Table 2: The chemical composition of compost, rabbit manure and olive pomace.

Organic fertilizer	EC (dS / m)	pH (1:2.5)	O.M (%)	Total C (%)	N (%)	C/N ratio	P (%)	K (%)
Compost	1.91	8.06	26.2	33.2	0.52	15.6	0.4	0.6
Rabbit manure	2.3	8.95	77.29	51.25	1.79	34.9	0.59	0.67
Olive pomace	0.81	4.84	55.8	37	0.97	26.7	0.56	4.82

Climatic data, maximum (T. max. °C) and minimum (T. min. °C) air temperature and relative humidity (RH %) under greenhouse conditions were obtained by the meteorological station of CLAC during both growing seasons and the date are shown in Table (3).

Table 3: Average maximum and minimum air temperature and relative humidity under greenhouse condition during growing seasons

	2020 / 2021			2021 / 2022		
Month	T. max. °C	T. min °C	RH (%)	T. max. °C	T. min °C	RH (%)
Oct.	27.0	14.1	61.8	27.5	14.5	61.1
Nov.	27.0	16.7	64.6	27.0	14.2	63.7
Dec.	21.6	10.9	66.8	24.5	11.1	66.5
Jan.	20.9	8.4	56.6	22.5	9.1	70.6
Feb.	21.9	9.2	55.3	23.7	10.6	66.1
Mar.	26.3	13.5	55.0	26.7	13.5	54.1
Apr.	29.0	14.3	47.9	31.1	16.4	48.2
May	34.1	19.8	47.1	34.4	19.8	45.8

2.4 Recorded Data

Soil temperature (°C) has been estimated weekly in 20 cm depth of soil by using a soil thermometer during the growing season under different treatments of plastic cover mulch. Besides, the soil moisture (%) was estimated under different covers of plastic mulch, as well in both growing seasons by using a soil moisture meter.

For the growth parameters estimation, samples of three plants from each subplot were taken randomly after 70 days from transplanting to record the following characters i.e., plant height (cm), number of leaves, stem diameter (mm), number of branches, number of flowers, plant fresh weight (g) and plant dry weight (g). The average dry weight of the plant sample was dried at 70 °C in the oven. For the chemical composition estimation, the sample of the fourth top leaf from the apical tip of the plant was dried at 70 ºC for three days, then it was digested to determine N, P and K contents as follows:

- Total nitrogen (%) in leaves was determined by using the micro Kjeldahl by (A.O.A.C., 1990).
- Phosphorus (%) was determined calorimetrically at 550 mm as described by (Ranganna, 1970).
- Potassium (%) was determined by a flame photometer as described by (Ranganna, 1970).

The ripe fruits of husk tomato were collected from plants and some parameters have been taken i.e., average fruit weight (g) and fruit diameter (mm). The total yield of fruits was estimated by collecting ripped fruits regularly every week picking to the end of the season and the total yield was estimated at the end of harvesting season (g / plant) as well as (Kg / GH) for each treatment.

2.5 Storage Experiment

The storage experiment was carried out on husk tomato plants, (Physalis pubescens. L) of the cultivar Balady, to investigate the effect of Pre-Harvest types of colors mulch and fertilization treatments on maintaining quality attributes, decay, and extend the Shelf life of fresh unhusk tomato fruits during cold storage. [redacted] at the green-yellow color stage and transported immediately within half an hour to the laboratory of the Department of Vegetable Handling and Postharvest Research Section, Horticultural Research Institute, Agriculture Research Center, Giza Governorate, Egypt. Then, remove the husk (without calyx) from the fruits and select the fruits that were uniform in size, color, and the absence of mechanical injuries, external defects, and free from any visual defects for all treatments of the field experiment. The fruits (unhusk tomato) were immersed in a 500 ppm sodium hypochlorite solution for 5 minutes to disinfect them, followed by repeated washing with distilled water and then, unhusk tomato fruits were dried in a well-ventilated room under the sterilized condition for 30 min and packed in plastic punnets and each packed was approximately 250g represented as an experimental unit (EU). Fifteen EU were prepared for each treatment. Samples were arranged in a complete randomized design. All treatments were placed inside carton boxes (40 × 30 ×12.5 cm) and stored at 5°C and 95% RH, for 24 days. Samples of 3 replicates (EU) were randomly taken and examined at five days intervals (0, 6, 12, 18, and 24 days) for the following properties.

2.5.1 Physical Analysis

- Weight Loss (%): The weight of each sample of the three replicates of each experimental unit was recorded after harvest and after every 5 days of storage period. by the following equation: weight loss % =Initial weight of fruit – the weight of fruit at sampling date / the initial weight of the fruit X 100.
- General Appearance: It was determined according to the scale of the scoring system 9: Excellent, 7: good, 5: fair, 3: poor and 1: unsalable, depending on morphological defects and pathological defects (Gorny et al., 2002).
- Decay percentage (%) was calculated by weighing all decayed fruits (affected by visible signs of rot or fungal growth) relative to the weight of total fruits.
- Total Soluble solids percentage (°Brix %): was determined by using PR- 101 digital refractometer.
- Fruit firmness: was recorded using a TA-1000 texture analyzer instrument using a penetrating cylinder of 1mm diameter. Firmness was expressed as a pound per square inch (Lb/in^2).

2.5.2 Chemical Composition

- Ascorbic acid content (mg/100g FW): was determined by titration method using 2, 6 dicloro phenol indophenols as described by (A.O.A.C., 2000).

2.6 Statistical Analysis

All obtained data were subjected to statistical analysis for variance by using a split plot design as mentioned by (Gomez and Gomez, 1983) for calculating the least significant differences (LSD) at 5% level and obtained Duncan's multiple range test at 5% level of significance by using CoStat (Version 6.3, CoHort, USA, 1998-2004).

3. Results and Discussion

3.1 Soil Temperature (°C)

The response of soil temperature (°C) to different types of polyethylene mulch is presented in Figure 1. Covering the soil with both polyethylene mulch colors i.e., transparent and black resulted in increasing soil temperature compared with bare soil treatment (control) during both growing seasons. Using transparent mulch increased the average soil temperature during the growing season and was better than using black mulch. During both growing seasons, the bare soil treatment resulted in the lowest average soil temperature readings. Data also cleared that The

impact of black and transparent mulch on soil temperature varied just marginally compared with bare soil. These results may have been due to the polyethylene mulch collecting the solar radiation beneath mulching material which led to enhancing the soil temperature. Similar results were reported by (Mashingaidze et al., 1996; Amare and Desta, 2021; Kirigiah et al., 2022).

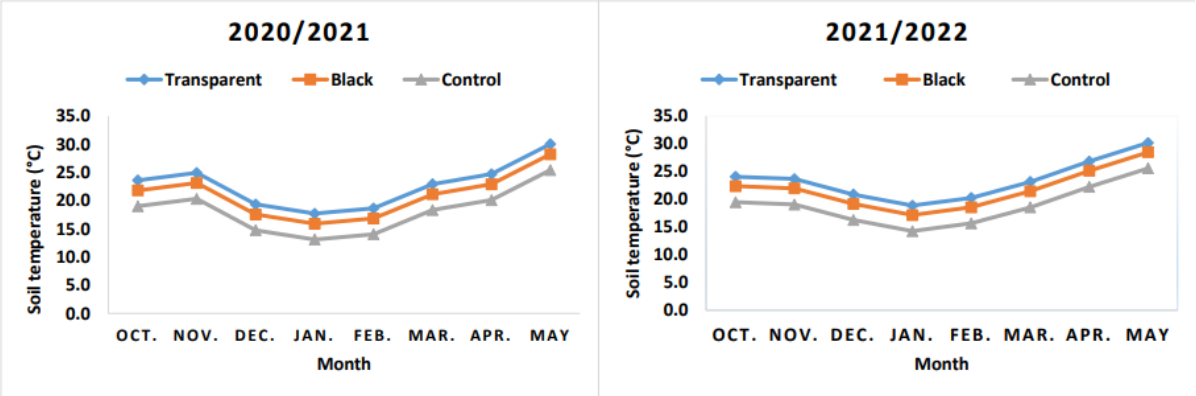

Figure 1: Effect of different types of polyethylene mulch on soil temperature (°C) during the first and second seasons

3.2 Soil Moisture (%)

Data in Figure (2) presented the difference in soil moisture content (%) between the application of black and transparent polyethylene mulch and bare soil (control) treatment. Data cleared that both types of polyethylene mulch transparent and black enhanced the moisture contents (%) beneath them compared with bare soil. The difference between transparent and black mulch was very small during the first and second seasons. During the first and second growing seasons, bare soil treatment produced the lowest values of soil moisture content. These results may have been due to the polyethylene mulch reducing the evaporation water from the soil surface and letting the soil have enough moisture during the growing season compared with bare soil. Similar results were reported by (Amare and Desta, 2021; Kirigiah et al., 2022).

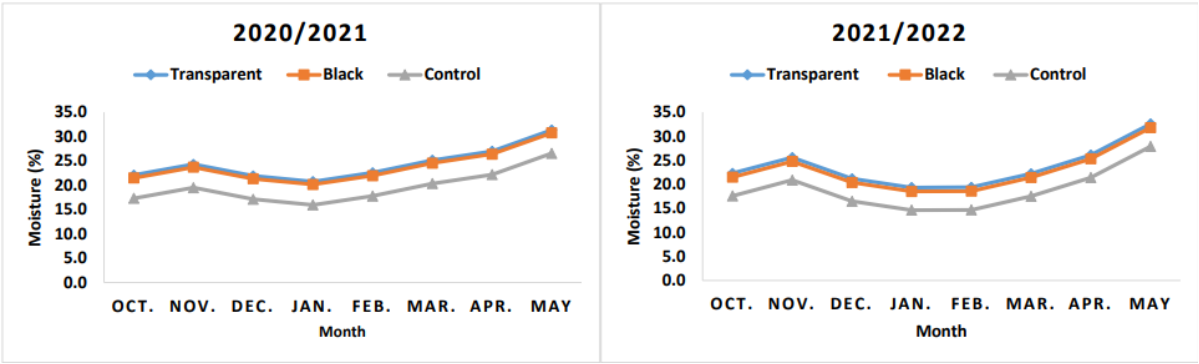

Figure 2: Effect of different types of polyethylene mulch on soil moisture (%) during the first and second seasons

3.3 Growth Pattern

The presented data in Tables (4 and 5) illustrated that The growth measurements of husk tomato plants were positively impacted by the application of different organic fertilizers as well as covering soil with polyethylene mulch. Using the organic fertilizers with 50% NPK (F1) gave the highest values of the growth characteristics, such as plant height, leaf and branch counts, stem diameter, and fresh and dried weight of the plant during the first and the second growing seasons. Whereas, using only one kind of organic fertilizer with 50% of NPK mineral fertilizers gave the lowest increments. A full dose (100% NPK) of mineral fertilizers (F5) came in the last rank. These results may have been due to the organic fertilizers mixture improving the soil's chemical and physical characteristics, such as its ability to hold water, water availability and ions exchange capacity (Ariati et al., 2016; Verma et al., 2017; Syropoulou et al., 2022). Using polyethylene mulch enhanced the aforementioned growth parameters of husk tomato plants compared with bare soil (control) treatment.

Transparent mulch was better than black mulch and gave the highest increments for growth parameters but bare soil gave the lowest values in both growing seasons. These results may be due to polyethylene mulch enhancing the properties of soil temperature and moisture and making suitable environments for root system and plant growth. Similar results were obtained by (Parmar et al., 2013; Helaly et al., 2017; Tüzen et al., 2021). Concerning the interaction effect, the application of rabbit manure, compost and olive pomace plus 50% of NPK (F1) combined with transparent polyethylene mulch gave the highest values of growth parameters followed by using black mulch with the same organic fertilizers mixture (F1) as well as using transparent mulch with rabbit manure plus 50% NPK treatment (F2). The lowest values of growth parameters obtained bare soil treatment (control) with all combinations of organic fertilizers i.e., rabbit manure (F2), compost (F3), olive pomace (F4) and 100% NPK (F5) during the first and the second season. These results may be due to the integrated effect of transparent mulch and organic fertilizers mixture in improving the physiochemical properties of soil and their impact on plant growth.

3.4 Flowering

Data in Table (5) cleared that the application of organic fertilizers mixture with a half dose of NPK (F1) produced the greatest number of flowers then came an individual appling compost then rabbit manure whereas, the lowest no. of flowers obtained from using olive pomace plus 50% NPK (F4) during the first and the second season. At the same time, using a full dose of NPK mineral fertilizers (F5) came in the fourth rank. These outcomes could be the result of the effect of organic fertilizers improving soil properties and enhancing the nutrient absorption especially, potassium which enhances plant flowering. These results were in agreement with those of (Gond et al., 2018).

On the other hand, using polyethylene mulch either transparent (TM) or black (BM) enhanced the flowering of husk tomato plants compared with bare soil (control) treatment but transparent polyethylene was better than black one and gave the highest number of flowers per plant. The combination of using organic fertilizers mixture plus 50% NPK (F1) and transparent polyethylene mulch (TM) was the reason behind the increasing in no. of flowers during both of growing seasons but bare soil treatment had produced the lowest no. of flowers during both of growing seasons.

Concerned the effect of interaction, the best flowering occurred by using transparent mulch with the mixture of organic fertilizers and 50% NPK (F1) followed by using transparent mulch with compost and 50% NPK (F3), whereas, the lowest flowers number obtained from application of rabbit manure (F2) in the bare soil (control) treatment in both of growing seasons. These results may have been due to the organic fertilizers and

mulching impact in improving soil properties such as water holding capacity and nutrients availability which led to improve the flowering (Parmar et al., 2013; Helaly et al., 2017; Gond et al., 2018; Tüzen et al., 2021).

Table 4: Effect of polyethylene mulch, organic fertilizers and their interaction on plant height, No. of leaves, No. of branches and stem diameter during first and second seasons

Mulch	2020/2021						2021/2022					
	Fertilizer											
	Plant height (cm)											
	F1	F2	F3	F4	F5	Mean	F1	F2	F3	F4	F5	Mean
BM	191.5b	184.7c	165.4g	174.9e	154.9i	**174.3B**	193.4c	186.5d	167.0g	176.7e	156.5h	**176.0B**
TM	195.9a	190.8b	171.1f	183.6d	163.2h	**180.9A**	199.9a	194.7b	174.6f	187.2d	166.5g	**184.6A**
Control	146.1j	140.0k	133.3m	135.7l	120.7n	**135.1C**	147.5i	141.4j	134.6l	137.0k	121.9m	**136.5C**
Mean	**177.9A**	**171.9B**	**156.6D**	**164.7C**	**146.3E**		**180.3A**	**174.2B**	**158.7D**	**166.9C**	**148.3E**	
	No. of leaves / plant											
BM	531.8b	488.6d	411.9h	447.3f	301.2m	**436.2B**	537.2b	493.5d	416.0h	451.7f	304.1m	**440.5B**
TM	543.8a	497.8c	418.3g	454.5e	305.8l	**444.1A**	554.7a	507.8c	426.7g	463.6e	311.9l	**452.9A**
Control	411.4h	376.1i	315.1k	342.5j	230.3n	**335.1C**	415.5h	379.8i	318.2k	345.9j	232.6n	**338.4C**
Mean	**495.7A**	**454.2B**	**381.7D**	**414.7C**	**279.1E**		**502.4A**	**460.3B**	**387D**	**420.4C**	**282.9C**	
	No. of branches / plant											
BM	9.4ab	8.8cd	8.1gh	8.3ef	7.2j	**8.4B**	9.6ab	9.0cd	8.3gh	8.9ef	7.3gj	**8.5B**
TM	9.4a	8.8c	8.2fg	8.4e	7.4i	**8.4A**	9.6a	9.1c	8.4fg	8.6e	7.5i	**8.6A**
Control	9.3b	8.7d	8.1h	8.3ef	7.3ij	**8.3B**	9.5b	8.9d	8.3h	8.5ef	7.4ij	**8.5B**
Mean	**9.3A**	**8.8B**	**8.2D**	**8.3C**	**7.3E**		**9.5A**	**8.9B**	**8.3D**	**8.5C**	**7.4E**	
	Stem diameter (mm)											
BM	24b	22.6d	18.5i	20.4g	16.4l	**20.4B**	25b	23d	18.8i	20.8g	16.8k	**20.9B**
TM	24.8a	23c	18.8h	20.7f	16.8k	**20.8A**	25.4a	23.5c	19.1i	21.3f	17.2j	**21.3A**
Control	22e	20.6fg	16.8k	18.3j	15m	**18.5C**	22.5e	20.2h	17.1j	18.8i	15.2l	**18.8C**
Mean	**23.6A**	**22B**	**18D**	**19.8C**	**16.1E**		**24.3A**	**22.3B**	**18.3D**	**20.3C**	**16.4E**	

Values of specific or interaction effect followed by the same capital and small letters are not significantly different at 5% level.

Table 5: Effect of polyethylene mulch, organic fertilizers and their interaction on plant fresh weight, plant dry weight and No. of flowers during the first and second seasons.

Mulch	2020/2021						2021/2022					
	Fertilizer											
	Plant fresh weight (g)											
	F1	F2	F3	F4	F5	Mean	F1	F2	F3	F4	F5	Mean
BM	2792b	1991f	1258k	1830g	1126l	**1799B**	2858b	2037f	1287k	1872g	1152l	**1841B**
TM	3399a	2399d	1544i	2202e	1354j	**2179A**	3478a	2455d	1580i	2253e	1386j	**2230A**
Control	2592c	1838g	1156l	1676h	1044m	**1661C**	2653c	1881g	1183l	1715h	1068m	**1700C**
Mean	**2928A**	**2076B**	**1319D**	**1902C**	**1174E**		**2996A**	**2124B**	**1350D**	**1947C**	**1202E**	
	Plant dry weight (g)											
BM	744b	531f	335k	488g	300l	**480B**	762b	543f	343k	499g	307lm	**491B**
TM	913a	638d	406i	586e	360j	**581A**	928a	655d	421i	601e	369j	**595A**
Control	683c	484g	304l	441h	275m	**437C**	708c	502g	315l	457i	285m	**453C**
Mean	**780A**	**551B**	**348D**	**505C**	**318E**		**799A**	**567B**	**360D**	**519C**	**320E**	
	No of flowers /plant											
BM	33c	28f	30d	23i	26g	**28B**	34c	19f	31d	23i	17g	**29B**
TM	36a	31d	34b	25h	29e	**31A**	37a	32d	35b	26h	30e	**32A**
Control	23i	20k	22j	16m	19l	**20C**	24i	20k	22j	16m	20l	**20C**
Mean	**31A**	**26C**	**29B**	**21E**	**25D**		**31A**	**27C**	**29B**	**22E**	**25D**	

Values of specific or interaction effect followed by the same capital and small letters are not significantly different at 5% level.

3.6 Yield and Its Components

The effects of plastic mulch and organic fertilizers on the fruits output and constituents of husk tomato plants were displayed in Table (6). i.e., number of fruits per plant, average fruit weight and total yield per plant (g / plant) as well as per greenhouse (Kg / GH). Application of an organic mixture of rabbit manure, compost and olive pomace beside 50% of mineral fertilizers (F1), during both of growing seasons, enhanced the yield of husk tomato fruits as well as its components followed by using compost with the half dose of mineral fertilizers (F3) then using rabbit manure with mineral fertilizers (F2) as well as using the full dose of mineral fertilizers (F5). Olive pomace with a half dose of mineral fertilizers (F4) yielded the lowest fruit yield and components.These results due to the positive impact of organic fertilizers on plant growth and flowering which led to an increase the yield.

The similar results obtained by mny researcher and disagree with those of who found mineral fertilizer was better than organic fertilizer in fruit yield (Yanar et al., 2011; Kochakinezhad et al., 2012; Patidar et al., 2018; Gond et al., 2018; Syropoulou et al., 2022). Besides, using transparent mulch (TM) had a great impact on yield and its components during both seasons compared with using black mulch (BM), the lowest fruit yield and its components appeared in bare soil (control) treatment. Similar results were obtained (Mashingaidze et al., 1996). Obviously, the interaction between mulching and fertilization enhanced the yield of husk tomato fruits, the highest yield of fruits as well as its components obtained from using transparent mulch followed by using black mulch with an organic mixture of rabbit manure, compost and olive pomace with the half dose of mineral fertilizers.

On the contrary, non-mulched treatment with olive pomace and half dose of mineral fertilizers gave the lowest values of fruits yield as well as its components. Using either compost or full dose of mineral fertilizers with both types of polyethylene mulch gave moderate results of fruits yield and its components as well in the first and the second growing seasons. These results may be due to the effect of mulching as well as organic fertilizers in improving soil properties and leading to an increase the fruit's yield (López et al., 2014; Helaly et al., 2017; Patidar et al., 2018; Gond et al., 2018).

Table 6: Effect of polyethylene mulch, organic fertilizers and their interaction on yield and its components of husk tomato plants during first and second seasons.

Mulch	2020/2021						2021/2022					
	Fertilizer											
	No. of fruits / Plant											
	F1	F2	F3	F4	F5	Mean	F1	F2	F3	F4	F5	Mean
BM	121.4b	104.7e	109.5d	83.1i	96.7f	**103.1B**	131.5b	115.2f	120.4d	115.2f	120.4d	**133.8A**
TM	135.7a	115.7c	120.5b	92.6gb	108.2d	**114.5A**	91.5j	106.4g	149.3a	127.3c	132.5b	**121.4B**
Control	104.2e	88.8h	92.8g	70.4	82.7i	**87.8C**	101.8h	119.1e	114.6f	97.7i	102.1h	**107.1C**
Mean	**120.4A**	**103.1C**	**107.6B**	**82.1E**	**95.9D**		**135.3A**	**113.5D**	**128.2B**	**113.4D**	**118.4C**	
	Ave. fruit weight (g)											
BM	2.8 b	2.3 d	2.5 c	1.7g	1.9f	**2.2B**	3.1b	2.53e	2.7d	1.93h	2.1g	**3.08A**
TM	3.2a	2.5c	2.7b	1.8fg	2.1e	**2.9A**	3.67a	2.83c	3.03b	2.03h	2.33f	**2.76B**
Control	2.7b	2.1e	2.3d	1.5g	1.75g	**2.1C**	3.03b	2.33f	2.53e	1.73i	1.93h	**2.31C**
Mean	**2.9A**	**2.3C**	**2.5B**	**1.7D**	**1.2E**		**3.2A**	**2.57C**	**2.76B**	**1.9E**	**2.12D**	
	Yield (g /plant)											
BM	344.4b	243.4f	268.4e	144.8k	184.1i	**340.8A**	416.7b	294.5ef	324.8c	220.8i	252.1h	**301.8B**
TM	438.9a	293.2d	329.4c	169.8j	230.9g	**239.7B**	325.2c	296.5def	449a	256.8h	311.1cd	**327.7A**
Control	287.3d	189.1i	215h	109.9l	144.8k	**189.3C**	308.8de	278.7g	292.3fg	167.9k	196.5j	**248.8C**
Mean	**357.8A**	**238C**	**270.9B**	**141.5E**	**186.6D**		**350.3A**	**289.9B**	**355.4A**	**215.1D**	**253.2C**	
	Yield (Kg /GH)											
BM	275.5b	194.7f	214.8e	115.9k	147.3i	**189.6B**	333.4b	235.6ef	259.9c	176.6i	201.7h	**241.4B**
TM	351.2a	234.5d	263.5c	135.9j	184.7g	**233.9A**	260.2c	237.2def	359.2a	205.4h	248.8cd	**262.2A**
Control	229.9d	151.3i	172h	87.9l	115.9k	**151.4C**	247.1de	222.9g	233.8fg	134.3k	157.2j	**199.1C**
Mean	**285.5A**	**193.5C**	**216.8B**	**113.2E**	**149.3D**		**280.2A**	**231.9B**	**284.3A**	**172.1D**	**202.5C**	

Values of specific or interaction effect followed by the same capital and small letters are not significantly different at 5% level.

3.7 Fruits Quality

Data in Table (7) present the effect of organic fertilizers, polyethylene mulch and their interaction on some quality characteristics of husk tomato fruits i.e., fruit diameter (mm), total soluble solids (TSS) and vitamin C (mg / 100 g FW). Using organic fertilizers mixture with a half dose of mineral fertilizers (F1) enhanced the quality properties of husk tomato fruit. Using compost with a half dose of mineral fertilizers (F3) had the second rank then using rabbit manure (F2). The lowest values of the aforementioned fruit quality characteristics were obtained from applying either a full dose of minerals (F5) or olive pomace fertilizer with a half dose of minerals (F4). These results were similar during the first and the second growing seasons. These results may be due to the effect of organic mixture in improving soil properties and the excess in nutrient availability. These results are in agreement with (Özer, 2017; Patidar et al., 2018; Gond et al., 2018; Syropoulou et al., 2022).

On the other hand, the application of soil mulching i.e., TM and BM enhanced the quality of husk tomato fruits but TM treatment was better than the BM. On the contrary, bare soil (control) gave the lowest values of fruit quality during both growing seasons. This may be due to the effect of mulching in improving soil temperature and moisture compared with bare soil. Similar results were obtained by (Helaly et al., 2017; Amare and Desta, 2021; Tüzen et al., 2021; Kirigiah et al., 2022). The interaction between mulching and fertilization enhanced the quality of husk tomato fruits. Application of TM and organic mixture (F1) gave the highest increments followed by using BM. The lowest values were observed in bare soil with olive pomace as well as a full dose of mineral fertilizers (F5). Using the compost with TM or BM gave more suitable results of fruit quality than using rabbit manure or olive pomace during the first and the second seasons.

Table 7: Effect of polyethylene mulch, organic fertilizers and their interaction on quality characteristics of husk tomato fruit during first and second seasons.

Mulch	2020/2021						2021/2022					
	Fertilizer											
	Diameter (mm)											
	F1	F2	F3	F4	F5	Mean	F1	F2	F3	F4	F5	Mean
BM	16.4ab	11.5def	14.1bcd	9.3ef	9.36ef	**12.2A**	17.98b	12.63g	15.54d	10.6j	10.29k	**13.4B**
TM	18.2a	12.6cde	15.4abc	10.7ef	10.2ef	**13.4A**	20.02a	13.8f	16.97c	11.77h	11.26i	**14.7A**
Control	15.2abc	10.4ef	9.1f	8.9f	8.5f	**10.4B**	16.71c	11.41i	14.41e	9.79l	9.35m	**12.3C**
Mean	**16.6A**	**11.5BC**	**12.9B**	**9.7CD**	**9.4D**		**18.2A**	**12.6C**	**15.6B**	**10.7D**	**10.3C**	
	TSS °Brix (%)											
BM	11.9b	10.03d	8.42fg	7.74h	7.45i	**9.1B**	13.1b	11d	9.3fg	8.5h	8.2i	**10B**
TM	12.9a	11.2c	9.2e	8.5f	8.2g	**10A**	14.2a	12.2c	10.1e	9.35f	9.1g	**11A**
Control	11.1c	9.2e	7.6hi	7.1j	6.8k	**8.4C**	12.2c	10.2e	8.4hi	7.8j	7.5k	**9.2C**
Mean	**11.9A**	**10.2B**	**8.4C**	**7.8D**	**7.5E**		**13.2A**	**11.2B**	**9.3C**	**8.6D**	**8.3E**	
	VC (mg/100g FW)											
BM	29.6b	18.5g	26.9d	15.6i	14.5j	**21B**	32.6b	20.3g	29.6d	17.2i	15.9j	**23.1B**
TM	32.4a	20.3f	29.8b	17.3h	15.7i	**23.1A**	35.6a	22.3f	32.7b	19.1h	17.2i	**25.4A**
Control	27.4c	17.1h	24.8e	14.5j	12.9k	**19.3C**	30.1c	18.8h	27.3e	15.9j	14.2k	**21.3C**
Mean	**29.8A**	**18.6C**	**27.2B**	**15.8D**	**14.4E**		**32.8AB**	**20.5C**	**29.9B**	**17.4D**	**15.8E**	

Values of specific or interaction effect followed by the same capital and small letters are not significantly different at 5% level.

3.8 Postharvest Characteristics

3.8.1 Weight Loss

Data in Figure (3) obtained the effect of polyethylene mulching, fertilization treatments and their interaction on weight loss of husk tomato fruits during the storage period. There were significant variations among all treatments in the weight loss (%) during the storage periods at 5°C and 95% RH in two seasons. Generally, the weight loss of fruits has increased with the prolongation of the storage period. The highest weight loss in fruits resulted in a full dose of mineral fertilizers treatment (F5), whereas, the lowest values were obtained from using F1 fertilizers

mixture in both growing seasons. These results may be due to the rapid absorption of root-to-mineral fertilizers leading to rapid waste in a short period whereas, organic fertilizers are like slow-release fertilizers so they make good nutrient suppliers for a long period and encourage the metabolism process in fruits.

Also, the maximum weight loss was observed in the non-mulched treatment (control) after 24 days, whereas, the minimum weight loss resulted from TM treatment. This may be due to mulching enhanced soil temperature and moisture and gave good conditions for plant growth which is reflected on the elongation of the shelf life period in fruits. The combination of the applications of the full dose of mineral fertilizers (F5) in control treatment gave the highest values of weight loss of fruit, while the minimum was observed in the husk tomato fruits which were treated with F1 fertilizers mixture under transparent mulch, TM treatment compared to other treatments and control in both of growing seasons. These results may be due to immature fruits produced under bad conditions suffering physiological damages during postharvest than good fruits. These results are in agreement with (Kader, 2002; Cardenas-Barboza et al., 2021).

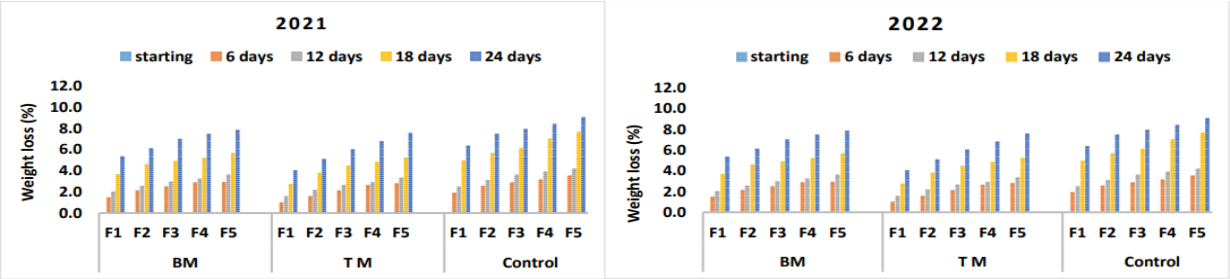

Figure 3: Effect of polyethylene mulching and fertilization treatments on weight loss (%) of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

3.8.2 General Appearance

As demonstrated in figure 4, there were significant differences among all fertilization and mulching treatments in the general appearance score of husk tomato fruits during storage periods at 5°C and 95% RH in both of growing seasons. Generally, the general appearance score has decreased with the prolongation of the storage period. The highest score was recorded by using F1 fertilization mixture and the lowest was recorded in F5 treatment in both growing seasons. On the other hand, Using transparent mulch gave the highest score of general appearance compared with other treatments whereas, the lowest score was recorded in the control (bare soil) treatment. regarding the interaction between mulching and fertilization, results revealed that husk tomato fruits treated with TM mulching and F1 fertilizers mixture gave the highest score and maintained and gave a good general appearance after 24 days during storage at 5°C. On the other hand, bare soil (control) and F5 mineral fertilizers treatments had a poor general appearance after 12 days of cold storage in two seasons. A similar result was obtained by (Olivares-Tenorio et al., 2017).

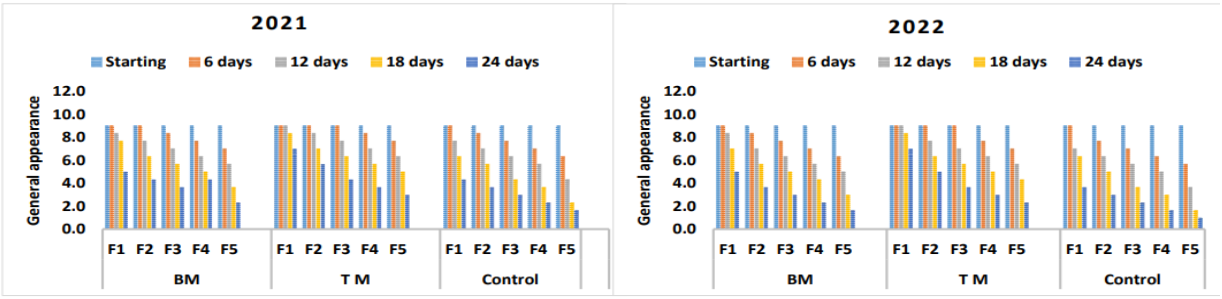

Figure 4: Effect of polyethylene mulching and fertilization treatments on weight loss (%) of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

3.8.3 Decay (%)

Data in Figure 5 showed a significant difference among all treatments on decay (%) of husk tomato fruits. Generally, the decay (%) of husk tomato fruits increased gradually during cold storage at 5°C and 95% RH . The lowest decay (%) was obtained by using F1 fertilizers mixture compared with other fertilization treatments. Using TM mulching has decreased the decay % in fruits compared with other mulching i.e., BM and control. Concerning the interaction effect of mulching and fertilization treatments, Data in Figure (5) show that the husk tomato fruits treated with TM mulching and F1 fertilizers mixture gave the lowest percentage of decay compared to the other treatments in the first and second seasons. These results may be due to the rate of decay for fruits depending on pre-harvest conditions in the field which affect all fruit quality. These results were consistent with those of (Wills et al., 1981; Olivares-Tenorio et al., 2017).

3.8.4 Total Soluble Solids (TSS) °Brix (%)

Presented data in Figure (6) Shows that the TSS percentage of husk tomato fruits decreased significantly in the two seasons. The reduction in TSS content during storage may be due to the higher rate of sugar loss through respiration than the water loss through transpiration. The fertilizers mixture F1 treatment gave the lowest percentage of TSS loss during storage periods. Besides, the highest TSS (%) was obtained from using TM mulching compared with other mulch color BM or bare soil. Concerning the effect of interaction between mulching and fertilization, the results showed significant differences between all treatments and the untreated control treatment in TSS % in the two seasons. Husk tomato fruits were treated with TM mulch and F1 fertilizers mixture reduced the loss of TSS percentage while the lowest value was obtained from the bare soil (control) and F5 (mineral fertilizers) after 24 days of storage at 5°C in the two seasons. These results of TSS content during the storage period may rely on the TSS content in ripped fruits after harvest. Thus the pre-harvest treatments affected TSS content and both organic fertilizers and mulching enhanced TSS (%) in fruits. These results were in agreement with those of (Wills et al., 1981; Ariati et al., 2017; Gond et al., 2018; Patidar et al., 2018; Amare and Desta, 2021; Kirigiah et al., 2022).

3.8.5 Firmness (lb/in²)

Presented results in Figure (7) indicated that there were significant differences among all treatments in the firmness (lb/in²) of husk tomato fruits during the cold storage period. The firmness progressively declined with the prolongation of the storage period at 5°C in the two growing seasons. Using F1 fertilizers mixture reduced the loss of firmness compared with other fertilization treatments i.e., rabbit manure, olive pomace as well as a full dose of mineral fertilizers. On the other hand, husk tomato fruits which resulted from using TM mulch gave the highest values of firmness compared with other mulching treatments i.e., BM and control. The combination of TM mulch and F1 fertilizers treatments maintained the firmness of husk tomato fruits and gave the highest values, while the lowest value was obtained from the control treatment with the full dose of mineral fertilizers after 24 days of storage at 5°C in the two studied seasons. These results of firmness depended on pre-harvest treatments. Plants exposed to suitable conditions i.e., soil fertility, good aeration and nutrient availability gave survival fruits during the storage period. These results are matched with those of (Wills et al., 1981; Olivares-Tenorio et al., 2017).

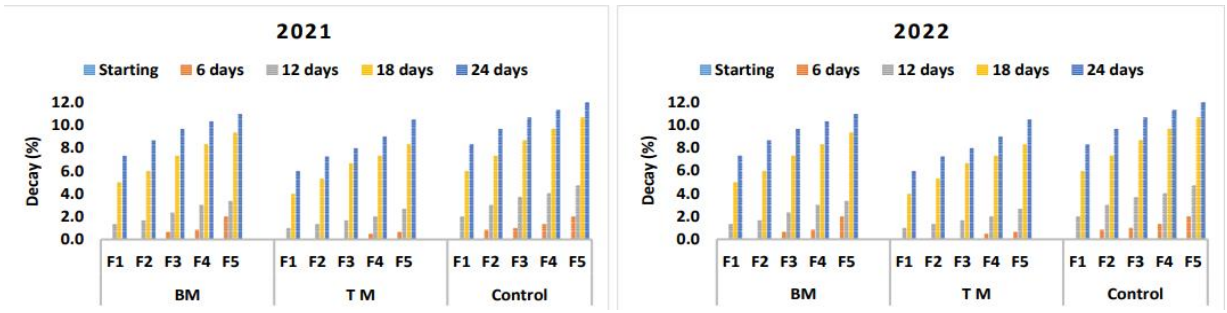

Figure 5: Effect of polyethylene mulching and fertilization treatments on decay (%) of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

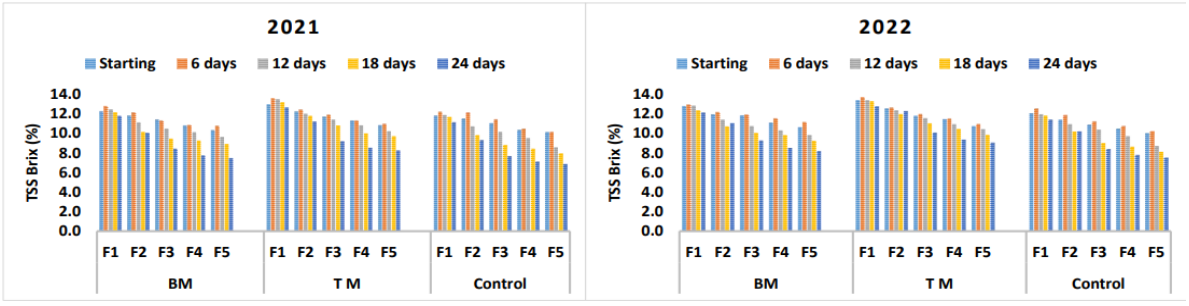

Figure 6: Effect of polyethylene mulching and fertilization treatments on TSS (%) of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

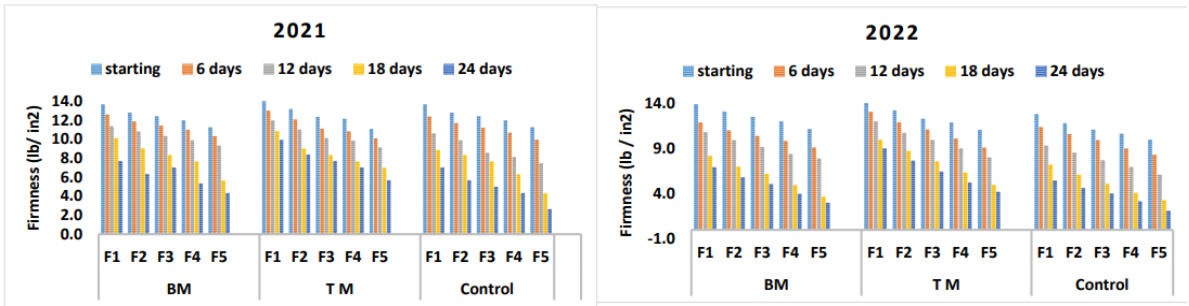

Figure 7: Effect of polyethylene mulching and fertilization treatments on firmness (lb/in2) of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

3.8.6 Vitamin C (mg/100g FW)

Data presented in figure (8) Indicated that vitamin C content decreased significantly during the storage period at 5°C up to 24 days in the two seasons. Regarding the effect of fertilizers, using F1 mixture gave the highest vitamin C values compared with other fertilizer treatments. In addition, using TM mulch in the field gave the highest vitamin C values in husk tomato fruits compared with other treatments i.e., BM and control. The effect of interaction between mulching and fertilization was significant during the two seasons of the study after 24 days of storage at 5°C. Husk tomato fruits treated with TM mulch and F1 fertilizers mixture were most effective in reducing the loss of vitamin C content during storage, the lowest value of vitamin C content was obtained in the control treatment using F5 mineral fertilizers in two seasons. This may have been due to the organic fertilizers as well as polyethylene mulching improving the physiochemical properties of the soil such as aeration, water movement and availability of nutrients which led to improved metabolism processes in plants and increased vitamin c content. These results are matched with those (Helaly et al., 2017; Özer, 2017; Shenstone et al., 2020; Amare and Desta, 2021; Tüzen et al., 2021; Kirigiah et al., 2022).

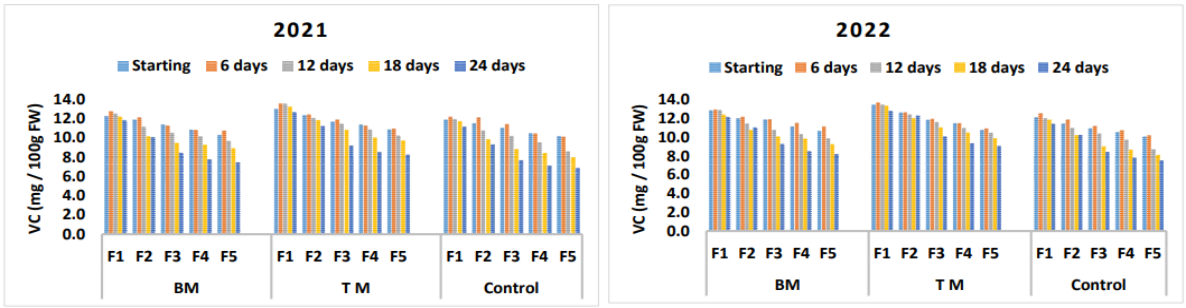

Figure 8: Effect of polyethylene mulching and fertilization treatments on vitamin C (mg/100g FW)of husk tomato fruits during storage at 5°C and 95% RH in the first and second seasons.

4. Conclusion

The experimental study was conducted during the winter seasons of 2020 / 2021 and 2021 / 2022 growing seasons. The study aimed to look into the impact of mixes of organic fertilizers, polyethylene mulching and their interaction on husk tomato plants in the field as well as during the postharvest period. The obtained results indicated that husk tomato plants responded to different organic fertilizers i.e., compost, rabbit manure and olive pomace together with a half dose of mineral fertilizers (NPK) and gave the highest growth values of plant height, number of leaves, stem diameter, number of branches, plant fresh weight, plant dry weight and number of flowers compared with the individual use of organic

matter with a half dose of NPK fertilizers or full dose of NPK fertilizers. The same response was obtained for husk tomato fruit yield and its components i.e., fruit yield, fruit weight, fruit number and fruit diameter.

On the other hand, husk tomato plants have been responding to polyethylene mulch and using transparent mulch gave the highest values of aforementioned characteristics compared with black mulch as well as bare soil (control) treatments. Besides, using both organic fertilizers mixture with a half dose of NPK fertilizers combined with transparent mulch gave the highest values of fruit quality such as TSS, vitamin C, firmness. On the other hand, F1 fertilizer and TM mulching were most effective in reducing decay and weight loss as well as giving a good general appearance (score) after 24 days as well as maintaining firmness and total soluble solids, Moreover maintaining vitamin C content compared to the untreated control during storage in two seasons.

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