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Cultivation, Storage and Processing of Watermelon and Melon Crops Based on Resource-Saving Technologies

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ABSTRACT
The article presents a deep scientific analysis of the results of research conducted to study the technology of growing, storing and processing watermelon and melon crops based on resource-saving technologies. In our experiment to study the influence of different mulching materials on the growth parameters and productivity of melon and watermelon crops, melon seeds were planted in double rows (2.30+0.70):2x0.50 cm scheme, watermelon seeds was planted in the (2.50+0.70):2x0.50 cm scheme. The experiment to determine the irrigation parameters and fertilization rate in the cultivation of melon and watermelon plants under mulch in the open field is a two-factor experiment, factor "A" is irrigation parameters and "B" factor is fertilization rate. We conducted our research in terms of storage in the watermelon plant, and our research in terms of processing in the melon plant.
Key words: *cultivation, storage, processing, watermelon, melon, crops resource-saving technologies, drip irrigation, drip irrigation, fertilization rate, irrigation parameters.*

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INTRODUCTION

In recent years, the climate is changing sharply, the need for water is increasing, as well as the occurrence of black frosts in the early spring, which are more than the norm, are causing some difficulties for our farmers in the cultivation of melon and watermelon crops. Taking all of this into account requires implementing agronomic practices such as mulching and drip irrigation to regulate soil temperature, moisture content, and weed, pest, and disease control [6, 10, 11].

The need for land improvement will be exacerbated by expected global climate change. In most regions of Uzbekistan, the biological productivity of the climate decreases by 10-20%, and in some regions by 30-40%, the steppe and semi-desert zones expand further. Therefore, it is impossible to effectively develop irrigated agriculture without developing and implementing resource and water-saving technologies aimed at increasing the efficiency of irrigated water use [2, 7, 8].

One of the important indicators of soil fertility is soil moisture, which is the main factor in the development and growth of plants. The moisture dynamics of the soil planted with melon and watermelon plants is formed depending on meteorological conditions and irrigation regimes studied with drip irrigation. Polyethylene mulch, which is considered another resource-saving agrotechnology, increases early stem growth and overall yield of melon and watermelon crops [1].

The effect of mulch color on yield has been studied in several crops, including tomato and squash [5, 9]. However, not enough research has been done to investigate the effects of mulching types and color of mulch materials and drip irrigation rates on growth parameters and yield of melon and watermelon crops [10, 11].

Therefore, considering the importance of mulching in the cultivation of various vegetable crops, we conducted our research to investigate the effect of different mulching materials and drip irrigation method on the growth parameters and yield of watermelon plant. Also, in our research, we studied the technology of storage and processing of melons and watermelons grown using this resource-saving technology [3,4].

MATERIAL AND METHODS

We conducted our research on the cultivation, storage and processing of melon and watermelon crops using modern resource-saving technologies. Field experiments with the purpose of growing melon and watermelon crops using different mulching materials and drip irrigation were conducted at the experimental farm area of the "Center for Innovative Developments and Consultations in Agriculture" DUK. All experiments in our research were carried out using watermelon varieties "Shirin", "Sharq Ne'mati", hybrid "Dolby F1" and fruits, melon varieties "Kichkintoy", "Kok Tinni 1087", "Kokcha - 588" and "Oq urug - 1157" and fruits. increased.

In our experiment to study the effect of different mulching materials on the growth parameters and yield of melon and watermelon crops, the number of options was three, i.e. control (without mulch), black mulch, and white mulch. Melon seeds were planted in double rows (2.30+0.70):2x0.50 cm, and watermelon seeds were planted in double rows (2.50+0.70):2x0.50 cm. We used white and black polyethylene films with a width of 140 cm and a thickness of 0.02 cm for our experiments. Polyethylene films of this size are the optimal size for mulching 70 cm furrow.

The experiment to determine the irrigation parameters and fertilization rate in the cultivation of melon and watermelon plants in the open field under the mulch by drip irrigation is a two-factor experiment, factor "A" is irrigation parameters and factor "B" is fertilization rate.

We studied the factor "A" experiment using three options:

Option 1: based on the maintenance of differentiated soil moisture 66...75...65%: in the period of "planting - shatrik (5-6 leaves)" in a layer of 0.0-0.2 m and " 0.0-0.4 m layer at the level of 65% in the "shatrik - flowering" period; 75% in the 0.0-0.5 m layer during the "flowering - fruiting" period and 65% in the 0.0-0.5 m layer during the "fruiting - ripening" period;

Option 2: based on maintaining differentiated soil moisture at 70% in the "planting - shatrik (5-6 leaves)" period in a layer of 0.0-0.2 m and in the "shatrik - flowering" period in the layer of 0.0-0,4 m; 80% in the 0.0-0.5 m layer during the "flowering - fruiting" period and 70% in the 0.0-0.5 m layer during the "fruiting - ripening" period;

Option 3: based on the maintenance of differentiated soil moisture at 75% in the "planting - shatrik (5-6 leaves)" period in a layer of 0.0-0.2 m and in the "shatrik - flowering" period in the layer 0.0-0,4 m; 85% in the 0.0-0.5 m layer during the "flowering - fruiting" period and 75% in the 0.0-0.5 m layer during the "fruiting - ripening" period.

We also studied the "B" factor experiment using three options:

Option 1. Cultivation without fertilizers (control);

Option 2. Cultivation with fertilizer at the rate of $N_{75}P_{75}K_{50}$kg/ha;

Option 3. Cultivation with fertilizer at the rate of $N_{120}P_{80}K_{50}$kg/ha.

During the planting of melon and watermelon seedlings, the maintain of moisture in the soil layer were 80-85% in the field of the experimental farm. Soil temperature (soil thermometer), number of seedlings, phenological observations and biometric measurements, irrigation method, duration (according to V.E. Kabaev's zuldar method) and number, yield amount, leaf surface and leaf stem weight, root weight, chemical composition of watermelon fruit, economic efficiency of the crop were studied.

We conducted our research in terms of storage in the watermelon plant, and our research in terms of processing in the melon plant.

We carried out the experiment of studying the influence of storage conditions and periods on the quality of watermelon fruits in 5 options:

Option 1. 3 days in the field + 27 days in a naturally ventilated warehouse;

Option 2. 5 days in the field + 25 days in a naturally ventilated warehouse;

Option 3. 10 days in the field + 20 days in a naturally ventilated warehouse;

Option 4. 15 days in the field + 15 days in a naturally ventilated warehouse;

Option 5. 20 days in the field + 10 days in a naturally ventilated warehouse.

During storage, natural weight loss and fruit quality were taken into account. The amount of major chemicals in watermelon fruits was determined before and after storage.

We conducted an experiment to determine the yield of melon fruits grown using different fertilization criteria in 3 options:

Option 1. Is the appearance of rind in melon fruits grown without fertilizer (control);

Option 2. Is the yield of melon fruits fertilized at the rate of $N_{75}P_{75}K_{50}$kg/ha;

Option 3. Is the yield of melon fruits fertilized at the rate of $N_{120}P_{80}K_{50}$kg/ha.

Melon was dried in a drying room covered with polyethylene film, hanging on special straws. The drying area has an open environment, with good sunlight and away from busy roads.

RESULTS AND DISCUSSION

The results of our research to investigate the effect of different mulching materials on the growth parameters of melon and watermelon plants showed that different types of mulching materials had a significant effect on the growth parameters of melon and watermelon crops, namely the number of side branches per stem, the length of the main stem, the total number and surface of leaves, number of whorls per stem, fruit weight and plant weight varied with mulching materials. Among the mulching methods, black polyethylene mulch resulted in an increase in the number of branches per stem, an increase in the length of the main stem and the number of curls per stem, and an increase in fruit and plant weight compared to the control and white mulch options (Table 1).

The control option showed the least increase among the study options. Availability and prolonged retention of moisture resulted in higher absorption of nutrients for proper plant growth and development, which resulted in higher growth parameters of plants in mulched land compared to the control. Variations in soil temperature under polyethylene film mulch can be attributed to different heating methods and heat transfer to the soil, as well as heat accumulation during the day and heat loss at night.The highest stem length under black mulch is due to higher nutrient absorption due to favorable soil moisture and reduced evaporation of soil moisture caused by mulching the soil surface in watermelon rows. Mulching with black polyethylene film was found to significantly affect stem length more than other mulching materials. This mulch consistently increased germination over other mulches. This may have been due to the favorable soil temperature, moisture conditions and the dramatic reduction in pests and diseases caused by the black mulch. This (black) mulching material significantly increased the average fruit weight (kg) of melon and watermelon. The maximum average fruit weight was recorded in the option mulched with black polyethylene film compared to the white mulch and control options.

Table 1: Effects of different mulching materials on growth parameters of melon and watermelon plants (2022 year)

Options	Varieties and hybrids	Number of lateral branches, pcs	Main stem length, cm	The number of curls in one bush, pcs	The number of leaves in one bush, pcs	Leaf surface, dm^2	Fruit weight, kg	Weight of one plant, kg
Without mulch	**Melon**							
	Kichkintoy	4±2,0	151±2,0	3±	350±50	1868±20	0,8±1,0	0,9±0,10
	Kok Tinni 1087	5±1,0	172±3,5	4±	382±60	1893±30	3,0±1,0	1,20±0,15
	Watermelon							
	Shirin	6±1,5	210±3,0	3,6±	510±60	2597±75	5±2,4	1,19±0,20
	Sharq Ne'mati	7±1,4	223±3,5	3,7±	527±54	2826±82	7±3,5	1,28±0,22
	Dolby F1	7±1,7	265±3,6	4,4±	502±46	2930±90	8±3,1	1,63±0,28
Black mulch	**Melon**							
	Kichkintoy	5±3,0	167±4,0	4±	364±60	1882±30	1,2±1,0	1,10±0,10
	Kok Tinni 1087	7±2,0	188±3,5	6±	402±80	1923±50	4,5±2,0	1,38±0,22
	Watermelon							
	Shirin	8±1,5	236±3,8	3,9±	534±56	2642±67	5±2,1	1,49±0,21
	Sharq Ne'mati	9±1,4	247±3,5	4,1±	556±49	2892±79	8±3,3	1,53±0,20
	Dolby F1	9±1,7	292±4,2	4,7±	524±61	2996±83	9±3,0	1,90±0,26
White mulch	**Melon**							
	Kichkintoy	7±2,0	180±5,0	5±	380±60	1897±40	1,5±1,0	1,5±0,15
	Kok Tinni 1087	8±2,0	196±3,1	6±	416±70	1928±50	5,0±2,0	1,40±0,20
	Watermelon							
	Shirin	6±1,6	223±2,9	3,8	523±59	2632±69	5±2,3	1,33±0,20
	Sharq Ne'mati	8±1,5	232±3,1	3,9	541±51	2857±75	8±3,1	1,42±0,25
	Dolby F1	8±1,7	276±3,7	4,5	512±47	2971±85	9±2,8	1,75±0,23

It can be seen that black mulch created favorable conditions for achieving high fruit weight. Plants under polyethylene (black mulch) produced larger fruits and higher yields per plant due to the favorable hydrothermal regime of the soil and the completely weed-free environment. Summarizing all indicators, all

growth parameters of melon and watermelon plants grown on mulched soil were higher than the control option. If we analyze based on the types of mulch, the indicators of the plants in the black polyethylene film mulch option were the highest. As a result, the overall productivity of the plant was also much higher than other options.

Table 2:Characteristics of water regime parameters in watermelon cultivation by drip irrigation, 2022 year

Plant type	Varieties and hybrids	Phenophases								Total number of irrigation, pcs	Irrigation rate, m³ / ha
		planting - shatrik (5-6 leaves)		shatrik - flowering		flowering - fruiting		fruiting - ripening			
		Irrigation rate, m3 / ha	Irrigation number, pcs	Irrigation rate, m3 / ha	Irrigation number, pcs	Irrigation rate, m3 / ha	Irrigation number, pcs	Irrigation rate, m3 / ha	Irrigation number, pcs		
Melon plant	Kichkintoy	Soil moisture before irrigation 65.75.65%									
		25	2	85	4	125	6	150	2	14	1440
		Soil moisture before irrigation 70.80.70 %									
		25	3	85	5	125	7	150	2	17	1675
		Soil moisture before irrigation 75.85.75 %									
		25	3	85	6	125	8	150	2	19	1885
	Kok Tinni 1087	Soil moisture before irrigation 65.75.65%									
		25	2	85	4	125	6	150	2	14	1440
		Soil moisture before irrigation 70.80.70 %									
		25	3	85	5	125	7	150	2	17	1675
		Soil moisture before irrigation 75.85.75 %									
		25	3	85	6	125	8	150	2	19	1885
Watermelon plant	Shirin	Soil moisture before irrigation 65.75.65%									
		31	2	95	5	135	7	170	4	18	2162
		Soil moisture before irrigation 70.80.70 %									
		31	3	95	6	135	8	170	4	21	2423
		Soil moisture before irrigation 75.85.75 %									
		31	3	95	7	135	10	170	4	24	2788
	Sharq Ne'mati	Soil moisture before irrigation 65.75.65%									
		31	2	95	5	135	7	170	4	18	2162
		Soil moisture before irrigation 70.80.70 %									
		31	3	95	6	135	8	170	4	21	2423
		Soil moisture before irrigation 75.85.75 %									
		31	3	95	7	135	10	170	4	24	2788
	Dolby F1	Soil moisture before irrigation 65.75.65%									
		31	2	95	5	135	6	170	4	17	2027
		Soil moisture before irrigation 70.80.70 %									
		31	2	95	5	135	7	170	4	18	2162
		Soil moisture before irrigation 75.85.75 %									
		31	2	95	6	135	9	170	4	21	2527

The results of the experiment to determine the irrigation parameters and fertilization rate in the cultivation of melon and watermelon by drip irrigation method showed this (Table 2).
As a result of the analysis and research of the moisture dynamics of the active soil layer according to the researched experimental options, we found the following.
The results of our research showed that among the 3 irrigation parameters, the yield of melons and watermelons was higher in the option where the soil moisture was maintained at the level of 70-80-70% than in the other options. At the same time, the quality of ripe melons and watermelons stood out from the rest. In order to maintain the average regime of this option, watering was carried out 21 times in the watermelon varieties "Shirin", "Sharq Ne'mati", 18 times in the "Dolby F1" hybrid, and 17 times in the "Kichkintoy" and "Kok Tinni 1087" melon varieties. Watermelon average varieties "Shirin", "Sharq Ne'mati" and "Dolby F1" hybrid increased yield and fruit quality in the 70-80-70% option, with 3-4 times the number of irrigation compared to the 75-85-75% option, the general irrigation norm and it was less than 365 m3/ha. These indicators make it possible to get a high yield and ecologically clean product from the melon and watermelon plant while using less water for our growers at a time when the climate is changing sharply and the water shortage is increasing.
According to the results of the study of the effect of storage conditions and periods on the quality of watermelon fruits, it was noted that the quality of watermelon fruits left in the field for 3-5 days did not change in the researched hybrids and varieties. After 10 days, this quality indicator increased by 1.0% in the "Shirin" variety, by 1.2% in the "Sharq Ne'mati" variety, by 0.8% in the "Dolby F1" hybrid, and by 2.7% in the "Shirin" variety after 15 days. , 2.8% in "Sharq Ne'mati" variety, 2.5% in "Dolby F1" hybrid. After 20 days, it decreased by 7.2% in "Shirin" variety, 7.4% in "Sharq Ne'mati" variety, and 7% in "Dolby F1" hybrid. As the fruit remained in the field, the quality decreased by 17-17.4% on the 30th day (Figure 1).
The greatest loss when stored for 30 days in the combined (open field and naturally ventilated warehouse) method (12.6% in the variety "Sharq Ne'mati", 12.4% in the variety "Shirin" and 12% in the hybrid "Dollby F1") was 20 days in the field + naturally ventilated was found in the option of storage for 10 days, which is 2.5-2.6 times more than the control (for 30 days from the time of harvesting).

Table 3: Change in fruit quality when stored in the combined method, % (2022 year)

Options	Decrease in quality indicators, %		
	Shirin	Sharq Ne'mati	Dolby F1
30 days in a naturally ventilated warehouse (control)	4,7	4,9	4,3
3 days in the field + 27 days in the warehouse	4,2	4,3	4,0
5 days in the field + 25 days in the warehouse	5,8	6,0	5,3
10 days in the field + 20 days in the warehouse	7,4	7,5	7,0
15 days in the field + 15 days in the warehouse	8,3	8,5	7,9
20 days in the field + 10 days in the warehouse	12,4	12,6	12,0

When watermelon fruits were stored in the field for 3 days + 27 days, it was found that the quality of fruits decreased by 4.0-4.3% in hybrids and varieties (Table 3).

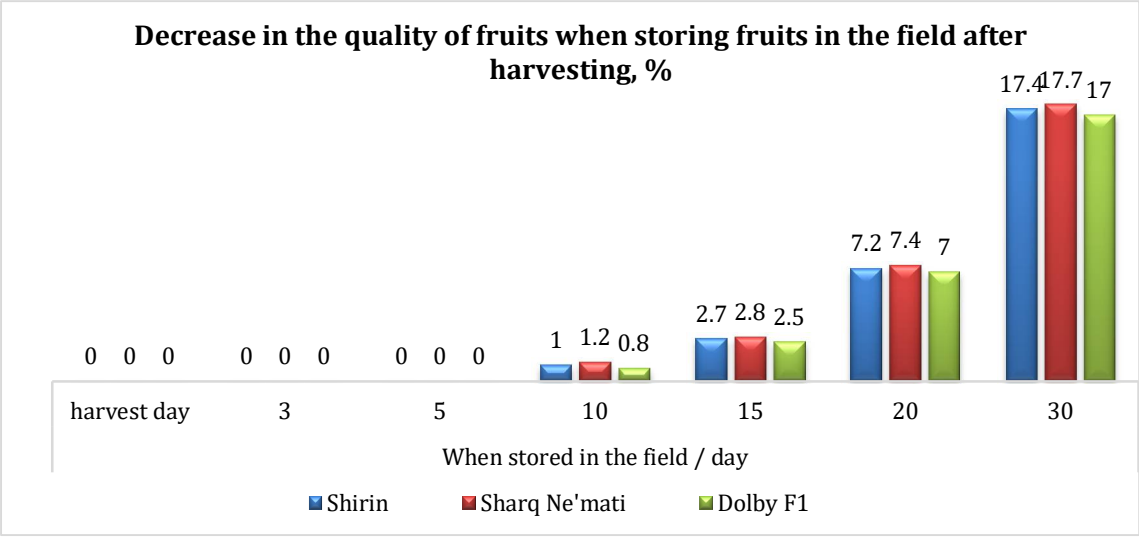

Fig 1. Decrease in the quality of fruits when storing fruits in the field after harvesting, % (2022 year)
The composition and amount of chemical substances play an important role in evaluating the quality of fruits. During the first 10 days of storage of watermelon fruits in the field, the amount of dry matter and

sugar in them increased, and with subsequent storage, these indicators decreased. Thus, at the end of storage, the amount of ascorbic acid decreased by 1.5 times, and the amount of nitrates decreased by 2.5 times (Figure 2).

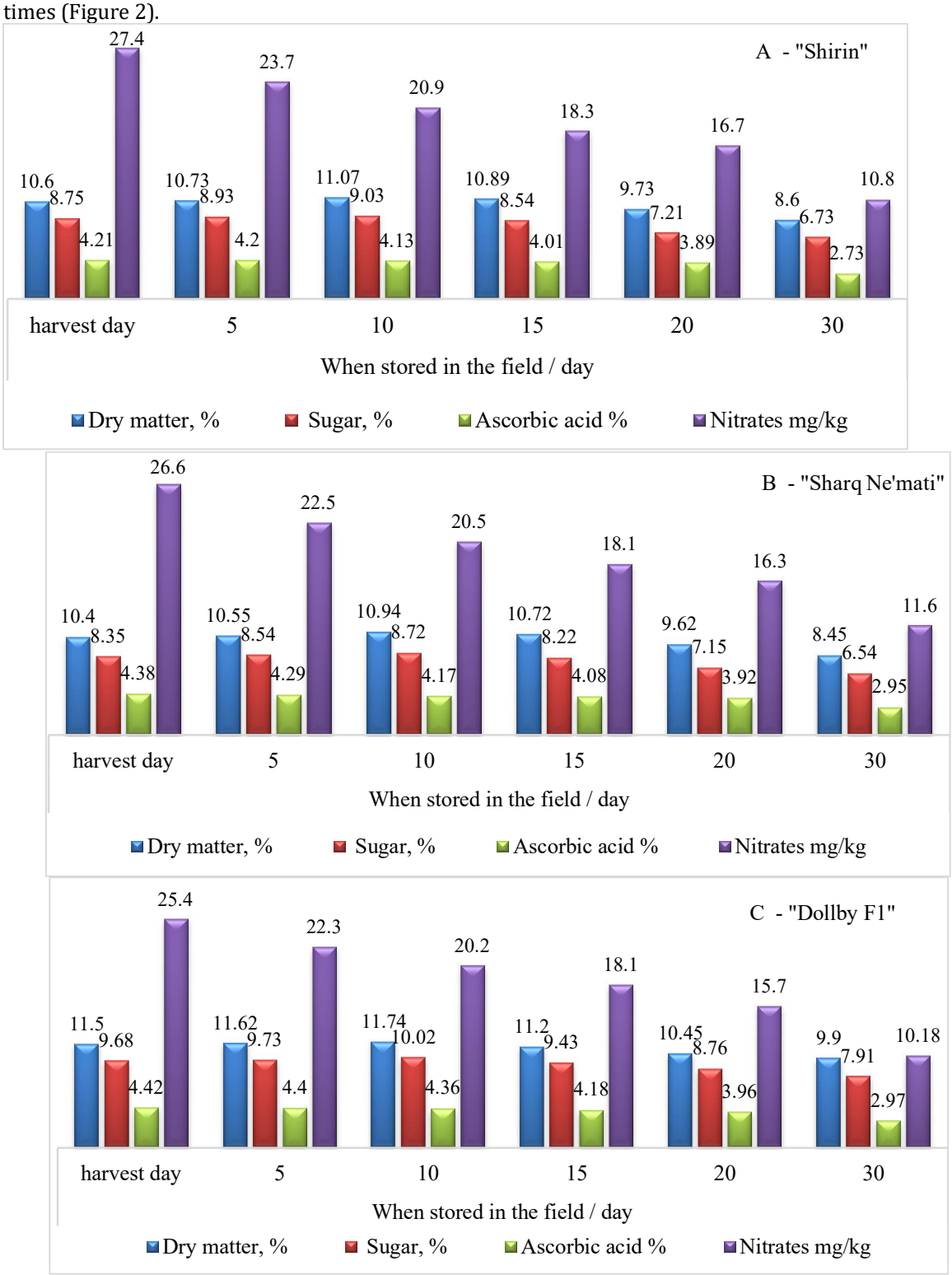

Figure 2. Changes in the chemical composition of "Shirin", "Sharq Ne'mati" varieties and "Dollby F1" hybrid fruit during storage in the field.

The results of the experiment to determine the pulp yield of melons grown using different fertilization rates showed that the flesh of the fruit was 82.4 - 82.6%, and the pulp was 12.8 – 13.0%, the seed-placenta was

4.8-4.4%. In the case of mineral fertilizers ($N_{75}P_{75}K_{60}$ kg/ha), respectively, 82.2 – 82.4; 12.8 – 12.9; It was 5.0-4.7%, and compared to the control option, it showed an increase of 0.2% of fruit flesh and pod, 0.2-0.4% of seed-placenta.

The most meat yield (83.6 – 83.4%), pod share (12.7 – 13.1%) and seed-placental weight (3.7 – 3.5%) studied melon varieties organomineral fertilizers ($N_{120}P_{80}K_{50}$kg/ ga) was obtained when grown under conditions (Table 4).

Table 4: Weight of pod, seed-placenta and flesh in fruit when melon cultivars are grown under different fertilization rates

№	Varieties name	Weight of fruit parts,%		
		meat	pod	seed - placenta (core)
Without fertilizer (control)				
1.	Kokcha - 588	82,4	12,8	4,8
2.	Oq urug - 1157	82,6	13,0	4,4
$N_{75}P_{75}K_{60}$ kg/ha				
3.	Kokcha - 588	82,2	12,8	5,0
4.	Oq urug - 1157	82,4	12,8	4,8
$N_{120}P_{80}K_{50}$ kg/ha				
5.	Kokcha - 588	83,6	12,7	3,7
6.	Oq urug - 1157	83,4	13,1	3,5

According to the data, when the fruit of melon varieties obtained in conditions without fertilizers is dried, the yield of pulp compared to flesh is 9.0-12.0%, and the yield is 2.02-2.62 tons per hectare.

The yield of melon varieties grown under conditions of mineral fertilizers ($N_{75}P_{75}K_{60}$ kg/ha) was 9.1-12.2% and the yield was 2.58-3.14 t/ha. The highest fruit yield (9.3 - 12.4%), yield (3.16 - 3.79 t/ha) was obtained when melon varieties were grown in organomineral conditions ($N_{120}P_{80}K_{50}$kg/ha). The above pattern was also observed when dried in an artificial chamber.

Table 5: Effects of drying methods on yield, fruit sugar content and rind yield when melon cultivars are grown under different fertilization rates

№	Varieties name	Yield, t/ha	Sugar content,%	Melon rind versus melon flesh			
				in the existing (helio) drying method		when dried in an artificial chamber	
				t/ha	%	t/ha	%
Without fertilizer (control)							
3.	Kokcha - 588	28,4	10,0	2,58	9,1	2,81	9,9
4.	Oq urug - 1157	25,7	9,2	3,14	12,2	3,44	13,4
$N_{75}P_{75}K_{60}$ kg/ha							
7.	Kokcha - 588	24,2	10,0	2,18	9,0	2,35	9,7
8.	Oq urug - 1157	21,8	9,0	2,62	12,0	2,86	13,1
$N_{120}P_{80}K_{50}$ kg/ha							
11.	Kokcha - 588	34,0	10,7	3,16	9,3	3,40	10,0
12.	Oq urug - 1157	30,6	10,4	3,79	12,4	4,16	13,6

However, it was noted that the fruit yield increased by 0.7-1.2%, the yield increased from 2.18 to 4.16 tons per hectare, and the highest fruit yield (10.0-13.6%) was obtained from melon varieties with organomineral fertilizers ($N_{120}P_{80}K_{50}$kg/ha) was recorded when grown under conditions (Table 5).

CONCLUSION

Generally speaking, the black mulching material and the option of 70, 80, 70% soil moisture before irrigation create favorable soil climate conditions for melon and watermelon crops, and mulching significantly reduces the evaporation of water resources in the soil and the number of weeds. Applying this mulching and drip irrigation practice allows our growers to have an environmentally friendly product, as well as a high yield, while observing the vagaries of the climate.

As for the technology of storage and processing of melon and watermelon crops, when using the method of storing watermelon in the field and in a naturally ventilated warehouse, it is not economically beneficial to store the fruits of watermelon hybrids and varieties in the field for more than 15 days, after 20 days the quality is 7.0-7.4%, after 30 days and it was found that it decreased by 17.0-17.7%. Based on the above, if

it is not possible to export the harvested watermelon on the day of harvesting, the harvested fruits can be stored in the field for up to 15 days. When melon fruits obtained under conditions of mineral fertilizers ($N_{75}P_{75}K_{60}$kg/ha) are dried, compared to the option without fertilizer (control), 0.2-0.7% dry matter, 2.1-2.8% total sugar, 3.1-3.9 mg/ It turned out that it contains a lot of vitamin C. Based on this, we can say that the biochemical value of the product will be high when we process the melon fruits grown with fertilizer at the rate of $N_{75}P_{75}K_{60}$kg/ha.

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