EFFECTS OF SEEDING SYSTEMS AND APPLICATION RATES OF MINERAL AND ORGANIC FERTILIZERS ON PHOTOSYNTHETIC NET PRODUCTIVITY OF SUNFLOWER

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Abstract: *This article describes the relationship between the growth period of sunflower (Helianthus annuus L.) and its planting system and row spacing, as well as the supply of mineral and organic fertilizers. The effect of planting system and row spacing on plant growth, development, and photosynthetic activity is shown.*

Keywords: *Sunflower, photosynthesis, row spacing, root system, net productivity*

INTRODUCTION

The growth and development of sunflower (Helianthus annuus L.) is directly related to the intensity of the photosynthesis process, which plays a decisive role in the formation of plant biomass and yield elements.

Photosynthetic net productivity is an indicator reflecting the amount of organic matter produced in leaves as a result of photosynthesis, which determines the overall growth rate and seed productivity of sunflower[Xietian Chen, Hengjia Zhang, Anguo Teng. Photosynthetic characteristics, yield and quality of sunflower response to deficit irrigation in a cold and arid environment // Journal ORIGINAL RESEARCH, Volume 14, Plant Sci., 17 November 2023.].

When the size of the leaf area and the photosynthetic activity are high, the efficiency of using light energy increases. [Tao Ma, Kaiwen Chen, Pingru He. Sunflower Photosynthetic Characteristics, Nitrogen Uptake, and Nitrogen Use Efficiency under Different Soil Salinity and Nitrogen Applications // Journal Clusters of Water Resources: Water. 20 March 2022.].

The availability of nitrogen, phosphorus and potassium increases the formation of chlorophyll and the physiological activity of leaves. As a result of the increase in photosynthetic productivity, assimilates are directed to the organs at the seed and flower stages[Shun Li, Zongqing Liu. Optimising sunflower yields: insights from meta-analysis on fertilisation impact and planting strategies for enhanced crop productivity in China // Journal Original Paper: Plant, Soil and Environment, 71, 2025 (1): 48–57.].

Thus, photosynthetic net productivity is one of the main factors determining the agrobiological characteristics of sunflower. Taking these circumstances into account, we also conducted our studies in the cross-section of variants in order to determine the effect of mineral and organic fertilizer application rates on photosynthetic net productivity during the research years by planting sunflower seeds in different systems. Main part. Seeds 70x20-1; 70x25-1; When the net photosynthesis productivity of plants in the 13-14-15 variants, planted in 70x30-1 systems and applied 10-15-20 tons of manure per hectare in addition to the mineral fertilizers N180P125K180 kg/ha during the growth period, was

studied, it was 3.31-3.22-3.30 g/m2/day in the 1st pair of leaves formation phase, 4.55-3.94-3.83 g/m2/day in the 3rd pair of leaves formation phase, 10.87-9.07-8.62 g/m2/day in the basket formation phase, 9.25-8.61-8.47 g/m2/day in the flowering phase, and 5.90-5.30-5.22 g/m2/day in the seed formation phase, and the seeds Compared to the 4-5-6 variants, which were planted in the 70x20-1; 70x25-1; 70x30-1 systems and applied 10-15-20 tons of fertilizer per hectare in addition to the N150P105K150 kg/ha rate during the growth period, the following values were observed: 0.67-0.79-0.95 g/m2/day in the 1st pair of leaves, 0.68-0.59-0.95 g/m2/day in the 3rd pair of leaves, 1.59-1.31-2.13 g/m2/day in the basket formation phase, 1.14-1.49-1.89 g/m2/day in the flowering phase, and 1.07-1.07-1.31 g/m2/day in the seed formation phase.

3.7-жадвал

Effect of seeding systems and application rates of mineral and organic fertilizers on net photosynthetic productivity of sunflower

№	Seed planting systems	Annual rates of mineral fertilizers, kg/ha	Organic fertilizer application rates, t/ha	Biohumus application rates, t/ha	Development phases				
					Formation of 1st pair of leaves	Formation of 3rd pair of leaves	Basket formation	Flowering	Seed formation
1	70x20-1	$N_{150}P_{105}K_{150}$	-	-	1,91	3,15	8,79	7,33	4,04
2	70x25-1		-	-	1,59	2,46	6,11	5,79	3,19
3	70x30-1		-	-	1,40	2,04	4,93	4,85	2,70
4	70x20-1		10	-	2,64	3,87	9,28	8,11	4,83
5	70x25-1		15	-	2,43	3,35	7,76	7,12	4,23
6	70x30-1		20	-	2,35	2,88	6,49	6,58	3,91
7	70x20-1		-	5	2,90	3,76	9,55	8,51	5,18
8	70x25-1		-	10	2,90	3,32	7,66	7,60	4,60
9	70x30-1		-	15	2,79	3,20	6,84	7,01	4,25
10	70x20-1	$N_{180}P_{125}K_{180}$	-	-	2,18	3,38	9,65	7,56	4,51
11	70x25-1		-	-	2,07	2,84	7,41	6,81	3,93
12	70x30-1		-	-	2,01	2,77	6,63	6,33	3,66
13	70x20-1		10	-	3,31	4,55	10,87	9,25	5,90
14	70x25-1		15	-	3,22	3,94	9,07	8,61	5,30
15	70x30-1		20	-	3,30	3,83	8,62	8,47	5,22
16	70x20-1		-	5	3,84	4,70	11,16	10,28	6,68
17	70x25-1		-	10	4,12	4,25	9,74	9,90	6,21
18	70x30-1		-	15	4,13	4,26	9,58	9,52	6,12
19	70x20-1	$N_{210}P_{145}K_{210}$	-	-	2,42	3,53	9,40	7,63	4,86
20	70x25-1		-	-	2,22	3,06	7,05	6,70	4,12
21	70x30-1		-	-	2,19	2,86	6,82	6,61	3,90
22	70x20-1		10	-	3,44	4,46	10,61	9,21	5,82
23	70x25-1		15	-	3,40	3,94	9,04	8,71	5,46
24	70x30-1		20	-	3,45	3,80	8,54	8,50	5,32
25	70x20-1		-	5	3,98	4,61	10,92	9,79	6,56
26	70x25-1		-	10	4,23	4,16	9,52	9,39	6,22
27	70x30-1		-	15	4,25	3,99	8,93	9,09	5,86

Seeds 70x20-1; 70x25-1; When analyzing the 25-26-27 variants planted in 70x30-1 systems and applying 5-10-15 tons of biohumus per hectare in addition to the mineral fertilizer N210P145K210 kg/ha during the growth period, the photosynthetic net productivity was 3.98-4.23-4.25 g/m2/day in the 1st pair of leaves formation phase, 4.61-4.16-3.99 g/m2/day in the 3rd pair of leaves formation phase, 10.92-9.52-8.93 g/m2/day in the basket formation phase, 9.79-9.39-9.09 g/m2/day in the flowering phase, and 6.56-6.22-5.86 g/m2/day in the seed formation phase, and the seeds Compared to the 7-8-9 variants, which were planted in the 70x20-1; 70x25-1; 70x30-1 systems and applied 5-10-15 tons of biohumus per hectare in addition to the mineral fertilizers N150P105K150 kg/ha during the growth period, the results were 1.08-1.33-1.46 g/m2/day in the 1st pair of leaves, 0.85-0.84-0.79 g/m2/day in the 3rd pair of leaves, 1.37-1.86-2.09 g/m2/day in the basket formation phase, 1.28-1.79-2.08 g/m2/day in the flowering phase, and 1.38-1.62-1.61 g/m2/day in the seed formation phase.

Conclusion.

It can be seen from the obtained data that the effects of seed planting systems, mineral and organic fertilizers on the photosynthesis net productivity of sunflower plants are significant, and high results were recorded in all seed planting systems in the variants using organic fertilizers in addition to the norms of mineral fertilizers.

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