

## **Effects of Some Organic manures with nitrogen levels on Growth, Productivity of potato in south Algeria**

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### **Abstract**

The objective of the study was to establish the influence of different organic manures with a difference level of nitrogen at growth and productivity of potato plants with the variety spunta – (leaves area, plants height, number and weight the tuber and production). The experiment was laid out in a randomized complete block design (RCBD) with ten treatments ( three manure treatment with three levels of nitrogen), add control treatment. Data collected were tested using analysis of variance and significant differences among treatment means were separated using LSD at 0.05 probability level. The results obtained from the study indicated that the highest percent emergence, leaves area and height stems and characteristic yield was observed was obtained under the chicken manure regime 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 by 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 regime 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. As for the chicken-sheep manure, growth characteristics was 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 productivity (Leytem and Westermann., 2005). Many previous studies have shown that organic manure is crucial for potato cultivation (Ghemam A and Senoussi., 2013), where potato requires high fertilizer-nitrogen quantities, also plays an important role in the balance between vegetative growth and reproduction for potato. Due to the poverty of EL-OUED sandy soil from nutrient elements, organic fertilizers are 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 par 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 profifert compound after the stage of germination spraying on the leaves. The results showed (figure 1) a significant difference on the percent emergence in all treatments and seasons 2011 2013 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 in the 2013 (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 (malicacid, humicacid and fulvicacid), 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)

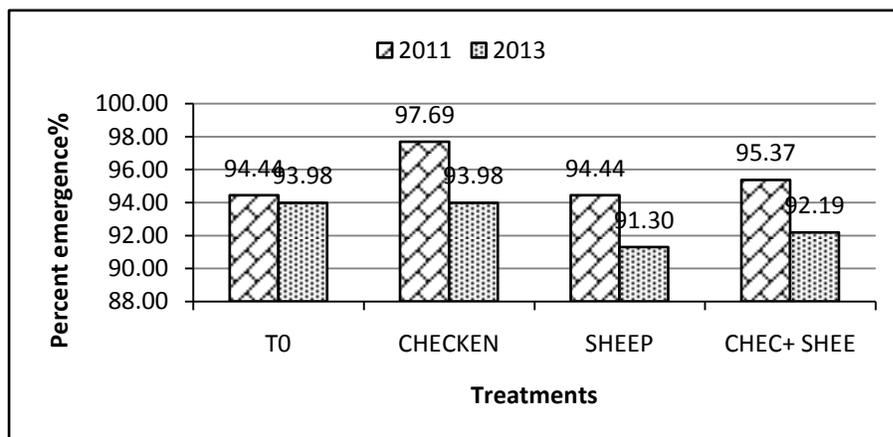


Figure 1: Effect of organic manure and nitrogen levels in percent emergence

#### 2- Effect of organic manure and nitrogen levels in leaves areaand 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) and control treatment, no significant differences with other treatments in season 2013.

Again remarked 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 seasons 2011 and 2013.

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 in the first measure is superior in T1 (59.05 and 65.77 cm) and is inferior the control treatment (14.63 and 23.05 cm) represented in figure 3 in seasons 2011 and 2013 respectively.

As for every type of organic fertilizer results showed of figure 2 and 3 superiority of leaf area and plant height in the year 2011, when the first level of nitrogen with chicken manure, the third level of nitrogen with sheep manure and mixed manure. In the year 2013 superiority the first level of nitrogen with chicken manure or sheep manure of leaf area and plant height while in mixed manure superiority the leaf area in treatment first level of nitrogen and plant height in third level.

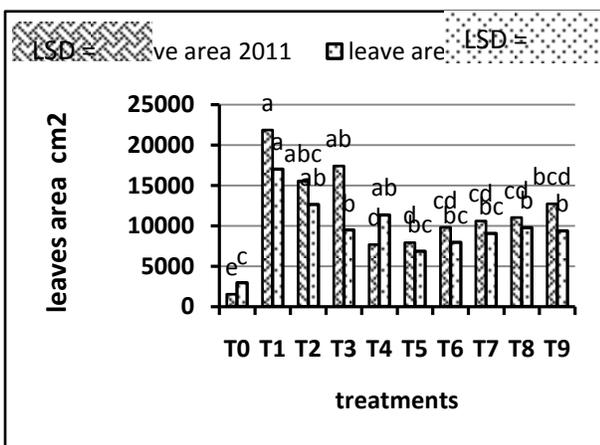


Figure2: Effect of organic manure and nitrogen levels in leaves area

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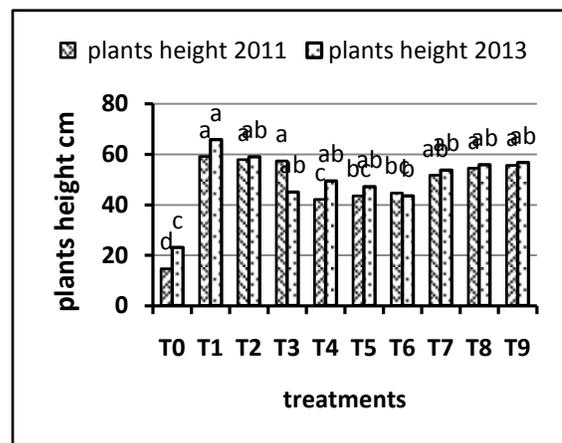


Figure 3: Effect of organic manure and nitrogen levels in plants height

The results figure (4) showed significant difference between tuber number rate by plant in treatments fertilizer and the control treatment for season 2011. Whilst outperforms a significant treatment T1 compared with the control treatment for the 2013 season.

These results indicate that chicken manure or chicken manure mixed with fertilizer sheep significant compared with the fertilizer sheep treatment in all the nitrogen levels. Also, the results showed by applying the 50t/h chicken manure + 1kg/h Protifert, it represented higher group than the other treatments in Tuber number rate for plant of seasons 2011 and 2013.

There was superiority the tuber number in the first level of nitrogen with chicken manure, during two seasons in 2011 and 2013. Also, the third level and first level of nitrogen with sheep manure during two seasons in 2011 and 2013 respectively. What's more, the second and third level of nitrogen with mixed manure during two seasons in 2011 and 2013.

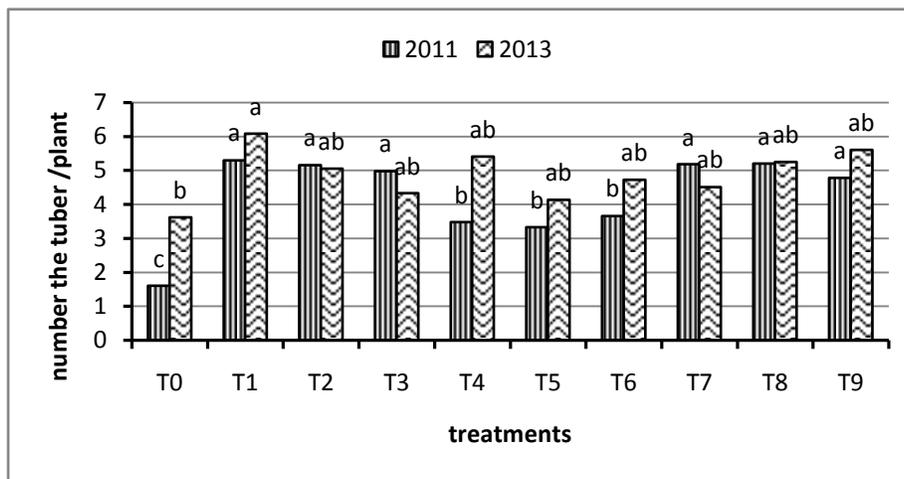


Figure 4: Effect of organic manure and nitrogen levels in number the tuber

#### 4-Effect of organic manure and nitrogen levels in tuber weight

The results figure (5) showed significant difference between the tuber weight rate in treatments fertilizer (T1, T3 and T9) and control treatment for season 2011. Whilst outperforming a significant treatment T2 compared with (T0, T4, T5, T6, T8 and T9) and also the results showed significant treatments (T1, T3, T7 and T8) compared with (T0 and T9) for the 2013 season.

These results indicate that superiority the tuber wright in the third level of nitrogen with chicken manure in the year 2011.

There was superiority the tuber weight in the third and second level of nitrogen with chicken manure, during two seasons in 2011 and 2013 respectively. Also, the first level and second level of nitrogen with sheep manure during two seasons in 2011 and 2013 respectively. What's more, the third and first level of nitrogen with mixed manure during two seasons in 2011 and 2013.

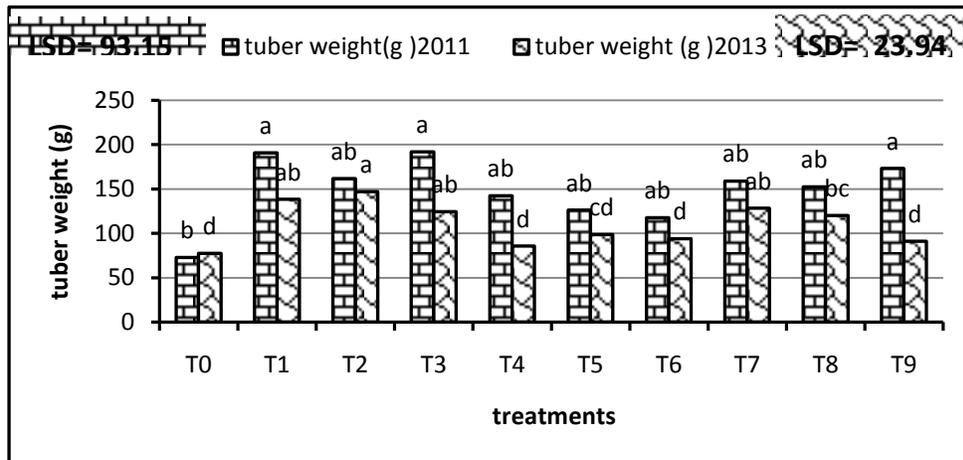


Figure 5 :Effect of organic manure and nitrogen levels in tuber weight

### 5 -Effect of organic manure and nitrogen levels in yield

The results presented in Table (1) have demonstrated that productivity increase varies according of kinds the organic manures the added and nitrogen levels. Regarding the effect of interaction between fertilizer treatments, results reveal that the highest mean values of yield in the plant were recorded at the chicken manure by first level the nitrogen during two seasons (2011 and 2013) were estimated at 861.07 and 782.78 g/plant respectively.

The highest values were obtained in yield ton/ h when treatment chicken manure + 1 kg/h or 3kg/h Protifert during two seasons (2011 and 2013) respectively were estimated at 58.7 and 60.7 ton/h.

Also, the results showed superiority significantly at the treatments chicken manure and mixed manure in yield (plant and hectare) compared with the sheep manure treatments in the year 2011. While, in the year 2013 significant influence by the chicken fertilizer + 1 kg/h Protifert treatment compared with the sheep fertilizer treatments. Showed significant difference between the yield rate in all treatments fertilizer and control treatment in the season 2011. While in the season 2013 significantly at the mixed manure + 2 kg/h Protifert treatment as compared with control treatment.

Table 1 : Effect of organic manure and nitrogen levels in yield

yield ton/ h		yield g/ plant		treatments
2013	2011	2013	2011	
204.93c	80.94c	273.25c	121.42 <sup>c</sup>	T0
587.08a	574.04a	782.78a	861.07 <sup>a</sup>	T1
510.68ab	507.24a	680.91ab	760.86 <sup>a</sup>	T2
378.25abc	607.01a	504.34ab	910.52 <sup>a</sup>	T3
321.13bc	337.44b	428.18b	506.17 <sup>b</sup>	T4
287.30bc	305.23b	383.07b	457.85 <sup>b</sup>	T5
314.24bc	268.37b	418.99b	402.56 <sup>b</sup>	T6
411.34abc	537.17a	548.45ab	805.75 <sup>a</sup>	T7
439.42ab	558.33a	585.90ab	837.5 <sup>a</sup>	T8
360.82abc	532.09a	481.10ab	798.14 <sup>a</sup>	T9
232.09	167.27	309.45	250.91	5%LSD

#### IV - Discussion

fluctuating environmental conditions effect on potato yield, from year to year. Several agronomic factors other affect potato yield and quality. Including soil, it 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). It is also possible that the application of organic fertilizer activated the soil microbial biomass, hence improved soil fertility (Aita et al. 2007). Plant fertilized with Sheep manure are less developed than those fertilized with chicken manure and mixed chicken-sheep manure . It is a known fact that the coefficient of mineralization the manure varied by type manure, depending on the type and 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, on the one hand, and phosphorus and potassium, on the other, considerably diverge when manures different. The findings showed that application of organic fertilizer greatly enhanced growth, development and yield performance of potato in terms of plant height, leaf area, number tuber and weight tuber thereby yield

Increased soil fertility following organic fertilizer application might have increased the leaves area and height of plants as observed in other crops (Moyin-Jesu 2007; Xu et al 2005; Eltun et al 2002) . could probably be attributed to N availability which promoted growth vegetative during vegetative development and also helped to maintain functional leaf area during the growth period (Adebayo and Akoun 2000; Bi et al 2008) recorded 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. Increase in 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. Findings of the present study are in

agreement with studies conducted on other crops (Berova et al 2010; Radhakrishnan and Mahendran 2010 ; Ismael et al 2012)

The number and weight of tuber increased with the application of chicken manure which was significantly different among the treatments applied. The results could be due to higher leaves area, stems height which may have increased tuber production. Increase in qualities of vegetative growth and production are convergent in the treatments the second and third nitrogen levels compared with the control treatment, 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 in agreement with Bharadwaj and Nainawat (2003) who reported that organic fertilizer increased the leaf area of two wheat varieties. These results are in agreement with those obtained by Tsyganov et al, Ferreira and Goncalves (Yanar 2014; Mbatha 2014)

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