

Performance of Exotic Onion Cultivars in Spring Season Under Faisalabad (Pakistan) Condition

KAISER LATIF CHEEMA¹, AKHTER SAEED AND MUHAMMAD HABIB

Vegetable Research Institute, Faisalabad-Pakistan

¹Corresponding author E-mail: KLcheema@hotmail.com

ABSTRACT

Nine exotic onion cultivars were evaluated along with approved variety, Phulkara, during spring 1999-2000 and 2000-2001. Cultivar Golden globe out yielded (20267 kg ha⁻¹) with maximum plant stand (89.28%). Maximum number of leaves (14.17) was observed in Ac-383-I with minimum bolting percentage. Maximum leaf length (44.17 cm) was observed in Phulkara while maximum single plant weight (152.33 g), bulb weight (140.50 g), bulb diameter (8.16 cm) and rings per bulb (11.03) were found in 606 Cal and dry matter contents (17.50%) in Ac-36-II. Red Nasic depicted minimum neck diameter (1.27 cm). Cultivars Golden globe, 606 Cal, Zeshan and Granex-429 yielded significantly higher than Phulkara (16921 kg ha⁻¹). These cultivars might be used as introduction following the improvement in the characters or may be used for crossing with the already well adapted varieties for character correction.

Key Words: *Allium cepa*; Cultivars; Bolting; Spring-crop; Yield; Punjab

INTRODUCTION

Onion is a photoperiod sensitive crop with short day (15-16 h) and long day (>17 h) types. So, onion crop needs more attention towards evaluation of varieties in a particular region where these cultivars are supposed to be cultivated. There are numerous varieties of onion, each having different characteristics and yield (Bolanos, 1989; Shimeles, 1998; Shimeles & Dessalegne, 1999; Costa *et al.*, 2000). The recommendations of different varieties in various areas, however, should be based on scientific support.

This study was carried out to evaluate nine cultivars introduced from Asian Vegetable Research Institute, Taiwan for yield and other traits in local conditions.

MATERIALS AND METHODS

Nine cultivars *viz.*, Zeshan, Red Nasik, Golden globe, AC-II-I, Granex-429, AC-36-II, 606 Cal, Ac-727-3 and Ac-383-I along with Phulkara (local approved variety) were tested for yield and yield components. Nursery was sown during 2nd week of October and transplanted during 1st week of December after dipping in 0.2% solution of Dithane M-45 for five minutes to keep it clean against fungal diseases. Experiment was laid out in RCBD with three replications. Plot size was maintained 7 x 1.40 m. Onion seedlings were planted on both sides of the 70 cm apart ridge keeping plant to plant distance 10 cm. Crop was harvested during second fortnight of May. Data regarding plot yield (bulb), leaf length, leaves per plant, diameter of neck and bulb, number of rings per bulb, single bulb weight, dry matter contents, population and bolting percentage and plant weight of 10 guarded plants were recorded. Data were analyzed statistically by factorial design (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Highly significant differences were observed among cultivars, year and their interaction.

Effect of cultivar on yield and yield contributing characters (Table I). Cultivars Golden globe, 606 Cal, Zeshan and Granex-429 of (20267, 20038, 18925 and 18875 kg ha⁻¹, respectively) were better yielder than Phulkara (16921 kg ha⁻¹). Golden globe, 606 Cal, and Phulkara had plant population 89.29, 89.07 and 83.22, respectively. Maximum number of leaves was observed in the cultivar AC-383-1 (14.17 leaves per plant). Cultivars Phulkara, 606 Cal and AC-383-1 (44.17, 44.00 and 43.33 cm, respectively) produced longer leaves than other cultivars. More single plant and single bulb weight were observed in cultivars 606 Cal and AC-383-1 (152.33 and 147.50 g single plant weight, respectively) and 140.50 and 134.67 g single bulb weight, respectively. The cultivars 606 Cal and AC-383-1 may be used in breeding programme to incorporate high bulb in adapted varieties, because bulb also had positive significant correlation with yield as reported by Iqbal *et al.* (2001). Cultivars AC-36-II, Golden globe and AC-727-3 produced higher dry matter contents 17.50, 17.0 and 16.83%, respectively. More number of rings was observed in cultivars 606 Cal (11.03) and AC-II-I (10.93). Red Nasik and AC-727-3 showed minimum diameter of neck of 1.27 and 1.35 cm, respectively. Maximum diameter of bulb was observed in cultivars 606 Cal (8.16cm), Zeshan (7.67cm), AC-383-1 (7.44cm), AC-II-I (7.15cm) and Granex-429 (7.08 cm) as compared to local cultivars, Phulkara (6.32cm).

Effect of environment/year on yield contributing characters (Table II). Effect of environment/year of sowing on cultivars was significant in the present studies,

and similar results have also been reported previously (Munize *et al.*, 1989; Shimeles, 1998). During 1999-2000, cultivars Golden globe gave maximum yield 20646 kg ha⁻¹ followed by cultivars 606 Cal (19599 kg ha⁻¹), Granex-429 (18975 kg ha⁻¹) and Zeshan (18802 kg ha⁻¹). During 2000-2001, cultivars 606 Cal produced maximum yield 20476 kg ha⁻¹ followed by cultivars Golden globe (19887 kg ha⁻¹), Zeshan (19048 kg ha⁻¹) and Granex-429 (18775 kg ha⁻¹). Cultivars Golden globe, 606 Cal, Zeshan and Granex-429 gave better performance during both the years. These cultivars showed more range of adaptability over environments. Shimeles (1998) selected short day onion cultivars; Regal PVP, gladalan B rown, Red systhetic, Early Red, Agrifound, Light red, and Ragia after evaluation. Similarly, pera ipa-lout of nine cultivars (Munize *et al.*, 1989) recommended for baturite region of Ceara, Brazil. Similarly, in line with present studies (Bolan, 1989) evaluated different varieties and yield contributing characters of onion. Plant population was recorded in cultivars Golden globe (91.67%), 606 Cal (89.57%), Phulkara (82.86%) and Granex-429 (78.50%) during 1999-2000. During 2000-2001, cultivars 606 Cal, Golden globe, Phulkara, Ac-383-1, Ac-36-II and Zeshan gave better crop

stand with the values of 88.57, 86.91, 83.57, 80.48, 80.30 and 75.60%, respectively. During 1999-2000 lesser bolting was recorded in cultivars 606 Cal, Ac-383-1, Granex-429, Phulkara, Golden globe, Zeshan and Ac-II-I of 0.00, 0.00, 0.25, 1.76, 3.35, 7.07 and 10.72%, respectively. During 2000-2001, minimum bolting was recorded in cultivars 606 Cal, Ac-383-1, Granex-429, Phulkara, Golden globe, Zeshan and Ac-II-I of 0.00, 0.00, 0.25, 1.76, 3.44, 7.07 and 10.45%, respectively. Bolting (reproductive stage) in onion is stimulated by low temperature, and some varieties are more prone towards bolting without forming desirable size of onion bulb, so low bolting of 606 Cal can be used in breeding programme. Low bolting is a quality character of onion cultivars and it depends on the genotype and environment (Yamaguchi, 1980). During 1999-2000, cultivars Granex-429 and Ac-383-1 produced more leaves of 14.0 and 13.33 leaves per plant, respectively. During 2000-2001, cultivars Ac-383-1 produced 15.00 leaves per plant.

During 1999-2000, cultivars Zeshan, 606 Cal and Ac-383-1 showed significantly higher leaf length of 47.00, 46.00 and 44.33 cm, respectively. Longer leaves were produced by the cultivars Phulkara, Ac-383-1 and 606 Cal

Table I. Yield and yield contributing characters among exotic onion cultivars

Cultivars	Yield (kg/ha)	Population (%age)	Bolting (%age)	Leaves per plant	Leaf length (cm)	Single plant weight (g)	Single bulb weight (g)	Dry matter contents (%age)	Rings per bulb	Diameter of neck (cm)	Diameter of bulb (cm)
Golden globe	20267	89.29	3.39	9.20	30.67	96.83	87.33	17.00	9.43	1.50	6.60
606 Cal	20038	89.07	0.00	9.85	44.00	152.33	140.50	12.00	11.03	1.46	8.16
Zeshan	18925	76.05	7.08	9.60	40.33	136.33	121.33	15.50	10.33	1.61	7.67
Granex-429	18875	76.16	0.251	11.17	39.67	105.00	93.00	15.83	10.03	1.43	7.08
Phulkara	16921	83.22	1.75	9.60	44.17	86.67	76.83	13.00	9.77	1.44	6.32
Ac-383-I	16342	78.81	0.00	14.17	43.33	147.50	134.67	12.83	10.17	1.41	7.44
Ac-36-II	16292	78.37	20.70	7.63	36.83	94.00	79.17	17.50	9.51	1.52	6.08
Ac-727-3	16218	70.70	32.83	7.58	37.66	93.00	81.83	16.83	9.85	1.35	6.55
Ac-II-I	16014	74.20	10.58	10.53	39.33	104.83	95.33	13.16	10.93	1.63	7.15
Red Nasik	13303	72.38	22.65	8.90	33.17	53.00	44.50	15.83	9.81	1.27	6.17
LSD (0.05)	1443	11.79	8.49	1.19	2.29	9.32	7.01	1.27	0.65	0.108	1.39
LSD (0.01)	1934	15.80	11.38	1.60	3.07	12.50	9.40	1.71	0.88	0.145	1.87

Table II. Effect of year of study on yield and yield contributing characters among exotic onion cultivars

Cultivars	Yield (kg/ha)		Population (%age)		Bolting (%age)		Leaves per plant		Leaf length (cm)		Single plant weight (g)		Single bulb weight (g)		Dry matter contents (%age)		Rings per bulb		Diameter of neck (cm)		Diameter of bulb (cm)	
	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01	99-00	00-01
Golden globe	20646	19887	91.67	86.91	3.35	3.44	8.97	7.43	36.67	24.67	97.67	96.00	87.33	87.33	16.33	17.67	9.63	9.23	1.49	1.52	6.57	6.63
606 Cal	19599	20476	89.57	88.57	0.00	0.00	8.03	11.66	46.00	42.00	154.67	150.00	142.67	138.53	13.00	11.00	11.58	10.47	1.40	1.52	7.12	8.4
Granex-429	18975	18775	78.50	73.81	0.25	0.25	14.0	8.23	41.67	37.67	100.00	110.00	91.00	95.00	16.00	15.67	10.30	9.77	1.40	1.44	6.97	7.20
Zeshan	18802	19048	76.50	75.60	7.07	7.07	11.0	8.2	47.00	33.67	129.33	143.33	117.67	125.00	15.67	15.33	10.40	10.27	1.55	1.67	7.73	7.60
Ac-36-II	16462	16122	76.43	80.30	20.71	20.71	7.77	7.50	36.33	37.33	88.00	100.00	76.67	81.67	18.00	17.00	10.07	8.97	1.52	1.51	6.07	6.10
Phulkara	17584	16258	82.86	83.57	1.76	1.76	9.87	9.33	43.33	45.00	85.00	88.33	74.67	79.00	14.00	12.00	10.62	8.73	1.42	1.46	6.63	6.00
Ac-383-I	15881	16803	77.14	80.48	0.00	0.00	13.33	15.00	44.33	44.33	145.00	150.00	134.33	135.00	14.00	11.67	10.95	9.40	1.40	1.47	7.62	7.27
Ac-727-3	15497	16939	70.20	71.19	32.93	32.73	7.43	7.73	40.00	35.33	96.00	90.00	85.33	78.33	18.33	15.33	10.53	9.16	1.39	1.31	6.53	6.57
Ac-II-I	15292	16735	72.60	75.80	10.72	10.45	10.07	11.00	39.67	39.00	107.00	102.67	98.00	92.67	14.00	12.00	11.67	10.20	1.52	1.74	7.47	6.83
Red Nasik	12857	13748	71.67	73.09	22.72	22.57	8.57	9.23	28.23	38.00	51.00	55.00	41.67	47.33	16.00	15.67	10.80	8.83	1.25	1.29	6.13	6.20
LSD (0.05)	1869		14.59		12.00				1.683	3.24	13.18		9.92		1.80		1.53		0.17		0.92	
LSD (0.01)	2506		19.56		16.09				2.257	4.35	17.67		13.30		2.13		2.05		0.22		1.24	

99 = 1999; 00 = 2000; 01 = 2001

of 45.00, 44.33 and 42.00 cm, respectively during 2000-2001. During 1999-2000, cultivars 606 Cal and Ac-383-1 produced higher single plant weight 154.67 and 145.00 g, respectively and single bulb weight 142.67 and 134.33 g, respectively. During 2000-2001, 606 Cal and Ac-383-1 produced higher single plant weight (150 g) and single bulb weight 138.53 and 135.00 g, respectively. During 1999-2000, cultivars Ac-727-3 and Ac-36-II produced higher dry matter contents of 18.33 and 18.00%, respectively. During 2000-2001 cultivars Golden globe and Ac-36-II produced higher dry matter contents of 17.67 and 17.00%, respectively. So, it is important to know the influence of such characters on bulb weight. Currah and Proctor (1990) concluded that onion varieties having high dry matter contents lead to lower yield, but it improves the storability of onion cultivars having high dry matter content. In the present studies, Ac-727-3 and Ac-36-II having high dry matter content can be used to incorporate the high storability in the present varieties, because dry matter content in two open pollinated onion varieties is reported having high heritability estimates for solid matter contents of 0.64 (Wall & Cregon, 1999). Cultivars Ac-II-I, 606 Cal, Ac-383-1, Phulkara, Ac-727-3, Zeshan, Granex-429, and Ac-36-II produced more number of rings per bulb of 11.67, 11.58, 10.95, 10.62, 10.53, 10.40, 10.30 and 10.07 rings per bulb, respectively during 1999-2000. During 2000-2001, cultivars 606 Cal, Zeshan, Ac-II-I, Granex-429, Ac-383-1, Golden globe, Ac-727-3 and Ac-36-II produced more number of rings per bulb of 10.47, 10.27, 10.20, 9.77, 9.40, 9.23, 9.16 and 8.77 rings per bulb, respectively. Smaller diameter of neck was observed in cultivars Red Nasik, Ac-727-3, 606 Cal, Granex-429, Ac-383-1 and Phulkara of 1.25, 1.39, 1.40, 1.40, 1.40 and 1.42 cm, respectively during 1999-2000. During 2000-2001, smaller diameter of neck was observed in cultivars Red Nasik, Ac-727-3, Granex-429, and Phulkara of 1.29, 1.31, 1.44 and 1.46 cm, respectively. More diameter of bulb was observed in cultivars Zeshan, Ac-383-1, Ac-36-II, 606 Cal and Granex-429 of 7.73, 7.62, 7.47, 7.12 and 6.97 cm, respectively during 1999-2000 but Cultivars 606 Cal and Zeshan showed more diameter of bulb of 8.40 and 7.60 cm, respectively during 2000-2001.

In the present study, cultivars having high diameter might be used to incorporate this character in the varieties which are already adopted in the locality and improvement in the yield is possible, because high diameter of bulb is major yield contributing character. Similar conclusions were made by Shaha and Kale (1999) that polar bulb diameter and weight of 50 cloves are the major yield contributing characters in garlic.

Cultivars Golden globe, 606 Cal, Granex-429 and Zeshan performed better than already recommended local variety Phulkara in respect of yield and yield contributing characters. These cultivars may be considered for future onion production or may be used in breeding programme to improve the already adopted varieties under Faisalabad condition and further experiments should be conducted to test the adaptability of these cultivars in other regions Pakistan.

REFERENCES

- Bolanos, H.A., 1989. Evaluation of ten onion cultivars in Potrero Cerrado de Cartago. *Investigacion Agricola*, 3: 10-4
- Costa, N.D., G.M. De. Resende and R.De. C.S. Dias, 2000. Evaluation of onion cultivars at Petrolina-De. *Horticulture Brasileira*, 18: 57-60
- Currah, L. and F.J. Proctor, 1990. *Onion in Tropical Region*. Natural Resources Institute, Central Avenue, Chatham Maritime, Kent ME4, 4TB, United Kingdom
- Iqbal, M.Z., F. Khan and S.A. Khan, 2001. Correlation and path coefficient analysis in potato. *J. Agric. Res.*, 39: 301-6
- Muniz, J.O., D. Silva and C.C. Gomes, 1989. Evaluation of onion cultivar for the Baturite region of Ceara. *Horticultura Brasileira*, 7: 18-9
- Shaha S.R. and P.N. Kale, 1999. Path coefficient analysis in garlic. *J. Maharashtra Agric. Univ.*, 24: 92
- Shimeles, A. and L. Dessalegne, 1999. Melkam-new onion cultivar for the low land irrigated production. *Agritopia*, 14: 6
- Shimeles, A., 1998. Performance of short day onion cultivars in upper awash valley. *Agritopia*, 13: 7-8
- Steel, R.G.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics. A Biometrical Approach*. McGraw Hill Book Company Inc., New York.
- Wall, A.D. and J.N. Corgan, 1999. Heritability estimates and progeny testing of phenotypic selections for soluble solids contents in dehydrator onion. *Euphatica*, 106: 7-13
- Yamaguchi, M., 1980. *World Vegetables, Principles, Productions and Nutritive Values*. pp: 187-8. Dept. of Vegetable Crops, Univ. of California Davis, California.

(Received 11 July 2003; Accepted 20 August 2003)