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EFFICIENCY OF USING RESOURCE-SAVING AGROTECHNOLOGY IN MELON CULTIVATION

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Abstract. This article describes agrotechnological methods aimed at saving water and fuel through resource-efficient cultivation of muskmelon (a type of melon) in open fields using transplant seedlings. The results showed that planting 20-day-old seedlings led to earlier ripening and had a positive effect on the growth and development of the above-ground parts of the plant. Among the studied varieties, Obi Novvot, Samarkand Yellow Muskmelon, and Local Yellow Muskmelon demonstrated the most vigorous growth in terms of the above-ground plant parts, including main stem length, number of lateral branches, total vine length, and number of leaves.

Keywords: muskmelon, planting, variety, seedling, resource, growing period, stem, leaf, lateral branch, flowers.

Introduction. Previously, muskmelon in our republic was mainly cultivated in open fields by direct seeding. In recent years, however, transplanting seedlings and applying resource-saving methods have been increasingly introduced. Significant reforms are being implemented in the country to save water and fuel in agricultural crop production. In this study, experiments were conducted to cultivate muskmelon seedlings of different ages in open fields using resource-saving technologies. The soil surface was mulched with polyethylene film, and then the ridges were additionally covered with film using an arched method. Seedlings were planted under this covering. This method is commonly known as the **"thermos method."** The primary objective of this technique is to save water, maintain optimal temperature, and reduce manual labor during muskmelon cultivation.

Materials and Methods. The experiment on resource-efficient cultivation of seeds of rare local muskmelon varieties was conducted during 2024–2025. For this purpose, seedlings of six rare muskmelon varieties were grown in a greenhouse in 8 × 8 cm polyethylene film pots and prepared as 15-, 20-, and 25-day-old seedlings. Each variety was planted using a double-row ribbon method with a planting scheme of (210 + 70)/2 × 50 cm.

The experiment was conducted in four replications. Each experimental plot had a length of 6 m and contained 24 plants. The feeding area for each plot was 16.8 m².

Results. During the research, direct sowing of muskmelon seeds in the warmed soil was used as the control treatment, and the remaining variants were compared with it. For this purpose, seedlings of six rare muskmelon varieties were grown in a greenhouse in 8 × 8 cm polyethylene film pots and prepared as 15-, 20-, and 25-day-old seedlings. In the greenhouse, a soil mixture was prepared in the first decade of March consisting of 40% field soil, 40% humus, and 20% loosening materials. This mixture was filled into the pots. The pots were then arranged in separate greenhouse sections according to the varieties, and the seeds were sown. The seedlings were grown according to generally accepted agrotechnological practices. Observations were conducted on seed germination as well as the growth and development of seedlings. Irrigation and fertilization of the seedlings were carried out in a timely manner. No diseases or pests were observed during the growing period. According to scientific sources, in our republic muskmelon seeds as a main crop are usually sown at different periods. However, in open fields they are mainly sown in the third decade of April and the first decade of May, when the soil temperature reaches 12–14 °C, which creates favorable conditions for rapid seed germination. However, in our experiment, muskmelon seedlings aged 15, 20, and 25 days were transplanted in the third decade of March into open fields prepared with furrows. The soil surface of the furrows was mulched with polyethylene film and additionally covered with film in a tunnel shape using arch wires, forming a double-layer warmed field. In contrast, in the experiment the seeds of muskmelon varieties were sown in open fields using the traditional method in the third decade of April. Both muskmelon seedlings and seeds were planted using a double-row ribbon method with a planting scheme of 70 cm between rows, 210 cm between ridges, and 50 cm between plants. In the experiment, the surface of the furrows was mulched with polyethylene film, and after transplanting the seedlings, arch-shaped wires were installed and covered with a second layer of film (see Figure 1).

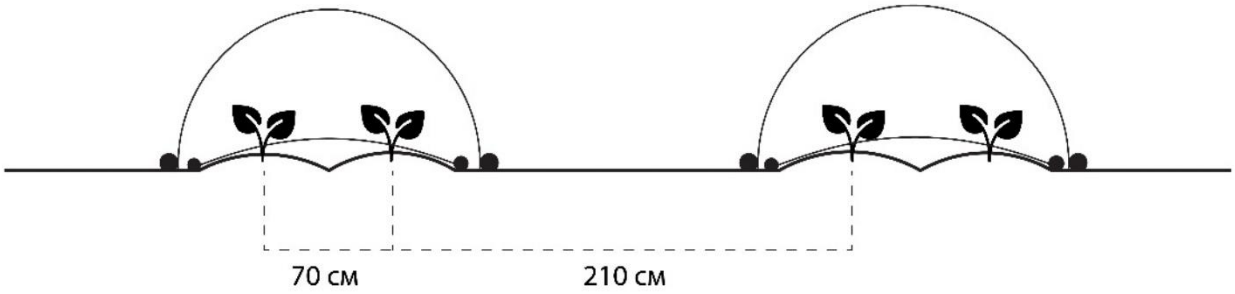

Figure 1. Layout scheme for cultivating muskmelon under plastic film cover.

In this method, solar radiation and heat passing through the two layers of polyethylene film maintained a temperature difference: about 5 °C in the first layer and 7 °C in the second layer. The 60–70 cm space between the layers acted as a thermos, providing a favorable temperature for the growth and development of muskmelon seedlings. At the same time, mulching the soil with polyethylene film increased soil temperature, enhanced warming of the soil, and helped retain soil moisture.Using this method, even without irrigation after transplanting, the soil contained sufficient moisture necessary for plant growth. Protection from natural wind, rain, and cold conditions also contributed to faster and better development of the seedlings.

The research results showed that muskmelon seedlings of a certain age, after applying the required agrotechnical measures, adapted quickly to open field conditions and demonstrated high survival rates. The upper plastic film cover remained closed until the seedlings fully entered the flowering stage. Later, the side parts of the film were periodically opened to gradually acclimatize the plants to external environmental conditions. Afterward, the arch wires and the upper film layer were removed. By that time, the muskmelon plants had already adapted well to the external environment and continued their growth and development while flowering.

During the experiment, when muskmelon was cultivated from seedlings, phenological observations were conducted on the flowering of male and female flowers, fruit ripening, and the harvest maturity period (see Table 1)

Table 1

Phenological observation indicators when muskmelon is cultivated from seedlings of different ages

Variety	Planting method	Number of plants per hectare	Days from sowing/transplanting to flowering (Male)		Days from sowing/transplanting to flowering (Female)
			Оталик	оналик	
Mahalliy sariq hadalak (Local yellow muskmelon)	Direct seeding – control				
	15-day-old seedlings	14185	33	35	
	20-day-old seedlings	14200	31	33	68
	25-day-old seedlings	13165	30	31	66
Apelsin-qizil handalak (Orange-red muskmelon-Cantaloupe)	Direct seeding – control	14272	39	41	81
	15 day-old seedlings	14175	35	39	79
	20 day-old seedlings	14192	36	40	78
	25 day-old seedlings	13078	32	35	77
Oq kallaposh	Direct seeding – control	14278	39	43	80
	15 day-old seedlings	14115	36	38	78
	20 day-old seedlings	14196	35	38	77
	25 day-old seedlings	13181	35	37	75
Qora qosh	Direct seeding – control	14260	42	48	82
	15 day-old seedlings	14188	36	39	77

	20 day-old seedlings	14255	33	36	75
	25 day-old seedlings	13170	29	32	75
Samarqand sariq handalak (Samarkand yellow muskmelon)	Direct seeding – control	14280	32	34	67
	15 day-old seedlings	14200	31	33	65
	20 day-old seedlings	14275	31	32	64
	25 day-old seedlings	13175	28	30	63
Obi novvot	Direct seeding – control	14278	36	39	78
	15 day-old seedlings	14185	35	39	77
	20 day-old seedlings	14195	35	38	76
	25 day-old seedlings	13190	32	36	75

The actual number of plants that emerged from seeds and seedlings per hectare in the field was calculated. Accordingly, for all six varieties of melons, the number of plants from direct seeding under film, as well as from 15- and 20-day-old seedlings, exceeded 14,200 per hectare. In the variant with 25-day-old seedlings, the number of plants per hectare was comparatively lower, exceeding 13,100 plants.

Observation results showed the appearance of 2–3 true leaves on melon seedlings, the emergence of male and female flowers at 10% and 75% flowering stages, and the timing of fruit ripening. Male flowers appeared earlier and in much greater numbers than female flowers. Female flowers appeared after male flowers. Male flowers remained open for 1 day, whereas female flowers stayed open for 3–5 days.

During the experiment, when 2–3 true leaves appeared on seedlings, no significant difference (2–3 days) was observed between the variants of 15-, 20-, and 25-day-old seedlings regarding seed germination and seedling emergence in greenhouses. However, sharp differences were observed among varieties in the timing of male and female flower opening. Based on the analysis of 75% male flowering from

sowing, in the Samarkand Yellow melon variety, the period ranged between 28–32 days, while in the Local Yellow melon varieties, male flowers appeared earlier, ranging between 30–35 days. In the variety where male flowering occurred relatively later, the Black Eyebrow variety, this period was 30–42 days. In other varieties, male flowers appeared 31–39 days after sowing.

The emergence of male flowers was strongly influenced by temperature, i.e., growth under film, sufficient soil moisture, and protection from external factors. Flowering of seedlings occurred earlier in all variants of 25-day-old seedlings compared to 15- and 20-day-old seedlings.

Sharp differences among melon varieties were also observed in the timing of female flower opening. Based on the 75% female flowering analysis, the Samarkand Yellow and Local Yellow melon varieties flowered earlier. In the Samarkand Yellow variety, female flowers appeared 30–34 days after sowing, and in the Local Yellow variety, 31–37 days after sowing. In the Black Eyebrow variety, where female flowering occurred relatively later, the period ranged between 32–48 days. In other varieties, female flowers appeared 33–43 days after sowing.

The research results indicate that the older the seedlings, the earlier the female flowers appeared. Compared to direct sowing in the open field, the variants with 20- and 25-day-old seedlings showed earlier female flowering. Among the studied variants, growing 25-day-old seedlings under film resulted in the highest performance across all varieties, causing female flowers to appear 2–6 days earlier than the control. This clearly demonstrates the positive effect of growing seedlings under film on plant growth and development.

Phenological observations in the experiment determined the timing of melon variety fruit ripening. The first harvest occurred earlier in the Samarkand Yellow and Local Yellow melon varieties, indicating early-maturing characteristics. In the Samarkand Yellow variety, the first harvest was conducted 60–67 days after sowing, and in the Local Yellow variety, 66–72 days after sowing. The relatively late-maturing variety was the Black Eyebrow variety, with the first harvest occurring 75–82 days after sowing. In other varieties, this period ranged from 68–80 days.

For conventional cultivation, i.e., direct sowing in open fields in the third decade of April, the first harvest among varieties occurred from June 30 to July 14. In contrast, when 15-, 20-, and 25-day-old seedlings were transplanted under film in the third decade of March, the first harvest among varieties occurred from May 29 to June 13.

These results indicate that compared to conventional open-field sowing, covering

the soil with film for mulching and then transplanting seedlings under film advanced fruit ripening by nearly 29–30 days. This accelerated seedling establishment, faster plant growth and development, and earlier fruit maturity. Harvesting approximately one month earlier led to higher economic returns, allowing farmers, households, and small landowners to sell early-mature melons at higher prices.

During the study, biometric measurements of melon plants' above-ground growth were conducted. These included main stem length, number of lateral shoots, total vine length, and number of leaves (see Table 2). Analysis of main stem length showed that the Obi Novvot, Samarkand Yellow, and Local Yellow varieties had the longest stems, ranging from 152.5 to 198.8 cm. In the Oq Kallaposh variety, the main stem length ranged from 118.4 to 148.5 cm, indicating relatively shorter vines. Other varieties ranged from 125.4 to 165.2 cm.

Regarding main stem growth and development, the 20-day-old seedling transplant variant showed the highest increase across all varieties, exceeding the control (directly sown seeds) by 20–28 cm.

Data on the number of lateral shoots showed that the Obi Novvot and Local Yellow varieties had the highest values, ranging from 3.5–4.3 shoots per plant. The Oq Kallaposh variety showed relatively lower branching, with 3.4–3.6 shoots per plant. Other varieties ranged from 3.5–3.9 shoots. In all cases, the 20-day-old seedling transplant variant produced higher numbers of lateral shoots than the control variant.

Tabe 2

of melons when cultivated from seedlings under film, biometric indicators (2024–

Varieties	Experimental variants	Main stem length, cm	Number of lateral branches, pcs	Total vine length, cm	Number of leaves, pcs
Mahalliy sariq hadalak (Local yellow muskmelon)	Direct seeding – control	152,5			85,2
	15 day-old seedlings	170,7		510,2	88,6
	20 day-old seedlings	175,8		518,4	94,7
	25 day-old seedlings	172,4	3,8	482,6	92,3
Apelsin-qizil handalak (Orange-red muskmelon-Cantaloupe)	Direct seeding – control	125,4	3,4	449,7	84,6
	15 day-old seedlings	140,6	3,6	465,4	86,2
	20 day-old seedlings	154,3	3,7	482,6	92,4
	25 day-old seedlings	149,8	3,5	458,2	87,6
Oq kallaposh	Direct seeding – control	118,4	3,4	322,4	82,1

	15 day-old seedlings	124,8	3,4	334,6	81,8
	20 day-old seedlings	148,5	3,6	381,5	86,6
	25 day-old seedlings	132,4	3,5	371,0	82,1
Qora qosh	Direct seeding – control	138,2	3,6	451,3	86,5
	15 day-old seedlings	145,8	3,7	487,2	88,0
	20 day-old seedlings	165,2	3,9	526,1	98,1
	25 day-old seedlings	157,2	3,6	496,0	92,6
Samarqand sariq handalak (Samarkand yellow muskmelon)	Direct seeding – control	150,0	3,6	455,0	86,3
	15 day-old seedlings	164,8	3,7	478,3	87,7
	20 day-old seedlings	178,6	3,8	497,8	93,5
	25 day-old seedlings	161,2	3,7	479,1	89,4
Obi novvot	Direct seeding – control	178,8	3,8	550,3	92,1
	15 day-old seedlings	182,7	4,2	560,4	94,5
	20 day-old seedlings	198,8	4,3	574,5	103,5
	25 day-old seedlings	190,8	4,0	566,8	96,8

ound parts of Obi Novvot, Samarkand Yellow, and Local Yellow melon varieties—main stem length, number of lateral shoots, total vine length, and number of leaves—

fields, mulching the soil surface with film followed by transplanting seedlings under film advanced fruit ripening by nearly 29–30 days. This clearly contributed to faster

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