

Bulb Yield and other Economic Traits in Eight Onion Cultivars Under Different Ecological Zones of Punjab-Pakistan

KAISER LATIF CHEEMA, AKHTER SAEED AND MUHAMMAD HABIB

Vegetable Research Institute, Faisalabad-Pakistan

Correspondence: (Ph: 92-041-652518 Fax: 92-041-657466, Email: KLcheema@hotmail.com)

ABSTRACT

Eight onion cultivars were evaluated at Vegetable Research Institute, Faisalabad and its three sub-stations at Sahiwal, Multan and Bahawalpur for yield and other economic traits. Early Red exceeded all the cultivars in plot yield (12.76 t ha^{-1}). Bahawalpur proved best location for onion cultivation with average yield (14.76 t ha^{-1}) followed by Multan (13.40 t ha^{-1}). Faisal red was the best cultivar for Bahawalpur with its yield (17.79 t ha^{-1}). Dark Red and Early Red were the best for Multan. While Early Red was the better yielder (12.38 t ha^{-1}) at Faisalabad and Phulkara proved best at Sahiwal (11.67 t ha^{-1}). Bahawalpur was the best location yield (14.76 t ha^{-1}) and single plant weight (113.0 g) while Multan for diameter of bulb (6.40 cm), rings per bulb (7.13) and dry matter contents (13.46%). Minimum diameter of neck (1.00 cm) and bolting (1.0%) was observed at Sahiwal.

Key Words: Environment; *Allium cepa*; Cultivar; Punjab

INTRODUCTION

Onion (*Allium cepa*) bulbs are consumed daily by people of Pakistan and majority of the world as well as a condiment helps to fight against the blood and heart diseases. It is utmost need to employ all the possible ways to boost the production this very important vegetable crop. Punjab has various ecological zones with different environmental conditions. A genotype usually shows its best yield only in a specific environment. Exploitation of best environments for specific genotypes is one of the factors to increase average production of onion in Punjab.

Onion cultivars Glacier and Swift (Vanpary, 1999a) and shallot cultivar Sante were evaluated and recommended for cultivation on high sandy loam soil. Several cultivars have been recommended for their higher yield such as Granex (Bolanos, 1989), upton hybrid (Callens *et al.*, 1998) and Texas Grano-PRR (Costa *et al.*, 2000). Onion cultivar Melkan was recommended for production in less irrigated lands (Shimeles & Dessalegne, 1999). 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-1 out of nine cultivars (Munize *et al.*, 1989) recommended for baturite region of Ceara, Brazil.

The present study was initiated to evaluated onion cultivars at four different locations of Punjab i.e. Vegetable Research Institute, Faisalabad, Vegetable Research Sub-Station Sahiwal, Multan and Bahawalpur.

MATERIALS AND METHODS

Nursery of eight onion cultivars viz. PK-10321, Red Imposta, Dark Red, Phulkara, Early Red, Faisal Red,

Robina and Pusa Red was sown at Vegetable Research Institute, Faisalabad during first week of October 2001 and transplanted in the week of December 2001 at area of Vegetable Research Institute, Faisalabad and Sub-Stations at Sahiwal, Multan and Bahawalpur. The design was laid out in Randomized Complete Block Design with three replications. Seedling was transplanted on both sides of 70 cm ridges in 7 x 1.4 m plots. All agronomic practices and plant protection measures were followed as per recommendations. At maturity data regarding single plant yield, diameter of bulb and neck, rings per bulb and dry matter contents from ten guarded plants in addition to bolting percentage and plot yield. The data were subjected to statistical analysis following factorial design by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Genotypes. Maximum yield was obtained from cultivar Early Red (12.76 t ha^{-1}), which was statistically at par to Dark Red, Pusa Red Faisal Red and Phulkara. Similarly, different varieties were evaluated at different localities and reported (Vanprays, 1999a; Bolans, 1989; Callens *et al.*, 1998). Dark Red showed significantly higher bulb diameter (6.56 cm) than rest of the cultivars which were statistically at par to control. Maximum rings per bulb were observed in the cultivar Faisal Red (7.58) while Early Red, Dark Red and Red Imposta followed by cultivars which were statistically non-significant (Table I).

All the cultivars except Red Imposta (1.21 cm) were statistically at par for neck diameter. The cultivar Red Imposta also showed maximum single bulb weight (73.20 g). The cultivar Pusa red showed maximum dry matter contents (15.0%) and was at par with Phulkara (14.92).

Table I. Effect of cultivar on various yield and yield contributing components in onion

Genotypes	Yield (T/ha)	Diameter of bulb (cm)	Rings/ bulb	Diameter of neck (cm)	Single plant weight (g)	Dry matter (%)	Bolting (%)
Early Red	12.76	5.56	7.00	1.03	69.04	13.08	3.0
Dark Red	12.48	6.54	7.00	1.13	70.04	12.58	3.0
Pusa Red	12.43	5.42	6.25	1.11	63.72	15.00	1.9
Faisal Red	12.41	5.70	7.58	1.06	62.33	13.33	2.4
Phulkara	12.11	5.40	6.17	1.10	68.50	14.92	1.9
PK-10321	11.64	5.26	6.67	1.02	69.61	11.92	2.4
Robina	11.62	5.63	6.42	1.00	65.10	11.33	2.5
Red Imposta	11.32	5.10	6.92	1.21	73.20	11.92	2.8
LSD (0.05)	0.904	0.499	0.822	0.164	9.794	0.861	1.721
LSD (0.01)	1.204	0.664	1.093	0.218	13.04	1.145	2.229

Table II. Effect of location on various yield and yield contributing components in onion

Locations	Yield (T/ha)	Diameter of bulb (cm)	Rings/ bulb	Diameter of neck (cm)	Single plant weight (gm)	Dry matter (%age)	Bolting (%age)
Bahawalpur	14.76	5.56	6.92	1.09	113.00	12.88	1.7
Multan	13.40	6.40	7.13	1.17	59.77	13.46	2.9
Faisalabad	11.93	6.00	7.00	1.07	57.08	13.00	4.4
Sahiwal	8.32	4.35	5.96	1.00	40.92	12.71	1.0
LSD (0.05)	1.067	0.525	0.481	NS	9.770	NS	1.952
LSD (0.01)	1.552	0.764	0.699	-do-	14.22	-do-	2.841

Table III. Effect of onion cultivars planted at different location on various yield and yield contributing components

Genotypes	Locations	Yield (T/ha)	Diameter of bulb (cm)	Rings/ bulb	Diameter of neck	Single plant weight (g)	Dry matter (%)	Bolting (%)
PK-10321	Bahawalpur	12.37	4.70	6.67	1.07	114.67	12.00	1.7
	Multan	14.43	6.30	7.00	1.10	59.33	11.00	4.2
	Faisalabad	12.50	5.77	7.67	1.03	56.67	12.67	3.7
	Sahiwal	7.37	4.27	5.33	0.90	47.67	12.00	0.0
Red Imposta	Bahawalpur	14.44	7.00	8.00	1.17	120.00	13.00	1.7
	Multan	11.70	6.50	7.00	1.49	69.15	12.00	3.3
	Faisalabad	10.67	6.13	7.00	1.13	60.00	11.33	5.3
	Sahiwal	8.48	4.77	5.67	1.07	43.67	10.67	1.0
Dark Red	Bahawalpur	15.14	5.17	7.67	1.17	114.33	12.23	1.7
	Multan	15.53	6.33	7.33	1.20	63.82	13.67	3.0
	Faisalabad	11.67	5.97	6.67	1.07	63.33	11.33	4.7
	Sahiwal	7.60	4.70	6.33	1.10	38.67	13.00	2.7
Phulkara	Bahawalpur	11.63	5.97	5.33	1.17	113.33	15.00	1.7
	Multan	12.97	5.40	6.67	1.07	63.00	15.00	3.3
	Faisalabad	12.17	6.03	7.33	1.17	63.33	14.67	2.7
	Sahiwal	11.67	4.20	5.33	1.00	34.33	15.00	0.0
Early Red	Bahawalpur	15.70	5.17	7.00	0.97	118.00	12.00	1.0
	Multan	15.53	6.30	7.00	1.03	56.17	13.33	3.3
	Faisalabad	12.83	6.20	7.00	1.20	60.00	13.33	5.7
	Sahiwal	6.97	4.57	7.00	0.93	42.00	13.67	2.0
Faisal Red	Bahawalpur	17.79	4.90	7.00	1.03	113.33	12.00	1.3
	Multan	11.93	7.20	8.00	1.13	53.98	15.00	2.3
	Faisalabad	11.83	6.03	8.00	0.93	46.67	15.00	5.0
	Sahiwal	8.10	4.67	7.33	1.03	35.33	11.33	1.0
Robina	Bahawalpur	15.97	6.17	6.67	0.90	99.67	10.33	3.0
	Multan	11.03	6.47	7.67	1.73	60.06	13.00	1.7
	Faisalabad	11.57	5.87	6.00	0.93	50.00	12.00	5.0
	Sahiwal	7.91	4.00	5.33	0.83	50.67	10.00	0.3
Pusa Red	Bahawalpur	15.01	5.40	7.00	1.27	110.67	15.67	1.3
	Multan	14.07	6.67	6.33	1.23	52.56	14.67	2.0
	Faisalabad	12.17	5.97	6.33	1.10	56.67	13.67	3.3
	Sahiwal	8.47	3.63	5.33	1.10	35.67	16.00	1.0
	LSD (0.05)	1.816	0.978	1.643	0.327	19.59	1.721	3.442
	LSD (0.01)	2.418	1.328	2.187	0.435	26.07	2.291	4.392

Bolting data showed that statistical no differences among cultivars with values 1.9-3.0%.

Environments. The yields were significantly higher at

Bahawalpur (14.76 t ha⁻¹) followed by Multan and Faisalabad (13.40 and 11.93 t ha⁻¹, respectively). The higher yields were obtained due to higher single plant weight

(113.00 g), the main yield contributing character. The yields at Multan were higher due to more diameter of bulb (6.40 cm), rings per bulb (7.13) and dry matter contents (13.46%). Minimum neck diameter (1.00) was observed at Sahiwal but it was due to the minimum diameter of bulb (4.35 cm). The minimum bolting was observed at Sahiwal (1.0 %). It might be concluded from the data that Bahawalpur and Multan were the best locations for onion cultivation (Table II). Effect of environment on cultivars is significant in the present studies, and similar results and studies were reported by (Munize *et al.*, 1989; Shimeles, 1998).

Effect of environments over cultivars. Faisal Red and Robina produced maximum yield (17.79 and 15.97 t ha⁻¹, respectively) at Bahawalpur while Dark Red, Early Red were the best yielding at Multan. Cultivar Early red showed maximum yield at Faisalabad. Phulkara proved the best yielding cultivar of onion.

Pusa Red and Robina produced bulbs having larger diameter (7.00 and 6.17 cm, respectively) at Bahawalpur. All cultivars except Phulkara were found statistically at par with their bulb diameter ranged from 6.30 cm to 7.20 cm at Multan. Similarly all cultivars showed no statistically difference in bulb diameter at Faisalabad and Sahiwal except Pusa Red (3.63 cm).

All Varieties showed no statistical difference in producing number of rings per bulb at all locations: Faisalabad, Bahawalpur, Sahiwal, and Multan. Cultivar Pusa Red (1.27 cm neck diameter) showed statistical difference where as all the other varieties were statistically at par with the values ranged from 1.17 cm (Red Imposta) to 0.90 cm (Robina) at Bahawalpur. There were no statistical differences recorded in diameter of neck at Faisalabad, Sahiwal and Multan.

The cultivar Robina yielded statistically the highest single plant weight (99.67 g), and all the other cultivars were statistically at par ranged from 110.67 g (Pusa Red) to 120.00 g (Red Imposta) at Bahawalpur. There was no statistical differences among the cultivars in single plant weight at Multan, Faisalabad and Sahiwal Among cultivars there was no statistical significance difference of dry matter content at all locations: Faisalabad, Bahawalpur, Sahiwal

and Multan. However, Phulkara and Pusa Red produced bulbs with higher dry matter contents of 15.67 and 15.00%, respectively at Bahawalpur. Phulkara (15%) at Multan, Faisal Red (15%) at Faisalabad and Pusa Red (16%) at Sahiwal excelled other varieties in dry matter content. Similar results were reported by Bolanos (1989) who evaluated different varieties, and yield contributing characters of onion.

There was found statistical significance difference among locations and varieties for bolting percentage. Cultivars Pk-10321 and Phulkara showed 0% of bolting at Sahiwal. Low bolting is quality character of onion cultivar and it depends on the genotype and environment.

CONCLUSION

Cultivars Faisal Red and Robina might be recommended for Bahawalpur zone, while Dark Red, Early Red Pk-10321 and Pusa Red for Multan. All cultivars except Red Imposta produced better yield at Faisalabad and Phulkara proved better yielder for Sahiwal.

REFERENCES

- Bolanos, H.A., 1989. Evaluation of ten onion cultivars in Potrero Cerrado de Cartago. *Investigacion Agricola*, 3: 10–4
- Callens, D., L. Rooster, De Reyche and L. De, 1998. Summer cultivars of leek hybrids give the best results. *Proefuinnieuws*, 8: 35–7
- Costa, N.D., G.M. De. Resende and R.D.C.S. Dias, 2000. Evaluation of onion cultivars at Petrolina-De. *Horticultura Brasileira*, 18: 57–60
- Muniz, J.O., D.E. L. Silva, L.A. De and C.C. Gomes, 1989. Evaluation of onion cultivar for the Baturite region of Ceara. *Horticultura Brasileira*, 7: 18–9
- Shimeles, A., 1998. Performance of short day onion cultivars in upper awash valley. *Agritopia*, 13: 7–8
- Shimeles, A. and L. Dessalegne, 1999. Melkam-new onion cultivar for the low land irrigated production. *Agritopia*, 14: 6
- Steel, R.G.D. and J.H. Torrie, 1960. *Principles and Procedures of Statistics*. McGraw Hill Book Company Inc., New York
- Vanparys, L., 1999a. Cultivar trial on winter onion for harvest as young onions. *Beitem-Roeselare*, 412: 4
- Vanparys, L., 1999b. Cultivar trial with shallot sets. *Beitem-Roeselare* 402: 4

(Received 01 January 2003; Accepted 11 March 2003)