

Effect of applying cow manure rates on the growth and yield of some selected onion cultivars under drip irrigation system at Eastern farm, Budaiya, Bahrain Kingdom

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Abstract

Onion is one of important vegetable in Bahrain Kingdom, the imported amount hit 2Mt. In accordance to sustainable agricultural development strategy of Bahrain kingdom 2030, three varieties of onion (Texas, white grano and red grano) were treated by four rate of organic fertilizer (cow manure) 0, 8, 16, 24 and 32 tons /acre to promote and sustain onion yield.

Bulb weight, bulb diameter, plant height, leaf length, leaf area index, biological weight and Harvest index were investigated

The result showed that bulb weight, bulb diameter and leaf length were significantly affected at ($p < 0.05$). The interaction between the treatments and the varieties is significantly affected the bulb weight. the growth indicators were not responded

The average production per acre at the highest application rate are, 11, 11, 17 for the Texas, Red and White onion respectively.

Introduction

Awareness and health concern are among reasons of increasing use of the organic fertilizers in addition to improving soil structure (Dauda 2008) and microbial biomass (Suresh 2004). Bayhan (2010) and Bevcau and Mellano (1993) explained that onions linearly responded to addition poultry manure while. Abdelrazzag (2010) said that not all organic fertilizers have a positive effect on plants. Several studies have also confirmed that the excessive use of fertilizers of both mineral or organic, leading to accumulation of chemical

nutrients, especially nitrogen and phosphorus, thus pollution of ground water (Biberacher et.al. 2009). However, Gebremichael, Y. et.al., (2017) recognized that inorganic fertilizers and inappropriate soil fertility management practices are among the major factors limiting onion productivity in Ethiopia and similarly Watson *et al.*, (2002) stated that the continuous chemical fertilizer uses deteriorated crop while organic manures improved these properties. Others such as Gupta *et al.*, (1999) declared that use of organic manures in combination with chemical fertilizers in an appropriate proportion improves the overall soil health for sustainable onion production.

The rate, time, and method of adding organic manure as varies among users vary according to the type of organic fertilizer (Gaskell and Smith). Lee, J. (2012) declared that the response to organic fertilizer depends on the available nitrogen which is in turn affected by the type and age of animal, feed type, storage (Bary et.al 2000) and its chemical content (Palm et al., 2001).

The Mineralization of organic matter depends on the content of the chemical nutrients and to a greater extent on the prevailing environmental conditions of heat and humidity (Rosen and Allen 2007)

According to united nation food and agricultural organization (FAO), there are estimated 6.7 million acres of onion in the world producing 105 billion pound per year. Leading producing countries are China, India, USA, Turkey and Pakistan respectively.

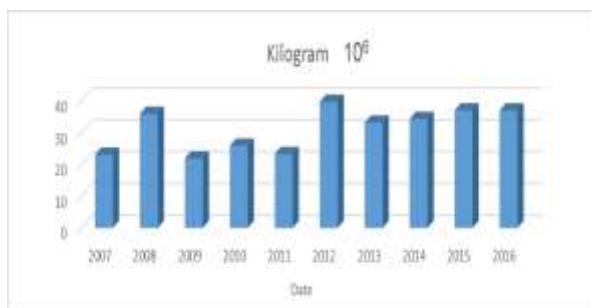
Before the oil booming in Bahrain the agricultural is an important sector of the economy dominated by date palm, for both local consumption and export.

Beginning of last 70s date palm cultivation is declining and a significant horticulture activity, poultry and dairy farm are replacing the date palm.

Onion cultivation is being practice in Bahrain in small scale with no specific record on production levels.

The imported quantity of fresh onion to Bahrain reached about 37, 000 tons in 2016 according to the Statistics from United Nations Statistical Office (Figure 1).

Figure 1: Import of onion in the Kingdom of Bahrain



Source: (FAO 2016)

Efforts is running to evolve onion production in Bahrain, the suitable varieties as well as the practice packages.

To promote agricultural production and productivity, sustainable management and effective use of natural resources by enhancing the capacity and technical knowledge of farmers are of majors of the Kingdom's strategy for 2030. With few operations and local potentials, onions can be developed in the Kingdom and contribute effectively to the overall production of the country.

This study was performed to test the response of different onion varieties to cow manure rates under salty affected sandy loam soil and drip irrigation system.

Materials and methodology

The experiment was conducted in the open research farm at Budaiya, Bahrain kingdom.

Bahrain receives little precipitation. The average annual rainfall is 70.8 mm. The average low temperature is about 23.3 °C while for highest is about 30.8 °C.

moderately to high saline (21.1), sandy loam, low fertility soil. The dominant mineral are Calcium and Sodium respectively

Three varieties have been chosen from the local market, varieties are

- Texas grano (V1)
- White grano (V2)
- Red cresol (V3)

-Bed preparation

- 0.5 m (width) X 5 length X 15cm (height)
- Double row bed (20-25cm between Hills)
- Depth of holes (3.5 cm).

-Basal fertility and transplanting

- cow manure added at rate; 00, 8,16,24,32 ton/acre (3weeks before transplanting)

-Transplanting

- 45 day after sowing date (pencil size) or 5 visible leaves and /15cm height

-Side dressing

- 10 days after transplantation;
- 7-10 gm/m² of (15:30:15+TE) and
- 5gm/m² of (12:12:36) the two week later

Irrigation

- After transplanting
- Tow time/week or/ whenever necessary
- At bulb (more frequency)
- Irrigation will be stopped 30 days before harvesting or 20-30% plant top fall
- Plant do not become waterlogged

Data collection

- Bulb weight, bulb diameter, plant height, leaf length, leaf area index, biological weight and Harvest index were investigated

-plant single yield = weight of each plot/ No

- Biological weight = measured by weighting total produced biomass of each bulb (g/p).

- Harvest index = Bulb weight/ Total biomass weight (Kanton et.al.,2002).

- Leaf Area Index (LAI)= K (L*W)

Where K= 0.75, L= Length and W= width

Data analyses

- Data on all parameters were subjected to analysis of variance (ANOVA) using the SPSS statistical package (23th Version).

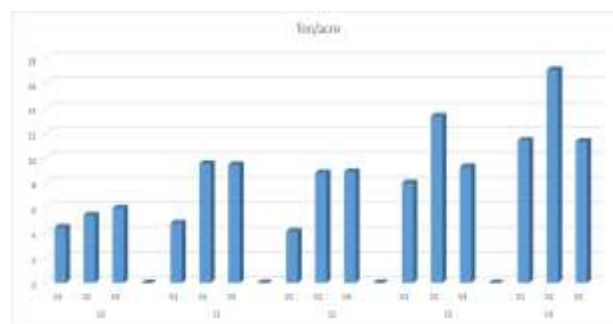
Result

The result indicated that the Mean Bulb weight and Bulb diameter were significantly (p <.05) affected by caw manure rates (treatments) and onion varieties while the interaction between the treatments and varieties is affected on mean bulb weight only. The growth characters (plant height, leaf length, leaf area index, biological weight and Harvest index were investigated) base on different rate of cow manure were insignificantly effected . The leaf length was affected by onion varieties but not by treatment.

The flowing Figures 2,3,4,5, displayed the effect of cow manure rate on onion yield acre⁻¹ of Texas, white and red cresol varieties. The onion varieties yields responded differently to cow manure rates application

Rates of cow manure with 24 and 32 t/acre are relatively high increased yield for Texas and White Grano varieties (Figure 2)

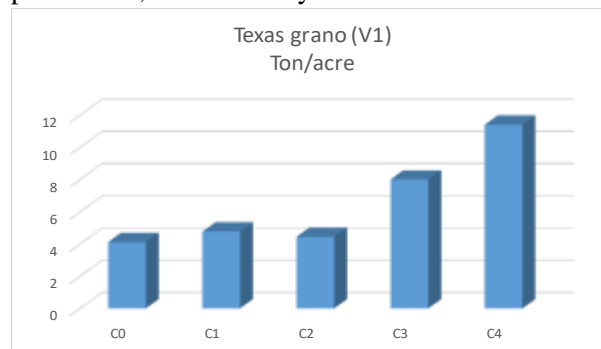
Fig. 2: Response of onion varieties; to the rates of organic fertilization



C0=00, C1= 8, C2= 16, C3=24 and C4=32 ton /acre

The production of the Texas variety has increased from 4 tons to 11 tons, i.e. about 174% (Figure 3)

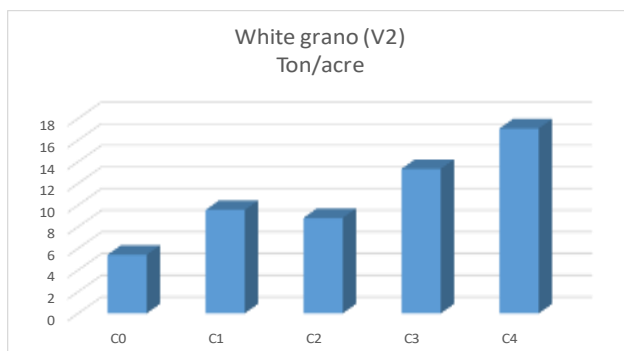
Figure 3: Effect of cow manure rates on onion production; Texas variety



C0=00, C1= 8, C2= 16, C3=24 and C4=32 ton /acre

The variety, white grano production increased from 5 to 7 tons or by 217% (Figure 4)

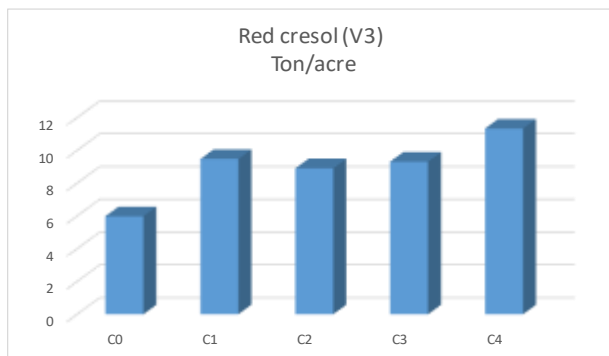
Figure 4: Effect of cow manure rates on onion production; White grano variety



C0=00, C1= 8, C2= 16, C3=24 and C4=32 ton /acre

The productivity of the Red cresol variety increased from 6 to 11 tons, or 89%, which is the least response. (Figure 5)

Figure 5: Effect of cow manure rates on onion production; Red cresol variety



C0=00, C1= 8, C2= 16, C3=24 and C4=32 ton /acre

However, the weather in Bahrain is very noticeable as instable that may have certain effect on growth and yield, even larger differences in yield between crops can be ascribed to the cultural practices applied, and to the relative expertise of the individual growers.

The response of mean bulb weight to application of organic matter rates is agreed with Gwari,

E.Y.et.ai., (2014) result and partially with Nasreen and Hussain (200) whom they concluded that onion responded significantly to organic and inorganic fertilizers. Lee,J. (2012), in his experiment done in South Korea using composted cow manure where by both growth and yield parameters were significant increasing effected . Other researcher attributed the response of plant to such fertilizers depend on both fertilizers and the prevailing environment condition. Likewise; Brewster, (2008) and Greenwood et al., (1982) recognized that, shallow root system of onion requires more fertilizer and according to Bary et al., (2000); type of animal, type and amount of bedding, and age and storage conditions of the manure are affecting manure quality and therefore the availability of minerals for plant

Moreover, Gallardo-Lara and Nogales, (1987), said that, yield response is greater in soils with low fertility, but response varies depending on the compost source.

However, the average yield obtained by this experiment is better than that of Iraq (8.8 ton/ha) as it mentioned by Zeda,G.J.,(2011) and approached the world average production (FAO, 1998).

In term of bulb size, the yield was graded traditionally into unmarketable (small size) and marketable (med and large). The unmarketable size approached on average 19% in Texas variety and about 10% and 14% for White and Red cresol varieties respectively. Generally, there was a subtle increase with increasing rate of cow manure in Red cresol (V3) while decreased with both Texas grano (V1) and White grano (V2) (table1)

Table 1: Comparison of Cow manure effect on bulb size of onion varieties

Cow manure rates	onion varieties					
	Texas grano		white grano		Red cresol	
	unmarketable	marketable	unmarketable	marketable	unmarketable	marketable
Control	29	71	0	100	0	100
8ton/acre	36	64	0	100	10	90
16ton/acre	45	55	14	86	11	89

24ton/a cre	19	81	10	90	0	100
32ton/a cre	33	67	10	90	0	100

Conclusion

Three varieties of onion (Texas, white grano and red grano) were treated by four rate of organic fertilizer (cow manure)00,8,16,24 and 32 tons /acre to promote and sustain onion yield.

Bulb weight, bulb diameter, plant height, leaf length, leaf area index, biological weight and Harvest index were investigated

The result showed that bulb weight, bulb diameter and leaf length were significantly affected. Interaction between treatments and varieties is significantly affected bulb weight. The average production per acre at the highest application rate are,11,11,17 for the Texas, Red and White onion respectively. The compost source should be addressed in the coming trials

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