

UNIVERSITY OF JORDAN
FACULTY OF GRADUATE STUDIES

60

***PLASTIC COVER USE AND METHOD OF
PLANTING INFLUENCES ON
ENHANCEMENT OF RAINFED MUSKMELON
PRODUCTIVITY***

BY

MARYEM AZZAM AL-MAJALI

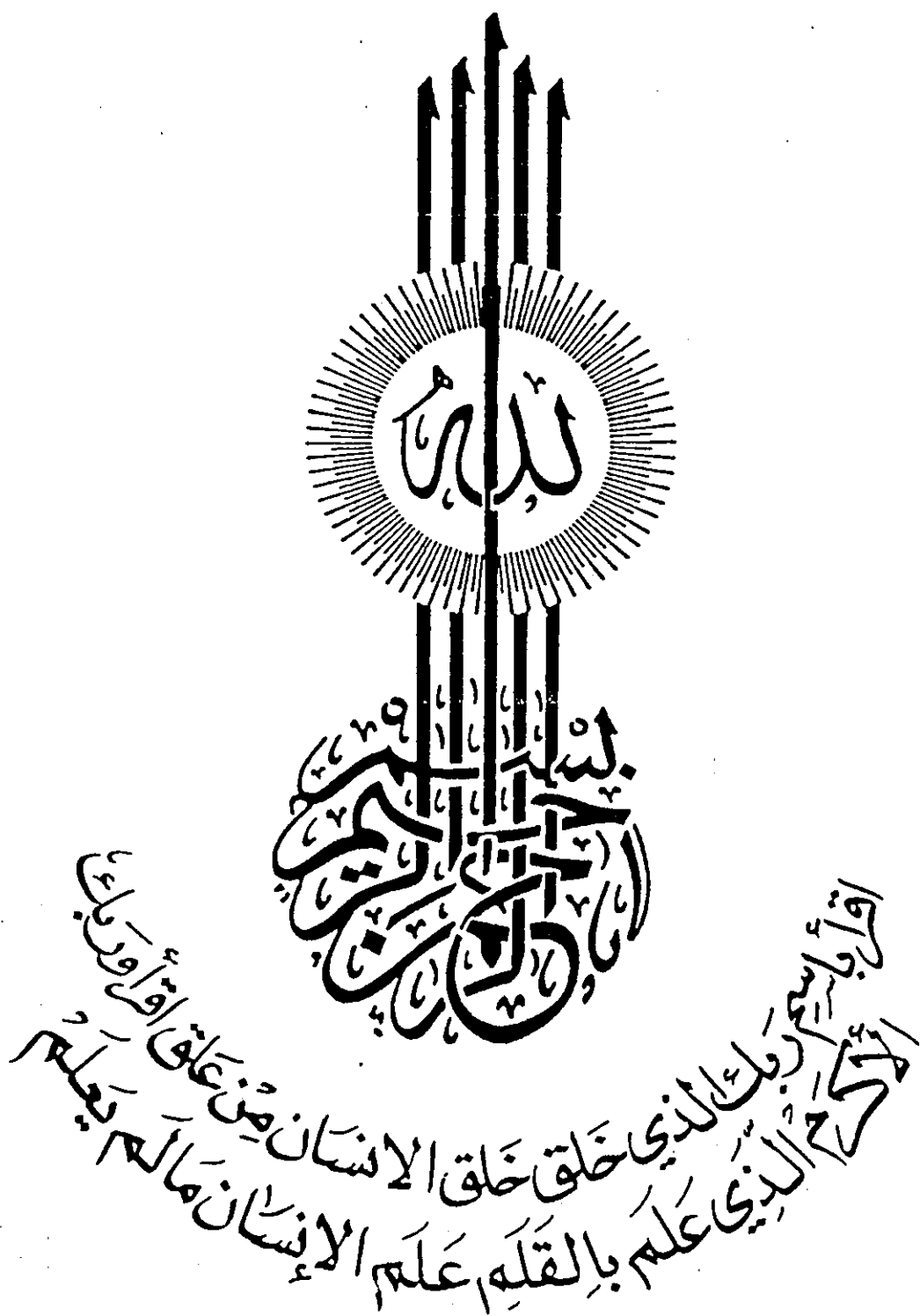
SUPERVISION

DR. MAHMOUD A. KASRAWI

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR THE
DEGREE OF MASTER OF SCINECE IN PLANT PRODUCTION , FACULTY OF
GRADUATE STUDIES, UNIVERSITY OF JORDAN .

December, 1993

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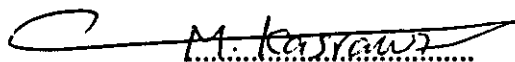


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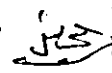
COMMITTEE MEMBRES

SIGNATURE

1. Dr. M. Kasrawi , Associate Prof.

 M. Kasrawi

2. Dr. A. Tell , Prof.

Abdelmajid Tell 

3. Dr. I. Ghawi , Associate Prof.

I. O. Ghawi

4. Dr. N. Hadidi , Assistant Prof.

N. Hadidi

DEDICATED TO
My MOTHER , HUSBAND
AND CHILDREN

ACKNOWLEDGEMENTS

I would like to express My sincere appreciation to Dr. M. Kasrawi for his valuable supervision throughout the course of this study .

Appreciation and thanks are also extended to committee members Dr. A. Tell, Dr. I. Ghawi and Dr.N. Hadidi for reviewing this thesis and their help.

TABLE OF CONTENTS

	Page
COMMITTEE DECISION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	ix
LIST OF APPENDICES	x
ABSTRACT	xiii
INTRODUCTION	1
LITERATURE REVIEW	3
1. Effect of mulch on crop growth and yield .	3
2. Effect of transplanting on muskmelon yield and growth .	6
MATERIALS AND METHODS	8
RESULTS AND DISCUSSION	11
1. Emergence and appearance of 1st, 2nd , 3rd true leaf and seed- ling length after 40 days .	11
2. Number of days for 50% flowering of plants and number of days for harvesting .	14

3. plant length, number of stems per plant, leaf area index per plant and dry weight per plant .	16
4. Total, marketable and unmarketable yield, fruit number per hectare average fruit weight , pH and total soluble solids .	16
5. Emergence and appearance of the first four true leaves .	19
6. Flowering	21
7. Plant length , stem diameter and number of branches .	24
8. Dry weight.	28
9. First harvest, average fruit weight for first harvest , number of fruits/ ha and number of days to harvest .	33
10. Total yield, marketable yield, unmarketable yield , number of fruits hectare, average fruit weight , pH and total soluble solids.	38
SUMMARY AND CONCLUSION IN ENGLISH	49
REFERENCES .	51
APPENDICES .	59
SUMMARY IN ARABIC	71

LIST OF TABLES

Table	Page
<p>1. Time in days needed to reach 50% emergence and appearance of first, second and third true leaf and seedling length after 40 days for direct seeded plants of muskmelon at mushaqar station 1990. planting date March, 15</p>	13
<p>2. Number of days for 50% flowering of plants, number of days for harvesting, plant length , number of stems./ plant , leaf area per plant and dry weight / plant of muskmelon at mushaqar station 1990. Planting date March, 15</p>	15
<p>3. Total , marketable and unmarketable yield , number of fruits/ hectare, average fruit weight , pH and total soluble solids (T.S.S) of muskmelon at mushaqar station 1990. Planting date March,15</p>	18
<p>4. Time in days needed to reach 50% emergence, and appearance of first, second, third and fourth true leaf and seedling length after 40 days for direct seeded plants of muskmelon at mushaqar station 1990 and 1991. planting date April,10</p>	20
<p>5. Means of number of days for 50% flowering of plants in 1990 and means of number of days for 25%, 50% , 75% and 95% flowering of plants of muskmelon for 1990 and 1991 experiment at Mushaqar station. planting date April, 10</p>	22
<p>6. Means of plant length , number of stems/plant , leaf area / plant and</p>	

Table	Page
stem diameter / plant of muskmelon at Mushaqar station 1990 and 1991. planting date April, 10	26
7. Means of plant length , number of stems/plant, leaf area index of muskmelon at Mushaqar station 1990 and 1991 for interactive effect of planting methods and covers	27
8. Means of dry weight per plant , leaves and stems dry weight per plant of muskmelon at Mushaqar station 1990 and 1991. Planting date April,10	31
9. Means of number of days to first harvest , quantity of first harvest, average fruit weight of first harvest and number of fruit/hectare of muskmelon at Mushaqar station 1990 and 1991. Planting date April,10.....	36
10. Total yield, marketable and unmarketable yield, number of fruits/hectare, average fruit weight, pH and total soluble solids (T.S.S) of muskmelon at Mushaqar station 1990 and 1991. planting date 1 April,10.....	40
11. Total yield , marketable and unmarketable yield, number of fruits/hectare average fruit weight, pH and total soluble solids (T.S.S) of muskmelon at Mushaqar station 1990 and 1991 for intractive effect . planting date April, 10	42
12. Soil moistur content on weight basis for 1990 and 1991 growing season at Mushaqar Experement Station.....	47
13. The mean monthly rainfall , temperature and class-A pan evaporation for the 2 growing seasons 89/90 and 90/91.....	48

LIST OF FIGURES

	<u>Page</u>
1. Interactive effect of planting method and mulch on dry weight of muskmelon plants grown in Mushaqar Agricultural Station during	
2. Interactive effect of planting method and mulch on No. of days to first harvest of muskmelon plants grown in Mushaqar Agricultural Station during 1990 (A) and 1991 (B). Vertical bars represent LSD at $P = 0.05$	37
3. Interactive effect of planting method and mulch on total yield of muskmelon plants grown in Mushaqar Agricultural Station during 1990 (A) and 1991 (B) . Vertical bars represent LSD at $P = 0.05$	41
4. Interactive effect of planting method and mulch on marketable yield of muskmelon plants grown in Mushaqar Agricultural Station during 1990 (A) and 1991 (B) . Vertical bars represent LSD at $P = 0.05$	45
5. Interactive effect of planting method and mulch on average fruit weight of muskmelon plants grown in Mushaqar Agricultural Station during 1990 (A) and 1991 (B) . Vertical bars represent LSD at $P = 0.05$	46

LIST OF APPENDICES

	Appendix	Page
Table 1.	Analysis of variance for number of days to reach 50% emergence and appearance of 1st, 2nd and 3rd true leaf and seedling length after 40 days for direct seeded plants of muskmelon in 1990, planting date March,15 .	59
Table 2.	Analysis of variance for number of days for 50% flowering of plants, number of days for harvesting , plant length, number of stems/plant, leaf area index per plant and dry weight/plant of transplanted muskmelon in 1990. planting date March,15 .	60
Table 3.	Analysis of variance for number of days for 50% flowering of plants, number of days for harvesting, plant length, number of stems/plant, leaf area index per plant and dry weight plant of direct seeded muskmelon in 1990. planting date March,15.	61
Table 4.	Analysis of variance for total, marketable and unmarketable yield, number of fruits/plot, average fruit weight, pH and total soluble solids of transplanted muskmelon in 1990 . planting date March,15 .	62
Table 5.	Analysis of variance for total, marketable and unmarketable yield, number of fruits/plot, average fruit weight, pH and total soluble solids of direct seeded muskmelon in 1990 . planting date March,15 .	63

Appendix	Page
Table 6. Analysis of variance for no. of days for 50 % emergence, appearance of 1st, 2nd , 3rd and 4th true leaf and seedling length after 40 days for direct seeded plants of muskmelon in 1990 and 1991. planting date April,10.	46
Table 7. Analysis of variance for no. of days for 50 % flowering of plants in 1990 and means of number of days for 25%, 50%, 75% and 95% flowering of plants of muskmelon for 1990 and 1991. planting date April,10.	65
Table 8. Analysis of variance for means of plant length, number of stems/ plant ,leaf area plant and stem diameter / plant of muskmelon in 1990 and 1991. planting date April,10.	66
Table 9. Analysis of variance for means of dry weight per plant, leaves and stems weight per plant of muskmelon in 1990 and 1991 planting date April,10.	67
Table 10. Analysis of variance for means of number of days to first harvest, quantity of first harvest, average fruit weight of first harvest and number of fruit/plot of muskmelon in 1990 and 1991. planting date April,10.	68
Table 11. Analysis of variance for total yield , marketable and unmarketable yield , number of fruits/plot, average fruit weight, pH and total soluble solids of muskmelon in 1990. planting	

Appendix	Page
date April,10.	69
Table 12. Analysis of variance for total yield, marketable unmarketable yield, number of fruits/plot, average fruit weight, pH and total soluble solids of muskmelon in 1990. planting date April,10.	70

Abstract

**Plastic cover use and method of planting influences on
enhancement of rainfed muskmelon productivity**

by : Maryem Azzam AL-Majall

Supervision : Dr. M. Kasrawi

Effect of planting method (transplanting and direct seeding) and covers (transparent mulch, black mulch with transparent cover , black mulch , leveled bare soil, bottom row bare soil) on muskmelon productivity under rainfed conditions was studied at Mushaqar Agricultural Experiment Station which is about 28 km south west of Amman, elevated 785 m above sea level and it is located between latitudes 32° 46' N and 32° 47' N, longitudes 32° 47' E and 32° 48' E during 1990 and 1991 summer season.

Transplanting gave earlier flowering and harvesting compared to direct seeding . Insignificant differences were obtained between planting methods in stem no., plant length , dry weight , total yield, marketable yield , unmarketable yield , fruit number, average fruit weight, pH and T.S.S. . Among cover treatments , transparent mulch gave earlier emergence by 5 - 13 days , earlier appearance of the first 3 true leaves , and longer seedlings. Also , transparent mulch produced earlier flowering and harvesting , longer plants , higher dry weight , higher total yield and higher unmarketable yield than other covers . Insignificant differences were obtained between the unmulched treatments . They gave the least values for all measured characters except for T.S.S. .

Black mulch with transparent cover and black mulch effects on the measured characters were intermediate . Mulched treatments either transplanted or direct seeded, gave lower No. of days for 50% emergence and flowering , longer seedlings , lower No. of days for harvesting , longer plants , larger leaf area , larger total dry weight , and larger total yield than unmulched treatments. Transparent mulch with transplanting or direct seeding gave longer plants ,higher total dry weight , and higher total and unmarketable yield than other mulched and unmulched treatments .

INTRODUCTION

Rainfed agriculture is important in Jordan, especially in areas where the annual rainfall exceeds 200 mm . Total cultivated area is about 4% of Jordan's total area. Ninety three percent of this area is considered dry land and seven percent is partially or fully irrigated (1) .

In 1980, the area of rainfed vegetable, in Jordan was 101.6 thousand dunums, which was equal to about 23.7% of the total vegetable production area . Vegetable production in rainfed area was 47.9 thousand tons which was equal to about 6.28% of the total vegetable production. In 1991, the rainfed vegetable production area decreased to about 63.5 thousand dunum and this was equal to 15.9% of the total vegetable grown area. The production of rainfed vegetables was 19.8 thousand ton or 2.3% of the total vegetable production (2) . The productivity of rainfed vegetable decreased from 0.47 ton / dunum in 1980 to 0.31 ton/dunum in 1991. Muskmelon occupies relatively large area of rainfed vegetable production and it is equal to about 13.6% of the total rainfed vegetable area. Muskmelon yield decreased from 0.45 ton/dunum in 1980 to 0.14 ton/dunum in 1991. This decrease in productivity is mainly due to the lack of the new technology and practices application in production . The most important limiting factor in the rainfed agriculture is the lack of efficient conservation and utilization of water . Therefore, proper cultural practices and other farm management may increase the productivity and farm income .

Therefore , the objective of this work was to study the effect of different

plastic mulchs (transparent mulch, black mulch , black mulch with transparent cover, leveled bare soil and bottom row bare soil), and method of planting (direct seeding vs transplanting) on muskmelon production under rainfed conditions.

LITERATURE REVIEW

Due to the limited research on rainfed vegetable production, most literature reviewed is under irrigation unless otherwise mentioned.

1 - Effect of plastic mulch on crop growth and yield.

Plastic mulch is widely used in Jordan for crop production due to their transmission effects which is reflected on plant growth and yield. In Jordan, about 60-70 thousand dunums are planted with various vegetables which are mulched with black plastic. Fifty five thousand dunums are covered by transparent plastic as tunnels for cucumber, squash, melons and green beans for early productions (2). Vegetable growth responded differently to various mulch types (3,4). Covers were used to increase growth and yield of rainfed crop production (5,6). Black plastic mulch enhanced ripening of melon by 8 days (6). Clarkson and Frazier, (7) found that using black polyethylene mulch on cantaloupe produced vigorous growth, larger leaf surfaces, greater stem number, and greater production of both male and perfect flowers than unmulched. Seed germination period of watermelon decreased from 18 days in unmulched plots to 6 days in clear polyethylene mulched plots and resulted in greater plant growth (8).

Cucumbers grown under tunnels, plastic film mulch increased the accumulation of fruit dry matter (9) and foliage and root fresh weight (10). Using black plastic mulch in zucchini production increased plant diameter and

reduced number of days to bloom as compared to unmulched (11) . Row covers increased earliness (2-3 weeks) of squash and peppers as compared to unprotective treatment under rainfed conditions (12) . Pepper seed establishment was enhanced by using reflective coating mulch under rainfed conditions (13) .

Tomato dry weight was higher under white over black plastic mulch, followed by black polyethylene mulch (14). Fresh weight of tomato was higher on wax-coated and on polyethylene coated paper mulch than on bare soil (15). Black polyethylene mulch increased tomato yield due to its direct effect on promotion of crop growth and development (16). Black mulch produced longer tomato plants as compared to aluminum, aluminized plastic and white plastic mulches (17) . Black plastic mulch increased strawberry leaflet elongation under dry and wet conditions (18) . Corn seedling emerged after 9 days from planting under petroleum and clear polyethylene mulch, while no emergence occurred under black polyethylene mulch (19). Cotton seedlings emerged 7-10 days earlier under black plastic mulch, and were 8-10 inches taller for both with taller without irrigation compared to unmulched soil (20).

431815

Clear plastic mulches increased yield and fruit size of summer and winter green bean, sweet corn , strawberry, squash and cucumber (12,21) . Covers increased early yields in muskmelon over uncovered treatment (22) . Transparent and black plastic mulch enhanced fruit ripening and increased yield of muskmelon as compared to unmulched control under irrigation

(6,23,24,25) and rainfed conditions (26). Marketable, total and early yields of muskmelon increased under black mulch as compared to bare ground under rainfed conditions (7,26,27).

Use of clear polyethylene soil mulch in watermelon production resulted in earlier appearance of the 1st female flower and increased early and total yields as compared to unmulched plots (8) . Transparent polyethylene as a frameless cover for cucumber seedlings up to the 1-3 true-leaf stage, then an opening made and the plant pullup and the transparent polyethylene stay for mulching the soil during plant growth increased the yield over the control (28). Clear plastic mulch increased yield of eggplant and cucumber compared to unmulched soil (29) . Black plastic mulch on watermelon and sugarbeet, in early spring, increased yield by 19.2% or more over unmulched crop (30). Squash transplants gave more production under black and transparent soil mulch than unmulched (31). Yields for broccli, lettuce, zucchini and cucumbers were higher under mulch than bare soil (32,33). The use of black plastic mulch in cucumber production gave the highest total yield /plot and marketable yield /plot compared to uncovered plots (10.34) . Tomato yield was higher and earlier under clear and black plastic mulches compared to bare soil and increased by 16.9% and 16.6% for clear and black plastic, respectively (35,36,37) . The use of black and transparent mulch on tomato and squash resulted in earlier production by 10-15 day and production increased by 40% compared to unmulched (31) . Black plastic polyethylene mulch increased yield of rainfed and irrigated tomato (38) . Early yields and large marketable

tomato fruits were higher under mulch than unmulched (33,39,40). White plastic mulch increased tomato marketable yield as compared to unmulched treatment (14) . Using white-black polyethylene mulch (white face up) increased tomato yields significantly over those of unmulched soil (42) . Higher early tomato yield, total marketable yields, and fruit numbers with larger fruits were obtained under mulched tomatoes (14) . Direct seeded tomato planted with wax-coated and polyethylene coated paper mulch gave higher number of clusters and flowers per plant than those of bare soil, (15) . Soil mulch increased water conservation (14,18,20,23,35,41,43) and increased soil temperature (13,21,26,44,45,46). Soil mulch affected salt movement (30) and enhanced N and P uptake (9,41,47) . Soil mulch aided in insect control (17). Finally, mulching was used for weed control (16,19,29,32,48,49) .

2 - Effect of transplanting on muskmelon yield and growth :

Transplanting is used to improve stands , reduce seed usage and improve earliness relative to direct seeding (5,50) . The main obstacle in melon transplants is the need for special care (50,51).

Transplanting from polyethylene bags gave better results with regard to earliness, fruits per vine, average fruit weight and yield than direct- seeding (52,53). Yield and fruit weight and total soluble solids of ten cantaloup varieties from transplants were higher than those from direct seeded plants (54,55). Fruits of cantaloup matured approximately 14 days earlier in transplant compared to direct seeding (54). Muskmelon transplants with dark polyethylene mulch out yielded direct -seeded plants (56,57), and resulted in

an increase in earliness, (58,59) . Transparent plastic mulch enhanced fruit ripening of muskmelon and increased yield for both direct and transplanted plants (6,31,56).

MATERIALS AND METHODS

An experiment was carried out during 1990 and 1991 at Mushaqar Agriculture Experiment Station. A muskmelon cultivar "Palestinian Ananas" was planted under rainfed condition.

Two planting methods were used, namely transplanting and direct seeding. Five mulched treatments were used in the experiment. The five mulch treatments were leveled bare soil, bottom row bare soil, transparent mulch, black mulch with transparent cover over the opening and black mulch. The design was split-plot with three replication. Main plots were the planting methods, sub-plots were the mulch treatments.

Each sub-plot unit consisted of four rows, each of 4.5 m length with 1.5m between the rows within the bed with plants set at 50 cm in each row. Total number of plants per sub-plot were 40.

The soil of the experimental location is clay. During 1990 season the experimental area was plowed and 25 kg/dunum of urea and 30 kg /dunum of trisuperphosphate were added before planting and incorporated with soil. During 1991 the amount of superphosphate was added in November 1990 and plowed with the soil. Urea was dissolved in water and added to soil at planting. Transplants of 2-3 true leaf stage were planted. The depth of furrow was 20 cm. Planting was in the bottom of the furrow and then covered by the transparent mulch and was fixed by the soil. The same planting method was done with black mulch with transparent cover which was as black mulch, but the openings, where the plants were set, were covered by transparent segments

(20x20cm) , which was stuck with the black mulch. When the growing points of plants were close to the cover, round openings were made to allow the plant to grow up safely. In 1990, the experiment was planted at two dates, first on March,15 and the second on April, 10. In the second season , 1991, planting was on April ,10 onley because of complete loss of plants in the first date of planting in the previous year . In first season " Rezolex" was used at a rate of 50 gm/20L to control fusarium, " Lanate" to control aphids and cut worms and " Sevin " for powdery mildew . In the second season "Neoron" was used to control mites and "Afugan" to control powdery mildew . Hand weeding was practiced 3 times during the growing season as needed. Irrigation was applied at planting only (250 ml / plant).

Rainfall, daily and monthly temperature was recorded (60). Soil moisture level at the beginning and at the ending of the experiment was measured gravimetrically. Number of days for 50% emergence, number of days for appearance of first , second and third true leaf, seedling length after 40 days, flowering and Leaf area (L.A) were also measured. Leaf area index was only measured for 1990 experiment . Ten plants of each plot were taken to determine dry weight , plant length and number of first and secondary branches. Total yield, marketable and unmarketable yield, average fruit weight , fruit number, total soluble solids (T.S.S) and pH were determined . For 1991 experiment , the amount of first harvest, average fruit weight and fruit number of first harvest were determined , also stem diameter was measured using the Caliper .

For leaf area (L.A.) , five leaves of ten plants were taken randomly in each plot to determine their leaf area surface by using leaf area meter .

The length of the longest three stems were determined and the average was considered as plant length. Oven dry weight was determined by putting plant sample in oven at 75°C for 48 hours. Total soluble solids was determined by refractometer (Kikuchi No. 8008) and pH was determined by pH meter .

RESULTS AND DISCUSSION

1 - Emergence and appearance of the first, second , third true leaf, and seedling length after 40 days:

In direct seeding, significant differences between treatments with respect to 50 % emergence , and appearance of 1st, 2nd and 3rd true leaf and in seedling length were obtained in muskmelon (Table 1) .Transparent mulch had the shortest time for 50 % muskmelon seedling emergence and for the 1st, 2nd and 3rd leaf appearance and the tallest seedling , followed by black mulch with transparent cover treatment. Unmulched soil and black mulch treatments gave the highest number of days for the 50% emergence and for the appearance of the 1st, 2nd and 3rd leaf.

Takatori et al.,(19) found similar results with corn where seedlings emerged earlier and had better stand under clear polyethylene film than planting under black mulch .

Black mulch treatment was similar to the unmulched treatment in all variables. This result was in contrary to Bennett et al.,(20) findings where cotton seedlings emerged earlier under black plastic mulch than unmulched plots .

The early emergence and appearance of true leaves under plastic mulches may be due to the increase in soil temperature , as indicated by Schales and Sheldrake (44) who reported an increase in temperature at one inch depth by 5.6°C under transparent mulch and 2.8°C under clear over black mulch .

In transplanting treatments, three treatments were destroyed due to the early frost which occurred on third and fourth of April, when the minimum temperature reached -1°C for the two days . These treatments were :
Leveled bare soil (unmulched), bottom row bare soil (unmulched) and black mulch . Therefore, direct seeding treatments and transplanting treatments were analyzed separately.

Table (1) Time in days needed to reach 50 % emergence and appearance of first, second and third true leaf and seedling length after 40 days for direct seeded plants of muskmelon at Mushaqar Station 1990. planting date March, 15 .

Treatment	no of days for 50 % emergence	no. of days for 1st leaf appearance	no of days for 2nd leaf appearance	no. of days for 3rd leaf appearance	seedling length after 40 days. (cm)
	(1)				
Leveled bare soil (unmulched)	27 b	32 a	40 a	47 a	2.4 b
Bottom row bare soil(unmulched)	29 a	32 a	40 a	47 a	2.2 b
Transparent mulch	14 d	21 b	27 c	30 c	9.4 a
Black mulch withTransparent cover	18 c	24 b	31 b	38 b	7.7 a
Black mulch	28 ab	32 a	41 a	47 a	2.5 b

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT .

2 - Number of days for 50 % flowering of plants and number of days for harvesting .

In transplanting, plants under transparent mulch flowered and were harvested earlier than those under black mulch with transparent cover (Table2) . This result agreed with Senchak and Yanat'ev, (59) who reported that transplanting muskmelon into soil previously covered by polyethylene sheet was harvested earlier than direct seeding or transplanting into open ground .

In direct Seeding, transparent mulch gave the earliest flowering (71 days) with significant difference over other mulched treatments and over unmulched ones, followed by black mulch treatment . Transparent mulch gave the earliest harvesting (130 day) with significant difference over unmulched treatment only .

Insignificant differences were found between the other treatments. Unmulched treatments gave the longest number of days for 50 % flowering of plants and harvesting (Table 2) . The early flowering and harvesting for plants under plastic mulch may be due to higher soil temperature and more moisture conservation as reported by Haddadin and Ghawi (35) and Schales and Sheldrake, (44) .

Table (2) Number of days for 50 % flowering of plants , number of days for harvesting, plant length, number of stems/plant,leaf area per plant and dry weight /plant of muskmelon at Mushaqar Station 1990. Planting date March ,15.

Treatment	no. of days for 50 % flowering of plants	no. of days for harvesting	plant length (cm)	no. of stems per plant	leaf area (cm ²) per plant	dry weight (gm) per plant
Tranplanting	(1)					
Levelled bare soil (unmulched)	-	-	-	-	-	-
Bottom row bare soil(unmulched)	-	-	-	-	-	-
Transparent mulch	64	115	50.7	4	38.6	60.7
Black mulch with Transparent cover	69	123	33.5	2	31.8	37.4
Black mulch	-	-	-	-	-	-
Direct seeding	(1)					
Levelled bare soil (unmulched)	82	141	11.9	1	14.6	14.4
Bottom row bare soil(unmulched)	82	141	8.5	1	12.7	15.0
Transparent mulch	71	130	47.2	2	27.2	44.3
Black mulch with Transparent cover	80	135	34.4	2	18.0	26.3
Black mulch	78	135	39.4	2	38.2	23.5

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT for each transplanting and direct seeding treatments which are not related .

3 - Plant length , number of stems per plant, leaf area (L.A) per plant and dry weight per plant (Table 2) .

In transplanting, plants under transparent mulch had significantly higher dry weight per plant and larger stem number than those under black mulch with transparent cover .Insignificant differences between transparent mulch and black mulch with transparent cover were found with respect to leaf area and plant length .

In direct seeding, plants under transparent mulch had significantly longer plant length (47 cm), larger dry weight per plant (44 gm) and larger number of stems (2) than plants grown under unmulched treatments . Insignificant differences were found among mulch treatments with respect to plant length, stem number and dry weight .

The unmulched plants gave the least stem number (1) and least dry weight (14 gm) . Black and transparent mulch treatments significantly affected and had the largest leaf area . These results agreed with those found by Schales and Sheldrake, (44) and Hemphill and Mansour, (56) .

4 - Total , marketable and unmarketable yield, fruit number per hectare, average fruit weight , pH and total soluble solids :

In transplanting, significant differences between transparent mulch and black mulch with transparent cover with respect to all these variables were obtained (Table 3) .

Transparent mulch treatment produced higher total yield (3.02 ton / ha) , marketable yield (2.33 t / ha) , unmarkatable yield (0.69 t / ha) , fruit number

per hectare (8162.16) , average fruit weight (370 gm) , pH (6.5) and T. S. S (12.4) .These results were in agreement with those found by Senchak and Yanat'ev, (59) . Also Izquierdo and Menendez, (55) reported that clear polyethylene soil mulching with transplanting increased yield quality.

In direct seeding, transparent mulch treatment gave the highest total yield (1.58 t / ha) , marketable yield (1.19 t / ha) ,unmarketable yield (0.39 t / ha) and number of fruits per hectare (7247.71) and were significantly higher than all other treatments (Table 3) . Black mulch treatment gave similar total yield (0.78 t \ ha) to black mulch with transparent cover.

Except with transparent mulch treatment , in significant differences were observed between the mulched and unmulched treatments in fruit number per hectare. Insignificant differences in average fruit weight were found among treatments .

The leveled bare soil (unmulched) treatment gave significantly higher values with respect to pH and T.S.S than black mulch treatment , and insignificant differences were found among all other treatments .

Results obtained were in agreement with the findings of Bravo and Ripoll , (24), Hemphill and Mansour (56) and Nagy (61) who reported that clear row covers increased total yield of muskmelon over unmulched soil . Under black mulch, the results were in contrary to those found by Clarkson and Frazier, (7). Data for 1991 season are not presented because the experiment was not repeated due to great loss during 1990 experiment .

Table (3) Total, marketable and unmarketable yield, number of fruits/ hectare, average fruit weight, pH and total soluble solids (T.S.S) of muskmelon at Mushaqar Station 1990. Planting date March, 15.

Treatment	Total yield T / Ha	marketable yield T /Ha	unmarketable yield T /Ha	no. of fruits/Ha	average fruit weight	pH	T.S.S (%) (Gm)
Transplanting	(1)	-	-	-	-	-	-
Levelled bare soil (unmulched)	-	-	-	-	-	-	-
Bottom row bare soil (unmulched)	3.02	2.33	0.69	8162.16	370	6.5 a	12.37 a
Transparent mulch	0.67	0.67	0.00	2977.78	225	6.0 b	10.33 b
Black mulch with Transparent cover	-	-	-	-	-	-	-
Black mulch	-	-	-	-	-	-	-
Direct seeding	(1)	-	-	-	-	-	-
Levelled bare soil (unmulched)	0.59	0.49	0.10	2341.27	252	6.4 a	12.00 a
Bottom row bare soil (unmulched)	0.30	0.22	0.08	1604.28	187	6.2 ab	11.17 ab
Transparent mulch	1.58	1.19	0.39	7247.71	218	6.1 ab	11.33 ab
Black mulch with Transparent cover	0.61	0.37	0.24	2479.68	246	6.0 ab	10.50 b
Black mulch	0.78	0.56	0.22	3291.14	237	5.8 b	10.50 b

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT for each transplanting and direct seeding treatments which are not related .

Table (4) Time in days needed to reach 50% emergence, and appearance of the first, second, third and fourth true leaf and seedling length after 40 days for direct seeded plants of muskmelon at Mushaqare Station 1990 and 1991. Planting date April, 10.

Treatment	1990					1991				
	no. of days for 50% emergence (1)	no. of days for 1s leaf appearance	no. of days for 2nd leaf appearance	no. of days for 3rd leaf appearance	seedling length after 40 days(cm)	no. of days for 50% emergence	no. of days for 1st leaf appearance	no. of days for 2nd leaf appearance	no. of days for 3rd leaf appearance	no. of days for 4th leaf appearance
Leveled bare soil (unmulched)	10 a	15 b	18 ab	22 ab	2.3 c	14 b	20 a	25 a	29 a	33 a
Bottom row bare soil (unmulched)	10.7 a	17 a	20.7 a	24.7 a	1.5 c	17 a	20 a	25 a	29 a	33 a
Transparent mulch	4.7 c	10 c	14 c	17 c	6.2 b	8 d	16 b	20 b	24 c	28 c
Black mulch with transparent cover	7.3 b	10.7 c	16 bc	19.3 bc	12.2 a	12 c	17 b	22 b	26 b	30 b
Black mulch	10.3 a	17 a	20.7 a	24.7 a	2.8 c	17 a	20 a	25 a	29 a	33 a

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5 % level according to DMRT .

6 - Flowering :

Averaged over mulch treatments, significant differences between transplanting and direct seeding with respect to number of days to 25 % , 50%, and 75 % flowering . Insignificant difference in 95 % flowering for the second season (1991), was observed. Significant differences in 50% flowering of plants of the first season experiment (1990) were observed. (Table 5).

Transplanting gave significant decrease in number of days to 25 % , 50%, and 75 % flowering of plants over direct seeding . Number of days to 50% flowering, was similar in both seasons. This might be due to early growth of the transplants in the glass house .

Significant differences in number of days to 25%, 50%, 75 %, and 95 % flowering of plants were found between mulch treatments (Table 5) . Transparent mulch gave the lowest number of days for 50 % flowering with significant difference over the unmulched and black mulch treatments in 1990 and 1991 seasons. The lowest number days for 25% , 50 % , 75 % and 95 % of flowering with significant differences were obtained under transparent mulch over all other treatments by 2- 5 days for 1991 season . The second earlier flowering was under black mulch with transparent cover .

The unmulched treatments gave the latest flowering in 1991 and 1990 growing season (Table 5) . Results obtained were according with the findings of Clarkson and Frazier, (7) and Iapichino and Gagaliano (8) . The early flowering of mulched plots might be due to moisture conservation and increased soil temperature under mulches (3,19,56,3) .

Table (5) Means of number of days for 50 % flowering of plants in 1990 and means of number of days for 25% , 50%,75% and 95% flowering of plants of muskmelon for 1990 and 1991 experiment at Mushaqar Station . Planting date April ,10.

Treatment	1990	1991			
	no of days for 50 % flowering	no. of days for flowering			
		25%	50 %	75 %	95 %
<u>Planting Method</u>					
Transplanting	62 b ⁽¹⁾	53 b	54 b	55 b	57 a
Direct - seeded	65 a	54 a	56 a	57 a	58 a
<u>Mulches</u>					
Leveled bare soil (unmulched)	66 a	55 a	56 a	58 a	59 a
Bottom row bare soil(unmulched)	66 a	55 a	56 a	57 ab	60 a
Transparent mulch	61 c	51 d	52 c	53 d	56 c
Black mulch withTransparent cover	61 bc	52 c	54 b	55 c	57 bc
Black mulch	62 b	53 b	55 a	56 bc	58 b
<u>Interaction</u> Transplanting ⁽¹⁾					
Leveled bare soil (unmulched)	64 b	55 a	56 a	58 a	59 a
Bottom row bare soil(unmulched)	64 b	54 a	55 ab	57 a	59 a
Transparent mulch	60 e	50 c	51 d	52 c	55 c
Black mulch withTransparent cover	61 de	52 b	53 c	54 b	55 c
Black mulch	61 de	52 b	54 bc	55 b	56 bc
Direct - seeding					
Leveled bare soil (unmulched)	68 a	55 a	56 a	58 a	59 a
Bottom row bare soil(unmulched)	68 a	55 a	57 a	58 a	60 a
Transparent mulch	62 cd	52 b	53 c	54 b	56 c
Black mulch with Transparent cover	63 bc	52 b	55 ab	57 a	58 ab
Black mulch	64 b	55 a	56 a	58 a	59 a

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5 % level according to DMRT .

The amount of water conserved under mulched treatments was higher than under unmulched treatments for the two growing seasons, the average amount of water measured on weight basis for mulched treatments which sampled on May, 5, 1990 is 0.263 at soil depth (0-60 cm) and the average amount of water in unmulched treatments is 0.200 so 0.063 more amount of water under mulch treatment which means for each of 100 gm dry soil we have 6.3 gm more water and 2.5 gm more water for mulched treatments for 1991 sampled on May, 5. (Table 12) .

Significant interaction effect between planting method and mulch treatment was obtained with respect to flowering time in 1990 and 1991 . In general , the earliest flowering was for of transplanting under transparent mulch treatment. The latest flowering was for direct seeding under unmulched treatment. Transplanting under transparent mulch gave the lowest number of days to flowering. It needed 5 days from the start to the end of flowering with significant differences over all other combinations except in 95 % flowering the differences were diminished among mulched treatments. Mulched transplanted treatments gave earlier flowering compared to mulched and direct seeded treatments for the two growing seasons . In 1990, significant differences between unmulched and transplanted and unmulched and direct seeding treatments in 50% flowering were obtained, while insignificant difference was found in 1991 for 50% flowering . The early flowering in 1991 might be due to high mean monthly temperature during 1991 (Table 5) .

These results might be due to the enhancement of microenvironment

under mulches which was reflected on plant growth and flowering (35,44) .

7 - plant length , stem diameter , no. of branches

Although transplanting had higher values with respect to plant length, number of branches, leaf area index , there were insignificant differences between transplanting and direct seeding for all these variables for the two growing seasons (Table 6) . The result contradicted the findings reported by Bhella (27) who found that direct - seeded muskmelons had significantly larger stem length and diameter. The taller plants with larger number of branches in 1991 might be due to the high amounts and good distribution of rainfall during the last months (April , March) compared to the 1990 season (Table 13) .

There were significant differences between mulch treatments in plant length and in leaf area for 1990 season and in stem diameter and number of branches for 1991 experiment . Transparent mulch gave the longest plant length (68 cm) and the largest leaf area (38.6 cm²) in 1990 experiment . The longest plant length (115 cm), largest stem diameter (8.5 mm) and highest number of secondary branches (11) were obtained in 1991 experiment (Table6) .

Black mulch and black with transparent cover followed transparent mulch and gave significant increase in plant length over unmulched treatments for the two years .Black mulch gave significant increase in stem diameter (7mm) over black mulch with transparent cover . This might be due to the shading effect created by black with transparent cover which caused etiolation of seedlings . Unmulched treatments produced shorter plants and smaller

number of branches and leaf area in both years. Results obtained were in agreement with those found by Clarkson and Frazier, (7), Iapichino and Gagliano (8), Schales and Sheldrake, (44) and Hemphill and Mansour, (56). and in contrary with Bhella and Kwolek, (11).

These results might be due to moisture conservation and higher temperature under plastic mulches as found by Hemphill and Mansour, (56). Daily mean soil temperature was increased by 1 - 4°C under clear row covers compared to black plastic mulch, while black plastic mulch increased mean soil temperatures by 1 - 2°C over bare soil temperature.

Significant interaction between mulch and planting method was found in plant length, stem diameter, leaf area index and in number of secondary branches (Table 7). Clear plastic with transplanting and with direct seeding combinations resulted in the highest plant length, stem diameter and no. of secondary branches. Black mulch with transparent cover and direct seeding combination didn't differ significantly with respect to plant length compared to mulched transplanting treatments in 1991 but not in 1990. Unmulched treatments gave the lowest values without any significant differences between them. Black mulch with transparent cover and transplanting or direct seeding combination gave the lowest values without any significant differences between them. These results agreed with those found by Izquierdo and Menendez, (55) who reported that strong growth was associated with transplanting under mulched muskmelons.

Table (6) Means of plant length , number of stems /plant, leaf area /plant and stem diameter /plant of muskmelon at Mushaqar Station 1990 and 1991 .
planting date April, 10 .

Treatments	1990				1991			
	plant length (cm)	no. of first branches	leaf area (c m ²)	plant length (cm)	stem diameter (mm)	no. first branches	no. second branches	
Transplanting	39.9 a ⁽¹⁾	2 a	26.1 a	86 a	5.9 a	3 a	9 a	
Direct - seeding	27.5 a	2 a	24.2 a	77 a	7.0 a	3 a	7 a	
Mulches	(1)							
Leveled bare soil (unmulched)	14.3 c	2 a	14.1 c	56 c	6.6 bc	3 a	6 d	
Bottom row bare soil(unmulched)	11.6 c	2 a	14.8 c	64 c	5.8 c	3 a	7 cd	
Transparent mulch	68.3 a	2 a	38.6 a	115 a	8.5 a	3 a	11 a	
Black mulch with Transparent cover	43.0 b	2 a	28.9 b	85 b	4.6 d	3 a	8 bc	
Black mulch	31.4 b	3 a	29.2 b	89 b	6.7 b	3 a	9 b	

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT.

Table (7) Means of plant length, number of stems / plant, leaf area index (L.A.I) of muskmelon at Mushaqar Station 1990 and 1991 . Planting date April, 10.

	1990			1991			
	Plant length (cm)	no. of first branches	L.A.I (cm ²)	Plant length (cm)	stem diameter (mm)	no.of first branches	no. of secondary branches
Interaction CVXPM		(1)					
Transplanting							
Leveled bare soil (unmulched)	16.4	2	13.6	64	5.4	3	6.8
Bottom row bare soil(unmulched)	12.6	2	15.7	71	4.8	3	7.9
Transparent mulch	73.0	2	40.0	119	8.0	3	11.8
Black mulch with Transparent cover	53.5	2	30.8	88	4.8	3	9.1
Black mulch	44.0	2	30.2	89	6.4	3	8.8
Direct - seeding							
Leveled bare soil (unmulched)	12.1	2	14.7	47	7.7	3	5.6
Bottom row bare soil(unmulched)	10.6	2	13.9	57	6.8	3	6.3
Transparent mulch	63.6	3	37.1	110	9.0	3	10.5
Black mulch with Transparent cover	62.6	2	26.9	82	4.3	2	6.7
Black mulch	18.8	3	28.2	89	7.1	3	8.2

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT.

8 - Dry weight .

Insignificant differences were found between transplanting and direct seeding with respect to total dry weight in the two years ,and in stem and leaf dry weights in 1991(Table 8). Elmstrom (63) stated that relatively shallow root systems were adequate if proper environmental conditions were provided . In the second season, higher dry weight was obtained . This increase might be due to more appropriate growth factors mainly rainfall (Table 13) .

Singificant differences between mulch treatments were obtained with respect to total dry weight in the two seasons and for leaves and stems dry weight in the second season . Transparent mulch gave the highest total dry weight 74.3 and 94 gm for 1990 and 1991, respectively, with significant difference over other mulched and unmulched treatments (Table 8) . Transparnt mulch gave the highest dry weight of leaves (58 gm) followed by black mulch (47 gm) without any significant difference between them . Transparent mulch gave also the highest stem dry weight (36 gm) compared to all other treatments in 1991 season . Insignificant differences between other mulch treatments in stem dry weight were observed.

Unmulched treatments had the lowest dry weight without any significant differences between them . Black mulch and black mulch with transparent cover treatment gave significant increase in total dry weight compared to unmulched treatments without any significant differences between them in the two years. Using clear mulches or black mulches significantly increased dry weight of muskmelon compared to bare soil.

Significant interactions between mulch treatments and planting methods were obtained for total, stem and leaf dry weight in the two years (Table 8). Transparent plastic mulch with transplanting gave the highest total dry weight in both years, 75.9 and 106 gm for 1990 and 1991, respectively (Fig. 1). It also gave the highest stem and leaf dry weight in 1991 and were 36 gm and 59 gm, respectively, with significant differences compared to other mulched and unmulched treatments with transplanting or direct seeding. Transparent mulch with direct seeding combination had the second dry weight values with insignificant differences between them. Unmulched treatments, including the control, gave the lowest dry weight without any significant differences between them (Table 8).

Black mulch with transplanting or direct seeding and black mulch with transparent cover with transplanting or direct seeding gave intermediate dry weight and did not differ significantly.

The effects of mulches might be due to better conditions of soil moisture and higher temperature under mulch. The amount of water in 100 gm dry soil was higher under mulch compared to bare soil for the 2 sampling dates the average amount of water measured on weight basis for mulched treatments is 0.263 and the average amount of water in unmulch treatments is 0.200, so 0.063 more water under mulch treatment which mean for each of 100 gm dry soil we have 6.3 gm more water for mulched treatments and 2.5 gm more water for unmulched treatments for 1991 sampled on May, 5 (Table 12).

Results obtained, confirmed those found by Izquierdo and Menendez,

(55) who found that strong growth was associated with using mulch and transplanting under mulched muskmelon compared to unmulched planting . These results were in contrary to the findings of Zatyko (6) who reported that direct seeding plants benefited more from mulching than transplanting .

Table (8) Means of dry weight per plant , leaves and stems dry weight per plant

of muskmeloen at Mushaqar Station 1990 and 1991 . planting date April ,10 .

Treatment	1990		1991			
	dry weight (gm)		total Dry weight	Leaves weight (gm)	stems weight (gm)	
<u>Planting Method</u>	(1)					
Transplanting	42.7 a		60.7 a	38.9 a	23.2	a
Direct - seeding	35.7 a		53.8 a	33.6 a	18.8	a
<u>Mulches</u>	(1)					
Leveled bare soil(unmulched)	16.8 c		33.4 c	19.2 d	14.2	b
Bottom row bare soil(unmulched)	18.2 c		37.1 c	22.6 cd	14.5	b
Transparent mulch	74.3 a		94.3 a	58.6 a	35.7	a
Black mulch with Transparent cover	46.4 b		54.4 b	34.0 bc	20.4	b
Black mulch	40.3 b		67.0 b	46.8 ab	20.2	b
<u>Interaction</u> Transplanting	(1)					
Leveled bare soil(unmulched)	18.4 de		35.5 e	18.4 d	17.1	bc
Bottom row bare soil(unmulched)	19.6 de		42.4 de	26.4 d	16.0	bc
Transparent mulch	75.9 a		106.2 a	65.3 a	40.9	a
Black mulch with Transparent cover	56.1 bc		58.9 cd	37.4 bcd	21.5	bc
Black mulch	34.5 c		67.5 bc	47.0 abc	20.5	bc
Direct - seeding						
Leveled bare soil(unmulched)	15.2 e		31.4 e	20.1 d	11.3	c
Bottom row bare soil(unmulched)	16.8 e		31.7 e	18.7 d	13.0	c
Transparent mulch	72.7 ab		82.2 ab	51.8 ab	30.4	ab
Black mulch with Transparent cover	36.7 cd		50.0 cde	30.7 cd	19.3	bc
Black mulch	37.1 cd		66.5 bc	46.7 abc	19.8	bc

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT.

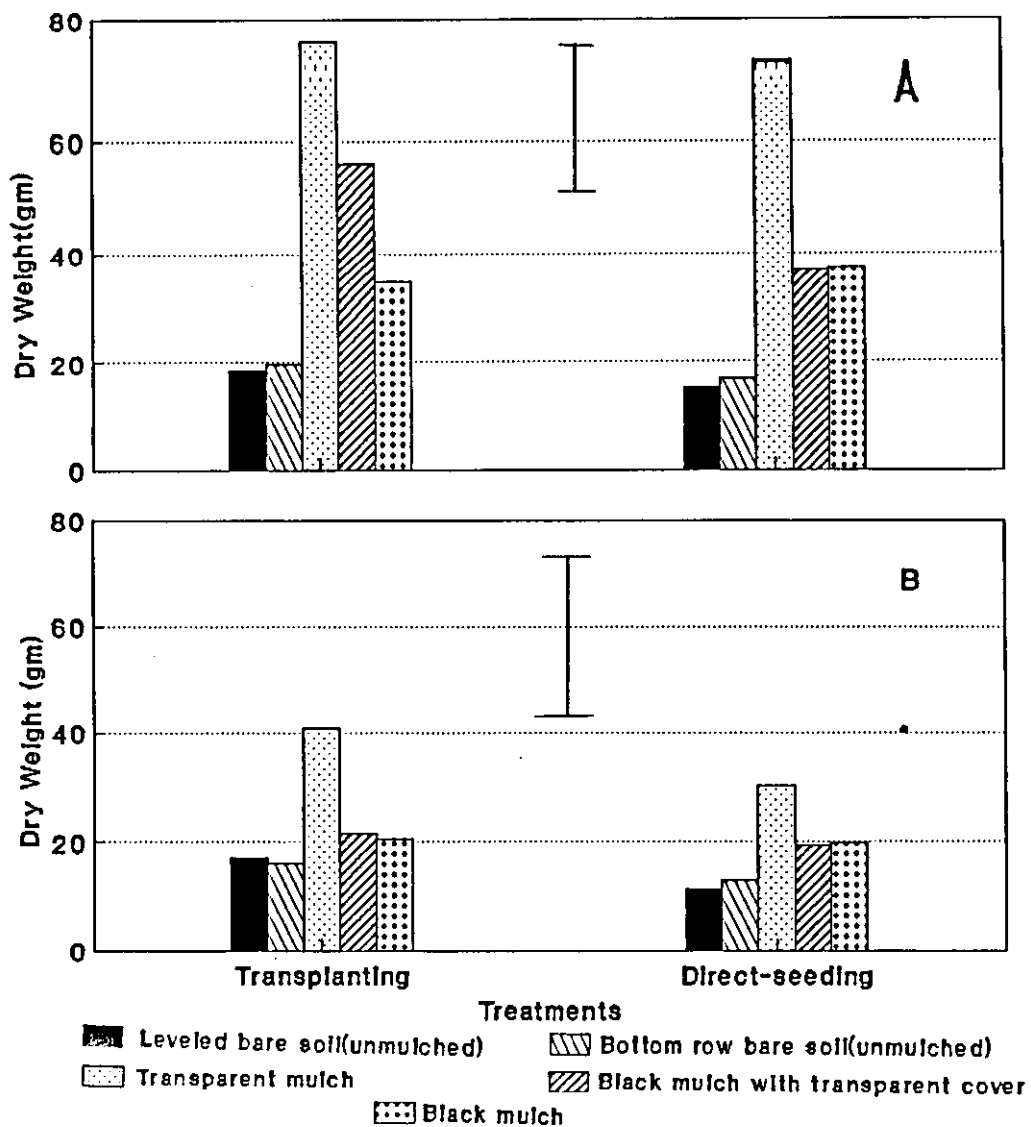


Fig.1 : Interactive effect of planting method and mulch on dry weight of muskmelon plants grown in Mushaqar Agriculture Station during 1990 (A) and 1991 (B) . Vertical bars represent LSD at $p= 0.05$.

9 - First harvest (T/ ha), average fruit weight for first harvest , number of fruit / ha and number of days to harvest .

Although transplanting gave better values than direct seeding, there were no significant differences between transplanting and direct seeding in first harvest (t / ha) , average fruit weight, and number of fruit /ha for first harvest (Table 9). Transplanting gave earlier harvesting by 9 and 13 days than direct seeding method for 1990 and 1991 seasons, respectively. This result agreed with those found by Norton (54) who found that fruits of transplanting plant matured approximately 14 days earlier than that of direct seeding. Melon fruit ripening was earlier by 10-19 days by transplanting than direct seeding (52,56).

There were significant differences between mulch treatments in days to harvest, first harvest, average fruit weight and number of fruit / hectare for the first harvest . Transparent mulch gave the highest yield in the first harvest (1.78 T / ha) and the largest No. of fruits /ha (3852.8) with significant differences over all other treatments (Table 9) . Black mulch with transparent cover gave the highest average fruits weight (494 gm) followed by transparent mulch and then by black mulch. All mulched treatments were significantly higher than leveled bare soil . Transparent mulch gave the earliest harvest over the other mulch treatments. The earliness was 8 and 12 days over the unmulched treatments for the growing seasons 1990 and 1991, respectively.

Number of days for the first harvest under black mulch and black mulch with transparent cover decreased significantly compared to the unmulched

treatments by 4 and 5 days for 1990 and 1991, respectively. This result agreed with those found by Zatyko (6), Stall et al., (22) and Hemphill and Mansour (56).

These differences might be due to differences in temperature between the different mulch treatments. These results agreed with those found by Bonnanno and Lamont (5) and Iapichino and Gagliano (8). Clarkson and Frazier, (7) found negative result where black polyethylene showed no advantage over the unmulched cantaloupe in earliness.

Interaction between method of planting and mulch treatments showed significant differences in No. of days to first harvest for 1990 and quantity of first harvest, average fruit weight, No. of fruits/ha and No. of days to harvest for 1991 (Table 9). Transparent mulch with transplanting gave the highest yield of first harvest (1.78 T/ha) and the highest number of fruits/ha (3708.33) followed by transparent mulch and direct seeding combination without any significant difference between them. The two treatments significantly increase the quantity of first harvest and No. of fruits/ha compared to other treatments. Insignificant differences were obtained among the rest of the combinations.

Black mulch with transparent cover and direct seeded plants gave the highest average fruit weight (612 gm) with significant difference over the unmulched direct seeded treatments. Leveled bare soil direct seeded treatment (control) gave the lowest average fruit weight (263 gm). Average fruit weight of the rest of treatments was intermediate.

Transparent mulch with transplanting gave the earliest harvest 115

and 117 day for 1990 and 1991, respectively with significant difference over all other treatments (Fig.2) . The transplanted treatments for mulched or unmulched gave significant decrease in number of days for first harvest over black mulch and over black mulch with transparent cover direct seeded treatments and over unmulched direct seeded treatments for both 1990,1991 seasons. These results confirmed with those found by Stall et al ., (22) which indicated that clear covers increased early yields in transplanted muskmelon .

Table (9) Means of number of days to first harvest ,quantity of first harvest , average fruit weight of the first harvest and number of fruit /hectare of muskmelon at Mushaqar Station 1990 and 1991 . Planting date April, 10 .

Treatment	1990		1991			
	no. of days to first harvest	first harvest T/Ha	average fruit wt (gm)	no. fruits per Ha	no.of day's to harvst	
<u>Planting Method</u>	(1)					
Transplanting	123 b	0.87 a	0.420 a	2071.43 a	123 b	
Direct - seeding	132 a	0.78 a	0.397 a	1964.74 a	136 a	
<u>Mulches</u>	(1)					
Leveled bare soil(unmulched)	132 a	0.48 b	0.273 c	1758.24 b	134 a	
Bottom row bare soil(unmulched)	132 a	0.52 b	0.373 bc	1394.1 b	134 a	
Transparent mulch	120 c	1.78 a	0.462 ab	3852.8 a	122 c	
Black mulch with Transparent cover	128 bc	0.59 b	0.494 a	1194.33 b	129 b	
Black mulch	128 b	0.74 b	0.440 ab	1681.82 b	131 b	
<u>Interaction</u> Transplanting	(1)					
Leveled bare soil(unmulched)	127 c	0.48 b	0.283 cd	1696.11 b	126 c	
Bottom row bare soil(unmulched)	127 c	0.59 b	0.478 ad	1234.31 b	126 c	
Transparent mulch	115 e	1.78 a	0.480 ab	3708.33 a	117 d	
Black mulch with Transparent cover	124 d	0.56 b	0.375 bcd	1493.33 b	123 c	
Black mulch	125 d	0.85 b	0.485 ab	1752.58 b	124 c	
Direct - seeding						
Leveled bare soil(unmulched)	138 a	0.52 b	0.263 d	1977.19 b	142 a	
Bottom row bare soil(unmulched)	138 a	0.44 b	0.270 d	1629.63 b	142 a	
Transparent mulch	124 d	1.70 a	0.445 abc	3820.22 a	126 c	
Black mulch with Transparent cover	132 b	0.67 b	0.612 a	1094.77 b	135 b	
Black mulch	132 b	0.63 b	0.395 bcd	1594.99 b	135 b	

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT.

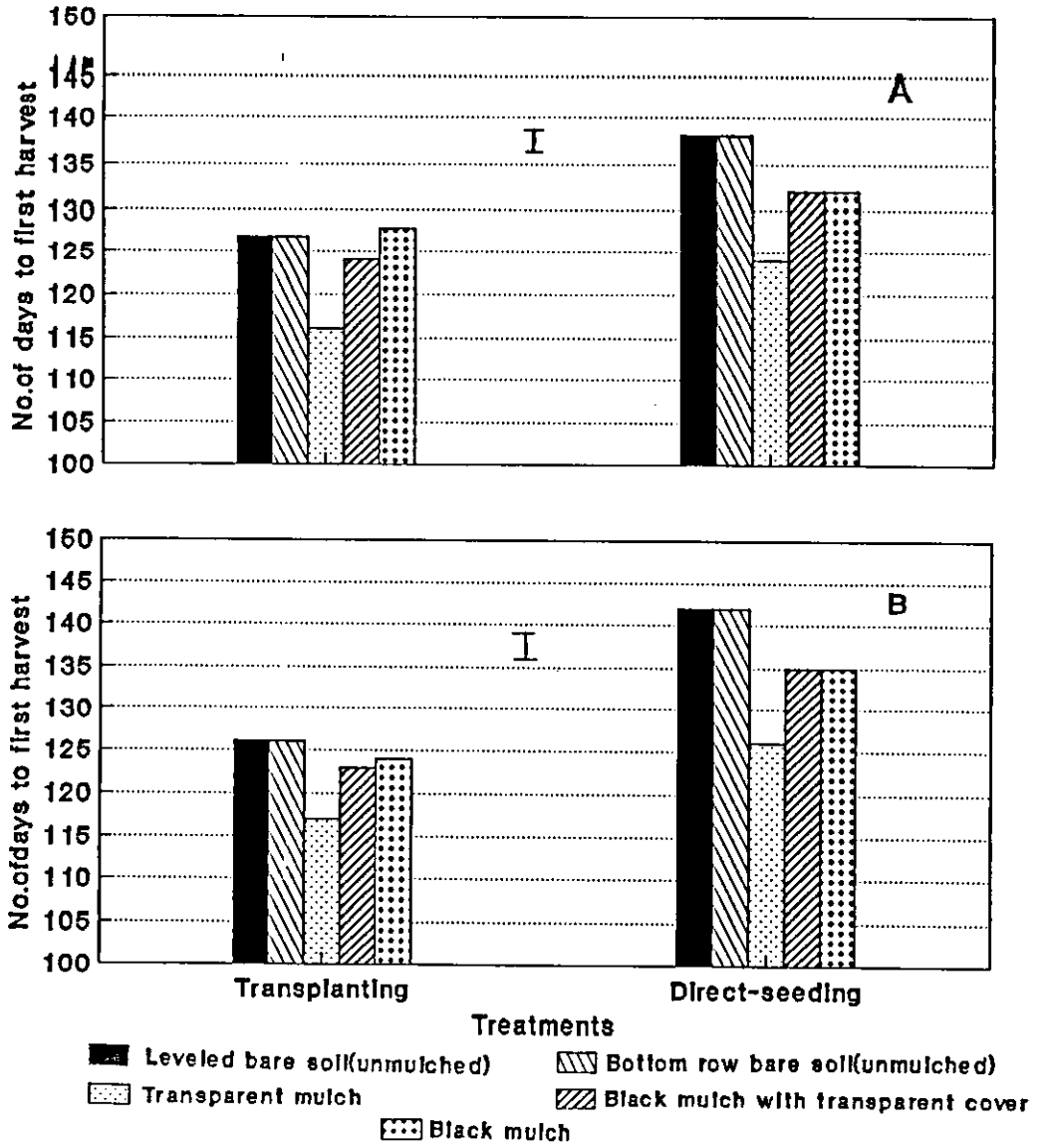


Fig.2 : Interactive effect of planting method and mulch on No. Of days to first harvest of muskmelon plants grown in Mushaqar Agriculture Station during 1990 (A) and 1991 (B). Vertical bars represent LSD at $p= 0.05$.

10 - Total yield, marketable yield, unmarketable yield, number of fruits/hectare, average fruit weight , pH and total soluble solids (T.S.S) .

There were Insignificant differences between transplanting and direct seeding in total yield, marketable yield, unmarketable yield , no . of fruits / ha, average fruit weight , pH and T.S.S for both 1990 , and 1991 growing seasons (Table 10) . Results obtained agreed with those found by Bhella (11) and in contrary with those found by Kumar and Mehta (52) , Norton (54), Hemphill and Mansour , (56) and Elmstrom (63) .

There were significant differences among mulch treatment in total yield , unmarketable yield ,no. of fruits/hectare, average fruit weight in 1990, and 1991 growing season (Table 10). Insignificant differences in PH and T.S.S. were observed in 1990, but the differences were significant in 1991 . In 1990, significant differences in marketable yield were obtained while the differences were insignificant in 1991.

In both season , total yield , unmarketable yield and No. of fruits / ha under transparent mulch were significantly higher than all other treatments . Total yield unmarketabl yield and No. of fruts / ha in 1990 and 1991 were 0.9 t / ha and 4.3 t / ha , 0.21 t / ha and 1.16 t / ha , and 22333.25 and 11314. 34, respectively . Fruit No. under mulched treatments in 1990 didn't differ significantly. Transparent mulch gave the highest marketable yield which were 0.69 t/ha and 3.23 t/ha in 1990 and 1991, respectively . The increase in 1990 was significant over all other treatments but insignificant in 1991. Black mulch

treatment gave significant increase in total yield over bottom row bare soil treatment in 1991 season, while in 1990 the difference was insignificant. insignificant differences were found between the rest of treatments in total and unmarketable yields .

Transparent mulch gave the highest pH (6.1) with significant difference compared to black mulch treatment which gave the lowest pH (5.8) . The differences between T.S.S were insignificant in 1991 growing season; but the differences were significant in 1990 . Leveled bare soil increased T.S.S (10.6) significantly compared to all other treatments . Black mulch with transparent cover increased average fruit weight (467 gm) significantly compared to unmulched treatments in 1991, while the differences insignificant in 1990 . Black mulch had similar effect to unmulched treatments . Brinen et al., (64) found contrary result with respect to mean fruit weight . He found higher mean fruit weights with black mulch that without mulch in one location , and insignificant differences at another location. Schales and Sheldrake, (44) found significant differences in average fruit weight and fruits number per plot due to covers compared to uncovered. Clear cover produced the highest number of fruits followed by black with clear cover followed by black plastic , and contradicted Clarkson and Frazier (7) . Black plastic increased yield by 60-65% compared to unmulched plots of muskmelon (6) . Results with respect to total yield agreed with Bonnano and Lamont , (5), Hemphill and Mansour, Iapichino and Gagliano, (8) , Bravo and Ripoll (24), Izquierdo and Mendenez, (55) , Hemphill and Mansour, (56) and Nagy (61) findings . They reported that

Table (10) Total yield , marketable and unmarketable yield, number of fruits/ hectare, average fruit weight, pH and total soluble solids (T.S.S) of muskmelon at Mushaqar Station 1990 and 1991 . planting date April , 10.

Treatment	Total yield T / Ha	marketable yield T / Ha	unmarketable yield T/Ha	no. of fruit per Ha	average fruit wt (Gm)	PH	T.S.S
1990							
<u>Planting methods</u>							
Tranplanting	0.56 a	0.42 a	0.14 a	1944.44 a	288 a	6.0 a	11.0 a
Direct - Seeding	0.32 a	0.23 a	0.09 a	1285.14 a	249 a	6.0 a	10.7 a
<u>mulches</u>							
Levelled bare soil (unmulched)	0.22 b	0.16 b	0.06 b	1073.17 b	205 b	6.1 a	11.3 a
Bottom row bare soil(unmulched)	0.19 b	0.12 b	0.07 b	896.23 b	212 b	6.1 a	10.9 a
Transparent mulch	0.90 a	0.69 a	0.21 a	2233.25 a	403 a	6.0 a	11.1 a
Black mulch with Transparent cover	0.43 b	0.34 b	0.09 b	1806.72 ab	238 b	6.1 a	11.0 a
Black mulch	0.43 b	0.31 b	0.12 b	1508.77 ab	285 ab	5.9 a	10.3 a
Treatments 1991							
<u>Planting Methods</u>							
Transplanting	2.32 a	1.59 a	0.73 a	6783.63 a	342 a	6.1 a	10 a
Direct - seeding	2.22 a	1.64 a	0.58 a	5620.25 a	395 a	6.5 a	9.8 a
<u>mulches</u>							
Levelled bare soil (unmulched)	1.48 bc	0.89 a	0.59 b	4698.41 b	315 b	6.0 ab	10.6 a
Bottom row bare soil(unmulched)	1.07 c	0.55 a	0.52 b	3302.47 b	324 b	6.1 ab	10.2 ab
Transparent mulch	4.39 a	3.23 a	1.16 a	11314.43 a	388 ab	6.1 a	9.9 ab
Black mulch with Transparent cover	2.02 bc	1.39 a	0.63 b	4325.48 b	467 a	6.1 ab	9.5 b
Black mulch	2.44 b	2.05 a	0.39 b	6991.40 b	349 ab	5.8 b	9.3 b

(1) Means followed by the same letter in each treatment column don't differ significantly at the 5% level according to DMRT for each transplanting and direct seeding treatments which are not related .

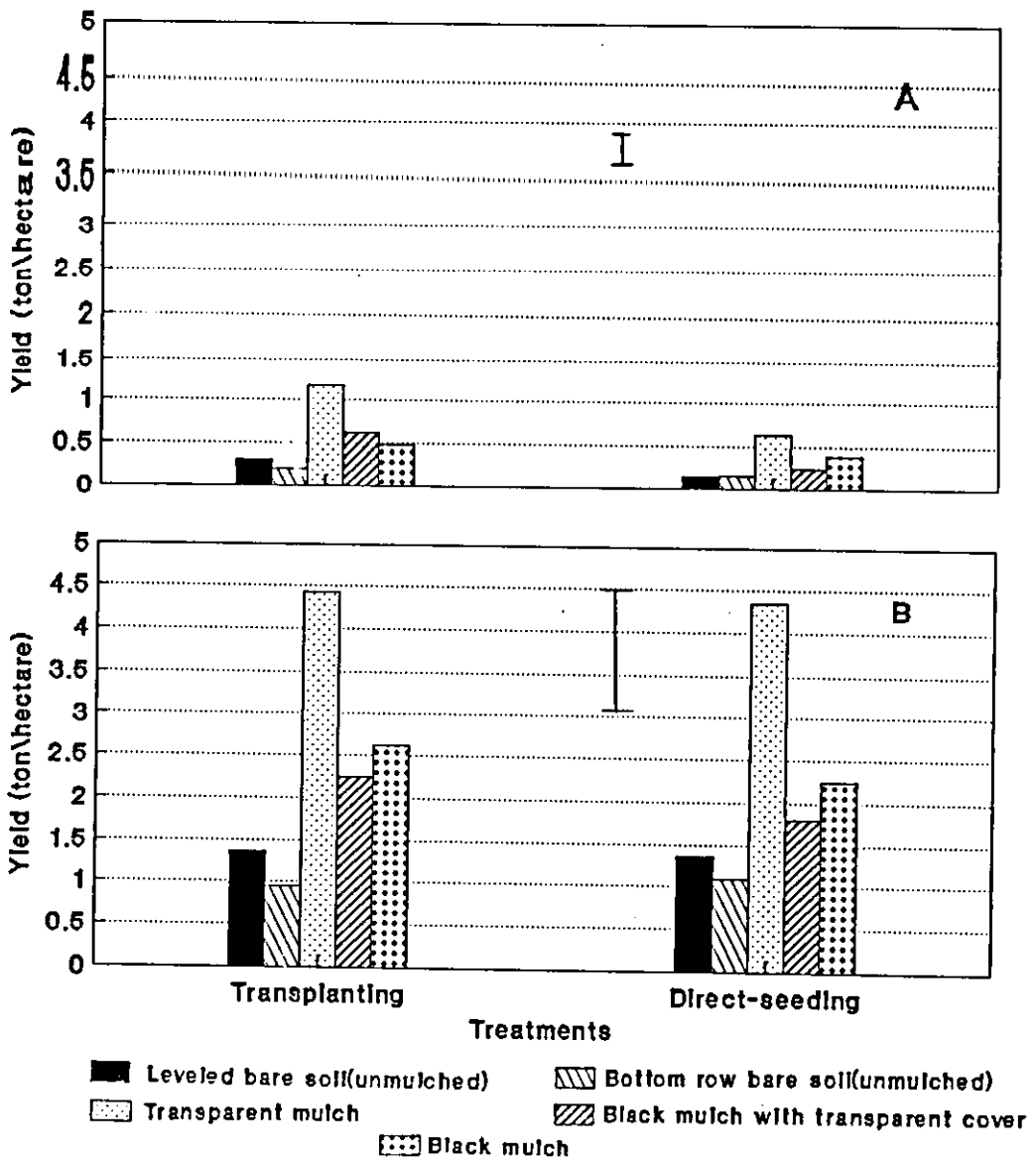


Fig.3 : Interactive effect of planting method and mulch on total yeild of muskmelon plants grown in Mushaqar Agriculture Station during 1990 (A) and 1991 (B). Vertical bars represent LSD at p= 0.05 .

Table (11) Total yield , marketable and unmarketable yield, number of fruits/ hectare, average fruit weight, pH and total soluble solids (T.S.S) of muskmelon at Mushagar Station 1990 and 1991 . planting date April, 10.

Interaction 1990 CVXPM	Total yield T / Ha	m. yield T/Ha	unm yield T/Ha	np. of fruits Ha	average fruit wt (Gm)	PH	T.S.S %
Transplanting	(1)						
Levelled bare soil (unmulched)	0.30 bcd	0.21 bcd	0.09 b	1209.68 bc	248 b	6.1 a	11.6 a
Bottom row bare soil(unmulched)	0.21 d	0.16 d	0.05 b	1009.62 c	208 b	6.3 a	11.0 a
Transparent mulch	1.16 a	0.86 a	0.30 a	2532.75 a	458 a	6.1 a	11.4 a
Black mulch with Transparent cover	0.62 bc	0.50 bc	0.12 b	2440.94 ab	254 b	5.9 a	10.8 a
Black mulch	0.48 bcd	0.34 bcd	0.14 ab	1758.24 abc	273 ab	5.8 a	10.5 a
Direct - seeding							
Levelled bare soil (unmulched)	0.14 d	0.10 d	0.04 b	864.20 c	162 b	6.0 a	11.0 a
Bottom row bare soil(unmulched)	0.16 d	0.08 d	0.08 b	740.74 c	216 b	6.0 a	10.8 a
Transparent mulch	0.64 b	0.51 b	0.13 ab	1839.08 abc	348 a	5.9 a	10.7 a
Black mulch with Transparent cover	0.25 cd	0.18 cd	0.07 ab	1121.08 bc	223 b	6.3 a	11.1 a
Black mulch	0.39 bcd	0.29 bcd	0.10 b	1308.72 bc	298 ab	5.9 a	10.2 a
Interactions 1991 CVXPM							
Transplanting	(1)						
Levelled bare soil (unmulched)	1.36 b	0.77 a	0.59 bc	5271.32 ab	258 b	6.1 a	10.8 a
Bottom row bare soil(unmulched)	0.94 b	0.21 a	0.73 bc	2984.13 ab	315 b	6.1 a	10.2 ab
Transparent mulch	4.43 a	3.15 a	1.28 a	11506.49 a	385 ab	6.1 a	10.2 ab
Black mulch with Transparent cover	2.25 b	1.52 a	0.73 bc	5829.02 ab	386 ab	6.2 a	9.5 b
Black mulch	2.62 b	2.29 a	0.33 c	7217.63 ab	363 ab	5.8 a	9.3 b
Direct - seeding							
Levelled bare soil (unmulched)	1.36 b	0.77 a	0.59 bc	3646.11 ab	373 ab	6.0 a	10.8 a
Bottom row bare soil(unmulched)	1.09 b	0.78 a	0.31 c	3283.13 b	332 b	6.1 a	10.2 ab
Transparent mulch	4.35 a	3.31 a	1.04 ab	11153.85 ab	390 ab	6.1 a	9.7 ab
Black mulch with Transparent cover	1.80 b	1.27 a	0.53 c	3290.68 b	547 a	5.9 a	9.5 b
Black mulch	2.25 b	1.8 a	0.45 c	6736.53 ab	334 b	5.8 a	9.3 b

clear mulch increased the total yield compared to bare ground soil. They attributed their findings to microclimate enhancement due to increased moisture level and high temperature under clear polyethylene mulch. Takatori,(19) and Haddadin and Ghawi, (35) found that clear polyethylene increased soil temperature during the day light hours to a depth of 6 inches and retained some soil heat during the night. In addition, Lippert et al., (48) found that clear and black polyethylene mulches were effective in moisture conservation.

Insignificant difference was obtained in pH between the different interactions between mulch treatments and planting methods. However, significant differences were found in total yield, unmarketable yield, No. of fruits/ ha, average fruit weight for both growing seasons (Table 11). The marketable yield and T.S.S were differed from year to year. Transparent mulch with transplanting gave the highest total production (1.16 t/ha) and marketable yield (0.86 t/ha) with significant difference compared to all other treatments for 1990 growing season. In 1991 it didn't differ significantly with transparent and direct seeded treatment (Fig. 3,4). Transparent mulch with transplanting gave the highest unmarketable yield which were 0.3 and 1.28 t/ha for 1990 and 1991, respectively, with significant difference compared to the rest of the treatments, followed by transparent mulch with direct seeding treatments for both years (Table 11). Transparent mulch with Transplanting in 1990 season gave the highest average fruit weight (458 gm) and highest fruitno./ha (2532.75). In 1991, black mulch with transparent cover over

transplants gave the highest average fruit weight (547 gm) with the lowest fruit No./ha (3290.68). Other treatments were intermediate (Fig.5)

The control (leveled unmulched - direct seeding treatment) gave the lowest values compared to other unmulched treatments, except in unmarketable yield , and average fruit weight which were intermediate .The highest T.S.S. value were 11.6 and 10.3 for 1990 and 1991, respectively with significant difference compared to black mulched transplants and direct seeding treatments, in 1991 only .Other treatments had intermediate values .

Results obtained confirmed Zhukava et al., (28) , Hemphill and Mansour, (56) and Senchak and Yanat'ev, (59) findings. Using clear cover mulch with muskmelon transplants increased the yield compared to direct seeding or transplanting into bare soil . With respect to T.S.S, the results were contrary to Izoquierdo and Mendendez, (55) findings . Clear polyethylene soil mulching with transplanting increased yield quality .

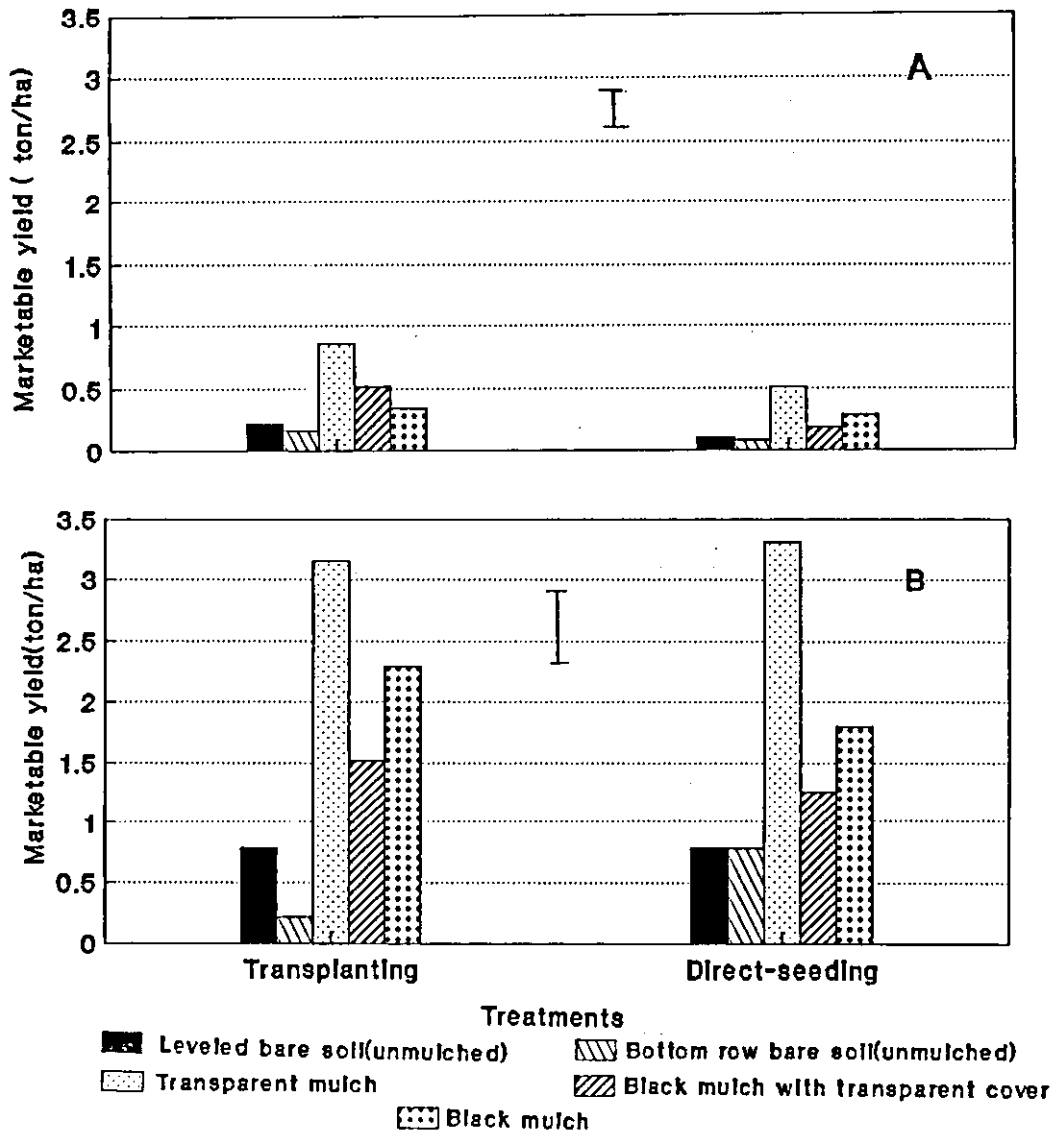


Fig.4 : Interactive effect of planting method and mulch on marketable yield of muskmelon plants grown in Mushaqar Agriculture Station during 1990 (A) and 1991 (B). Vertical bars represent LSD at p= 0.05 .

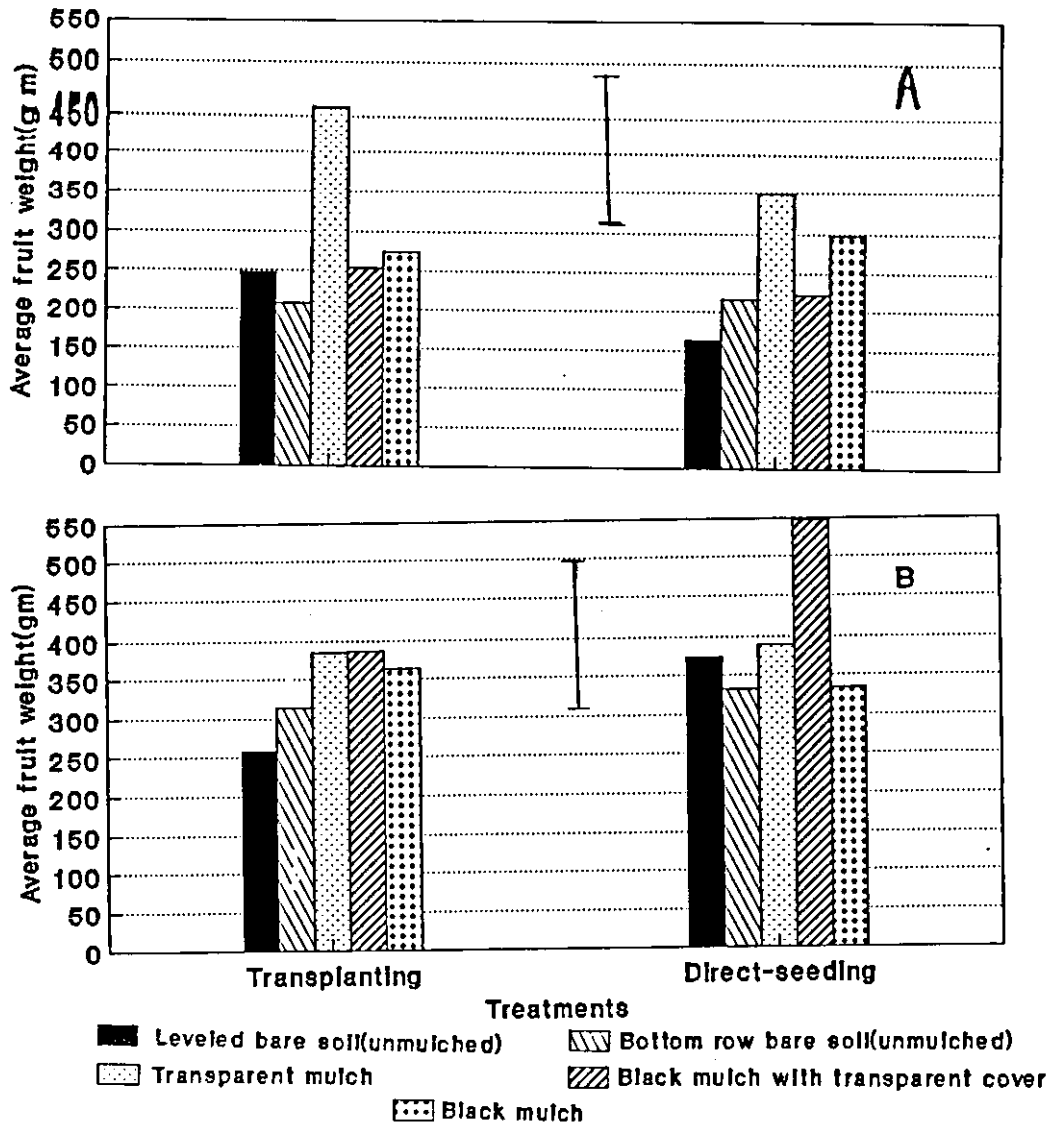


Fig.5 : Interactive effect of planting method and mulch on average fruit weight of muskmelon plants grown in Mushaqar Agriculture Station during 1990 (A) and 1991 (B). Vertical bars represent LSD at $p=0.05$.

Table (12) : Soil moisture content on weight basis (Qm) for 2 sampling dates at 3 soil depths for 1990 and 1991 growing seasons of the experiment at Mushaqar Station.

Treatments	1990				1991	
	planting date 15/3		planting date 10/4		planting date 10/4	
	20/5	5/10	20/5	5/10	20/5	5/10
Transplanting						
(1) leveled bare soil						
(0 - 15)			0.06	0.07	0.12	0.04
(15 - 30)			0.10	0.09	0.17	0.05
(30 - 60)			0.25		0.27	0.08
(2) middle row bare soil						
(0 - 15)			0.09	0.02	0.21	0.07
(15 - 30)			0.22	0.09	0.24	0.08
(30 - 60)			0.24		0.27	0.10
(3) Transparent cover						
(0 - 15)	0.16	0.06	0.13	0.08	0.25	0.12
(15 - 30)	0.22	0.08	0.26	0.10	0.26	0.12
(30 - 60)	0.24		0.44		0.28	0.19
(4) Black + Transparent Cover.						
(0 - 15)	0.10	0.02	0.11	0.02	0.25	0.10
(15 - 30)	0.15	0.09	0.31	0.11	0.26	0.12
(30 - 60)	0.20		0.36		0.27	0.14
(5) Black mulch						
(0 - 15)			0.12	0.02	0.22	0.09
(15 - 3)			0.24	0.13	0.27	0.10
(30 - 60)			0.26		0.31	0.15
Direct seeding						
(6) leveled bare soil						
(0 - 15)	0.12	0.06	0.19	0.08	0.25	0.01
(10 - 30)	0.15	0.09	0.22	0.09	0.27	0.05
(30 - 60)	0.25		0.26		0.28	0.09
(7) middle row bare soil						
(0 - 15)	0.17	0.08	0.24	0.08	0.23	0.01
(15 - 30)	0.24	0.09	0.27	0.09	0.27	0.04
(30 - 60)	0.25		0.28		0.28	0.10
(8) Transparent cover						
(0 - 15)	0.23	0.07	0.25	0.09	0.24	0.09
(15 - 30)	0.26	0.10	0.27	0.11	0.26	0.10
(30 - 60)	0.26		0.30		0.28	0.12
(9) Black + Transparent cover .						
(0 - 15)	0.24	0.08	0.19	0.09	0.27	0.10
(15 - 30)	0.25	0.18	0.26	0.12	0.27	0.10
(30 - 60)	0.26		0.29		0.29	0.14
(10) Black mulch						
(0 - 15)	0.24	0.06	0.25	0.08	0.21	0.07
(15 - 30)	0.27	0.11	0.30	0.10	0.27	0.09
(30 - 60)	0.28		0.38		0.27	0.11

Qm : amount of water in 100 gm oven dry soil .

Table (13) :Total monthly n rainfall (mm) , mean monthly temperature (°c), and mean monthly class- A evaporation (mm) for 1989/1990 and 1990/1991 growing season at the Musaqur Agricultur Experiment Station.

	Season 89 /90	oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	Jun	July	Aug.	Sept
Rainfall (mm)	4.0	6.8	35.5	100	77.4	50.5	43.8	--	--	--	--	--	--
Mean monthlyTemp				6.3	7.0	9.5	14.1	17.4	21.0	22.6	22.1	20.5	
class A pan Evap.				2.0	2.1	3.8	5.3	7.7	8.7	9.0	8.8	7.3	
Season 90 /91													
Rainfall (mm)	4.2	6.0	2.0	73.8	76.1	107.2	3.5	--	--	--	--	--	--
Mean monthlyTemp				6.5	8.0	12	16.3	18.6	21.6	22.5	23.5	21.4	
class A pan Evap.				5.5	6.4	6.2	8.2	9.2	12.4	11.9	11.3	10.3	

Summary and Conclusions

Effect of planting methods (transplanting and direct seeding) and covers (transparent mulch, black mulch with transparent cover , black mulch, leveled bare soil and bottom row bare soil) on muskmelon productivity under rainfed condition were studied at Mushaqar Agriculture Experiment Station during 1990 and 1991 summer season. The results indicated the following :

- 1 - Using of transplants gave significant decrease in number of days for flowering and harvesting compared to direct seeding.
- 2 - Insignificant effect of transplanting on vegetative growth as compared to direct seeding .
- 3 - Insignificant effect of transplanting on yield and quality as compared to direct seeding.
- 4 - In general , all mulche treatments gave lower No. of days for 50% emergence and flowering, longer seedlings, lower No. of days for harvesting, longer plants, larger leaf area, larger total dry weight , and larger total yield than unmulched treatments for seeding and transplanting.
- 5 - Transparent mulch gave significantly shorter time for 50% seedling emergence and for the 1st, 2nd, and 3rd true leaf appearance and gave longer seedlings for direct seeded plants .
- 6 - Transparent mulch gave significantly larger total dry weight , longer plants, larger leaf area , larger stem diameter and higher number of secondary branches for transplanted and direct seeded plants compared

to unmulched treatments.

- 7 - Transparent mulch gave earlier flowering and harvesting of plants for direct seeding and transplanting .
- 8 - Transparent mulch gave higher production for the first harvest and higher number of fruits for the first harvest compared to black mulch and the unmulched treatments .
- 9 - Transparent mulch gave higher total yield, unmarketable yield and number of fruits per hectare than black mulch and unmulched treatments.
- 10 - Marketable yield, average fruit weight and total soluble solids, were significantly different in one year and not in the second year .
- 11 - Significant interaction between planting method and mulch was obtained for flowering and harvesting . In general , the earliest flowering was with the combination of transplanting and transparent mulch.
- 12 - Transparent mulch with transplanting and direct seeding combinations resulted in the highest plants, largest stem diameter and largest number of secondary branches.
- 13 - Black mulch with transparent cover gave long, spindle seedlings with low number of branches, but after that it continued normal growth .

REFERENCES

1. Jaradat, A.A. An assessment of research needs and priorities for Rainfed Agriculture in Jordan, 1st. Edition, The United States Agency for International Development , Irbid, Amman, 1988, pp .
2. Anonymous. Department of agriculture economics, 1992. Ministry of Agriculture , Amman - Jordan .
3. Ashworth, S., and H. Harrison. " Evaluation of mulches for use in the home garden", HortScience, Vol.9 , No.6 , 1974, pp 555- 650 .
4. Wells . O. S., and J. B. Loy . " Vegetable cover - up" , American Vegetable Grower, February , 1980 , pp 8 - 9.
5. Bonanno, A.R., and W.J., Lamont, JR. "Effect of polyethylene mulches , irrigation method, and row covers on soil and air temperature and yield of muskmelon", Horticultural Abstracts, Vol. 57, No.12, 1987, pp 1000 .
6. Zatyko, L. " Melon mulching with coloured plastic film " , Horticultural Abstracts , Vol. 54 , No. , 1984 , pp 335 .
7. Clarkson, V.A.. and W. A. Frazier." Effect of paper and polyethylene mulches and plastic caps on cantaloup yield and earliness", Proc. Amer. Soc. Hort. Sci, Vol. 85, 1956, pp 400 - 404 .
8. Iapichino, G.; and L. Gagliano. " Mulching and heat control devices for early cropping of water melons", Horticultural Abstracts, Vol. 56, No.7, 1986 pp 562 .

9. Zheng, J. S., and Y. Y. Wang . " Studies on the mineral nutrient absorbing capacity of cucumbers with a plastic film mulch " , Horticultural Abstracts, Vol. 56 , No. 5 , 1986 , pp 941 .
10. AL-Khtom, M.M. "Effect of methylbromide soil fumigation and black plastic mulching on cucumber grown under plastic tunnels", M.S. Thesis, University of Jordan , Amman, Jordan, 1981 .
11. Bhella, H.S, and W.F. Kwolek. "The effects of trickle Irrigation and plastic mulch on Zucchini", HortScienc. Vol 19, No.3, 1984, pp 410-411.
12. Hall, B. J.; and S.T. Besemer. "Agricultural plastics in california", HortScience, Vol.7, No.4, 1972, pp 373-378 .
13. Gerard, C.J., and G. Chambers. " Effect of reflective coatings on soil temperatures, soil moisture, and the establishment of fall bell peppers", Agronomy Journal, Vol. 59, No.4, 1967, pp 293- 296 .
14. Suwwan , M. A. , and O. M. Judeh . " Influence of platic mulching in growth , yield and soil moisture conservation in plastic house tomatoes", Dirasat , Vol. XII , No. 4 , 1985 , pp 21 - 32 .
15. Vandenberg , J. , and H. Tiessen . " Influence of wax- coated and polyethylene - coated paper mulch on growth and flowering of tomato", Hortscience , Vol. 6 , No. 5 , 1972 , pp 464 - 465 .
16. Teasdale , J. R. , and D. Colacicco . " Weed control systems for fresh market tomato production on small frams , " J. Amer. Soc. Hort. Sci, Vol. 110, No.4, 1985 , pp 533 - 537 .
17. Schalk, J. M, C.S. Creighton , R.L. Fery, W.R. Sitterly, Bi. W. Davis, T.L.

- McFadden, and A. Day . " Reflective film mulches influences on insect control and yield in vegetables ", J. Amer. Soc. Hort. Sci. Vol. 104 , No.6, 1979 , pp 759 - 762 .
18. Renquist, A.R., P.J. Breen, and L.W. Martin. " Effects of black polyethylene mulch on strawberry leaf elongation and diurnal leaf water potential," J. Amer. Soc. Hort. Sci. Vol. 107, NO.4, 1982, pp 640 - 643 .
19. Takatori . F. H ,L. F. Lippert , and F. L . Whiting . " The effect of petroleum mulch and polyethylene films on soil temperature and plant growth" , proc. Amer. Soc. Hort. Sci. , Vol. 85 , 1964 , pp 532 - 546 .
20. Bennett, o.L., D.A. Ashley, and B.D. Doss. "Cotton responses to black plastic mulch and irrigation", Agronomy Journal, Vol. 58, JAN-Feb, 1966, pp 57-59 .
21. Voth , V. " Plastics in California strawberries " , HortScience , Vol. 7 , No. 4, 1972 , pp. 373 - 380 .
22. Stall , W. M. , S. R. Kostewicz ,G. J. Hochmith , and S. J. Locascio . " Row covers on vegetables in North Florida " , Horticultural Abstracts , Vol. 57, No. 5 , 1987 , pp 348 .
23. Battlghi, A.M., and I. Ghawi. "Muskmelon production under mulch and trickle irrigation in the Jordan Valley", Horticultural Abstracts, Vol. 58, No.1, 1988, pp 30 .
24. Bravo, A. , and R. Ripoll " Effects of the use of plastic tunnels and mulch on yield of two melon (cucumis melo L) cultivars " Horticultural

Abstracts, vol. 57, No. 12 , 1987, pp. 1000 .

25. Incaterra, G. " The Effects of mulching and heat control tubing on melon production in unheated greenhouse ", Horticultural Abstracts, Vol. 56, No.7, 1986, pp 451 .
26. Rogers, H.T. " Ready in ajiffy," American vegetable Grower, January , 1981, pp 18-20 .
27. Bhella, H.S. "Muskmelon growth, yield, and nutrition as Influenced by planting method and trickle irrigation ", J.Amer. Soc. Hort. Sci, Vol. 110, No.6, 1985, pp 793-796 .
28. Zhukava , P. S. , A. P. Kharytonava , and S. F. Sl' Vanovich . " Productivity of cucumber under different methods of covering the seedlings with polyethylene film",Horticultural Abstracts,Vol. 57, No. 7 , 1987 , p577.
29. Gorske, S.F. " Weed control on plastic", American Vegetable Grower, 1979, Febreury, pp 13-14 .
30. Yang, Y. Z. " Changes in soil under plastic mulching and their influence on crops " , Horticultural Abstracts , Vol. 55 , No. , pp 789 .
31. Kamal, A.,and Z.Abdel Malic " Plastic mulches their use , benefits, and those suitable for AL-Bahreen" proc. 2nd . systems of protected Agriculture. No.2 , AL-Bahreen, 25 feb. 1984, pp.10-11.
32. Höpen, H.J.; and N. F. oebker. " Mulch effects on ambient carbon dioxide levels and growth of several vegetables", Hortscience, vol. 10, No.2, 1975, pp 159-161 .
33. West . J. , and L. C. peirce. " Yields of tomato phenotypes modified by

- planting density, mulch , and row covers" , HortScience , Vol. 23 ,
No .2 , 1988 , pp 321 - 324 .
34. Hocking, D.F., and G. Kelly. " Minimum tillage for vegetable production",
Horticultural Abstracts, Vol. 56, Np.7, 1986, pp451 .
35. Haddadin, SH.H., and I. Ghawi. : "Effect of plastic mulches on soil water
conservation and soil temperature in field grown tomato in the
Jordan Valley", Dirasat, Vol., No. 19, pp 25 - 29 .
36. Haddadin, SH.H., M.H. Suwwan, and I. Ghawi, " Effect of plastic mulches
on growth and yield of tomato (*Lycopersicon esculentum* Mill)
under drip irrigation in the Jordan valley", Dirasat, Vol. XLL, No.6,
1985, pp 47-57 .
37. Haddadin, Sh.H. "Effect of palstic mulches on soil water conservation, soil
temerature and yield of tomato in the Jordan Valley", M.S. Thesis,
University of Jordan, Amman, Jordan, 1982 .
38. Emmert, E.M. " Black polyethylene for mulching vegetables", Proc. Amer.
Soc. Hort. Sci, Vol. 69, 1957, pp 464-469 .
39. Perry, K.B., and D.C. Sanders. " Tomato yield as influenced by plant
protection systems", HortScience, Vol. 21, No.2, 1986, pp 238-239 .
40. Karlen, D.L.; and M.L. Robbins. " Management practices for fresh market
tomato production in the south eastern coastal plain, " Hort
Science, Vol. 18, No.5,1983, pp 732-734.
41. Jones, T.L., U.S. Jones, and D,O,Ezell. "Effect of nitrogen and plastic
mulch on properties of troupe loamy sand and on yield of "Walter

- tomatoes," J. Amer. Soc. Hort. Sci., Vol. 102, No. 3, 1977, pp 273- 275 .
42. Jones , U.S., and T. L. Jones. "Influence of polyethylene mulch and magnesium salts on tomatoes growing on loamy sand", soil Sci. Soc. Am.J. Vol. 49, 1978, pp 918-922.
43. Taja, H., A. Cadorna, D. Suetos., and P. Vanderzaag. " Potato (Solanum Tuberosum L.) tuber yield in Cagayan as influenced by planting date , mulching , and location." Phil. Agr., Vol. 67, 1984, pp 55 - 69 .
44. Schales, F.D., and R. Sheldrake, JR. "Mulch effects on soil conditions and muskmelon response", Proc. Amer. Soc. Hort. Sci., Vol. 88, 1966 , pp 425- 429 .
45. Wells , O. S. ,and J. B. Loy . " Intensive vegetable production with row covers " , HortScience , Vol. 20 , No. 5, 1985 , pp 822 - 825 .
46. Spiers . J. M. " Root distribution of " Tifblue " rabbiteye blueberry as influenced by irrigation , incorporated peatmoss , and mulch , " J. Amer Soc. Hort. Sci. , Vol. 111 , No. 6 , 1986 , pp 877 - 880 .
47. Sweeney , D. W., D. A. Graetz , A. B. Bottcher , S. J. Locascio , and K. L. Campbell . " Tomato yield and nitrogen recovery as influenced by irrigation method , nitrogen source , and mulch , " HortScience , Vol. 22, No. 1 , 1987, pp. 27 - 29 .
48. Lippert, L. F., F.H. Takatori, and F.L. Whiting. " Soil moisture under bands of petroleum and polyethylene mulches", American Society for Horticultural Science, Vol. 85, 1964, pp 541- 545 .
49. Chen, Y, and J. Katan. "Effect of solar heating of soils by transparent

polyethelene mulching on their chemical properties", Soil Science.

Vol. 130, No.5, 1980, pp 271-277 .

50. DuFault, R.J. "Influence of nutritional conditioning on muskmelon transplant quality and early yield," J. Amer. Soc. Hort. Sci. Vol. 111, No.5, 1986, pp 698 - 703 .
51. Lorenz, O.A; and D.N. Maynard. Knott's handbook for vegetable growers, 2nd EDITION , Awiley- Interscience publication New york, U.S, 1980, p38 .
52. Kumar, J. C.; and A.K. Mehta. " Comparative performance of muskmelon varieties as adirect sown and transplanted crop", Horticultural Abstracts, Vol. 57, No. 12, 1987, pp 1000 .
53. Peirce., L.C.; and L.E. Peterson. " The response of muskmelons to spacing, seeding date and plant container", American Society for Horticultural Science, Vol. 77, 1961, pp 434 - 439 .
54. Norton, J.D. "Effects of field Seeding and Trans planting on Earliness, Quality, and yield of cant aloupe varieties," HortScience, Vol.3, No.3, 1968, pp 175-177.
55. Izquierdo, J.A., R. Menendez, " Effect of mulching on the growth , Production, quality and keeping of melon CV. Honey Dew," Horticultural Abstracts, Vol. 58, No.7, 1988, p 458 .
56. Hemphill, D.D., and N.S. Mansour. " Response of muskmelon to three floating row covers", J.Amer. Soc. Hort. Sci, Vol.111, No.4, 1986, pp 513-517 .

57. Khristov, B, "Suitable methods for melon forcing", Horticultural Abstracts , Vol. 54, No. 10, 1984, pp 169 .
58. Lancaster, D.M.; B. Mulkey, C.E. Johnson; and W.C. Porter. " Improving early yields of cantalopes,": Horticultural Abstracts, Vol. 56, No,8 Bo. , 1986 pp 941 .
59. Senchak, I. S. ; and v.p. Yanat'ev . " Frameless coverings for melon ", Horticultural Abstracts , Vol. 58 , No. 11 , 1988 , pp 940 .
60. Anonymous. Ministry of water and irrigation, 1992 . Mmman- Jordan .
61. Nagy, J. " Early production " plastic film covering of cucurbits", Horticultural Abstracts, Vol. 57, No.7, 1987, pp 577 .
62. Nerson, H., H.S. Paris, A. Govers, Z. Karchi, M. Edlsten, and R.Y. Burger. " Pretreatments of seeds improve germination and emergence of polyploid watermelons," Horticultural Abstracts. Vol.55, No.7, 1985, pp 546 :
63. Elmstrom, G.W. " Watermelon root development affected by direct seeding and transplanting", HortScience., Vol.8, No.2, 1973, pp 134-135 .
64. Brinen, G.H; S.L. Locascio, and G.W. Elmstrom, "Plant and row spacing, mulch, and fertilizer rate effects on water melon production", J. Amer. Soc. Hortsci, Vol. 104, No.6, 1979, pp 724-726 .

APPENDICES

Table (1) Analysis of variance for number of days to reach 50 % emergence and appearance of 1st, 2nd and 3rd true leaf and seedling length after 40 days for direct seeded plants of muskmelon in 1990 , planting date 15 march .

Source of variation	df	Mean Squares				
		50 % emergence	1st leaf appear.	2nd leaf appear.	3rd leaf appear.	seedling length (cm)
Rep	2	1.800	3.467	0.800	2.467	0.842
Treatment	4	133.433	81.067	126.400	170.267	35.541
Error	8	0.883*	2.467*	2.800*	3.467*	1.171*

Coefficient of

variation 4.05 % 5.56 % 4.7 % 4.45 % 22.36

* significant at 5 % level .

Table (2) Analysis of variance for number of days for 50% flowering of plants, number of days for harvesting, plant length, number of stems/ plant, leaf area index per plant and dry weight/plant of transplanted muskmelon in 1990. planting date march,15.

Source of Variation	df	Mean Square					
		no. of days for 50% flowering	no. of days for harvesting	plant length (cm)	no. of stems/plant	leaf area / plant (cm ²)	dryweight /plant (gm)
Ref	2	8.167	1.167	93.672	0.502	101.247	228.489
Treatment	1	32.667	96.000	445.482	2.94	68.479	881.309
Error	2	8.167*	0.500*	20.172	1.085	4.030*	66.535*

Coefficient of variation 4.31% 0.59% 10.67% 35.11% 5.7% 16.63%

* Significant at 5% level .

Table (3) Analysis of variance for number of days for 50% flowering of plants, number of days for harvesting, plant length, number of stems/ plant, leaf area per plant and dry weight /plant of direct seeded muskmelon in 1990. planting date March, 15.

Source of Variation	df	Mean Square					
		no. of days for 50% flowering of plants	no. of days for harvesting	plant length (cm)	no. of stems/plant	leaf area/plant (cm ²)	dry weight /plant (gm)
Ref.	2	8.867	106.667	322.416	0.173	177.376	115.566
Treatment	4	58.400	68.667	883.910	0.794	326.266	442.571
Error	8	1.450*	17.167*	181.829*	0.257*	74.077*	124.209*

Coefficient of variation 1.53% 3.03% 47.72% 29.58% 38.20% 45.12%

* Significant at 5% level .

Table (4) Analysis of variance for total , marketable and unmarketable yield, number of fruits / plot , average fruit weight , pH and total soluble solids of transplanted muskmelon in 1990 . Planting date March,15 .

Source of Variation	df	Mean Square					pH	T.S.S %
		total yield kg/pbt	marketable yield kg/plot	unmarketable yield kg.plot	no. of fruits/plot	average fruit wt (gm)		
Ref	2	1.547	1.253	0.068	8.167	11516.667	0.082	0.185
Treat.	1	9.478	4.120	0.713	42.667	31682.667	0.427	6.202
Error	2	0.181*	0.093*	0.068	1.167*	2530.667*	0.052	0.452*
Coefficient of variation		22.12%	20.36	75.38%	19.06%	16.90%	3.65%	5.92%

* Significant at 5% level .

plot area = 27m² .

Table (5) Analysis of variance for total , marketable and unmarketable yield, number of fruits plot, average fruit weight, pH and total soluble solids of direct seeded muskmelon 1990. planting date March,15 .

Source of Variation	df	Mean Square					pH	T.S.S %
		total yield kg/pbt	marketable yield kg/plot	unmarketable yield kg:plot	no. of fruits/plot	average fruit wt (gm)		
Ref	2	0.331	0.121	0.015	2.467	6026.600	0.005	0.000
Treat.	4	0.766	0.409	0.048	12.400	2050.333	0.178	1.192
Error	8	0.021*	0.015*	0.004*	1.050*	3732.433	0.062*	0.354*

Coefficient of variation 19.77% 21.97% 29.70% 31.37% 26.80% 4.08% 5.36%

* Significant at 5% level .

plot area = 27m² .

Table (6) Analysis of variance for no. of days for 50% emergence, appearance of 1st, 2nd, 3rd and 4th true and seedling length after 40 days for direct seeded plants of muskmelon 1990 and 1991. planting date April, 10.

Source of Variation	df	Mean Square									
		1990					1991				
		no. of days for 50% emerg.	no. of days for 1st leaf	no. of days for 2nd leaf	no. of days for 3rd leaf	seedling length after 40days	no. of days for 50% emerg.	no. of days for 1st leaf	no. of days for 2nd leaf	no. of days for 3rd leaf	no. of days for 4th leaf
Rel	2	0.800	3.467	4.267	4.867	7.349	1.867	1.067	1.667	1.667	1.067
Treat.	4	19.733	34.567	25.600	33.933	58.552	45.267	10.667	16.667	13.600	15.267
Error	8	0.633*	0.967*	3.100*	3.533*	1.745*	1.117*	1.067*	1.667*	1.000*	1.067*

Coefficient of variation 9.25% 7.06% 9.85% 8.73% 26.46% 7.85% 5.53% 5.53% 3.63% 3.28%

* Significant at 5% level.

Table (7) Analysis of variance for number of days for 50% flowering of plants in 1990 and means of number of days for 25%,

Source of variation	df	Mean Square				
		1990	1991	no. of days for flowering		
		no. of days for 50% flowering		25%	50%	75%
Rep	2	0.433	0.233	0.033	1.200	2.233
Factor A	1	73.633	14.700	20.833	22.533	19.200
Error	2	1.633*	0.700*	0.633*	0.533*	0.100
Factor B	4	34.300	16.383	17.033	18.333	17.000
AB	4	1.300	1.617	0.667	1.867	2.533
Error	16	0.825*	0.300*	0.750*	0.700*	1.292*

Coefficient of variation

1.43%

1.03%

1.59%

1.49%

1.97%

* Significant at 5% level .

Table (8) Analysis of variance for plant length, No. of first branches for 1990 experiment and leaf area, stem diameter, No. of first branches and No. of secondary branches for 1991 experiment planting date April, 10.

Source of variation	df	Mean Square							
		1990				1991			
		plant length (cm)	no. of first branches	leaf area (cm ²)	plant length (cm)	stem diameter (mm)	no. of first branches	no. of secondary branches	
Replication	2	60.961	0.399	41.890	57.912	1.766	0.27	1.766	
Factor A	1	1143.301	0.033	27.227	609.662	8.933	0.013	8.933	
Error	2	281.785	0.352	33.119	111.425	0.666	0.105	0.666	
Factor B	4	3227.419	0.488	657.408	3204.519	12.404	0.380	12.404	
AB	4	156.951	0.066	5.403	70.299	1.892	0.062	1.892	
Error	16	121.994*	0.258	34.949*	87.337*	0.467*	0.121	0.467*	

Coefficient of variation 32.76%

23.10 %

23.55%

11.44%

10.63%

12.06%

10.63%

*Significant at 5% level.

Table (9) Analysis of variance for means of dry weight per plant, leaves and stems weight per plant of muskmelon in 1990 and 1991. planting date April,10 .

Source of variation	df	Mean Square			
		1990		1991	
		dry weight (gm)	total dry weight (gm)	leaves weight (gm)	stems weight (gm)
Rep	2	81.626	574.574	422.771	9.193
Factor A	1	368.130	447.451	212.055	149.098
Error	2	429.671	90.634	76.575	72.531
Factor B	4	3338.949	3470.474	1636.851	456.542
AB	4	75.431	39.606	56.046	22.120
Error	16	112.464*	152.919*	113.842*	67.905*

Coefficient of variation 27.06% 21.75% 29.45% 39.25%

*Significant at 5% level .

Table (10) Analysis of variance for means of number of days to first harvest, quantity of first harvest, average fruit weight of first harvest and number of fruits / plot of muskmelon in 1990 and 1991. planting date April, 10 .

Source of variation	df	Mean Square				
		1990	1991	no. of days to First harvest	no. of days to harvest	
Rep	2	0.400	5.991	0.020	17.033	74.133
Factor A	1	662.700	0.49	0.004	2.133	1346.700
Error	2	0.400*	0.839	0.026	0.233	20.800
Factor B	4	164.800	12.542	0.046	39.533	162.667
AB	4	5.200	0.234	0.040	2.800	14.867
Error	16	0.400*	0.878*	0.008*	3.342*	5.217*

Coefficient of variation

0.49%

42.11%

21.33%

33.44%

1.76%

* Significant at 5% level .

plot area = 27m²

Table (11) Analysis of variance for total yield , marketable and unmarketable yield, number of fruits/ plot, average fruit weight , pH and total soluble solids of muskmelon in 1990 . planting date April, 10 .

Source of variation	df	Mean Square						
		total yield kg/plot	marketable yield kg/plot	unmarketable yield kg/plot	no. of fruits per plot	average Fruit wt (gm)	pH	T.S.S %
Rep	2	0.249	0.175	0.05	2.452	3602.216	0.084	0.916
Factor A	1	3.112	1.859	0.008	31.621	11201.737	0.002	0.736
Error	2	0.081	0.021	0.042	1.985	3734.098	0.098	0.114
Factor B	4	3.576	2.225	0.222	15.085	39552.048	0.072	0.769
AB	4	0.419	0.213	0.026	2.438	5108.036	0.111	0.221
Error	16	0.289*	0.212*	0.053*	4.260*	8512.442*	0.083	0.947

Coefficient of variation 45.85% 52.69% 60.24% 49.62% 34.33% 4.79% 8.93%

*Significant at 5% level .

plot area = 27 m²

Table (12) Analysis of variance for total yield , marketable and unmarketable yield, number of fruits/ plot, average fruit weight , pH and total soluble solids of muskmelon in 1990 . planting date April, 10 .

Source of variation	df	Mean Square						
		total yield kg/plot	marketable yield kg/plot	unmarketable yield kg/plot	no. of fruits plot	average Fruit wt (kg)	pH	T.S.S %
Replication	2	36.851	3.791	4.263	614.933	0.015	0.050	8.125
Factor A	1	0.540	1.432	1.212	2.700	0.022	0.048	0.300
Error	2	15.476	24.554	3.374	292.800	0.006	0.043	0.175
Factor B	4	73.935	17.395	3.799	321.367	0.023	0.096	1.529
AB	4	1.009	2.272	0.466	150.700	0.010	0.029	0.113
Error	16	5.403*	8.316	0.467*	118.908*	0.010*	0.051	0.452*

Coefficient of variation 37.92% 61.50% 38.43% 54.43% 27.53% 3.74% 6.79%

*Significant at 5% level .

plot area = 27 m²

المخلص بالعربية

تأثير استعمال الأغطية البلاستيكية وطريقة الزراعة على إنتاجية الشمام

المزروع بعلياً .

إعداد : هريم عزام الهجالي

بإشراف : الدكتور محمود قسراوي

أجريت هذه التجربة لدراسة تأثير طريقة الزراعة (زراعة بالشتول وزراعة بالبذور مباشرة) وإستعمال الأغطية البلاستيكية (البلاستيك الشفاف ، البلاستيك الأسود والفتحة مغطاة بالشفاف والبلاستيك الأسود ، مكشوف والزراعة على مستوى سطح التربة ، مكشوف والزراعة في قلب التلم) على إنتاجية الشمام المزروع بعلياً .

تبين من خلال هذه التجربة ان الزراعة بالشتول اعطت إزهار وقطف مبكرين ولم يكن هناك تأثير معنوي على الانتاج والنوعية . بالنسبة للأغطية البلاستيكية فإن الاغطية البلاستيكية اعطت نتائج افضل مقارنة بالمكشوف ، وقد اعطى البلاستيك الشفاف إنبات مبكر وإنخفاض معنوي في عدد الأيام اللازمة لظهور الثلاث اوراق الحقيقية الاولى بالاضافة لأشتال طويلة .

وقد اعطت معاملة البلاستيك الأسود والمغطى بالشفاف نتائج متقاربة كذلك اعطى البلاستيك الشفاف إزهار وقطف مبكرين بالإضافة لإنتاج مبكر وإجمالي عالٍ كما كان هنالك زيادة معنوية في عدد الثمار . ايضاً كان تأثير البلاستيك الشفاف ايجابي على المجموع الخضري ، إذ اعطى نباتات طويلة ومساحة ورقه اكبر بالاضافة لمجموع خضري كبير .

وقد كان تأثير الأغطية اكثر وضوحاً من الزراعة بالأشتال وبالنسبة للتداخل بينهما فقد اعطت الزراعة بالأشتال والتغطية بالبلاستيك الشفاف افضل النتائج .