# EFFECT OF SET-SIZE AND PLANTING DEPTH ON THE EMERGENCE AND YIELD OF DRY ONION SETS

**Hosseny, H.M*. ; K.A.A. ,El-shaikh * and A.A ,Gamie ****
***Faculty of Agriculture Sohag, South Valley University**
****Onion Research Station, Field Crops Research Institute A.R.C.**

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**ABSTRACT: Onion sets of cultivar Giza 6 Mohassan were used in this investigation to study the effect of set-size and planting depth on emergence and yield of dry onion sets in the field of Shandweel experimental Farm station during 2000/2001 and 2001/2002 seasons. The results indicated that, percentage of emergence and total yield were significantly increased with large onion sets (16-24mm) and 5cm depth of planting. Number of days to emergence increased with increasing the number of days from planting date until 18 days in the large onion sets and this trait increased to 22, 18 and 15 days with 1, 5 and 10cm deep respectively. Also, Missing plants were decreased by increasing of set-size on the other side increased with increasing of planting depth.**

## INTRODUCTION

Onion (*Allium cepa L*.) is one of the most important vegetable crops in Egypt. There is along list of importing onion countries which show that onion is an important item in the world trade. Egypt has long been a leading country in onion export especially that produced in Upper Egypt district. Many factors affect growth of onion plants and subsequently the yield and quality. One of these factors is sowing depth. The importance of this factor is due to its effect on seed germination, seedling damage caused by herbicides and subsequently decrease plant stand at harvesting.

Vonhosslin and Andresen(1963) reported that, the proportion of

large bulbs of onion decreased as sowing depth increased. Sucin *et al.*(1979) in trail of sets with 3 planting depth ,i.e, 3,5 or 7cm they found that the highest returns were obtained from plots planted at 7cm deep. Shalaby *et al.* (1991) reported that total yield was increased with increasing of set size. The 5cm deep produced the highest yield. Bhardwaj *et al.* (1991) found that planting bulbs 2.5 cm deep increased scape number and seed yield per plant Ellis (1992) reported that seed germination, vigour and bulb size may influence crop yield. The indirect effects include those on (%) emergence and time from sowing to emergence. Direct effects on subsequent plant performance are more difficult to discern. Hagiladi *et al.* (1992) indicated that increasing planting depth delayed emergence. and reduced the percentage of emerged plants. Farag (1994) decided that sowing depth increased scale thickness and the number of centers per bulb , but decreased doubling percentage. They also indicated that the planting depth decreased percentage of doubling. The planting depth, 5 cm resulted in the highest average bulb weight, total bulb yield and marketable yield in both seasons. Both the 2-cm sowing depth and the 5-cm planting depth resulted in well-rounded bulbs. Kretschmer (1994) reveal that emergence of onion seed was began after (6-11 days) on 2 cm and continuous up to (15-20 days) from sowing. Krestchmer *et al.*(1997) studied the effect of sowing depth on bulb size and shape. Emergence at the lower depths was slower and young plants were smaller on a given date than those sown at a shallower depth. Sowing depth had no significant effect on bulb size and shape was not affected by sowing depth. A sowing depth of 3cm is recommended. Gabriel *et al.* (1997) found that seed germination increased linearly as seed diameter increased. This work aimed to improve the emergence and yield of dry onion sets through investigating set size and planting depth.

## MATERIALS AND METHODS

The present study was carried out at the experimental farm of Shandweel Station for two successive seasons (2000/2001 and 2001/2002) to study the effect of set size and planting depth on the emergence and yield of onion sets

cultivar Giza 6 Mohassan in the field. The soil was loam clay.

**Table 1: Chemical and physical properties for experimental soil sites**

| Seasons | Soil analysis | | | | | |
|---|---|---|---|---|---|---|
| | Texture | pH | O.M | Nutrient status in soil(ppm) | | |
| | | | | N | P | K |
| 2000/2001 | Loam clay | 8.00 | 1.80 | 38 | 17.0 | 364 |
| 2001/2002 | Loam clay | 7.85 | 1.59 | 33 | 11.5 | 248 |

The experiment consisted of 9 treatments which were the combinations of three sizes of sets, i.e, 4-8, 8-16 and 16-24 mm in diameter and three planting depths, viz. 1 , 5 and 10cm. The onion sets were planted on 5 September in both seasons. The number of sprouting sets were recorded after eight days from planting and three days intervals. Missing plants were recorded after two months from planting. The design was split plot with four replications. The main plots contained the set-size, while the subplots contained the planting depth. The plot consisted of eight rows with three meter long and 25cm apart and the spacing between plants was 7.5cm in rows. The cultural practices and weed control were as recommended for production of onion grown from sets. Data were recorded on the following characters:-

**1.percentage of emergence** was calculated by the following equation **(Bartlett, 1937)**

$$\frac{\text{Number of emergence sets}}{\text{Total number of planted sets}} \times 100$$

**2.Number of days to emergence sets**

**3.Percentage of missing plants, it** was calculated by the following equation:

$$\frac{\text{Number of missing plants}}{\text{Total number of planted sets}} \times 100$$

**4.Total bulbs yield (ton/fed.)**

Data were subjected to statistical analysis and means were compared using the L.S.D. method according to Steel and Torri (1982).

## RESULTS AND DISCUSSION

### 1.Percentage of emergence

Data in Table 2 clearly show that, percentage of emergence was significantly effected by set-size in all weeks in both seasons. It was

clear that the large sets gave the highest emergence percentage as compared with the small ones during the two experimental seasons. Obtained results shown in Table 2 indicated that, the depth of planting significantly affected the percentage of sets emergence in both seasons. It is clear that the depth of 1cm gave the highest values after six weeks from planting (90.88% and 90.6%), while the 10 cm depth gave the lowest values of emergence (75.72% and 75.80%) in the first and second seasons , respectively. Data in the same Table clearly indicate that the interaction between the two studied factors significantly affected this trait in both seasons. Whereas, the highest values were (97.8 and 97.60%) resulted from the interaction between the large onion sets, i.e., 16-24mm and planting depth of one cm compared to the lowest values (69.13 and 69.30%) which were produced by the combination between the small sets 4-8mm and 10cm depth in the first and second seasons, respectively.

**Table 2 : Effect of set-size and planting depth on percentage of emergence sets in the 2000/2001 and 2001/2002 seasons.**

| | Season 2000/2001 | | | | Season 2001/2002 | | | |
|---|---|---|---|---|---|---|---|---|
| Planting depth (cm) | 1 | 5 | 10 | Mean | 1 | 5 | 10 | Mean |
| Set-size (mm) | | | | | | | | |
| 4-8 | 81.27 | 73.13 | 69.13 | 74.51 | 79.43 | 72.90 | 69.30 | 73.88 |
| 8-16 | 93.57 | 89.27 | 69.73 | 84.19 | 93.43 | 89.00 | 69.80 | 84.08 |
| 16-24 | 97.80 | 94.77 | 88.30 | 93.62 | 97.60 | 94.07 | 88.30 | 93.32 |
| Mean | 90.88 | 85.72 | 75.72 | | 90.16 | 85.32 | 75.80 | |

**L.S.D at 0.05**

| | | | |
|---|---|---|---|
| | Set-Size | 9.96 | 8.91 |
| Planting depth | 6.01 | 5.19 | |
| | Size x depth | 8.49 | 7.33 |

## 2.Number of days to emergence

Data in Table 3 and Figs. 1,2,3 and 4 clearly indicate that the rates of emergence was affected by set-size and planting depth in 2000/2001 and 2001/2002 seasons. It's evident that emergence rate was increased with increasing

number of days after planting until the 18 days from planting in all studied treatments. The highest values of this character were achieved with sets (8-16mm) in both seasons. The above mentioned data at Table 3 also reveal that the emergence rates were the highest value with one cm depth of planting after 22 days from sets planting, while the ten cm depth was the lowest after 15 days from planting sets in both seasons.

**Table 3 : Effect of set size and planting depth on number of days to Emergence sets in the 2000/2001 and 2001/2002 seasons.**

| | Season 2000/2001 Dates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13/9 date | 16/9 date | 19/9 date | 22/9 date | 25/9 date | 28/9 date | 1/10 date | 4/10 date | 7/10 date | 10/10 date | 13/10 date |
| **Set size(mm)** | | | | | | | | | | | |
| 4-8 | 4.07 | 9.43 | 11.9 | 12 | 11.8 | 9.57 | 7.4 | 4.3 | 2.4 | 1.46 | 0.62 |
| 8-16 | 6.7 | 14.2 | 19.8 | 20.9 | 14.3 | 7.47 | 3.17 | 2.6 | 1 | 0.4 | 0.1 |
| 16-24 | 5.43 | 15 | 15.2 | 15.8 | 18.3 | 4.5 | 2.87 | 1.22 | 0.86 | 0.4 | 0.1 |
| **Planting depth (cm)** | | | | | | | | | | | |
| 1 | 5.97 | 9.4 | 11.3 | 19.7 | 22.9 | 9.17 | 6.07 | 4.27 | 2.7 | 1.63 | 0.59 |
| 5 | 7.1 | 14.6 | 15.4 | 16.6 | 12.9 | 7.1 | 3.47 | 2.3 | 0.73 | 0.47 | 0.2 |
| 10 | 3.13 | 13.6 | 19.1 | 14.3 | 11.3 | 3.9 | 3.27 | 1.5 | 0.8 | 0.16 | 0.01 |
| | **Season 2001/2002** | | | | | | | | | | |
| **Set size(mm)** | | | | | | | | | | | |
| 4-8 | 6.9 | 7.63 | 9.03 | 11.9 | 11.1 | 8.8 | 6.63 | 4.97 | 3.5 | 2.04 | 1.87 |
| 8-16 | 6.53 | 15.5 | 17.2 | 21.0 | 15.9 | 7.5 | 3.3 | 2.47 | 1.07 | 0.77 | 0.4 |
| 16-24 | 5.66 | 9.2 | 15.7 | 19.7 | 16.8 | 8.37 | 4.83 | 3 | 2.2 | 0.97 | 0.4 |
| **Planting depth (cm)** | | | | | | | | | | | |
| 1 | 5.83 | 7.8 | 11.9 | 16.7 | 20.6 | 10.1 | 5.53 | 4.33 | 2.87 | 2.03 | 1.17 |
| 5 | 6.87 | 13.2 | 14.4 | 19.3 | 12.7 | 7.83 | 5.6 | 3.83 | 3.1 | 1.7 | 1.23 |
| 10 | 6.4 | 11.2 | 17.9 | 16.6 | 10.5 | 6.7 | 3.63 | 2.05 | 0.97 | 0.70 | 0.30 |

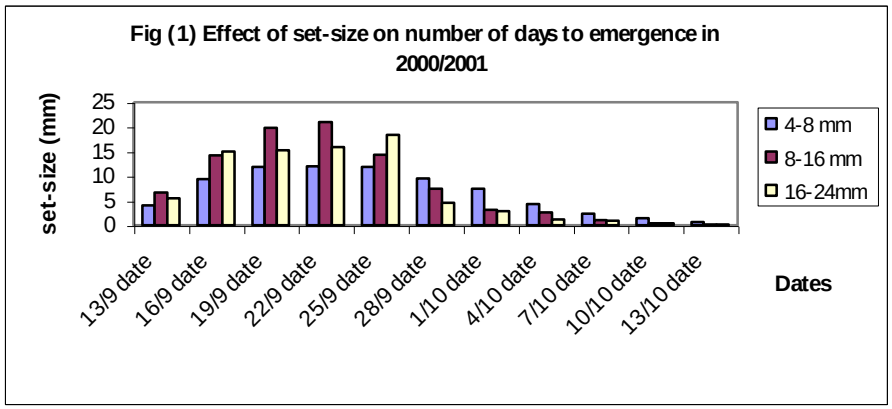
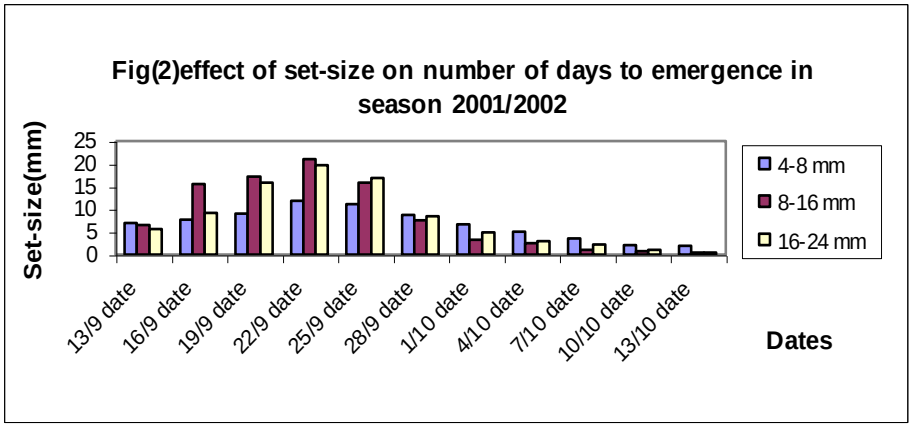
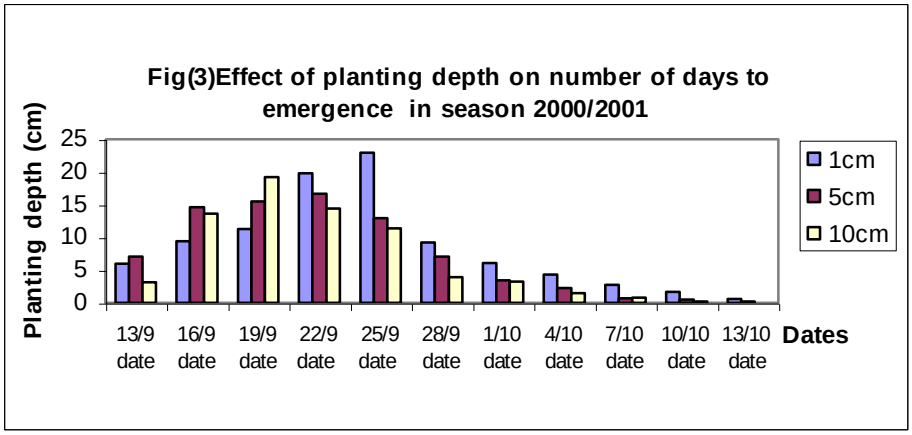


Fig (1) Effect of set-size on number of days to emergence in 2000/2001
set-size (mm)
25
20
15
10
5
0
4-8 mm
8-16 mm
16-24mm
13/9 date
16/9 date
19/9 date
22/9 date
25/9 date
28/9 date
1/10 date
4/10 date
7/10 date
10/10 date
13/10 date
Dates


Fig(2)effect of set-size on number of days to emergence in season 2001/2002
Set-size(mm)
25
20
15
10
5
0
4-8 mm
8-16 mm
16-24 mm
13/9 date
16/9 date
19/9 date
22/9 date
25/9 date
28/9 date
1/10 date
4/10 date
7/10 date
10/10 date
13/10 date
Dates


Fig(3)Effect of planting depth on number of days to emergence in season 2000/2001
Planting depth (cm)
25
20
15
10
5
0
1cm
5cm
10cm
13/9 date
16/9 date
19/9 date
22/9 date
25/9 date
28/9 date
1/10 date
4/10 date
7/10 date
10/10 date
13/10 date
Dates

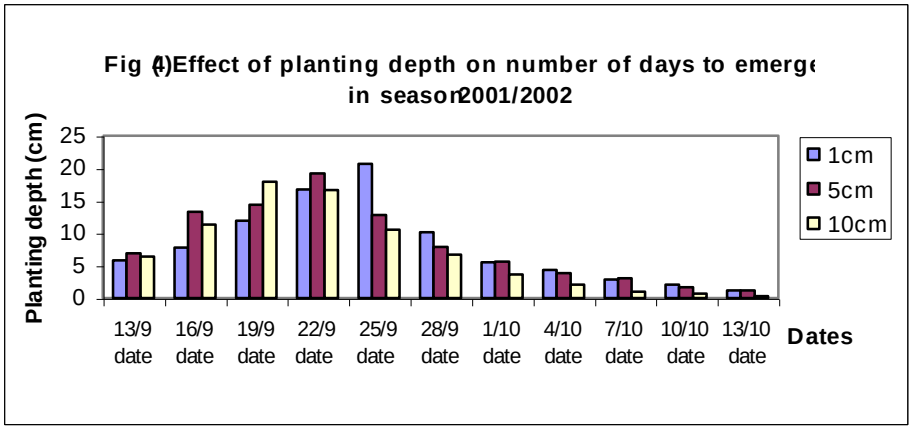


Fig (4)Effect of planting depth on number of days to emerge
in season 2001/2002
Planting depth (cm)
25
20
15
10
5
0
1cm
5cm
10cm
13/9 date
16/9 date
19/9 date
22/9 date
25/9 date
28/9 date
1/10 date
4/10 date
7/10 date
10/10 date
13/10 date
Dates

## 3.Percentage of missing plants

Results in Table 4 obviously indicate that the two studied factors, i.e., (sets size and planting depth) significantly affected the percentage of missing plants in the two experimental seasons. Moreover, this trait inversely related with the two studied factors. However, the best results (lowest values),i.e., 6% and 6.22% were achieved by the large onion sets compared to the highest values (23.55% and 25.55%) resulted from the small onion sets. These results are true in both experimental seasons. Also percentage of missing plants was increased with increasing planting depth. The depth of one cm gave the lowest percentage of missing plants (8.78% and 9.44%), while the depth of ten cm produced the highest values (22.22% and 23.67%) in the first and second seasons, respectively. Data in Table 4 Moreover, show that the interaction between sets size and planting depth significantly affected the percentage of missing plants. It was clear also that the combination between large sets (16-24mm) with 1 cm planting depth gave the lowest value compared with the small sets (4-8mm) with 10 cm depth which recorded the highest percentage of missing plants in the first and second seasons Table 4.

**Table 4 : Effect of set-size and planting depth on percentage of missing plants in the 2000/2001 and 2001/2002 seasons.**

| | Season 2000/2001 | | | | Season 2001/2002 | | | |
|---|---|---|---|---|---|---|---|---|
| Planting depth (cm) / Set-size (mm) | 1 | 5 | 10 | Mean | 1 | 5 | 10 | Mean |
| 4-8 | 18.33 | 26.67 | 29.66 | 23.55 | 20.00 | 26.66 | 30.00 | 25.55 |
| 8-16 | 6.00 | 10.33 | 25.66 | 15.33 | 6.00 | 10.67 | 30.00 | 15.55 |
| 16-24 | 2.00 | 4.66 | 11.33 | 6.00 | 2.33 | 5.33 | 11.00 | 6.22 |
| Mean | 8.78 | 13.89 | 22.22 | | 9.44 | 14.22 | 23.67 | |

**L.S.D at 0.05**

| | | | |
|---|---|---|---|
| | Set-Size | 9.27 | 8.39 |
| Planting depth | 6.13 | 5.08 | |
| | Size x depth | 8.68 | 7.21 |

## 4.Total bulb yield (ton/fed.)

Results in Table 5 show the effect of the two studied factors, i.e, (sets size and planting depth)on total bulb yield in 2000/2001 and 2001/2002 seasons. It reveal that the total yield was significantly increased with the increase of set size in both seasons. Large sets (16-24mm) produced the best yield, while the small sets (4-8mm) gave the lowest yield during the two experimental seasons. On the other hand, total bulb yield fluctuated among the three planting depths. Whereas, the differences were more announced and statistically approved in the second season only. It is evident that the depth of 5 cm gave the highest bulbs yield, while ten cm depth gave the lowest value of bulbs yield.

Total bulb yield was not significantly influenced by the interaction between set size and planting depth in both seasons of study. In respect of adapting some cultural practices which might affect the emergence of dry onion sets in the field, it was found in this present study that using large onion sets (16-24mm) and planting depth of 1-5 cm showed the highest values in this respect. Such results are in harmony with those obtained by Shalaby *et al* .(1991), Ellis (1992), Farag (1994) and Gabriel *et al.* (1997). who found that seed germination increased linearly as seed diameter increased. Also, the planting depth, 5 cm resulted in the highest average of bulb weight, total bulb yield and marketable yield in both seasons.

**Table 5 : Effect of set-size and planting depth on total bulb yield (ton/fed.) in the 2000/2001 and 2001/2002 seasons.**

| | Season 2000/2001 | | | | Season 2001/2002 | | | |
|---|---|---|---|---|---|---|---|---|
| **Planting depth (cm)** | **1** | **5** | **10** | **Mean** | **1** | **5** | **10** | **Mean** |
| **Set-size (mm)** | | | | | | | | |
| **4-8** | **14.19** | **12.87** | **10.65** | **12.57** | **13.72** | **12.73** | **9.10** | **11.85** |
| **8-16** | **16.21** | **15.87** | **13.24** | **15.11** | **15.21** | **15.12** | **12.42** | **14.19** |
| **16-24** | **18.03** | **20.92** | **20.50** | **19.82** | **18.84** | **20.05** | **19.29** | **19.39** |
| **Mean** | **16.14** | **16.55** | **14.80** | | **15.92** | **15.97** | **13.60** | |
| **L.S.D at 0.05** | | | | | | | | |
| **Set-Size** | | | | | **2.29** | | | **2.73** |

| | | | |
|---|---|---|---|
| **Planting depth** | **N.S** | **1.17** | |
| | **Size x depth** | **N.S** | **N.S** |

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## تأثير حجم البصيلة وعمق الزراعة على انبات البصيلات و المحصول فى البصل

**ماهر حسن حسنى* ، خالد احمد امين الشيخ*, عبد المنعم عباس جامع****

***كلية الزراعة بسوهاج – جامعة جنوب الوادى**

****معهد بحوث المحاصيل الحقلية-مركز البحوث الزراعية**

أجريت هذة الدراسة فى محطة بحوث شندويل خلال موسمى الزراعة 2001/2000 و 2002/2001 على صنف البصل جيزة 6 محسن وذلك لدراسة تأثير كلا من حجم البصيلة وعمق الزراعة على نسبة الإنبات فى الحقل. وقد أظهرت النتائج إن كلا من نسبة الإنبات والمحصول الكلى كانت معنوية فى استجابتها لزيادة حجم البصيلة (16-24 مم) وعمق زراعة 5سم. كما زادت نسبة الإنبات اليومى بزيادة عدد الأيام من تاريخ الزراعة وحتى 18 يوم وذلك فى الأحجام الكبيرة وهذه الصفة قد زادت بزيادة الأيام 22 ، 18 و 15 يوما بعمق زراعة 1 ، 5 و 10 سم على التوالى. كما قلت نسبة النباتات الغائبة بزيادة حجم البصيلات المستخدمة فى التجربة ومن ناحية أخرى زادت نسبة النباتات الغائبة بزيادة عمق الزراعة.

**RESEARCHER NAME**: Hosseny, H.M. ; K.A.A. ,El-shaikh and A.A ,Gamie

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**اسم الباحث:** ماهر حسن حسنى ، خالد احمد امين الشيخ, عبد المنعم عباس جامع

**عنوان البحث:** تأثير حجم البصيلة وعمق الزراعة على إنبات البصيلات والمحصول فى البصل

**ملخص البحث:** أجريت هذه الدراسة فى محطة بحوث شندويل خلال موسمى الزراعة 2001/2000 و 2002/2001 على صنف البصل جيزة 6 محسن وذلك لدراسة تأثير كلا من حجم البصيلة وعمق الزراعة على نسبة الإنبات فى الحقل. وقد أظهرت النتائج إن كلا من نسبة الإنبات والمحصول الكلى كانت معنوية فى استجابتها لزيادة حجم البصيلة وعمق زراعة . كما زادت نسبة الإنبات اليومى بزيادة عدد الأيام من تاريخ الزراعة وذلك فى الأحجام الكبيرة . كما قلت نسبة النباتات الغائبة بزيادة حجم البصيلات ومن ناحية أخرى زادت نسبة النباتات الغائبة بزيادة عمق الزراعة.