

Development of Indau Seed Technology (*Eruca Sativa* Mill) in the Southern Region of Uzbekistan

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ABSTRACT

The article presents the results of research on the development of elements of seed production technology introduced in the conditions of Uzbekistan, a rare, but valuable in terms of nutritional values and medicinal properties of a vegetable crop - indau. The largest and high-quality seed yield (4.5-5.5 t/ha) was obtained when seeds were sown on September 10 and the planting pattern was 70x20 cm, 70x25 cm. Studies have shown high seed productivity and high efficiency of indau seed production in Uzbekistan

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Кириш. Индау (*Eruca sativa* Mill.) кам тарқалган қимматли сабзавот экинларидан бири ҳисобланади. А.Н.Папонов, Т.Казанцева (2001) таъкидлашича индау аъло даражадаги ўзига хос ҳидга ва аччиқ таъмга эга бўлиб, айрим кишилар уни ёнғоқ-ханталга, айримлар уни ковурилган ёввойи паррандага ўхшатади.

It contains up to 14% of dry matter, mustard oil, and leaves contain antioxidants - vitamins (S, A, K, R, N), vitamins of group V, rich in folic acid.

One of the important aspects is the presence of a large amount of potassium, calcium and vital phosphorus, iron, and iodine salts. All this determines the dietary value of indau. (Vigorov L.I., 1969; Vasilenko M.T., 1975; Paponov A.N., Kazantseva T., 2001; Spirichev V.B., 2004; Kursheva J.V., 2009).

According to Golovko T.K., Tabalenkova G.N. and others (2010), the following substances are present in indau leaf (in terms of mg per 100 g of product) in protected areas: chlorophyll-82, caratinoids-18, ascorbic acid-267, monosaccharides-710, disaccharides-70, total nitrogen-430, amino acids-1930.

They claim that indau contains more calcium and molybdenum salts than lettuce, scallions, basil, and cilantro.

In the researches of J.V. Kursheva (2009), the composition of watercress-lettuce, indau and two-row thin leaf crops was studied, and in terms of dry matter, vitamin C and sugar content, indau was more superior than other studied crops and retained 2 times less nitrates.

For the first time, the author determined the content of iodine and selenium in the above crops. The largest amount of micronutrients is found in indau. Indau dry mass contains 835 µkg/kg of iodine and 132 µkg/kg of selenium. These indicators mean 2 times more than other crops. Therefore, attention to this crop is increasing in recent years.

Part of the research conducted within the framework of the introduction of indau to the conditions of Uzbekistan is aimed at the development of its seed production technology, some of its results are presented in this article.

Research material and method. Indau seed plants are planted in the following planting schemes: 70x20; 70x25; 70x30; 70x35 cm and in the following terms: 10.09; 20.09; 30.09; 10.10 planted and studied. In a scheme of 70x20 cm, the feeding area of one plant is 0.14 m², The number of plants in 1 hectare is 71429 plants; In a scheme of 70x25 cm, the feeding area of one plant is 0.175 m², The number of plants in 1 hectare is 57143 units; In a scheme of 70x30 cm, the feeding area of one plant is 0.21 m², The number of plants in 1 hectare is 47,619; In a scheme of 70x35 cm, the feeding area of one plant is 0.24 m² and the number of plants per 1 hec was 41,667.

The Sicilian variety was taken as the object of research. During the growth period, phenological observations and morphobiological characterization were carried out before the collection of seed plants. Observation and measurements were carried out individually on 20 plants in each variant. The height of the seed plant, the number of branches in one plant, the number of pods, the seed productivity of one plant, and the yield characteristics of seeds were determined.

Research results. Planting periods and schemes significantly affected the manifestation of morphobiological and economic important characters of indau plant, table 1. When the seeds were sown on September 10, regardless of the planting scheme, the plant height was almost the same compared to the three-year average data and was 179-180 cm. A slight difference was noticed here by years. In 2018, plant height was 193-196 cm, depending on planting schemes, in 2019 - 168-172 cm, in 2020 - 179-184 cm. The number of branches per plant increased as the feeding area expanded. In particular, when planted in a 70x20 cm plot, the average number of branches per plant was 17 pieces, in a 70x25 cm plot, it was 19 pieces, in a 70x30 cm plot, 21 pieces, and in a 70x35 cm plot, it was 20 pieces, and this is 11.8% in accordance with the first version of the experiment; 23.5%; 17.6% means a lot.

This ultimately led to an increase in the number of pods and an increase in seed productivity. Like the number of branches, the number of pods increased as the feeding area expanded. In the smallest feeding area (70x20 cm plot), the number of pods per plant was 2467, while in the 70x25 cm plot, it was 2558, in the 70x30 cm plot, it was 2923, and in the 70x35 plot, it was 2802. This is 103.7% in accordance with the first version of the experiment; 118.5%; 113.% means a lot. During the research years, the highest number of pods in one plant was observed in 2019.

One of the most important economic traits, the seed yield per plant also increased with the expansion of the feeding area. The seed yield of one plant was 77 g in the least feeding area, i.e. 70x20 cm planting scheme. In the scheme of 70x25 cm, this indicator was 79 g, in the scheme of 70x30 cm it was 91 g, and in the scheme of 70x35 it was 84 g.

Table 1
Manifestation of important economic characteristics of indau seed plants in different planting schemes and periods (2019-2021 year)

Planting scheme	Plant height, cm	Number of branches, pcs	Number of piles, pcs	Plant productivity, g/plant
10.09				
70x20	180	17	2467	77
70x25	180	19	2558	79
70x30	179	21	2923	91
70x35	180	20	2802	84
Σ	719	77	10750	331
x	180	19	2688	83
20.09				
70x20	172	16	2137	63
70x25	171	18	2536	68
70x30	171	19	2939	74
70x35	169	18	2766	73
Σ	683	71	10378	278
x	171	18	2595	70
30.09				

70x20	160	15	1432	41
70x25	158	16	1675	42
70x30	159	18	2063	52
70x35	157	17	1984	51
Σ	634	66	7154	186
x	159	17	1789	47
10.10				
70x20	140	14	1421	39
70x25	138	15	1578	40
70x30	139	16	1952	47
70x35	137	17	1848	46
Σ	554	62	6861	172
x	139	16	1700	43

At this point, we found it necessary to mention the data obtained in the research carried out in the Perm region of the Russian Federation. Here Shirinkin V.N. (2012) studied seed plants of indau cultivar Izumrudnaya grown directly from seeds and seedlings. Plants are 450 cm in both cultivation methods², 900sm², 1350sm² studied in the field of nutrition. 450 cm² when grown directly from seed seed yield of indau plant in the feeding area is 5.3 g, 900 cm² da-11.84 g, 1350 cm² in - 11.79 g, and correspondingly 6.13 g when grown through seedlings; 8.57 g; It was 12.68 g. Kursheva J.V. in the Moscow region of the Russian Federation. (2009) also obtained similar data.

When these indicators are compared, it indicates that the seed productivity of the indau plant is very high in the conditions of the south of Uzbekistan.

When the seeds were planted on September 20, a slight decrease in plant height was observed as the feeding area expanded. The expansion of the feeding area led to a slight increase in the number of branches on the plant.

The height of seed plants in the least feeding area (70x20 cm) was 172 cm, and in the most feeding area (70x35) it was 169 cm.

In the plants planted in the 70x20 cm scheme, the number of branches was 16, while in the 70x25 cm scheme, this indicator was 18. The largest number of branches (19) was observed in plants planted in a 70x30 cm scheme. Planting patterns significantly affected the number of pods per plant and seed yield, meaning that their number increased as the feeding area expanded. In particular, 2137 tubers were formed on one plant in the 70x20 cm scheme, 2536 in the 70x25 cm scheme, 2939 in the 70x30 cm scheme, and 2766 in the 70x35 cm scheme. Compared to the first version of the experiment, 400 more tubers were formed in the 70x25 cm plot, 802 in the 70x30 cm plot, and 629 in the 70x35 cm plot, which is 118.7% compared to the 70x20 cm plot; 137.5%; 129.4% means a lot. One of the most important characteristics was that the seed yield of a single plant also varied according to the planting patterns. As the nutritional area expanded, the seed productivity of the plant also increased. The seed yield of plants planted in the 70x20 scheme was 63 g, in the 70x25 cm scheme - 68 g, in the 70x30 cm scheme - 74 g, and in the 70x35 cm scheme - 73 g.

These indicators are 14 in accordance with September 10; 11; 17; 11 g means less. So, as the planting dates are delayed, the seed productivity of the plants also decreases.

When the indau seeds were sown on September 30, all indicators of seed plants were significantly reduced. The height of seed plants was 157-160 cm, depending on the planting scheme. When the Indau seeds were sown on September 10, the height of the seed plants was 179-180 cm. Even in this planting period, plant height decreased as the feeding area expanded. In the scheme of 70x20 cm, the height of the plant was 160 cm, and in the scheme of 70x35 it was 157 cm. As the feeding area expanded, so did the number of branches per plant. In the scheme of 70x20 cm, the number of branches in one plant was 15, while in the scheme of 70x30, 70x35 cm, their number reached 17-18.

The number of tillers per plant also varied between planting schemes during this planting period. In the scheme of 70x20 cm, one seed plant produced 1432, in the scheme of 70x25 cm, 1645, in the scheme of 70x30 cm, 2047, in the scheme of 70x35 cm, 1984. Compared to the first version of the experiment, 213 (114.8%) more tubers were formed in the second version, 615 (143.0%) in the third version, and 552 (138.5%)

in the fourth version. As for seed plants planted on September 10, 58.0% (1035 less) in the 70x20 cm scheme, 64.3% (913 less) in the 70x25 cm scheme, 70.0% (876 less) in the 70x30 cm scheme, in the 70x35 cm scheme 70.8% (818 fewer) piles were formed. When the seeds were sown on October 10, the height of the seed plants was the lowest. The height of seed plants was 137-140 cm, depending on the planting scheme. During this period, as the feeding area expanded, the number of plants decreased. This means 40-42 cm less than the first period, that is, compared to September 10. As the feeding area expanded, the number of branches per plant decreased. In the 70x20 cm scheme, 14 branches were formed in the seed plant, while in the 70x35 cm scheme, this indicator was 17. Compared to the first term, it was 3-4 less, or 81.0-82.4%. The lowest number of pods was also observed in this planting period and was 1421-1952 depending on the planting patterns. As the feeding area expanded, the number of pods per plant increased. In the 70x20 cm scheme, 1421 pods were formed per plant, in the 70x25 cm scheme - 1578, in the 70x30 cm scheme, 1952, and in the 70x35 cm scheme, 1848 pods were formed. 1046 in accordance with this first term; 980; 971; 954 less or 57.6%; 61.7%; 66.8%; It was 66.0%. The lowest seed yield was observed in plants planted in this period and was 39-47 g, depending on the planting scheme. The lowest seed yield was observed in seed plants planted in the 70x20 cm scheme and it was 39 g. During this period, as the feeding area increased, the seed productivity of the plants increased. It was 40 g in the 70x25 cm scheme, 47 g in the 70x30 cm scheme and 46 g in the 70x35 cm scheme. This is 38 in accordance with the planting schemes of the first term; 39; 44; less than 38 or 50.6; 50.6; 51.6; It was 54.8%.

Thus, the manifestation of important morphobiological and economic characteristics of indau seed plants in different planting periods and schemes was studied. Depending on the planting period, the transition period and duration of the development periods of the indau plant differed.

Planting periods and schemes significantly affect the manifestation of characters such as plant height, number of branches, number of pods, plant seed productivity.

The highest seed yield was obtained in the scheme of 70x20 cm and in the variant planted on September 10. 1 m² in this term and scheme 550 g seed yield was obtained from the area, which is 5.5 t/ha per hectare. A similar yield was obtained in the 70x20 cm scheme and when planted on September 20 (4.5 t/ha). These indicators showed that the seed yield of indau plant is very high in the south of Uzbekistan. Studies have shown that the South of Uzbekistan has great potential in the establishment of indau seed production, and the establishment of this work will bring great economic benefits.

Table 1

Seed yield and yield of indau seed plants in different planting schemes and periods, (year 2019-2021)

Planting scheme	Plant seed productivity, g/plant	Seed yield		Weight of 1000 seeds, g
		г/м ²	т/га	
10.09				
70x20	77	550	5,5	1,41
70x25	79	451	4,5	1,43
70x30	91	422	4,2	1,45
70x35	84	351	3,5	1,50
HCP ₀₅			1,2	
S _{x%}			0,9	
20.09				
70x20	63	450	4,5	
70x25	68	389	3,9	
70x30	74	344	3,4	
70x35	73	305	3,0	
HCP ₀₅			0,8	
S _{x%}			0,5	
30.09				
70x20	41	293	2,9	
70x25	42	240	2,4	

70x30	52	241	2,4	
70x35	51	213	2,1	
HCP ₀₅			0,6	
S _{x%}			0,4	
10.10				
70x20	39	279	2,8	
70x25	40	229	2,3	
70x30	47	218	2,2	
70x35	46	192	1,9	
HCP ₀₅			0,7	
S _{x%}			0,5	

It was observed that the seed yield of indau sharply decreases as the planting dates are delayed. In particular, in the 70x20 cm scheme, when seeds were sown on September 10, the seed yield was 5.5 t/ha, while in the same scheme, it was 2.8 t/ha when planted on October 10, or 50.9% compared to the period on September 10. When planted in a 70x35 cm scheme, the seed yield was 3.5 t/ha on September 10, and 1.9 t/ha when planted on October 10 in the same scheme. This is 54.3% compared to the period on September 10.

As a result of the research conducted in this way, it is recommended to plant seed plants in the south of Uzbekistan on September 10 in the scheme of 70x20 and 70x25 cm in order to grow high-quality seeds from indau. The seed yield of indau when planted in these periods and schemes was 5.5 and 4.5 t/ha, respectively.

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