J. Bangladesh Agril. Univ. 3(2): 197–202, 2005 ISSN 1810-3030

Effects of ash and longitudinal set cutting on the yield and economics of off-season onion

M.F. Mondal and M.A. Hoque
Department of Horticulture, Bangladesh Agricultural University, Mymensingh -2202

Abstract

An experiment was conducted at the Horticulture Farm of the Bangladesh Agricultural University, Mymensingh during the period from July 2003 to January 2004. The objectives of the study was to examine the influence of set sizes including whole and cut pieces in order to develop a low–cost technology for onion production. The results of the experiment revealed that bulb yield increased with the increase in bulb size with proportionate increase in the production cost. Cut bulbs treated with ash had no effect on yield of onion bulbs. The yield of plants raised from whole bulbs was higher than that raised from cut bulbs irrespective of size. Small whole bulbs were more profitable for commercial onion production followed by very small whole bulb and cut pieces from large bulbs.

Keywords: Onion, Ash, Set, Growth and Yield

Introduction

The demand of onion is increasing day by day due to increasing population growth. Both the yield and area of onion are very low in our country compared to that of the other onion growing countries of the world (FAO, 2003). Moreover, neither the yield nor the area under onion cultivation has increased in Bangladesh over the last two decades rather it remained fairly static (BBS, 2003). As a result, we have to import onion every year from our neighboring countries like India, Burma. The shortfall of onion is also met to some extent by growing it from sets. But the production of onion using sets requires very high cost due to high price of the sets. Mondal and Alam (2003) recommended small sets for commercial production of onion. But small sets are not usually available even at high price when these are planted for bulb production. Because the farmers and traders keep the small sets for selling them on a later date at a further high price for seed production. Attempts were made in the past to reduce the production cost of onion through set method (Anon, 1995; Shalaby *et al.* 1991; Mondal and Alam, 2003) but no definite technology could be recommended. The present experiment was therefore undertaken in an attempt to develop a technology for reducing the production cost of onion using sets.

Materials and Methods

The experiment was conducted at the Horticulture Farm of Bangladesh Agricultural University, Mymensingh during the period from August 2003 to March 2004. A local cultiver of onion namely, Taherpuri was used. Eight different bulb sizes including whole and longitudinally cut bulbs were used in the experiment. These were: very small whole bulb weighing 2 g in weight (T_1), small whole bulb weighing 4 g in weight (T_2), cut bulb obtained from a small bulb (4g in wt.) by dividing into two pieces (T_3), medium whole bulb weighing 8 g in weight (T_4), cut bulb obtained from a medium sized bulb (8 g in wt.) by dividing into two pieces (T_5), cut bulb obtained from a medium sized bulb (8 g in wt.) by dividing into four pieces (T_6), cut bulb obtained from a large bulb (16 g in wt.) by dividing into two pieces (T_7), and cut bulb obtained from a large bulb (16 g in wt.) by dividing into four pieces (T_8). The experiment involving two factors such as bulb treatment with or without ash and eight bulb sizes, was laid out in randomized complete block design with three replications. The size of each unit plot was 2 m×1 m. Well decomposed cowdung, urea, triple superphosphate (TSP) and muriate of potash (MP) at the rate of 10 tons, 200, 125 and 180 kg per hectare, respectively were well mixed with the soil following Mondal and Alam (2003) . Uniform sets were planted in the experimental plots on 12 October 2003 at a spacing of 20 cm ×20 cm. Weeding, mulching and irrigations were done as and when necessary. Some of the plants were attacked by mole crickets and purple leaf blotch disease which were controlled mechanically and by spraying Ridomil, respectively (Mondal, 1991). Bolting was discouraged by pinching off the flower stalks soon after their emergence. The crop was harvested on 25 January 2004. Data were recorded on different parameters from ten randomly selected plants of each unit plot and were statistically analyzed. The yield per hectare was determined on the basis of per plot yield.

Results and Discussion

Emergence and establishment of seedlings: Set treatment with ash before planting showed significant effect on the emergence and establishment of crop. Bulb size as well as the splitting also showed marked influence on this parameter. The highest percentage of seedling emergence and establishment was recorded in T_4 which was statistically identical with those of T_1, T_2, T_5 and T_7. The least emergence and establishment was noticed in T_6 followed by T_8 (Table 1). The interaction effect of ash and bulb cutting was not statistically significant. In general, the establishment of seedlings was lower for the smaller cut bulbs. Ahmed *et al.* (1997) put forward the same opinion in this regard.

Growth components: The ash treatment could not make any significant differences in respect of growth components like leaf number per plant, plant height and fresh and dry matter of leaves but the effects of bulb splitting were statistically significant on these parameters (Table 1). Plant height and leaf production ability of the plants were higher for the whole and larger bulbs than those of the cut and smaller bulbs (Table 1). Ahmed *et al.* (1997) and Mondal and Alam (2003) reported similar findings from their experiments.

Yield components: Ash had no significant effect on different yield components as well as the yield but statistically significant variations were observed among the treatment means of different yield components and yield due to different bulb sizes and cutting treatments (Table 2). Bulb diameter was the highest in T_4 and the lowest in T_6. Again, the treatments T_1, T_2, T_4, T_7 and T_8 were statistically identical in this respect. Bulb diameter was lower in the plants raised from smaller as well as cut bulbs (Table 2). Ahmed *et al.* (1997) gave similar views in this regard. The same trend of treatment effects as seen for bulb diameter was noticed in respect of bulb length. More or less similar trend of results was found in case of bulb weight due to the treatment effects. This was quite likely because the cumulative contribution of bulb diameter and length was reflected in the bulb weight. In general, the weight of bulbs raised from larger bulbs was higher than those of smaller bulbs. The whole bulbs in general gave rise to higher bulb weight than cut bulbs irrespective of the size. Marked variations were recorded in splitting of bulbs due to different treatments. The highest splitting (97.50 %) occurred in T_4 which was statistically identical with that of T_7. The least splitting (74.33 %) was observed in T_3. Higher splitting was responsible for higher bulb yield (Table 2).

Table 1. Combined effects of ash and bulb cutting treatments on seedling emergence and growth components of onion

Treatment *		Seedling emergence (%)	Plant height (cm)	No. of leaves/plant	Fresh wt. of leaves (g/plant)	Dry matter of leaves (%)
Control	T_1	98.00a	33.46g	11.90d-f	17.33a-c	7.86b
	T_2	96.00a	37.63cd	14.16a-c	20.00ab	8.93b
	T_3	68.66c	30.50i	9.00h	15.83a-c	8.20b
	T_4	98.66a	40.50a	16.16a	22.50a	13.73a
	T_5	91.33a	35.53ef	13.96b-d	17.00a-c	7.53b
	T_6	45.33d	32.10g-i	10.63f-h	15.00a-c	9.06b
	T_7	92.00a	38.73bc	13.83b-d	18.73a-c	7.90b
	T_8	62.66c	36.66d-f	12.80c-e	17.00a-c	8.50b
Ash	T_1	98.00a	32.80gh	10.66f-h	16.66a-c	8.8b
	T_2	97.33a	36.90de	15.20ab	14.66bc	8.53b
	T_3	82.00b	31.50hi	9.36gh	13.16bc	9.53b
	T_4	98.66a	40.00ab	15.53ab	18.40a-c	8.90b
	T_5	96.00a	35.26ef	11.30e-g	11.83c	10.33b
	T_6	64.66c	31.83g-i	10.96e-h	12.00c	9.03b
	T_7	96.00a	37.83cd	13.60b-d	13.50bc	8.06b
	T_8	81.33b	35.23f	11.46ef	12.66bc	8.53b

In a column, figures with common letter(s) do not differ significantly at 0.05 level.

***Footnote**

T_1: very small whole bulb (2 g), T_2: small whole bulb (4 g), T_3: cut bulb obtained from a small bulb (4g) by dividing into two pieces, T_4: cut bulb obtained from a medium sized bulb (8 g) by dividing into two pieces, T_5: cut bulb obtained from a medium sized bulb (8 g) by dividing into four pieces, T_6: medium sized whole bulb (8 g), T_7: cut bulb obtained from a large bulb (16 g) by dividing into two pieces and T_8: cut bulb obtained from a large bulb (16 g) by dividing into four pieces.

Bulb yield: No significant variation in yield of bulb was noticed due to ash treatment (Table 2). Bulb size and longitudinal cutting caused statistically significant difference in bulb yield (Table 2). The highest bulb yield was recorded in T_4 and the lowest in T_3. Again, T_2 and T_4 gave statistically identical yields. The interaction effect of ash and bulb cutting treatments was not significant. The yield of bulbs gradually increased with the increase in bulb size (Table 2). The result has got support of Mondal and Alam (2003). The whole bulbs in general, caused higher yields than cut bulbs irrespective of the size (Table 2). Ahmed *et al.* (1997) was also of the same opinion on this point. The results of the present experiment are in support of some previous workers (Lazic, 1975: Natlob and El-Haber, 1983; Yamashita *et al.*, 1986). The interaction effects of ash and bulb cutting treatments were not significant on the yield components and yield. Data in Table 2 showed the combined effects of ash and different bulb cutting treatments on yield components and yield of bulbs.

Economic analysis: Data in Table 3 showed that the net return was the highest (Tk.169340) in the treatment combination of $A_0 \times T_2$ and the lowest (Tk.. 90015) in the treatment combination of $A_0 \times T_6$. The economic analysis also showed the highest benefit cost ratio (3.10) in the same treatment combination ($A_0 \times T_2$) and the lowest BCR (2.35) was recorded from the treatment combination of $A_0 \times T_7$ (Table 3). The second highest BCR was obtained from $A_1 \times T_1$ followed by $A_0 \times T_1$. The highest BCR among the cut bulb treatments was recorded in $A_1 \times T_8$ followed by $A_0 \times T_8$. Therefore, it may be concluded that small whole bulbs (T_2) were more profitable for commercial onion production followed by very small whole bulb (T_1) and cut bulbs obtained from a large bulb (16 g in wt.) by dividing into four pieces (T_8) and cut bulbs obtained from a medium sized bulb (8 g in wt.) by dividing into two pieces (T_5), respectively. Small whole bulb was better than very small whole bulb and cut pieces from large bulbs were better than those from medium sized bulbs from economic point of view. Ahmed *et al.* (1997) recommended for use of longitudinally cut bulbs for onion production in the autumn.

Table 2. Combined effects of ash and bulb cutting treatments on yield and yield components of onion

Treatment combinations *		Bulb diameter (cm)	Bulb length (cm)	Split bulbs (%)	Bulb fresh weight (g/plant)	Bulb dry matter (%)	Bulb yield (kg/plot)	Bulb yield (t/ha)
Control	T_1	4.23a-c	4.30ab	81.33e-i	41.66de	13.40b-d	2.08de	10.42de
	T_2	4.36ab	4.30ab	92.00a-c	50.00a-c	14.23a-c	2.50a-c	12.50a-c
	T_3	4.06bc	3.73c-e	73.33i	32.33fg	10.93d	1.62fg	8.08fg
	T_4	4.73a	4.56a	98.33a	53.00a	16.83a	2.65ab	13.25ab
	T_5	4.06bc	4.03b-d	82.66d-g	40.33d-f	13.06b-d	2.02d-f	10.08d-f
	T_6	3.70c	3.66de	83.33d-g	30.33g	11.56cd	1.52g	7.58g
	T_7	4.33ab	4.06b-d	90.00a-d	45.00a-d	16.80a	2.25b-d	11.25b-d
	T_8	4.33ab	4.20a-c	78.66f-i	42.33c-e	14.63a-c	2.12c-e	10.58c-e
Ash	T_1	4.30ab	4.13a-d	84.66c-f	42.33c-e	13.30b-d	2.12c-e	10.58c-e
	T_2	4.40ab	4.10a-d	88.00b-e	50.00a-c	13.33b-d	2.50a-c	12.50a-c
	T_3	3.70c	3.70de	75.33g-i	35.00e-g	11.70cd	1.75e-g	8.75e-g
	T_4	4.43ab	4.30ab	96.66a	53.50a	15.50ab	2.67a	13.37a
	T_5	4.20a-c	3.96b-e	88.00b-e	40.33d-f	15.43ab	2.02d-f	10.08d-f
	T_6	3.70c	3.53e	74.00hi	30.83g	12.50b-d	1.54g	7.70g
	T_7	4.33ab	4.30ab	96.00ab	46.00a-d	16.80a	2.30a-d	11.50a-d
	T_8	4.26ab	4.10a-d	82.00d-h	42.67c-e	14.00a-d	2.13c-e	10.67c-e

In a column, figures with common letter(s) do not differ significantly at 0.05 level

* Footnote as in Table 1

Table 3. **Cost and benefit analysis of onion production due to bulb size and ash treatments**

Treatment combination*	Seed bulb requirement (t/ha)	Cost (Tk/ha)		Total marketable yield (t/ha)	Gross income (Tk/ha)	Total cost production (Tk/ha)	Net return (Tk/ha)	Benefit- cost ratio (BCR)
		Seed	Ash					
A_0T_1	0.5	17500	-	10.42	208000	67756	140044	3.06
A_0T_2	1.0	30000	-	12.5	250000	80660	169340	3.10
A_0T_3	0.5	15000	-	8.08	161600	64310	97290	2.51
A_0T_4	2.0	50000	-	13.25	265000	102460	162540	2.59
A_0T_5	1.0	25000	-	10.08	201600	75210	126390	2.68
A_0T_6	0.5	12500	-	7.58	151600	61585	90015	2.46
A_0T_7	2.0	44000	-	11.25	225000	95920	129080	2.35
A_0T_8	1.0	22000	-	10.58	211600	71940	139660	2.94
A_1T_1	0.5	17500	750	10.58	211600	68507	143093	3.09
A_1T_2	1.0	30000	750	12.5	250000	81478	168522	3.07
A_1T_3	0.5	15000	750	8.75	175000	65128	109872	2.69
A_1T_4	2.0	50000	750	13.37	267400	103278	164122	2.59
A_1T_5	1.0	25000	750	10.08	201600	76028	125572	2.65
A_1T_6	0.5	12500	750	7.7	154000	62403	91597	2.47
A_1T_7	2.0	44000	750	11.5	230000	96738	133262	2.38
A_1T_8	1.0	22000	750	10.67	213400	72758	140642	2.93

* **Footnote** as in Table 1

Price of seed bulb:
Very small size bulb Tk. 35/kg
Small size bulb Tk. 30/kg
Medium size bulb Tk. 25/kg
Large size bulb Tk. 22/kg

Sale price of onion bulb: Tk. 20000/ton
BCR: Gross income/total cost of production

From the results of the present experiment and foregoing discussion, it was observed that the bulb yield increased with the increase in bulb size but the production cost also increased proportionately. The yield of plants raised from whole bulbs was higher than those raised from cut bulbs irrespective of bulb size. The split bulbs (4 g) obtained from large onion (16 g) may be recommended for commercial onion production in the autumn.

Acknowledgement

The financial support of BAURES, Bangladesh Agricultural University, Mymensingh for conducting the experiment through a project is gratefully acknowledged.

References

Ahmed, M. M.,Asaduzzaman,S. M., Mannaf, M. A. and Hoque, M. Z. 1997. Evaluation of seed bulb splitting on the growth and yield of onion. *Bangladesh Hort.*, 25(1 & 2):61-65.

Anonymous. 1995. Annual research report of the on-farm research division, Faridpur, *Bangladesh Agril. Res. Inst.* Joydebpur, Gazipur. Pp 46

BBS. 2003. Statistical Yearbook of Bangladesh 2002.. Bangladesh Bureau of Statistics. Planning Division, Ministry of Planning. Govt. of the People's Republic of Bangladesh, p.26.

FAO, 2003. Production Yearbook. Food and Agriculture Organization of the United Nations. Rome, Italy. 57: 91-94.

Lazic, B.1975. The effect of the size of the sets on the intensity of growth, maturity and qualitative properties of onion. *Acta Hort.*,52 : 259-262.

Mondal, M.F. 1991. Controlling purple blotch decease of onion seed crop. *Bangladesh J. Bot.*, 22(1): 99-100.

Mondal, M. F. and Alam, M. S. 2003. Effects of set size and growth regulators on growth and yield of onion. *J. Bangladesh Agril. Univ.*, 1(1):7-12.

Natlob, A.N. and El-Haber, M.T. 1983. The effect of set sizes and planting dates on bolting and yield of onion cv. Bashela. *Iraqi J. Agril. Sci.*, Zanco, 1(1): 51-62.

Shalaby, G.I., El-Muraba, A.I., Kandeel, N.M. and Gamie, A.A. 1991. Effect of some cultural practices on onion bulb production grown from sets. 2. plant density and set size. *Assiut J. Agril. Sci.*, 22(5): 83-101.

Yamashita, F., Moriwaka, K. and Takase, N. 1986. Studies on the culture of onion sets. Effects of onion set size, temperature treatment during storage period and planting date. *Res. Bull. Aichiken Agril. Res. Centre*, Japan, 18: 128-135.