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# INCREASING POTATO PRODUCTIVITY GROWN IN SANDY SOIL THROUGH ORGANIC AND BIOFERTILIZERS APPLICATIONS..

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## ABSTRACT

A study was carried out during two successive seasons, of 2002/2003 and 2003 /2004 at EL-Sheikh Zoweid, North Sinai Governorate .The cultivar Spunta produced locally and obtained from the union of producers and exporters of horticultural crops was used . The aim of the study was to investigate the effect of different levels of compost and biofertilizers on potato growth, the chemical constituents and productivity of potato grown in sandy soil using drip irrigation.

**The results were as follows :**

1-Using compost and biofertilizer 15 tons /feddan +2 or 4 liters of rizobecterien enhanced vegetative growth ( plant height ,leaves fresh weight , leaves dry weight ,stem fresh weight and stem dry weight ) . The lowest vegetative growth was noticed due to the application of 20 tons /fed. + 4 liters of rizobecterein.

2- The application of compost 15 tons / fed. +4 liters of rizobecterein gave the highest total yield ( 20.8 tons /fed. ) compared with either chicken manure + bio fertilizers (17.9 tons/fed.) or compost at 20 tons / fed. ( 15.9 tons / fed.).

3- The highest marketable yield was obtained by applying 15 tons compost / feddan + 4 liters of rizobecterein (85%). The lowest marketable yield was produced at using 20 tons / feddan of compost + 2 liters of rizobecterein (61.2%).

## INTRODUCTION

Organic fertilizers such as compost or chicken manure play an important role in potato production grown in sandy soil condition. Organic fertilizers improve soil fertility and uptake of nutrients . Many authers investigated the effect of organic fertilizers on potato production . For instance Stroilykovic and Slobdan (1981) observed that starch concentration and yield were very high when NPK +60 kg MgO/ha. were applied. Tashkhadzhaer (1985) demonstrated that increasing the rates of FYM and NPK fertilizers increased the potato tuber yield , starch and dry matter content(DM) .Banerje and Singhamathpatra (1986) declared that the dry matter content(DM) of potato tubers was very high during the early growth stages in the treatment given N,P,K, but these values with organic manure became higher in the later stage of the growth . Borin and Magrini( 1987) concluded that using organic and inorganic fertilizers increased number of produced tuber . Banerje and Singhamathpatra (1986) demonstrated that tuber yield was higher by application of organic manure . Singh *et al.* ( 1990) showed that FYM increased both uptake and recovery percentage of N,P and K in potato plants . Blecharezyk and Skrzypozak (1996) found that applying composts increased the P,K and Mg contents of the plants at the beginning of flowering and P and K content of the tubers .Arishe and Bardisi ( 1999) reported that contents of N, P and K in plant parts ,leaves and tubers in most cases were significantly increased by the addition of chicken manure up to $35m^3$ / fed. in both growing seasons.

The application of bio fertilizers is suggested as a sustainable way of increasing crop yield which would reduce the use of chemicals in fertilizing of crops and improve soil fertility .Thus phosphate solubilizing bacteria plays a fundamental role in correcting the solubility problem in many soils by transforming this insoluble part against soluble by secreting organic acid such as formic , acetic , propionic and succinic acids .These acids lower the PH and make most elements available for growing plants Ibrahim and Abdel Aziz(1977) Lampkin(1990) ,Gomaa(1989) and Rahman *et al.* (1992).

Several investigators reported that addition of bio fertilizers such as Azotobacter and Azospirilluim were found to have not only the ability to fix nitrogen but also, to release certain photohormones such as gibberellin and indolic substances in nature, which could stimulate plant growth, nutrients availability and photo synthetic process ( Tien *et al.* 1979 ; Reynders and Vlassak 1982 ; Fayez *et al.* 1985, Abou – Hussein 1995 , Abdel- Ati1998).

Many investigations were done on this item in other vegetable crops. Abdel- Rahman (2000) on cantaloupe showed that the combination between phospharein with mineral P fertilizer at the rate of 60 kg $P_2O_5$/ fed. significantly increased plant dry weight as compared with other rates of mineral P ( 30 or 90 kg $P_2O_5$ / fed. ) Hewedy (1999) stated that inoculation of tomato plants with mixture of some bio fertilizers( phospharein, rizobectrein and microbein ) induced slight effect on N, P and K content of tomato plants . Abdel- Rahman (2000 ) observed that combination between mineral phosphate with phospharein significantly increased the concentration of N, P, K and Ca in cantaloupe leaves as compared with un-inoculated plants .El – Shimi et al. ( 2002 ) noticed that inoculation of two strawberry cultivars with microbein bio fertilizer produced highest level of yield with 75% of recommended dose of N and P when compared with the control . Also, Sallam (2002) indicated that combination of 50% N,P,K and bio fertilizers (Rizobecterein and Microbein ) significantly increased N,P and K content in sweet pepper fruits. Tantawy (2001) working on tomato plants observed that maximum increment in average fruit weight was obtained from using Rizobectrein treatment followed by Microbein treatments. Abdella et al. (2001) mentioned that inoculation of pepper plants with mixture of phosphorein +biogein under plastic house conditions resulted in the highest fruit weight. Ouda (2000) stated that inoculation tomato seedlings with mixture of phosphorein , microbein or rizobectrein in addition to soil fertilizing by 50% of recommended dose NPK produced the highest leaf area. Ashour and Sarhan (1998) showed that application of organic manures with each others or in combination with inorganic fertilizers gave the highest foliage fresh weight / plant and plant height compared with control ( inorganic fertilizer only). Quastel (1965) and Zayed (1998) found that soil microorganisms known as phosphate solubilizing bacteria (PSB) play a fundamental role in converting P fixed form to be available .Increasing N fertilizer level or inoculation with HALEX2 increased leaf N content and dry matter content of potato tuber ( El-Gamal 1996)

## MATERIALS AND METHODS

This study was performed at El- Sheikh Zoweid ,North Sinai governorate during two successive seasons, i. e., 2002/2003 and 2003/2004. Certified seed potato tubers of cultivar Spunta ( locally produced and cold stored ) were obtained from union of producers and exporters of horticultural crops, Cairo, Egypt, .The whole seed tubers were planted, on 9th of October in the two seasons. Potato seed tubers were planted at a distance of 25 cm between plants and 75cm between rows .

**Treatments**

The experiment included eight treatments, which were arranged in a split plot design:

**A- Main plots:-**

1- Compost biogreen at a rate of 10 tons / fed. (BG 1)
2- Compost biogreen at a rate of 15 tons / fed. (BG 2)
3- Compost biogreen at a rate of 20 tons / fed. (BG 3)
4- (Control) Chicken manure at a rate of 15 tons / fed. (CH)

**B- Sub plots:-**

1- Rizobacterien at a rate 2 liters / fed. (RB1)
2- Rizobacterien at a rate 4 liters / fed.(RB2)

The experiment consisted of 4 replicate . Each replicate had 4 main plots contained the compost treatments . Each main plot divided into 2 subplots representing the rizobacterien treatments . All treatments were distributed at random .The sub main dimension were 30 m long and 80 cm wide and sowing 15 plants.

The biogreen compost and chicken manure were applied 20 days before planting and they were added in the middle of the row at 25 cm depth in the soil. Other agricultural practices for potato production were performed as common in that area. All experimental plots received the same amount of water from planting till harvest using drip irrigation system, the flow rate of drippers was 4 L/hour and the distance between the lateral irrigation lines was 75 cm with distances of 50 cm between the drippers. The physical and chemical properties of the soil are presented in Table (1) The analyses of biogreen compost and chicken manure were shown in Table (2).

Table (1): Chemical and physical properties of El Shiekh Zowied farm soil .

| Physical properties | | | | | | Chemical properties | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Practical size distribution | | | texture | pH | EC | Cation meq/l | | | Anion meq/l | | |
| Sand | Silt | Clay | | | Ds/m | $Ca^{++}$ | $Mg^{++}$ | $Na^{++}$ | $K^{-}$ | $HCO_3^{-}$ | $CL^{-}$ |
| 94.2 | 1.04 | 4.76 | sandy | 7.4 | 3.2 | 11.5 | 11.4 | 12.3 | 5.71 | 2.83 | 13.1 |

Table (2): Analysis of biogreen compost and chicken manure used in El Sheikh Zowied farms.

| Compost manure | pH | EC ds/m | C/N ratio | Humidity (%) | Macro nutrients (%) | | | Micro nutrients (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | N | P | K | Fe | Mn | Zn | Cu |
| Biogreen compost | 8.86 | 6.87 | 1:20.9 | 20.6 | 4.3 | 1.45 | 3.43 | 990 | 372 | 323 | 60.4 |
| chicken manure | 7.3 | 2.34 | 1:18 | 13.3 | 3.1 | 1.8 | 2.3 | 1181 | 543 | 535 | 54.7 |

**Measurements**

**1- Vegetative growth**

A random sample of ten plants was taken from each plot 90 days after planting for determination of the vegetative growth i.e. :

1- Plant height ( cm).
2- Fresh weight for leaves and stem / plant ( g ).
3- Dry weight for leaves and stem /plant ( g ), fresh samples were dried at 70 °C till constant weight.

**2- NPK content**

Sample of the fourth top leaves was taken for determination of N, P and K percentage. Each experimental plot was harvested individually 120 days after planting and yield data were recorded. seventy days after planting. samples of leaves were dried at 70°C till constant weight and wet digested to determine N,P and K contents. A random sample of 20 tubers were selected from each plot then washed dried and cut into small pieces for the determination of N, P and K and starch contents.

- Total nitrogen (%) in leaves was determined using the microkjeldahl method by A.O.A.C.(1990).
- hosphorus (%) was determined colour metrically at 660 mm as described by Ranganna (1979)
- Potassium (%)was determined by flame photometer **Ranganna(1979).** Micro nutrients Fe, Mn and Zn were determined of the above ground dried vegetative parts by using atomic absorption spectrophotometer (Berkin Elmer -3300 ) according to Chapman and Pratt (1961) .

**3- Chemical compositions :-**

- Starch was determined according to the method of luff – schoorl which proceeds by the acid hydrolysis of starch and titration by sodium thio sulphate ( A.O.A.C. 1990).

-Dry matter ( % ). 100 grams of fresh potato tubers were dried at 70 C till constant weight for dry matter determination.

**4-yield and its components:-**

1- Small, medium and big tubers size ( %)
2- marketable and unmarketable tubers size (%)

**Statistical analysis :-**

All obtained data were subjected to statistical analysis of variance by using split plot analysis method as mentioned by Gomez and Gomez ( 1984) for calculating the least significant differences between treatments.

## RESULTS AND DISCUSSION

**Vegetative growth**

Data in Table(3A) showed that applying compost at 15 tons / feddan gave rise to significantly the tallest plants compared with the other used treatments. The shortest plants were obtained from application of biogreen 20 tons / feddan . In the mean line ,the high concentration of rizobacterein resulted in significantly taller plants than the lower concentration . This was true in both years of the experiment .

The highest values of leaves fresh weight , stem fresh weight , leaves dry weight and stem dry weight were obtained under 15 tons / feddan of compost and the lowest were recorded under 20 tons/ feddan with significant effect during the first season. The bio fertilizer ( rizobecterein) at a rate 4 litters /feddan was more effective than the lower rate of the same biofertilizer and former gave significantly higher values of leaves fresh weight , stem fresh and dry in both seasons of study.

Table (3 A): **Effect of different composts and bio fertilizers on vegetative growth of potato plants**

| Treatments | 2002/2003 | | | | | 2003/2004 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 days from planting | | | | | 90 days from planting | | | | |
| | plant height cm | leaves fresh weight g | stem fresh weight g | leaves dry weight g | stem dry weight g | plant height cm | leaves fresh weight g | stem fresh weight g | leaves dry weight g | Stem dry weight g |
| BG(1) | 35.4 | 39.5 | 32.0 | 12.7 | 8.6 | 44.0 | 35.2 | 26.2 | 12.9 | 8.9 |
| BG(2) | 49.3 | 69.7 | 41.7 | 29.4 | 11.1 | 57.8 | 71.4 | 34.4 | 23.5 | 11.7 |
| BG(3). | 33.2 | 41.9 | 29.8 | 10.9 | 7.3 | 39.4 | 47.8 | 30.0 | 10.0 | 7.3 |
| CH ( control) | 43.0 | 58.3 | 36.7 | 17.8 | 9.7 | 50.4 | 56.8 | 31.7 | 16.9 | 9.9 |
| L.S.D. at 0.05 | 1.4 | 2.6 | 3.4 | 2.3 | 0.5 | 4.2 | 7.9 | 1.8 | 0.7 | 0.2 |
| RB(1) | 30.5 | 36.1 | 30.5 | 16.2 | 7.6 | 39.1 | 46.5 | 19.7 | 7 1 | 6 7 |
| RB(2) | 26.4 | 34.7 | 27.4 | 13.2 | 6.7 | 36.1 | 37 5 | 21.7 | 4.6 | 5.9 |
| L.S.D. at 0.05 | 2.7 | 1.1 | 0.7 | 0.8 | N.S | 2.1 | 3.5 | 0.9 | 1.3 | N.S |

The interaction effect of different composts and bio fertilizers on vegetative growth is presented in Table (3 A B ) .It is clear from the data that applying 15 tons of compost + 2 liters of bio fertilizer or4 liters of bio fertilizer showed the highest values of plant length ,leaves fresh and dry weight , and stem dry weight with significant difference between these treatments and any other treatment used in this experiment in both years of study .

The lowest values of vegetative growth were obtained from the treatment of adding 20 tons compost +2 liters or 4 liters of bio fertilizer compared with the control and other treatments .These results were true during the two studied seasons.

The applying biofertilizer to potato inoculated with tuber or added directly to the soil before planting increased vegetable growth of potato plant ,i.e. plant height ,leaves number ,leaves and stem fresh and dry weight . This effect may be due to that applying biofertilizer increases microorganisms living in the soil .The microorganisms working on the organic matter in the soil to convert organic form nutrients such as N to mineral N . This increase in the uptake of nutrients form soil by root of plant growth results were in agree with those of Ibrahim and Abdel Azize (1977) and Ashour and Sarhan(1998) .

The microorganisms , in turn , release chemicals which may affect plant growth , and organic acids which are needed to break down soil mineral fertilizer and make nutrients such as phosphate available to the plant .These results were in agreement with those of (Tien *et al.* ,1979 Gomaa 1989,Lampkin,1990 Reynders and Vlassak ,1982 Rahman *et al.* 1992 and Fayez *et al.* 1985)

**Table (3 A*B ):Effect of different composts and bio fertilizer interaction on vegetative growth of potato plants**

| | | 2002/2003 | | | | | 2003/2004 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (A) | (B) | 90 days from planting | | | | | 90 days from planting | | | | |
| compost | biofertilizer | plant height cm | leaves fresh weight g | stem fresh weight g | leaves dry weight g | stem dry weight g | Plant height cm | leaves fresh weight g | Stem fresh weight g | Leaves dry weight g | Stem dry weight g |
| BG(1) | RB(1) | 34.1 | 47.1 | 30.4 | 12.1 | 8.5 | 41.3 | 38.5 | 27.4 | 11.9 | 8.2 |
| | RB(2) | 36.6 | 52 1 | 33.7 | 13 2 | 8.7 | 44.7 | 52.1 | 31.7 | 14.0 | 9.5 |
| BG(2) | RB(1) | 47.3 | 66.4 | 40.6 | 27.1 | 10.4 | 56.2 | 65.6 | 33 7 | 21.8 | 11.2 |
| | RB(2) | 51 2 | 70 3 | 42.8 | 31.7 | 11.8 | 59.3 | 77.1 | 35 1 | 25.3 | 12.3 |
| BG(3) | RB(1) | 32.0 | 40.6 | 31.4 | 10.0 | 6.4 | 37.8 | 31.8 | 28.3 | 9.3 | 6.9 |
| | RB(2) | 34.3 | 43.2 | 28.2 | 11.8 | 8.2 | 43.0 | 43.5 | 24.7 | 10.8 | 7.8 |
| CH | RB(1) | 41.5 | 56.2 | 35.3 | 15.4 | 9.6 | 49.6 | 53.2 | 31.0 | 15 4 | 6.8 |
| | RB(2) | 44.5 | 60.3 | 38.3 | 20.1 | 9 8 | 51.2 | 58.4 | 32.6 | 18.3 | 10.4 |
| L.S.D. at 0.05 | | 1.8 | 3.8 | 2.7 | 3.3 | 0.6 | 1.3 | 1.0 | 2.4 | 1.3 | 0.3 |

**2 – NPK content:-**

The effect of different compost levels and bio fertilizer on NPK contents of potato plants after 90 days from planting are shown in Table ( 4A) . Results showed that application of compost at a rate of 15 tons / fed. gave the highest values of N and K in potato plants with significant effect compared with the control and other treatments .The low concentration of N and K were observed under applying 20 tons / feddan .

**Table (4 A): Effect of different composts and bio fertilizers on N,P,K, contents of potato plants**

| Treatments | 90 days from planting | | | | | |
|---|---|---|---|---|---|---|
| | 2002-2003 | | | 2003/2004 | | |
| | N (%) | P (%) | K (%) | N(%) | P (%) | K (%) |
| BG(1) | 3.1 | 0.44 | 3.70 | 3.6 | 0.41 | 3.77 |
| BG(2) | 3.6 | 0.49 | 3.99 | 4.1 | 0.51 | 4 35 |
| BG(3). | 2.8 | 0.41 | 3.54 | 3.4 | 0.37 | 3.56 |
| CH ( control) | 3.7 | 0.45 | 3.81 | 4.3 | 0.47 | 4 10 |
| L.S.D .at 0.05 | 0.2 | N.S | 0.12 | 0 23 | N.S | 0.21 |
| RB(1) | 2.7 | 0.35 | 3.21 | 3.29 | 0.33 | 3 53 |
| RB(2) | 3.1 | 0.37 | 3.54 | 3.65 | 0 34 | 3.79 |
| L.S.D .at 0.05 | 0.1 | N.S | 0.06 | 0.07 | N.S | 0 11 |

This result prove that applying compost and chicken manure at a rate of 15 tons / fed. increased N.K contents in potato plants during the studied seasons .As for phosphorous concentration the results showed that there was no significant difference between all treatments during the two seasons of study.

As for bio fertilizers two treatments ( 2L and 4L ) no significant differences were detected in the concentration of N and P during the two successive studied seasons .The concentration of K in potato plants showed that application of the high rate of rizobacterein (4 L/fed. ) resulted in significantly higher K content compared with the low rate (2L/fed.) of the same biofertilizer These results were true in both seasons.

The interaction effect between the different levels of compost and bio fertilizers on NPK contents of potato plants after 90 days from planting are presented in Table ( 4A*B) . Data showed that using compost at 15 tons / feddan + 2 letters or 4 liters rizobecterein increased NPK contents of plant with significant difference compared with other treatments and control i.e. chicken manure + 2 or 4 liters / fed. or other compost rates + biofertilizer .The chicken manure at 15 tons / fed. +2L or4L rizobecterein increased the concentration of NPK in plant compared with adding compost at levels of 20 tons / feddan plus bio fertilizer .The lowest concentrations of NPK were observed with the treatment of adding 20 tons of compost / fed .These results were similar during the two planting seasons .It can be concluded from the mentioned results that applying 15 tons of compost + 2 or 4 liters of rizobecterein increased the NPK concentration in potato plants. Many authors investigated the effect of organic fertilizers on NP and K contents in potato plants , Singh *et al.* (1990) showed that FYM increased both uptake and recovery percentage of N,P an K in potato plant . Also, Blecharezyk and Skrypezak(1996) and Arishe and Bardisi (1999) found that applying organic manure increasing N,P and K in potato plants .Abd El-Rahman(2000) El-Gamal (1996), El-Shimi *et al.* (2002), and Sallam (2002) on cantaloupe, potato , strawberry and pepper respectively obtained similar results.

**Table ( 4 A*B ): Effect of different composts and bio fertilizer interaction on N,P,K contents of potato plants .**

| ( A ) | (B) | 90 days from planting | | | | | |
|---|---|---|---|---|---|---|---|
| Compost | Biofertilizer | 2002/2003 | | | 2003/2004 | | |
| | | N (%) | P(%) | K (%) | N (%) | P (%) | K (%) |
| BG(1) | RB(1) | 2.9 | 0.43 | 3.66 | 3.5 | 0.40 | 3.62 |
| | RB(2) | 3.2 | 0.44 | 3.74 | 3.7 | 0.42 | 3.92 |
| BG(2) | RB(1) | 3.5 | 0.47 | 3.94 | 3.8 | 0.50 | 4.24 |
| | RB(2) | 3.8 | 0.51 | 4.04 | 4.2 | 0.52 | 4.45 |
| BG(3) | RB(1) | 2.6 | 0.40 | 3.47 | 3.4 | 0.36 | 3.25 |
| | RB(2) | 3.0 | 0.42 | 3.61 | 3.6 | 0.38 | 3.86 |
| CH (control) | RB(1) | 3.3 | 0.37 | 3.77 | 3.8 | 0.46 | 4.03 |
| | RB(2) | 3.6 | 0.45 | 3.85 | 4.0 | 0.48 | 4.17 |
| | L.S.D .at 0.05 | 0.1 | 0.03 | N.S | 0.2 | 0.07 | N.S |

3- Tubers starch content:-

Tubers starch contents as affected by adding compost and bio fertilizers to potato plants are presented in Table (5A) Data showed that using compost increased starch in tubers at the rate of 10 tons and 15 tons / feddan than using the other treatments with significant difference .The low amount of starch was detected at a rate of 15 tons of chicken manure or 20 tons compost per feddan .

As bio fertilizer effect data showed that using 4 liters of rizobecterein increased starch content than using 2 liters of bio fertilizer. Similar results were obtained during the two seasons of study .

The interaction effect for different composts and bio fertilizers on tubers starch contents are presented in table(5A*B) .The results showed significant differences between the treatments during the two seasons of the study .Using compost at the rate of 10 tons / feddan + 4 liters or 15 tons / feddan + 2 liters of rizobecterein were more effective in increasing tubers starch than using chicken manure +2 or 4 liters rizobecterein in both seasons.

The results agreed with those reported by Tashkadzhaer (1985), Ouda (2000), Abdella *et al.* (2001), Tantawy (2001),Stroilykovic and Stobdom (1981), and Hawedy (1999) who demonstrated that increasing the rates of FYM and NPK fertilizers increased the tuber yield ,starch and DM content.

Adding compost and chicken manure plus biofertilizer increased dry matter and total carbohydrates (starch) This effect could be due to that biofertilizer play a fundamental role in converting P or K fixed form to be soluble ready for plant nutrition making the uptake of nutrients by plants more easy .Similar results were found by Quastel (1965) and Zayed (1998)

**4-Yield and its components:-**

The effect of different compost and bio fertilizers on yield components (total yield , marketable yield and unmarketable yield) are presented in Table (5A) .The data showed significant difference between treatments in the two studied seasons .Application of compost at a rate of 15 tons per feddan gave significantly greater total and marketable yields compared with chicken manure treatment. Similar trended was obtained fruit yield of small and medium sizes of tubers in both years of study.

Applying chicken manure ( dry or extract ) and compost plus biofertilizers increased total yield of potato crop . The effect might be due to the increase of the nutrients elements in the soil .This increase can 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 fund by, Abdel -Ati (1998),Banerje and Singhamathpatra(1986), Borin and Magrini(1987) and Abou- Hussein (1995)

Concerning application of biofertilizer it is clear that using 4 liters / fed. rizobacterein was more effective than using 2 liters with significant difference. This was true for total and marketable yields beside the quality of small and medium size tubers in both years.

The interaction effect for using different levels of compost and bio fertilizer on total yield and its components is presented in Table (5A*B).Data showed that using compost at a rate of 15 tons / fed. + 4 liters of rizobecterein produced significantly the highest total yield compared with the other treatments .It gave 20.8 tons / feddan , while the using of 10 tons /feddan +4 liters ,20 tons / feddan +4 liters and chicken manure +4 liters of rizobecterein gave 17.8 ,15.97 and 17.9 tons/fed. respectively in the first season. Similar results were obtained in the second season .

The results of marketable yield for the different treatment followed the same trend as total yield in both years of study. Besides the lowest marketable yield was obtained under the rate of 20 tons / feddan of compost + 2 liters of rizobecterein (61.8 % ) .

Table ( 5 A ): Effect of different composts and bio fertilizers on chemical composition and yield of potato plants.

| Treatments | Potato tubers yield 2002/2003 | | | | | | |
|---|---|---|---|---|---|---|---|
| | starch % | Total yield ton/fed. | Small size % | medium size % | big size % | marketable size % | unmarketable size % |
| BG(1) | 71.6 | 17.27 | 29.6 | 28.0 | 42.4 | 75.2 | 24.8 |
| BG(2) | 69.8 | 19.93 | 23.7 | 26.0 | 50.3 | 73.9 | 26.1 |
| BG(3). | 66.4 | 15.40 | 17.7 | 41.2 | 41.1 | 71.6 | 28.4 |
| CH ( control) | 64.6 | 16.48 | 20.8 | 44.5 | 34.7 | 80.4 | 19.6 |
| L.S.D .at 0.05 | 1.85 | 0.43 | 2.4 | 3.8 | N.S | 1.5 | 1.3 |
| RB(1) | 66.8 | 16.48 | 22.2 | 30.2 | 47.6 | 78.9 | 21.1 |
| RB(2) | 69.4 | 18.12 | 24.1 | 37.9 | 38.0 | 84.4 | 15.6 |
| L.S.D .at 0.05 | 0.69 | 0.33 | N.S | 4.2 | 3.8 | 3.6 | 3.9 |
| 2003/2004 | | | | | | | |
| BG(1) | 69.6 | 16.98 | 29.7 | 28.9 | 41.4 | 79.8 | 20.2 |
| BG(2) | 70.7 | 19.13 | 22.5 | 28.5 | 49.0 | 81.0 | 19.0 |
| BG(3). | 66.1 | 15.98 | 19.7 | 36.0 | 44.3 | 83.0 | 17.0 |
| CH ( control) | 65.0 | 17.45 | 22.1 | 35.5 | 42.4 | 80.0 | 20.0 |
| L.S.D .at 0.05 | | 1.08 | 1.7 | 2.9 | N.S | 0.6 | 1.8 |
| RB(1) | 67.6 | 16.75 | 23.5 | 36.4 | 40.1 | 76.1 | 23.9 |
| RB(2) | 69.1 | 18.02 | 23.6 | 56.1 | 20.3 | 84.6 | 15.4 |
| L.S.D .at 0.05 | 1.1 | 0.17 | N.S | 5.8 | 6.7 | 2.7 | 4.8 |

Table (5 A*B ): Effect of different composts and bio fertilizers on chemical composition and yield of potato plants.

| Treatments | | potato tubers yield 2002/2003 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (A) compost | (B) bioferti-lizer | starch % | total yield ton/ fed. | small size % | medium size % | Big size % | marketable size % | unmarketable size % |
| BG(1) | RB(1) | 70.9 | 16.75 | 26.9 | 25.5 | 47.6 | 64.7 | 14.9 |
| | RB(2) | 72.2 | 17.77 | 32.4 | 30.4 | 37.2 | 85.1 | 35.3 |
| BG(2) | RB(1) | 69.3 | 19.03 | 23.3 | 26.1 | 50.6 | 63.6 | 35.4 |
| | RB(2) | 70.3 | 20.83 | 24.1 | 25.9 | 50.0 | 85.0 | 15.0 |
| BG(3) | RB(1) | 64.2 | 14.83 | 16.2 | 41.3 | 42.5 | 61.2 | 38.8 |
| | RB(2) | 68.6 | 15.97 | 19.2 | 41.1 | 39.7 | 81.4 | 18.6 |
| CH (Control) | RB(1) | 62.8 | 15.07 | 21.7 | 29.9 | 48.4 | 70.1 | 29.9 |
| | RB(2) | 66.4 | 17.90 | 20.1 | 56.8 | 23.1 | 88.8 | 11.2 |
| L.S.D .at 0.05 | | 1.8 | 1.31 | 2.6 | N.S | 4.2 | 5.8 | 3.5 |
| 2003/2004 | | | | | | | | |
| BG(1) | RB(1) | 71.6 | 17.33 | 27.1 | 24.8 | 48.1 | 75.6 | 24.4 |
| | RB(2) | 71.7 | 17.57 | 29.0 | 31.3 | 39.7 | 84.8 | 15.2 |
| BG(2) | RB(1) | 70.3 | 18.93 | 23.2 | 26.9 | 49.9 | 73.9 | 26.1 |
| | RB(2) | 71.1 | 19.33 | 25.9 | 30.0 | 44.1 | 88.0 | 12.0 |
| BG(3) | RB(1) | 64.8 | 14.60 | 19.2 | 41.1 | 40.7 | 80.8 | 19.2 |
| | RB(2) | 67.3 | 16 27 | 21.5 | 39.3 | 39.2 | 86.6 | 13.4 |
| CH (Control) | RB(1) | 63.8 | 15 07 | 21.9 | 30.7 | 43.6 | 80.3 | 19.7 |
| | RB(2) | 66.2 | 18 27 | 25.9 | 36.3 | 41.4 | 82.1 | 17.9 |
| L S.D .at 0.05 | | 1.4 | 0 17 | 1.9 | N.S | 2.7 | 4.4 | 2.6 |

It can be concluded that adding biogreen compost at a rate of 15 tons / fed. +4 liters of rizobacterein had merits on potato production as this treatment increased total and marketable yields beside increased the different sizes of tubers compared with chicken manure or other biogreen compost rates + 4 liters of rizobacterein in both years of study. This could be related to the significant positive effect of that treatment on potato vegetative growth and in turn due to better photosynthesis . Moreover , that treatment i.e. 15 tons of biogreen compost + 4 liters of bioferilizer per feddan provided significant source and uptake availability of NPK for plant nutrition.

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# تأثير الأسمدة العضوية والحيوية على نمو ومحصول البطاطس المزروعة فى الاراضى الرملية

**سعيد محمد على قابيل و نظير محمد حسنين**
**معهد بحوث البساتين – أقسام بحوث الخضر – قسم الزراعات المحمية**

أجريت هذة الدراسة فى عامى ٢٠٠٢/٢٠٠٣ و٢٠٠٣/٢٠٠٤ فى منطقة الشيخ رويد بمحافظة شمال سيناء لدراسة زيادة انتاجية محصول البطاطس فى الاراضى الرملية من خلال الاسمدة العضوية والحيوية باستخدام كمبوست بيوجرين بثلاث مستويات وهى ١٠و١٥ و٢٠ طن /فدان مع أضافة مستويين من المخصب الحيوى ريزوباكترين بمعدلين ٤،٢ لتر لكل فدان بالاضافة لمعاملة الكنترول (سماد الدواجن)بمعدل ١٠طن لكل فدان وكانت اهم النتائج المتحصل عليها كلاتى:

١- استعمال الكمبوست والسماد الحيوى بالمعدل (١٠طن/فدان+٢او٤ لتر من السماد الحيوى ) اعطى اعلى نمو خضرى (طول النبات والوزن الطازج والجاف لكل من الاوراق والسيقان بينما استخدام (٢٠طن/فدان من الكمبوست و٤لتر /فدان من الريزوباكترين )اعطى اقل نمو خضرى
٢- اضافة١٥ طن /فدان(كمبوست )+٢ او ٤ لتر / فدان ( ريزوباكترين ) ادى الى الحصول على اعلى تركيز من العناصر الكبرى نتروجين وفسفور وبوتاسيوم فى نباتات البطاطس .
٣- استخدام الكمبوست بمعدل ١٥طن لكل فدان + ريزوباكترين بمعدل ٤لتر / فدان ادى الى زيادة الدرنات والنشا عن استخدام المستويات الاخرى وسماد الدواجن
٤- اضافة الكمبوست بمعدل ١٥طن لكل فدان +٤لتر من ريزوباكترين لكل فدان اعطى اعلى محصول كلى (٨و٢٠طن لكل فدان بالمقارنة بسماد الدواجن +الاسمدة الحيوية (١٧,٩ طن /فدان ) والكمبوست بمعدل ٢٠ طن لكل فدان (٩و١٥ طن/فدان )
٥- كان اعلى محصول قابل للتسويق عندما تم اضافة الكمبوست بمعدل ١٥ طن لكل فدان +٤لتر /فدان ريزوباكترين (٨٥%) وكان اقل محصول قابل للتسويق عندما تم اضافة الكمبوست بمعدل ٢٠طن لكل فدان + ٢ لتر / فدان (٢و٦١% ).