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Original Research Article

Performance of Locally Produced Seed of Onion (Texas Early Grano) Cultivar in Sudan

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ABSTRACT

The onion cultivar "Texas Early Grano" is very popular in Sudan as it is consumed as a salad vegetable. Attempts to produce seeds of this cultivar locally succeed under Gezira condition by using vernalization and GA. Therefore, the objective of this study was to evaluate onion cultivar "Texas Early Grano" planted from the seeds, which were produced locally, with those planted from the imported seeds which produced by two seed companies (A and B) for growth parameters, bulb quality parameters and during winter season of 2010/11. Results indicated that there were no significant differences in number of leaves and bulbing ratio index, but there were significant differences in plant height. The tallest plants (68 cm) were obtained from seeds of A Company followed by those from local seeds and lastly plants grown from seeds of B Company (66.1 and 62.8 cm, respectively). Bulbs produced from local seeds obtained the highest bulb weight (213.6 gm), the highest percentage of large bulbs (43.0%) and the highest percentage of globe bulb shape (64.1%). However, it obtained average values of doubling percentage (18.2%), thick neck percentage (15.9%), percentage of small bulb size (24.8%), medium bulb size (32.2%) and percentage of flat bulb shape (12.3%) compared with bulbs produced from the two seed companies. The highest yield was obtained by bulbs produced from seeds from A Company (39.8 ton/ha).

Key words: Onion, Texas Early Grano, Salad.

I. INTRODUCTION

Onion (Allium cepa L.), belongs to the family Alliaceae, is the widely grown herbaceous biennial vegetable crop with cross-pollinated and monocotyledonous behavior. [1] Onion production and consumption are gradually increasing globally. [2] In Sudan onion is also one of the most important vegetables that cultivated in about 33 percent of the total area vegetables cultivated. The onion production are representing about 25 percent of the country's total vegetable production. [3] Variation in production seasons in the different regions of Sudan makes it available throughout the year. The main production areas are Gezira, Shendi and Kassala. Total production of onion in Sudan is around 1.12 million tons. [4]

Seed production is a vital part in onion growing and is a highly specialized business requiring particular knowledge and training. Steady supply of good quality seeds is pre-requisite for the successful accomplishment of high production of acceptable onion for local consumption or export. The production of onion seeds with high quality depends on a number of factors. The most important one includes storage methods, size of bulbs, planting dates and harvesting times. Moreover, onion seed production depends on the cultivars,

location, growing season and adequate plant protection measures. [5] About 9,745.36 tones of onion seed was produced in the world in 2011. [6]

The introduced cultivar "Texas Early Grano" is widely grown and consumed in Sudan as a salad crop due to its mild and pleasant taste and low pungency. While seeds of all landraces are produced locally, seeds of "Texas Early Grano" have to be imported from western seed companies. This makes the cost of producing of "Texas Early Grano" quite high. Seed of "Texas Early Grano" was produced in Sudan in previous study [7] to minimize the use of import seeds and minimize the cost of producing this cultivar. The objective of this study is to evaluate onion cultivar "Texas Early Grano" planted from the seeds produced locally with those planted from the imported seeds which produced by two seed companies (A and B) for growth parameters, bulb quality parameters and yield components.

II. MATERIALS AND METHODS

This experiment was carried out to evaluate onion cultivar Texas Early Grano planted from the seeds, which were produced locally in previous study by [7] with those planted from the imported seeds which produced by two seed companies (A and B) for growth parameters, bulb quality parameters, yield components and seed quality during winter season of 2010/11. Seeds were sown in the nursery on the second week of September and seedlings were transplanted on the second week of November. Fully mature bulbs were harvested from April to May. The roots were cut and the tops were severed one inch above the bulb. Treatments were arranged in a randomized complete block design with three replications. Data taken consisted of the following:

2.1. Growth parameters

a. Number of leaves

Numbers of leaves per plant were recorded in a random sample of 10 plants from each plot, 90 days from transplanting.

b. Plant height (cm)

Plant height was measured from the tip of the longest leaf to the neck of the bulb at the soil surface.

c. Bulbing ratio

The bulbing ratio is measured to describe the degree of bulbing. Ten plants were randomly selected and bulb and neck diameters (cm) were determined using a vernier caliper and then the bulbing ratio was determined using the formula:

$$\text{Bulbing ratio} = \frac{\text{Bulb diameter}}{\text{Neck diameter}}$$

2.2 .Bulb quality parameters

Bulb quality was evaluated by the following characteristics:

a. Doubling (%).
b. Thick neck (%).
c. Bulb shape (flat, flattened globe, globe).
d. Bulb size

Bulbs were divided into three groups based on bulb diameter. These groups were small (3.0 – 4.4 cm), medium (4.5 – 6.0 cm) and large bulbs (> 6 cm).

e. Bulb weight (gm)

2.3. Yield and other related parameters

a. Total yield

Harvested onion bulbs were weighed and total yield (ton/ha) was determined.

b. Total Soluble Solids (TSS)

The total soluble solids (TSS) were determined in a random sample of 10 bulbs from each plot using a hand refractometer.

c. Dry matter content

Dry matter content was determined from a random sample of 10 bulbs. The outer scales were removed and the bulbs were divided into 4 quarters using a sharp knife. Ten quarters from each plot were weighed and dried in an oven at 70 - 75°C for 48 hours until a constant weight was reached and dry matter content was determined according to the following equation:

$$\text{Dry matter content (\%)} = \frac{\text{Dry weight x 100}}{\text{Fresh weight}}$$

d. Pungency

Pungency was determined by a taste panel according to the following rating:

1 = Mild.

2 = Pungent.
3 = Very pungent.

Data analysis:
Data were subjected to analysis of variance using MSTAT-C program. Means were separated using Duncan Multiple Range Test at 5% level of significance.

III. RESULTS AND DISCUSSION

3.1. Growth parameters

The growth parameters of onion cultivar Texas Early Grano planted from the seeds which were produced locally were compared with those planted from the imported seeds which produced by two seed companies (A and B)9Table. 1). There were no significant differences in number of leaves and bulbing ratio index, but there significant differences in plant height (Table 1). The tallest plants (68 cm) were obtained from seeds of A Company followed by those from local seeds and lastly plants grown from seeds of B Company (66.1 and 62.8 cm, respectively). This findings are in line with those reported by [8] who found a significant different in plant height in different onion cultivars.

3.2. Bulb quality parameters

The quality of bulbs of onion cultivar Texas Early Grano resulting from the seeds which were produced locally were compared with those resulting from the seeds produced by two seed companies (A and B) (Table 2). Results showed significant effects on all bulb quality parameters (doubling %, thick neck %, bulb weight, bulb size and bulb shape except flat end). Bulbs produced from local seeds obtained the highest bulb weight (213.6 gm), the highest percentage of large bulbs (43.0%) and the highest percentage of globe bulb shape (64.1%). However, it obtained average values of doubling percentage (18.2%), thick neck percentage (15.9%), percentage of small bulb size (24.8%), medium bulb size (32.2%) and percentage of flat bulb shape (12.3%) compared with bulbs produced from the two seed companies. Thickness of neck is an important parameter that determines the storability qualities of onion varieties. [9] The presence of variation in thick neck among onion cultivars is also reported by [10] Kalb (2001). The cause of thick neck in onion is generally due to defective nutrition prolonged cool time and lack of interplant competition in addition to genetic inheritance. [11] Bulb shape differed among cultivars and affected by environmental condition. [12] These results indicated that bulbs produced from the seeds which were produced locally had good bulb quality characteristic compared with those produced from distinguished seed companies these may be due it's to adaption to the local environment.

Table 1. Growth parameters of onion cultivar "Texas Early Grano" produced from different sources of seed.

Sources of seed	Number of leaves/plant	Plant height (cm)	Bulbing ratio index
A	12.8	68.0 a	4.3
B	13.9	62.8 b	5.7
Local seed	13.2	66.1 ab	4.8
Significant level	NS	*	NS
C.V (%)	3.7	2.3	11.8

Means within columns followed by the same letter(s) are not significantly different at P≤0.05 level according to Duncan's Multiple Range Test.
* and NS indicate significance at P≤0.05 and not significant, respectively.

Table 2. Bulb quality parameters of onion cultivar "Texas Early Grano" produced from different sources of seed.

Source of seeds	Doubling (%)	Thick Neck (%)	Bulb weight (gm)	Bulb size (%)			Bulb shape (%)		
				Small	Medium	Large	Flat	Flat end	Globe
A	6.6 c	16.5 a	203.3 a	31.5 a	37.1 a	31.4 b	10.3 b	21.8	67.9 a
B	31.9 a	10.7 b	176.2 b	34.6 a	29.5 b	35.9 b	30.1 a	17.4	52.5 b
Local seed	18.2 b	15.9 a	213.6 a	24.8 b	32.2 b	43.0 a	12.3 b	23.6	64.1 a
Significant level	**	*	*	*	*	*	**	NS	**
C.V (%)	18.4	11.7	9.3	19.3	19.4	19.3	21.4	29.6	4.5

Means within columns followed by the same letter(s) are not significantly different at P≤0.05 level according to Duncan's Multiple Range Test.
*, ** and NS indicate significance at P≤0.05, 0.01 and not significant, respectively.

3.3. Yield and other related parameters

The yield and other related parameters of onion cultivar "Texas Early Grano" planted from the seeds which were produced locally compared with those planted from the seeds produced by two seed companies (A and B) are shown in table 3. Total yield (ton/ha) showed highly significant differences, whereas TSS, dry matter content and pungency were not significant. The highest yield was obtained by bulbs produced from seeds from A Company (39.8 ton/ha). There was no significant difference in yield produced from seeds from B Company and bulbs produced from local seeds (26.4 and 24.2 ton/ha, respectively). The present findings are supported by different investigations previously done by [13,14] suggested that varieties could have different yield potential in different agro-ecologies due to their genetic potential and genetic environment interaction effect.

Table 3. Total yield and quality of bulbs of onion cultivar "Texas Early Grano" produced from different sources of seed.

Source of seeds	Total yield (ton/ha)	TSS (brix)	Dry matter content (%)	Pungency
A	39.8 a	6.3	5.5	Mild
B	26.4 b	5.3	5.6	Mild
Local seed	24.2 b	6.3	5.3	Mild
Significant level	**	NS	NS	__
C.V (%)	7.67	0.20	11.58	__

Means within columns followed by the same letter(s) are not significantly different at P≤0.05 level according to Duncan's Multiple Range Test.
** and NS indicate significance at P≤ 0.01 and not significant, respectively.

CONCLUSION

The locally produced seeds of onion cultivar "Texas Early Grano" have the ability to give high bulb yield and excellent bulb quality characteristics under central Sudan condition.

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