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INTERACTING OF MULCHING AND PLANT SHADING ON MOISTURE STORAGE, WATER CONSUMPTIVE USE AND CALCAREOUS SOILS PRODUCTIVITY

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A field experiment was set up in Maryout experimental station Desert Research Center, south west of Alexandria, to study the influence of shading and mulching using two types of plant residues, rice straw and milled sugarcane stalks on evapotranspiration and sweet pepper production. The experiment was conducted in a split plot design. The main plots were assigned for shading and the sub main plots included mulching. The obtained results revealed the following:

1. Shading resulted in a considerable increase of soil moisture content in the surface soil layers and decreased evapotranspiration compared to non- shading treatment.
2. Mulching resulted in increasing retained soil moisture in the soil profile compared to the control treatment. From the water conservation point of view, the obtained results indicated that soil shading was superior to soil mulching and in the same time increased sweet pepper yield.
3. Pepper yield significantly increased from 1.5 kg/m^2 for the control treatment to 2.86 kg/m^2 for shading treatment without mulching.

Keywords: Mulching, plant shading, evapotranspiration, Calcareous soil productivity.

In arid region, the available water resources are seriously dwindling and thus constitutes one of the most important constraints to the increase of agricultural production in the face of increasing population. This situation inevitable adaption and execution of scientifically based plan and management practices in order to ensure efficient conservation and sustainable utilization of such resources.

The scientific literature indicates that the characteristics and processes of soil water extraction and utilization by plants are based on recognition that the field with all its parts (soil, plant and atmosphere) forms together a physically integrated dynamic system in which the various processes occur inter-dependently like links in chain. This unified systems have been called by Philip (1966) the SPAC (soil- plant- atmosphere continuum). In this context, Rylski and Spigelman (1986) reported that weather modification upon shading can be very effective in improving soil environment and hence crop production. They found that shading reduced solar radiation by about 70% and increased bacterial population. Monteith (1965) stated that shading causes reduction in radiation energy and thereby reduces evapotranspiration and mediates temperature fluctuation.

Mulches have commonly been used to obtain beneficial changes in soil environment including water balance and temperature regime in the uppermost soil layers in addition to the change of soil radiation balance and reduction of evaporation losses, Miller and Miller (2000) and Rechigal and MacKinnon (1997). Mulches consist of many different types of materials ranging from natural plant residues to various industrial products, e.g. emulsions and plastic sheets.

The current study aimed to investigate the influence of plant shading and the application of plant residues i.e. rice straw or milled sugarcane stalks, on soil moisture regime and sweet pepper production grown on sandy clay loam calcareous soil.

MATERIALS AND METHODS

The study was implemented during the summer season, 2004 in Maryout the agriculture experiment station of the Desert Research Center, some 40 km south-west of Alexandria, Egypt. The area is generally characterized by the Mediterranean climate. The soil of the experimental site is typic calciorthids according to Erain *et al.* (1989) highly calcareous sandy clay loam, saline and non- alkali, (Tables 1 to 3).

Sweet pepper seedlings (*Capsicum annumm L.*) as an indicator crop, were transplanted on first of July 2004. Two harvests were picked during late August and early September 2004, representing early and mid- season yields. Thereafter, deformed and unmarketable fruits were not included in the yields of the various treatments.

TABLE (1). Physical properties of Maryout soil

Soil depth (cm)	Particle size distribution %				Texture class	$CaCO_3$ %	H.C cm/h	ρ_b g/cm³	Moisture content %	
	C.S	F.S	Silt	Clay					F.C 0.1 bar	W.P 15 bar
0-30	9.78	50.30	28.64	11.28	S.L	36.40	7.70	1.25	18.80	8.44
30-60	8.29	50.81	26.17	14.73	S.L.	37.90	5.13	1.35	19.50	9.52
60-90	10.03	49.37	20.23	20.37	S.C.L	45.30	6.94	1.25	22.30	9.70
90+	14.00	49.24	19.08	17.68	S.L.	42.80	3.81	1.36	19.70	9.75

C.S= Coarse sand, F.S= Fine sand, H.C = Hydraulic conductivity, F. C= Field capacity, W.P= Welting point .

TABLE (2). Chemical properties of Maryout soil.

Soil depth (cm)	EC dS/m	pH	Cation me/l				Anion me/l				O.M%	C.E.C me/100g soil
			Na^+	K^+	Ca^{++}	Mg^{++}	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}		
0-30	7.00	7.39	14.91	2.09	19.89	33.11	-	6.0	15.30	48.70	0.86	10.02
30-60	2.59	8.00	11.78	1.16	5.24	7.81	-	4.0	6.80	15.10	0.63	10.59
60-90	3.86	7.69	13.90	1.84	13.46	9.40	-	3.0	5.95	29.65	0.45	11.55
90+	2.25	7.90	9.50	0.87	2.21	9.90	-	2.0	3.40	17.08	0.36	9.50

C.E.C = Cation Exchange Capacity, O.M= Organic matter

TABLE (3). Chemical analysis of irrigation water.

E.C dS/m	pH	Cation me/l				Anion me/l				SAR
		Na^+	K^+	Ca^{++}	Mg^{++}	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}	
2.45	7.5	13.71	0.42	4.59	5.73	0.0	6.83	12.55	5.57	6.71

SAR = Sodium Adsorption Ratio.

The experiment was carried out in a split plot design with three replicates. The plot dimensions were 3 x 2 m including 6 plant / raw. The total number of plants/plot was 36. The main plots were assigned for shading treatments; namely, without shading and 60% shading with porous black plastic sheets (seran). The subplots were specified for mulching treatments namely;

i) application of rice straw; 4, 6 and 8 tons/ Feddan.

ii) application of milled sugarcane stalks; 4, 6, and 8 tons/ Fadden .

All plots were fertilized with the recommended rates of nitrogen, phosphorus and potassium fertilizers; i.e., 200 kg/ fed. 150 kg/ fed. and 150 kg/fed. in the forms of ammonium sulphate, super phosphate and potassium sulphate, respectively. To protect the crop from pests and diseases, insecticides and fungicides were applied when necessary.

The growing period following transplanting was arbitrary divided into three equal stages, each lasted about 30 days. These stages were the vegetative growth stage 30 days after transplanting, i.e. from 15 July to 14 August, early harvest season continued from 30 to 60days , i.e. from 15 August to 13 Sep. and mid and late harvest season lasted from 60 to 90 days, i.e. from 15 Sep. to 14 Oct. The first plant growth stage was irrigated every 10 days, meanwhile the second and third stages were irrigated every 15 days at a rate of 0.2 m^3/plot. Irrigation water EC was 2.45 dS/m and its SAR(Sodium Adsorption Ratio) value was 6.71 (Table,3) .To compare the effect of the applied treatment on soil moisture storage and plant water consumption, soil samples were collected from 0-30 and 30-60cm layers before and after one irrigation during each of the above mentioned stages. Such soil samples were taken during the periods from 25 of July to 3 of Agust, from 15 Agust to 29 Agust and from 15September to 29 September through the first ,second and third growth stages, respectively. Fruit yields were cumulated from early, mid and late season harvests. Soil and water analysis were made using the standard methods described by Richards (1954). The statistical analysis was carried out according to Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Soil Moisture Storage

The influence of the applied treatments on the amount of moisture stored within the crop root- zone (top 60 cm of the soil) was followed up immediately before irrigation water application for each of the chosen period during the three growth stages. The obtained data given in tables (4a and b) indicate that generally soil moisture content throughout the root- zone was significantly higher under shading treatment compared with the control treatment. This behaviour is probably attributed to the fact that incoming radiation to the soil and plant surfaces decreases under shading, and thus the available energy for evapotranspiration decreased, thereby water losses decreased, hence soil moisture content was relatively high. It is also noticed that the impact of shading on increasing soil moisture content within the crop root- zone was more pronounced during the first growth stage, i.e. 30 days after transplanting compared with the very late growth stages. This trend may be rendered to the relatively low plant cover especially in case of sweet pepper row cultivation, with consequent low plant water requirement during such early growth stage. In the meantime, the applied depth of total irrigation water during the early growth stage was 1.7 times the depth of total irrigation water during either of the preceding 2 growth stages. However, at the second growth stage after transplanting, i.e. from 30 to 60 days, the influence of shading on soil moisture conservation was reduced most probably due to the increase of plant growth and consequently greater soil water requirement compared to the control treatment. These findings are in concord with Rylski and Spigelman (1986).

Regarding the influence of mulching with rice- straw on the pre-irrigation soil moisture content, data in table (4a) point out that under non-shading conditions, i.e. the control treatment, mulching sharply enhanced soil moisture conservation especially in the surface soil layers. It is also evident that such effect progressively increased with increasing mulch application level. This behavior can be attributed to the fact that rice straw is more effective in decreasing the net incoming solar radiation than the natural soil constituents, consequently lowered soil temperature. Therefore, the soil retained high moisture in the upper most soil layers.

Under shading condition, the effect of mulching by rice straw on the increase of the pre-irrigation soil moisture content was insignificant compared with that for the non- shading treatment, (Table 4-a).

TABLE (4a). Soil moisture content (w/w) after and before irrigation and depth of stored water (mm), during the chosen periods representing the different growth stages.

Treatments	Soil depth, cm	Growth stages	Non Shading					shading				
			% Soil moisture		Depth of moisture storage (mm)		Plant water consumption, mm/period	% Soil moisture		Depth of moisture Storage (mm)		Plant water consumption, mm/period
			After irrig.	Before irrig.	After irrig.	Before irrig.		After irrig.	Before irrig.	After irrig.	Before irrig.	
Control	0-30	First stage	22.47	10.75	84.26	40.31	43.95	20.39	12.27	76.46	46.00	30.46
		Second stage	22.91	11.55	85.91	43.31	42.60	22.12	11.23	82.95	42.10	40.85
		Third stage	24.41	12.93	91.54	48.49	43.05	24.13	13.57	90.49	50.90	39.59
	30-60	First stage	20.04	10.62	81.16	43.01	38.15	19.86	11.14	80.43	45.10	35.33
		Second stage	19.63	9.83	79.50	39.81	39.69	18.79	9.80	76.09	39.70	36.39
		Third stage	21.36	10.84	86.51	43.92	42.59	20.46	11.19	82.86	45.30	37.56
Rice straw (4 tons/fed)	0-30	First stage	22.12	13.31	82.95	49.91	33.04	22.15	14.01	83.06	52.54	30.52
		Second stage	21.98	11.60	82.43	43.50	38.93	20.90	13.01	78.38	48.80	29.58
		Third stage	21.95	13.55	82.31	50.81	31.50	21.26	13.71	79.73	51.40	28.33
	30-60	First stage	19.26	11.04	78.00	44.71	33.29	19.11	12.11	77.40	49.50	27.90
		Second stage	19.55	10.12	79.18	40.99	38.18	18.94	10.30	76.71	41.70	35.01
		Third stage	21.15	10.94	85.66	44.31	41.35	19.53	11.23	79.10	45.50	33.60
Rice straw (6 tons/fed)	0-30	First stage	27.03	13.95	101.36	52.31	49.05	23.59	14.24	88.46	53.40	35.06
		Second stage	24.28	12.00	91.05	45.00	46.05	23.34	13.81	87.53	51.80	35.73
		Third stage	21.95	12.96	82.31	48.60	33.71	21.59	13.80	80.96	51.75	29.21
	30-60	First stage	20.42	10.94	82.70	44.31	38.39	20.04	11.58	79.89	46.90	32.99
		Second stage	20.24	10.57	81.97	42.81	39.16	19.34	10.15	78.33	41.10	37.23
		Third stage	21.67	11.33	87.76	45.89	41.87	21.17	11.23	85.74	45.50	40.24
Rice straw (8 tons/fed)	0-30	First stage	24.23	12.21	90.86	45.79	45.07	23.11	15.00	86.66	56.25	30.41
		Second stage	23.00	12.21	86.25	45.79	40.45	22.66	14.77	84.98	55.40	29.58
		Third stage	23.17	13.52	86.89	50.70	36.19	22.92	15.28	85.95	57.30	28.65
	30-60	First stage	20.19	10.94	81.77	44.31	37.46	20.12	11.47	81.49	46.40	35.09
		Second stage	22.51	10.15	91.17	41.11	50.06	20.01	10.32	81.04	41.80	39.24
		Third stage	20.93	11.14	84.70	45.12	39.58	20.87	11.19	84.52	45.30	39.22

First stage represented by the period from 25 of July to 3 of August 2004
Second stage represented by the period from15 of August to 29 of August 2004
Third stage represented by the period from 15of September to 29 of September 2004

Therefor, the effect of shading, i.e., the presence of rice- straw mulch, on conserving soil moisture can be neglected. In case of mulching with milled sugarcane stalks, the obtained data exhibited trends nearly similar to those obtained for rice straw mulch treatments (Table 4-b).

TABLE (4b). Soil moisture content (w/w) after and before irrigation and depth of stored water (mm), during the chosen periods representing the different growth stages.

Treatments	Soil depth, cm	growth stages	Non Shading					Shading				
			%Soil moisture		Depth of moisture storage (mm)		Plant water consumption, mm/period	%Soil moisture		Depth of moisture storage (mm)		Plant water consumption, mm/period
			After irrig.	Before irrig.	After irrig.	Before rrig.		After irrig.	Before irrig.	After irrig.	Before irrig.	
Milled sugarcane stalks (4 ton/ fed)	0-30	First stage	24.27	13.31	91.01	49.90	41.11	23.36	14.67	87.60	55.01	32.59
		Second stage	23.75	12.59	89.06	47.20	41.86	22.54	14.77	83.51	55.40	28.11
		Third stage	23.09	13.31	86.59	49.90	36.69	23.43	14.00	87.86	52.50	35.36
	30-60	First stage	20.18	11.46	81.73	46.40	35.33	19.74	12.41	73.14	58.36	14.78
		Second stage	20.49	10.30	82.98	41.70	41.28	19.24	11.60	77.92	46.98	30.94
		Third stage	21.42	11.60	86.75	46.98	39.77	19.37	11.09	78.45	44.90	33.55
Milled sugarcane stalks (6 ton/ fed)	0-30	First stage	23.38	13.07	87.68	49.01	38.57	21.36	13.60	80.10	51.00	29.10
		Second stage	23.72	11.71	88.95	43.90	45.05	20.30	15.00	76.13	56.25	19.88
		Third stage	22.17	14.83	83.14	55.60	27.54	19.52	13.55	73.20	50.80	22.40
	30-60	First stage	20.08	11.58	81.32	46.90	34.42	18.76	11.19	75.98	45.30	30.68
		Second stage	20.66	10.10	83.60	40.90	42.70	19.69	9.95	79.74	40.30	39.44
		Third stage	21.75	11.01	88.09	44.59	43.50	21.19	11.51	85.82	46.60	39.22
Milled sugarcane stalks (8 ton/ fed)	0-30	First stage	24.14	13.65	90.53	51.20	39.33	22.45	16.56	84.19	62.10	22.09
		Second stage	22.90	11.17	85.88	41.89	43.99	22.08	14.29	82.80	53.59	29.21
		Third stage	22.92	13.84	85.95	51.90	34.05	20.04	13.15	69.34	49.30	20.04
	30-60	Firststage	20.48	11.46	82.94	46.41	36.53	20.24	11.28	81.97	45.70	36.27
		Second stage	20.04	10.69	81.16	43.29	37.87	19.49	12.00	78.93	48.60	30.33
		Third stage	20.73	11.41	83.96	46.21	37.75	19.91	12.07	80.64	48.90	31.74

First stage represented by the period from 25 of July to 3 of August 2004
Second stage represented by the period from 15 of August to 29 of August 2004
Third stage represented by the period from 15 September to 29 of September 2004

Water Consumptive use

To compare the influence of the applied treatment on sweet pepper plants water requirement, the obtained data for soil moisture contents before and after irrigation were used to calculate the amount of water consumed during each of the chosen 3 growth stage periods. It is worth to mention that the calculations were made for the assumed 30 cm depth of plant active root zone during the first growth period the second lower soil depth, 60 cm, was considered for the other two growth periods.

The obtained results given in table (5) point out that shading resulted in reducing plant water consumption, relative to the control, by 30.71%, 6.17% and 19.92% during the periods representing the first, second and third growth stages, respectively. This behavior is rendered to the fact that shading reduces the incoming solar radiation and consequently the available latent heat for evaporation. These results reveal that shading can contribute for saving irrigation water by about 18.9 % which is considered an important amount for areas which have limited water resources.

Regarding mulching treatments, obtained results presented in table (5) show that the influence of rice straw mulch either separately or in combination with shading treatments on sweet pepper plants consumptive use of water during the tested periods in the different growth stages, except few cases, is very small and could be neglected. However the effect of milled sugarcane stalks on reducing water consumption, especially under shading is appreciably high. On percentage basis, such reduction throughout the growth season approaches, on the average, 18.5%,13.5%and 27%, compared with the control upon applying 4,6and 8 tons / fed, respectively. The limited effectiveness of mulched plant residues, as compared to shading treatment, may be attributed to the uneven distribution of such materials on soil surface and the relatively rapid movement around plant surfaces.

Crop Yield

Table (6) shows the effect of shading and mulch treatments on sweet pepper fruit yield. It is evident that 60% shading using seran plastic sheets has sharply increased fruit yield from 1.5 kg/m^2 to 2.86 kg/m^2. This behavior can be attributed to the impact of shading on reducing evapotranspiration and subsequent increases in the amount of available water for plant growth and fruit yield.

As regard to mulch treatments in the absence of shading, it is clear that the application of plant residues, rice straw or milled sugarcane stalks resulted in maximum yield compared to the control. Moreover, increasing the level of application progressively increase pepper fruit yield. On percentage basis, this increases approached 108%, 170% and 225% relative to the non shading control, upon applying 4,6 and 8 tons/feddan of rice straw, respectively. The corresponding values of increase using 4, 6 and 8 tons/feddan of milled sugarcane stalks were 26, 40 and 158%, in the same sequence. These results indicate that rice straw is superior than milled sugarcane stalks in improving soil environment including temperature regime. It is also evident that the effect of the applied mulches when combined with shading treatment was not beneficial compared to that obtained for their separate effect on sweet pepper yield. This is evidenced by the marked decrease in the yield relative to the control as a result of combining shading with mulching. Such effect may be probably attributed to the relatively high moisture content stored in the surface soil layer, i.e. the most active root- zone layer, which consequently adversely affect fruit setting and yield.

In this respect, Schoch (1972) found that 30% shading is the optimum level for sweet pepper production because photosynthesis was still very effective and allowed greater accumulation of food in the root, whereas 50% shading had significantly reduced yield compared with 0 and 30% treatments.

Comparing the effect of mulch materials, i.e. rice- straw and milled sugarcane stalks on sweet pepper production point out that irrespective to the application level, rice- straw is superior to the milled sugarcane stalks in increasing sweet pepper yield. In this concern, the effectiveness of the applied treatments could be arranged in the descending order : rice - straw, shading, milled sugarcane stalks, rice- straw + shading, control and milled sugarcane stalks + shading.

TABLE. (5). Plant water consumption during the chosen periods representing different growth stages.

Treatments		1st growth stage from25/7 to 3/8		Difference between treatments %	2nd growth stage from15/8 to 29/8		Difference between treatments %	3rd growth stage from15/9 to 29/9		Difference between treatments %
		Water consumption mm/period	Eta mm/day		Water consumption mm/period	Eta mm/day		Water consumption mm/period	Eta mm/day	
Control	Non-shad	43.95 38.15	4.40	30.71	42.60 39.69	5.49	6.17	43.05 42.59	5.71	9.92
	Shading	30.46 35.33	3.05		40.85 36.39	5.15		39.59 37.56	5.14	
Rice straw (4tons/fed)	Non-shad	33.04 33.29	3.31	7.66	38.93 38.18	5.14	16.24	31.50 41.35	4.86	15.00
	Shading	30.52 27.90	3.05		29.58 35.01	4.31		28.33 33.6	4.13	
Rice straw (6tons/fed)	Non-shad	49.05 38.39	4.91	28.54	46.05 39.17	5.68	14.81	33.71 41.87	5.04	8.12
	Shading	35.06 32.99	3.51		35.73 37.23	4.86		29.21 40.24	4.63	
Rice straw (8tons/fed)	Non-shad	45.07 33.88	4.51	32.51	40.45 50.06	6.04	24.09	36.19 39.58	5.06	10.53
	Shading	30.41 35.09	3.04		29.58 39.24	4.59		28.65 39.22	4.52	
Milled sugarcane stalks (4tons/ fed)	Non-shad	41.11 35.33	4.11	20.72	41.86 41.28	5.54	28.98	36.69 39.77	5.10	9.85
	Shading	32.59 14.78	3.26		28.11 30.94	3.94		35.36 33.55	4.59	
Milled sugarcane stalks (6tons/ fed)	Non-shad	38.57 34.42	3.87	24.77	45.05 42.70	5.85	32.45	27.54 43.50	4.74	13.25
	Shading	29.1 30.68	2.91		19.88 39.44	3.95		22.40 39.22	4.11	
Milled sugarcane stalks(8tons/ fed)	Non-shad	39.33 36.53	3.93	43.83	43.99 37.87	5.46	27.29	34.05 37.75	4.79	27.93
	Shading	22.09 36.27	2.21		29.21 30.33	3.97		20.04 31.74	3.45	

TABLE (6). Sweet pepper yield in various treatments.

	Non Shading						
	Rice straw				Milled sugarcane stalks		
	Control	4tons /Fed	6tons /Fed	8tons /Fed	4tons /Fed	6tons /Fed	8tons /Fed
Weight of fruits (kg/m²)	1.53	3.06	4.84	3.99	1.89	2.02	3.86
	1.56	3.13	4.91	4.01	1.92	2.20	3.85
	1.50	3.18	4.88	4.09	1.87	2.10	3.91
Main weight of plots (kg/m²)	1.53	3.12	4.87	4.03	1.89	2.10	3.87
Total yield (kg/m²)	4.59	9.37	15.63	12.09	5.78	6.32	11.62
	Shading						
	Rice straw				Milled sugarcane stalks		
	Control	4tons /Fed	6tons /Fed	8tons /Fed	4ton/Fed	6tons /Fed	8tons /Fed
Weight of fruits (kg/m²)	2.91	2.63	1.80	1.66	1.51	0.80	1.11
	2.86	2.59	1.85	1.72	1.58	0.79	1.07
	2.80	2.60	1.82	1.67	1.50	0.81	1.13
Main weight of plots (kg/m²)	2.86	2.60	1.82	1.68	1.53	0.80	1.10
Total yield (kg/m²)	8.57	7.82	5.47	5.05	4.59	2.40	3.31
L.S.D 0.05	99.33	105.25	72.28	97.76	97.37	140.17	63.04
Significance at 1.00%	*	*	*	*	*	*	*

REFERENCES

Erain,W.F.; Y.A. Nasr and S.A.A. Ismaeil (1989). The use of synthetic approach for mapping and classifying some soils in Maryut area. *J.Soil. Sci.*, Special Issue: p. 143- 160.

Miller, D.M.; and W.P. Miller (2000). In "land application of wastes". M.E Sumner(ed.), *Handbook of soil science*. p. 217-245.

Monteith, J.L.(1965). Evaporation and environment symp. Soc. Exp. Biol 19 th. p. 205-234. Daniel Hillel(ed.), "In *Introduction to soil physics*". Academic press 1982.San Francisco,U.S.A.

Philip, J.R. (1966) Plant water relations. Some physical aspects. *Ann. Rev. plant physiol.*,17: p. 245 - 268.

Rechigal, J.E. and MacKinnon (ed.) (1997)." In Agricultural uses of by products and wastes."*Am.Chem.Soc*",Washington, DC.,USA.

Richards, L.A.(ed) (1954) . Diagnosis and improvement of saline and alkali soils. "In U.S. salinity laboratory staff." , *Agriculture Handbook,* No. 60. Riverside, California, USA.

Rylski,I. and M.Spigelman (1986). Effect of shading on plant development, yield and fruit quality of sweet pepper grown under conditions of high temperature and radiation. *Sci.Hort.*, 29:p. 31 – 35 .

Schoch, P. G. (1972). Effect of shading on structural characteristics of the leaf and yield of fruit in *Capsicum annumm* L. *J. Amer. Hort. Sci.* , 97 (4) : p. 461 – 464.

Snedecor, G.W. and W.G. Cochran (1989) . In"*Statistical methods*" . The Iowa State Univ. Press, Ames, Iowa,U.S.A.

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الأثر المشترك لتغطية وتظليل النبات على المخزون الرطوبى وكفاءة استخدام المياه وانتاجية الاراضى الجيرية

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يهدف هذا البحث إلى دراسة إستخدام أغطية بلاستيكية من السيران الأسود (٦٠% تغطية) بإرتفاع ٢م من سطح التربة والتغطية بمخلفات نباتيةمن قش الأرز ومصاصة القصب على رطوبة التربة والبخر نتح ، وانتاجية محصول الفلفل.

اقيمت التجربة فى محطة مريوط التابعة لمركز بحوث الصحراء، فى تصميم قطاعات منشقة حيث خصصت القطع الرئيسية لمعاملات التغطية بالسيران وتحت الرئيسية لتغطية سطح التربة بقش الأرز ومصاصة القصب بمعدلات إضافه ٤ ، ٦ ، ٨ طن / فدان وقد توصلت النتائج إلى ما يلى:-

١ – أدت التغطية بالسيران إلى زيادة احتفاظ التربة بالرطوبة وتقليل البخر نتح مقارنه بمعاملة الكنترول.

٢ – أدت اضافة مخلفات النباتات على سطح التربة إلى زيادة احتفاظ التربة بالرطوبة مقارنه بالكنترول وكانت معاملات قش الأرز أفضل من معاملات مصاصة القصب فى الاحتفاظ بالرطوبة.

٣ – أدى استخدام التغطية بالسيران والمخلفات النباتية إلى تقليل الاستهلاك المائى خلال مراحل النمو المختلفه بنسب تتراوح ما بين ٧,٦٦ الي ٤٣,٨٣ % في المرحله الاولي و٦,١٧ إلى ٣٢,٤٥ % في المرحله الثانيه و٨,١٢ الي ٢٧,٩٣ % في المرحله الثالثه.

٤ – أدى استخدام السيران فى التغطية إلى زيادة معنوية فى محصول الفلفل مقارنه بمعاملة الكنترول، فى حين وجد ان الزيادة فى المحصول كانت كبيرة فى كل المعاملات الغير مغطاه بالسيران، ويرجع السبب فى ذلك إلى حساسية نبات الفلفل إلى الزيادة فى رطوبة التربة.