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EFFECT OF SOIL TEMPERATURE AND ITS ACIDITY ON THE DEVELOPMENT OF SUDDEN WILT IN MELON

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ABSTRACT

Two field experiments were conducted in the summer seasons of 2005 and 2006 in Nubaria area, Alex- Desert Road to evaluate the effect of ammonium sulfate quantity and both type and number of layers of plastic mulch on soil temperature and its acidity with relation to melon wilt as well as melon yield. The results showed that increasing ammonium sulfate quantity decreased melon wilt incidence due to its effect on decreasing soil pH. Plastic mulch treatments significantly affected on melon wilt reduction due to its effect on increasing soil temperature to be sufficient for *Monosporascus* inhibition. Generally, black plastic mulch was better than the clear one in increasing soil temperature and consequently melon wilt reduction, and the same trend was true with two layers of plastic mulch compared with one layer. The best treatment in this study on melon wilt reduction was using two layers of plastic mulch, the black one above and the clear layer below. This treatment led to increase soil temperature to be 47 and 49°C in 2005 and 2006, respectively and consequently led to melon wilt reduction to be 34.1 and 28.7% compared to the control treatment, which was 65.6 and 60.8% in 2005 and 2006, respectively. Melon fruit yield was improved significantly by the treatments in this study due to its effect in decreasing soil pH and increasing soil temperature and consequently melon wilt reduction. TSS(%) didn't affect by ammonium sulfate quantity, whereas it was improved under plastic mulch treatments.

In the present study, it could be concluded that melon wilt reduction and consequently increasing melon yield especially marketable yield can be achieved by reduction soil pH by extra ammonium sulfate quantity due to its acidity reaction and increasing soil temperature to be enough for *Monosporascus* inhibition by doubling plastic mulch layers to be act as a solarization treatment. More research for melon wilt control is needed.

INTRODUCTION

In the mid- 1990's, a new vine decline disease was observed in melon fields in Egypt. Aboveground symptoms included stunting, yellowing, and necrosis of the inner crown leaves, followed by progressive necrosis of the leaves. Approximately 10-14 days before harvest, the entire canopy may collapse, exposing fruit to intense solar radiation and more likely to be low in sugars and abscise from the pedicle before ripening (full slip). There are no distinctive lesions on runners or petioles. Belowground symptoms include root lesions, particularly at root junctions, loss of secondary and tertiary feeder roots, and under conditions that tend to stress the plant, a secondary root rot and death of the tap root.

The cause of this disorder was not identified until recent in Egypt. In late summer of 2001, Melon Team Work in Agricultural Technology Utilization and Transfer Project (ATUT, 2001) observed and described the symptoms of this disorder. Root samples were sent to the laboratory to USA by the project, and the causal was identified as *Monosporascus cannonballus* (Merghany, 2006).

Economically significant loss due to *Monosporascus* root rot and vine decline were first noticed in melon fields in last fifteen years, but it is probable that losses occurred prior to this and were either undetected or attributed to other causes. The disease persists and continues to be a major constraint to melon production in some major commercial areas. Losses fluctuate year to year from approximately 15 to 25% of the crop, although individual fields may suffer 100% loss. Similar losses have been reported from Israel (Reuveni *et al.*, 1983) and Southern Spain (Garcia – Jimenez *et al.*, 1994). Pivonia *et al.* (1997) reported that observations in melon fields show that the severity of the disease may increase under certain environmental conditions, and the melon crop may be totally destroyed in late summer (which is a short growing season when temperatures are high); whereas the following melon crop in the same field in the spring (when temperatures are lower) is unaffected or less severely affected by wilt.

Martyn and Miller (1996) reported that *Monosporascus* appears to be adapted to hot (32-35°c), semiarid climates with soil that tend to be saline and alkaline. This is inferred from areas where the fungus has been found (Israel, Iran, India, Pakistan, Southern Spain, Tunisia, Libya, the Southwest United States) and its high growth temperature optimum (30-35°C).

In Japan, *Monosporascus* root rot is mainly associated with plastic mulch, plastic tunnels or green- house melon culture (Uematsu, *et al.*, 1985). These cultural conditions may raise soil temperatures to a level conductive to growth and infection by *M. cannonballus*, thus producing an artificial niche for the fungus in an otherwise temperate zone, while vegetative mycelial growth is optimal over the range of 25 to 35°C, perithecia formation in vitro is optimal at 25 to 30°C. Isolates from Japan had a growth optimum of 28-32°C and were inhibited above 40°C (Uematsu and Sekiyama, 1990 and Uematsu *et al.*, 1992). Similar results were observed with isolates from the United States and Israel (Reuveni *et al.*, 1983), while an isolate from Libya was inhibited above 45°C (Hawksworth and Ciccaron, 1978).

Mertely *et al.* (1991 and 1993) reported that *Monosporascus* grow optimally at pH 8 to 8.5 in vitro, but will grow at pH values up to at least 9. Growth is reduced below pH 7.9 and inhibited completely at pH 7.3.

Zornoza and Carpena (1992) reported that response of cucumber plants for extra amounts of ammonium sulfate was limited and had no effect on soil pH reduction, whereas Al-Harbi (1995) reported that soil pH reduction was observed and both tomato and cucumber seedlings growth was improved under extra amounts of ammonium sulfate (500 kg / ha.). Also, Al-Harbi and Burrage (1999) reported that increasing ammonium sulfate level in the nutrient solution of cucumber plants under saline conditions decreased soil pH and encouraged plant growth compared with the control. Hochmuth (2002) found that the acidity reaction of ammonium sulfate with farm-yard manure led to increasing soil temperature compared with non-farm yard manure treatment. Also, Hochmuth and Dahlan (2005) reported that ammonium sulfate compared to urea resulted in increasing soil temperature and soil pH reduction to be 7.4 instead of 7.8 with urea and Turnip root yield was improved under these conditions.

The pH of most of the soils in melon growing regions of Egyptian reclaimed sandy soils is 7.5 or higher, and plastic mulch is a common practice in melon crop production. So, if *Monosporascus* fungus tended to grow at pH values up to 8.5,and growth is reduced below pH 7.9 and grow well under temperature of 30-35°C, can we reduce wilt incidence by modification of micro environmental conditions around the plant, i.e., soil pH and its temperature. This is the purpose of the present study.

MATERIALS AND METHODS

Two field experiments were carried out during late summer of 2005 and 2006 in Nubaria area, Alex - Desert Road. Seeds of melon cv. Ideal (Galia type, Syngenta Co.) were sown in seedling trays containing 209 cells, filled with a 1:1 (V/V) mixture of peat and vermiculite on 8th and 10th of May in 2005 and 2006 season, respectively. Transplanting was carried out 3 weeks later. All experiments were conducted in a field with a history of sudden wilt caused by *Monosporascus cannonballus* (ATUT, 2001). This field was grown with melon four years (since 2001)before carrying out the present study. Soil of the experimental site was sandy in texture, having a pH of 8.2 and irrigation depends on ground water.

The physical and chemical analysis of the experimental soil and irrigation water are shown in Table (1) according to the methods reported by Black (1965) and Chapman and Pratt (1961), respectively.

Each experiment included 14 treatments which were the combinations of two levels of ammonium sulfate (20.5%N) and six plastic mulch treatments in addition to the control treatment. The two levels of ammonium sulfate were 150 (control, the recommended level) and 300 kg/feddan and they were injected in equal doses for each level twice a week through irrigation lines during the growing season, starting from the second week after transplanting. Plastic mulch with thickness of 55µ treatments were as follows:

1. Black plastic mulch, one layer.
2. Black plastic mulch, two layers.
3. Clear plastic mulch, one layer.

Table (1): Physical and chemical characteristics of the site experimental soil and the irrigation water used.

Soil													
Season	Clay %	Silt %	Fine Sand %	Coarse Sand %	Texture	pH	EC ds/m	$CaCO_3$ %	Total N %	P_2O_5 ppm	K_2O ppm	CaO ppm	Na Meq/L
2005	8.12	4.18	11.06	77.00	Sandy	8.2	1.10	2.23	0.019	29.5	49.7	47.4	3.71
2006	8.92	5.41	10.28	75.00	Sandy	8.0	1.21	1.95	0.022	33.5	53.1	52.4	2.92

Irrigation Water										
Season	pH	EC ds/m	K_2O ppm	CaO ppm	MgO ppm	Na mg/L	CO_3 mg/L	Hco_3 mg/L	SO_4 ppm	CL mg/L
2005	8.2	1.71	6.39	43.81	22.51	15.46	0.75	3.21	128	10.34
2006	8.0	1.56	5.97	41.62	23.67	14.64	0.84	2.86	117	12.15

4. Clear plastic mulch, two layers.
5. Two layers of plastic mulch, one black layer above and one clear layer below.
6. Two layers of plastic mulch, one clear layer above and one black layer below.
7. Control (without plastic mulch).

The experimental layout was a split-plot design with three replicates. The main plots were assigned for the two ammonium sulfate levels and the sub one were occupied by the tested plastic mulch treatments. Each sup-plot included 5 beds, 175cm wide and 10m long (87.5m^2). Seedlings were spaced 50cm apart.

During soil preparation, 15m^3 of cooked-chicken manure, 250kg calcium super phosphate (15.5% P_2O_5) and 200kg potassium sulfate (48% K_2O) were mixed and added to planting rows. Also, all experimental units were fertigated during growing season with 80 liters/fed of phosphoric acid (60% P_2O_5), and 200kg/fed potassium sulfate. All agricultural practices took place as recommended for melon production.

Data were recorded on the following characters.

A- Soil temperature:

Two beds per each plot have been chosen randomly and data logger thermometer was placed 25cm depth under plastic mulch in three sites per bed separated by 2m for each thermometer. Soil temperature was recorded daily in mid-day. Average of soil temperature per day were transformed to weekly average and consequently to monthly average.

B- Soil pH:

Two weeks after transplanting (second week of June), three random samples of soil per each plot were taken 25cm depth and pH analysis had been done and continued every week and consequently average monthly was recorded according to the method described by Black, (1965).

C- Wilt incidence:

Data on disease incidence was recorded during the two growing season. A plant was considered dead when the whole plant exhibited irreversible wilt symptoms. The number of wilted plants and the total number of plants per plot were used to calculate the incidence of wilt (%). Data for disease incidence were transformed prior to analysis. When the F values were significant at >0.05, differences among the treatments were determined by Fisher's protected least significant difference (LSD) test.

D- Fruit yield and its quality:

In each plot in both diseased and healthy plants, fruits were collected, weighed, graded to marketable yield as well as total yield per feddan were calculated. Total yield included defected and non-defected fruits, whereas marketable yield included only non-defected fruits. The following defects have been recorded in galia melon in this study:

-Lack of color	.-Malformation.	-Net malformation.
-Sun scald.	-Decay.	-Scarring.
-Ground spot.	-Under weight (<300 gm).	

Marketable yield was calculated in fruits free from the above defects, round and symmetrical fruits with complete netting.
Total soluble solids percentage (TSS%) in five fruits/plot per each harvesting time was estimated by hand refractometer.

The obtained data were subjected to the analysis of variance as proposed by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

A- Soil temperature:

1- Effect of ammonium sulfate:

Data presented in Table (2) show that doubling the amount of ammonium sulfate led to significant increasing in soil temperature in both growing seasons. Little information is available on effect of ammonium sulfate quantity on soil temperature, but these results prove that ammonium sulfate quantity may play an important role against *Monosporascus* through increasing soil temperature. Soil temperature reached 42.9 and 43.4°C under 150kg, whereas it was 45.9 and 47.0°C under the quantity of 300kg in 2005 and 2006 respectively. Increasing in soil temperature in this study may be due to the reaction between ammonium sulfate and micro organisms in the chicken manure in the experimental site of this study. As Hochmuth (2002) mentioned that the acidity reaction of ammonium sulfate with farm-yard manure led to increasing soil temperature due to the high respiration rate and activity of micro organisms compared with non-farm yard manure treatment. Also, Hochmuth and Dahlan (2005) reported that the acidity of ammonium sulfate compared to urea resulted in increasing soil temperature.

2- Effect of plastic mulch treatments:

As shown in Table (2), soil temperature was significantly affected by plastic mulch types and number of layers. The highest values of soil temperature were obtained by using two layers of plastic mulch, which were one black layer above and the second was a clear below. Soil temperature under this treatment reached 47.0 and 49.0°C compared with the control treatment (without plastic mulch) which was 36.6 and 38.6°C in 2005 and 2006, respectively. Generally two layers were better than one layer and the black one was better than the clear layer (Table 2). Similar results were reported by Bonanno and Lamont (1987) who found that the sun light absorption under black plastic mulch was better and soil temperature was higher by 7°C than the clear plastic mulch. Also, Motsenbocher and Bonanno (1989) reported that although the clear plastic mulch kept the soil temperature higher than the black one by 5°C during the night, but soil temperature during the day was higher by 6 °C than the clear one. Soltani *et al.* (1995) found that soil temperature under black polyethylene was 45 °C, whereas it was 40 °C under the clear one in the summer season. These results are in agreement with those reported by Schales and Shelderake (1996), Wolf *et al.* (1998) and Daskalaki and Burrage (2003).

Table (2): Main effect of ammonium sulfate quantity and plastic mulch treatments on soil temperature(°C), 2005 and 2006 seasons

Treatments	2005 season													
	June					July					August			Mean
Ammonium sulfate (kg/fed):	Week1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Mean	
150 (control)	34.8	36.5	36.7	38.9	36.7	43.3	44.5	46.3	46.7	45.2	47.5	46.6	47.0	42.9
300	36.9	38.6	38.7	41.0	38.8	45.9	47.4	49.6	50.4	48.3	52.1	49.5	50.8	45.9
L.S.D. at (0.05)	1.5	1.5	1.5	1.6	1.5	1.7	1.8	1.9	1.8	1.8	1.9	1.8	1.9	1.7
Plastic mulch :														
Black, one layer	35.3	36.5	36.6	39.5	36.9	42.6	42.5	44.4	46.1	44.0	48.5	45.5	47.0	42.6
Black, two layers	38.6	40.8	40.6	42.5	40.6	45.0	46.5	48.5	49.4	47.3	51.6	48.7	50.1	46.0
Clear, one layer	32.5	34.3	34.6	36.7	34.5	40.1	40.6	42.6	43.7	41.7	45.2	42.8	44.0	40.0
Clear, two layers	38.4	39.2	40.1	42.5	40.1	45.3	45.9	47.7	48.2	46.7	49.9	48.0	48.9	45.2
Two layers, a black layer above and a clear layer below	39.6	41.6	41.5	43.6	41.5	46.7	47.4	49.6	50.5	48.5	52.4	49.7	51.0	47.0
Two layers, a clear layer above and a black layer below	37.4	39.6	39.7	41.5	39.5	42.5	45.5	47.5	48.7	46.0	50.6	47.7	49.1	44.8
Control (without plastic mulch)	29.4	31.3	31.6	33.5	31.4	37.2	37.4	39.4	39.7	38.4	41.1	39.2	40.1	36.6
L.S.D. at (0.05):	1.4	1.5	1.6	1.6	1.5	1.6	1.7	1.7	1.7	1.7	1.9	1.9	1.9	1.7
2006 season														
Ammonium sulfate (kg/fed):														
150	36.8	37.7	37.7	40.5	38.1	43.3	44.5	46.3	46.7	45.2	47.5	46.6	47.0	43.4
300	40.5	434	42.4	43.9	42.0	46.0	47.4	49.6	50.4	48.4	52.1	49.5	50.8	47.0
L.S.D. at (0.05):	1.6	1.6	1.6	1.7	1.6	1.7	1.7	1.8	1.9	1.9	1.8	1.8	1.8	1.9
Plastic mulch :														
Black, one layer	38.2	38.1	38.8	42.3	39.3	44.6	44.8	47.0	48.3	46.1	50.2	47.8	49.0	44.8
Black, two layers	41.7	42.6	43.1	45.5	43.2	47.2	48.8	50.8	51.2	49.5	52.8	51.2	52.0	48.2
Clear, one layer	35.4	36.4	36.7	39.2	37.0	42.3	43.0	45.0	45.3	43.9	46.0	45.1	45.5	42.1
Clear, two layers	40.4	41.7	42.2	44.2	42.1	46.1	47.5	49.7	50.2	48.3	51.5	49.6	50.5	46.9
Two layers, a black layer above and a clear layer below	42.5	43.6	44.0	45.3	43.8	49.0	50.0	50.0	52.7	50.4	54.0	51.6	52.8	49.0
Two layers, a clear layer above and a black layer below	40.5	41.2	42.0	43.6	41.8	44.2	48.1	51.2	50.5	48.5	51.8	49.8	50.8	47.0
Control (without plastic mulch)	32.1	32.8	33.3	35.6	33.4	38.8	40.0	42.2	41.8	40.7	42.5	41.4	41.9	38.6
L.S.D. at (0.05):	1.5	1.5	1.6	1.7	1.6	1.6	1.7	1.8	1.8	1.7	1.8	2..2	2.0	1.7

3- Interaction effect:

Regarding to the effect of interaction between ammonium sulfate quantity and plastic mulch treatments on soil temperature, data presented in Tables (3 and 4) prove that highly significant differences were observed. The highest records were obtained under both high quantity of ammonium sulfate, i.e., 300kg and plastic mulch treatment of two layers, the black one above and the second clear layer below. Soil temperature under this treatment reached 48.0 and 50.9°C in 2005 and 2006, respectively compared with no plastic mulch treatment (control) which were 37.5 and 40.2 °C in 2005 and 2006, respectively (Tables, 3 and 4).

B- Soil pH:

1- Effect of ammonium sulfate quantity:

Data presented in Table (5) show that slightly significant differences on soil pH were recorded due to doubling the amount of ammonium sulfate from 150 to 300kg/feddan. Zornoza and Carpena (1992) reported that response of cucumber plants for extra amounts of ammonium sulfate was limited and had no effect on soil pH reduction, whereas Al-Harbi (1995) reported that soil pH reduction was observed and both tomato and cucumber seedlings growth were improved under extra amounts of ammonium sulfate (500 kg / ha.). Also, Al-Harbi and Burrage (1999) reported that increasing ammonium sulfate level in the nutrient solution of cucumber plants under saline conditions decreased soil pH and encouraged plant growth compared with the control.

2- Effect of plastic mulch:

Plastic mulch treatments had no effect on soil pH. The same trend was observed regarding to the effect of interaction between ammonium sulfate amount and plastic mulch treatments, no significant differences were noticed on soil pH (Tables, 6 and 7). These results were true in both seasons.

C- Wilt incidence (%):

1- Effect of ammonium sulfate quantity:

Data in Table (8) show that doubling the amount of ammonium sulfate from 150 to 300 kg/fed led to significant reduction in wilt incidence from 48.9 to 41.4 in 2005 season and from 43.0 to 36.8% in 2006 season. No sufficient information are available on effect of ammonium sulfate on melon wilt, but these results prove that ammonium sulfate amount may play an important role against *Monosporascus* wilt of melon plants. These results in melon wilt reduction may be due to reduction in soil pH by increasing ammonium sulfate quantity and its acidity effect and reaction. Mertely *et al.* (1991 and 1993) reported that *Monosporascus* grow optimally at pH 8 to 8.5 in vitro, but will grow at pH values up to at least 9. Growth is reduced below pH 7.9 and inhibited completely at pH 7.3. Hochmuth and Dahlan (2005) reported that ammonium sulfate compared to urea resulted in soil pH reduction to be 7.4 instead of 7.8 with urea and Turnip root yield was improved under these conditions.

2- Effect of plastic mulch treatments:

Sever wilt was developed in both seasons in untreated plants and more than 60% of these plants were lost. (Table, 8). Generally two layers of plastic mulch caused significant reduction in wilt incidence compared with one layer and the black one was effective against melon wilt compared with the clear one. In this study, two layers, (a black layer above and a clear layer below) saved more than 65 and 70% of the plants in 2005 and 2006, respectively to be survive (Table, 8). Melon wilt reduction in this treatment may be due to high temperature, it was 47.0 and 49.0°C in 2005 and 2006, respectively and these temperature acted as a solarization treatment to be enough to inhibit *Monosporascus* wilt in melon plants. These results are in agreement with those reported by Uematsu and Sekiyama (1990) and Uematsu *et al.* (1992). They reported that vegetative mycelial growth of *Monosporascus* is optimal over the range of 25-35°C, perithecia formation in vitro is optimal at 25 to 30°C, whereas isolates from Japan had a growth optimum of 28 to 32°C and were inhibited above 40°C. Similar results were observed with isolates from the United States and Israel (Reuveni *et al.*, 1983), while an isolate from Libya had an optimum of 45°C (Hawksworth and Ciccaron 1978). Also Pivonia *et al.* (1999) found that the controlled laboratory tests revealed that exposure of *Monosporascus* ascospores to 55°C for 5hr. was sufficient for total inhibition of ascospore germination.

3-Interaction effect

Regarding to effect of the interaction between ammonium sulfate quantity and plastic mulch treatments on melon wilt incidence, data presented in Tables (9 and10) show that wilt incidence was decreased by increasing ammonium sulfate quantity with using two layers of plastic mulch, especially when the black layer above and the clear layer below. This reduction in wilt may be related to high temperature under these conditions which inhibited growth of *Monosporascus*.

D- Fruit yield and its quality:

1- Effect of ammonium sulfate:

As shown in Table (8), slightly significant differences were observed in fruit yield due to quantity of ammonium sulfate, whereas TSS content didn't affect by ammonium sulfate quantity. Doubling the amount of ammonium sulfate increased total yield as well as marketable yield, may be due to its acidity effect on soil pH reduction and this led to wilt reduction and consequently increased melon yield

2- Effect of plastic mulch treatments

Highly significant differences on fruit yield and its quality were observed due to plastic mulch treatments (Table, 8). The highest values of infected plants were obtained in untreated plots and these plants had the lowest yield especially marketable yield. Generally two layers led to higher yield compared to one layer and the black layer produced higher yield than the clear one. The highest values of total melon yield were recorded in plots covered with two layers especially when the black layer above and the clear one below (Table, 8). This increasing in total yield may be due to the high temperatures under this treatment which were 47 and 49°C (Table, 2) which resulted in wilt reduction of melon plants. Similar results were obtained by Uematsu and Sekiyama (1990)and Uematsu *et al.* (1992). They reported that *Monosporascus* was inhibited above 40°C, and this resulted in increasing melon yield. Also, an isolate from Libya was increasing inhibited above 45 °C (Hawksworth and Ciccaron, 1978) and this led to melon wilt reduction and consequently improved melon yield

Table (3): Effect of interaction between ammonium sulfate quantity and plastic mulch treatments on soil temperature, 2005 season.

Treatments		Soil temperature (c)													
		June					July					August			Mean
Ammonium Sulfate (kg/fed):	Plastic mulch	Week1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Mean	
150	Black, one layer	34.5	35.6	35.7	38.2	36.0	41.8	41.6	43.2	45.1	42.9	47.3	44.4	45.8	41.5
	Black, two layers	37.8	39.9	39.6	41.8	39.7	44.2	45.5	47.7	48.3	46.4	50.8	47.9	49.3	45.1
	Clear, one layer	31.2	33.3	33.8	35.7	33.5	38.7	39.6	41.4	42.8	40.6	44.2	41.8	43.0	39.0
	Clear, two layers	37.1	38.2	39.4	41.8	39.1	44.3	44.8	48.1	47.2	46.1	48.9	47.0	47.9	44.3
	Two layers, a black layer above and a clear layer below	38.6	40.4	40.5	42.7	40.5	45.7	46.6	48.5	49.6	47.6	51.3	48.7	50.0	46.0
	Two layers, a clear layer above and a black layer below	36.6	38.5	38.8	40.2	38.5	41.8	44.3	46.6	47.8	45.1	49.6	46.7	48.1	43.9
	Control (without plastic mulch)	28.4	30.2	30.6	32.5	30.4	35.6	36.5	38.4	39.2	37.4	40.8	38.9	39.8	35.8
L.S.D. at (0.05):		1.5	1.6	1.6	1.7	1.6	1.7	1.7	1.7	1.8	1.7	1.8	1.8	1.8	1.7
300	Black, one layer	36.2	37.4	37.5	40.8	37.9	43.5	43.4	45.6	47.2	44.9	49.7	46.8	48.2	43.6
	Black, two layers	39.5	41.7	41.6	43.3	41.5	45.8	47.5	49.4	50.5	48.3	52.5	49.6	51.0	46.9
	Clear, one layer	33.8	35.3	35.5	37.8	35.6	41.6	41.7	43.9	44.7	42.9	46.3	43.9	45.1	40.8
	Clear, two layers	39.8	40.2	40.8	43.2	41.0	46.3	47.1	47.4	49.2	47.5	50.9	49.1	50.0	46.1
	Two layers, a black layer above and a clear layer below	40.7	42.8	42.5	44.6	42.6	47.7	48.3	50.8	51.4	49.5	53.5	50.7	52.1	48.0
	Two layers, a clear layer above and a black layer below	38.3	40.7	40.6	42.7	40.5	43.2	46.7	48.5	49.7	47.0	51.6	48.8	50.2	45.9
	Control (without plastic mulch)	30.4	32.5	32.7	34.6	32.5	38.9	38.3	40.5	40.3	39.5	41.5	39.6	40.5	37.5
L.S.D. at (0.05):		1.6	1.6	1.7	1.9	1.8	1.7	1.8	1.8	1.9	1.8	1.9	2..0	2.0	1.9

Table (4): Effect of interaction between ammonium sulfate quantity and plastic mulch treatments on soil temperature, 2006 season.

Treatments		Soil temperature (c)													
		June					July					August			
Ammonium Sulfate quantity (kg/fed):	Plastic mulch	Week1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Mean	Mean
150	Black, one layer	36.2	36.1	36.2	40.1	37.1	43.1	43.3	45.5	46.2	44.5	47.7	46.6	47.2	42.9
	Black, two layers	39.9	40.8	40.9	43.7	41.3	46.2	47.1	49.3	49.3	48.0	50.3	49.8	50.0	46.4
	Clear, one layer	33.0	34.1	34.0	37.1	34.5	40.5	41.4	43.4	43.3	42.0	44.8	43.4	44.1	40.2
	Clear, two layers	38.7	40.7	40.3	42.3	40.5	45.2	46.1	48.3	48.6	47.1	48.8	48.1	48.4	45.3
	Two layers, a black layer above and a clear layer below	40.8	41.9	41.8	44.6	42.2	47.4	48.8	46.3	50.8	48.3	51.2	50.1	50.6	47.0
	Two layers, a clear layer above and a black layer below	38.5	39.4	39.4	42.1	39.8	43.3	46.4	51.2	48.6	47.4	49.4	48.3	49.0	45.4
	Control (without plastic mulch)	30.6	31.2	31.3	34.1	31.8	37.4	38.6	40.7	40.3	39.2	40.5	40.2	40.3	37.1
L.S.D. at (0.05):		1.6	1.7	1.8	1.8	1.7	1.8	1.8	1.8	1.9	1.8	1.9	1.9	1.9	1.8
300	Black, one layer	40.3	40.2	41.4	44.6	41.6	46.1	46.3	48.6	50.4	47.8	52.7	49.1	50.9	46.7
	Black, two layers	43.6	44.5	45.4	47.3	45.2	48.3	50.5	52.4	53.2	51.1	55.4	52.7	54.0	50.1
	Clear, one layer	37.8	38.7	39.5	41.4	39.3	44.2	44.5	46.4	47.3	45.6	47.3	46.8	47.1	44.0
	Clear, two layers	42.1	42.8	44.1	46.2	43.8	47.1	48.9	51.1	51.9	49.3	54.2	51.1	52.6	48.7
	Two layers, a black layer above and a clear layer below	44.2	45.3	46.3	46.1	45.4	50.4	51.3	53.8	54.7	52.5	56.7	53.2	54.9	50.9
	Two layers, a clear layer above and a black layer below	42.5	43.1	44.4	45.2	43.8	45.2	49.4	51.3	52.5	49.6	54.3	51.4	52.8	48.7
	Control (without plastic mulch)	33.6	34.5	35.3	37.1	35.1	40.2	41.3	43.7	43.4	42.1	44.5	42.7	43.6	40.2
L.S.D. at (0.05):		1.7	1.8	1.9	1.9	1.8	1.8	1.9	1.9	1.9	1.9	2..0	2..0	2..0	1.9

Table (5): Main effect of ammonium sulfate quantity and plastic mulch treatments on soil pH, 2005 and 2006 seasons

Treatments	2005 season												
	June				July					August			Mean
Ammonium sulfate (kg/fed):	Week2	Wk3	Wk4	Mean	Wk1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Mean	
150 (control)	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
300	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.8	7.7	7.7	7.7	7.8
L.S.D. at (0.05)	n.s.	n.s.	n.s.	n.s.	n.s.	0.2.	0.2	0.2	0.2	0.2	0.2.	0.2	0.2
Plastic mulch:													
Black, one layer	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Black, two layers	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Clear, one layer	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Clear, two layers	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Two layers, a black layer above and a clear layer below	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Two layers, a clear layer above and a black layer below	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
Control (without plastic mulch)	8.2	8.1	8.0	8.1	8.0	8.0	7.9	7.8	7.9	7.8	7.8	7.8	7.9
L.S.D. at (0.05):	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
	2006 season												
Ammonium sulfate (kg/fed):													
150	8.0	8.0	7.9	8.0	7.9	7.9	7.9	7.8	7.9	7.8	7.8	7.8	7.8
300	8.0	7.9	7.8	7.9	7.7	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
L.S.D. at (0.05):	n.s.	n.s.	n.s.	n.s.	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Plastic mulch :													
Black, one layer	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Black, two layers	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Clear, one layer	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Clear, two layers	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Two layers, a black layer above and a clear layer below	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Two layers, a clear layer above and a black layer below	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
Control (without plastic mulch)	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.8
L.S.D. at (0.05):	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Table (6): Effect of interaction between ammonium sulfate quantity and plastic mulch treatments on soil pH, 2005 season.

Treatments		Soil pH												
		June				July					August			Mean
Ammonium sulfate quantity (kg/fed):	Plastic mulch	Week2	Wk3	Wk4	Mean	Wk1	Wk2	Wk3	Wk4	Mean	Wk1	Wk2	Mean	
150	Black, one layer	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
	Black, two layers	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
	Clear, one layer	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
	Clear, two layers	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
	Two layers, a black layer above and a clear layer below	8.2	8.2	8.1	8.2	8.1	8.1	8.0	8.0	8.1	8.0	8.0	8.0	8.0
	Two layers, a clear layer above and a black layer below	8.2	8.2	8.1	8.2	8.1	8.1	8.0	8.0	8.1	8.0	8.0	8.0	8.0
	Control (without plastic mulch)	8.2	8.2	8.1	8.2	8.1	8.1	8.1	8.0	8.1	8.0	8.0	8.0	8.0
L.S.D. at (0.05):		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
300	Black, one layer	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Black, two layers	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Clear, one layer	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Clear, two layers	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Two layers, a black layer above and a clear layer below	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Two layers, a clear layer above and a black layer below	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
	Control (without plastic mulch)	8.2	8.1	8.0	8.1	8.0	7.9	7.8	7.7	7.7	7.7	7.7	7.7	7.8
L.S.D. at (0.05):		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

٢٠٠٥، سنة ٢٠٠٦ على التوالى بالمقارنة بمعاملة الكنترول والتى لم يستخدم فيها البلاستيك الملش حيث سجلت درجة الحرارة فى هذه المعاملة ٣٦,٦، ٣٨,٦ْم لتسجل نسبة ذبول ٦٠,٦ ، ٦٥,٨% في سنوات الدراسة ٢٠٠٥ ، ٢٠٠٦ على التوالي.

كان لتأثير المعاملات تحت الدراسة تأثيرا معنويا فى زيادة المحصول الكلى، وكذلك المحصول القابل للتسويق من خلال تأثيرها على زيادة درجة حرارة التربة وانخفاض رقم حموضتها الأمر الذى أدى إلى انخفاض نسبة الذبول وبالتالى زيادة المحصول.

- لم يتأثر مستوى الثمار من السكريات بمعاملات كمية سلفات الأمونيوم بينما كانت لمعاملات البلاستيك الملش تأثيرها المعنوى فى زيادة السكريات بالثمار.

وتوصى الدراسة بأنه يمكن الحد من نسبة الذبول الفجائى فى القاوون عن طريق زيادة الكميات المستخدمة من سلفات الأمونيوم لتصل إلى ٣٠٠كجم/فدان لما له تأثيره الحامضى فى خفض رقم حموضة التربة والذى يصبح غير ملائم لنمو الفطر المسبب للمرض. بالإضافة إلى استخدام طبقتين من البلاستيك إحداهما ذات لون أسود من أعلى والأخرى شفافة من أسفل لما لها من تأثير فى ارتفاع درجة حرارة التربة وتؤدى مزايا التعقيم الشمس للحد من جراثيم الفطر مونوسبوراسكس كانونبلس الذى يسبب مرض الذبول الفجائى فى القاوون وبالتالى زيادة المحصول خاصة المحصول القابل للتسويق الذى يتأثر بشدة بالمرض الذى يحدث قبل الحصاد بفترة قليلة وكبل ان تصل الثمار إلى الحجم المناسب للتسويق وتكون عرضة لأشعة الشمس بسبب موت عرش النبات ، و بالتالي قلة محتواها من السكر.

يحتاج هذا المرض مزيداً من الدراسات للحد من خطورته على محصول القاوون.