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The Effect of Organic Mulch Materials on Weed Control in Cucumber (*Cucumis sativus* L.) Cultivation

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Abstract

This study was carried out in Iğdır University Şehit Bülent Yurtseven Campus to investigate the effects of different mulch materials on weed control, cucumber yield and soil temperature and moisture in cucumber (*Cucumis sativus* L.) cultivation in 2020 and 2021. Five mulch materials (Linen cover, peat, chopped paper, straw and fresh clipping grass) were used in the study. Temperature and humidity data loggers were used in the study. The research was established in a randomized complete block design with 7 characters and 4 replications. In the both years of the study, the effects of mulch applications on weed dry weights and cucumber yield and some yield components were determined. As a result of the study, a total of 12 weed species belonging to 7 families were determined in the trial area. Accordingly, the effects of mulching on weed dry weight and cucumber yield were significant for both years (p<0.01). The findings of the current study revealed that the effects of mulch applications on weed control, the lowest weed dry weights in both years were in Linen (0.00 g/m^2) mulch plots that control weeds 100%, the highest weed dry weights were in weed control parcels in the first year were 285,25 g/m^2 and 248,14 g/m^2 in the second year. Also, the highest cucumber yield was obtained as 4.685 kg/da in the first year and 4.520 kg/da in the second year in both years in the linen plots, whilst the lowest cucumber yield was obtained in weed control plots in both years. Considering temperature and humidity, the highest values were noted in linen covered plots.

Key words: Mulching, grass clippings, weed management, linen, straw

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is of the oldest crops dating back to 3000 years ago in India. It spread eastward to China and westward to Europe approximately 2,000, and 700–1500 years ago, respectively (Weng, 2021). Cucumber, due to their nutritional and health properties, have been widely assayed for better cultivation and yield in many regons of the world, in general and in Türkiye, in particular. With its excellent low calories corresponding to 12 calories per 100 g; it is preferred in diet programs and its alkaline structure eliminates the acidity of animal foods in humans. In addition, it also contributes to cardiovascular diseases. As well known, its water content is over 90% but the relevant fruit is very rich in vitamins, enzymes and minerals amoung other vegetables. In 100 g of fruit, 45 IU of vitamin A, 0.03 mg of vitamin B1, 0.02 mg of vitamin B2, 0.3 mg of Niacin, 12 mg of vitamin C, 12 mg of calcium, 0.3 mg of iron, 15 mg of magnesium and 24 mg of phosphorus (Sevgican 1989).

Cucumber is produced in many countries of the world. Cucumber was planted on an area of 2 261,318 ha in the world in 2020, and 91 258.272 tons of cucumber were produced. In addition, the Asian continent ranks first with 89% of the highest cucumber production in 2020. Asia is followed by Europe (7%), America (2%) and Africa (2%), respectively. The highest cucumber production in the world in 2020 is China with 73 million tons, Türkiye is the second with 19 million tons and Russia is the third

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with 1.6 million tons (FAO, 2022). There is a total of 335 thousand hectares of cucumber cultivation area in Türkiye in 2021, and 1.9 million tons of cucumbers were produced (TUIK, 2022).

With the rapid increase in the world's population, the need for agricultural products is increasing. To meet the nutritional needs, it is necessary to increase plant production. Since there is no possibility of expanding agricultural production areas, the only way to increase production is to increase productivity (Demirbaş and Atış, 2005). However, there are factors that reduce crop productivity and quality in agricultural areas, and weeds are the leading factor among them (Swinton and Van Deynze 2017).

Weeds not only reduce crop yield, but also seriously damage crop quality (Reddiex et al., 2001; Jabran and Chauhan 2018). However, crop losses caused by weeds vary according to geographical regions and the type of cultivated plant. Weeds retard the growth of cucumber plants and reduce fruit yield and quality. It is important to control weeds at an early stage in order to prevent yield losses in crop plants (Su, 2020). Today, in agricultural areas, in order to control weeds; chemical control methods are preferred because of their fast results, easy application and low cost due to the increase in labor and costs (Kitiş, 2011). These herbicides used for weed control (Su, 2020) might cause serious environmental and ecological damages and un-known consequences due to their unconcious and intensive uses (Sardana et al., 2017). However, on water and soil pollution (Silva et al., 2019; Casado et al., 2019), biodiversity (Schütte et al., 2017), human health (Jabłońska-Trypuć et al., 2019) and bees (Cullen et al., 2019) are of the reported direct and in-direct consequences. In addition, excessive use of herbicides causes weed resistance (Bo et al., 2017; Peterson et al., 2018) as the case of memory in plants, which are of the major concern in agricultural studies (Perotti et al., 2020). The relevant resistance result in innumerable problems (Mengüç and Elibüyük, 2014) and increasing costs (Beckie, 2020).

One of the alternative ways to get rid of the negative effects of chemical control of weeds is mulching. Mulching is called spreading various cover materials on the soil surface in order to minimize weed population and moisture losses and increase crop yield (Kader et al., 2019). Mulches can potentially limit weed populations through shading and act as barriers to evapotranspiration (Rathore et al., 1998). When mulch is applied over the soil surface, it acts as a barrier to the passage of light, resulting in reduced germination of small-seeded weed species (Iqbal et al., 2020). Mulches play a role not only in weed control, but also in maintaining soil moisture by reducing the evaporation rate and changing the infiltration capacity of the soil surface (Jordan et al., 2010). Mulching covers the soil surface and therefore helps maintain soil temperature that is beneficial for overall crop growth. It regulates and balances the soil temperature. It also has positive effects on the protection of water and soil (Kasirajan and Ngouajio 2012). Mulches act as physical barriers to the emergence of weeds (Ahmad et al., 2020). In simple terms, mulch can also be defined as the material used in the field to control the growth of unwanted plants (Chopra and Koul, 2020).

Rapid industrialization and urbanization have caused rising global temperatures over the years, destabilizing agro-ecological systems around the world. Therefore, new environmentally friendly agricultural practices are needed for sustainable food production (Iqbal et al., 2020). In addition, water availability has been decreasing rapidly in recent years due to climate change, increase in human population and pollution of fresh water resources by heavy metals and other pollutants. In addition to water scarcity, the degradation of land resources is on the rise. Therefore, some easy and economical options are needed. Mulches play an important role in achieving the sustainability goal of modern agricultural production systems. It is also important to choose the most appropriate mulch type, taking into account the soil type, environmental conditions, product, and the specific objectives for which the mulch is used (Jabran, 2019).

When we evaluate all these objectively, the mulch method, which is one of the most effective methods of controlling weeds, is both environmentally friendly and effective in terms of product quality. Taking into account all benefits of the mulch materials; herewith, we designed the current study to determine the effects of different mulch materials on weed control, cucumber yield and soil temperature and moisture in cucumber cultivation in order to ensure sustainability without damaging the ecosystem and to reduce producer costs.

MATERIALS and METHODS

The study was carried out in Iğdır University Şehit Bülent Yurtseven Campus (39°48'34"N - 44°05'06"E) for two consecutive years (2020-2021). Commercially available Beith Alpha cucumber seeds were used in the study. Five different mulch materials were used in the research. Mulch materials used, general features and application rates (Table 1).

Table 1. Mulch materials used in the research, their general properties and application rates

Materials used	General features	Application rate
Straw	Wheat straw	3.750 kg/da
Linen cover	Width-1.2m Length 4m Thickness 4mm	
Peat	It has a fibrous structure and the pH is in the range of 5.5 - 6.5 .	1000 kg/da
Grass clippings	*Lolium perenne* 25% *Festuca arundinacea* 45% *Poa pratensis* 10% *Festuca rubra rubra* 20% mixed mown grass wastes	4.375 kg/da
Chopped paper	1 cm vertically cut sheets of paper	2.000 kg/da

Datalogger was used to measure soil temperature and humidity values with a temperature measuring range -30, +60 °C humidity measuring range 0% - 99% RH. The meteorological data of the province of Iğdır, where the study was carried out, between the years 2020, 2021 and the MLY (1941-2021) (Table 2). Soil samples were collected at a depth of 0–0.30 m in experimental area before trial establishment in 2020. The soils of the experimental sites were homogenous, with a Clay- Loamy texture. Soil physical and chemical characteristics of the experimental areas are described in Table 3.

Table 2. Meteorological data for the province of Iğdır between the years 2020, 2021 and the MLY (1941-2021)

Months	Average Temperature (°C)			Total Precipitation (mm)			Average Relative Humidity (%)		
	2020	2021	UYO	2020	2021	UYO	2020	2021	UYO
March	10.44	10.02	6.2	18.1	17.5	22.1	65.6	60.5	52.2
April	11.49	17.4	13	83.6	18.4	33.8	76.6	43.6	49.9
May	18.80	21.1	17.7	76.1	42.1	46.5	63.1	46.3	51.5
June	24.19	26.8	22.1	15.7	0.7	32	48.3	33.9	47.3
July	26.7	27.4	25.9	30.2	32.4	13.7	48.4	45.7	45.3
August	24.2	27.4	25.3	15.3	8.3	9.7	47.6	40.6	47.1
September	23.5	22.2	20.4	1.4	11.5	11.5	47.7	44.8	46.2
October	14.5	12.7	13.1	7.3	18.5	26.3	49.6	60.0	48.53

MLY: Mean of long years (MGM, 2022)

Table 3. Soil physical and chemical characteristics of the experimental areas

Soil Properties plants	Profile Depth cm	Texture	Lime $CaCo_3$ %	Total Salt mmhos /cm	pH	Phosphorus P_2O_5 kg per $^{-1}$	Potassium (K_2O) kg per $^{-1}$	Organic Matter %
Trial Area	0-30	Clay- Loamy	11.32	2	7.9	0.8	9.28	2

Cucumber planting, care and experimental setup

Beith Alpha cucumber seeds were first planted in viols in both years. When the sown seeds germinated and reached the average 4-leaf period, they were transplanted in the field between 07.05.2020 in the first year and 12.05.2021 in the second year. Cucumber seedlings were planted with a distance of 50 cm within row and 100 cm between rows. After planting the seedlings, the first irrigation was done with the drip irrigation system. Afterwards, irrigation was done once a week, taking into account the rainfall situation and the water requirement of the plant. In both years, approximately 8-10 tons of animal manure per decare was mixed into the soil in the autumn before the study was setup in the experimental area. The study was established according to the randomized complete block design with 4 replications and 7 main treatments (Linen cover, chopped paper, fresh clipping grass, wheat straw, peat, weed-free (hoe) control and weedy control). In the study, the area of each plots were established as the plot area (4m x 1m) 4 m^2. In the study, the distance between characters was 0.5 m and the distance between replications were 0.5 m. The total trial area was established as 175 m^2 and 325.5. Stakes were fixed to the ground for parcellization and rope was used in the strips. In the study, mulch materials were laid on 25.06.2020 in the first year and 20.06.2021 in the second year, with a mulch thickness of 7.5 cm and 16 cucumber seedlings for each plot. Care was taken not to cover the cultivated plant while covering the mulch materials between and on the rows. In the study, weed-free (hoe) control plots were hoed shortly after the emergence of weeds.

Determination of weed species and densities in the experimental area

In the study, weed species and densities in the trial area were determined before the mulch materials were applied. For this purpose, a 1 m^2 frame was used in the trial area, and the weeds in the frame were counted by randomly discarding them. Thus, the density of each weed species was determined. An evaluation was made on the basis of arithmetic mean in determining the density of weeds. Weed densities (plant/m^2) were calculated by dividing the total number of plants per m^2 in the surveys to be made by the number of surveys, and the densities of each species were calculated (Odum, 1971).

Density (piece/m^2) = B/m
B; The total number of individuals in the sample taken;
m; Total number of samples.

In order to determine the effects of mulching on weed dry weights, the weeds in all plots were cut from the soil base separately and brought to the Herbology Laboratory before the last harvest of the cucumber. After being kept in an oven at 70 °C for 24 hours in the laboratory, they were taken and their dry weights were weighed one by one and numerical data were recorded. In addition, in order to determine the percent effects of the mulch materials used in the study on weeds, the percent effects of the mulched plots on the weeds were determined based on the weed control plots.

The effect of mulching on cucumber yield

Cucumber harvest was done between 23.07-12.10.2020 and 20.07-12.10.2021. Depending on the type of harvest, the fruits were harvested when they were of normal size. Cucumber fruits were pulled by hand from the part where the fruit stem meets the branch, and were properly plucked and collected. The collected cucumber fruits were taken to the Herbology Laboratory of the Faculty of Agriculture at the Şehit Bülent Yurtseven Campus of Iğdır University; Cucumber yield (kg/da) collected in each plot was determined. The obtained values were compared with the weed control and no weed-free (hoe) control plots in the mulched plots.

Effect of mulching on soil temperature and moisture

In the study, temperature and humidity data loggers were placed in the experimental plots at a depth of 5 cm into the soil. The measurements were recorded at 12:00 at noon and at 00:00 at night.

Data analysis

The data of the relevant treatments were subjected to one-way variance analysis. The means were separated using Duncan's multiple range test at the 5% probability level ($p < 0.05$) (SPSS20).

RESULTS and DISCUSSION

Weed families detected in the experimental area in the years 2020-2021, when the study was conducted, are presented in Figure 1. A total of 12 weed species belonging to 7 families were observed in the experimental area in both years. The families with the highest number of weed species were as Amaranthaceae (4 species), Poaceae (2 species) and Brassicaceae (2 species). Those findings are consistent with the report of Gürbüz et al. (2021) indicating that Amaranthaceae (3 species) and Poaceae (2 species) were the most common with respect to the weed numbers amongst families observed. Furthermore, a total of 8 weed species belonging to 6 families in the study area was reported and the Amaranthaceae (2 species), Poaceae (2 species) were the most common families (Yakar, 2008). Sırrı and Özaslan (2020) identified 52 weed species belonging to 20 families, 2 of which are narrow-leaved and 18 are broad-leaved, in vegetable cultivation areas. The families with the most species in terms of the number of species they contain are respectively; Poaceae (10 species), Asteraceae (8 species) and Fabaceae (6 species) were determined. In the studies mentioned above, the weed families detected in the experimental area and vegetable planting areas are similar to the weed families we detected in the present study area. Weed families, scientific names, common names and life cycles detected in the trial area during the years of the study are given in Table 4.

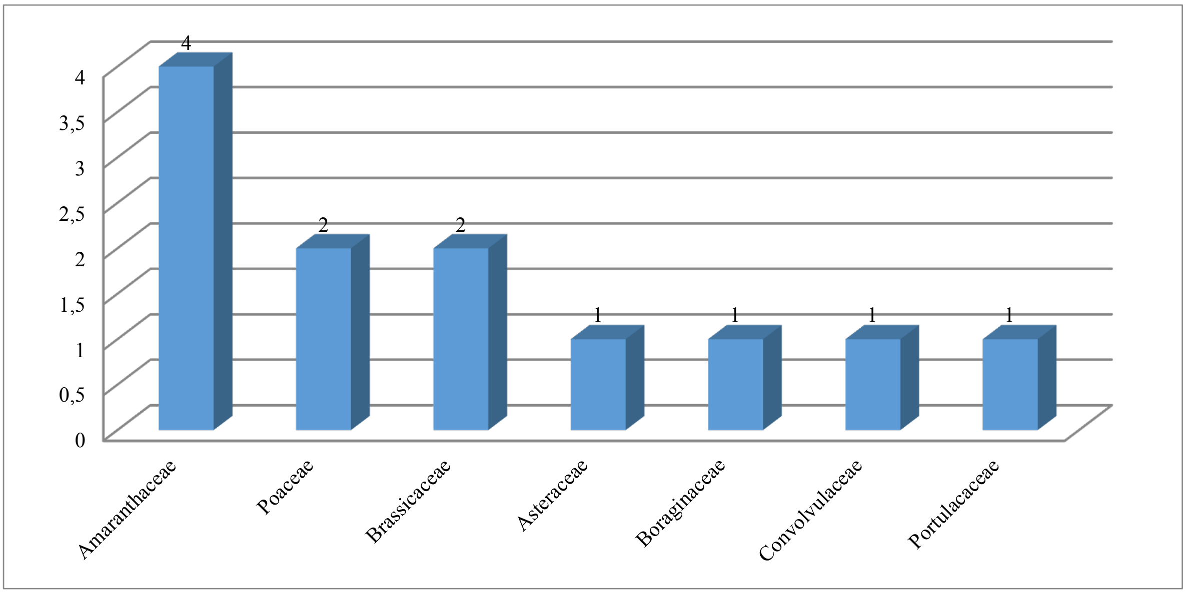

Figure 1. Weed families detected in the trial area

Table 4. Weed families, scientific names, common names and life cycles detected in the trial area

Family	Latin name	Common name	Lifecycle
Narrow leaf			
Poaceae	*Sorghum halepense* (L.) Pers.	Johnson grass	P
	Cynodon dactylon (L.) Pers.	Bermuda grass	P
Broadleaf			
Amaranthaceae	*Amaranthus retroflexus* L.	Redroot pigweed	A
	Chenopodium album L.	Fat hen	A
	Chenopodium botrys L.	Jerusalem-oak	A
	Atriplex nitens schkuhr .	Saltbush	P
Asteraceae	*Cirsium arvense* (L.) Scop .	Canada thistle	P
Boraginaceae	*Heliotropium europaeum* L.	Heliotrope	A
Brassicaceae	*Sinapis arvensis* L.	Wild mustard	A
	Myagrum perfoliatum L.	Musk weed	A
Convolvulaceae	*Convolvulus arvensis* L.	Field bindweed	P
Portulacaceae	*Portulaca oleracea* L.	Purslane	A

A: Annual; P: Perennial

Of the weed families observed in the experimental area, one of them was narrow-leaved and 6 of which were broad-leaved. Among the detected weeds, there were 2 species of narrow-leaved and 10 species of broad-leaved weeds. In addition, 5 species of weeds were perennial and 7 species were annual. Yakar (2008) reported 8 weed species in experimental area, and 2 species of narrow leaves and 6 species of broad leaves were recorded. Regarding species; *A. retroflexus, P. oleracea, C. arvensis* and *C. album* weeds detected in the experiment area and the weeds we detected in the experimental area were similar.

Bingölbali (2019) stated in his study that *C. arvensis, C. album* and *P. oleraceae* weed species were the most common in vegetable cultivation areas in general. Gül (2020) detected 18 weed species in their study area. Except for *M. perfoliatum*, one of the weed species we detected in the trial area in our study, all other weed species were similar. Tepe (1998) stated that among the weeds that are a problem in vegetable planting fields, there are weeds that we identified above in the trial area. Examples of these weeds are *A. retroflexus, C. arvensis, C. album, P. oleracea, C. dactylon* and *S. arvensis*. The densities of weeds detected in the trial area in both years of the study are presented in Table 5.

Table 5. Densities of weeds detected in the trial area in both years of the study

Weeds	Density (plants/m ^{2})	
	1st year (2020)	2nd year (2021)
Amaranthus retroflexus L.	3.6	2.4
Atriplex nitens Schkuhr .	0.01	0.2
Chenopodium album L.	4.8	3.02
Chenopodium botrys L.	2.6	1.8
Cirsium arvense (L.) Scop .	0.3	0.4
Convolvulus arvensis L.	0.2	0.3
Cynodon dactylon (L.) Persian.	3.5	2.5
Heliotropium europaeum L.	3.02	2.6
Myagrum perfoliatum L.	0.1	0.09
Portulaca oleracea L.	0.8	0.4
Synapis arvensis L.	0.8	0.5
Sorghum halepense (L.) Pers.	2.4	1.9

The highest density of weeds detected in the experiment area in the first year; *C. album* (4.8 plants/m^2), *A. retroflexus* (3.6 plants/m^2) and *C. dactylon* (3.5 plants/m^2) weed species were determined. In the second year of the study, weed species of *C. album* (3.02 plants/m^2), *H. europaeum* (2.6 plants/m^2) and *C. dactylon* (25 plants/m^2) were determined with the highest density. Gül (2020), in her study, the highest density in the experimental area was *C. album* (32.15 plants/m^2), *A. retroflexus* (12.16 plants/m^2), *H. europaeum* (8.5 plants/m^2), *C. botrys* (6.29 plants/m^2) and *A. hortensis* (6.12 plants/m^2) weeds. It is similar to the weed species detected at the highest density in the experimental area and the weed species we detected with the highest density in the experimental area. Sırrı and Özaslan (2020), in their study, have similarity with the weed species that we have detected most intensively in the experimental area with *A. retroflexus, H. europaeum, S. halepense, P. oleracea* and *C. arvensis* weeds that they have detected in the vegetable areas. The data obtained as a result of the study carried out to determine the effect of different mulch materials on weed dry weights in cucumber cultivation for two years were subjected to the Duncan multiple comparison test. According to the results of the analysis, among the mulch materials, in terms of weed dry weights, 2020 $F=156.73$ and $P=0.00<0.01$, 2021 $F=108.34$ and $P=0.00<0.01$ statistically mulch materials There was a difference of 1% between them (Table 6).

Table 6. The effect of mulch materials on dry weight of weeds in the years the study was carried out, average dry weight of weeds according to mulch materials, groups formed according to Duncan multiple comparison test and percent effect ratios

Apps	Year 1 (2020)		Year 2 (2021)	
	Dry weight (g/m^2)	**Percent effect (%)**	**Dry weight (g/m^2)**	**Percent effect (%)**
Grass clippings	121.87b	57.28	105.27b	57.58
Peat	100.70c	64.70	85.55c	65.52
Linen cover	0.00e	100.00	0.00e	100.00
Chopped paper	67.63d	76.29	45.12d	81.82
Wheat straw	92.55c	67.55	96.47bc	61.12
Weed free	0.00e	100.00	0.00e	100.00
Weedy	285.25a	0.00	248.14a	0.00
Cover.	95.42		82.93	
F	156.73		108.34	
P	0.00		0.00	

As a result of the study on the effects of mulch applications on weed control, the lowest weed dry weights in both years were obtained in the Linen cover (0.00 g/m^2) plots, which control weeds completely. Afterwards, the lowest weed dry weights (67.63 g/m^2) and 76.29% impact rate were obtained in the chopped paper plots in the first year. In the second year, after the linen cover plots, 45.12 g/m^2 dry weight and 81.82% effect rate, the highest percentage effect on weed dry weight was again obtained in the chopped paper plots. In both years, the highest weed dry weights were obtained in the control plots with 285.25 g/m^2 in the first year and 248.14 g/m^2 in the second year, respectively. In his study, Gül (2020) obtained the lowest weed dry weight in linen cover and weed-free (hoe) (0 g/m^2) plots. These parcels are respectively; straw (37.025 g/m^2), turf (44,125 g/m^2), sawdust (45,025 g/m^2), peat (117 g/m^2), rotted grass (238,25 g/m^2) and weed control (466,25 g/m^2) parcels are followed. The weed dry weights obtained according to the mulch materials above and the weed dry weights obtained in our study are largely similar. Yakar (2008), Jodauigene et al. (2006) reported that the mulch materials they used in their studies effectively prevented weed germination and emergence. This is similar to the results we obtained in our study.

As a result of the study carried out to determine the effect of different mulch materials on cucumber yield in cucumber cultivation areas for two years were subjected to Duncan multiple comparison test. According to the results of the analysis, in terms of weed dry weight among mulch materials, 2020 F=72.158 and P=0.00<0.01, 2021 F=104.45 and P=0,00<0.01 % statistically among mulch materials There was a difference of 1 level (Table 7).

Table 7. The effect of mulch materials on cucumber yield in the years of the study, the average yield of cucumbers and the groups formed according to Duncan multiple comparison test

Apps	Year 1 (2020) Yield (kg/da)	Year 2 (2021) Yield (kg/da)
Linen cover	4 685.25a	4 520.00a
Grass clippings	3 561.00d	3 250.00c
Chopped paper	4 451.25ab	4285.00a
Wheat straw	3 220.00e	3 002.50cd
Peat	2 996.25e	2 767.50d
Weed free	3 861.25c	4 013.75b
Weedy	2 221.50f	2 110.00e
Average	3 656.06	3 539.06
F	72.15	104.45
P-value	<0.01	<0.01

In both years of the study, the highest cucumber yields were obtained in linen cover plots with values of 4 685.25 kg/da in the first year and 4 520.00 kg/da in the second year. In the first year of the study, the highest yield of chopped paper (4 451.00 kg/da) was obtained after the Linen cover, and in the second year, the highest yield of cucumber after the Linen cover was obtained in the chopped paper parcels with the amount of 4 285.00 kg/da. The lowest cucumber yield was obtained in weedy control (2 221.5 kg/da – 2 110.06 kg/da) plots in both years. In the study, while the average cucumber yield was 3 656.06 kg/da in the first year, it was 3 539.06 kg/da in the second year. Yakar (2008), in her two-year study, found the highest cucumber yield in black polyethylene (8,269.20 kg/da) in the first year and the highest cucumber yield in mulch textile (4192,8 kg/da) applications in the second year. In both years, the lowest cucumber yield was obtained in weed control (5556.7 kg/da - 2816,7 kg/da) plots. The data obtained in her study and the results obtained in our study were similar. In the study, the effects of mulch materials on soil temperature and moisture, soil temperature and humidity values as a result of different measurements are presented in Table 8.

Table 8. Soil temperature and moisture values as a result of different measurements made according to mulch materials

mulch materials	Temperature (^{O}C)				Humidity (%)			
	August 10		30 August		August 10		August 10	
	12:00 Noon	00:00 night	12:00 Noon	00:00 night	12:00 Noon	00:00 night	12:00 Noon	00:00 night
Wheat straw	25.4	24.0	23.6	21.4	52.1	86.3	61.0	86.9
Linen cover	26.0	23.1	23.8	20.7	62.9	90.3	68.5	90.1
Grass clippings	25.0	23.8	23.5	22.1	52.2	85.9	60.2	86.5
Peat	24.8	23.5	23.4	21.9	51.9	85.7	60.8	86.8
Chopped paper	24.1	23.5	23.0	22.8	52.2	86.5	60.1	87.1
Weedy	23.9	23.2	23.0	20.5	50.2	83.4	59.2	84.1
Weed free	24.0	23.4	22.8	20.4	50.0	82.5	58.4	82.2

As a result of the measurements made, on August 10 at noon (at 12:00), the highest temperature value was 26 ^{O}C and the lowest temperature value was obtained in the linen cover plots with a value of 23.9 ^{O}C in the weed control plots. On the same day, at night (hour; 00:00), the highest temperature was observed in wheat straw (24 ^{O}C) plots, and the lowest temperature was observed in linen cover (23.1 ^{O}C) plots. At noon (time; 12:00) on August 30, the highest temperature was obtained in linen cover (23.8 ^{O}C), and the lowest temperature (22.8 ^{O}C) was obtained in weed-free (hoe) control plots. At night time of 30 August (time; 00:00) the highest temperature was in chopped paper (22.8 ^{O}C), the lowest temperature (20.4 ^{O}C) observed in weed-free (hoe) control plots. In the study, the highest humidity was measured at night time of 10 August with a value of 90.3%. The lowest humidity value was measured at noon on August 10 with 50% value. The results we obtained in the study are similar to the results obtained by Devi Dayal et al., (1991), Schonbeck and Evanylo (1998) and Ramakrishna et al., (2006).

CONCLUSION

In the study we carried out to determine the effects of different mulch materials on weed control and cucumber yield in cucumber cultivation, 12 weed species belonging to 7 families in total were determined in the experimental area in both years. Amaranthaceae (4 species) was the family with the highest number of weed species among the detected families. The highest density of *C. album* weeds was detected in the experimental area in both years. The effects of mulch applications on weeding, the lowest weed dry weights in both years were obtained in the Linen cover (0.00 g/m^2) plots, which control weeds by 100%. In both years of the study, the highest cucumber yields were obtained in linen cover plots with values of 4 685.25 kg/da in the first year and 4.520.00 kg/da in the second year. The lowest cucumber yield was obtained in the control plots with weeds in both years of the study. In the study, the highest temperature and humidity values were observed in the linen cover plots. In the study, it was observed that all mulch materials retarded the germination and emergence of weeds. As a result of the study, it was concluded that Linen cover is very effective on weed control, yield and soil temperature and value.

AUTHOR CONTRIBUTIONS

The authors declare that they have contributed equally to the article.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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