops, the method of so-called cold sprouting was found to be effective, which is to create conditions close to the field. The conditions include seed germination in the soil at variable low temperatures, which usually occur during the sowing period. According to various reports, the results of cold germination in most cases are closer to field similarity, when the germination mode coincides with the biological characteristics of a particular crop.

1. *Similarity of seeds of hybrids of maize depending on propagation method (2011 - 2014),%*

Гібрид	2011–2012 рр.			2013–2014 рр.		
	1	2	3	1	2	3
Дніпровський 181СВ	99	86	85,2	99	89	84,0
Креміль 200СВ	96	68	73,3	99	78	80,3
Любава 279МВ	97	78	79,5	99	77	78,5
Розівський 311СВ	93	62	63,2	99	85	81,8

Примітка: 1 — стандартне пророщування (ДСТУ 4138); 2 — холодне пророщування; 3 — польова схожість.

2. Similarity and yield of seeds of hybrids of corn depending on its various quality (2011-2012).

Гібрид	Партія насіння	Схожість, %		Урожайність зерна, т/га
		за холодного пророщування	польова	
Дніпровський 181СВ	Перша	68–80	68–85	4,63–5,10
	Друга	80–91	80–93	5,07–5,63
Любава 279МВ	Перша	67–80	68–81	5,11–5,93
	Друга	80–90	78–88	5,52–6,49
Розівський 311СВ	Перша	65–80	68–85	5,25–6,04
	Друга	80–90	79–90	5,87–7,05
НІР _{0,5}			1,8–2,5	0,15–0,24

The purpose of the research is to establish a germination regime and to modify the method of cold germination of maize hybrids, depending on their biological characteristics, quality and field similarity. Research methodology. The seeds were germinated according to the standard method (control) and cold at different temperature and duration of the process. Cold sprouting consisted of different stages, option number 1 (2-stage) - temperature 8 - 10 °C for 7 days, 18 - 20 °C - 7 days; № 2 (3-stage) - temperature 8 - 10 °C for 7 days, 25 °C - 2 days, 18 - 20 °C - 5 days; No. 3 (3-stage) - temperature 8 - 10 °C for 5 days, 25 °C - 2 days, 18 - 20 °C - 5 days; No. 4 (3-stage) - temperature 8 - 10 °C for 3 days, 25 °C - 2 days, 18 - 20 °C - 5 days. The temperature regime of 8 - 10 °C was a cold test, 25 °C - stimulation - germination, 18 - 20 °C - grazing. Seeds were sprayed on filter paper, sand and soil in various ways. Field similarity of seeds was determined by the method of conducting field experiments with corn [6]. In experiments, maize hybrids were used by the Institute of Agriculture of the steppe zone of NAAS. Research results. The similarity of seed of hybrids of maize in experiments varied depending on the method of germination (Table 1). For standard germination, the similarity was high (93 - 99%), that is, by this method hybrids almost did not differ. However, the field similarity of seed hybrids was very different from the laboratory: in 2011 - 2012 it was lower by 14 - 30%, in 2013 - 2014 - by 15 - 21%. In addition, if in 2011 - 2012 there was some pattern in decline, then in 2013 - 2014 - there was no. Instead, the similarity of cold sprouting was closely related to the field in all years of research, for example, the difference between the similarity in 2011 - 2012 was 0.8 - 5.3%, in 2013 - 2014 - 1.5-5 % With the help of the method of cold sprouting, it is possible to carry out the selection of seeds, to predict not only its field similarity, but also productivity. Thus, according to this method, seed samples prepared for sowing and conditional similarity (92-100%) were selected individual batches that showed higher field similarity and yielded higher yields (Table 2). Hence, the method of cold sprouting is a reliable criterion for assessing the seed quality and yield properties of corn hybrids. However, its implementation in the system of valid certification is hampered by two factors: the duration of the method (14 days) and seed propagation in the soil.

3. Similarity of maize seeds depending on the method and stage of propagation (2012-2014), %

Варіант методу	Характеристика методу		Стадія пророщування — схожість		
	температура, °C	експозиція, год	холодний тест	стимуляція	пророщування
I	8–10, 18–20 (контроль)	14	14	–	84
II	8–10, 25, 18–20	14	14	82	89
III	8–10, 25, 18–20	12	22	77	83
IV	8–10, 25, 18–20	10	6	62	82

Therefore, we studied modifications of the method with a shorter term and sprouting in sand and on filter paper. In the experiments, reduction was achieved due to 3-stage germination and stimulation of seed germination at a temperature of 25 ° C. They also shortened the cold test to 3 to 5 days. As a result, the total duration of the method was 10 - 12 days, the result of germination was almost at the control level (Table 3). It was also established that seed germination in sand and on filter paper was similar to germination in soil, the difference between these variants was 2 - 3%. As a rule, the germination of germination in sand and on paper was higher compared to germination of seeds in the soil. Tests indicate that the temperature regime, especially at the stimulation stage, is better provided by the transfer of seeds from one thermostat to another, which is set to a temperature of 25 ° C. In this very thermostat, seeds can be grown by switching to a temperature of 18 - 20 ° C.

Conclusions

A new method for determining the grain yield of a corn seed (patent for utility model No. 86727), which consists in modification of cold sprouting, has 3 stages: 1 - at a temperature of 8-10 ° C for 3 - 5 days; 2-th - at a temperature of 25 ° C - 2 days; 3rd - at a temperature of 18 - 20 ° C - 5 days. The duration of germination of seeds using the new method is 10-12 days, the results of the determination of similarity are similar to the cold test. The method is recommended for the selection of high quality seeds of hybrids of maize, as well as for predicting its field similarity and productivity. Spread the seeds in a layer of soil, in sand or on filter paper. In the latter case, the correction factor should be used (2 to 3% reduction of similarity).

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