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Effect of Organo-Mineral Fertilization on Vegetative Growth and Productivity of Potato under the New Valley Conditions

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ABSTRACT

Filed experiment was conducted during winter seasons (2014-2015, 2015-2016 and 2016-2017) to study the effect of organo-mineral fertilization (NPK, compost , poultry manure, ½ NPK + compost and ½ NPK + poultry manure) on vegetative growth and production of two potato cultivars (Rosetta and Burren) under EL-Dakhala Oasis (latitude 25 35 2.35N , longitude 29 0 31.62 E) New valley governorate . The amount of the used fertilizers was 300 kg Ammonium nitrate 33.5% (NH_4 NO_3). In addition, Super phosphate (15.5% P_2O_5) was applied at rate of 387 kg/fed and potassium sulfate (50 % K_2O) was added at rate of 200 kg/fed. The compost was added as 11 tons / fed and the poultry manure was added at rate of 4 tons/fed. Half of the above amounts of mineral fertilizers, NPK, were added when either of the organic materials were mixed with NPK. The experiment was laid out in randomized complete block design using split plot arrangement with four replications. The two potato cultivars were arranged in the main plots while, the five organo-minerals treatments were allocated in the sub plots. The results showed that all studied factors and their interaction had a significant effect on the studied traits. Burren potato cultivar surpassed Rosetta cultivar in all studied traits. Moreover, organo-mineral fertilization (½ NPK + compost fertilizer) was superior treatment in all studied traits followed by ½ NPK + poultry manure compared to NPK or organic manures alone. Furthermore, the highest mean values of the studied traits were obtained by Burren cultivar that fertilized with ½ NPK + compost and ½ NPK + poultry manure under New valley conditions.

Keywords: Potato, *Solanum tuberosum*, NPK, Compost, Poultry manure, organo-mineral fertilization, yield.

INTRODUCTION

Potato (*Solanum tuberosum* L) is essential daily food in most of the world countries. It considered the most important human food field crop because of its local consumption and it increases the hard currency revenue through its exportation (Kandil *et al.,* 2011). Potato ranked fourth position after rice, wheat and maize (Spooner and Bamberg,1994; Stephen and Jackson,1999; Amara and Mourad, 2013)

A higher value crop per hectare than cereal was produced from potato because, it is containing high amount of starch and protein (Stephen and Jackson., 1999; Krylova *et al.,* 2000).

It can grow to 13000 feet from sea height (Dave, 1987). It can cultivate under a varied range of climates and soil types (Saunders, 2001; Kandil *et al.,* 2011) more than any other crops. It is important to increase the crop productivity by using the most essential inputs as fertilizers (Ali *et al*., 2009).

Balanced and adequate Fertilizer application has a great effect on the quality and yield of potatoes since it is one of the high consumer of nitrogen and potassium due to its high biological yield (Leytem and Westermann., 2005).

Chemical fertilizers are fundamental in most cropping systems but in long run they cause many problems in soil such as soil and environmental contamination and health dangers (Top *et al*. 2002). Therefore, it is important to use organic fertilizers to avoid these problems as the soil and water pollution (El-Ghamry, 2011).

Sandy soil, it is a poor soil which has low content of organic and nutrition and need more fertilizer than clay soil and use of organic manures lead to increase soil fertility. NPK fertilizers are the main essential macro nutrients for healthy plant growth and crop quality (Adediran and Banjoko, 2003; Akinrinde, 2006; Nweke and Emeh, 2013; Nweke *et al*., 2013a; Okoli and Nweke,2015). Nevertheless, in many cases, the use of chemical fertilizers causes environmental pollution and ecological damage that increase the crop production costs.

Organic manures such as chicken, compost manures play an important role in plant development through its influence on improving the soil characteristics (physical, chemical and biological) as well as through its effect as a source of essential nutrients (Abou – Baker and Samia, 1994; Meshref *et al.*, 1995; El-Nagar, 1996; El-Sayed *et al.,*2010).

Many researchers such as (Mondal and Mazumdar, 1986; Volodko, 1990; Ashour and Sarhan, 1998) reported that using organic manure such as compost and chicken manures led to increase total tuber yield and all vegetative growth.

The aim of this study was to examine the effect of organo-mineral fertilization on vegetative growth and productivity of Potato under the hyper arid climate of the New Valley Oasis at the western desert conditions.

MATERIALS AND METHODS

This study was conducted during three growing winter seasons of 2014-2015, 2015-2016 and 2016-2017 at El-Dakhla Oasis, New Valley Governorate. (latitude 25 35 2.35N, longitude 29 0 31.62 E), at the hyper arid climate of Western Desert of Egypt. Randomized complete block design in split plot arrangement with four replicates was used. Two potato cultivars (Rosetta and Burren) occupied the main plots and the five fertilizers were ranked in the sub plots as it follows:

1-NPK full amount.
2- Compost
3-Poultry manure
4- ½ NPK + Compost
5-½ NPK + Poultry Manure

The experimental unit area was 10.5 m^2 (3m long x 3.5m wide) consist of five rows with 70 cm distance. Tuber seeds were planted in one side of the row at a distance of 20 cm apart and 12-15 cm depth. Also, surface irrigation was used. Representative Soil samples were collected from the site before cultivation. The physical and chemical analysis of the soils and the organic fertilizers (compost and poultry manure) were carried out at the Soils and

Water Department laboratories, Faculty of Agriculture, Assiut University according to Jackson (1973) and Page *et al*., (1982) and the results were presented in Tables (1 and 2).

Table 1. Soil physical and chemical analysis of the experimental site.

Characteristic	Values
Particle size distribution:	
Sand,%	75.10
Silt,%	15.50
Clay,%	9.40
Soil Texture	Sandy Loam
Field capacity %	20.50
Wilting Point %	9.10
Saturation Water %	36.50
Bulk density, Mg m^3	1.49
pH	7.50
Total Soluble Salt, $EC_{1:1}$ dSm^{-1}	4.31
$CaCO_3$	13.50
Soluble Cations in soil $_{(1:1)}$	meq/kg
Ca^{2+}	18.30
Mg^{2+}	3.10
Na^{+}	15.50
K^{+}	2.90
Soluble Anions	
Cl^{-}	29.40
$HCO_3^{-} + CO_3^{2-}$	1.80
SO_4^{2-}	8.90
Total nitrogen %	0.08
Av phosphorus ppm	10.17

The average monthly temperature and relative humidity of the El-Dahkla Oasis during the three growing seasons were presented in Table (3).

Table 2. Physical and chemical prosperities of compost and poultry manure

Component	Poultry manure*	Compost** (Plant residuals)
Density Kg m^{-1}	185.00	600.00
N%	2.50	0.90
P %	0.97	0.71
K %	1.40	0.82
Fe ppm	230.00	61.00
Mn ppm	266.00	152.00
Zn ppm	78.00	51.00
Cu ppm	29.00	40.00
C/N ratio	11.36	30.10
$EC_{(1:10)}$ dSm^{-1}	4.60	1.58
Organic carbon %	28.40	27.10
$pH_{(1:10)}$	8.30	8.00
Organic matter %	48.90	46.70
Moisture content %	17.30	22.10

***Poultry manure was brought from El-Nakheel farm at El-Dakhla Oasis and**

**** the compost was brought from the Agricultural research center (ARC) at El_kharga Oasis.**

Table 3. Average monthly temperature and relative humidity of the El-Dahkla Oasis during the three growing seasons*:

Season	Day	214/2015			2015/2016			2016/2017		
		Temperature °C		Relative Humidity %	Temperature °C		Relative Humidity %	Temperature °C		Relative Humidity %
Month		Max.	Min.		Max.	Min.		Max.	Min.	
September	1 - 10	36.40	17.60	38.60	36.80	17.40	32.40	39.00	21.20	56.30
	11 - 20	35.00	16.60	39.40	37.80	16.80	33.40	39.10	22.50	58.50
	21 - 30	37.60	16.20	40.20	36.60	16.00	34.80	35.70	20.80	63.50
	Average	36.33	16.80	39.40	37.06	16.73	33.80	37.93	21.50	59.43
October	1 - 10	32.80	14.40	41.60	34.80	15.40	36.00	35.90	20.10	45.40
	11 - 20	29.40	13.60	42.60	35.20	14.40	35.40	34.20	18.00	37.90
	21 - 31	30.20	13.40	44.40	34.60	13.00	38.80	33.80	19.40	38.90
	Average	30.80	13.80	42.86	34.86	14.26	36.73	34.63	19.16	40.70
November	1 - 10	28.20	8.60	47.20	32.20	12.60	44.40	29.80	12.80	44.20
	11 - 20	27.40	7.80	47.80	29.40	10.90	45.60	27.10	14.70	46.30
	21 - 30	26.80	7.20	49.40	28.00	9.80	45.80	26.40	10.90	43.20
	Average	27.46	7.86	48.13	29.86	11.10	45.26	27.76	12.80	44.50
December	1 - 10	26.40	5.40	49.80	26.80	6.80	42.80	29.20	12.00	53.20
	11 - 20	23.80	4.60	50.30	24.60	5.90	46.40	23.60	6.80	52.40
	21 - 31	22.40	3.80	52.60	22.80	6.20	48.20	29.70	10.00	53.70
	Average	24.20	4.60	50.90	24.73	6.30	45.80	27.50	9.60	53.10
January	1 – 10	22.80	4.20	54.60	23.30	6.30	50.60	21.90	7.40	54.40
	11 – 20	21.70	4.80	53.80	21.60	5.80	52.00	21.80	7.80	53.80
	21 – 31	22.60	4.60	52.60	21.20	5.40	51.40	27.90	6.30	43.10
	Average	22.36	4.53	53.66	22.06	5.83	51.33	23.90	7.20	50.40
February	1 – 10	21.80	21.80	48.40	20.80	6.00	50.00	26.70	11.70	39.30
	11 – 20	24.20	24.20	46.80	21.60	7.40	46.20	21.20	6.60	38.30
	21– 28 or29	25.80	25.80	42.40	27.40	8.20	44.20	22.40	6.90	39.10
	Average	23.93	23.93	45.86	23.26	7.20	46.80	23.40	8.40	38.90

(*) Source: El-Dakhla meteorological station.

The amount of applied fertilizers was added according to the recommendation of the Ministry of Agriculture (ARC-CAAE, 2013). Organo-minerals fertilizers treatments per plot 10.5 m^2 were as it follows:

The nitrogen was applied at rate of N was 100 kg N/fed or 300 kg Ammonium nitrate 33.5% (NH_4 NO_3). That equal 780 g ammonium nitrate/plot (260g N/plot). Also, Super phosphate (15.5% P_2O_5) was applied at rate of 387 kg/fed (1 Kg/plot = 155 g P_2O_5) and potassium sulfate (50 % K_2O) was added at rate of 200 kg/fed (500 g/plot = 250g K_2O).

The amounts of Compost or poultry manure were added on these bases (260 g N/plot). The compost was added as 18 m^3 as volume or 11 tons/fed (28.8 - 30.0 kg/plot). Poultry manure was added at rate of 4 tons/fed (10.4 kg/plot). Half of the above amounts of mineral fertilizers, NPK, were added when either of the organic materials were mixed with NPK. The organic fertilizer and super phosphate were applied during soil preparation while the nitrogen and potassium amounts were applied at two doses. The first dose was applied after full germination and the second was added twenty days later.

The tubers were planted in October 17th, 10th and 1st in the first, second and third seasons, respectively.

The measurements were recorded on ten guarded plants in each experimental plot as it follows:

1) Plant height (cm)
2) Number of branches per plant
3) Plant fresh weight (g) after 75 days from planting
4) Average tuber weight (g)
5) Total tuber yield (ton/fed) at the end of the season
6) Marketable tuber yield (ton/fed) as well as the first degree of the crop then separated according to their size and weight. The best size and weight were recorded as marketable yield.

Statistical analysis:

Collected data were analyzed using MSTAT-C Statistical Software Package (Michigan State University, Freed *et al*. 1991) and means were compared using the LSD at P≤ 0.05 according to Gomez and Gomes (1984).

RESULTS AND DISCUSSION

1-Plant height (cm):

Illustrated data in Table (4) show that the studied potato cultivars, organo-mineral fertilization and their interaction had a significant influence on the potato plant height in all seasons. Thus, the tallest plants were obtained from Burren cultivar (63.48, 69.05 and 68.19 cm in the first, second and third seasons respectively). This may be due to the genetic reaction with environmental factors which was suitable for Burren cultivar than Rosetta one. These results are matched those obtained by Gunasena and Harris (1971); Wurr *et al*. (1992) and Alsharari *et al*. (2007).

Furthermore, organo-mineral fertilization (½ NPK +compost) enhanced significantly plant height in all seasons (67.31, 71.40 and 72.17 cm in the first, second and third seasons respectively) compared to NPK or organic manures alone. This may be due to the role of organic manures on improving soil physical and chemical properties and to effect readly available mineral nutrient which were important vigorous growth through cell division and elongation. These results are agreement with those obtained by Souza *et al*. (2008).

In addition, the tallest potato plants (72.16, 79.65 and 78.33 cm in the first, second and third seasons respectively) were obtained from cultivated Burren cultivar which were fertilized with ½ NPK + compost. These results are good accordance with those obtained by Gunasena and Harris (1971); Shafeek *et al*. (2001) and Love *et* a*l*. (2005).

Table 4. Effect of cultivars and organo-mineral on plant height (cm) during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	56.75	59.78	58.27	57.86	66.71	62.29	60.12	65.67	62.90
Compost	46.53	53.65	50.09	47.65	58.62	53.14	51.00	59.00	55.00
Poultry manure	54.76	62.87	58.82	56.89	67.89	62.39	59.25	66.93	63.09
½ NPK + compost	62.46	72.16	67.31	63.15	79.65	71.40	66.00	78.33	72.17
½ NPK + poultry manure	63.15	68.95	66.05	64.13	72.36	68.25	65.12	71.00	68.06
Mean	56.73	63.48		57.94	69.05		60.30	68.19	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	**	1.65		**	1.23		**	1.46	
AB	**	3.25		**	3.79		**	3.30	

**** significant at 0.01 probability level.**

2-Number of branches per plant:

Data presented in Table (5) clear that studied potato cultivars, organo-mineral fertilization and their interaction had a significant effect on the number of branches per plant in all seasons. Burren cultivar surpassed Rosetta cultivar and produced the highest mean values of branches number per plant in all seasons (4.871, 4.883 and 4.896 branch in the first, second and third seasons respectively). This matched performance of the same cultivar with regard to plant height and consequently surpassed in number of branches per plant. Also this may be attributed to genetic variations between the two potato cultivars. Similar results were reported by Wurr *et al.* (1992); Alsharari *et al*. (2007) and Belhjati *et al*. (2013).

Table 5. Effect of cultivars and organo-mineral on number of branches per plant during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	3.920	4.137	4.029	3.933	4.150	4.041	3.946	4.163	4.054
Compost	2.798	4.010	3.404	2.810	4.022	3.416	2.823	4.035	3.429
Poultry manure	3.750	4.727	4.239	3.763	4.740	4.251	3.776	4.753	4.264
½ NPK + compost	5.007	6.345	5.676	5.019	6.357	5.688	5.032	6.370	5.701
½ NPK + poultry manure	4.012	5.132	4.572	4.025	5.145	4.585	4.038	5.158	4.598
Mean	3.897	4.871		3.910	4.883		3.923	4.896	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	**	0.123		**	0.095		**	0.111	
AB	**	0.341		**	0.412		**	0.365	

**** significant at 0.01 probability level.**

Also, potato plants which fertilized by ½ NPK + compost produced the maximum number of branches per plant (5.676, 5.688 and 5.701 branch in the first, second and third seasons respectively). These results are in agreement with those obtained by Gunasena and Harris (1971); Shafeek *et al*. (2001) and Ayoola and Makinde (2007).

In addition, the interaction between ½ NPK + compost application on Burren cultivar produced the highest mean values of 6.345, 6.357 and 6.370 branch per plant in the first, second and third seasons respectively. These results are harmony with those obtained by Gunasena and Harris (1971); Shafeek *et al* (2001) and Love *et al.* (2005).

3-Plant fresh weight (g):

The obtained data in Table (6) show that the studied potato cultivars, organo-mineral fertilization and their interaction had a significant influence on the plant fresh weight in all seasons. Thus, the heaviest plant fresh weight was obtained from Burren cultivar (213.50, 216.50 and 220.10 g in the first, second and third seasons respectively). This may be due to the superiority of Burren cultivar with regard to plant height and number of branches per plant which considered the essential source of Photosynth which led to an increment of plant fresh weight. These results are matched those obtained by Gunasena and Harris (1971); Wurr *et al*. (1992) and Alsharari *et al*. (2007).

Furthermore, organo-mineral fertilization (½ NPK +compost) enhanced significantly plant fresh weigh in all seasons (172.10, 171.80 and 174.90 g in the first, second and third seasons respectively) compared to NPK or organic manures alone. This may be due to the role of organic manures on improving soil physical and chemical properties and to effect readly available mineral nutrient which were important vigorous growth through cell division and elongation. These results are agreement with those obtained by Souza *et al*. (2008) and El-Sayed *et al.* (2010).

In addition, the heaviest fresh weight per plant (223.10, 222.80 and 226.00 g in the first, second and third seasons respectively) was obtained from cultivated Burren cultivar which were fertilized with ½ NPK + compost. These results are good accordance with those obtained by Gunasena and Harris (1971); Shafeek *et al*. (2001) and Love *et* a*l*. (2005).

Table 6. Effect of cultivars and organo-mineral on plant fresh weight (g) during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	111.2	211.1	161.1	116.0	215.0	165.5	115.0	219.0	167.0
Compost	102.8	202.7	152.7	109.1	207.8	158.4	107.8	212.4	160.1
Poultry manure	110.7	214.7	162.7	112.0	218.1	165.1	118.1	221.4	169.8
½ NPK + compost	121.1	223.1	172.1	120.8	222.8	171.8	123.8	226.0	174.9
poultry manure½ NPK +	116.1	216.0	166.1	114.5	219.0	166.8	119.1	221.8	170.4
Mean	112.4	213.5		114.5	216.5		116.7	220.1	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	*	2.13		*	4.12		*	2.85	
AB	**	2.78		**	4.33		**	3.15	

***,** significant at 0.05 and 0.01 probability level respectively.**

4-Averege tuber weight (g):

Both mineral and organic fertilizers and their interaction in the three seasons (Table 7) significantly affected potato tuber weight. Burren potato cultivar produced the highest value of tuber weight (140.04, 142.08 and 146.00 g in the first, second and third seasons respectively). This may be due to the superiority of Burren cultivar with regard to plant height and number of branches per plant which considered the essential source of Photosynth which led to an increment of metabolism translocated into tuber as a sink source theory. These results are in agreement with those obtained by Ashour and Sarhan (1998) and Vaezzadeh and Naderidarbaghshahi (2012).

Moreover, organo-mineral fertilization (½NPK+ compost) enhanced significantly tuber weight in all seasons compared to NPK or organic manures alone (116.00, 117.80 and 122.65 g in the first, second and third seasons respectively). This may be due to the role of available nutrients in increment carbohydrate synthetic which reflect on tuber weight. These results are in harmony with those obtained by Sud *et al.* (1992); Vaezzadeh and Naderidarbaghshahi (2012) and Amir *et al*. (2013).

Also, Burren cultivar fertilized by ½ NPK + compost produced the heaviest tubers weight of 146.70, 149.20 and 155.80 g in the first, second and third seasons respectively. While, the lightest tuber weight (69.80, 71.60 and 73.20 g in the first, second and third seasons respectively) were obtained from Rosetta cultivar fertilized with compost only in all seasons. These results are in good accordance with those obtained by Gunasena and Harris (1971); Giardini *et al*. (1992); Vaezzadeh and Naderidarbaghshahi (2012) and Amir *et al*. (2013).

Table 7. Effect of cultivars and organo-mineral on average tuber weight (g) during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	76.40	141.60	109.00	78.60	143.70	111.15	80.10	147.10	113.60
Compost	69.80	131.50	100.65	71.60	132.60	102.10	73.20	135.60	104.40
Poultry manure	71.60	137.10	104.35	72.50	138.60	105.55	75.60	140.20	107.90
½ NPK + compost	85.30	146.70	116.00	86.40	149.20	117.80	89.50	155.80	122.65
½ NPK + poultry manure	82.60	143.30	112.95	83.10	146.30	114.70	85.30	151.30	118.30
Mean	77.14	140.04		78.44	142.08		80.74	146.00	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	*	1.302		**	2.123		**	3.125	
AB	**	3.756		**	4.634		**	6.943	

***,** significant at 0.05 and 0.01 probability level respectively.**

5- Total tubers yield (ton/fed):

The data in Table (8) showed that there was significant effect on tubers yield in all seasons. Burren cultivar surpassed Rosetta produced the highest mean values of tubers yield of 6.92, 7.45 and 8.68 ton/fed in the first, second and third seasons respectively. This match the single tuber weight and consequently produced high tuber yield per feddan. Similar results were obtained by Arzani (2001) and Belhjati *et al*. (2013).

Also, potato plants which fertilized by ½ NPK + compost produced the highest tuber yield of 7.18, 8.10 and 8.12 ton/fed in the first, second and third seasons respectively. This is to be expected since the same fertilizer treatment produced the heaviest tuber weight and consequently produced the highest tuber yield. These results are in concordance with obtained by Shafeek *et al.* (2001); Arancon *et al.* (2003); Tu *et al.* (2006) and Amir *et al.* (2013).

Furthermore, the interaction between ½ NPK + compost with Burren cultivar produced the highest mean values of 7.62, 8.88 and 8.89 ton/fed in the first, second and third seasons respectively. This is to be expected since the same trend was true regard to tuber weight. These results are in agreement with obtained by Giardini *et al* (1992); Bélanger *et al* (2000); Khan *et al*. (2000) and Shafeek *et al.* (2001).

Table 8. Effect of cultivars and organo-mineral on total tuber yield (ton/fed) during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	5.65	6.92	6.28	6.20	7.27	6.74	6.31	7.44	6.87
Compost	5.12	6.15	5.64	5.73	6.61	6.17	6.20	7.16	6.68
Poultry manure	5.39	6.41	5.90	5.89	6.94	6.42	6.15	7.09	6.62
½ NPK + compost	6.74	7.62	7.18	7.32	8.88	8.10	7.35	8.89	8.12
½ NPK + poultry manure	6.27	7.47	6.87	6.36	7.53	6.94	6.76	8.12	7.44
Mean	5.84	6.92		6.30	7.45		6.88	8.68	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	**	0.722		**	0.485		**	0.581	
AB	**	1.022		**	0.764		**	0.682	

**** significant at 0.01 probability level.**

6- Marketable tuber yield (ton/fed):

Collected data in Table (9) focus that studied potato cultivars, organo-mineral fertilization and their interaction had a significant effect on marketable tubers yield in all seasons. Burren cultivar surpassed Rosetta one in this respect and produced the highest mean values of marketable tubers yield (5.60, 6.08 and 6.14 ton/fed in the first, second and third seasons respectively. This is to be logic since the same cultivar surpassed the other one with regard to tuber weight and consequently surpassed in marketable tuber yield (ton/fed). These results are agreement with obtained by Gunasena and Harris (1971).

Also, potato plants which fertilized by ½ NPK + compost produced the highest marketable tuber yield of 5.89, 6.69 and 6.45 ton/fed in the first, second and third seasons respectively. This is to be expected since the same fertilizer treatment produced the heaviest tuber weight and consequently produced the highest marketable tuber yield. These results are in agreement with obtained by Khan *et al*. (2000). Shafeek *et al* (2001). Arancon *et al.* (2003) and Tu *et al.* (2006).

Furthermore, the interaction between ½ NPK + compost with Burren cultivar produced the highest marketable tuber yield of 6.25, 7.33 and 7.06 ton/fed in the first, second and third seasons respectively. This is to be expected since the same trend was true regard to tuber weight. These results are in agreement with those obtained by Giardini *et al.* (1992); Bélanger *et al.* (2000). Shafeek *et al.* (2001) and Amir *et al. (*2013).

Table 9. Effect of cultivars and organo-mineral on marketable tuber yield (ton/fed) during the three growing seasons.

Seasons	2014-2015			2015-2016			2016-2017		
Cultivars / Treatments	Rosetta	Burren	Mean	Rosetta	Burren	Mean	Rosetta	Burren	Mean
NPK	4.52	5.53	5.03	5.03	5.89	5.46	4.97	5.87	5.42
Compost	4.25	5.11	4.68	4.77	5.51	5.14	5.01	5.78	5.40
Poultry manure	4.26	5.06	4.66	4.71	5.58	5.15	4.74	5.42	5.08
½ NPK + compost	5.53	6.25	5.89	6.04	7.33	6.69	5.84	7.06	6.45
½ NPK + poultry manure	5.08	6.05	5.57	5.16	6.08	5.62	5.47	6.60	6.03
Mean	4.73	5.60		5.14	6.08		5.20	6.14	
	F value	LSD at 0.05		F value	LSD at 0.05		F value	LSD at 0.05	
A (cultivars)	**	---		**	---		**	---	
B (organo-minerals)	**	0.180		*	0.187		**	0.177	
AB	**	0.468		**	0.473		**	0.484	

***,** significant at 0.05 and 0.01 probability level, respectively.**

CONCLUSION

The results of the study showed that Under EL-Dakhla Oasis New Valley conditions, Burren cultivar gave the highest mean values in all studied traits compared to Rosetta cultivar. Furthermore, the organo-mineral fertilization produced the highest yield compared to NPK or organic manures alone. The mixed fertilizer treatment was the best for potato production, which could be interpreted as the release of nutrients from organic and inorganic fertilizers at different times. Combined applications of organic and inorganic sources of nutrients are more productive and sustain soil fertility. Also, the highest yield was obtained from Burren cultivar which fertilized with ½ NPK + compost followed by ½ NPK +

poultry manure. Because the experimental soil texture was sandy loam and surface irrigation was used, the applied chemical fertilizers will be leached below the plants root zone. Also applying organic matter plus NPK well help in conserving the moisture and nutrient in the root zone which will be reflected in higher yield (Busscher *et al*., 2007).

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تأثير التسميد العضوى - المعدنى على النمو الخضري وإنتاجية محصول البطاطس تحت ظروف الوادى الجديد

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تحت ظروف واحة الداخلة - محافظة الوادى الجديد. أجريت هذه التجربة خلال مواسم شتاء 2014-2015 ، 2015-2016 ، 2016- 2017 وذلك لدراسة تأثير التسميد العضوى - المعدنى (السماد النتراتى الفوسفاتى البوتاسى، الكمبوست، زرق دواجن، نصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + الكمبوست، نصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + زرق دواجن) على النمو الخضرى وإنتاجية محصول البطاطس لصنفى (روزيتا، برن). وكانت كمية السماد المضافة بمعدل 300 كجم للفدان نترات امونيوم 33.5 % وسوبر فوسفات (15.5 % أكسيد فسفور) بمعدل 387 كجم للفدان وسلفات البوتاسيوم (50% أكسيد بوتاسيوم) بمعدل 200 كجم للفدان. وتم إضافة الكمبوست بمعدل 11 طن للفدان وزرق الدواجن بمعدل 4طن للفدان (وهذه الكميات تحتوي على نفس معدل النيتروجين في السماد المعدنى). وتم إضافة نصف الكمية من السماد النتراتى الفوسفاتى البوتاسى عند خلطه مع الكمبوست او زرق الدواجن. كما استخدم الرى السطحى في هذه التجربة. وكان تصميم التجربة باستخدام القطع المنشقة مرة واحدة فى قطاعات كاملة العشوائية فى أربع مكررات حيث وضعت الاصناف فى القطع الرئيسية بينما وضعت الخمس معاملات من التسميد في القطع الشقية. أظهرت النتائج المتحصل عليها ان جميع الصفات تأثرت معنويا بعوامل التجربة المدروسة والتداخل بينها. حيث وجد أن الصنف برن تفوق على الصنف روزيتا في جميع الصفات المدروسة. كما وجد أن استخدام نصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + الكمبوست كانت أفضل معاملة فى جميع الصفات المدروسة. كما تفوق السماد العضوى المعدنى على كلا من السماد النتراتى الفوسفاتى البوتاسى والكمبوست وزرق الدواجن بمفرده. كما أعطى الصنف برن المسمد بالسماد العضوى المعدنى (نصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + الكمبوست) أعلى القيم لكل الصفات المدروسة تحت ظروف الوادى الجديد. وتوصى التجربة انه تحت ظروف الوادى الجديد للحصول على أفضل نمو خضرى وإنتاجية من البطاطس يسمد الصنف بيرن بالسماد العضوى المعدنى (بنصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + الكمبوست) يليه معاملة التسميد بالسماد العضوى المعدنى (بنصف المعدل من السماد النتراتى الفوسفاتى البوتاسى + زرق الدواجن) مقارنة باستخدام ايأ من السماد العضوى او المعدنى بمفرده.