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Studies on performance of red onion advance lines for growth and yield for selection of good quality variety for different agroclimatic condition

RK Singh, SK Singh and AK Tailor

Abstract
India is second largest producer of onion in the world after China. Onion (*Allium cepa* L.) is commercially cultivated and widely consumed as vegetable and as spices in India. About 73.23 million tons of onions are produced in the world from 3.65 million ha area. India, being major onion-producing country, produces 20.13 million tons from 1.19 million ha, with a very low productivity of 16.24 t/ha in comparison to Republic of Korea (64.58 t/ha), USA (54.47 t/ha), Spain (53.69 t/ha), Netherland (45.80 t/ha), Japan (42.46 t/ha), Germany (41.86 t/ha) and United Kingdom (41.15 t/ha). Lack of recommended or released variety of high yielding as well as good keeping quality in the country, it creates price fluctuation during off season arrival period. To meet out the domestic requirement and also to fulfill the export demand, selection of high yielding genotype under different agro-climatic conditions is necessary. The experiment was conducted at Nashik and Karnal during *Rabi* 2017-18. At Nashik data revealed that highest gross yield (453.79 q/ha) and marketable yield (297.95 q/ha) was observed in advance lines-824 and 807, respectively, and was at par with lines-811, 824, 852, check varieties NHRDF Red-3 and NHRDF Red-4 regarding marketable yield. The highest total soluble solids (14.11%) and dry matter content (15.43%) were recorded in lines-703 and 825, respectively and was found at par with line-852 and NHRDF Red-4 in respect of total soluble solids, while at Karnal, the highest gross yield (365.51 q/ha) and marketable yield (333.47 q/ha) were recorded in advance line-844 which were at par with line-807 in respect of marketable yield. Highest total soluble solids (12.93%) was recorded in advance line-703 and it was at par with advance lines-704, 811, 825, 845, 873, NHRDF Red-3 and NHRDF Red-4. Hence it is concluded that above advance lines can be utilized for onion breeding programme for develop a good quality variety for different agroclimatic condition.

Keywords: Onion, *Allium cepa*, genotypes, evaluation, utilization of onion

Introduction
Onion is one of the most important underground bulbous vegetable crops grown in India, having both the food and medicinal values. It is widely cultivated for internal consumption as well as for the export. India is the second largest producer of onion in the world after China. About 73.23 million tons of onions are produced in the world from 3.65 million ha area. India, being major onion-producing country, produces 20.13 million tons from 1.19 million ha, with a very low productivity of 16.24 t/ha in comparison to Republic of Korea (64.58 t/ha), USA (54.47 t/ha), Spain (53.69 t/ha), Netherland (45.80 t/ha), Japan (42.46 t/ha), Germany (41.86 t/ha) and United Kingdom (41.15 t/ha).
About 55-60% of onion comes from *Rabi* season and 40-45% from *Kharif* and late *Kharif* season. Because of its high export potential, it comes under cash crop apart from vegetable (Pandey, 1989) [4]. It is predominantly a *Rabi* season crop and most onion cultivars are sensitive to photo period and thus their range of adoption is limited (Gupta and Singh, 2010) [2]. Lack of recommended or released variety of high yielding as well as good keeping quality in the country, it creates price fluctuation during off season arrival period. To meet out the domestic requirement and also to fulfill the export demand, selection of high yielding genotype under different agro- climatic conditions is necessary. In onion, local genotypes play important role in development of new cultivars. The main onion growing states in India are Maharashtra, Gujarat, Karnataka, Tamil Nadu, Odisha, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Bihar and Punjab. It is used as a salad or cooked in various ways in all curies, fried or baked and also used in processed form e.g. flakes powder, paste, crush and pickle, etc. National Horticultural Research and Development Foundation, Nashik, collected good number of germplasm and evaluated their performance regarding different attributes. Hence under present study a total of 15 germplasm along with three checks Agrifound Light Red, NHRDF

Red-3 and NHRDF Red-4 at Nashik while at Karnal also 15 genotypes along with four checks such as NHRDF Red, NHRDF Red-2, NHRDF Red-3 and NHRDF Red-4 were evaluated to assess their performance for selection of high yielding varieties for *Rabi* season.

Materials and Methods

The present investigation was carried out at National Horticultural Research and Development Foundation at Nashik, Maharashtra, during *Rabi* 2017-18. The experiment was laid out in randomized block design with three replications. The Nashik (20^0 N latitude and 73^0 E longitudes) is located at altitude of 492.0 meter above mean sea levels. The minimum and maximum temperature and humidity is ranging between 10 ^{0}C to 40 ^{0} C and 48% to 80%, respectively, with an annual rain fall around 881 mm. The soil of the trial was clay loam, medium in organic carbon (0.58%), available nitrogen (385.2 kg/ha), phosphorus (45.13kg/ha) and high in available potash (291.2kg/ha). The study comprises under present study a total of 15 germplasm along with three checks Agrifound Light Red, NHRDF Red-3 and NHRDF Red-4 at Nashik while at Karnal also 15 genotypes along with four checks such as NHRDF Red, NHRDF Red-2, NHRDF Red-3 and NHRDF Red-4, selected among more than 600 genotypes evaluated at this centre. The seeds were sown on 4/11/2017 and seedlings were transplanted on 30/12/2017 at Nashik, while at Karnal, the seeds were sown on 13/11/2017 and seedlings were transplanted on 28/01/2018. The harvesting was done as per maturity of bulbs at Nashik from 16/04/2018 to 28/04/2018 and at Karnal on 14/05/2018. 50 to 55 days old seedlings of each onion genotypes were transplanted in flat beds in the spacing of 15 cm x 10 cm in a plot of 3.6 m x 1.8 m size. The recommended package of practices was uniformly followed during whole experiment period to raise a successful crop. Randomly selected ten plants from each plot were taken to record the observations on plant establishment (%), plant height (cm), leaves per plant, neck thickness (cm), equatorial bulb diameter (cm), polar bulb diameter, P: E ratio, weight of 20 bulbs (kg), days for harvesting, doubles (%), bolters (%), rotten%, total soluble solid (%), dry matter content (%), gross yield (q/ha), marketable yield (q/ha), skin intactness at harvest, compactness of bulbs, colour of bulbs, shape of bulbs, reducing sugar, non-reducing sugar, total sugar, thrips per plant, stemphylium blight intensity. The data were analyzed to find out the superior genotypes for development of good quality onion varieties suitable for different agro climatic conditions.

Results and Discussion

The data of Nashik presented in Table-1, revealed that the number of leaves per plant exhibited non-significant differences. Highest plant establishment (90.63%) was recorded in advance line-745 and it was found at par with all the advance lines except lines-800, 807, 811, 824, 852 and 873. Maximum plant height (69.60 cm) was recorded in check variety NHRDF Red-4 and found at par with lines-825, 849, 873, check variety NHRDF Red-2 and NHRDF Red-3. Thinnest neck (1.32 cm) was recorded in line-826 and it was found at par with lines-703, 704, 800, 807, 824, 844, 845, 849 and 852. The highest equatorial bulb diameter (6.01 cm), polar bulb diameter (4.32 cm) and P: E ratio (1.58) were recorded in lines-825, 704 and NHRDF Red-4, respectively, and were found at par with advance line-849 in respect of equatorial bulb diameter, advance lines-703, 745, 800, 825 and 849 regarding polar bulb diameter and lines-811, 826, 844, 845, 852, 873, check NHRDF Red-2 and NHRDF Red-3 in respect of P:E ratio. The highest 20 bulbs weight (1.31 kg) was recorded in check NHRDF Red-4 which found at par with advance lines-703, 704, 745, 807, 824, 826, check NHRDF Red-2 and NHRDF Red-3. The significant and highest bulb weight was recorded in check Agrifound Light Red. (Singh *et. al.*, 2010, Singh 1991, Mohanty 2001, Patel *et. al.*, 1985, Sidhu *et. al*., 1986, Singh *et. al.*, 2010, Singh *et. al.* 2010 Singh *et. al.*, 2011 and Singh *et. al.*, 2011) reported that bulb diameter; size index and weight of bulb had correlated positively and increases the yield. Advance lines-825, 826, 852 and 873 recorded no bolters on number basis and it was at par with 703, 704, 807,811, 844 and 849. No doubles were recorded in line-844, however, lines-703, 704, 745, 800, 825, 852 and NHRDF Red-2 recorded no rotten bulbs on number basis and these were at par with 845 and NHRDF Red-4. The advance lines which showed minimum bolters and doubles can be utilized for good quality onion bulb variety. (Bhonde *et. al.,* 1991) also recorded similar range of bolting in their study of different varieties. The highest total soluble solids (14.11%) and dry matter content (15.43%) were recorded in line-703 and 825, respectively, though line-852 and NHRDF Red-4 were at par in respect of total soluble solids. The highest reducing sugar (5.63%), non-reducing sugar (5.89%) and total sugar (12.37%) contents were recorded in line-826, NHRDF Red-3 and advance line-849, respectively. The highest gross yield (453.79 q/ha) and marketable yield (297.95 q/ha) were recorded in lines-824 and 807, respectively and was at par with advance lines-811, 824, 852, NHRDF Red-3 and NHRDF Red-4 regarding marketable yield. The minimum duration for bulb maturity (107 days) was taken by advance line-703. The duration for maturity ranged from 107 to 120 days.

The data of Karnal presented in Table-2 revealed that the traits neck thickness and equatorial bulb diameter exhibited non-significant differences. The highest plant establishment (99.65%) was recorded in advance line-844 and it was found at par with all the lines except lines-703, 745, 800, 845, 854 and NHRDF Red-3. Maximum plant height (72.87 cm) and number of leaves per plant (7.53) were recorded in check variety NHRDF Red-3 and advance line-849, respectively and at par with lines-745, 826, 845, 849 and check variety NHRDF Red in respect of plant height and lines-704, 826, 844, NHRDF Red and NHRDF Red-3 regarding number of leaves per plant. Highest polar bulb diameter (3.91 cm) was recorded in line-811 and it was at par with all the lines except lines-800, 825, 845, 873, NHRDF Red and NHRDF Red-2. The highest P: E ratio (1.43) and weight of 20 bulbs (1.30 kg) were recorded in NHRDF Red and advance line-849, respectively and it was found at par with lines-704, 800, 807, 825, 845, 873, NHRDF Red-2 and NHRDF Red-3 in respect of P: E ratio and advance lines-703, 854 and NHRDF Red-3 regarding weight of 20 bulbs. No bolters were recorded in all the lines except lines-845, 854, check varieties NHRDF Red, NHRDF Red-3 and NHRDF Red-4. The lowest rotten bulbs on number basis (1.41%) were recorded in line-807 which was at par with lines-703, 745, 800, 811, 825 and 826. No doubles were recorded in advance line-825.The highest total soluble solids (12.93%) were recorded in advance line-703 which was at par with lines-704, 811, 825, 845, 873, check NHRDF Red-3 and NHRDF Red-4.

The highest gross yield (365.51 q/ha) and marketable yield (333.47 q/ha) were recorded in line-844 and it was at par with line-807 in respect of marketable yield. 100% stemphylium

blight incidence was recorded in all the lines including check varieties, however, the lowest intensity of stemphylium blight (13.60%) was recorded in check variety NHRDF Red-4 and it was at par with lines-745, 824, 873 and NHRDF Red-3. The lowest thrips population was recorded in NHRDF Red and it was at par with check variety NHRDF Red-3. The minimum duration for bulb maturity (104 days) was taken by advance lines-703, 745, 800, 824, 825, 844, 852, 854 and NHRDF Red-2. The duration for maturity ranged from 104 to 107 days.

Table 1: Performance of red onion advance line at Nashik during *Rabi*, 2017-18

Advance lines	Plant establishment (%)	Plant height (cm)	No. of leaves/ plant	Neck thickness (cm)	Equatorial bulb diameter (cm)	Polar bulb diameter (cm)	P: E Ratio	Weight of 20 bulbs (kg)
L-703	90.10	66.00	8.27	1.39	5.35	4.25	1.26	1.25
L-704	89.76	67.13	8.53	1.35	5.53	4.32	1.28	1.23
L-745	90.63	67.07	8.60	1.48	5.40	4.20	1.29	1.29
L-800	85.42	67.73	8.60	1.40	5.53	4.08	1.36	1.22
L-807	85.83	65.93	8.47	1.40	5.43	3.87	1.40	1.24
L-811	86.11	66.47	8.53	1.44	5.62	3.82	1.47	1.20
L-824	80.56	66.27	9.00	1.39	5.35	3.78	1.42	1.23
L-825	88.89	68.20	9.07	1.43	6.01	4.24	1.42	1.22
L-826	89.26	67.27	8.93	1.32	5.44	3.66	1.49	1.23
L-844	89.63	67.60	8.47	1.39	5.37	3.46	1.57	1.03
L-845	90.28	67.47	8.60	1.37	5.49	3.62	1.52	1.20
L-849	90.00	68.33	8.87	1.40	5.82	4.14	1.41	1.20
L-852	80.56	67.60	8.73	1.39	5.50	3.59	1.53	1.17
L-854	89.93	67.47	8.67	1.45	5.43	3.92	1.38	1.19
L-873	75.93	68.13	8.80	1.47	5.31	3.46	1.54	1.19
NHRDF-Red-2 (C)	89.41	69.07	9.07	1.46	5.45	3.65	1.49	1.27
NHRDF-Red-3 (C)	89.24	69.00	8.60	1.48	5.44	3.72	1.47	1.27
NHRDF-Red-4 (C)	88.19	69.60	8.67	1.42	5.55	3.54	1.58	1.31
S Em±	2.12	0.83	0.24	0.04	0.11	0.17	0.07	0.04
CD at 5%	4.31	1.69	NS	0.08	0.22	0.35	0.14	0.08
CV%	2.97	1.50	3.35	3.86	2.52	5.30	6.11	3.76

Advance lines	Bolters on number basis (%)		Doubles on number basis (%)		Rotten (%)		TSS (%)	Dry Matter (%)	Gross yield (q/ha)
L-703	0.95	(1.20)	0.19	(0.83)	0.00	(0.71)	14.11	13.83	243.40
L-704	0.19	(0.83)	0.40	(0.95)	0.00	(0.71)	11.64	13.73	259.25
L-745	0.38	(0.94)	0.58	(1.04)	0.00	(0.71)	12.65	14.17	285.58
L-800	0.81	(1.15)	0.28	(0.88)	0.00	(0.71)	12.13	13.57	292.14
L-807	1.62	(1.45)	0.98	(1.22)	0.84	(1.15)	12.11	12.42	355.08
L-811	0.33	(0.91)	0.94	(1.20)	0.97	(1.21)	11.53	13.74	348.55
L-824	2.28	(1.67)	1.73	(1.49)	1.11	(1.27)	12.27	13.78	453.79
L-825	0.00	(0.71)	0.41	(0.94)	0.00	(0.71)	12.09	15.43	207.29
L-826	0.00	(0.71)	1.03	(1.23)	0.40	(0.95)	13.02	13.63	243.62
L-844	0.40	(0.95)	0.00	(0.71)	0.54	(1.02)	11.80	14.36	250.65
L-845	0.55	(1.02)	0.54	(1.02)	0.18	(0.82)	13.22	13.87	295.30
L-849	0.39	(0.94)	0.38	(0.92)	0.38	(0.94)	13.07	13.63	310.11
L-852	0.00	(0.71)	1.99	(1.57)	0.00	(0.71)	13.60	13.24	350.52
L-854	1.80	(1.50)	1.47	(1.40)	1.09	(1.26)	12.25	14.46	306.27
L-873	0.00	(0.71)	1.55	(1.43)	1.21	(1.26)	12.42	13.87	320.70
NHRDF-Red-2 (C)	0.55	(1.02)	0.54	(1.02)	0.00	(0.71)	13.06	13.63	262.87
NHRDF-Red-3 (C)	0.99	(1.17)	0.55	(1.02)	0.37	(0.93)	11.35	13.24	323.33
NHRDF-Red-4 (C)	0.57	(1.01)	0.56	(1.03)	0.36	(0.91)	13.58	14.46	332.43
S Em±	-	0.12	-	0.07	-	0.1	0.29	0.41	21.71
CD at 5%	-	0.24	-	0.14	-	0.2	0.59	0.83	44.12
CV%	-	13.95	-	8.16	-	12.91	2.82	3.63	8.80

Note: Data shows in parenthesis Square root transformed value

Advance lines	Market-Able yield (q/ha)	Days for maturity	Skin intactness at harvest	Compactness of bulb	Color of bulb	*Shape of bulb	Reducing sugar (%)	Non Reducing Sugar (%)	Total Sugar (%)
L-703	186.87	107	Tight	Compact	Red	G Round	4.74	3.49	8.23
L-704	222.42	113	Tight	Compact	Red	G Round	4.92	3.12	8.03
L-745	229.06	115	Tight	Compact	Red	G Round	5.17	2.46	7.63
L-800	236.15	113	Tight	Compact	Red	G Round	5.10	2.57	7.66
L-807	297.95	115	Tight	Compact	Red	G Round	4.49	3.82	8.31
L-811	266.19	113	Tight	Compact	Red	G Round	4.43	3.94	8.37
L-824	297.86	120	Tight	Compact	Red	G Round	4.61	3.58	8.19
L-825	187.28	118	Tight	Compact	Red	G Round	4.93	3.85	8.78
L-826	203.77	118	Tight	Compact	Red	G Round	5.63	2.37	8.00

L-844	196.43	114	Tight	Compact	Red	G Round	3.83	5.15	8.99
L-845	238.06	114	Tight	Compact	Red	G Round	4.03	4.52	8.55
L-849	259.81	120	Tight	Compact	Red	G Round	3.89	8.48	12.37
L-852	274.76	120	Tight	Compact	Red	G Round	4.02	4.38	8.40
L-854	233.41	118	Tight	Compact	Red	G Round	3.81	4.59	8.40
L-873	232.65	114	Tight	Compact	Red	G Round	4.01	5.38	9.38
NHRDF-Red-2 (C)	198.37	118	Tight	Compact	Red	G Round	4.01	4.94	8.95
NHRDF-Red-3 (C)	275.67	120	Tight	Compact	Red	G Round	3.92	5.89	9.80
NHRDF-Red-4 (C)	268.72	120	Tight	Compact	Red	G Round	3.95	4.39	8.34
S Em±	16.88	-	-	-	-	-	0.08	0.17	0.16
CD at 5%	34.30	-	-	-	-	-	0.16	0.35	0.33
CV%	8.64	-	-	-	-	-	2.27	4.76	2.25

*Globular Round

Table 2: Performance of red onion advance lines at Karnal during *Rabi*, 2017-18

Advance lines	Plant establish-ment (%)	Plant height (cm)	No. of leaves/ plant	Neck thickness (cm)	Equatorial bulb diameter (cm)	Polar bulb diameter (cm)	P: E Ratio	Weight of 20 bulbs (kg)
L-703	93.40	68.00	6.53	1.60	5.05	3.83	1.32	1.25
L-704	98.61	67.07	7.33	1.54	5.17	3.77	1.37	1.17
L-745	94.44	70.93	6.67	1.57	5.04	3.76	1.34	1.21
L-800	97.22	68.13	6.87	1.53	4.98	3.61	1.38	1.16
L-807	97.92	69.87	7.07	1.56	5.15	3.71	1.39	1.19
L-811	98.26	69.93	6.33	1.52	5.07	3.91	1.30	1.20
L-824	97.92	70.67	6.93	1.54	5.14	3.84	1.34	1.13
L-825	98.96	68.13	6.67	1.56	4.72	3.35	1.41	1.03
L-826	98.26	72.00	7.47	1.52	5.03	3.83	1.32	1.10
L-844	99.65	69.40	7.40	1.63	4.97	3.84	1.30	1.17
L-845	96.53	71.67	7.13	1.55	5.09	3.69	1.38	1.21
L-849	97.92	71.00	7.53	1.57	5.09	3.89	1.31	1.30
L-852	97.92	67.60	7.20	1.52	4.97	3.75	1.33	1.20
L-854	95.83	69.20	6.60	1.58	5.20	3.84	1.35	1.25
L-873	99.31	70.20	7.13	1.58	4.97	3.61	1.38	1.09
NHRDF Red (C)	98.96	72.80	7.47	1.62	5.09	3.56	1.43	1.14
NHRDF-Red-2 (C)	98.26	64.53	6.27	1.58	5.01	3.66	1.37	1.12
NHRDF-Red-3 (C)	96.88	72.87	7.40	1.74	5.23	3.74	1.40	1.25
NHRDF-Red-4 (C)	97.57	67.13	6.73	1.54	4.97	3.72	1.33	1.07
S Em±	1.19	0.98	0.16	0.07	0.13	0.10	0.03	0.04
CD at 5%	2.41	1.99	0.32	NS	NS	0.20	0.06	0.08
CV%	1.49	1.72	2.74	15.62	3.17	3.36	2.83	3.98

Advance lines	Bolters on number basis (%)		Doubles on Number basis (%)		Rotten (%)		TSS (%)	Gross yield (q/ha)	Market-able yield (q/ha)	Stemphylium blight Int. (%)	
L-703	0.00	(0.71)	2.57	(1.49)	5.53	(1.98)	12.93	316.04	283.38	14.13	(4.17)
L-704	0.00	(0.71)	1.75	(1.27)	3.51	(2.59)	12.47	323.13	301.37	16.87	(4.37)
L-745	0.00	(0.71)	1.10	(1.70)	6.24	(1.93)	11.78	299.05	274.17	18.63	(3.77)
L-800	0.00	(0.71)	2.50	(1.38)	3.22	(1.37)	12.28	254.40	231.94	13.70	(4.39)
L-807	0.00	(0.71)	1.42	(2.17)	1.41	(1.72)	12.40	330.63	314.19	18.80	(4.45)
L-811	0.00	(0.71)	4.24	(2.17)	2.48	(1.72)	12.60	288.66	256.71	19.27	(4.45)
L-824	0.00	(0.71)	1.43	(1.38)	4.27	(2.15)	12.40	327.08	300.28	15.63	(4.02)
L-825	0.00	(0.71)	0.00	(0.71)	2.81	(1.81)	12.60	247.50	232.27	17.20	(4.21)
L-826	0.00	(0.71)	1.41	(1.38)	3.53	(2.01)	11.67	301.97	286.46	21.67	(4.71)
L-844	0.00	(0.71)	2.09	(1.61)	4.53	(2.23)	11.60	365.51	333.47	19.20	(4.44)
L-845	0.71	(0.71)	1.80	(1.62)	6.47	(2.48)	12.80	301.18	272.01	15.43	(4.36)
L-849	0.00	(0.71)	2.13	(1.10)	5.67	(3.00)	12.40	332.80	300.02	18.53	(4.89)
L-852	0.00	(0.89)	0.71	(1.39)	8.53	(2.50)	12.15	287.62	256.13	23.43	(4.56)
L-854	0.35	(0.71)	1.47	(1.82)	5.75	(3.21)	11.93	316.20	291.78	20.37	(4.40)
L-873	0.00	(1.38)	2.80	(3.42)	9.79	(2.32)	12.60	265.05	214.35	18.90	(3.98)
NHRDF Red (C)	1.40	(0.71)	11.23	(1.68)	4.91	(2.87)	12.27	348.94	260.07	15.33	(4.50)
NHRDF-Red-2 (C)	0.00	(0.71)	2.47	(1.68)	7.77	(2.87)	11.87	269.19	234.24	19.80	(4.50)
NHRDF-Red-3 (C)	1.09	(1.26)	2.51	(1.73)	4.63	(2.24)	12.53	328.56	302.64	14.47	(3.86)
NHRDF-Red-4 (C)	0.72	(1.07)	6.04	(2.52)	4.98	(2.32)	12.67	241.74	204.12	13.60	(3.75)
S Em±	-	0.08	-	0.16	-	0.2	0.24	7.80	9.71	-	0.14
CD at 5%	-	0.16	-	0.32	-	0.41	0.49	15.82	19.69	-	0.28
CV%	-	12.56	-	12.02	-	10.67	2.34	3.16	4.39	-	3.94

Note: Data shows in parenthesis Square root transformed value

Advance lines	Thrips per plant	Days for maturity	Skin intactness of harvest	Compactness of bulb	Color of bulb	Shape of bulb
L-703	42.40	104	Tight	Compact	L. Red	Round
L-704	43.73	107	Tight	Compact	Red	Round
L-745	41.33	104	Tight	Compact	L. Red	Round
L-800	42.40	104	Tight	Compact	L. Red	Round
L-807	40.53	107	Tight	Compact	L. Red	Round
L-811	42.40	107	Tight	Compact	L. Red	Round
L-824	42.67	104	Tight	Compact	L. Red	Round
L-825	42.13	104	Tight	Compact	L. Red	Round
L-826	45.07	107	Tight	Compact	L. Red	Round
L-844	42.40	104	Tight	Compact	L. Red	Round
L-845	42.40	107	Tight	Compact	L. Red	Round
L-849	45.60	107	Tight	Compact	L. Red	Round
L-852	44.27	104	Tight	Compact	L. Red	Round
L-854	43.47	104	Tight	Compact	L. Red	Round
L-873	42.13	107	Tight	Compact	L. Red	Round
NHRDF Red (C)	36.80	107	Tight	Compact	D. Red	Round
NHRDF-Red-2 (C)	42.93	104	Tight	Compact	L. Red	Round
NHRDF-Red-3 (C)	40.00	107	Tight	Compact	Red	Round
NHRDF-Red-4 (C)	43.20	107	Tight	Compact	L. Red	Round
S Em±	1.95	-	-	-	-	-
CD at 5%	3.95	-	-	-	-	-
CV%	5.63	-	-	-	-	-

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