Effect of planting time and seedling feeding area on changes in the number and area of leek leaves

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Abstract. in the article, the results of the research carried out in order to study the influence of planting time and feeding area on the change in the number and area of leek leaves are presented with a deep scientific analysis. Planting was done by hand in 4x1 cm rows in 7x40x60 cm boxes in the greenhouse on February 20, March 10, and April 1. Seedlings appeared after 10-12 days, on May 1 they were transplanted to open field. This ensured that the seedlings were 70, 50, and 30 days old. Planting in open field was carried out in a scheme of 50x10 cm. Harvesting took place on September 1-5. Morpho-biometric indicators include determining the main quality indicators of seedlings before planting in open field: the number and surface of leaves. In each replicate, 10 of the most typical continuously recorded plants were identified, excluding plants from the soil. Data analysis at the end of the research shows that plants with higher seedling nutrition had better morphometric parameters. This is explained by the fact that the plants already have good performance during the seedling period and are of higher quality than the smallest area for seedling production.

1 Introduction

Leek is an ancient crop that has been cultivated since 2000 years. Centers as far as the Mediterranean Sea and Asia are considered the homeland of leeks [1-4].

Cultivated forms of wild leeks appeared in the area of distribution, where the first cultivated varieties were created, which later spread beyond their centers of origin. These cultivated varieties are polymorphic and have often returned to their original wild forms due to pollination by wild plants [2].

Currently, leeks are widespread in European countries and have a large share in world production [5-8].

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Leek is one of the main crops, the volume of production is constantly increasing due to the versatility of their use and long-term storage of fresh products [7, 9-16].

Leek is a perennial plant with a two-year growth cycle. In the first year of vegetation, plants form leaves and a production organ - a false stem [1, 6].

The stem of the leek is round: it rises in the form of a "ring". The first two true leaves are also round, and the next ones are curled, tapering to the end. The leaves are flat, linear-lanceolate, half-folded along the central vein, 80-90 cm long, 3-6 cm wide, opposite, each subsequent leaf grows from the previous one. Leaf color varies from light to dark green [2,3,5,9].

The surface of the leaf is covered with a waxy coating of varying intensity. The lower parts of the leaves are tightly closed, forming a false stem. The length of the false stem is 10-25 cm in short-stemmed varieties, 25-45 cm in long-stemmed varieties, 60-80 cm in the south [10].

2 Materials and Methods

Experiments were conducted in 2020-2022 at the "Center for Innovative Developments and Consultation in Agriculture" at the Tashkent State Agrarian University, as well as at the experimental farm site of the Research Institute of Plant Genetic Resources. Experiments were conducted in 4 rows and 4 replications.

Sowing was done by hand in 7x40x60 cm boxes in 4x1 cm rows. Planting was carried out in a greenhouse on February 20, March 10, and April 1. Seedlings appeared after 10-12 days. On May 5, they were transplanted to open field.

In our studies, leek onion seedlings were 70, 50 and 30 days old when planted in open field (May 1), and the feeding area of plants of each age was 4, 8, 12, 16 cm^2.

Morpho-biometric indicators include determining the main quality indicators of seedlings before planting in open field: the number and surface of leaves. During the growth period, plants were observed every year, every 15 days. A total of 10 observations were made during the season. In each replicate, 10 of the most typical permanent census plants were identified, excluding plants from the soil.

According to the above parameters, more detailed measurements were made on 10 plants taken from the soil, and in addition: leaf number and leaf area were measured using the formula proposed by E.S.Karataev [6].

Taking into account the leaf area from time to time made it possible to monitor the dynamics of the development of the absorption surface, but it does not provide a complete picture of the photosynthetic power of the whole plant during the growing season.

3 Results and Discussion

An early planting date (February 20) created conditions for the development of plants with the most leaves (Table 1), and by the end of harvest, leek plants had 13-15 leaves. A significant increase in the number of leaves is observed with a feeding area of 16 cm^2 compared to the feeding area of the smallest seedlings.

The same order was observed between the feeding sites of the seedlings in March and April planting days. At the end of the harvest, 12-13 leaves were formed in the March variant, and 9-10 leaves in the April variant. The dynamics of leaf growth is as follows: at the time of planting in February and April, the sharp growth of plants grown from seedlings with feeding areas of 4, 8, 12, 16 cm^2 was observed from mid-July to mid-August . The growth of leaves during this month was 46% of the total number of leaves formed during the entire growing season.

The middle and end of July is the period of reduction in the formation of new leaves. The physiological reason for this process is a significant reduction in the length of daylight hours in interaction with the low air temperature of this period. Therefore, it is very important to provide the plant with conditions for the formation of biomass sufficient for high yield by the middle of August.

Leeks do not complete their vegetative development in 4-5 months. At all planting dates, it can be observed that the formation of new leaves continues until late autumn. The number of leaves on plants has changed little over the years.

Table 1. The effect of planting time and seedling feeding area of the "Lincoln F1" hybrid on the number of leaves (pieces) during the growing season (average for 2022-2023)

Planting time	Feeding area, cm^2	Date of observation								
		June 1	June 10	June 25	July 5	July 15	July 25	August 5	August 15	August 1
February 20	4	4,6	5,8	6,1	7,2	9,6	11,3	12,4	13,1	13,5
	8	4,8	6,3	6,7	7,8	10,4	11,6	12,7	13,8	14,3
	12	5,3	6,4	7,1	8,7	10,6	12,1	13,2	13,7	14,8
	16	5,6	6,5	7,5	9,2	11,2	12,3	13,7	14,5	15,1
March 10 (control)	4	3,7	4,7	5,5	7,2	9,2	9,8	10,8	11,7	12,8
	8	3,8	4,9	5,9	7,4	9,4	10,1	11,1	11,8	13,1
	12	4,1	5,4	6,5	8,1	9,7	10,1	11,1	11,8	13,3
	16	4,4	5,7	6,8	8,7	9,9	10,7	11,7	12,6	13,7
April 1	4	2,6	3,1	3,9	5,7	7,5	8,3	8,7	9,1	9,8
	8	2,7	3,2	4,2	5,9	7,7	8,4	8,8	9,1	10,1
	12	2,9	3,3	4,3	6,1	7,8	8,5	9,1	9,4	10,4
	16	3,2	3,6	4,7	6,3	8,1	8,6	9,2	9,7	10,7

The main source of organic matter in plants is the process of photosynthesis. Crop photosynthesis appears to be the most complex level of regulation of CO_2 assimilation at the molecular, organ, and organismal levels. A number of indicators are used to describe the photosynthetic activity of crops.

The area of the assimilation surface, the main source of organic matter and, as a result, the yield directly depends on the number of leaves. In the experiment, the leaf area of an individual plant (Table 2) has significant differences (up to 140%) and mainly depends on the planting time; the role of the seedling feeding area did not affect this indicator. Plants

planted in February had the largest leaf area during the growing season compared to those planted in March and April. The difference between the assimilation surface areas of leaves in the February planting period and the March and April planting periods was on average 15.5 and 42.5%.

Table 2. Changes in the leaf area (cm2) of the hybrid "Lincoln F1" depending on the time of planting and the feeding area of seedlings (average for 2022-2023)

Date of observation	Area of feeding of seedlings, cm^2			
	4	8	12	16
February 20				
June 1	42	47	49	55
June 10	82	86	90	94
June 25	204	207	215	227
July 5	627	640	655	652
July 15	951	1026	1094	1130
July 25	1479	1509	1541	1556
August 5	1902	1918	1950	1971
August 15	2104	2115	2200	2197
September 1	2374	2436	2482	2526
March 10				
June 1	18	19	20	21
June 10	41	46	48	50
June 25	101	111	112	113
July 5	361	372	382	388
July 15	650	699	723	868
July 25	1009	1031	1064	1080
August 5	1596	1623	1636	1676
August 15	1804	1821	1798	1836
September 1	2090	2100	2156	2156
April 1				
June 1	7	7	8	8
June 10	13	14	15	17
June 25	35	38	40	43
July 5	124	125	134	138
July 15	376	381	404	416
July 25	643	648	691	695
August 5	1131	1154	1191	1194
August 15	1429	1438	1451	1474
September 1	1693	1713	1739	1747

All planting dates and seedling feeding plots showed low absorption surface growth until mid-July, which may be related to plant survival and weather conditions during this period.

Intensive growth of the assimilation surface with February and March planting dates was observed from early July to early August, and April planting dates were observed from mid-July to mid-August. Larger areas of plant and seedling nutrition at earlier planting dates resulted in greater leaf surface formation per unit area.

After August 5, the growth dynamics of the absorption surface area decreases for all planting dates and seedling feeding locations.

In general, plants with higher seedling nutrition had better morphometric parameters. This is explained by the fact that the plants already have good performance during the seedling period and are of higher quality than the smallest area for seedling production.

4 Conclusion

From here, it is already clear how the quality of seedlings affected the further growth and development of leek plants.

Leaf surface index means leaf area per unit of yield. At the optimal value of the leaf surface index, the maximum possible amount of incident radiation is absorbed under the given conditions (90-95%) and the highest rate of biomass accumulation is achieved. Depending on the crop and growing conditions, it usually varies from 1 to 7 or more, which can be used to estimate the level of water and mineral nutrient supply of crops.

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