EFFECTS THE APPLICATION OF SOME ORGANIC MANURES WITH NITROGEN LEVELS ON THE GROWTH AND PRODUCTIVITY OF POTATO IN THE ALGERIA SOUTH

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ABSTRACT

The aim of the study is to establish the influence of different organic manures with a different level of nitrogen on the growth and productivity period (leaves area, plants height, number and weight the tuber and production) of potato plants spunta variety. The experiment was laid out a randomized complete block design (RCBD) with ten treatments (three manure treatment with three levels of nitrogen), add the control treatment. Data collected were tested using analysis of variance and significant differences among treatment means were separated using LSD at 0.05 probability. The results obtained from the study indicated highest percent emergence, leaves area and height stems and characteristic yield was obtained under the chicken manure with first nitrogen level. With sheep manure showed lower growth and yield indicators as compared to those fertilized with chicken manure or chicken-sheep fertilizers with all levels N. As regards levels of N in organic manures treatment, the biggest leaves area, height stems and characteristic yield were obtained under the chicken and sheep fertilization in the first level N with no difference height plants between levels N in treatment sheep manure. No significant differences in tuber number were observed among the levels N. For the chicken-sheep manure, growth characteristics were high in the third level of nitrogen, yield recipes at the second level of nitrogen. Based on the results obtained it is evident that poultry manure as organic manure with 1 kg/ h protifert is a good factor of amelioration the growth and yield parameters of potato.
Keywords: Chicken manure, sheep manure, potatoes, nitrogen organic, Growth and Yield

I. INTRODUCTION

The important crop plant potato (Solanum tuberosum) grows on large areas all over the world (19.46 million ha) in 2013 (FAO, 2016). It is a rich source of starch and having protein of a high biological value (Stephen and Jackson., 1999). It is grown on a large scale for climate and soil (Kandil et al., 2011). Potato is highly responsive to the quantity and quality of fertilization, where it is added to improve growth and productively (Leytem and Westermann., 2005). Many previous studies have shown that organic manure is crucial for potato cultivation (Ghemam A and Senoussi., 2013), where potato require high fertilizer-nitrogen quantities, also plays on important role in the balance between vegetative growth and reproduction for potato. Due to poverty of EL-OUED sandy soil from nutrient elements, organic fertilizers are so crucial for potato cultivation, This experimental study aims to show the effect of chicken and sheep manures with different nitrogen levels on the growth and yield of potato.

II. MATERIALS AND METHODS

This study was conducted at the agricultural zone (Hassi Khalifa El-oued) during the autumn season of 2011 and 2013. Cultivar spunta Potato was planted with the following four different fertilizers added three levels of nitrogen for every type of fertilizer via spraying protifert compound. The experiment was carried out on a Randomized Complete Block Design (RCBD), with ten treatments replicated three times.

T0; no manure use (control)

T1: 50 t/ h chicken manure +1kg/h protifert

T2: 50 t/ h chicken manure +2kg/h protifert

T3: 50 t/ h chicken manure +3kg/h protifert

T4: 50 t/ h sheep manure +1kg/h protifert

T5: 50 t/ h sheep manure +2kg/h protifert

T6: 50 t/ h sheep manure +3kg/h protifert

T7: 25 t/h of chicken manure and 25 t /h sheep manure +1kg/h protifert.

T8: 25 t/h of chicken manure and 25 t /h sheep manure +2kg/h protifert.
T9: 25 t/h of chicken manure and 25 t/h sheep manure +3kg/h protifert.

The plots in each replication were regularly observed and data was recorded on percent emergence by Kotowski (1996), leaf area by zidan (2005), plants height, number of stems per plant, the tuber weight, number of tuber per plants, the yield and standard tubers percentage.

The data were statistically analyzed of variations ANOVA was made to determine the signification between the averages, it was compared by the use of LSD with 0.05 probability level.

III. RESULTS AND DISCUSSION

1. Effect of organic manure and nitrogen levels in percent emergence

Consider an average percentage of germination of all organic fertilizer as a result of adding protifert compound after the germination stage spraying on the leaves. The results showed (figure 1) a significant difference on the percent emergence in all treatments and the 2011 and 2013 seasons compared to the control, a highest percentage of germination when poultry treated manure in the 2011 season (97.69%), while the last one was observed in the sheep treatment at 2013 seasons (91.30%). They could be attributed to poultry manure provides the protection to the tubers before the development of shoots from rotting, which is as a source of many essential macro and micronutrients and acids organic (malic acid, humic acid and fulvic acid), because it is fast and easy disintegration. Terms of organic acids that improve soil pH and increase water retention and this is reflected on the soil moisture and stimulates the growth and development of shoots on the eyes (Fusum et al., 2010; Shaaban et al., 2009).

![Figure 1: Effect of organic manure and nitrogen levels in percent emergence](image-url)
2. Effect of organic manure and nitrogen levels in leaves area and stem height

The results figure (2) represents the leaf area of potato plants after 70 days from planting combined data of 2011 and 2013 seasons. A significant difference amongst all the manure treatments shows a significant difference of leaf area in all the manure treatments compared to the control in season 2011. A significant differences between (T1, T2, T3 and T4) with the control treatment, no significant differences with other treatments in season 2013. Again, the leaf area was significantly higher in plants derived from treatment 50t/h chicken manure + 1 kg/h Protifert (T1) and lowest in plants derives the control treatment in 2011 and 2013 seasons. The results figure (3) represents the stem height of potato plants after 70 days from planting. Combined data of 2011 and 2013 seasons shows a significant difference of plant height in all the manure treatments compared to the treatment control in seasons 2011 and 2013. Also, the results showed increased significantly in the plant height in treatments (T1, T2, T3, T8, T9) on treatments (T4, T5, T6), while no significant with treatment T7 in year 2011. While in the year 2013 results showed significantly in treatment T1 compared to the T6 without the other treatments. The plant height is superior in T1 (59.05 and 65.77 cm) in the first measure then the control treatment (14.63 and 23.05 cm) (figure 3) in 2011 and 2013 seasons respectively. The results showed in fig2 and fig 3 represent the leaf area and plant height is superior in the first level of nitrogen with chicken manure, the third level of nitrogen with sheep manure and mixed manure treatment during 2011 season. During 2013 the leaf area and plant height is superior in the first level of nitrogen with chicken manure or sheep manure, while in mixed manure the leaf area is superior in first level treatment of nitrogen and plant height is superior in third level.
Figure 3: Effect of organic manure and nitrogen levels in plants height

3. Effect of organic manure and nitrogen levels in number the tuber

The results showed (figure 4) a significant difference between tuber number rates by plant in all fertilizer treatments for 2011 season, a significant T1 treatment compared with the control for the 2013 season. Results indicate the chicken manure or chicken manure mixed with fertilizer sheep has a significant differences compared with the fertilizer sheep treatment in all nitrogen levels. The results represent the best tuber number rate is recorded with applying the 50t/h chicken manure + 1kg/h Protifert, of seasons 2011 and 2013. The tuber number rate in the first level of nitrogen with chicken manure is the best one in the all chicken manure treatment, 2011 and 2013 seasons, also, in third and the first level of nitrogen with sheep manure and the second with third level of nitrogen with mixed manure during two seasons.

Figure 4: Effect of organic manure and nitrogen levels in number the tuber
4. Effect of organic manure and nitrogen levels in tuber weight

The results of the tuber weight rate represent (figure 5) a significant between the fertilizer treatments (T1, T3 and T9) with the control at 2011 season. Also, a significant difference among T2 treatment compared with (T0, T4, T5, T6, T8 and T9) and a significant difference amongst (T1, T3, T7 and T8) treatments compared to (T0 and T9) for 2013 season. The best tuber weight was recorded in the third level of nitrogen with chicken manure in the 2011 season. The tuber weight is greatest one in the third and second level of nitrogen with chicken manure and in the first level and second level of nitrogen with sheep manure and the third and first level of nitrogen with mixed manure during 2011 and seasons 2013 respectively.

![Figure 5: Effect of organic manure and nitrogen levels in tuber weight](image)

5. Effect of organic manure and nitrogen levels in yield

The results (Table 1) represented the productivity is increased according the classes of organic manures added and nitrogen levels. The finest yield recorded (861.07 and 782.78 g/plant) through T1 treatments, The highest values yield (58.7 and 60.7 ton/h.) were obtained in chicken manure + 1 kg/h or 3kg/h Protifert treatment during 2011 and seasons 2013 respectively. Yield results showed a significantly differences at the chicken manure and mixed manure treatments compared to the sheep manure treatments 2011 season. While, during 2013 season a significant differences at the chicken fertilizer + 1 kg/h Protifert treatment compared with the sheep fertilizer treatments.
Table 1: Effect of organic manure and nitrogen levels in yield

<table>
<thead>
<tr>
<th>treatments</th>
<th>yield g/ plant 2011</th>
<th>yield ton/ h 2011</th>
<th>yield g/ plant 2013</th>
<th>yield ton/ h 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>121.42c</td>
<td>273.25c</td>
<td>80.94c</td>
<td>204.93c</td>
</tr>
<tr>
<td>T1</td>
<td>861.07a</td>
<td>782.78a</td>
<td>574.04a</td>
<td>587.08a</td>
</tr>
<tr>
<td>T2</td>
<td>760.86a</td>
<td>680.91ab</td>
<td>507.24a</td>
<td>510.68ab</td>
</tr>
<tr>
<td>T3</td>
<td>910.52a</td>
<td>504.34ab</td>
<td>457.85b</td>
<td>382.56ab</td>
</tr>
<tr>
<td>T4</td>
<td>506.17b</td>
<td>428.18b</td>
<td>402.56b</td>
<td>314.24bc</td>
</tr>
<tr>
<td>T5</td>
<td>457.85b</td>
<td>548.45ab</td>
<td>805.75a</td>
<td>411.34abc</td>
</tr>
<tr>
<td>T6</td>
<td>402.56b</td>
<td>585.90ab</td>
<td>837.5ab</td>
<td>360.82abc</td>
</tr>
<tr>
<td>T7</td>
<td>287.30bc</td>
<td>305.23b</td>
<td>457.85b</td>
<td>314.24bc</td>
</tr>
<tr>
<td>T8</td>
<td>321.13bc</td>
<td>337.44b</td>
<td>506.17b</td>
<td>457.85b</td>
</tr>
<tr>
<td>T9</td>
<td>232.09</td>
<td>167.27</td>
<td>309.45</td>
<td>250.91</td>
</tr>
</tbody>
</table>

IV. DISCUSSION

Fluctuating environmental conditions, several agronomic factors effect on the potato yield and quality, including soil as a cornerstone for maintaining crop production potential (Makléry and Porter 2007). Organic fertilizer contain large amounts of nutrients and positively affect plant growth and yield by improving the chemical, physical and biological properties of soil (Darzi et al. 2012; Najm et al. 2012). also, the application of organic fertilizer possible activated the soil microbial biomass, hence improved soil fertility (Aita et al. 2007). Plants fertilized with Sheep manure are less developed than chicken manure and mixed chicken-sheep manure fertilized. It is a known fact that the coefficient of manure mineralization varied by type manure, depending on the type and the degree of decomposition of manure as well as on the soil and climate conditions (Mitova and Dinev 2011). The available data show that the ratio between the nitrogen, phosphorus and potassium, considerably diverge when manures different. The application of organic fertilizer greatly enhanced growth, development and yield performance of potato in terms of plant height, leaf area, tuber number and weight tuber so yield. Soil fertility following organic fertilizer application might have increased the leaves area and height of plants was observed in other crops (Moyin-Jesu 2007; Xu et al 2005; Eltun et al 2002). Could probably be attributed to nitrogen availability which promoted growth vegetative during plant development and helped to maintain functional leaf area during the growth period (Adebayo and Akoun 2000; Bi et al 2008). The highest leaves area and height of plants in potatoes plants amended with chicken manure compared to other treatments (John et al., 2004) made similar observation when they
reported that poultry manure contained essential nutrient elements that favour high photosynthetic activities to promote plant roots and vegetative growth.

Increasing in the yield of agricultural crops is probably to release of nutrients which promoted vigorous plant growth through efficient photosynthesis (Ayoub et al 1994; Islam 2002; Iqtidar et al 2006). While, sheep manures are slow release fertilizers. The number and weight of tuber are increased with the application of chicken manure which has a significantly different among the treatments applied. The results could be due to higher leaves area, stems height may have increased tuber production. qualities of vegetative growth and production are convergent in the treatments the second and third nitrogen levels compared with the control could be due to cattle manure release both micro and macro nutrients slowly. in addition to increase the amount of nitrogen available to the plant, stimulates vegetative growth at the expense of production giving rise to significant the first nitrogen level treatment. This is an agreement with Bharadwaj and Nainawat (2003) who reported that organic fertilizer increased the leaf area of two wheat varieties.

REFERENCES


