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EVALUATION OF THE SEED QUALITY OF EARLY MATURING SOYBEAN VARIETIES

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The article presents the results of research work carried out to assess the quality of seeds and the quality of crops of fast – maturing soybean varieties. In particular, such indicators as laboratory germination of seeds, field germination, pre-harvesting survival rate, plant height, oil and protein content were determined. In the research work, seed samples of varieties Bilyavka, Lybid, Vizhn, Tanais, 422, 180/2 were compared in terms of above mentioned indicators.

The study results revealed that the laboratory germination rate of seeds among the compared varieties was consistently higher, ranging from 90.0% to 97.0%, respectively. The field germination of the examined varieties did not vary significantly from the quality standard outlined in the standard. The pre-harvesting plant survival rate yielded notably high results in varieties 422 and 180/2, ranging from 86.6% to 80.8%, respectively. Among the examined varieties, the selection number 422 exhibited the highest fat content at 22.3%. In terms of protein content, the variety samples fell within the categories of low and medium levels, with the selection number 422 showing the highest result at 38.1%. The average weight of 1000 seeds ranged from 131 to 190 grams.

Key words: soybean, seed quality, germination, oil, protein.

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В статье приводятся результаты проведенных научно-исследовательских работ по оценке посевного качества семян скороспелых сортов сои. В частности, получены такие показатели, как лабораторная всхожесть семян, полевая всхожесть, предуборочная сохранность растения, высота растения, содержание масла и белка. В исследовательских работах сравнивались сортообразцов сои Билявка, Лыбидь, Вижн, Танаис, 422, 180/2 по вышеуказанным показателям. Результаты исследования показали, что лабораторная всхожесть семян в сравниваемых образцах сортов была выше у всех и составляла от 90,0 до 97,0% соответственно. Посевная всхожесть изученных сортообразцов не сильно отклонялась от нормы качества, указанной в стандарте. Показатель сохранности растения до сбора урожая дал высокие результаты в сортообразцах 422, 180/2, в пределах 86,6 и 80,8% соответственно. В исследуемых сортообразцах самый высокий показатель жирности наблюдался в селекционном номере 422 – 22,3%. По содержанию белка изученные образцы сортов вошли в категории низкого и среднего уровня. Высокий результат по этому показателю наблюдался селекционного номера 422, соответственно 38,1%. Масса 1000 семян в среднем показал от 131 до 190 г.

Ключевые слова: соя, качество семян, всхожесть, масло, белок.

ТЕЗ ПІСЕТІН МАЙБҰРШАҚ СОРТТАРЫНЫҢ ТҰҚЫМ САПАСЫН БАҒАЛАУ

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Мақалада тез пісетін майбұршақ сорттарының егістік сапасы және тұқым сапасын бағалау бойынша жүргізілген ғылыми – зерттеу жұмыстарының нәтижелері келтірілген. Атап айтқанда, тұқымның зертханалық өнгіштігі, егістік өнгіштігі, өсімдіктің жинап алуға дейінгі сақталуы, өсімдіктің биіктігі, май мен ақуыздың құрамы сияқты көрсеткіштері алынған. Зерттеу жұмыстарында майбұршақтың Билявка, Лыбидь, Вижн, Танаис, 422, 180/2 сорт үлгілері жоғарыда көрсетілген көрсеткіштері бойынша өзара салыстырылған. Зерттеу нәтижелері салыстырылып отырған сорт үлгілеріндегі тұқымның зертханалық өнгіштігі барлығында жоғары екенін көрсетті, сәйкесінше 90,0 – 97,0 % аралығында болды. Зерттелген сорт үлгілерінің егістік өнгіштігі стандартта көрсетілген сапа нормасынан көп ауытқымады. Ал, өсімдіктің жинап алуға дейін сақталуының көрсеткіші 422, 180/2 сорт үлгілерінде жоғары нәтижені берді, сәйкесінше 86,6 және 80,8% аралығында болды. Зерттелген сорт үлгілерінде майдың ең жоғары көрсеткіші 422 селекциялық номерінде байқалды – 22,3 %. Ақуыздың мөлшері бойынша зерттелген сорт үлгілері төмен және орташа деңгейдегі категорияларға енді. Бұл көрсеткіш бойынша да жоғары нәтижені 422 селекциялық номері берді, сәйкесінше 38,1 %. 1000 тұқымның массасы орташа есеппен 131 – ден 190 г. дейінгі көрсеткішті көрсетті.

Түйінді сөздер: майбұршақ, тұқым сапасы, өнгіштік, май, ақуыз.

Introduction. An important role in increasing the yield of agricultural crops is given to the quality of the sown material. Therefore, one of the main tasks in obtaining high and stable yields of agricultural crops is still to improve the quality and properties of seeds [1, p.8].

The sowing quality of seeds characterizes the level of their suitability for sowing. To get a new plant from seeds, they must be viable, germinating, clean. As it turned out, the field germination of seeds is often significantly lower than laboratory germination, and when storing seeds, first the level of their productive qualities, the intensity of sprout growth, then – sowing and finally – laboratory germination decreases [2, p.13]. Seeds with high energy of germination are more resistant to adverse sowing conditions, their shoots develop faster, are less susceptible to diseases and are less damaged by pests, which has an optimal effect on the future harvest [3, p.22].

Due to the expansion of the soybean area, due to its cultivation in the northern regions, there is a need to provide consumers with high-quality arable material. It is known that in the process of simple storage of seeds, soybeans quickly lose field conditioning and have low environmental resistance in terms of germination [4, p.77]. This is due to the fact that its seeds are rich in protein and fat, which is why it attracts moisture, and the thin seed film is easily damaged, allowing air, moisture and pathogens to enter. The higher the storage temperature and the higher the moisture content of the seeds, the faster the germination rate of the seeds decreases. It becomes especially dangerous if these two factors act at the same time, as it creates favorable conditions for more breathing and the development of microorganisms.

However, the germination rate of soybean seeds is one of the main indicators on which its quality directly depends. Natural and climatic conditions (ecological) have a great influence on the yield and quality of seeds. If at the time of maturation there is a warm and necessary moisture, and at the time of maturation there is a sufficiently warm weather and no precipitation falls, the seeds are formed with good sowing qualities and productive qualities. Low temperatures and a large amount of precipitation negatively affect the quality of seeds. During drying, the seeds are formed withered.

The aim of the studies is to assess the quality of crops and seeds of rapidly ripe soybean varieties. In this regard, the following tasks were set:

- perform analysis of laboratory and field germination of seeds;
- determine the fat and protein content in seeds of Bilyavka (St), Vision, Lybid, Tanais, 422, 180/2 varieties.

Material of research and methodology

Our research seeds of fast-maturing soybean varieties showed the following sowing quality indicators (table 1).

Laboratory germination was determined in laboratory conditions and laboratory germination by varieties gave a high indicator in all – 90.0 – 97.0 % (image 1).

As can be seen from the table, the indicators of the studied varieties for field germination didn't deviate much from the standard (Gost 52325 – 2005) soybean seed quality standards and showed a good result in terms of the indicator of plant preservation before harvesting 422 variety -84.7 and 86,6% , the variety 180/2

showed – 89.1 and 80.8%.

The lowest results in these indicators were the varieties Vision and Tanais.

Research results

In general, compliance with all the elements of technology, sowing in the optimal time, timely use of plant protection products, favorable weather conditions helped us to get good shoots, better plant development and tolerate drought at the initial stages of development.

Table 1 – The sowing quality of fast-maturing soybean varieties (2020-2022 years.)

Name of the variety	Laboratory germination, %	Sowing germination, %	Storage of the plant before harvesting, %	Height of plant, cm
Bilyavka (St)	90,0	81,8	84,5	66,5
Vision	93,4	81,2	59,2	64,6
Lybid	96,7	78,3	63,0	77,5
Tanais	90,2	71,0	63,8	76,9
422	97,0	84,7	86,6	74,2
180/2	97,0	85,2	80,8	70,2



Image 1 – Laboratory germination of soy variety 180/2

Fast-maturing soybean varieties require the study of their quality indicators for rational use in production and increasing their competitiveness.

The quality of seeds is an important factor for the economic efficiency of production. The seed quality of any agricultural crop is its complex feature, it includes a number of properties of the seed, which include the biochemical composition of the seed, which determines the nutritional value of a particular product, and the physical parameters that determine the suitability of the seed for processing [5,p.56].

Discussions. The quality indicators of soy seeds determine the possibility of their use in a particular industry. According to the indicators of seed quality, according to the direction of use, they are divided into fatty, fodder and food [6, p.32].

For varieties of the oil direction, the high content and quality of the oil are of great importance. In the feed direction, the most important parameter of seed quality is the protein content. The quality indicators of varieties with a nutritional orientation, in addition to the high protein content in the seeds, include the physical parameters and organoleptic properties of the seeds (table 2) [7,p.12].

In the varieties, the oil content was from average (18.1 – 20 %) to high (20.1 – 25%) according to the international classifier. The highest oil content was observed in the number 422 (22.3 %) and the variety Bilyavka (St) (22.1%).

According to the classifier for protein content, varieties entered the category of low (25.0 – 35.0 %) and medium (35.1-45.0%) [125]. The highest indicator for protein content was given by the selection number 422, 38.1%, respectively (image 2).

Table 2 – Requirements for the quality indicators of soybean seeds

Parameters of seed	Directions of using		
	Oil	Fodder	Food
Chemical indicators			
Protein composition	--	*	*
Oil composition	*	--	*
Physical properties			
Size	--	--	*
Uniformity	*	*	*
Shape	--	--	*
Nature	*	*	*
Hardness of seed	--	--	*
Friability	--	--	*
Organoleptic properties			
Color of seed shell	--	--	*
Color of seed scar	--	--	*
Color of pigment	--	--	*
«*» – important indicator		«--» – not important indicator	

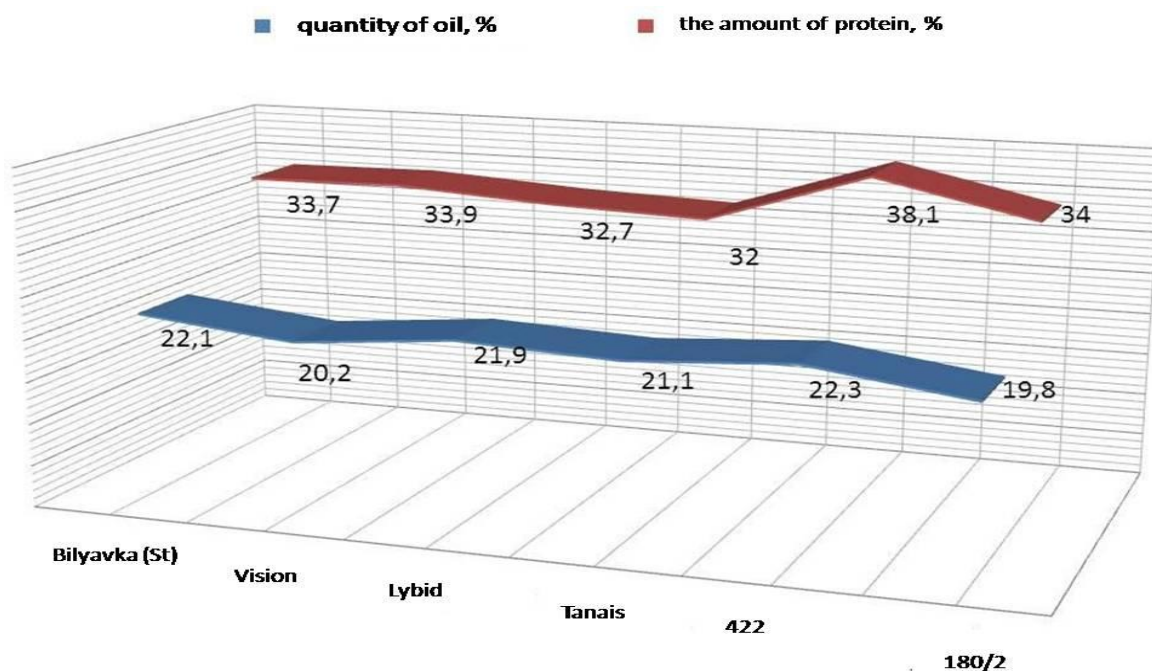


Image 2 – Chemical composition of seeds of soybean varieties

The physical properties of seeds are of great importance in the technology of their storage. In our research, the shape of the soybean, linear dimensions (length, width, thickness), uniformity, coarseness, mass of 1000 seeds were determined.

Soy seeds have different shapes: spherical, oval, oval – oblong, oval – flattened. It varies depending on the growing conditions of the seed.

Knowing the size of seeds is necessary for the correct choice of cleaning and technology of varieties.

The uniformity of seeds is important when preparing seed material for sowing. Seeds that are uniform in size ensure the germination of sprouts, the smooth development of the plant, the simultaneous maturation of the grain, facilitate the harvesting of the crop, and also improve the quality of the new product.

For soybean seeds, size is an important indicator, the larger the seed, the greater the content of the endosperm. Large, well-maturing seeds give a high yield of the product. Plants sprouted from large seeds will have advantages in terms of stem height, root system size, leaf area and are less susceptible to diseases. The

size of the seed can characterize the mass of 1000 seeds. The results of the varieties in our study for the listed indicators are shown in the table 3.

Table3 – Physical indicators

Named of the variety	Shape of seed	Mass of 1000 seeds, г	Linear dimensions of the seed, mm		
			length (mm)	width (mm)	Thickness (mm)
Bilyavka (St)	Oval	144,9	9,0	7,3	6,0
Vision	Oval	167,4	9,1	6,8	5,2
Lybid	Spherical	180,5	8,9	6,4	5,5
Tanais	spherical – oval	180,6	9,5	7,2	6,0
422	Oval	164,1	9,0	7,2	6,0
180/2	oval – longest	160,1	9,1	7,0	6,0

The research showed that the varieties have an average mass of 1000 seeds (from 131-190 g).

In the analysis of linear dimensions of seeds, their coarseness and uniformity were determined.

Organoleptic indicators of seed quality include its color, heat and taste. These indicators are important for the production of flour, milk, cheese, canned food, protein concentrates, isolates and texturates.

For the direction of food use of oil peas, it is better that the color of the seeds and the scar is light, and there is no pigment. Pigmentation has not been observed in our varieties (Table 3).

Table 4 – Description of coloring soybean seeds

Name of variety	Color		
	Pigmentation of seed	Seeds shell	Seeds scar
Bilyavka (St)	Not	Yellow	Yellow
Vision	Not	Yellow	Yellow
Lybid	Not	Yellow	Yellow
Tanais	Not	Yellow	Yellow
422	Not	Yellow	Yellow
180/2	Not	Yellow	blackcurrant

In general, due to the good level of fat and protein in soybean and the absence of pigments in the seeds, all the studied varieties can be used as raw materials for the oil, animal feed and food industries.

Conclusion

The lower favorable temperature slows down the growth of heat-loving and cold-sensitive plants, leads to a slight decrease in the efficiency of photosynthesis, which was also observed in our research. In addition, the effect of lower favorable temperatures was observed in the composition of photosynthesis pigments.

According to the results of ecological variety testing, it was observed that the growth period of genotypes in the northern region increases by 7 – 18 days compared to the southern region. In the conditions of Kostanay region, 422, 180/2 varieties of fast-ripening oilseeds of domestic selection are promising.

Researches conducted in laboratory conditions showed that at the initial stage of plant growth, low temperatures (100c) negatively affect photosynthetic pigments: the content of chlorophyll a, chlorophyll B and carotenoids decreased, amounting to 46, 36-37 and 28-32%, respectively.

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