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THE INFLUENCE OF ORGANIC AND MINERAL FERTILIZATION ON GROWTH, YIELD AND QUALITY OF POTATO CROP.

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ABSTRACT

Two field experiments were carried out during the two successive fall (nili) seasons of 2003/2004 and 2004/2005 on potato cv. Spunta at Abou Awad village, Aga, Dakahlia Governorate, to study the influence of organic manures (farmyard biogas and chicken), and mineral fertilizers NPK at the recommended rates fed. in alone and/or combined application, on growth, yield and quality of potato crop.

The results revealed that addition 50% of chicken manure combined with 50% mineral fertilizers (NPK) gave the highest values of vegetative growth characteristics (plant height, number of main stems/plant, chlorophyll content and foliage fresh and dry weight (%) at 75 days after planting (DAP), total tubers yield t/fed., number of tubers/plant, tubers average weight, tubers dry matter (%) and specific gravity at harvest in both seasons.,

Application of mineral fertilization at recommended full rates of NPK gave the highest content of NPK in leaves at 75 DAP and tubers at harvesting in both seasons. On the other hand, the lowest content of nitrate (ppm) in tubers was obtained from plants received farmyard manure alone.

Therefore, organic manure must be used as a substitute for chemical fertilizers requirements in potatoes production especially for exportation and also, reduce the risks of environmental pollution.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important vegetable crops cultivated in Egypt for local consumption and exportation. Improving the quality of potatoes for exportation is the main aim of potato growers.

It is well known that addition of organic fertilizers is principal that plays an extraordinary role in the cultivation of potato, not only as a source of nutrients, but also an improving agent to the physical and chemical properties of the soil (Sujatha and Krishnappa, 1995). Therefore, the use of both organic and inorganic fertilizers in appropriate proportion assumes special significance as complementary and supplementary to each other in crop production.

With regard to the effect of farmyard manure (FYM) on vegetative growth characteristics and yield. Sharma (1994); Karadogan (1996); Merghany (1998); Arisha and Bardisi (1999); and El-Fakhrani (1999) found that organic manures had a significant stimulative effect on growth characteristics and tubers yield of potato crops.

Kolbe *et al.* (1995) observed that continued organic fertilizer application led to about 10% to 20% higher tubers yield. Selvi and Selvanseelan (1999) reported that potato tuber yield increased 20% when FYM was applied with 100% of the recommended NPK rate. El-Banna and Abd El-Salam (2000); Awad *et al.* (2002) obtained that potato tubers yield

and dry matter increased significantly with application of FYM. Also, Abd El-Kader (2002) found that total yield., marketable yield/fed., number and weight of tubers significantly increased with 30m^3/fed FYM with NPK fertilizers at rate 90N, 85 P_2O_5 and 170 K_2O kg/fed. Das and Banerjee (1996) reported that fertilizing with 160 kg N + 100 kg P_2O_5 + 100 kg K_2O and 50 t/ha FYM caused maximum total uptake of N, P and K. Galeev (1996) obtained that combined FYM and NPK application gave good tubers quality. while Singh *et al.* (1996) reported that the application of 15 t/ha FYM + 100 kg P_2O_5 was more effective on tuber yield than using FYM alone. Lape and Thakvenka (1999) reported that highest crop yield (23.5 t/ha) was achieved with a treatment of 60: 40: 120 N, P_2O_5, K_2O /ha with 70 t/ha cattle manure. Eiecharczyk and Malecka (2000) found that potato yields were increased by fertilizer application and were greatest with FYM + NPK.

Zaghloul (2002) observed that growth characteristics of the potato plants were significantly increased with biogas manure application in combination with potato tuber inoculation with phosphate solubilizing bacteria, also, he mentioned that tuber yield/fed. was higher with Azotobacter and Azospirillum and biogas manuring treatments than ammonium sulfate application.

Abou- Hussen (1995) declared that using chicken manure (10 m^3/fed.) in sand soil increased vegetative growth of potato crop. In addition of, applying cattle manure at a rate of 30 m^3/fed. combined with 10 m^3/fed. chicken manure gave the highest yield.

Abdel-Ati (1998) reported that increasing chicken manure application rate up to 15 m^3/fed. increased plant height and number of branches/potato plant and contents NPK percentage in the leaves. He, also showed that chicken manure application with phosphorus increased contents of N, P and K in leaves and tubers.

Deka and Dutta (1998) and El-Sawy *et al.* (2000) found that total yield was significantly increased with increasing NPK levels.

The main purpose of this research is to study the influence of organic and mineral fertilization on growth, yield and quality of potato crop.

MATERIALS AND METHODS

Two field experiments were carried out during fall (nili) seasons of 2003/2004 and 2004/2005 at Abou Awad village region, Aga, Dakahlia Governorate.

Some physical and chemical properties of the experimental soil were presented in Table (1) and Chemical analysis of the organic manures at Table(2).

Chemical analysis of the organic manure was determined by using standard methods described by (AOAC, 1990).

Table(1): Some Physical And Chemical Properties Of The Experimental Soil At The Depth Of 0-30 Cm.

Sand%	Silt%	Clay%	Texture	O.M.	EC dSm^{-1}	pH	Available (ppm)		
							N	P	K
26.2	23.8	48.5	Clay loam	1.5	1.46	7.42	26.8	15	160

Table (2): Some Chemical analysis of the various organic manures.

Manure sources	Macro- elements			Micro- elements (ppm)			
	N (%)	P (ppm)	K (ppm)	Fe	Zn	Mn	Cu
FYM	0.75	536	408	162	78	84.6	14.8
Chicken manure	2.00	625	640	364	194	180.5	23.3
Biogas manure	1.20	568	575	248	136	116.5	18.0

The experimental design was a randomized complete blocks (RCB) with three replicates. Each plot was comprised of 3 ridges, 5m long and 75 cm wide, each individual plot was $15m^2$. Potatoes seed tubers of the cultivar Spunta, was used and planted in rows (75cm) at 25 cm spacing between plants. Planting dates were 6 and 9 of October in the two seasons and were harvested 105 days from planting dates in both seasons.

The experimental treatments of organic and mineral fertilizers in single and/or combined application were conducted as follows:

1-100% mineral fertilization recommended full rate of NPK at the rate 180 kg N + 75 kg P_2O_5 + 96 kg K_2O/fed.
2-100% farmyard manure (FYM) at the rate (24ton/fed).
3-100% chicken manure (Ch.M) at the rate (9ton/fed).
4-100% biogas manure (B.M) at the rate (15ton/fed).
5-50% farmyard manure (12 ton/fed) + 50% NPK(90kgN+ 37.5 kgP_2O_5+ 48kg K_2O).
6-50% chicken manure(4.5 ton/fed) + 50% NPK (N90 gN+37.5 kg P_2O_5+ 48kg K_2O).
7-50% biogas manure(7.5 ton/fed) + 50% NPK (N90kgN+ 37.5kgP_2O_5+ 48kg K_2O).
8- 50% farmyard manure + 50% chicken manure.
9- 50% farmyard manure + 50% biogas manure.
10- 50% chicken manure + 50% biogas manure.
11- 1/3farmyardmanure(8t/fed)+1/3chickenmanure(3t/fed)+1/3biogas manure(5t/fed).

Nitrogen as ammonium nitrate (33.5%N) was added at three equal portion at 3, 5 and 7 weeks after planting super phosphate (P_2O_5 15.5%) was applied once during the soil preparation .

potassium sulfate (48% K_2O) was added two equal portion at 3and 7 weeks after planting .

Organic manures (Farmyard manure, chicken manure and biogas manure) were spread and thoroughly mixed with the surface soil layer (0-20 cm) before planting during the soil preparation.

Data recorded:

Vegetative growth characteristics:

Five plants from each treatment were taken randomly after 75 days after planting (DAP) for measuring the vegetative growth parameters, i.e. plant height (cm), number of main stems/plant, chlorophyll contents were determined by a Minolta SPAD chlorophyll meter (Yadava, 1986). Chlorophyll reading were taken on 5^{th} leaf from the plant apex foliage fresh weight (g)/plant, and dry weight/plant (%).

Yield and its components:

At harvesting (105) days after planting the total tubers yield (ton/fed.), number of tubers/plant and average tuber weight (g)/plant were determined.

Tubers quality:

At harvest, random samples of tubers were dried at 70 °c till constant weight for dry matter (%) determination.

Specific gravity of tubers was estimated by the following formula, according to Schippers (1968).

$$\text{Specific gravity (SG)} = \frac{\text{tuber weight in air}}{\text{tuber weight in air- tuber weight in water}}$$

Nitrate content in tubers (ppm dry weight basic) estimated was determined as described by Singh (1988).

Chemical composition:

The mineral content N, P and K were determined by taken a sample of the fourth leaf from the plant apex at 75 days after planting and tubers at harvesting time.

Nitrogen was determined by micro- keelhaul method. Phosphorous was determined calorimetrically as described by Jackson (1967). Potassium was determined by using a flame photometer (Jackson, 1967).

Statistical analysis:

All obtained data were statistically analyzed according to Snedecor and Cochran (1982). The means were compared using Duncan's multiple range test as published by Duncan.

Economic evaluation:

based on yield of both seasons, addition net return was estimated.

RESULTS AND DISCUSSION

1- Vegetative growth characteristics:

Data in Table (3) revealed that plant height, foliage fresh weight and foliage dry weight percentage at 75 days after planting (DAP) were significantly affected in both seasons, except number of main stems per plant and chlorophyll content in the first season. Whereas, applying 50% chicken manure and 50% (NPK) gave the highest values of plant height, number of main stems per plant, chlorophyll content, foliage fresh weight and foliage dry weight percentage compared with other treatments. This attributed to the improvement of physical conditions of the soil and supplying plant with nutrients, thus benefiting plant growth (Abou Hussen, 1995 ; Rechcigl, 1995; and Abdel Ati, 1998).

The response of potato plants to organic fertilizers differed from one kind of manure to the other according to chemical composition of the different manures and/or due to rapid releasing of essential nutrients from mineral fertilizers to plant these results are in agreement with reported by Das and Banerjee (1996). Rizk (2001).

2- Yield and its components:

Data presented in Table (4) show that total tubers yield ton/fed. and number of tubers per plant were significantly affected by different treatments.

Table (3): Vegetative growth characteristics as affected by organic and mineral fertilization during the two fall seasons 2003 and 2004.

Characteristics / Treatments	Season 2003					Season 2004				
	Plant height (cm)	Number of main stems/plant	Chlorophyll (SPAD)	Foliage F.W. (g) /plant	Foliage D.W. (%)	Plant height (cm)	Number of main stems/ plant	Chlorophyll (SPAD)	Foliage F.W. (g) /plant	Foliage D.W. (%)
100% mineral fertilization (NPK)	57.44abc	2.00a	54.13 a	298.93 bc	11.28 de	61.66 ab	1.78 b	55.87 ab	312.20 ab	11.31 cd
100%Farm yard manure YM)	52.89c	2.11a	49.15 a	251.27 e	10.62 e	54.22 b	1.77 b	49.48 b	257.57 d	10.77 d
100%Chicken manure (Ch.M)	55.33bc	2.77a	52.37 a	284.87 cd	11.15 de	58.66 ab	2.66 a	52.12 ab	288.10 bcd	11.13 cd
100%Biogas manure (B.M)	52.00c	2.33a	50.73 a	270.90 d	10.80 e	54.66 b	2.22 ab	50.95 b	273.77 cd	10.99 cd
50%FYM+50%NPK	57.55abc	2.44a	53.50 a	309.23 ab	12.40 c	59.89 ab	2.33 ab	54.20 ab	314.60 ab	12.44 b
50%Ch.M+50%NPK	64.11a	3.00a	59.00 a	319.50 a	14.19 a	67.55 a	2.66 a	60.28 a	331.27 a	14.17 a
50%Bio.M+50%NPK	62.33ab	2.66a	55.95 a	296.50 bcd	13.17 b	64.78 a	2.33 ab	55.62 ab	303.17 abc	12.55 b
50%FYM+50%Ch.M	55.22bc	2.22a	54.23 a	280.50 cd	11.40 de	60.77 ab	2.11 ab	54.55 ab	286.03 bcd	11.33 cd
50%FYM+50%Bio.M	53.33c	2.44a	52.60 a	274.93 cd	11.08 de	59.33 ab	2.33 ab	52.58 ab	280.50 bcd	11.25 cd
50%Ch.M+50%Bio.M	58.77 abc	2.66a	51.27 a	273.70 cd	11.35 de	59.44 ab	2.44 ab	52.70 ab	277.13 cd	11.35 cd
$^1/_3$FYM+$^1/_3$Ch.M+$^1/_3$Bio.M	59.33abc	2.55a	54.07 a	277.70 cd	11.82 d	60.77 ab	2.22 ab	54.90 ab	284.40 bcd	11.85 bc
LSD (5%)	5.1401	NS	NS	16.7394	0.5824	5.8135	0.4940	5.2693	22.0288	0.5993

Means followed by a common letter(s) in the same column not differ significantly duncan's multiple rang test at 5% levels.

Table (4): Total tubers yield and its components as affected by organic and mineral fertilization during the two fall seasons 2003 and 2004.

Characteristics / Treatments	Season 2003			Season 2004		
	Total Yield (t/fed)	Number of tubers/plant	Tuber weight (g) /plant	Total Yield (t/fed)	Number of tubers/plant	Tuber weight (g) /plant
100% mineral fertilization (NPK)	9.730 d	3.93 ab	465.1 d	11.28 c	4.43 c	490.2 d
100%Farm yard manure (FYM)	7.840 h	3.30 c	362.1 g	8.770 f	3.53 e	372.7 g
100%Chicken manure (Ch.M)	9.410 de	3.88 abc	461.8 d	10.74 d	4.15 cd	475.2 d
100%Biogas .manure (B.M)	8.980 ef	3.73 bc	433.7 e	10.19 d	3.82 de	444.8 e
50%FYM+50%NPK	10.680 c	3.98 ab	515.6 c	11.88 b	4.85 b	530.1 c
50%Ch.M+50%NPK	12.360 a	4.41 a	603.3 a	13.56 a	5.30 a	623.2 a
50%Bio.M+50%NPK	11.130 b	4.20 ab	572.6 b	12.34 b	5.10 ab	583.5 b
50%FYM+50%Ch.M	8.520 fg	3.67 bc	400.2 f	9.210 ef	3.83 de	411.6 f
50%FYM+50%Bio.M	8.200 gh	3.67 bc	376.8 g	7.880 g	3.43 e	383.6 g
50%Ch.M+50%Bio.M	8.900 ef	3.86 abc	431.6 e	9.580 e	3.68 de	448.1 e
$^1/_3$FYM+$^1/_3$Ch.M+$^1/_3$Bio.M	8.820 f	3.83 abc	418.5 ef	10.21 d	4.03 cd	433.4 e
LSD (5%)	0.4232	0.3851	21.327	0.5108	0.3327	20.230

Means followed by a common letter(s) in the same column not differ significantly duncan's multiple rang test at 5% levels.

Whereas, the plant which supplied with 50% chicken manure mixture with 50% NPK gave the highest tubers yield followed by biogas 50% mixture with 50% NPK in both seasons. The increase over the inorganic fertilizers (100% NPK) were by 21.28%, 12.57 in 1st season and 16.81, 8.59 in 2nd season for both superiority treatments, respectively. These increments might due to that organic materials encourage the haulm growth, which increases the photosynthetic rates leading to an increase of the assimilation rates. So that the tuber weight and tuber size increased, which increased the total yield. Similar results have been found by Ifenkwe *et al.* (1992); Abou-Hussein (1995); Kolbe *et al.* (1995); Abdel-Ati (1998); Ashour and Sarhan (1998); Abou-Hussein *et al.* (2002); and Nicholson *et al.* (2003).

3-Tuber quality:

Data in Table (5) reveal that tubers dry matter percentage and specific gravity increased significantly in both seasons. The highest values in this respect were obtained by 50% chicken manure combination with 50% NPK. These results could be attributed to effect of organic manure and NPK on increasing nutrient elements and activity of photosynthesis which lead to accumulation of metabolites in the reproductive organs and this reflects on the tuber dry matter content. These results are in agreement with those reported by Kolbe *et al.* (1995); Arisha and Bardisi (1999); Rizk (2001); Abou-Hussein (2002). In this respect Schippers (1976) reported that there were relationships between specific gravity and dry matter contents in tubers.

Data in the same table indicated that nitrate content in the fresh tubers affects by various treatments. The lowest level of nitrate in potatoes when using 100% farmyard manure in both seasons, respectively. While, the highest level of nitrate was obtained by using of mineral fertilizer (100%NPK).The steady release of nitrogen form organic manures may have taken up mainly in the form ammonium relatively slow release which probably caused low nitrate contents of the tubers (Kolble *et al.*, 1995; Ashour and Sarhan 1998; Abou-Hussein *et al.*, 2002 and Awad, 2002).

4-Mineral composition:

Data in Table (6) clearly indicate that mineral fertilization significantly increased N, P and K percentage in leaves and tubers compared with other treatments. The highest values of nitrogen, phosphorus and potassium percentage in leaves and tubers were found in plants which fertilized with 100% mineral fertilizer in both season, while the lowest percentage were found in the treatments which treated with farmyard manure only.

The increment uptake of N, P and K in the leaves and tubers may be due to higher availability of the nutrients with increase in the fertilizer application which ultimately resulted in better root growth and increased physiological activity of roots to absorb the nutrients. Veeranna *et al.*, (1997).

Table (5): N, P and K contents in leaves and tubers as affected by organic and mineral fertilization during the two fall seasons 2003 and 2004.

Characteristics / Treatments	Season 2003						Season 2004					
	N% in Leaves	P% in Leaves	K% in Leaves	N% in Tubers	P% in Tubers	K% in Tubers	N% in Leaves	P% in Leaves	K% in Leaves	N% in Tubers	P% in Tubers	K% in Tubers
100% mineral fertilization (NPK)	2.81 a	0.48 a	3.04 a	1.91 a	0.40 a	1.88 a	2.86 a	0.52 a	2.99 a	2.13 a	0.42 a	1.78 a
100%Farm yard manure (FYM)	1.55 g	0.19 g	1.58 i	1.19 f	0.18 d	1.13 e	1.58 f	0.22 f	1.54 f	1.22 e	0.19 e	1.18 d
100%Chicken manure (Ch.M)	1.93 d	0.24 f	1.71 hi	1.35 de	0.23 cd	1.25 cde	1.95 d	0.23 f	1.77 e	1.38 d	0.24 de	1.28 cd
100%Biogas manure (B.M)	1.73 ef	0.24 f	1.83 gh	1.28 e	0.19 d	1.18 de	1.76 e	0.43 b	1.81 e	1.31 de	0.21 e	1.21 d
50%FYM+50%NPK	2.11 c	0.31 de	2.33 cd	1.58 c	0.30 b	1.45 c	2.16 c	0.31 de	2.37 c	1.60 c	0.31 bc	1.54 bc
50%Ch.M+50%NPK	2.52 b	0.42 b	2.63 b	1.75 b	0.33 b	1.68 b	2.53 b	0.43 b	2.66 b	1.82 b	0.33 b	1.72 a
50%Bio.M+50%NPK	2.22 c	0.37 c	2.43 c	1.72 b	0.31 b	1.43 c	2.21 c	0.36 c	2.48 c	1.75 b	0.30 bc	1.47 cd
50%FYM+50%Ch.M	1.78 e	0.30 de	2.13 e	1.41 d	0.28 bc	1.31 cde	1.82 e	0.30 e	2.17 d	1.44 d	0.27 cd	1.34 cd
50%FYM+50%Bio.M	1.60 fg	0.28 e	1.93 fg	1.41 d	0.22 cd	1.27 cde	1.59 f	0.31 e	2.01 d	1.42 d	0.23 de	1.27 cd
50%Ch.M+50%Bio.M	1.71 ef	0.33 d	2.06 ef	1.43 d	0.23 cd	1.32 cde	1.80 e	0.35 cd	2.10 d	1.47 cd	0.23 de	1.33 cd
$^1/_3$FYM+$^1/_3$Ch.M+$^1/_3$Bio.M	1.79 e	0.33 d	2.23 de	1.45 d	0.28 bc	1.36 cd	1.74 e	0.33 cde	2.31 c	1.47 cd	0.27 cd	1.35 cd
LSD (5%)	0.1139	0.0318	0.1571	0.0868	0.0407	0.1328	0.1198	0.0293	0.1409	0.1173	0.0337	0.1804

Means followed by a common letter(s) in the same column not differ significantly duncan's multiple rang test at 5% levels.

Table (6): Tubers dry matter specific gravity and nitrate contents as affected by organic and mineral fertilization during the two fall seasons 2003 and 2004.

Characteristics / Treatments	Season 2003			Season 2004		
	Tuber Dry matter (%)	Specific gravity	Nitrate Content (ppm)	Tuber Dry matter (%)	Specific gravity	Nitrate Content (ppm)
100% mineral fertilization (NPK)	18.17 g	1.082 d	68.07 a	18.20h	1.083 c	72.10 a
100%Farm yard manure (FYM)	19.13 f	1.067 g	30.27 h	19.18g	1.068 d	31.10 e
100%Chicken manure (Ch.M)	19.92 de	1.071 f	35.63 fg	19.82 ef	1.071 d	35.95 d
100%Biogas .manure (B.M)	19.50 ef	1.071 f	33.13 gh	19.53 gf	1.072 d	34.01 de
50%FYM+50%NPK	21.70 b	1.086 c	51.17 c	21.62 c	1.088 b	52.93 b
50%Ch.M+50%NPK	22.30 a	1.094 a	56.43 b	22.48 a	1.096 a	56.80 b
50%Bio.M+50%NPK	22.07 ab	1.091 b	52.15 c	21.87 b	1.092 a	53.07 b
50%FYM+50%Ch.M	21.57 b	1.082 d	41.23 e	21.62 c	1.083 c	42.32 c
50%FYM+50%Bio.M	20.03 de	1.081 de	38.12 f	20.18 de	1.082 c	41.10 c
50%Ch.M+50%Bio.M	20.25 cd	1.078 e	44.07 de	20.39 d	1.081 c	44.93 c
$^1/_3$FYM+$^1/_3$Ch.M+$^1/_3$Bio.M	20.63 c	1.079 de	45.70 d	20.46 d	1.078 c	45.90 c
LSD (5%)	0.4436	0.00239	3.0714	0.3912	0.00362	3.6779

Means followed by a common letter(s) in the same column not differ significantly duncan's multiple rang test at 5% levels.

5-Economic evaluation:

Results in Table (7) show that the maximum net return(490 and 468 L.E/fed) were obtained with application 50%chicken manure(4.5ton/fed.) combination with 50%mineral fertilization(90kg N +37.5kg P_2O_5+48 kg K_2O /fed.) followed by biogas manure(6 ton/fed.) plus 50 %mineral fertilization comparison with other treatments respectively , the treatment 100%mineral fertilization (180 kg N +75kg P_2O_5+ 96 kg K_2O /fed.) is considered a base for economic evaluation.

Table(7):Estimated of additional net return for treatments.

Characteristics / Treatments	Tuber yield (t/fed)*	Addi. yield (t/fed)	Total cost L.E/fed	Addi. cost L.E/fed**	Addi. gross retun	Addi. Net retun L.E/fed	Order
100% mineral fertilization (NPK)	10.505	0	4365	1365	---	---	11
100%Farm yard manure(FYM)	8.305	-2.2	3560	560	1320	-760	9
100%Chicken manure (Ch.M)	10.07	-0.43	3600	600	258	-315	8
100%Biogas .manure (B.M)	9.585	-0.92	3565	565	552	-13	5
50%FYM+50%NPK	11.280	+0.775	3963	963	495	+468	2
50%Ch.M+50%NPK	12.960	+2.455	3983	983	1473	+490	1
50%Bio.M+50%NPK	11.735	+1.230	3968	966	738	+230	3
50%FYM+50%Ch.M	8.865	-1.640	3580	580	984	-404	9
50%FYM+50%Bio.M	8.040	-2.465	3565	565	1479	-914	10
50%Ch.M+50%Bio.M	9.240	-1.265	3585	585	351	-234	7
$^1/_3$FYM+$^1/_3$Ch.M+$^1/_3$Bio.M	9.515	-0.990	3577	577	594	-17	6

***Tuber yields as average of two seasons.**

****Additional cost was calculated to the following price of N=L.E 3.56kg, Price of P_2O_5 = L.E 3.67/kg. price of K_2O = L.E 4.7/kg. FYM = L.E 25.5/ton, Ch.M = L.E 66/ton, Bio.M = L.E 30/ton and price produce = L.E. 600/ton**

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تأثير التسميد العضوى والمعدنى على النمو والمحصول والجودة فى محصول البطاطس

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أجريت تجربتان حقليتان خلال موسمين نيليين ناجحين ٢٠٠٣/٢٠٠٤ و٢٠٠٤/٢٠٠٥ على محصول البطاطس صنف اسبونتا بقرية أبو عوض – أجا – بمحافظة الدقهلية، لدراسة تأثير بعض الأسمدة العضوية (سماد مواشى –سماد الدواجن – سماد البيوجاز) مع التسميد المعدنى (نيتروجين وفوسفور وبوتاسيوم) بالمعدل الموصى به (١٨٠ كجم ن/ فدان + ٧٥ كجم فو٢أ٥/فدان + ٩٦ كجم بو٢أ / فدان) كل بمفرده أو خليط فيما بينهم ،وتأثير ذلك على النمو والمحصول والجودة فى محصول البطاطس.

ولقد أوضحت النتائج أن التسميد بـ ٥٠ ٪ من سماد الدواجن مع ٥٠ ٪ من التسميد المعدنى (NPK) أعطت أعلى قيم فى صفات النمو الخضرى (طول النبات – عدد السيقان الرئيسية / نبات – محتوى الكلوروفيل – الوزن الطازج للنبات – النسبة المئوية للوزن الجاف عند عمر ٧٥ يوم بعد الزراعة) ، وكذلك المحصول الكلى للفدان وعدد الدرنات / نبات ومتوسط وزن الدرنات للنبات بالإضافة إلى النسبة المئوية للمادة الجافة والكثافة النوعية عند الحصاد فى كلا الموسمين.

كما أوضحت النتائج أن إضافة الأسمدة المعدنية بالمعدل الموصى به كاملا أعطى أعلى محتوى من NPK فى كل من الأوراق عند ٧٥ يوم بعد الزراعة وكذلك الدرنات عند الحصاد فى كلا موسمى الزراعة.

وبذلك فان استخدام السماد العضوى يوصى به كبديل للتسميد المعدنى لإنتاج محصول البطاطس الخاص بالتصدير وخفض ضرر التلوث البيئى.