Middle East Journal of Agriculture Research
ISSN 2077-4605
Volume : 04 | Issue : 02 | April-June | 2015
Pages: 232-239

An Economic Study to Evaluate the Potato Production under Using Some Composts as Organic Manures Compared With Chemical Nitrogen Fertilizer

[1]Shaheen, A. M., [2]H. M. Foly, [1] Fatma, A. Rizk, [1]Omaima M. Sawan and [1]Awatif G. Behairy

[1]*Vegetable Research Dept., National Research Centre, 33 El-Bohouth St., (former El- Tahrir St.,) Dokki, Giza, Egypt. Postal Code: 12622.*
[2] *Hort. Res. Institute, ARC, Giza, Egypt.*

ABSTRACT

Two field experiments were conducted out during the two successive seasons of 2012 and 2013 at the Sadat City area (70 km fair Cairo City) in private farm to evaluate using some organic (Begasses, Corn stalks, water hyacinth and MSW composts) as well as chemical nitrogen fertilizer (urea 46 % N) for potato production under the Egyptian condition. All fertilizer treatments applied at rate of 120 N units/fed. The important obtained results are as follows:

Potato plants which received its nitrogen requirements as chemical (urea 46 % N) if compared with all organic sources resulted in the best plant growth, total tubers yield (13.6 and 13.98 tons/fed., in 1st and 2nd season) total marketable yield (11.56 and 11.743 tons/fed., for the same respective) as well as the heaviest local marketable tubers yield (8.092 and 7.993 tons yield in 1st and 2nd seasons).

Application of begasses compost for potato production resulted in the highest marketable tubers yield as well as the heaviest exportable tubers weights (5.63 and 5.995 tons/fed for 1st and 2nd season) due to the heaviest medium size of tubers if compared with other nitrogen sources.

The potato plants with using begasses organic manure gained the highest total income (21495 and 21072 Egyptian pounds/fed in 1st and 2nd seasons) as comparison for the other nitrogen sources. Moreover, it resulted in the highest revenue as Ep./one pound (2.17 and 2.13 in 1st and 2nd seasons). Also, the net income recorded its highest values with the application of begasses as nitrogen source for potato production (11590 and 11167 LE /fed in 1st and 2nd seasons respectively.

As general, it could be abstracted that, chemical nitrogen fertilizer for potato production under this study in spite of it recorded the heaviest total potato yield as tons/fed. (13.6 and 13.98 tons/fed in 1st and 2nd seasons) more than using begasses, but it gained the total and/or net income less than using begasses as organic nitrogen fertilizer for potato production.

Key words: Potato, organic, nitrogen fertilizer, Economic Study.

Introduction

The population of Egypt is estimated at 90 million people, inhabiting less than 5 % of the natural territory. The total area of agricultural land in Egypt amounts to around 3.5 million ha (nearly 8.4 million fed.). Whereas, the rapid increase in the population of Egypt together with a limited cultivated area result in an acute need for additional production of various crops. Efforts are being focused on measures that lead to a significant increase in crop production. Among the many factors involved in achieving this aim are the balanced fertilization and the adaption of suitable fertilizer use practices. The intensive utilization of chemical fertilizers cultivation of short seasonal crops particularly in absence or lack of organic manure and the removal of plant residues from the local all of these practices adversely affect the soil fertility status. The Egyptian soils are very poor in their organic matter content which seldom exceeds 2 % and is rottenly less than 1% or even less than 0.1 % in some newly reclaimed soils. According to the report of Maha (2000), in Egypt the organic fertilizers are multifarious in their chemical contents, but all organic fertilizers are available, and inexpensive.

Potato is one of the major vegetable crops in Egypt. It is widely grown for local consumption and exportation, where the yield increase could be achieved by the appropriate horticultural practices. Fertilization in general with nitrogen in particular is considerably factor that affects tuber yield and its quality. The farmers use to apply excess of fertilizers that resulted in a higher pollution in the underground water and increasing the crop running cost. The nitrogen (N) is a vital nutrient for the activity of plant organs. It is a fraction of many components such as, amino acids, nucleic acids, chlorophyll and etc.

The organic manure (such as begasses compost, corn stalk compost, water hyacinth compost and/or MSW compost) are another source of nitrogen and other nutrient, which can decrease the demand of chemical

Corresponding Author: Shaheen, A. M., Vegetable Research Dept., National Research Centre, 33 El-Bohouth St., (former El- Tahrir St.,) Dokki, Giza, Egypt. Postal Code: 12622.
E-mail: dr.abdelmoatey@yahoo.com

fertilizer, and it has been used for many centuries to increase soil fertility (Drazi, 2012; Koloy, 2007; Mir and Quadri, 2009; Tagoe *et al,* 2008 and Whasen and Chang, 2001 and Whik *et al*., 2007). Moreover, many researchers have mentioned the beneficial effects of organic fertilizer including the increase of hydraulic conductivity, raising the water holding capacity, changing the soil, it reducing the frequency of plant diseases and etc. (Dong and Shu, 2004. Olson and Papworth, 2006 and Tagoe *et al*., 2008). The positive effect of organic manure on the plant height, dry matter of potato organs have been previously reported (Abou-Hussein *et al.,* 2003; Alam *et al*., 2007 and Powon *et al*., 2006).

May investigators were carried out to study the response of some vegetables productivity to the application of organic manures as denoted by Abdel-Mouty *et al*. (2001); Abou-Hussein *et al*. (2002) and El-Mancy *et al*. (2008) on potatoes, Shaheen *et al*. (2011), Fatma *et al*. (2001); Mondal *et al*. (2004); Aisha *et al*. (2007); Shaheen *et al*. (2007) and Gomba *et al*. (2008) on onion plant, and Abdel-Moez *et al*. (2001), Hasan, (2002); Ghoname and Shafeek, (2005) on pepper.

The aim of this study is to evaluate biologically and economically of using some organic manures compared with the chemical fertilization for potatoes production.

Materials and Methods

Field experiments were carried out during the two seasons of 2012 and 2013 in the Sadat area (75 km after Cairo City) to investigate the application of 4 sources of organic manures plus chemical fertilizer on the biological , nutritional , and economical values of potato production. The treatments of fertilization were as follows:

1. Organic manure of begasses.
2. Organic manure of corn stalks.
3. Organic manure of water hyacinth.
4. Organic manure of Municipal Solid Wastes (MSW).
5. Chemical fertilizer of N.

All fertilizer treatments used at rate of 120 nitrogen units per feddan (0.42 hectare). The physical and chemical analysis of the organic manures used and the experimental soil were presented in Table (1a) and (1b) respectively. The experimental design was a complete randomized with 4 replicates. The area of each experimental plot was 25.6 m^2 (4 ridges, 80 cm width and 8 meter in length). Potato seeds (tubers) were planted manually on the 1st week of November month during the two seasons of 2012 and 2013 using hand tool to dig holes at 30 cm intervals. Where nitrogen sources (Begasses, corn stalk compost , water hyacinth , MSW compost) were applied at once time before planting. The chemical nitrogen fertilizer (urea, 46 % N) was divided into 3 equal portions and at 30 , 45 and 60 days after sowing). Phosphorus and potassium fertilizer at the recommended rates, i.e. 60 and 90 units/fed., were supplied. Whereas, phosphorus rate as single superphosphate 15.5 % P_2O_2 was added at once during soil preparing, but potassium as potassium sulphate form was divided into two equal quantity and added 45 and 60 days after planting. All other agronomic practices were conducted according the recommendation of Egyptian Agriculture ministry. All organic manure treatments were added at the rate of 120 N units/fed., which were dressed during soil preparation and before planting.

During the plant growth period the following data were recorded:

Plant growth characteristics:

Four plants from each experimental plot were randomly taken after 105 days from planting for measuring the vegetative growth parameters, i.e. plant height, number of leaves and/or shoots, fresh and dry weight of whole potato plant and its different organs.

Total tuber yields and its some physical properties:

All harvesting time (115 days after planting) the tuber yield, i.e. number per plant and total tubers yield (as ton/fed.) as well as some physical properties of tuber such as average tuber fresh weight as gram/tuber, size of tuber as cm^3/tuber and tuber specific gratify as well as dry weight percentage, all of these measurements were recorded.

Nutritional elements:

At harvesting time potato tuber samples from each experimental plot were taken for elemental analysis where N, P and K elements in the dry matter of tuber tissue were determined according to the methods described by Pregl (1945), Trough and Mayer (1939), Brown and Lilleland (1946), respectively for N, P and K. But Fe, Mn, Zn and Cu concentration were determined using flame ionization atomic absorption spectrophotometers model 1100 B (Purkin Elmer) according to the method of Chapman and Pratt (1978). Whereas, NH_4, NO_3, Pd and Ni were determined according Cottenie *et al*. (1982).

Table 1a: The physical and chemical analyses of the organic manures used.

Organic manure properties	Bagases compost	Corn stalks compost	Water hyacinth compost	Municipal solid compost (MSW)
Weight of cubic meter (kg)	400	310	336	355
Moisture %	30	27	28	28
pH	7	6.41	6.5	7.8
EC (mmhos)	3.91	3.7	3.8	4.7
Organic carbon %	23.2	19.7	8.1	10.4
Organic matter %	40	34	14	18
Total nitrogen %	2.1	1.2	0.5	0.8
C/N ratio	19.0	21.2	23	22.5
Total phosphorus %	0.6	0.25	0.58	0.36
Total potassium %	1.0	0.6	1.21	0.77
Iron ppm	2900	2310	3660	4220
Manganese ppm	190	240	480	208
Copper ppm	35	51	91	110
Zinc ppm	75	77	299	336
Lead ppm	1.75	2.1	7.3	5.1
Nickel ppm	3.2	3.5	7.4	5.7

Table 1b : The physical and chemical properties of the experiments soil.

Physical properties				Chemical properties								
%			Soil texture	Values		%			Meq./L.			%
Sand	Silt	Clay		pH	EC	N	P	K	Fe	Zn	Mn	O.M.
90.0	5.0	5.0	Sandy	8.4	1.5	Trace	0.44	0.57	1.16	0.61	0.22	0.21

D. Economic evaluation :

To evaluation the application of organic manures with that of chemical fertilizers the following measurements are recorded :

- Cost of fertilizer application (fertilizer price and the cost of labors).
- The exportation income.
- Local marketable income.
- The revenue of one Egyptian pound (LE).

Obtained data were statically analyzed according to the method described by Gomez and Gomez (1984).

Results and Discussion

Potato Plant growth:

Effect of the application of some different organic nitrogen fertilizers sources as well as chemical one on the potato plant growth are presented in Table (2) for the two experimental seasons of 2012 and 2013. Whereas, within organic nitrogen manures, adding Begases compost at rate of 120 N units/fed., resulted in the vigor plant growth, i.e. the highest plant length, out-number of leaves and shoots, as well as the heaviest fresh and dry weight of whole plant and its different organs. On the contrary, the poorest plant growth were noticed with using water hyacinth compost as organic nitrogen fertilizer. Moreover, that potato plants which received its nitrogen requirement as chemical (urea 46 % N) at the same rate mentioned above, i.e. 120 N units/fed., resulted in the best plant growth over that plants received the begasses compost. These findings are in good harmony during the two seasons. The statistical analysis of the obtained data reveals that, the differences within different sources of nitrogen were great enough to reach the 5 % level. These were true for all plant growth parameters except plant length (only in 1st season).

Generally, it could be concluded that, using chemical nitrogen for potatoes gained the best growth i.e. the highest values of plant growth measurements compared to the using organic nitrogen fertilizer. These are expected due to the animalization form of nitrogen in the chemical fertilizer, which easy and faster release consequently absorbed by rooting system. Moreover, using begasses compost resulted the less plant growth characters than using chemical, followed by declining order with that plants received MSW (Municipal solid Waste), then that supplied with corn Stalks compost and lastly that received hyacinth compost. These results held good in the two experimental seasons The studies which carried by Abel Mouty *et al*. (2001); Abou-Hussein *et al*.(2002), El-Mancy *et al*. (2008) on potatoes, and Mondal *et al*. (2004); Aisha *et al*. (2007) and Shaheen *et al*. (2011) on onion and Ghoname and Shafeek, (2005) on Sweet pepper and Abou El-Magd *et al.,* (2009) on Broccoli all of them are agreed with the obtained data.

It could be concluded that, the positive effect of organic manure on the plant growth parameters of potato have been previously reported by Abou-Hussein *et al*. (2003); Alam *et al*. (2007) and Powon *et al*. (2006).

Table 2: Effect of different nitrogen fertilizer sources on growth characteristics of potato plant during the experimental seasons of 2012 and 2013.

Fertilizer sources	plant length, cm	No./plant		Fresh weight (g./plant)			Dry weight (g./plant)		
		Leaves	Shoots	Leaves	Shoots	Total	Leaves	Shoots	Total
First season									
Bagases compost	77	45	5.2	276	313	589	34.1	51.65	85.75
Corn stalk compost	69	35	4.2	231	285	516	22.41	38.76	1.17
Water hyacinth compost	66	38	2.8	201	261	462	17.49	33.67	51.16
MSW compost	73	51	4.8	244	301	545	22.20	49.36	71.56
Chemical fertilizer	78	68	7.1	351	386	737	48.1	70.37	118.47
L.S.D. at 5% level	N.S.	4.76	1.75	17.33	29.3	21.41	5.77	13.5	15.5
Second season									
Bagases compost	69	51	5.3	306	279	585	36.7	49.66	86.36
Corn stalk compost	59	43	4.1	241	211	452	24.18	31.65	55.83
Water hyacinth compost	57	41	3.7	233	201	434	20.51	28.54	49.05
MSW compost	68	49	5.1	275	256	531	27.5	34.76	62.26
Chemical fertilizer	69	57	5.7	296	333	629	31.97	52.28	84.25
L.S.D. at 5% level	2.71	3.66	N.S.	16.16	25.6	31.33	5.21	6.66	10.50

Physical properties of Tubers yield:

The obtained data of the effect of different nitrogen sources on some physical properties of potato tuber yield are shown in Table (3) for the two seasons of 2012 and 2013. It could be concluded that the highest tubers number/plant, the heaviest and largest as well as the tuber specific gravity and dry matter percentage, all of these parameters were associated with in using chemical nitrogen fertilizer followed with that plants received organic nitrogen as begasses compost. Moreover, the poorest tuber properties were gained when hyacinth compost used. The statistical analysis of the obtained data reveals that the differences within different treatments were great enough to reach the 5 % level except number of tubers/plant. These findings were true in both experimental seasons.

Table 3: Effect of different nitrogen fertilizer sources on some physical properties characteristics of potato tuber yield during the experimental seasons of 2012 and 2013.

Fertilizer sources	First season					Second season				
	Tuber No./plant	Tuber wt., (g)	Tuber size (cm^3)	Tuber specific gravity	Dry matter %	Tuber No./plant	Tuber wt., (g)	Tuber size (cm^3)	Tuber specific gravity	Dry matter %
Bagases compost	5.11	115	108	1.065	18.51	4.33	113	103	1.097	16.33
Corn stalk compost	4.18	91	88	1.034	15.08	4.22	86	77	1.117	14.51
Water hyacinth compost	4.01	78	75	1.040	15.33	4.15	77	75	1.027	13.75
MSW compost	4.36	84	107	0.785	17.75	4.77	80	96	0.833	15.57
Chemical fertilizer	6.33	136	115	1.182	16.27	5.27	126	113	1.115	16.09
L.S.D. at 5% level	N.S.	7.75	6.18	0.035	------	N.S.	5.56	11.08	0.073	------

Total tubers yield and it components:

Total tubers yield as tons/fed., marketable (exportable and local marketable) as well as the categories' of tubers as affected by different nitrogen fertilizer sources during the two seasons of 2012 and 2013 are shown in Table (4). Whereas, the heaviest tonnage as total yield, total marketable and local marketable tubers yield were detected with that plants received chemical nitrogen source. However, within organic nitrogen sources, using begasses compost followed the same order concerning to the total tubers yield and/or total marketable yield, but the addition of Municipal Solid Compost (MSC) resulted the heaviest local marketable tuber yield. On the contrary, the lowest total tubers yield and total marketable one were redistricted with that potato plants fertilized by water hyacinth compost. The statistical analysis of the collected data showed a great differences within different studied treatments to reach the 5 % level during the two experimental seasons.

Concerning to the exportable tubers yield (tubers of 4.0 – 6.0 cm in diameter) the presented data in Table (4) clearly demonstrated that, the heaviest yield (5.630 and 5.955 tons/fed., in 1st and 2nd seasons) was associated with potato plants which received the organic nitrogen in the form of begasses compost, followed in descending order by that plants fertilized by chemical nitrogen (3.468 and 3.75 tons/fed., in 1st and 2nd experiments) then followed by using corn stalk compost. It great to mentioning that, both plants received water hyacinth and/or MSW compost gained no exportable tubers, due to their contents of some heavy metals like Fe, Mn, Zn, Cu, Pd and Ni (Table 1a). Also, it could be concluded that, in spite of the higher total tuber yield (as ton/fed.) was higher with addition of chemical nitrogen fertilization (13.6 and 13.98 ton/fed. in 1st and 2nd seasons) over that plants received organic nitrogen in the form of begasses compost (11.5 and 10.78 tons/fed. in

1st and 2nd season), but the opposite was occurred concerning the exportable tuber yield. These might due to when using chemical nitrogen gained bigger tuber than organic fertilizer which the external market no need for it. Regarding to the percentage of marketable tuber yield, the obtained data no reveal great differences within different nitrogen fertilizer sources particularly in 1st season, but it clear to mentioning that, the highest value of marketable tuber yield was correlated with adding begasses compost in the 2nd season.

Table 4: Effect of different nitrogen fertilizer sources on total tubers yield and its components of potato during the experimental seasons of 2012 and 2013.

Fertilizer sources	Total tubers yield ton/fed.	Marketable yield				Yield of Tuber sizes (ton/fed.)		
		Tubers yield %	Ton/fed.	Exportable ton/fed.	Locally marketing ton/fed.	Large 6.0 cm	Medium 4.0-6.0 cm	Small 4.0 cm
First season								
Bagases compost	11.50	89	10.235	5.630	4.605	3.622	5.630	0.983
Corn stalk compost	9.10	87	7.917	2.375	5.542	2.217	2.375	6.625
Water hyacinth compost	7.88	83	6.540	----	6.540	1.635	1.635	6.270
MSW compost	8.35	88	7.348	----	7.348	2.204	3.307	1.837
Chemical fertilizer	13.60	85	11.560	----	8.092	6.936	3.468	1.156
L.S.D. at 5% level	1.665	----	1.771	----	0.815	2.175	0.886	1.666
Second season								
Bagases compost	10.18	90	9.162	5.955	3.207	2.211	5.955	0.916
Corn stalk compost	8.66	75	6.495	1.884	4.611	1.494	1.884	3.117
Water hyacinth compost	7.85	63	4.945	----	4.945	0.890	1.430	2.175
MSW compost	8.07	76	6.133	----	6.133	1.349	2.940	1.844
Chemical fertilizer	13.98	84	11.743	----	7.993	6.450	3.750	1.543
L.S.D. at 5% level	1.515	----	1.313	----	1.336	1.776	2.110	0.733

When tuber potato yield was classified in to 3 categories, i.e. large (> 6.0 cm), medium (4.0 – 6.0 cm), and small (< 4.0 cm), the collected data reveals that, addition of chemical nitrogen fertilizer had the highest big tuber yield (6.936 and 6.450 ton/fed., in 1st and 2nd seasons) and with using begasses compost as organic nitrogen fertilizer gained the highest medium tuber yield (5.630 and 5.955 tons/fed., in 1st and 2nd season). However, the highest small tuber yield was detected with using corn stalk compost. As general, it could be concluded that, the highest big and medium tuber yield was collected with fertilizing potato by chemical nitrogen and begasses compost respectively, but the lowest big and small tubers yield was recorded with that plants received water hyacinth compost. The use of organic inputs such as crop residues, manures and compost has great potential for improving soil productivity and crop yield through improvement of the physical, chemical and microbiological properties of the soil as well as nutrient supply (Tandon, 1992; Stone and Elioff, 1998). The organic forms must be mineralized or converted into inorganic forms over time before they can be used by plants. Compost is also a slow-release fertilizer compared with fresh manure its N is in a more stable form and not susceptible to loss as NH gas (Leonard, 1986). The nutrient value of compost varies a lot and depends on what it is made from. The obtained findings were in the same trend during the two experimental seasons. The previous studies by Aisha *et al*.(2007); Shaheen *et al*. (2007); Abou El-Magd *et al*. (2009); Shaheen *et al*. (2011); Shaheen *et al*. (2014); Blemi(2012); Sidhu *et al*. (2007); Al-Moshileh and Motawei, (2005) and Amir *et al*. (2013).

*Economic evaluation***:**

Table (5) shows the effect of using different nitrogen fertilization on the total income of potato production during the experimental seasons of 2012 and 2013. The added quantity of nitrogen sources varied greatly depending to its contents of nitrogen (Table 1a). Whereas, in spite of the variation in the quantity (as tons/fed.) but agreed with their nitrogen content (120 N units/fed.). For this it could be concluded that, the highest quantity was added from the water hyacinth compost (contain the lowest nitrogen value), on the contrary, the lowest quantity was added from chemical nitrogen (contains the highest nitrogen value). The previous paragraphs explained clear, the highest cost (price and application cost) was recorded by using water hyacinth compost but the lowest cost was by using chemical nitrogen fertilizer.

It could be concluded that, production costs for organic potatoes are higher and their yields are lower than for conventionally produced potatoes. This finding is similar that which obtained by Wyman and Diercks,(1992), on potatoes. Moreover, the author's added that, organic potato yielded lower per unit area than conventional method. To achieve beak-even returns for organic, growers needed price increases over conventional potato price.

Table 5: Effect of different nitrogen fertilizer sources on total tubers yield and its components of potato during the experimental seasons of 2012 and 2013.

Fertilizer sources	Fertilizer applications		Agric. Services costs (LE / fed.)**	Total costs (LE / fed.)	Sources of income (E.P. /fed.)			(E.P. / fed.) revenue of one (LE)	Net income (LE)
	Rate (ton / Fed.)	Costs (LE / fed.)*			Exportable yield***	Local marketable****	Total income (LE / fed.)		
First season									
Bagases compost	5.7	1835	8070	9905	16890	4605	21495	2.17	11590
Corn stalk compost	10.0	2750	8070	10820	7125	5542	12667	1.17	1847
Water hyacinth compost	24.0	3000	8070	11070	----	6540	6540	0.71	- 4530
MSW compost	15.0	1700	8070	9700	----	7348	7348	0.76	- 2352
Chemical fertilizer	0.582	1410	8070	9480	10404	8092	18496	1.95	9016
Second season									
Bagases compost	5.7	1835	8070	9905	17.865	3207	21072	2.13	11167
Corn stalk compost	10.0	2750	8070	10820	5652	4611	10263	0.95	- 557
Water hyacinth compost	24.0	3000	8070	11070	----	4949	4945	0.45	- 6125
MSW compost	15.0	1700	8070	9700	----	6133	6133	0.37	- 3567
Chemical fertilizer	0.582	1410	8070	9480	11250	7993	19243	2.03	9763

= Include the fertilizer price + application tuber cost, ** = Include the cost preparing soil, nitrogen, seeding, control the seed and diseases, harvesting cost... etc. , * = Exportable accounted as 3000 LE /ton , **** = Local marketable accounted as 1000 LE. /ton*

Regarding to the total income, the obtained data showed that, the highest values (21495 and 21072 LE./fed.) in 1st and 2nd season were gained from using begasses compost followed in descending order by that plants received chemical nitrogen (18496 and 19243 LE./fed, in 1st and 2nd experiment). On the contrary, using water hyacinth compost as source of nitrogen fertilizer resulted the lowest value of total income (6540 and 4945 LE/fed., for 1st and 2nd seasons). These findings might be due to the higher income coming from the reveal able big part of total tuber for foreign market with the high price which resulted from addition of begasses compost and/or chemical nitrogen if compared with using other nitrogen sources. These results were completely similar in both seasons.

Also, the presented data of Table (5) indicate that the revenue of one Egyptian pound resulted in highest values when using begasses compost (2.17 and 2.13 in 1st and 2nd seasons) followed by using chemical nitrogen (1.95 and 2.03). Finally, it could concluded that the addition begasses compost for potato plant gained the best exportable tubers (quantity) and/or quality, but the addition of MSW and/or water hyacinth compost gained no proper exportable potato tuber because its contains high content of heavy metals such Fe, Mn, Zn, Cu, Pd and Ni. In addition, its net income recorded negative response. Whereas, Wyman and Diercks, 1992. Stated that, production cost for organic potatoes are higher and their yields are lowers than for conventionally produced potatoes. Moreover, Charles 2014 reported that the cost of available nitrogen is often a limiting factor in organic production. In some cases the cost per kg from organic sources can be more than two times that of conventional source. Also, the organic inputs will not meet the nutritional needs of crop because they contain a comparatively less quantity of nutrient compared to inorganic fertilizer.

Nutritional values of potato tubers:

The effect of using different nitrogen sources for potato plant fertilization on the natural values of tubers during the two seasons of 2012 and 2013 are shown in Table (6). It clear that, using chemical nitrogen source resulted in the highest values of protein content, N, P, K, NH4 and NH3 and the lowest values of Cu and Pd. However, the highest values of Mn, Cu, Pd and Ni and the lowest values of N, protein and K were detected with that plants received water hyacinth compost during the two experimental seasons. In addition, applying MSW for potato plant as organic nitrogen source resulted in the highest values of Fe, and Zn.

Generally, it could be stated that if using water hyacinth compost and/or MSW as source for organic nitrogen fertilizer. Some heavy metals such as Fe, Mn, Zn, Cu, Pd and Ni recorded higher values if compared with other studied sources. These findings are true in both experiments. The statistical analysis of the collected data reveals that, the differences within treatments were no great enough to be significantly at least 5 % level during the two seasons.

Shorty, it could be concluded that, using begasses compost, yielded tuber contained lower NO_3, Pb, Ni and most heavy metal and it contained a rescannable values of N, P and K which necessary for the good health, consequently this quality is most favorable for exporting with high price.

These findings are in good accordance which obtained by Abou-Hussein *et al*. (2002), Abdel-Mouty *et al*., (2001); El-Mancy *et al*. (2008); Shaheen *et al*. (2014) on potatoes, as well as Aisha *et al*. (2007); Shaheen *et al*. (2007); Mondal *et al*. (2004); Fatma *et al*. (2002) and Shaheen *et al*. (2011) on onion plants.

Table 6: Effect of different nitrogen fertilizer sources on total tubers yield and its components of potato during the experimental seasons of 2012 and 2013.

Fertilizer sources	%			ppm								
	Protein	N	P	K	Fe	Mn	Zn	Cu	NH4	NH3	Pb	NI
First season												
Bagases ompost	6.31	1.01	0.42	2.01	176	20.0	26.6	10.0	55.1	105	3.33	0.31
Corn stalk compost	4.81	0.77	0.27	1.31	128	21.8	23.8	11.2	31.5	53	3.19	1.11
Water hyacinth compost	4.00	0.64	0.34	1.07	192	46.9	31.1	12.1	35.0	88	6.65	3.11
MSW compost	5.94	0.95	0.34	1.87	252	26.4	33.6	13.5	66.3	70	4.09	1.66
Chemical fertilizer	10.43	1.67	0.54	2.27	160	23.2	25.9	8.7	92.8	118	2.66	0.71
L.S.D. at 5% level	-----	0.33	0.12	N.S.	N.S.	N.S.	N.S.	N.S.	17.5	27.3	1.76	0.79
Second season												
Bagases compost	8.18	1.31	0.47	1.77	115	21.0	25.5	8.5	33.9	67	3.31	0.17
Corn stalk compost	6.06	0.97	0.33	1.22	111	24.7	22.3	10.3	25.1	51	4.12	0.75
Water hyacinth compost	4.56	0.73	0.31	1.22	181	55.0	29.5	13.6	21.6	53	8.75	2.01
MSW compost	7.31	1.17	0.29	1.55	209	31.4	34.6	11.1	41.8	83	5.55	1.73
Chemical fertilizer	10.37	1.66	0.64	1.79	155	26.1	26.1	5.6	55.5	132	2.13	0.85
L.S.D. at 5% level	-----	N.S.	0.33	N.S.	171	N.S.	N.S.	N.S.	9.7	13.6	N.S	N.S

References

Abdel-Mouty, M.M., A.H. Ali and F.A. Rizk, 2001. Potato yield as affected by the interaction between bio and organic fertilizers. Egypt. J. Appl. Sci. 16(6): 287 – 288.

Abou El-Magd, M.M., A.A. Abd El-Fattah and E.M. Salim, 2009. Influence of mineral and organic fertilization methods on growth yield and nutrients uptake by Broccoli crop. World Journal of Agricultural Sciences, 5(5): 582 – 589.

Abou-Hussein S.D., I.I. El-Oksh, T. El-Shorbagy and A.M. Goma, 2002. Effect of cattle manure bio-fertilizers and reducing mineral fertilizer on nutrient content and yield of potato plant. Egypt. J. Hort. 29(1) : 99 – 115.

Abou-Hussein, S.D., A.F. Abou-Hadid, T. El-Shorbaggy, and U. El-Behairy, 2003. Effect of cattle and chicken manure with or without mineral fertilizers on vegetative growth. Chemical composition and yield of potato crops Acta Hort. (ISHS); 608 : 73 – 79.

Aisha, H.A., Fatma A. Rizk, A.M. Shaheen and Mona M. Bdel-Mouty, 2007.Onion plant growth bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. Res. J. of Agriculture and Biological Sci., 3(5) : 380 – 388.

Alam, M.N., M.S. Jwhan, M.K. Ali, M.A. Ashraf and M.K. Islam, 2007. Effect of vermicomost and chemical fertilizers on growth, yield and yield components of potato in Barind soils of Bangladesh. J. Appl. Sci. Res. 3(12) : 1879 – 1888.

Al-Moshileh, A.M. and M.I. Motawei, 2005. Effect of bio-fertilization (Chicken and Pigeon Manures) on growth and yield of potato under central Saudi Arabia Conditions. Acta Hort. (ISHS) 72 : 168 – 173.

Amir, N.A., M.R. Hadi, T.M. Darzi, and F. Fazeli, 2013. Influence of nitrogen fertilizer and cattle manure on the vegetative growth and tuber production of potato. International J. Agric. and Crop Sci. Vol., 5 (2) : 147 – 154.

Balemi, T., 2012. Effect of integrated use of cattle manure and inorganic fertilizers on tuber yield of potato in Ethiopea. J. oil Sci. and Plant nutrition a Vol. 12, No. 2.

Brown J.D. and D. Lilleland, 1946. Rapid determination of potassium and sodium in plant natural and soil extracts by flame photometry. Proc. Amer. Soc. Hort. Sci. 48 : 341 – 346.

Chapman, H.D. and P.F. Pratt, 1978.Methods of analysis for soils, plants and waters. Univ. California, Div. Agric. Sci Priced Pub. 4034.

Charles, O. Zachy, 2014. Evaluation of an organic nitrogen sources in a yellow squash collard rotation. M. Sc. Thesis, Auburn Univ. Alabama.

Cottenie, A., M. Verloo, L. Kiekens, G. Velghe and R. Camerlynck, 1982. Chemical analysis of plant and soils. Laboratory of Analytical and Agrochemistry, State University of Gent, Belgium.

Dong S. and H. Shu, 2004. Sheep Manure improves the Nutrient Retention Capacity of Apple Orchard Soils. ActaHort (ISHS) 638 : 151 – 155.

Durzi M.T., 2012. Effects of organic manure and bio-fertilizer application on flowering and some yield traits of coriander (*Coriandrum sativum*). Intl. J. Agri. Crop Sci. 4(3) : 103 – 107.

El-Mancy, M.H.A., E.M. Selim and N.A. Atia, 2008. Combined effect of organic and mineral fertilizers on yield of potato grown under coarse-textured soil conditions. Egypt. J. Soil Sci.48 No. 1, pp. 31 – 43.

Fatma A. Rizk, M.H. Foly and Safia M. Adam, 2002.Response of onion plant (*Allium cepa* L.) to organic and inorganic nitrogen fertilizers. Minia J. of Agric. Res. Develop. 22 : 129 – 149.

Ghoname, A.A. and M.R. Shafeek, 2005. Growth and productivity of sweet pepper (*Capasicum annum* L.) grown in plastic house as affected by organic mineral and bio-N-fertilizer. Pakistan J. of Agronomy, 4(4) : 369 – 372.

Gomba B.A., M.D. Magaji, A.I. Yakubu, and A.U. Dkko, 2008. Effects of Farmyard manure nitrogen and weed interference on the growth and yield of onion (*Allium cepa* L.) at Sokato Rima valley, J. of Sustainable Development in Agriculture at Environment Vol. 3(2) : 87 – 29 April, 2008.

Gomez, K.A. and A.A. Gomez, 1984.Statistical procedures for Agricultural Research (Second Ed.) pp. 457 – 423. John Wiley and Sons Inter Sci. Pub. New York.

Hassan, Z.F., 2002. Effect of some sources of organic manure and levels of potassium fertilizer on growth, yield and quality of pepper plants (*Capsicum annum* L.) Ph. D. Thesis, Cairo Univ. Egypt.

Maha, Kamal Ghareb 2000. An Economic study of marketing efficiency of Egyptian onion. B. Sc. Degree Alazhar Univ.

Mir S.A. and S. Quadri, 2009. Decision support systems: Concepts, Progress and issues-A Review. In : Lichtfouse E. (ed) Climata Ghange intercropping. Pest control and Benelicial Microorganisms. Substainable Agriculture Review 2. Pp. 373 – 399. Springer Science Business Media B.V. Dordrecht. Netherlands.

Mondal, S.S. Debabrata Achharya Anup Ghosph and U. Thapa, 2004. Integrated management of organic and inorganic sources of nutrient to improve productivity in rice onion cropping sequences and qualitative characters of rice and environment and ecology. MKK publication. Calculata. India, 22(1) : 125 – 128.

Olson B.M., L.W. Papworth, 2006. Soil chemical changes following manure application on irrigated alfalfa and railed timothy in southern Alberta. Canadian Journal of Soil Science, 86 (1) : 119 – 132.

Pown, M., J. Aguych and V. Mwaja, 2006. Effects of inorganic fertilizers and farmyard manure on shoot dry weight and tuber yield of potato (*Solanum tuberosum*, L.). Agriculture tropica et subtropica, 39 (3) : 189 – 194.

Powo, M., J. Aguyoh and V. Mwaja, 2006. Effects of inorganic fertilizers and farmyard manure on shoot dry weight. Tuber dry weight and tuber yield of potato (*Solanum tuberosum* L.) Agriculture tropica et subtropica 39(3) : 189 – 194.

Pregl, F., 1945. Quantitative organic micro analysis, 1st Ed. Cl and A. Chrdill, ltd. London.

Shaheen, A.M., Fatma A. Rizk and Noha Abdel-Rahman, 2014. Growth, tuber yield and its Nutritional value of potatoes as affected by cattle, Chicken and/or chemical fertilizer. Middle East J. Agric. Res. 3(2) : 282 – 301.

Shaheen, A.M., Fatma A. Rizk and S.M. Singer, 2007. Growing onion plants without chemical fertilization. Research Journal of Agriculture and Biological Sci. 3(2) : 96 – 104.

Shaheen, A.M., Fatma A. Rizk, Faten Abdel-Aal and Hoda Habib, 2011. Production of safe and Economic onion bulbs. International J. Academic Res. Vol. 3, No. 1, Part II.

Shaheen, A.M., Mona M. Abdel-Mouty, Aisha H. Ali and Fatma A. Rizk, 2007b. Natural and chemical phosphorus fertilizers on affected onion plant growth bulbs yield and its some physical and chemical properties. Australian Journal of Basic and Applied Sci. 1(4) : 519 – 524.

Sidhu, A.S., S.S Thind, N.K. Sekon, and G.S. Hra, 2007. Effect of farmyard Manure and P application to potato on available P and Crop Yield of potato-Sunflower Sequence. Journal of Sustainable Agriculture, 3,5-15.

Snedecor, G.W. and W.G. Corhranm, 1980. Statistical Methods. 12th ed. Iowa State Univ., Press, Ames., Iowa, USA.

Tagoe, S.O., T. Horiuchi, and T. Maisui, 2008. Effects of carbonized and dried chicken manures on the growth yield and N content of soybean. Plant and Soil, 306 (1) : 211 – 220.

Troug E. and A.M. Mayer, 1939. Improvement inkiness colorimetric method for phosphorus and arsenic. Indian Eng. Chem. Annals Ed.1 : 136 – 139.

Whalen J.K. and C. Chang, 2001. Phosphorus accumulation in cultivated soils from ion-term annual application of cattle feedlot manure. Journal of environmental quality 30 : 229 – 237.

White, P.J., R.E. Wheatley, J.P. Hammond, and K. Znang, 2007. Minerals soils and roots. In Veugherhill D. Bnadeha J.E. Gebhardi, C. Gowers, F. Mackerron D.K.L., Taylor M.A. Ross H.A. (eds) Potato biology and biotechnology, p. 739 – 752. Elsevier, Oxford, U.K.

White, P.J., R.E. Wheatley, K.P. Hammond and K. Zhang, 2007. Minerals soils and roots. In : Vreugdenhil D. Bradshaw J.E. Gebhardt C. Govers F. Mackerron DKL, Taylor MA. Ross HA (eds) Potato biology and biotechnology advances and perspectives pp. 739 – 752. Elsevier. Oxford, U.K.

Wyman, J. and S. Diercks. 1992. “Organic Potatoes: They can be grown, but Can they be profitable?” Research Brief #4 University of Wisconsin-Madison.