

**SELECTION OF OIL FLAX
IN SIBERIAN EXPERIMENTAL STATION**



DOI: 10.24411/2588-0209-2018-10020

UDK 633.854.54:631.527

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Summary

The article presents the results of selection in the flax oil seed Siberian Experimental Station (Omsk region, Russia) VNIIMK. Selection work on flax oil seed in the Station conducted since 1961, the main direction - the creation of highly productive mid-season- varieties with high oil content in the seeds of good quality, stability to fusarium, sloughing and lodging. Breeder's laboratory for this period created and regionalized 5 flax varieties: Isil'kul'skiy, Legur, Severnyy, Sokol, Avgust. Since 2016 the State variety testing takes new highly productive early maturing, highly stable to fusarium variety of oil flax Sapfir. Also, one of the promising areas of of oil flax breeding creation low linolenic varieties for use for food purposes. In the process selection of oil flax highly varieties sample created, with a high stability to fusarium having of linolenic acid content in the oil 1,32-31,53%. Each year, a new material that passes a rigorous selection.

Keywords: flax oil seed, selection, variety, productivity, oil content, stability to fusarium.

The oil flax is one of the most important technical cultures of the world. Its seeds contain more than 50% oil and up to 33% protein. Due to the high content of polyunsaturated fatty acids, linseed oil has a high iodine number (170-200 units) and when dried it forms a strong and

resistant film. Therefore, it is used to produce drying oil, paint and varnish, which is the standard of durability and reliability. Among technical oils, linseed oil occupies the first place in the world in terms of production. It is widely used in metalworking, electrical engineering, printing, leather-footwear, textile, food, medical, perfumery and many other industries [1].

Fresh flaxseed oil, due to the high total content of polyunsaturated fatty acids, has unique dietary and therapeutic-prophylactic properties. It is used to treat and prevent many diseases. Flaxseed oil helps to remove cholesterol from the body, improve the exchange of proteins and fats, and reduce the likelihood of blood clots [2].

Whole flaxseed in many countries is used as a popular supplement to various types of bread. It is one of the richest sources of lignans - substances that have a powerful antioxidant effect [3].

After the extraction from the flax seeds, oil remains cake and meal, which is a valuable high-protein concentrated food, which does not contain harmful substances and is easily digestible by agricultural animals. In 1 kg of feed contains 1.15 feed units, 285 g digested protein, 4.3 grams of calcium, 8.5 grams of phosphorus, 2 grams of carotene. Pectin substances in linseed meal swell in the water and give a thick mucus, beneficial for digestion and suitable for the treatment of gastrointestinal disorders of all kinds of animals. Myakina flax is an excellent food for pigs and sheep, since in 1 centimeter contains 27 feed units and 2 kg of protein [4].

The stalk of flax oil contains between 12 and 18% of fiber, suitable for processing on the patch and making coarse fabrics, ropes, twine, stuffing, packaging and heat insulation materials. In addition, flax straw contains up to 50% cellulose and can be used for the production of fine paper of high quality and cardboard. From the waste products of flax production - bonfires, by way of pressing they make building boards [5].

The reserve for increasing the productivity of flaxseed oil culture is the creation of new highly productive, adapted to local conditions varieties, with high seed oil and quality of oil resistant to major diseases and adverse environmental factors.

To realize this potential, it is of vital importance to create a new source material on the basis of modern selection methods using varieties of the world collection of VNIIR, hybridization, chemical mutagenesis, and the creation of genetic characteristic collections of flax [6].

According to FAO data, flax occupies about 3.5 million hectares of acreage in the world. Of these, more than 3 million hectares are planted with oil-bearing flax, which is used to produce oil and seeds [7].

At the border of the North-Kazakhstan and Omsk Regions for more than 55 years, the Siberian Experimental Station of the All-Russian Scientific Research Institute of Oil Crops named after V.S. Pustovoyta. The main task that was set before the station was the creation of new varieties of oilseeds for Western Siberia and Northern Kazakhstan.

Selection work on flax oil on the Siberian Experimental Station VNIIMK has been carried out since 1961. The main selection method at the first stage was multiple individual selection from the best varieties of the VNIIR collection, breeding varieties of other research institutions. At present, the main method of creating a source material is an intraspecific hybridization of ecologically and geographically distant forms with subsequent individual selection. Sortoobraztzy valued by the main biological and economically valuable traits: the duration of the growing season, the yield and harvest of oil from a unit area, oil content, plant height, the mass of 1000 seeds, resistance to disease.

Selective work on oil-flax is aimed at creating highly productive middle-ripening varieties with a high oil content in seeds of good quality, resistant to fusarium, shedding and lodging [8].

To the selection of flax oil, in addition to high yields, seed oil and early maturity, the requirements and high resistance to flaxseed fennel (f. Lini. Boll.) are required. Fusariosis is common in all zones of flax seeding, causing severe damage to varieties that are unstable to Fusarium and sharply reducing the yield, up to its complete death. Ill plants give frail, infected seeds and low-quality fiber.

At the Siberian experimental station, the selection of varieties of flax oil for resistance to fusariosis has been carried out since 1968 on an artificial fusarium background with a high load of Fusarium Lini. A scheme for selecting flax varieties for resistance to this disease has been developed. As a source material for the identification of resistant forms, hybrids obtained in crosses with sustainable breeding numbers and selection varieties of VNIIMK and other scientific institutions of the country and stable varieties of the VNIIR collection from Canada, USA, Argentina and other countries are used. Stability of created varieties on an infected background is 90-92% and higher. In normal field conditions on a natural background, such cultivars are practically not affected by fusariosis [9].

The seed-growing of flaxseeds is being carried out, according to the method of improving seed production, developed at VNIIMK. This allows not only to maintain high varietal purity of cultivated varieties, but also to improve their content of oil in seeds, the size of seeds, resistance to disease [10].

Breeders of the oil flax laboratory for this period of time created and zoned five varieties of flax.

Table 1

Characteristics of zoned varieties of flax oil
for economically valuable traits main
(average for 2012-2016).

Varieties	Year of regionalization	Vegetation period, days	Yield of seeds, t / ha	Seed oil, %	Oil collection, kg / ha	Weight of 1000 seeds, g	Plant height, cm
Isil'kul'skiy	1978	98	2,37	45,0	928	7,8	57
Legur	1990	99	2,56	47,8	1065	7,8	55
Severnnyy	1994	96	2,70	47,2	1109	8,7	60
Sokol	1998	102	2,54	47,1	1041	7,6	57
Av gust	2016	94	2,84	51,9	1282	7,9	55

Isil'kul'skiy - the variety was selected by the method of individual selection from the sample of the VIR collection in the Kustanai region. The mid-ripening, vegetative period is 90-105 days. The height of the plants is 55-70 cm. The weight of 1000 seeds is 7.0-8.0 g, the seeds are brown, the flowers are blue, the oil content is 44.0-46.4%, the iodine number of the oil is 178-185 units, the yield is 2.10 -2,40 t / ha. Matures amicably. Resistant to shedding and lodging, medium-resistant to drought. Neus-is tactful to fusariosis.

Legur - the variety is derived by hybridization of the Soyuz-Start grades with subsequent individual selection from the 4th generation of the hybrid. The medium-long, vegetative period is 90-105 days. The height of plants is 50-60 cm. The yield of seeds is 2.20-2.60 t / ha, the oil content of seeds is 47.5-48.5%, the iodine value of oil is 185 units. The weight of 1000 seeds is

7.8-8.2 g. Matures in unison. The variety is resistant to fusariosis, shedding and lodging. Suitable for mechanized cultivation. Designed to produce high-quality technical oil and short fiber.

Severnnyy - the variety was deduced by the method of multiple individual selection from a hybrid population from the crossing of a line from the VIR collection collection (Morocco K-1994) to the breeding line No. 157. The variety early-ripening, vegetation period is 80-104 days. The height of plants is 50-65 cm. The yield of seeds is 2.20-2.70 t / ha, the oil content of seeds is 47.0-48.0%, the iodine number of oil is 183 units. The weight of 1000 seeds is 8.5-9.0 g. Matures amicably. The variety is resistant to Fusarium, lodging and shedding. Suitable for mechanized cultivation. Designed to produce high-quality technical oil and short fiber.

Sokol- the variety is derived by the method of multiple individual selection from a hybrid population from crossing varieties / (Soyuz x Start) x Dawn /. The mid-ripening, vegetative period is 95-110 days. The height of plants is 50-60 cm. The yield of seeds is 2.20-2.60 t / ha, the oil content of seeds is 47.0-48.0%, the iodine number of oil is 190 units. The weight of 1000 seeds is 7.5-8.0 g. Matures together. The variety is resistant to Fusarium wilt, shedding and lodging. Suitable for mechanized cultivation. Designed to produce high-quality technical oil.

August - the variety was selected by the method of individual selection from a hybrid population of the third generation from the crossing of selection lines (34825 x 34577). Mid-ripening, the duration of the growing season is 87-100 days, well adapted to the soil and climatic conditions of Siberia. The height of the plants is 55-70 cm. The yield of seeds is 2.50-2.90 t / ha, the oil content is 51.0-52.5%, the iodine number is 179 units, the mass of 1000 seeds is 7.6-8.0 g. Matures amicably. The variety is resistant to Fusarium, lodging and shedding. Suitable for mechanized cultivation. Designed to produce high-quality technical oil.

Of the flax varieties of oilseed breeding of the Siberian experimental station, the Severniy variety is most common, which is characterized by a short vegetation period, high seed yield and a high mass of 1000 seeds. In August 2016, the August variety, which differs from the North with a higher oil content of seeds (higher by 4.7%), and a shorter duration of the growing season, was included in the State Register of Selection Achievements admitted for use in production.

Since 2016, the state variety testing is taking place in a new early-stage highly productive Fusarium-resistant grade of flax oil sapphire. The variety is well adapted to the soil and climatic conditions of Siberia. It differs from the North variety with higher oil content, higher by 3.5-4.5%, the duration of the growing season is shorter by 3-5 days, the yield of seeds is higher by

0.20-0.25 t / ha. The variety blossoms and ripens together, it is highly resistant to fusariosis, lodging and shedding.

Table 2

Characteristics of Flax Oil Sapphire

Sibirskaya opytnaya stantsiya (ESI 2014-2016 gg.)

Varieties	Vegetation period, days	Yield of seeds, t / ha	Seed oil, %	Oil collection, kg / ha	Weight of 1000 seeds, g	Plant height, cm
Sapfir	91	2,90	51,6	1301	7,8	60
Severnnyy St	96	2,67	47,1	1094	8,8	59
	-5	+0,23	+4,5	+207	-1,0	+1

The requirements of agricultural producers are increasing every year, so the requirements for new created varieties become tougher. Every year a new material is created, which is being rigorously selected. At the present time, one of the promising areas for selection of flax oilseed is the creation of low-linolenic varieties for the purpose of use for food purposes. In the process of selection of flax oleaginous, highly productive varieties were created, with high resistance to fusariosis, having a content of linolenic acid in oil of 1.32-31.53%, i.e. they can be recommended for production for various uses of linseed oil (food or technical).

Flax oleiferous is a crop at cultivation which does not demand the big expenses, has various directions of use (oil, flax fiber, fodder cakes and meal), differs high stability of efficiency. A large number of valuable properties of flaxseeds and processed products make their production all over the world very profitable. Flax is practically not affected by pests and diseases. If all the elements of the flax cultivation technology and the proper selection of regionalized varieties are observed in Siberian conditions, it is possible to obtain stably high yields of flaxseed oil. Due to early ripeness this culture early releases fields and harvesting equipment, which makes it competitive and promising for cultivation in the regions of Siberia, the Urals and Kazakhstan.

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