

STUDY ON ECONOMIC FEATURES AND GERMINATION ABILITY OF SEEDS OF POLYSPERMOUS POLLINATOR OF SUGAR BEET UNDER LOW TEMPERATURES

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The results of studying on the influence of low temperature on the germinative energy and germination of sugar beet polyspermous pollinators are shown. It is proposed the use of the best lines as parental components to create the heterotic hybrids that can provide seed germination at low temperatures.

Keywords: *hybrid, sugar beet, polyspermous pollinator, productivity, energy of germination, seed germination, low temperature.*

The introduction. From the history of the development and incipience of the agricultural sector, it is known that the variety and seed always played an important role. From them depends not only the yield, but also its quality. In many branches of plant growing it is difficult to overestimate the role of variety and seed, because they also determined the technology and the effectiveness of the production and processing of products, which is typical for the beet production [1,2].

Solution of the issues of sugar-beet industry development, increase of sugar raw production are impossible without high-quality seeds. The high level of new technologies of sugar beet production increases the requirements to the seed, the importance of selection and seed production is increasing. It is necessary to implement into production the new high-productivity hybrids that created on the basis of cytoplasmic male sterility (CMS). Intensively, technology without these hybrids is impossible, as it is based on the using of the high quality seeds for precise seeding [3].

Among the factors that affect the sugar beet productivity more than 50% doesn't depend on the human. Thus, with the help of the nine-year field researches that were conducted on eight different locations of Germany, was found that the average portion of the dependence of sugar yield from the action of various factors is as follows: the conditions of the year 34%, the place of growing 17%, variety 14%, nitrogen fertilization 11%, planting density 10%, term of seeding 5%. The most important factors that influence on the yield of sugar beet are varieties and seed. In order to receive the yield of sugar beet of 18-20 t/ha, the varieties and hybrids, as well as seed quality if it responds at least the minimum requirements of the standard, have no significant value, because the potential of productivity of this crop is in 3-4 times higher. But to get the good harvest by the modern technology of production the seed quality indices should be significant [4].

Many scientists [4-7] indicate the important role of parental polyspermous component in forming the productivity of sugar beet hybrids based on CMS, and the type of pollinator (the orientation of selection by economic features) mainly

implemented in the hybrids productivity [8]. It is possible to say that own high productivity of polyspermous pollinators affects the final productivity of monoseed CMS hybrids [9].

The methodology of the research. The research was carried out during 2008-2011 in the seed laboratory of the Institute of Root Crops of NAAS of Ukraine. The sowing seed quality of polyspermous pollinators of sugar beet, was measured with air temperature of 20⁰C according to DSTU [10] and, respectively, at 10⁰C. According to the source material, was used 500 sugar beet polyspermous pollinators of different genetic origin.

The results of research. During evaluating of the indicators of yield of represented lines-pollinators, should be noted stability of this indicator, which for selected variety-samples varied in range – 40.1-42.2 t/ha (Table 1).

1. Basic indicators of polyspermous pollinator productivity, 2008-2011

Field number	Mass of 1000 seeds, g	Yield, t/ha	Sugar content, %	Sugar harvest, t/ha
59	21,2	40,2	17,4	6,99
13	21,4	42,1	17,8	7,49
36	21,3	41,3	18,8	7,76
180	21,7	40,1	17,9	7,18
1	21,7	41,4	17,9	7,41
143	22,7	40,7	18,3	7,45
138	21,2	42,2	17,6	7,43
140	21,4	41,1	17,7	7,27
29	21,1	40,4	16,6	6,71
94	21,1	41,4	17,8	7,37
167	21,5	41,3	16,8	6,94
101	24,1	40,4	17,8	7,19
173	31,1	41,8	16,7	6,98
Average	22,4	41,1	17,6	7,24

Since the represented selection numbers are the result of purposeful selection of materials with high sugar content, very high indicators are observed – 16.6-18.8%. The highest sugar content was observed in variety-sample 36 – 18.8%, which provided the sugar harvest at 7.76 t/ha.

The mass of 1000 seeds was ranged from 21.1-31.1 g. The highest value of this index was observed in variety-sample with number 173.

Concerning qualitative indices of polyspermous pollinator seeds germinated at different temperatures, should be noted the stability of energy and sprouting during germination at temperature of 10⁰C (Table 2).

2. Qualitative indices of polyspermous pollinator seed under the conditions of germination at different temperatures, 2008-2011

Field number	Sprouting at a temperature 10°C			Sprouting at a temperature 20°C		
	mass of 1000 seeds, g	germinative energy, %	germination, %	mass of 1000 seeds, g	germinative energy, %	germination, %
59	21,2	31,0	38,0	20,1	40,0	85,1
13	21,4	26,0	34,0	21,0	40,0	84,0
36	21,3	36,0	39,0	21,1	40,0	81,2
180	21,7	29,0	42,0	20,9	38,0	79,5
119	21,7	30,0	30,0	21,9	38,0	79,8
143	22,7	29,0	31,0	22,1	38,0	80,0
138	21,2	36,0	42,0	20,0	41,0	83,2
140	21,4	1,0	43,0	21,0	40,0	81,0
29	21,1	22,0	38,0	20,9	39,0	81,2
94	21,1	30,0	33,0	21,0	37,0	72,6
167	21,5	34,0	35,0	21,5	37,0	89,2
101	24,1	37,0	39,0	23,9	37,0	79,8
173	31,1	8,0	29,0	28,9	38,0	80,1
Average	22,4	26,8	36,4	21,9	38,7	81,3

Thus, all variety-samples provided a relatively high energy of germination of seeds, except for the numbers 140 and 173 for which this index was 1.0 and 8.0%. However, the seed germination of these materials was 43.0 and 29.0%. In case of germination with temperature in accordance with the methods, the energy germination and sprouting higher than marked samples was – 40.0-81.0% for number 140 and 38.0-80.1 for number 173.

It is also necessary to note the high germination of seeds of the sample at a sprouting temperature of 10 °C, which ranged within 23.0-49.0%.

Regarding to the quality indicators of seeds during the germination at 20 °C should be noted the high germination of seeds in all submitted samples – 72.6-89.2%. Herewith the sample 167 at very low energy index of germination was 37.0%, provided the highest germination of seeds for a given sample.

The conclusions. The investigated samples of sugar beet polyspermous pollinators actively react on the conditions of germination and germinative energy and sprouting of seeds directly depend on the temperature.

However, in the breeding work for creating the hybrids appropriate for the cultivation under the intensive technologies, an important feature of initial breeding materials is providing high indices of energy germination and sprouting under the low temperature, which allows to sow the sugar beet heterosis hybrids in earlier periods.

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Study on economic features and germination ability of seeds of polyspermous pollinator of sugar beet under low temperatures

It has been established that presented selective numbers taken from materials have high sugar content, namely 16,6 – 18,8%. It is observed that variety samples №36 have high sugar content – 18,8 that ensured the yield of sugar at 7,76 t/ha.

The weight of 1000 seeds fluctuated within 21,1 – 31,1 g. The maximum value of this index was noted in variety sample № 173.

As to the quality indicators of seeds of polyspermous pollinator germinated under different temperatures certain stability of energy and germination ability during sprouting under 10°C should be noted.

Thus, all variety samples ensured relatively high energy of seed germination, with the exception of numbers 140 and 173, for which this indicator is 43,0 and 29,0%. Under conditions of germination according to the temperature accepted with methods, the energy of germination and germination ability of seeds of studied genotypes was 40,0 -81,0% for number 140 and 38,0 – 80,1 for sample 173.

We should mention that the high germination ability of seeds was under temperature of germination of 10°C, that fluctuated within 23,0 – 49,0%.

According to the quality indicators of seeds during germination (temperature 20°C) seeds of the above mentioned genotypes have high germination ability – 72,6-89,2%. In this case sample 167 with relatively low indicator of germinative energy – 37,0% ensured the highest germination ability of seeds in this experiment.

In the breeding work for creating the hybrids appropriate for the cultivation under the intensive technologies, an important feature of initial breeding materials is providing high indices of energy germination and sprouting under the low temperature, which allows to sow the sugar beet heterosis hybrids in earlier periods.

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Изучение основных хозяйственно-ценных признаков и схожести семян многосемянного опылителя сахарной свеклы при пониженных температурах

Установлено, что представленные селекционные номера, отобранные в результате целенаправленного отбора материалов с высоким содержанием сахара имеют такое содержание – 16,6-18,8%. Отмечено высокое содержание сахара у сортообразцов № 36 – 18,8%, что обеспечило сбор сахара на уровне 7,76 т/га.

Масса 1000 семян колебалась в пределах 21,1-31,1 г. Наибольшее значение этого показателя зафиксировано у сортообразца под номером 173.

На счет качественных показателей семян многосемянного опылителя, пророщенного при разных температурах, стоит отметить определенную стабильность энергии и схожести при проращивании при температуре 10°C.

Так, все сортообразцы обеспечили относительно высокую энергию прорастания семян, за исключением номеров 140 и 173, для которых этот показатель составляет 43,0 и 29,0%. В условиях проращивания за принятой в соответствии с методиками температурой энергия прорастания и схожесть семян исследуемых генотипов была – 40,0-81,0% для номера 140 и 38,0 – 80,1 для образца 173.

Также необходимо отметить высокую схожесть семян при температуре прорастания 10°C, которая варьировала в пределах 23,0-49,0%.

Соответственно показателям качества семян при проращивании (температуре 20°C), следует отметить высокую схожесть семян у всех выше представленных генотипов – 72,6-89,2%. При этом образец 167 при относительно низком показателе энергии прорастания – 37,0% обеспечил наивысшую схожесть семян для данного опыта.

Исследуемые материалы достаточно активно реагируют на условия проращивания, а энергия прорастания и схожесть семян находится в прямой зависимости от температуры. При этом, в селекционной работе при создании гибридов с важными признаками, пригодных для выращивания за интенсивными технологиями важным есть обеспечение высоких показателей энергии прорастания и схожести при пониженных температурах, что даст возможность сеять гетерозисные гибриды сахарной свеклы в более ранние сроки.