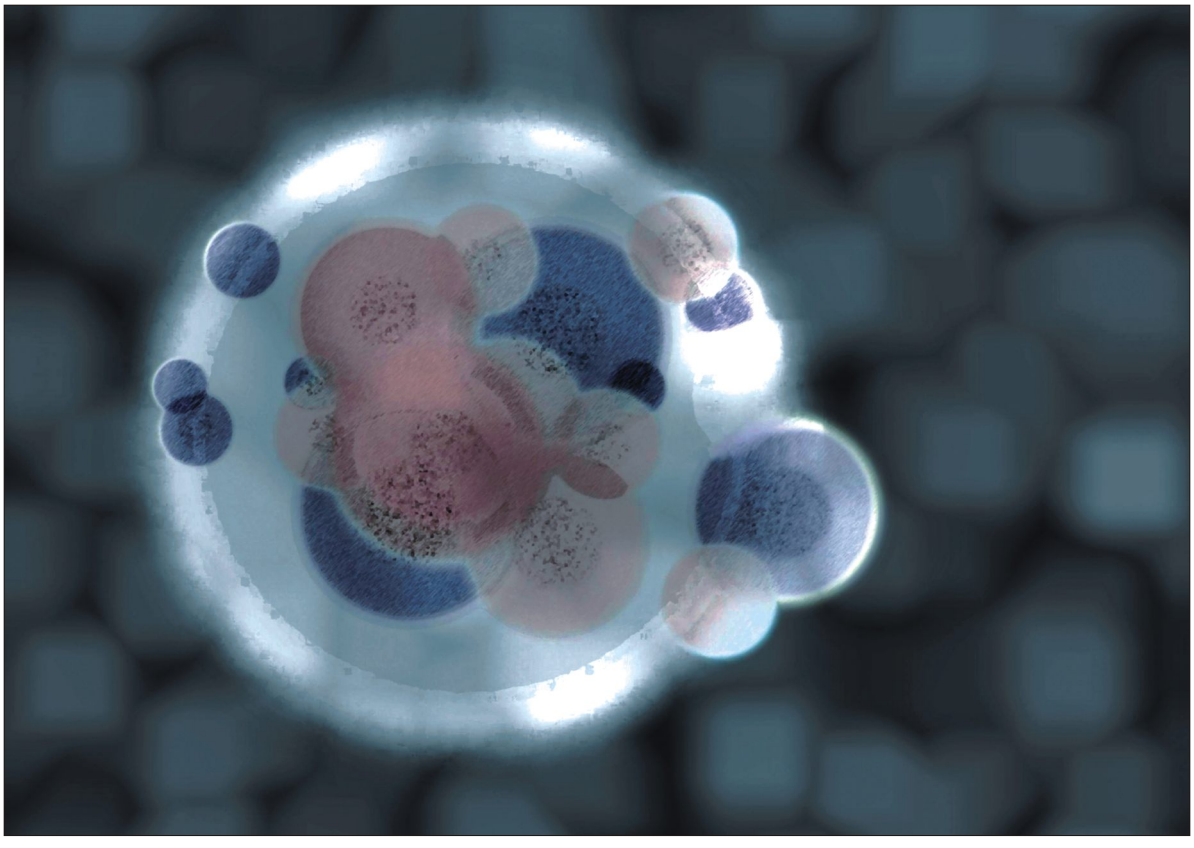

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Effect of Different Bulb Sizes and Planting Dates on Green Leaf Production of Onion (*Allium cepa* L.)

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Abstract: Different bulb sizes and planting dates significantly affected onion leaf production. Small bulb sizes showed maximum sprouting (83.98%) and benefit ratio (0.98) as compared to 38.1% and loss ratio (-0.49) respectively for large bulbs. Number of leaves/plant (35.13) and marketable yield/ha (31.8 t) were significantly higher in medium size bulbs (4.5-5.5 cm diameter) as compared to number of leaves/plant (27.63) for small bulbs (3.5-4.5 cm diameter) and yield/ha (13.3 t) respectively for large bulbs (5.5-7.0 cm diameter). Planting on 21st July showed maximum number of leaves/plant (38.37) and days taken to uprooting (122.9) of green yield, while minimum number of leaves/plant (26.07) on 15th Sept. and days taken to uprooting (60.92) were recorded on 29th Sept. Maximum sprouting (78.70%) in total number of 45 bulbs/plot was observed by planting bulbs on 29th Sept., while less sprouting (43.14%) was found when the plantation was done on 21st July. Planting bulbs on 29th Sept. significantly enhanced the total marketable yield per ha (28.3 t) and benefit ratio (0.54). Plants obtained from small bulbs sown on 29th Sept. gave more profit and therefore is recommended for onion growers.

Key words: Onion, bulb, planting dates and bulb sizes

Introduction

The onion (*Allium cepa* L.) is probably a native of Asia, perhaps India and Palestine are the places of its origin. Western Asia and the areas around the Mediterranean Sea are secondary centres of its development (Baloch, 1994). The most important onion producing countries are the United States, Japan, Romania, Italy, and Turkey. Green onions, or scallions are an important winter crop in the southern United States (Janick, 1963).

Dumitrescn and Radoi (1984) planted sets of the cv. Stuttgarter Riesen, 7to 14 or 14 to 21 mm in diameter at 360,000-560,000 sets ha^{-1} on 5 dates between 10 September and 1 March. The highest leaf yield (42 t ha^{-1}) of good quality bulbs (108 g) was obtained by planting sets 14-21 mm in diameter on 10 September at 460,000 sets ha^{-1}.

Miccolis (1988) assessed that planting onion bulbs in early October gave higher yields (83 t ha^{-1}) of salad onions than planting in early September (76 t ha^{-1}) or early November (55 t ha^{-1}). Mean yields of all cultivars (Borettana, Bianca di Barletta and Dornata di Parma) increased with increasing bulb diameter, in the range 35 to 45 mm (52 t ha^{-1}) to >75.1 mm (87 t ha^{-1}).

Yamashita *et al*. (1989) suggested that onion sets of >2.5 cm diameter produced bigger bulbs and higher yields than smaller sets. Sets of >3.0 cm diameter produced many split or double onions. The most suitable time for planting sets in Aichi Province was from late August to early September.

Green leaves of onion is very much used in our daily diet, such as in soups, meat dishes, rice, sandwiches, Kababs, beans and is cooked alone as a vegetable. Keeping in mind the above mentioned utilization of this crop, the present research project was initiated with the following objectives:

1. To study the effect of different planting dates and bulb sizes on the performance of onion for green leaves
2. To find out the best time of onion bulb planting for the production of green leaves
3. To find out the best size of bulb for maximum green leaf production

Materials and Methods

A research trial "effect of different bulb sizes and planting dates on yield and quality of onion" was carried out at Horticultural Farm NWFP Agricultural University Peshawar from July to December, 1998. The variety `Gilasi' from Mohmand Agency was chosen for the study. All cultural practices was carried out uniformly.

The following bulb sizes and planting dates were studied during the course of research work:

Bulb sizes	Planting dates
3.5-4.5 cm diameter (small)	21st July
4.5-5.5 cm diameter (medium)	4th August
5.5-7.0 cm diameter (large)	18th August
	1st September
	15th September
	29th September

The experiment was laid out in two factor RCB design with four replications. The row to row and plant to plant distance was kept 30 cm and 10 cm respectively. The area of a subplot was 1.5 m^2 and total area of the experimental plot without side ridges and water channels was 108 m^2. There were 3 rows with total number of 45 bulbs in each subplot. The number of treatment combinations in one replication were 18, while the total number of treatment combinations in all the four replications were 72.

The cv. Gilasi was selected because of its availability in the market on the planting time of the research work. The fresh bulbs were graded with the help of vernier calliper in cm.

Results and Discussion

Days taken to complete sprouting: Different bulb sizes and planting dates had significant effect on days to complete sprouting. The mean results showed that maximum days (43.71) to complete sprouting were noted in plots having bulbs of large size (5.5-7.0 cm diameter). The difference between small and medium size bulbs was non significant, however minimum days (36.83) were observed in small size bulbs (3.5-4.5 cm diameter). The possible reason might be the rooting system. The small bulbs rooted earlier, therefore they were sprouted earlier than large bulbs which

took more time for rooting. These findings are in conformity with Bielinska-Czarnecka *et al*. (1982) who reported that the smallest bulbs were the first to sprout and produce roots and the largest bulbs at last (Table 1).

Mean values of planting dates showed that maximum days (68.17) to complete sprouting were noted by planting bulbs on 21st July. The difference between planting on 15th and 29th September was non significant, however minimum days (17.83) were recorded by planting bulbs on 29th September. The reason could be the environmental temperature of Peshawar region.

Percent sprouting: Sprouting response to different bulb sizes and planting dates had significant effect. Maximum sprouting (83.98%) was noted in plots having bulbs of small size, whereas minimum sprouting (38.10%) was recorded in plots of large size bulbs. This big difference in sprouting percentage between these two bulb sizes might be due to quick rooting of small bulbs as compared to large bulbs where very less sprouting was observed, while some of the large bulbs were deteriorated in the soil.

In response to the time of sowing, maximum sprouting (78.70%) was recorded by planting bulbs on 29th September, while minimum sprouting (43.14%) by planting bulbs on 21st July. The plausible reason could be that the temperature of Peshawar region in September-October was lower as compared to July-August. Therefore the plants sprouted better under milder temperature of September as compared to early planting of onion bulbs where due to high temperature, majority of the bulbs were deteriorated in the soil without sprouting.

Number of shoots per plant: Number of shoots per plant was significantly effected by different bulb sizes and planting dates. Highest number of shoots per plant (5.41 and 5.25) were observed from bulbs having 4.5-5.5 and 5.5-7.0 cm diameter, while lowest number of shoots per plant (4.24) was recorded from bulbs having 3.5-4.5 cm diameter. The shoot primordia are more in large size bulb as compared to small size bulb, it may be the reason that large size tubers gave more shoots.

Different planting dates also revealed maximum number of shoots per plant (6.23 and 5.84) planted on 21st July and 4th August, respectively. The difference between planting on 18th August onward was non significant, however minimum shoots per plant (4.25) were noted by planting bulbs on 18th August. The possible reason could be maximum days taken to complete sprouting by early plantings to produce more shoots by taken more time in the soil as compared to late planting of onion bulbs. Upto some extent these results are in agreement with Natlob and Haber (1984), who reported that the percentage of bolting and double bulbs was significantly increased with large sets and early planting dates (Table 2).

Number of leaves per plant: Different bulb sizes had significant effect on number of leaves per plant. Medium and large size bulb gave 35.13 and 32.55 leaves per plant as compared to 27.63 leaves per plant by small size bulb. The increase in number of leaves is directly related to the number of shoots. The more the number of shoots the more were the leaves and vice versa.

Planting bulbs on 21st July gave 38.37 leaves per plant as compared to 26.07 leaves by planting on September 15. The reason for increase number of leaves per plant is due to more shoots per plant. Early planting gave comparatively more shoots as compared to late planting. The similar results were also observed for number of leaves per plant. These findings are in conformity with Lujan-Favela (1992) who sown seeds at different intervals between 22nd August and 3rd November and reported that later sowing decreased the leaf growth than early sowing.

Days taken to uprooting of leaf yield: The statistical analysis showed significant effect for different bulb sizes and planting dates. Maximum days to uprooting (95.83) were noted for bulbs having large diameter (5.5-7.0 cm), while the difference between the mean values for small and medium bulbs was non significant, however minimum days to uprooting (81.38) were recorded for bulbs having small diameter (3.5 to 4.5 cm). Late uprooting of onion is related to late sprouting. Large size onions completed sprouting late and uprooted late and vice versa for small size bulbs (Table 1).

The mean values showed maximum days to uprooting (122.92) by planting bulbs on 21st July, while minimum days to uprooting (60.92) by planting bulbs on 29th September. The plausible reason could be that late sprouting was done in early planted bulbs because of harsh summer temperature which effected the growth badly. Late planted bulbs sprouted earlier and due to favourable temperature, vigorous growth occurred which helped early uprooting.

Table 1: Effect of different bulb sizes on mean days taken to complete sprouting, percent sprouting, number of shoots per plant, number of leaves per plant, days taken to uprooting of leaf yield, total leaf yield (kg), marketable leaf yield (t ha^{-1}) and benefit ratio (1:1) of onion

Parameters	Bulb sizes		
	Small (3.5-4.5 cm)	Medium (4.5-5.5 cm)	Large (5.5-7.0 cm)
Days taken to complete sprouting	36.83 b	37.92 b	43.71 a
Percent sprouting	83.98 a	74.16 b	38.10 c
Number of shoots per plant	4.24 b	5.41 a	5.25 a
Number of leaves per plant	27.63 b	35.13 a	32.55 a
Days taken to uprooting of leaf yield	81.38 b	85.63 b	95.83 a
Total leaf yield (kg)	4.33 b	5.00 a	2.13 c
Marketable leaf yield (t ha^{-1})	27.3 b	31.8 a	13.3 c
Benefit ratio (1:1)	0.98 a	0.64 b	-0.49 c

Total leaf yield per plot (kg): Significantly maximum yield per plot (5 kg) was observed from bulbs having 4.5-5.5 cm diameter, while minimum yield (2.13 kg) was noted having 5.5-7.0 cm diameter. These findings contradict the results of Miccolis (1988) and Yamashita *et al*. (1989) who have reported that more yield was obtained by planting largest sets. They might be right but the reason for minimum yield in our result was because of lowest sprouting percentage observed by planting largest sets of onion. Had they sprouted like small sets, they would have given more yield than small sets. The total yield is due to more sprouting and more leaves per plant.

Our results are also in slight contradiction with those of Alekseeva and Kostyaev (1981) and Natlob and Haber (1984), who had harvested greater yield by planting bulbs of small diameter as compared to large diameter because minimum yield given by largest sets was mainly due to lowest sprouting percentage in our results.

Table 2: Effect of different planting dates on mean days taken to complete sprouting, percent sprouting, number of shoots per plant, number of leaves per plant, days taken to uprooting of leaf yield, total leaf yield (kg), marketable leaf yield (t ha^{-1}) and benefit ratio (1:1) of onion

Parameters	Planting dates					
	21st July	4th Aug.	18th Aug.	1st Sept.	15th Sept.	29th Sept.
Days taken to complete sprouting	68.17 a	55.17 b	45.33 c	31.67 d	18.75 e	17.83 e
Percent sprouting	43.14 d	65.74 c	60.55 c	68.52 bc	75.74ab	78.70 a
Number of shoots per plant	6.23 a	5.84 a	4.25 b	4.78 b	4.38 b	4.33 b
Number of leaves per plant	38.37 a	36.00 ab	28.60 c	31.67 bc	26.07 c	29.92 c
Days taken to uprooting of leaf yield	122.92 a	115.08 a	85.17 b	72.17 c	69.42 c	60.92 d
Total leaf yield (kg)	2.52 c	3.80 b	3.53 b	4.00 ab	4.51 a	4.54 a
Marketable leaf yield (t ha^{-1})	16.4 c	24.5 ab	22.7 b	25.2 ab	27.8 a	28.3 a
Benefit ratio (1:1)	-0.003 b	0.36 a	0.43 a	0.44 a	0.50 a	0.54 a

The mean values for different planting dates also indicated significant effect. More yield (4.54 kg) was harvested from planting bulbs on 29th September, while less yield (2.52 kg) for planting bulbs on 21st July. Non significant difference was found between the last two planting dates. The reason might be the difference of environmental temperature between July and September. These findings also support the argument of Dumitrescn and Radoi (1984), who have suggested September plantation of onion sets for highest leaf yield (Table 2).

Marketable yield per hectare (t): Significantly maximum yield (31.8 t ha^{-1}) was noted from medium bulbs having 4.5-5.5 cm diameter, while minimum yield (13.3 t ha^{-1}) from bulbs having 5.5-7.0 cm diameter. More yields (27.8 and 28.3 t ha^{-1}) were observed by planting bulbs on 15th and 29th September respectively, while less yield (16.4 t ha^{-1}) by planting bulbs on 21st July. These findings contradict the results of Suciu *et al*. (1981b), Miccolis (1988) and Toman *et al*. (1990) who have reported that highest leaf yield was obtained by planting largest sets.

Benefit ratio: Benefit ratio was significantly affected by different bulb sizes and planting dates. The mean values indicated only benefit ratio, that is if apply Re.1 as input and it will give extra income on Re.1 as output.

The effect of different bulb sizes on benefit ratio has indicated that maximum benefit ratio (0.98) by planting smallest bulb sizes (3.5-4.5 cm diameter) was observed as compared to maximum loss (-0.49) by planting largest bulb sizes (5.5-7.0 cm diameter). These findings contradict the results of Suciu *et al*. (1981a) who have planted different bulb sizes and recommended largest sets for highest economic returns. They might be right but the reason of contradiction is because of lowest sprouting (38.10%) observed by large bulbs as compared to highest sprouting (83.98%) by small bulbs.

A little loss ratio (-0.003) was found by planting bulbs on 21st July. Non significant differences were observed between the mean values of planting bulbs from 4th August onward, however maximum benefit ratio (0.54) was recorded by planting bulbs on 29th September. The possible reason might be that highest marketable yield was obtained by planting bulbs on 29th September as compared to lowest marketable yield by planting bulbs on 21st July. From the present experiment we can concluded that, the effect of large bulbs for maximum days to sprouting and uprooting were due to slow rooting and sprouting as compared to small and medium size bulbs. More sprouting and benefit ratio for smaller bulbs were due to quick rooting and low expenditure on the seed as compared to larger bulbs. The highest leaf Yield/ha from medium bulbs were due to better and healthy plants as compared to smaller bulbs, while large bulbs showed less yield due to low sprouting percentage. Early planted bulbs showed more days to complete sprouting and uprooting due to unfavourable high environmental temperature for onion as compared to late planted bulbs, while maximum sprouting was observed in late planted bulbs due to favourable environmental temperature. Late planted bulbs gave maximum marketable leaf yield/ha and benefit ratio due to prevailing favourable temperature.

References

Alekseeva, M.V. and V.A. Kostyaev, 1981. The yield and quality of bunching onions grown in greenhouses in the winter in relation to the size of the planting material. Int. Zaoch. Obraz, 163: 97-99.

Baloch, A.F., 1994. Vegetable Crops Horticulture. Manza Printing Corporation, Islamabad, pp: 633.

Bielinska-Czarnecka, M., A. Kepkowa, E. Kielak and E. Zdanowska, 1982. Influence of size of onion bulb cv. *Czerniakowska* on its dormancy, sprouting and rooting. Acta Agrobotanica, 34: 129-136.

Dumitrescn, M. and V. Radoi, 1984. The in uence of planting date, set quality and planting density on onion yield quality and quantity. Floriculture Virda, 7: 291-298.

Janick, J., 1963. Horticultural Science. W.H. Freeman and Company Publication, USA., pp: 472.

Lujan-Favela, M., 1992. Growth and productivity of onions sown and transplanted at different dates, ages and sizes. Rev. Fitotecia Mexicana, 15: 51-60.

Miccolis, V., 1988. The effect of time of planting and of bulb size on the yield of salad onions from three onion cultivars. Inform. Agrario, 43: 93-99.

Natlob, A.N. and M.T.E. Haber, 1984. The effect of set sizes an planting dates on bolting and yield of onion cv. J. Agric. Sci., 1: 51-62.

Suciu, Z., A. Costin, E. Diaconu and T. Nan, 1981a. Studies on the effect of bulb size and planting depth and density on the production of bunching onions. Agronomie, 16: 211-216.

Suciu, Z., E. Balica and M. Ionica, 1981b. Contribution to the cultivation of onion for bulbs using sets. Agronomie, 16: 223-227.

Toman, S.I., L.V. Pavlov, N.O. Gorchakova and V.I. Rudenok, 1990. Optimum size of onion mother bulbs. Kartofel'i-Ovo-shchi, 6: 20-21.

Yamashita, F., K. Moriwaka and N. Takase, 1989. Studies on the culture of onion sets. Effect of onion set size, temperature treatment during storage period and planting date. Res. Bull. Aichi-Ken Agric., 18: 128-135.