THE MINERAL FERTILIZERS EFFECT ON THE MEDICINAL MARIGOLD (*CALENDULA OFFICINALIS* L.) PLANTS PRODUCTIVITY IN TASHKENT REGION

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ABSTRACT

In this article, it was found that different standards of mineral fertilizers used to accelerate the medicinal marigold seedlings cultivation in the soil and climatic conditions of Tashkent region affect the seedlings yield. The $N_{90}P_{60}K_{40}$ norm gave good results for the plants rapid growth when fed with different norms of applied mineral fertilizers. In this case, the data on the mineral fertilizers application to medicinal marigold seedlings are given.

Keywords: medicinal marigold, agrotechnology, mineral fertilizers, raw materials, soil, care, productivity, growth and development rate.

INTRODUCTION

The main indicator of the local pharmaceutical industry development and independence is the raw materials cultivation and production for import-substituting and export-oriented medicinal plants in these areas. In this area, as stated in the Resolution of the President of the Republic of Uzbekistan on April 10, 2020 "On protection, cultivation, processing and rational use of available resources of wild-growing medicinal plants" PR№ -4670 in recent years, consistent reforms have been carried out in the protection of medicinal plants, rational use of natural resources, the establishment and processing of plantations where medicinal plants are grown[1].

RESEARCH OBJECT AND METHODOLOGY

The study object was the medicinal marigold (Calendula officinalis L.). Commonly used methods were used in the studies of B.A. Dospekhov [2], (Borisova, Beydeman, Ponomarev, Zaytsev, Yarosh, Terekhin, Torikov V.E. and etc.) [3]. During the study, the medicinal marigold seedlings yield was studied. The research was conducted in 2020 in the experimental field of Chatkal branch of the Saksonota state forestry enterprise, Tashkent region. The experimental field soils were typical gray soils, and according to the agrochemical analysis of the soils, the humus content in the tillage layer was 1.54%, total nitrogen 0.175%, total phosphorus 35 mg/kg, and potassium 204 mg/kg. [5].

RESEARCH RESULTS AND THEIR DISCUSSION

The indicators of mineral fertilizer norms for 1 model plant of medicinal marigold seedlings planted in the experimental fields were as follows: in the control (fertilizer-free) variant, the number of branches was 5, the number of leaves was 38, the root length was 64 cm, the branching length was 16.9 cm and the leaf surface was 21cm^2. In the second variant, these figures were 5 branches of the plant, 45 leaves, 81 cm of root length, 18.3 cm of branching length and 23 cm^2 of leaf surface. In the third variant, the number of branches of the plant increased by 7, the number of leaves by 53, the root length by 93 cm, the branching length by 18.6 cm and the leaf surface by 26 cm^2. In the fourth variant, the number of plant branches was 9, the number of leaves was 62, the root length was 117 cm, the branch length was 19.7 cm and the leaf surface was 28 cm^2(Table 1, Figure 1).

Table 1

The effect of mineral fertilizers on medicinal marigold seedlings

Options	For a single model plant

	number of branches, pcs	number of leaves, pcs	root length, cm	branch length, cm	баргнинг юзаси, cm^2
spring					
fertilizers free	5	38	64	16,9	21
$N_{30}P_{60}K_{40}$	5	45	81	18,3	23
$N_{60}P_{60}K_{40}$	7	53	93	18,6	26
$N_{90}P_{60}K_{40}$	9	62	117	19,7	28
autumn					
fertilizers free	16	180	82	16,9	22
$N_{30}P_{60}K_{40}$	21	220	98	18,6	26
$N_{60}P_{60}K_{40}$	23	245	116	20,7	29
$N_{90}P_{60}K_{40}$	24	283	140	21,4	31

These indicators are 16 in the fall in the control (fertilizers free) option, the number of leaves was 180, the root length was 82 cm, the branching length was 16.9 cm, and the leaf surface was 22 cm^2.

Figure 1. The phenological observation process of medicinal marigold in the experimental field

In the fourth variant, when applied to the norms of mineral fertilizers, the number of branches was 24, the number of leaves was 283, the root length was 140 cm, the branching length was 21.4 cm and the leaf surface was 31 cm^2.

In the conditions of Tashkent region, in order to accelerate the seedlings growth of medicinal marigold seedlings in spring and autumn, different standards of mineral fertilizers were applied. In this case, the diagonal method was used to determine the yield in medicinal plants where the topsoil or flower is the raw material. The medicinal plants yield was collected on the basis of 4 variants of 3 returns per $1m^2$ and measured wet. Once the wet weight of the raw material was determined, it was dried and re-measured, and the average yield of medicinal marigold seeds was determined.

According to 2018 data, the wet and dry mass of medicinal marigold plant flowers planted in the spring was 1.6-1.7 times higher than the control, and the yield of seeds was 1.6 times, or 166%.

At the time of sowing in autumn, the yield was 1.6 times 168% of the wet and dry mass of flowers, and the yield of seeds was 1.3 times or 135%.

According to 2019 indicators, the average yield in the spring is 1.7 times the wet and dry mass of flowers per $1m^2$, i.e. 177%; increased seed yield by 1.7 times, or 174%.

When planted in the fall, the average yield is 1.7 times the wet mass of flowers per $1m^2$, i.e. 177%; dry mass 1.8, i.e. 188%; increased seed yield by 1.4 times, or 141% (Table 2).

Table - 2.

Yield of medicinal marigold flowers and seeds, s/ha

Options	Wet mass of flowers		Dry mass of flowers		Seeds	
	In $1m^2$, g	kg/ha	In $1m^2$, g	kg/ha	In $1m^2$, g	kg/ha
Yield indicators for 2018						
spring						
Fertilizer free	281,2	2812	37,8	378	24,1	241
$N_{30}P_{60}K_{40}$	335,7	3357	46,6	466	27,8	278
$N_{60}P_{60}K_{40}$	387,9	3879	57,4	574	35,4	354
$N_{90}P_{60}K_{40}$	453,9	4539	66,7	667	40,2	402
autumn						
Fertilizer free	338	3380	47,1	471	182	1820
$N_{30}P_{60}K_{40}$	389	3890	64,0	640	194	1940
$N_{60}P_{60}K_{40}$	484	4840	69,9	699	218	2180
$N_{90}P_{60}K_{40}$	571	5710	79,6	796	247	2470
Yield indicators for 2019						
spring						
Fertilizer free	322	3220	46,7	467	216	2160
$N_{30}P_{60}K_{40}$	368	3680	54,9	549	297	2970
$N_{60}P_{60}K_{40}$	492	4920	72,3	723	368	3680
$N_{90}P_{60}K_{40}$	570	5700	83,2	832	377	3770
autumn						
Fertilizer free	354	3540	49,1	491	289	2890
$N_{30}P_{60}K_{40}$	433	4330	66,4	664	348	3480
$N_{60}P_{60}K_{40}$	582	5820	79,8	798	392	3920
$N_{90}P_{60}K_{40}$	617	6170	92,7	927	410	4100
Yield indicators for 2020						
spring						
Fertilizer free	275,8	2758	31,7	317	205	2050
$N_{30}P_{60}K_{40}$	279,5	2795	35,8	358	210	2100
$N_{60}P_{60}K_{40}$	319,7	3197	37,9	379	265	2650
$N_{90}P_{60}K_{40}$	368,2	3682	43,5	435	295	2950
autumn						
Fertilizer free	444,9	4449	62,2	622	273	2730
$N_{30}P_{60}K_{40}$	484,3	4843	70,4	704	316	3160
$N_{60}P_{60}K_{40}$	510,5	5105	73,9	739	343	3430
$N_{90}P_{60}K_{40}$	536,9	5369	77,2	772	387	3870

In the field experimental work planted in the spring of 2020 in the control of medicinal marigold (fertilizer-free) flowers wet mass 275.8g per $1m^2$ area, 2758 kg/ha per hectare, the dry mass of flowers was 31.7 g/ha per $1m^2$, 317 kg/ha per hectare, and the seed yield was 205g/ha per $1m^2$ and 2050 kg/ha.

In the fourth variant of the study, when applied with different standards of mineral fertilizers, the wet mass of flowers was 368.2 g per $1m^2$ area, 3682 kg/ha per hectare, the dry mass of flowers was 43.5 g/ha per 1 m^2, 435 kg/ha, and the seeds were 295 g/ha per 1 m^2, 2950 kg/ha.

Compared to the average yield control, the wet mass and dry mass of flowers increased by 1.3 times or 137% per $1m^2$, and the seed yield increased by 1.4 times, or 143%.

When planted in the fall, these figures are 444.9 g per $1m^2$ of wet mass of flowers and 4449 kg/ha per hectare in the control (fertilizer-free) variant, the dry mass of flowers was 62.2 g per $1m^2$ and 622 kg/ha per hectare, and the seed yield was 273 g/ha per $1m^2$ and 2730 kg/ha.

In the fourth option, when applied with different standards of mineral fertilizers, the wet mass of flowers is 536.9 g per $1m^2$ area, and 5369 kg/ha per hectare, the dry mass of flowers was 77.2 g per $1m^2$, 772 kg/ha per hectare, and the seeds were 387 g/ha per $1m^2$ and 3870 kg/ha (Table 2).

CONCLUSION

In spring and autumn studies of soil and climatic conditions of Tashkent region, the different standards application of mineral fertilizers for the accelerated cultivation of medicinal marigold seedlings increased 1.7 times in height and 1.4 times in diameter, 1.6 times the number of leaves and branches; number of buds 3.3; and the number of flowers increased 2.6 times. In particular, $N_{90}P_{60}K_{40}$ norm showed high results for the rapid growth of plants among the various norms of mineral fertilizers used in the experiment. меъёри юқори натижа кўрсатди.

It was also found that these standards of mineral fertilizer increase the leaf level in medicinal marigold plants by 140% compared to the control, and root development by 170%. Yield is 120% of the dry flowers mass per $1m^2$ area compared to control; seed yield was 141%; dry mass per plant model was 162%.

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