Effect of Water Stress and Plant Residues on Yield and Yield Components of Two Varieties of Pea plant Under Drip Irrigation System Using Neutron Moisture Meter .

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ABSTRACT

Field experiment was conducted at the experimental farm of Nuclear Research Center, Atomic Energy Authority, Inshas, Egypt, to study the effect of irrigation water stress and some residual conditioners on optimizing the effect of water stress on growth and yield of two varieties of pea (*Pisum sativum* L.) cv. (Strain B and victory freezer). The experimental was laid out using drip irrigation system.

The obtained result show the following :

- The yield of caswarina was higher with the studied varieties.
- Stain B variety superior vectory freezer on yield and weight of 100 seed and total yield of pods on dry seeds weight.
- The growth of strain B was faster at the first stage and flowering, Although, the strain B was higher in yield and plant growth period.
- The consumptive use for strain B variety was higher than vectory freezer.
- The application of caswarina and increased significantly on No. of seeds on pod, weight of 100-seeds, total yield of green pods and seed dry weight and water use efficiency comparing with control (sand) but the effect of caswarina superior than maize.
- The effect of the plant residues was clearly on water consumptive use. Also on water extract pattern which was at the surface layer for the plant residues treatments. The soil extract pattern for sandy soil was from the suberface soil layer as a result to the drought at the surface soil layer for long periods.

Key wards : Pea - water stress - sandy soil - plant residues - consumptive use - water extract pattern - strain B - vectory freezer.

INTRODUCTION

Peas (*Pisum sativum* L.) is considered as one of the most important winter vegetative legume crops in Egypt. It is a popular member of the family leguminous. Which mostly consumed as green shelled, dried canned or frozen and mainly grown for green pods and dry grain and also improving soil fertility the increment in human population, that may be archived by increasing the cultivated area through cultivation in newly reclaimed sandy soils in Egypt. This sandy soil are characterizes by droughty, erodible and infertile. However, it could be economically exploited, if the fertilizer and water well managed during the growing crop. Soil conditioners and use of the proper irrigation quantity which minimize the waste of infiltration of water and fertilizers to meet the needs of growing crop using the drip irrigation system. The value of organic matter and its importance as a soil conditioners as well as a source of nutrients has been reviewed by many authors.

El-Awady et al., (1976) studied irrigation on pea with newly reclaimed sandy soils are considered poor in its physical and chemical properties. Growing pea under drip irrigation in such soils is subjected to many drawbacks associated with the soil properties i.e., low water holding capacity, poor in its nutrients, loss of fertilizers and need of high cost fertilizers for soil management. Therefore, to increase the production of the unit area and to unsure maximum use of the resources of soil water and fertilizers, planting density and arrangement are considered of the most important factors in this respect. Also, he mentioned that the pod yield of pea and water use efficiency were 2.5 ton/fed and 2.5kg/m^3 under trickle irrigation trail.

Goda (1984) reported that the water use efficiency value of pea plants was 5.9kg/m^3 under drip irrigation system.

Abdel-Razek (1996) found that the seed yield of peas plant and water use efficiency were 1153.6kg/fed. and 1.2 seed/m^3 water under drip irrigation system.

Arnaout (1997) reported that the highest yield of peas plant were 2625 kg/fed. and water use efficiency 95.8kg/fed.cm under drip irrigation system.

The share of Egypt in Nile water is 55.5 billion m^3 of water yearly which is amounted to be less than $1000m^3$ per capita per year. This amount is below the international average of water sufficiency and possesses a serious alarm for the importance to rationalize water use (kerlous, 1997). Any delay in irrigation timing or insufficient water supply results in water stress and yield reduction, whereas, too frequent irrigation or adding excessive amounts of water will results, too frequent irrigation or adding excessive amounts of water will result in water losses and / or yield reduction (Ramond et al., 1987 and Malik and Bhandrai, 1994) measurements of soil water content is perhaps the most obvious method for scheduling irrigation management.

Pea (*Pisum sativum*, L.) is one of the major winter vegetable crops grown in Egypt for local consumption and export, especially to the Arab countries. Most researches on irrigation management for pea production dealt with the soil water content (Pumphrey and Schwanke, 1974, Hukkeri and Sharma, 1980). However, few studies examined the soil water matric potential (SWMP) to define pea water requirements for a maximum production (Doorenbos and Pruitt, 1975, and Aguiar et al., 1998).

The increment in pea production could be achieved through estimating the optimum water supply and choicing the suitable cultivar. Differences in irrigation treatments utilization among pea cultivars were studied by Abed et al. 1988, Ney et al. (1994) and Aguiar et al. (1998)

Arnaout (1995) reported that drip irrigated field produced the highest yield and healthy vegetative growth of beans (*Vicia faba*, L.) plants than both sprinkler and furrow irrigation ones.

Ghamriny et al., (1992) found that drip irrigation system, generally, enhanced the vegetative growth as well as the dry weights of pea plants. It was also the best system concerning the yield and its components.

This work was aimed to study the effect of irrigation water stress and some residual conditioners on optimizing the effect of water- stress on growth, yield, consumptive use, water extraction pattern of two varieties of pea (*Pisum sativum* L.) cv. (Strain B and victory freezer).

MATERIAL AND METHODS

Experimental site :

Field experiments were carried out during winter season of 2000-2001 at Inshas area, Nuclear Research center, Atomic Energy Authority Egypt.

The physical and chemical analysis of experimental soil are presented in Tables (1 and 2).

Table (1): Some physical properties of soil under treatments (Inshas sandy soil).

Depth (cm)	Sand		Silt (%)	Clay (%)	O.M. (%)	Bulk density	Water holding capacity (%)
	Coarse (%)	Fine (%)					
0 -20	88.50	3.70	4.30	3.50	0.1	1.72	7.8
20 – 40	80.00	14.55	1.25	4.20	-	1.72	7.9

Table (2): Some chemical properties of soil under treatments.

Depth (cm).	pH	Ec mm/hos 25 °C	Soluble ions (me/L) 1:5						
			Cations				Anions		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Cl^{-}	SO_4^{--}	HCO_3^{-}
0 - 20	7-40	0.19	1.04	0.98	0.74	0.08	1.00	1.04	0.80
20–40	7-50	0.11	0.52	0.49	0.56	0.06	1.00	0.09	0.55

Pea seeds cv. (Master B pea and Vectory freezer) were sown after inoculation with root nodules bacteria (*Rhizobium leguminosarum*) and spaced 10 cm apart on both sides of dripper line. The experimental unit area was 40 cm^2. the distance between dripper was 40cm.

Plant residues treatments :

Plant residues, i.e., corn straw and caswarina leaves locally available were grounded by a suitable mill and then mixed (100 kg dust + 30 kg ammonium sulphate + 5 kg calcium superphosphate) per one ton of both plant residues, according to Edward and Nabila (1993) and then stayed for one year before using. Plant residues applied one month before planting at the rate of 10 tons/Fed. to sandy soil based on final C/N of 14/1. Some physical and chemical properties of the results soil are present in Table (3).

Table (3) : Chemical characteristics of studied plant residues.

Plant residues	Chemical characters				
	C %	N %	P %	K %	C/N ratio
Corn ash	42	0.46	0.31	1.31	42 / 0.5
Caswarina	35	2.56	0.52	1.46	36.0 / 2.6

Irrigation treatments:

Drip irrigation system was used in this study. Drip lines were 16 mm (inside diameter) and the discharge of the drippers used was 4 L/h.

Water irrigation levels:

four irrigation treatments were used .

W1 60 % of Av. Water .

W2 70 % of Av. Water .

W3 80 % of Av. Water .

W4 100-90 of Av. Water .

Fertilization method :

Fertigation method which is used with irrigation water as a carrier of fertilizers through irrigation networks .

The amounts and types of fertilizers applied were determined according to recommendation of field crop Department, Agriculture Research center Ministry of Agriculture and land Reclamation fertilization program was as follows:

1- Nitrogen: 150 kg/ fed Ammonium nitrate 33% were added 15 days after planting into 20 doses for fertigation methods.

2- 100 kg/fed superphosphate (15.5 P_2O_2) and 50 kg/fed potassium sulfate 48% K_2O were added during seedbed preparation .

Measurements :

Measurements recording in this study can be summarized as follows:

Soil moisture distribution was determined using neutron moisture which was calibrated before starting this experiment. Access tube was installed at the middle between two drippers. The calibration equation for different studied depths are following.

1- C.R (30 cm) = 0.1664 + 0.0383 θ R^2 = 0.9975

2- C.R (45 cm) = 0.2185 + 0.0375 θ R^2 = 0.9565

3- C.R (60 cm) = 0.2444 + 0.0380 θ R^2 = 0.9163

4- C.R (75 cm) = 0.2689 + 0.0389 θ R^2 = 0.9754

Soil salinity was measured by using electrical conductivity meter in 1:5 soil water extract samples described by black (1965).

The soil pH in a 1 : 5 soil water extract was determined by using a glass electrode with a standard PH meter (Jackson, 1967)

Yield and yield components :

All harvested green plants from each treatment were used to determine the following data:

- Seeds / pods.
- Weight of 100 seeds.
- Total green pods yield.
- Total seeds yield.
- Yield (kg / fed).

Water use efficiency (WUE) :

It was determined according to Awady et al. (1976) and Bos (1980) using the following equation :

$$\text{Water use efficiency } (kg / m^3) = \frac{\text{Average yield kg/ fed}}{\text{Amount of applied water, } m^3\text{/ fed}}$$

The experimental design was similar to the split plot design. The main plots assigned for plant residues treatments, as well as the irrigation levels arranged in the sub-plots.

Statistical analysis :

The data were Statistically analyzed using micro computer program M-Stat (Michigan State University).

RESULTS AND DISCUSSION

Yield and yield components :

The results in Table (4) show the effect of plant residues application and water stress on the yield and yield components of two verities of pea plant, i.e., total yield of green pods, total dry seeds, number of seeds per pod, and weight of 100 seeds. Besides water use efficiency of both green pods and dry seeds. Data indicated that total yield of green pods and total seeds dry weight significantly increased with application of plant residues to sandy soil. In this regard soil application of caswarina and maize straw markedly increased both total green pods and seeds weight compared to that of sandy soil. These were increased for green pods by 63.27 and 58.78% for caswarina and maize, respectively.

Increasing the yield of both green pods or seeds as a result of addition plant residual to sandy soil as plant organic matter may be attributed to the improvement in the physical and chemical properties of the investigated soil which caused by plant residual. These improvement of the availability of the nutrients in the soil and the physical and chemical properties of the soil reflecting on the soil productivity, comparing with sandy soil only. In the same time, the increasing of seeds dry weight were 42.40 and 36.25% for caswarina and maize application, respectively. Regarding to the effect of water stress the results in Table (4) show that increasing of irrigation significantly. Increased both total green pods and total seeds yield.

The highest value of both green pods and seed yield indicated with the highest irrigation (W4, 100-90 % of available water (A.W.)) and (W3, 80 % of A.W.) comparing with the lowest irrigation i.e., (W1, W2). On the other word there was direct relationship between amount of irrigation water and both yield of green pods and seeds yield of pea plant. The corresponding increments in these trail for seeds yield were (37.66 and 30.04 %) and for pods yield were 19.97 and 17.17% for (W4 and W3) irrigation treatments comparing with the highest moisture stress i.e., (W1, 60 % of A.W.).

The increase in pods and seeds yield affecting with increasing moisture levels may be due to the modifying effects of higher irrigation water on plant anatomy, morphology and physiology regarding the two varieties i.e., (Strain B and victory freezer). Data in Table (4) indicated also that Cv_1 (Strain B) were show superior in both total green pods and seeds yield comparing with Cv_2 (victory freezer). The increments were 11.06% and 9.51 respectively.

Concerning the interaction between adding of plant residues and moisture levels there were significant value on both total green pods and seeds yield. The same trend indicated with the interaction between varieties and irrigation level. While insignificant effect were with the interaction with both plant residues with irrigation and varieties. In general, it can be noticed that highest pods yield and seeds yield were produced by cultivate caswarina. Irrigation with (W4) combined with addition of caswarina (Cv_1) as plant organic matter, and this treatment could be recommended under the same conditions of experiments.

Table (4) : Effect of soil water stress, plant residues uses and its interaction on yield and yield characteristics and water use efficiency WUE of pea Plant varieties strain B, (V1 and victory freezer, V2)

Parameter / Treatment			No. of seeds / Pod	Weight of 100 seeds (gm)	Total Yield (kg/fed)		WUE (kg/m³)	
					Green pods	Seeds dry Wt.	green pods	Dry Seeds
Sand	W1	V1	3.623	10.600	1018.333	411.333	1.030	0.417
		V2	3.437	8.673	949.000	368.667	1.087	0.423
	Mean S × W1		3.530	9.637	983.667	390.000	1.058	0.420
	W2	V1	3.870	14.970	1090.667	463.333	0.963	0.413
		V2	4.003	14.140	936.333	430.333	0.930	0.430
	Mean S × W2		3.937	14.555	1014.500	446.833	0.947	0.423
	W3	V1	4.307	16.170	1143.000	483.333	0.877	0.373
		V2	4.230	15.637	1019.333	471.667	0.913	0.423
	Mean S × W3		4.268	15.903	1081.167	477.500	0.895	0.398
	W4	V1	3.167	17.440	1262.667	565.000	0.870	0.390
		V2	3.017	16.797	1116.333	504.333	0.907	0.410
	Mean S × W4		3.092	17.118	1189.500	534.667	0.888	0.400
Maize	W1	V1	6.730	29.100	2450.667	587.000	2.917	0.697
		V2	5.570	25.430	2309.000	530.667	2.733	0.627
	Mean M × W1		6.150	27.265	2379.833	558.833	2.825	0.662
	W2	V1	6.170	22.717	2223.000	607.000	2.267	0.620
		V2	6.210	28.940	2427.000	527.667	2.477	0.537
	Mean M x W2		6.190	25.828	2325.000	567.333	2.372	0.578
	W3	V1	8.100	34.183	2975.333	858.667	2.540	0.760
		V2	7.233	32.143	2722.000	824.333	2.717	0.823
	Mean M x W3		7.667	33.163	2848.667	841.500	2.628	0.792
	W4	V1	9.720	35.397	3218.333	992.667	2.350	0.723
		V2	8.973	30.850	2358.333	872.333	2.153	0.787
	Mean M x W4		9.347	33.123	2801.833	932.500	2.252	0.755
Cas.	W1	V1	7.060	37.233	2606.667	617.667	3.467	0.820
		V2	6.150	31.163	2372.667	552.667	3.040	0.707
	Mean cas.x W1		6.605	34.198	2489.667	585.167	3.253	0.763
	W2	V1	7.570	38.933	2803.667	795.667	3.163	0.897
		V2	6.380	34.497	2539.333	720.000	2.630	0.747
	Mean cas.x W2		6.975	36.715	2671.500	757.833	2.897	0.822
	W3	V1	8.673	42.717	3209.667	897.333	2.837	0.793
		V2	7.433	40.047	3063.667	850.333	3.110	0.863
	Mean cas.x W3		8.053	41.382	2136.667	873.833	2.973	0.828
	W4	V1	11.087	44.540	3779.000	1078.000	2.950	0.843
		V2	10.047	38.973	2866.666	909.000	2.833	0.897
	Mean cas.x W4		10.567	41.757	3322.833	993.500	2.892	0.870

Table (4) Continue

Parameter		Treatment	No. of seeds / Pod	Weight of 100 seeds (gm)	Total Yield (kg/Fed) Green pods	Total Yield (kg/Fed) Seeds dry Wt.	WUE (kg/m³) green pods	WUE (kg/m³) Dry Seeds
Mean plant Res.		Sand	3.707	14.303	1067.208	462.250	0.947	0.410
		Maize.	7.338	29.845	2588.833	725.042	2.519	0.697
		Cas.	8.050	38.513	2905.167	802.538	3.004	0.821
Mean Irrig.		W1	5.248	23.700	1951.056	511.333	2.379	0.615
		W2	5.701	25.699	2003.667	590.667	2.072	0.607
		W3	6.663	30.149	2355.500	730.944	2.166	0.673
		W4	7.668	30.666	2438.056	820.222	2.011	0.675
Mean Var.		V1	6.673	28.667	2315.083	696.417	2.186	0.646
		V2	6.057	26.441	2059.056	630.167	2.128	0.639
Mean Irrig. X variety		W1xV1	5.804	25.644	2025.222	538.667	2.471	0.644
		V2	5.052	21.756	1876.889	484.000	2.287	0.586
		W2xV1	5.870	25.540	2039.111	622.000	2.131	0.643
		V2	5.531	25.859	1968.222	559.333	2.012	0.571
		W3xV1	7.027	31.023	2442.667	746.444	2.084	0.642
		V2	6.299	29.276	2268.333	715.444	2.247	0.703
		W4 V1	7.991	32.459	2753.333	875.556	2.057	0.6̂25
		V2	7.346	28.873	2122.778	761.889	1.964	0.698
Mean Soil x Variety	S x	V1	3.742	14.795	1128.667	480.750	0.935	0.398
		V2	3.672	13.812	1005.750	443.750	0.959	0.422
	M	V1	7.680	30.349	2716.833	761.333	2.518	0.700
		V2	6.997	29.341	2460.833	688.750	2.520	0.693
	Caz	V1	8.598	40.856	3099.750	847.167	3.104	0.838
		V2	7.502	36.170	2710.538	758.000	2.903	0.803
L.S.D. 0.05								
Plant Res.		(A)	0.27	1.59	129.01	24.26	0.13	0.030
Irrig.		(B)	0.31	1.83	40.82	28.02	0.15	0.030
Var .		(C)	0.22	1.30	105.34	194.23	N.S.	N.S.
Plant Res.× irrrig.		(A × B)	0.54	N.S.	258.00	48.35	N.S.	0.05
Plant Res. × var.		(A × C)	0.38	2.25	N.S.	N.S.	N.S.	0.04
Irrig. × var.		(B × C)	N.S.	2.59	210.68	39.63	0.48	0.04
Pl.R. × Irrig.Var.		(A × B × C)	N.S.	N.S.	N.S.	N.S.	N.S.	0.07
L.S.D. 0.01								
Plant Res.		(A)	0.36	2.12	172.64	32.46	0.18	0.03
Irrig.		(B)	0.41	2.45	54.61	37.49	0.216	0.04
Var .		(C)	0.29	1.73	140.94	263.33	N.S.	N.S.
Plant Res.× irrrig.		(A × B)	0.72	N.S.	345.25	64.93	N.S.	0.06
Plant Res. × var.		(A × C)	0.51	3.00	N.S.	N.S.	N.S.	N.S.
Irrig. × var.		(B × C)	N.S.	3.47	281.89	53.03	N.S.	0.06
Pl.R. × Irrig.Var.		(A × B × C)	N.S.	N.S.	N.S	N.S.	N.S.	N.S.

Numbers of seeds per pod and weight of 100 seeds :

No of seeds per pod and weight of 100 seeds/pod for pea plant were recorded and presented as shown in Table (4). The data indicated that there were increased significantly with addition of organic plant residues comparing with sandy soil for both No of seeds per pod and weight of 100 seeds. Highest value of both data was obtained by caswarina and maize, respectively.

Concerning irrigation levels, data in Table (4) show that significant increase in both No of seeds / pod and weight of 100 seeds with increasing of moisture levels also the highest value of both data obtained with highest moisture level i.e., (W4, 100-90 % of A.W.). On the other hand, V1 (Strain B) showed slight increase in both No of seeds / pods and weight of 100 seeds comparing with V2. While both varieties showed significant effects under these treatments. In the same time No of seeds / pod showed significant effect with interaction of both plant residues with irrigation, plant residues with variety. While showed in signification effect with irrigation × var. and plant residues × irrigation × varieties. While weight of 100 seeds declared significant effect with plant residues with varieties and irrigation with varieties while in significant effect with both plant residues with irrigation and plant residues with irrigation and varieties. ****

Water use efficiency (WUE) :

Water use efficiency of both green pods and seeds yield were determined and presented in Table (4). The data indicate that water use efficiency was statistically increased by the application of plant residues compared with sandy soil.

Added of caswarina indicated the highest value of WUE. These result observed with both green pods and seed yield.

Concerning irrigation levels, data in Table (4) indicated that, moisture level were significant on WUE of green pods and seed yield.

But in the same time no difference had been observed between highest, medium or lowest irrigation level on WUE of green or seed yield.

Regarding the two studied varieties and WUE, data presented in Table (4) showed insignificant differences were detected between the two varieties, i.e., (v_1 strain B) and v_2, vectory freezer) on WUE .

In spite of the interaction between water stress and plant residues, plant residues and varieties, irrigation and varieties, plant residues and irrigation and varieties indicated that insignificant effect on WUE with green pods yield expect the interaction between irrigation with varieties. While all the above mentioned interaction detected signification effect with seed yield.

Water relations :

Soil moisture extraction pattern :

As shown Table (5), it is clear that for the two varieties of pea plants was removed the water extracted from the surface layer (0 - 45 cm) the highest percentage of the moisture uptake was occurred at the surface layer of 0-15 cm of the soil profile decreased with decreasing the total available water (TAW) compared with the second and third ones. This means that as soil moisture content of the surface soil layer decreased because of drought during the growing season, the plant tended to extract their water requirements from the deeper soil layers.

Table (5) : Soil moisture extraction pattern of Pea plant varieties from different soil layers as affected by water stress and plant residues.

Plant residual treat.	Irrig. treat.	Strain B			Vectory freezer		
		0-15	15-30	30-45	0-15	15-30	30-45
Sand	W1	44.30	32.80	22.40	40.20	28.28	31.52
	W2	46.30	31.18	22.52	43.17	35.77	21.06
	W3	40.33	37.15	22.52	46.38	36.18	17.04
	W4	46.12	28.16	25.72	49.13	33.15	17.72
Maize	W1	45.36	28.32	2632	46.16	21.20	32.64
	W2	42.30	29.18	28.52	47.28	23.15	29.57
	W3	49.11	28.15	22.74	46.31	18.30	35.39
	W4	53.50	25.30	21.20	58.12	23.18	18.70
Cas. *	W1	50.66	24.80	24.52	48.38	26.80	24.82
	W2	54.36	27.16	18.48	46.22	30.12	23.66
	W3	58.40	25.80	15.80	60.15	23.80	16.05
	W4	72.50	21.38	6.12	63.32	25.15	21.53

* Caswarina

This trend was shown for the all studied soil conditioners treatments and also for the two studied varieties. Israelson and Hansen (1962) came about the same conclusions. Also, it could be noticed that pea plants consumed most of their water requirement (> 70 %) from the upper 45 cm of soil.

Water consumptive use:

Water consumptive use (CU) by pea plants as a function of irrigation treatments for the growing seasons are shown in Table (6) for both varieties, consumptive use of water was the highest at the low water stress (100-90 of AW) and interacted with caswarina residual. It was found to be 34.57 and 29.29 cm for strain B and vectory freezer, respectively. While the lowest values were obtained for sand and the highest water stress (60% of AW) for strain B and vectory freezer 23.55 And 20.71, respectively.

Concerning the plant residual, data in Table (6) reveal that the plant cultivated in caswarina and maize residual consumed water slightly more than control (sand). It can be seen from data in the Table (6) that the caswarina residual can be used instead of farmyard.

The most probable explanation for these findings is that more available soil moisture provided a chance for more vegetative growth and this in turn caused more luxuriant use of water, which ultimately resulted in increasing evapotranspiration. These results were supported by the data obtained by Attia and sultan (1987).

The higher CU in the control treatment (sand) may be due to that the small plant in these treatments caused an increase in evaporation from the bare soil.

Table (6) : Water consumptive use at different irrigation and plant residual treatments for the two studied varieties.

Plant residual treat.	Irrig. treat.	Strain B	Vectory freezer
Sand	W1	15.67	13.18
	W2	17.30	14.13
	W3	17.90	15.86
	W4	19.11	17.20
Maize	W1	17.30	16.80
	W2	19.28	16.70
	W3	20.80	18.61
	W4	21.69	20.15
Caswarina	W1	18.60	18.10
	W2	21.16	18.22
	W3	22.15	20.07
	W4	23.85	21.36

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تأثير استخدام بعض المصلحات الطبيعية على تقليل تأثير الإجهاد الرطوبى على النمو والمحصول والإستهلاك المائى لصنفين من نبات البسلة باستخدام نظام الري بالتنقيط وباستخدام جهاز الرطوبة النيتروني.

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أقيمت تجربة حقلية بالمزرعة التجريبية التابعة لمركز البحوث النووية بهيئة الطاقة الذرية بانشاص خلال الموسم الزراعى 2001/2000 لدراسة اثر إضافة بعض المصلحات الطبيعية المأخوذة من البيئة وهى الكازورينا ومخلفات النباتات الذرة على تقليل تأثير الإجهاد الرطوبى على الصفات النباتية والاستهلاك المائى لصنفين من نباتات البسلة هما صنفى فيكتورى فريزر واستيرين بى ويمكن تلخيص النتائج المتحصل عليها فيما يلى.

- كان تأثير مخلفات الكازورينا أكثر من تأثير الذرة على صنفى البسلة التى تم زراعتها.
- تفوق الصنف استرين بى على الصنف الفيكتورى فريزر فى المحصول ووزن 100 حبة والمحصول الإجمالى من القرون ووزن البذور الجافة.
- كانت نمو نبات فيكتورى فريزر أسرع من الفترة الاولى وأسرع فى الأزهار من الصنف ستيرين بى التى كانت أعلى في معدلات التزهير بدرجة كبيرة و طول فترة نمو النبات.
- كان الاستهلاك المائى لصنف الاسترين بى اكبر منة لصنف فيكتورى فريزر إلا ان كفاءة الاستخدام المائى للصنف ستيرين بى كانت أعلى وذلك لزيادة المحصول الناتج من وحدة المياه عنه فى الصنف فيكتورى فريزر.
- ادي إضافة مخلفات الكازورينا والذرة الى زيادة معنوية فى كل من : عدد البذور فى القرن، ووزن الـ 100 حبة ، والمحصول الإجمالي من القرون ووزن البذور الجافة وكفاءة إستخدام المياه عن معاملى المقارنة (الرمل) إلا أن تأثير مخلفات الكازورينا كان أكبر من مخلفات الذرة.
- كان تأثير المصلحات واضحا على الإستهلاك المائى وكذلك إستخلاص الجذور للماء من التربة ، حيث كان من الطبقة السطحية بكمية أكبر فى حالة إستخدام المصلحات ، وكان من الطبقة السفلى فى معاملة المقارنة (الرمل) حيث دفع الإجهاد الرطوبى والجفاف الجذور للتعمق فى التربة لإستخلاص الماء.