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Determination of the Best Feeding Area for Growing Cauliflower (Brassica Oleracea Var. Botrytis) in Protected Land Areas

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ABSTRACT

In the republic, there are not enough scientifically-based recommendations on the feeding area and placement methods for growing cauliflower, so in order to grow cauliflower and achieve high productivity in it, many scientists and practicing experts are conducting many experiments on its most suitable planting schemes.

KEYWORDS: *Cauliflower, leaf surface, leaf length, seed, seedling, planting scheme, fertilization, temperature, growth period.*

INTRODUCTION

In recent years, cauliflower cultivation has been given special importance in many countries of the world. The volume of cauliflower production and export is increasing year by year. Cauliflower is grown on 400,000 hectares worldwide, and most of it is grown in countries such as France, Italy, Great Britain, the Netherlands and India. At present, the world production of cauliflower is 4,3-4,5 million tons. In the current conditions, the consumer's demand for the quality and value of the composition of vegetable products is increasing day by day. Therefore, it is urgent to create varieties and hybrids of vegetable crops that are resistant to diseases and pests, give high yields, especially with high nutritional and technological quality, to determine suitable planting schemes and introduce them into production.

For this reason, we aimed to determine the scheme of planting cauliflower early in protected land areas.

The cabbage group of vegetables includes various types of cabbage belonging to the family Brassicaseas (Cruciferae). Cabbage, other vegetables (radish, turnip, radish, mustard, horseradish) and horseradish also belong to this botanical family. Cauliflower is a plant belonging to the genus (*Brassica oleracea var. botrytis*).

Usually, the optimal feeding area depends on the planting and its variety, as well as the external environmental conditions and the agrotechnics used. Saline and swampy lands are not very suitable for planting cauliflower. It gives a high yield on well-fertilized, light loam and sandy soils in terms of mechanical composition. It can be grown in medium and heavy sandy soils. The area that can ensure the germination and maturation of one plant with the use of less labor and material means and a large harvest is the area of optimal nutrition of the plant. (Eidelstein V.I., Zuev V.I and Abdullaev A.G.).

Sh.I. Asatov writes that in Germany, cauliflower is planted in the open field in the scheme of 60x60 and 80x80 cm, and under the tunnel enclosures spread in France, at a thickness of 15-18 thousand bushes per hectare. (1996).

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In this regard, during the years 1990-1995, Asatov Sh.I. worked on the cultivation of cauliflower in the spring season under temporary low film covers. (1996) conducted experiments. In this study, the research was carried out to determine the most optimal scheme of the crop and the most convenient feeding areas by planting cauliflower under a film cover in double-row 90+50 cm and three-row 90+60+60 cm methods and placing plants in rows at intervals of 20, 25, 30, 35 cm. directed. As a result of these experiments, the author Asatov Sh.I. (1996-2012) made scientific and practical vegetable growing conclusions, including:

1. Enlarging the area of plant nutrition and reducing the density (number) of crops per unit area accelerates the development of the plant, for example, increasing the distance between plants in a row from 20 cm to 30-35 cm accelerates the ripening of cauliflower heads by 7-10 days;

2. When the number of rows is three (triple) instead of two (double) while the nutritional area is equal, the development of plants slows down for 1-2 days;

3. Intensification of crops, i.e. reducing the surface of feeding areas, reduces the number and surface of leaves per plant;

4. Due to the expansion of the surface of the feeding grounds by extending the distance between the plants in the row, the number and surface of the leaves increases, the cabbage heads become larger, and their average weight and content of dry matter, nutrients, vitamin C and nitrates increases. These indicators were higher when placing the crop in a three-row average two-row method.

Experience styles. The field experiments were carried out in the training field of the Agricultural Information and Consultation Center (Extension Center) under the Tashkent State Agrarian University based on the methodical manuals of B.J.Azimov, B.B.Azimov's "Methodology of conducting experiments in vegetable growing, potato growing and potato growing". [1; 2; 3; 4; 5; 6; 8; 9; 10.].

Field experiments to determine the optimal planting scheme were conducted 4 times in 7 m^2 plots with a length of 5 meters. The number of plants in the account was 33. Planting scheme 70×30 cm, Kashmer F_1 variety was used.

Research results. Cauliflower in the field experiment area of Tashkent State Agrarian University was planted in the spring period temporarily using transparent film tunnel closures, in order to grow early and high-quality crops, seedlings were planted in rows of 70 cm at intervals of 20-45 cm. The Talassa F_1 variety of cauliflower was used in the experiment.

In the experiment, the cauliflower seedlings transferred to the crop rows are spaced from 20 cm to 45 cm in a known standard between six types, that is, extending the spacing of plants of each type by 5 cm increases the feeding area by 0,140; 0,175; 0,210; 0,245; With the extension of 0,280 and 0,315 m^2, the number of plants per hectare changed significantly. (Table 1).

Table 1. Effect of cauliflower planting density on plant foliage (2022-2023).

№	Varieties (planting scheme, cm)	Feeding area of one plant, m^2	Plants per hectare		Leaves on a plant		Length of the largest leaf, cm
			soni	%	soni	%	
1	70x20	0,140	71,4	150	14,7	86	35,5
2	70x25	0,175	57,1	120	15,8	92	36,7
3	70x30 (Control)	0,210	47,6	100	17,1	100	38,8
4	70x35	0,245	40,8	86	18,7	109	40,4
5	70x40	0,280	35,7	75	19,9	116	42,4
6	70x45	0,315	31,7	67	20,9	122	42,7

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When cauliflower seedlings are planted in a planting scheme of 70x20-25 cm, the number of plants per hectare is 20 and 50% more than in the comparative variety (70x30 cm), that is, it is denser. When planting seedlings at intervals of 70x35, 40, 45 cm, plants in the cultivated area were thinned by 14, 25 and 33%, respectively.

Biometric measurements show that the number of leaves is 8-14% less in densely planted plants (types 1, 2) compared to the comparator (type 3), and 9, 16 and 22% more in sparsely planted plants. ldi The largest leaves in deciduous plants have grown relatively taller.

Due to the increase in the number and height of the leaves in each bush due to the expansion of the food area of plants, that is, the thinning, the level of the leaves, that is, the absorption surface, also expanded.

The figures in Table 2 show that when planting cauliflower seedlings with reduced feeding areas (types 1 and 2), the leaf surface area of each plant was 64 and 81% compared to the comparative type (3), that is, 36 and decreased by 19%. In the varieties planted with expanded feeding areas, it was 118, 130 and 140% of the assimilation surface of the plant. However, when calculating the assimilation surface of the leaves of each plant per hectare, such changes were weak compared to the comparative (control) species. These indicators showed that over-dense (70x20 cm) or over-thinning (70x45 cm) placement of cauliflower seedlings reduced the total assimilation surface of plants in the field by only 3-7%.

But when transplanting cauliflower seedlings to the field, the substances absorbed from the soil related to the expansion of the plant nutrition area, the gas-air regime, and especially due to the enlargement of the assimilation surface of each plant, the possibilities of using light energy have been adjusted.

Figure 1. Field of experience

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Table 2. Effect of cauliflower planting density on plant development (2022-2023 year).

№	Plant nutrition area, m^2	Number of plants per hectare, pcs	Leaf surface, m^2				Past days after sowing	
			in 1 pcs		in 1 hectare		Bunches of carnations	
			m^2	%	m^2	%	Until the beginning of the formation of the inflorescence, day	Duration of ripening, days
1	0,140	71,4	0,43	64	30702	96	63	75
2	0,175	57,1	0,54	81	30834	97	62	73
3	0,210 - control	47,6	0,67	100	31892	100	59	68
4	0,245	40,8	0,79	118	32943	103	57	66
5	0,280	35,7	0,78	130	31059	97	54	63
6	0,315	31,7	0,94	140	29798	93	53	61

It was observed that due to increased nutrition of plants from the soil and air, the growth of the crop increased and the development accelerated. In particular, denser planting of cauliflower seedlings compared to comparison type 3 (types 1 and 2). The beginning of the formation of carnation bunches was delayed by 3-4 days, and the initial harvest was delayed by 5-7 days. Placement of plants at a distance of 35, 40, 45 cm accelerated the formation of cabbage inflorescences by 2, 5, 6 days, and harvesting of the initial crop by 2, 5, 6 days.

The fact that plants have different assimilation surfaces in different feeding areas, their differences in growth and development, and the formation of cabbage inflorescences at different speeds have an effect on the amount of the commodity crop and the acceleration of maturation. (Table 3).

By weight, the largest cabbage inflorescences were formed in the plants that were planted with the least thinning (31,700 bushes/hectare), therefore, the harvest started 10-11 days earlier.

The smallest cabbage inflorescences were sown densely (71,400 bushels / hectare), due to which they developed weakly and the end of the harvest was observed in plants that were quite late.

From the data of Table 3, it can be seen that the lowest amount of early harvest (6,2 t/ha) is in the type with densely planted seedlings, the feeding area is 0,140 m^2, the number of plants is 71,400 plants per hectare. It's done.

Thinning of seedlings had a strong effect on early harvest. In particular, in the variety with a feeding area of 0,245 feeding area, the early yield was 2,2 t/ha or 26,5% compared to the comparison type (0,210 m^2), and in the feeding areas of 0,280 m^2 and 0,315 m^2, it was 3,4 t/ha and 2,8 t/ha or 41,0 and 33,7% higher, respectively.

Table 3. The influence of cauliflower plant feeding area on the speed of crop ripening (2022-2023 average).

№	Feeding area of one plant, m^2	Number of plants per hectare, thousand	The average weight of a ripe cabbage floret, g	Next harvest			
				T\ hectares	In comparison		% of total yield
					t/ga	%	
1	0,140	71,4	226	6,2	-2,1	74,7	32,5
2	0,175	57,1	383	7,3	-1,0	87,9	33,3
3	0,210	47,6	475	8,3	-	100	36,8

	(comparative)						
4	0,245	40,8	581	10,5	2,2	126,5	44,6
5	0,280	35,7	657	11,7	3,4	141	49,7
6	0,315	31,7	692	11,1	2,8	133,7	50,8

With the increase of the cauliflower feeding area and the decrease in the number of plants in the cultivated area, not only the amount of the early harvest increased, but its contribution to the total yield was also high. For example, when 71,400 bushes were planted with dense planting, the early harvest was 32,5% of the total harvest, and when 31,700 seedlings were planted with thinning, this figure was 50,8%. (Table 3).

44,6% of the total harvest due to lengthening the row spacing from 30 cm to 40 cm and 45 cm or reducing the number of plants per hectare from 47,600 (comparative) to 40,800, 35,700 and 31,700 bushes in the comparative variety in the experiment, 49,7% and 50,8% were harvested prematurely and the remaining part was harvested, due to the thinning of the crop density, the conditions were further adjusted. As a result, the subsequent cabbage inflorescences became larger (Table 3).

Thus, the growth of cabbage inflorescences formed on sparsely located plants had a positive effect on the increase of the total yield. However, due to the fact that the leaves of the thinning plant are not as upright as possible, but instead grow towards branching, it becomes difficult to protect the forming cabbages from the negative effects of sunlight. As a result, some cabbages have reduced the quality of the product by changing the clear whiteness (high quality) characteristic to yellowish and yellowish-purple color.

As shown by the numbers in Table 4, high and high-quality harvests of cauliflower plants were observed in varieties placed in 70x35, 70x40 cm plots. The average weight of cabbage grown by planting seedlings in a 70x45 cm pattern was 1,0 t/ha or 8,6% less than the comparison variety, regardless of the highest (large) weight.

Table 4. Effect of cauliflower planting density on productivity and product quality

№	Scheme of planting a plant, cm	Number of plants per hectare, pcs	Average weight of 1 bunch of cabbage in the harvest, g	Total yield, t/ha	High-quality cabbage bouquets		
					%	T/ha	In addition to the comparative, t/ha
1	70x20	71400	276	19,7	97,8	19,3	-3,5
2	70x25	57100	380	21,6	96,6	20,8	-0,7
3	70x30 (comparative)	47600	484	23,0	95,0	22,6	-
4	70x35	40800	597	24,3	94,5	23,5	0,9
5	70x40	35700	667	23,8	93,3	23,5	0,9
6	70x45	31700	732	23,2	86,4	21,6	1,0

Economic efficiency of planting density in cauliflower production.

The importance of any technological (agrotechnical) event used in farming, including production, is measured by the difference between the amount of expenses related to its use and the input value resulting from the production process, that is, economic efficiency.

In this study, which is aimed at determining the planting density of cauliflower in the spring period, plants are placed in rows of 70 cm at intervals of 70x20, 70x25, 70x30, 70x35, 70x40 and 70x45 cm, that is, 71428, 57143, 47619, 40816, per hectare of cultivated area. 35714 and 31746 seedlings are used.

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In the conditions of the market economy and currently existing economized farms, the purchase price including direct and indirect (overhead) costs for growing 1,000 seedlings was shown as 50,000 soums effective in 2023. Therefore, when planting seedlings in a row, if the distance is greater than 20 cm, the number of seedlings will decrease, and the amount of expenses will also decrease. However, as it was mentioned above, the distance between the plants, i.e. thinning, has a slight negative effect on the quality of the crop and the amount of ripe high-quality cabbages, so it can also affect the amount of income from the sale of the product. To determine these, first of all, the Ministry of Agriculture of the Republic of Uzbekistan summarizes the direct and indirect overhead costs for the general technological processes of cabbage cultivation (cultivation, plowing, leveling, preparation for planting, planting, maintenance, etc.) approved.

The instructions of the model technological card for the care of the main agricultural crops and the production of their products were used.

Cauliflower yield was estimated at 5,000,000 soums/kg based on the conditions of the current market economy.

Table 5. Economic efficiency of cauliflower cultivation in different planting schemes, thousand soums/ha.

Indicators (expenditure and income)	Spacing of seedlings in crop rows					
	70x20	70x25	70x30 (Control)	70x35	70x40	70x45
Land preparation for planting, thousand soums	1759	1759	1759	1759	1759	1759
Preparation and planting of seedlings and maintenance thousand soums	22 550	22 400	22 260	22 100	21 950	21 820
For harvesting, sorting and transportation, one thousand soums	2 600	2 780	2 860	2 950	2 950	2 820
Total cost, thousand sums	26 909	26 939	26 879	26 809	26 659	26 399
Direct costs, thousand. soum (25%)	6 727	6 734	6 719	6 702	6 664	6 599
Total expenses, thousand soums	33 636	33 673	33 598	33 511	33 323	32 998
Commercial yield, t/ha	19,3	20,8	22,6	23,5	23,5	21,6
Price of 1 t of harvest, thousand. soum	5000	5000	5000	5000	5000	5000
Cost of goods sold.	96 500	104 000	113 000	117 500	117 500	108 000
Cost of 1 t crop	1742	1618	1429	1426	1418	1 527
Net profit, thousand. soum	62 864	70 327	79 402	83 989	84 177	107 967
Profitability, %	186	208	236	250	252	327

The level of efficiency of the cultivated crop (profitability) was mainly determined by the cost spent and the amount of the cultivated product. However, it is natural that this concept differs sharply in the conditions of the current market economy, especially when taking into account the periods of scarcity or, on the contrary, abundance of products.

According to the figures given in the table, the expenses for cauliflower cultivation and general agro-technical works are 1759 thousand soums, and the largest part of the total expenses is the purchase of seedlings, planting and maintenance. When planting 70x20 cm, i.e. 71,416 seedlings, the cost was

60-70 percent of the total cost. On top of that, due to the delay in the ripening of cabbage compared to sparsely planted plants, and the total yield was also low, the net income was the lowest at 62,864 thousand soums per hectare, or the farming efficiency was 186 percent.

When planting seedlings, placing plants at intervals of 25, 30, 35, 40, 45 cm, that is, appropriately expanding the food areas, will definitely reduce costs for seedlings, increase productivity, especially early ripening, and increase the amount of products and income from sales. went When cauliflower is planted in the usual 70x30 cm (control) option, the net income from crop production and sale is 79,402 thousand soums or the efficiency is 236 percent, while when planting seedlings at 35 and 40 cm, the net income is 83,989 and 84,177 thousand. to soum or increased efficiency to 250 and 252 percent.

Conclusions

1. In the technology of growing cauliflower, each agrotechnical event should be directed to the fulfillment of the intended goals.
2. The main goal of growing cauliflower in the spring period is to grow early, high-quality and high-quality crops.
3. Planting density of seedlings in the cauliflower cultivation technology determines the rate of growth and development, the amount of harvest and the quality of the product.
4. Extending the feeding area by extending the spacing between seedlings in the crop row from 25-30 cm to 35, 40 and 45 cm increases the number of leaves and the assimilation surface proportionally.

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