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CHANGES OF FATTY OIL AND PROTEIN IN SEEDS OF WINTER RAPSEED VARIETIES UNDER THE INFLUENCE OF SOWING DATES AND NORMS

Abstract: The article provides data about three sowing dates (20-25.09; 01-05.10; 10-15.10) and three sowing norms (1.0; 1.5; 2.0 million / hectare per hectare) on the growth, development for the cultivation of winter rapeseed and impact on seed yield and quality of Yasna varieties. In the winter rapeseed varieties, the sowing dates was early, in the 1st variant with the sowing norm of 1.0 million / ha, the seed oil content was 43.1%, in the 2nd variant with the sowing norm of 1.5 million / hectare, the figure was 42.4%, and in the 3rd variant with the sowing norm of 2.0 million / hectare, the sowing rate was 42.3%. When planted in the period was 40.5-40.1-39.8%, respectively. It can be seen that increasing the sowing rate of Yuntai by 500,000 seeds per hectare reduced the amount of oil in the seeds by 0.3-0.7%, while sowing of this variety by 1.5 million units per hectare yielded the highest amount of protein. It was observed that increasing the norm from 1.5 million / units to 500 thousand units per hectare reduced the amount of protein in the seeds by 0.5-0.6%, and reducing it by 500 thousand units by 0.3-0.4%.

According to the data obtained in our study on the effect of sowing dates, the delay in sowing date also led to a relative decrease in the amount of oil in rapeseed seeds.

Key words: winter rapeseed, sowing date and norm, yield, quality indicators, oil, protein.

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Introduction

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The food industry plays an important role in satisfying the food needs of the world's population. Therefore, one of the main tasks remains the sustainable development of local food and raw material production, the delivery of safe and quality food products to the market in the range specified in the standards.

Among oilseed crops (Brassicaceae), rapeseed is the highest yielding crop. In terms of biological and nutritional value, rapeseed oil ranked third in the world in terms of production after palm and soybeans, leaving behind oil-bearing crops such as olives,

cotton, and sunflower. Currently, 86 percent of rapeseed seeds in the world are used for oil production.

In the world, rapeseed oil is a raw material rich in essential fatty acids necessary for human and animal growth and development, as well as by-products of oil extraction - provendor and oilcake, high-protein food for poultry and animals, among medical personnel and vegetable oils. The demand for this raw material is very high, as it is one of the best.

Rapeseed oil is not inferior to sunflower and soybean oils in terms of food quality, and in terms of fat-acid content it is close to olive oil. Rapeseed oil is very good for health: it prevents the formation of blood clots in the body, lowers blood cholesterol,

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reduces the risk of cardiovascular disease, maintains the body's immunity, contains two linoleic and linolenic essential polyunsaturated fatty acids, i.e. omega-6 and omega-3. They play an important role in growth and reproductive processes, maintaining healthy skin and cell structure, and help prevent heart and autoimmune diseases (rheumatoid arthritis). Linoleic acid is a major component of cell membranes and brain tissue, while linolenic acid plays a fundamental role in oxygen metabolism in nerve cells, reducing the amount of cholesterol and triglycerides in the blood.

The degree which the problem has been studied. It is known that the rapeseed seed yield is influenced by the elements of cultivation technology, weather conditions and varietal characteristics of the crop. In any case, in order to increase the potential of plant biology, it is necessary to pay attention to its maintenance agrotechnics.

Although seed yield is the main economic indicator, this indicator is not an important factor determining the field productivity of rapeseed. A decrease in this figure can be offset by an increase in seed yield per 1 ha of area and a further increase in oil consumption. [1, 2, 3, 9, 10, 13].

Rapeseed seeds also contain significant amounts of pigments belonging to the chlorophyll group (10 mg / kg and above), which accelerate oxidation during storage and heating after exposure to oil during processing, as well as complicate the refining process. Thus, high levels of tocopherols in rapeseed seeds with a yellow shell and low content of pigments ensure the resistance of the oil to oxidation and improve its quality indicators [4, 5].

Although the oil content is high in seed content, it takes on a unique appearance due to the high yield per hectare.

It is known that one of the quality indicators of each plant is the amount of protein in this plant.

Seeds of oilseeds and products of their processing, in addition to oils and proteins, are very rich in a complex of biologically active substances, including vitamins and pro-vitamins, as well as phospholipids, carbohydrates and trace elements. Scientifically based methods of processing the seeds of oilseeds are aimed at maximizing the preservation of all valuable components in the process from harvesting to obtaining vegetable oil, protein and other products. [8].

MATERIALS AND METHODS

Our research was conducted at the Jizzakh Scientific Experimental Station of the Scientific Research Institute of Cotton Breeding, Seed Production and Agrotechnology for 2017-2020. The mechanical composition of the going to be meadow sierozem soils of Jizzakh region is moderately sandy, the groundwater level is at a depth of 2.0-2.5 meters, weakly saline.

In the experiment, Yuntai and Yasna varieties of winter rapeseed were selected, which have three sowing dates (20-25.09; 01-05.10; 10-15.10) and three sowing norms (1.0; 1.5; 2.0 million / units per hectare). From this study, based on scientific results, the level of germination, growth, development, periodicity between growth phases, high and high quality yields of winter rapeseed varieties in the conditions of going to be meadow sierozem soils of Jizzakh region.

The experimental field consisted of 18 variants, the area of each variant was 72 m², of which the calculated area was 36 m². The experiment was placed in three tiers and performed in three iterations, and the total area of the experiment was 0.40 ha.

The first year of the experimental field was irrigated at 10.09. After the land was ready, on 19.09, mineral fertilizers were applied and on 19.09 the land was plowed. For winter rapeseed the ground is required to be flat, so the experimental field is were chiseled on 20.09, and harrowed on 21.09. The harrow were pushed and the lines were taken on 22.09 planted for the first time on the day. After sowing the seeds, on 23.09, 500-600 m³ of seed water was given per day. In the second period of the experiment, the preparation of land for planting, sowing and watering of seeds after plowing, respectively, 30, 31.09, 01, 03.10. These measures were carried out on 06, 07, 10, 12, 13.10. Seeds are sown at a depth of 2-3 cm, depending on soil moisture.

Field and laboratory experiments, biometric and phenological observations of plants and various analyzes were carried out on the basis of such manuals as "Methods of field experiments" [6], "Methods of agrochemical analysis of soil and plants" [12], "Methods of agrophysical research" [11]. Statistical analysis of the results obtained in the experiments performed in the style of B.A.Dospekhov [7].

RESULTS AND DISCUSSION

According to the first data of the study, in 2017-2018, the increase in sowing norms of winter rape in the variety "Yuntai" led to a decrease in the amount of oil in rapeseed seeds. The sowing date of the experiment was early, in the 1st variant with the sowing norm of 1.0 million / hectare, the seed oil content was 40.8%, in the 2nd variant with the sowing norm of 1.5 million / hectare, the figure was 40.5%, in the 3rd variant, where the sowing rate was 2.0 million / ha per hectare, it was 40.3%. These indicators were found to be 40.5-40.2-39.8% in the medium term in accordance with the sowing norms, and 39.7-39.4-39.2% in the late sowing period, respectively. In the 10th variant with an early sowing period of 1.0 million / ha, the oil content in the seeds was 43.1%, in the 2nd option with a sowing rate of 1.5 million / ha - 42.4%. the sowing rate was 2.0 million / ha in option 3, it was 42.3%. In the medium term, it was 42.1-41.8-41.2%,

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according to the sowing norms, and in the late period it was 40.5-40.1-39.8%, respectively.

It can be seen that increasing the sowing rate by more than 500,000 seeds per hectare reduced the amount of oil in the seeds by 0.2-0.5% in the Yasna variety and 0.3-0.7% in the Yuntai variety.

According to the experience, the oil content of seeds in the early sowing of autumn rapeseed variety "Yuntai" was 40.8-40.5-40.2%, respectively, in options 1, 2, 3, respectively, in the medium term 4, 40.5-40.2-39.8% in variants 5 and 6, and 39.7-39.4-39.2% in variants 7, 8 and 9 planted late.

Table 1. The amount of oil and protein in the grain of winter rapeseed and the amount of oil per hectare (2017-2018)

№	Winter rapeseed cultivars	Sowing dates	Sowing norms mln, piece/ha	Seed yield, c/ha	Oil content in seed, %	The amount of oil per hectare, kg/ha	The amount of protein, %
1	Yuntai	20-25.09	1,0	29,5	40,8	1203,60	24,5
2			1,5	31,0	40,5	1255,50	24,8
3			2,0	31,3	40,3	1261,39	24,2
4		01-05.10	1,0	29,0	40,5	1174,50	24,0
5			1,5	32,8	40,2	1331,68	24,4
6			2,0	31,6	39,8	1257,68	23,8
7		10-15.10	1,0	26,1	39,7	1036,17	23,7
8			1,5	26,9	39,4	1059,86	24,1
9			2,0	27,8	39,2	1089,76	23,5
10	Yasna	20-25.09	1,0	32,9	43,1	1417,99	24,7
11			1,5	33,7	42,4	1428,88	24,9
12			2,0	34,9	42,3	1476,27	24,6
13		01-05.10	1,0	29,7	42,1	1250,37	24,2
14			1,5	30,1	41,8	1258,18	24,5
15			2,0	32,4	41,2	1334,88	24,2
16		10-15.10	1,0	28,8	40,5	1166,40	23,9
17			1,5	28,9	40,1	1158,89	24,1
18			2,0	29,9	39,8	1190,02	23,8

According to the data on the effect of sowing dates, the delay in sowing in the Yasna variety also led to a relative reduction in the amount of oil in rapeseed seeds. In other words, when this variety was sown in accordance with the norms of early sowing, the oil content in the seeds was 43.1-42.4-42.3%, respectively, in variants 10, 11, 12, and in variants 13, 14, 15 sown in the medium term were 42.1-41.8-

41.2%, and in late 16, 17, 18 variants 40.5-40.1-39.8%.

Thus, in the experiment, delaying the sowing period by 10 days increased the oil content by 0.3-0.5% in Yuntai, 0.6-1.1% in Yasna, and delaying the sowing period by 20 days, it was found to decrease to 1.0-1.1% from 5-3.3%.

Table 2. The amount of oil and protein in the grain of winter rapeseed and the amount of oil per hectare (2018-2019)

№	Winter rapeseed cultivars	Sowing dates	Sowing norms mln, piece/ha	Seed yield, c/ha	Oil content in seed, %	The amount of oil per hectare, kg/ha	The amount of protein, %
1	Yuntai	20-25.09	1,0	30,7	40,4	1240,28	23,8
2			1,5	32,1	40,2	1290,42	24,1
3			2,0	32,3	39,9	1288,77	23,6

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4			1,0	29,6	40,2	1189,92	23,4
5		01-05.10	1,5	33,0	40,3	1329,90	23,8
6			2,0	32,8	39,2	1285,76	23,6
7			1,0	27,6	39,2	1081,92	23,1
8		10-15.10	1,5	28,8	38,9	1120,32	23,4
9			2,0	28,7	38,6	1107,82	22,8
10	Yasna	20-25.09	1,0	33,8	42,1	1422,98	24,1
11			1,5	34,7	41,8	1450,46	24,3
12			2,0	36,8	42,0	1545,60	24,2
13		01-05.10	1,0	30,8	41,8	1287,44	23,5
14			1,5	31,4	41,4	1299,96	23,8
15			2,0	30,4	40,9	1243,36	23,6
16		10-15.10	1,0	29,2	40,0	1168,00	23,2
17			1,5	30,6	39,6	1211,76	23,4
18			2,0	31,5	39,2	1234,80	23,1

When analyzing the data on the amount of oil in the seeds, according to the data obtained, the highest oil content per hectare in the variety "Yuntai" was obtained in the 5th variant of the experiment, planted in the winter rapeseed in the medium term at a rate of 1.5 million / ha, 1331.68 kg / g formed. At the same sowing rate, when rapeseed was planted early, the oil content was formed 1255.50 kg / ha in variant 2, 76.18 kg / ha compared to variant 5, and 1059.86 kg / ha in

late variant 8. In comparison with variant 5, it was found that it was less than 271.82 kg / ha. At the same sowing rate, when rapeseed was planted in the medium term, the oil content was 1334.88 kg / ha in variant 15, 141.39 kg / ha compared to variant 12, and 1190.02 kg / ha in variant 18 planted late. Compared to option 12, it was found to be 286.25 kg / ha less. Similar patterns have been observed in other planting dates and norms of the experiment.

Table 3. The amount of oil and protein in the grain of winter rapeseed and the amount of oil per hectare (2019-2020)

№	Winter rapeseed cultivars	Sowing dates	Sowing norms mln, piece/ha	Seed yield, c/ha	Oil content in seed, %	The amount of oil per hectare, kg/ha	The amount of protein, %
1	Yuntai	20-25.09	1,0	29,2	41,3	1203,04	24,9
2			1,5	30,5	41,2	1259,65	25,1
3			2,0	30,9	40,9	1263,81	24,6
4		01-05.10	1,0	28,7	41,2	1182,44	24,4
5			1,5	32,3	41,1	1327,53	24,9
6			2,0	31,3	40,0	1252,00	24,2
7		10-15.10	1,0	25,5	40,2	1025,10	24,1
8			1,5	26,4	39,8	1050,72	24,5
9			2,0	26,0	39,6	1029,60	23,8
10	Yasna	20-25.09	1,0	31,7	42,9	1359,93	24,7
11			1,5	32,4	42,7	1383,48	25,3
12			2,0	33,9	42,7	1447,53	25,2
13		01-05.10	1,0	28,3	42,4	1199,92	24,6
14			1,5	29,1	42,1	1525,11	24,8
15			2,0	32,0	41,5	1328,00	24,6
16		10-15.10	1,0	26,6	40,9	1087,94	24,2
17			1,5	27,8	40,5	1125,90	24,5
18			2,0	28,6	41,0	1172,60	24,2

It should be noted that the oil content of winter rapeseed seeds of Yasna variety was on average 1.9-

2.3% higher than the oil content of Yuntai seeds, i.e. the oil content of Yasna seeds of winter rapeseed was

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higher. However, the data obtained on the effect of sowing dates and norms on seed quality indicators repeated the patterns observed in the Yuntai variety.

It is known that one of the quality indicators of each plant is the amount of protein in this plant. When analyzing the protein data of autumn rapeseed varieties, the highest protein content in the seeds was observed when sowing 1.5 million / ha per hectare in the early period of the experiment, in variant 2-11, this figure was 24.8-24.9%.

This figure is 24.5-24.7% for varieties 1-10 planted with 1.0 million units per hectare during the sowing period, and 24.2-24.6% for varieties 3-12 planted with 2.0 million units per hectare. These patterns were also observed during the remaining planting periods of the experiment.

This means that sowing of winter rapeseed varieties with a maximum yield of 1.5 million / units per hectare will increase the sowing rate from 1.5 million / hectare to 500,000 units per hectare, reducing the protein content of seeds by 0.5-0.6% to 500,000 units while it decreased by 0.3-0.4%.

In the remaining years of our experiments, these patterns have been repeated.

CONCLUSIONS

It can be seen that the increase in sowing norms by more than 500,000 seeds per hectare reduced the amount of oil in the seeds of "Yasna" variety by 0.2-0.5% and Yuntai variety by 0.3-0.7%. Delaying sowing norms by 10 days reduced amount of oil in seed by 0.3-0.5% in Yuntai variety, " by 0.6-1.1% in Yasna "variety, and sowing norms were delayed by 20 days, the amount of oil in seed was found to be from 1.0-1.1% to 2.5-3.3%.

The oil content of Yasna seeds of winter rapeseed was 1.9-2.3% higher than the oil content of Yuntai seeds, i.e. the oil content of Yasna seeds of winter rapeseed was higher.

Sowing 1.5 million / ha of winter rapeseed varieties with the maximum amount of protein per hectare, increasing the sowing rate from 1.5 million / ha to 500,000 grains per hectare, reducing the protein content of seeds by 0.5-0.6%, and it was proved that reducing sowing norms by 500 thousand grains per hectare, caused in reducing oil content by 0.3-0.4%.

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