

Effect of Sowing Date on Set Size in Various Cultivars of Onion (*Allium cepa* L.)

KAISER LATIF CHEEMA, AKHTER SAEED AND MUHAMMAD HABIB
Vegetable Research Institute, Faisalabad-Pakistan

ABSTRACT

Eight cultivars of onion (*Allium cepa* L.) were sown on different dates for two years to attain desirable set size (1.5-2.0 cm). It was observed in 2nd and 4th week of January with 262.92 – 461.60 sets/kg. Effect of interaction of year and date of sowing showed that in year 2000-01 3rd week of December to 4th week of January yielded desired set size while differences were non-significant for number of sets/kg. Effect of year and cultivar showed that environment affected set size not the number of sets. Date of sowing significantly affected set size and number of sets. Sowing dates of 2nd and 4th week of January gave desired set size with 262.92 – 461.60 sets/kg.

Key Words: *Allium cepa* L.; Onion sets; Autumn crop; Punjab

INTRODUCTION

Onion is used as condiment in daily diet and helps to fight against blood and heart diseases. In Pakistan, onion is grown on an area of 105.6 thousands hectares with an annual production of 1488.5 thousand tonnes (MINFAL, 2001). Rapid increase in population is exerting more pressure on its demand. Onion being perishable commodity could not be stored for longer period. Less availability of fresh onion increases its price from November to February in Punjab. Autumn crop was introduced by the Vegetable Research Institute, Faisalabad in 1990 to cover up shortage. This could not get popularity among farmers due to difficulty in nursery raising in high temperature and rainfall during July-August and transplanting in September.

Raising onion crop during autumn season through sets is a new technique in Punjab but being regularly used in the world. Thompson and Smith (1938) studied the bolting of plants grown from several size of set in New York. Davis and Jones (1947) reported the effect of size of transplant on bolting in over-wintered grano, with transplanting of grano ¼ inch showed little bolting than large size bolting. Jones and Mann (1963) elaborated that choice of cultivar is very important in growing of onion from set. It must be rapid growing, early maturing and attractive Yamaguchi (1980) reported that ideal size of set should be 1.5-2.0 in diameter. Bulb greater than 2.5 cm in diameter become vernalized at low temperature and prone to bolting. Bulb less than 2.5 cm in diameter is still juvenile stage and less apt to be vernalized. Onion set of 1.0-1.5 cm are less sensitive to cold. Madisa (1994) studied the effect of planting date, set size, and spacing on the yield of onion in Botswana. Yield was the highest with 0.75-1.0 cm set size. Munoz *et al.* (1995) found that small bulbs could successfully produce marketable onions. Use of small bulb as planting stock is successful for obtaining early onion harvest. Shallot sets of onion can also be used as alternate source of nursery

seedlings to plant off-season crop (Vanparys, 1999).

It is also easy to grow onion sets in favorable season and store but needs refinement. Major problem is how to get sets of desirable size (1.5 – 2.0 cm) with local cultivars in Punjab. This study was planned to standardize the date of sowing for harvesting of desirable sized sets of eight different cultivars.

MATERIALS AND METHODS

Eight onion cultivars i.e. Dark Red, Desi Red, Phulkara, Robina, Pk-10321, Faisal Red, Pusa Red and Red Imposta were sown on eight sowing dates (1st and 3rd week of November and December, 2nd and 4th week of January, 3rd week of February and 1st week of March) during 2000-01 and 2001-02 at Vegetable Research Institute, Faisalabad. Randomized Complete Block Design (RCBD) with three replications was followed for cultivars on each date of sowing. Plot size was kept 1x1 m with row to row and plant to plant distance 10 cm and 1 cm, respectively. Nursery matured in May each year. After harvesting, data regarding diameter of sets of 10 guarded plants and number of sets per kg was recorded from each plot and was analyzed statistically following Factorial Design by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Significant differences were found among varieties, date of sowing, and interaction. Non-significant differences were observed for year, its effect on cultivar and on date of sowing and cultivar for number of sets per kg while it was significant for diameter at center of set (Table I). The effect of both the factors and their strong interaction was observed on set size in onion.

Date of sowing. Sowing was better from third week of December to fourth week of January, for desirable set size

Table I. ANOVA

Source	D.F.	Mean Squares	
		Diameter at center of set (cm)	No. of Onion Sets/kg
Year	1	0.478 **	22.042 N. S.
Replication	4	0.226 **	4.646 N. S.
Date of Sowing	7	14.950 **	231272.601 **
Year X Date of Sowing	7	0.112 *	24.494 N. S.
Variety	7	0.618 **	4205.762 **
Year X Variety	7	0.271 **	9.476 N. S.
Date of Sowing X Variety	49	0.341 **	1660.893 **
Year X Date of Sowing X Variety	49	0.137 **	11.888 N. S.
Error	252	0.052	15.998

(1.5-1.94 cm) with 195.84 and 461.60 sets per kg respectively (Table II). Sowing on third week of November produced maximum set size (2.72 cm) with 124.68 sets per kg while minimum size was observed for sowing on third week of February (1.37 cm) with 657.2 sets per kg. Maximum number of sets per kg (876.4) was harvested from sowing on first week of March with 1.4 cm diameter.

This might be due to higher germination due to higher temperature during March than December January. In present studies shorter growing period forced the set size to remain in desirable diameter limit (1.5-1.94 cm). If set size has bigger diameter than (2 cm) the resulting bulb produced will bolt after verbalization (Yamaguchi, 1980).

Interaction of year and date of sowing. Sowing on 4th week of January proved the best for raising desirable sets with 1.46 cm and 1.52 cm diameter and 462.80 and 460.80 number of sets per kg in both the years (2000-01 and 2001-02), respectively (Table III). Maximum diameter (2.81 cm) was observed from sowing on third week of November during year 2001-02 with 125.16 sets per kg. Minimum diameter (1.32 cm) was found from sowing on first week of March with 870.40 sets per kg. Maximum sets per kg were harvested from sowing of March but are susceptible to rotting in store due to forced maturity.

Cultivars. Maximum onion sets were obtained in cultivar Robina (414.0) with set size 1.93 cm. Cultivars Desi red, Phulkara, PK-10321 and Red Imposta gave desirable onion

Table II. Effect of date of sowing on set size and number of sets per kg during 2000-01 and 2001-02

Date of sowing	Diameter at center of set (cm)			Number of Onion Sets per kg		
	2000-01	2001-02	Means	2000-01	2001-02	Means
1 st week of November	2.57	2.62	2.60	152.68	151.84	152.24
3 rd week of November	2.62	2.81	2.72	124.16	125.16	124.68
1 st week of December	2.42	2.61	2.52	160.00	163.84	161.92
3 rd week of December	1.95	1.93	1.94	192.68	199.00	195.84
2 nd week of January	1.79	1.79	1.79	266.32	259.52	262.92
4 th week of January	1.46	1.52	1.50	462.80	460.80	461.60
3 rd Week of February	1.38	1.35	1.37	656.40	658.00	657.20
1 st week of March	1.32	1.49	1.40	870.40	882.80	876.40
Cd (0.05)	0.13		0.09	9.11		6.43

Table III. Effect of cultivars on set size and number of sets per kg during 2000-01 and 2001-02

Cultivars	Diameter at center of set (cm)			Number of Onion Sets per kg		
	2000-01	2001-02	Means	2000-01	2001-02	Means
Dark Red	2.108	2.000	2.054	378.52	380.68	379.6
Desi Red	1.751	1.871	1.784	306.68	311.00	296.84
Phulkara	1.974	2.004	1.909	403.60	401.20	402.40
Robina	1.790	2.071	1.930	410.00	418.00	414.00
Pk-10321	1.963	1.821	1.892	379.00	377.33	378.16
Faisal Red	1.990	2.221	2.110	345.16	348.52	346.84
Pusa Red	2.090	2.138	2.118	333.84	336.84	335.32
Red Imposta	1.886	2.063	1.974	328.89	327.16	328.32
Cd (0.05)	0.12		0.091	9.11		6.342

Table IV. Interaction of cultivars and date of sowing on set size (cm)

Sowing dates	1 st week of November	3 rd week of November	1 st week of December	3 rd week of December	2 nd week of January	4 th week of January	3 rd Week of February	1 st week of March
Varieties								
Dark Red	2.47	2.83	2.73	1.93	1.88	1.68	1.50	1.42
Desi Red	2.75	2.56	2.55	1.77	1.76	1.23	1.29	1.36
Phulkara	2.47	2.18	2.37	1.74	1.92	1.54	1.36	1.34
Robina	2.35	2.91	2.73	1.65	1.72	1.40	1.33	1.35
Pk-10321	2.48	2.82	2.35	2.12	1.50	1.23	1.22	1.42
Faisal Red	2.78	2.60	3.18	2.15	1.86	1.50	1.45	1.35
Pusa Red	2.82	2.37	2.58	2.40	2.17	1.67	1.43	1.43
Red Imposta	2.63	2.45	2.65	1.78	1.52	1.77	1.40	1.60

Table V. Effect interaction of cultivars and date of sowing on number of sets per kg

Sowing dates	1 st week of	3 rd week of	1 st week of	3 rd week of	2 nd week of	4 th week of	3 rd Week of	1 st week of
Varieties	<u>November</u>	<u>November</u>	<u>December</u>	<u>December</u>	<u>January</u>	<u>January</u>	<u>February</u>	<u>March</u>
Dark Red	176.68	145.32	178.68	144.00	294.00	482.00	623.32	992.00
Desi Red	166.00	96.68	211.32	236.00	208.80	453.32	550.00	544.00
Phulkara	188.00	126.68	184.68	211.32	288.68	564.00	700.68	995.32
Robina	203.32	172.68	176.00	242.00	243.32	530.00	726.68	1016.68
Pk-10321	106.00	92.68	134.68	189.32	258.68	544.00	771.32	928.68
Faisal Red	164.00	132.68	95.32	157.32	268.00	331.32	702.68	923.32
Pusa Red	104.00	134.00	140.68	169.32	258.68	406.68	592.00	877.32
Red Imposta	108.00	96.68	174.00	216.68	282.00	382.00	950.68	772.00

set size, 1.784, 1.909, 1.892 and 1.974 cms with Number of sets 296.84, 402.4, 378.16 and 328.32 per kg respectively (Table IV). Different cultivars showed different response to set production and ultimate bulb production and yield (Vanparys, 1999).

Interaction of year and cultivar. Six cultivars Desi Red, Phulkara, Robina, PK-10321, Faisal Red and Rd Imposta produced desirable set size (1.751-1.990 cm) during 2000-01 and four cultivars Dark Red, Desi Red Phulkara and PK-10321 (1.751-1.990 cm) in 2001-02 (Table I). The variation seems to be due to change in temperature and humidity.

Interaction of cultivar and date of sowing

A. Set diameter. All cultivars gave desirable set size (1.5-2.0 cm) sown in 2nd 4th week of January. However, in case of sowing in 3rd week of December five cultivars Dark Red, Desi Red, Phulkara, Robina and Red Imposta gave desirable set size 1.93, 1.77, 1.74, 1.65 and 1.78 cm, respectively. From sowing on 3rd and 1st week of February and March, most of the cultivars gave under size sets (> 1.5 cm) except cultivar Dark Red which was sown on 3rd week of February (1.5 cm) and cultivar Red Imposta sown on 1st week of March (1.6 cm). So it is concluded that from 3rd week of December to 4th week of January are the best dates of sowing of nursery to raise onion sets of desirable size. Different size of set and varieties are tried so that to evaluate the varieties for desirable size of set production and ultimately bulb production (Madisa, 1994).

B. Number of sets. Cultivar Robina gave maximum number of sets (1016.68) from sowing on 1st week of March. All cultivars gave maximum number of sets from sowing on 3rd week of February and 1st week of March. However, with desirable set size (1.5-2.0 cm) and optimum number of sets 2nd week of January and 4th week of January were found better. Sowing dates after 4th week of January produced smaller sets (>1.5 cm). These sets are prone to

rottening in storage due to forced/ incomplete maturity and high temperature and humidity during May to August.

CONCLUSION

The purpose of present studies was also to get the desirable size of onion set by sowing the seed on different dates, so that diameter of set may be reduced to a desirable size. So, in present studies, December and January sowing has been proved better sowing date to get desirable set diameter. Secondly, varieties, Robina and Phulkara proved better than others to produce desirable set size and number.

REFERENCES

- Davis, G.N. and A.H. Jones, 1947. Experiment with transplant onion crop in California. *Bull. Calif. Agric. Expt. Station*, 682: 20
- Jones, H.A. and L.K. Mann, 1963. *Onion and Their Allies*. London Leonard Hill Ltd., Inter Sci. Pub., Inc. New York
- Madisa, M.E., 1994. The effect of planting date, set size, and spacing on the yield of onion in Botswana. *Acta Hort.*, 358: 3537
- MINFAL, 2001. *Agriculture Statistics of Pakistan*. Govt. of Pakistan, Ministry of Food, Agriculture and livestock, Islamabad-Pakistan
- Munoz, S.O., D.F. Gonzalez and A. Lewis, 1995. Effect of two propagate size on the early production of three onion (*Allium cepa* L.) cultivars. *Proc. Int. Soc. Trop. Hort.*, 39: 16-22
- Steel, R.G.D. and J.H. Torrie, 1984. *Principles and Procedures of Statistics*. 2nd Ed. McGraw Hill Book. Co. Inc., Singapore
- Thompson, H.C. and O. Smith, 1938. Seed stalk and bulb development in onion. *Bull. Cornell Agric. Expt. Station*, 708: 21
- Vanparys, L. 1999. Cultivars trials with shallot sets. *Provinciale onderzoek- en Voorlichting seentrum voor land-en tuinbouw, Beitem-Roeselare*, 408: 4 (*Plant Breed. Abst.*, 70(10): 725; 2000)
- Yamaguchi, M., 1980. *World Vegetables, Principles, Productions and Nutritive Values*. pp: 187-8. Dept. of Vegetable Crops, Univ. of California, Davis, California

(Received 10 December 2002; Accepted 20 February 2003)