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Research Article

Gujarat Junagadh Red Onion-11 (GJRO-11) – a new high yielding red onion variety

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Abstract
To boost-up onion production in the Gujarat state, a new high yielding Red Onion Variety "Gujarat Junagadh Red Onion-11" (GJRO-11) developed by Vegetable Research Station, Junagadh Agricultural University, Junagadh, which was evaluated under state and co-ordinated trials during 2007-08 to 2013-14 at various locations along with check varieties AGFL-Red, Pilli Patti and Talaja Red. On the basis of mean bulb yield data, GJRO-11 recorded the highest bulb yield of 323.55 q/ha as compared to check varieties AGFL-Red (266.15 q/ha), Pilli Patti (272.55 q/ha) and Talaja Red (280.34 q/ha), which was 21.57, 18.71 and 15.41 per cent higher, respectively. Mean bulb yield in the AICRP trials revealed that GJRO-11 recorded mean bulb yield of 275.65 q/ha as compared to checks; Line-355 (345.62 q/ha), Bhima Kiran (332.43 q/ha) and Bhima Shakti (344.11q/ha). This genotype was not overtaken any of these checks in AINRPOG trials. The bulb of this variety are medium in size, flat globe in shape and red in colour. Regarding quality parameters, this variety contains higher TSS (12.94%), total carbohydrates (9.3%), total protein (1.16%), ascorbic acid (3.89 mg/g), total phenol (13.66 mg/100 g), pyruvic acid (1.22) and total soluble sugar (1.22%) as compared to check varieties. This variety also recorded less jointed bulb percent (2.04%) as compared to check varieties. It has good tolerance against purple blotch disease (12.67%) as compared to check varieties AGFL-R (20.33%), Pilli Patti (23.56%) and Talaja Red (24.28%). Thrips population was also less (5.70/leaf) in GJRO-11 variety as compared to check varieties; AGFL-Red (8.3/leaf), Pilli Patti (8.9/leaf) and Talaja Red (9.4/leaf).

Keywords
GJRO-11, Onion

Introduction

Onion (*Allium cepa* L.) is one of the important spices and vegetable crops grown in temperate Brewster (1990), sub-tropical Corgan and Kedar, (1990) and tropical climate Currah and Proctor, (1990) throughout the world. It is cultivated round the year but maximum during *rabi* season in our country. The crop is grown for several of purposes from kitchen to factory made products/food and also for dehydration. It is valued for its distinct pungent flavor and its essential ingredients cuisine. It is consumed round the year by all the classes of people throughout the world due to healing properties of onion in case of cardiac diseases, rheumatism, cancer, digestive disorders, blood sugar and prolong cough. It is a photo-sensitive crop and on the basis varieties are divided into short day and long day types. Long day types are high yielder but have poor shelf life whereas, short day types have better shelf life with the low yielding capacity. So, development of high yielding varieties with good quality traits is need of now a days. Therefore, present study was undertaken to identify a high yielding genotype in onion.

The variety GJRO-11 was developed by selection from local materials during 2011-02. After six generations (seeds and bulbs) evaluation, phenotypic selection was made on the basis of bulb size, shape and weight. Both these procedures were operated during the biannual cycle of advancement of generations. From the segregating populations, after than this genotype was isolated and evaluated for its yield performance.

Materials and methods

The studies were conducted on different onion genotypes during *rabi* 2007-08 to 2013-14 at different locations/centers in state trials and in national trials under All India Network Research Project on Onion and Garlic from 2012-13 to 2013-14. An onion genotype JDRO-07-13 (ASRO-1213) was tested in these trials along with three checks *viz.,* AGFL Red, Pilli Patti and Talaja Red in state trials at Junagadh, Mahuva, Talaja and Navasari locations and Line-355, Bhima Kiran and Bhima Shakti in AINRPOG trials at Junagadh, Nasik, Rahuri and Rajgurunagar. The experiments were laid down in a Randomized Block Design with three replications. The experimental plot size was 2.00 x 2.25 m^2 with a distance of 15 x 10 cm spacing in a plot. All the recommended package of practices were followed to raise good crop. The analysis was performed following standard procedures as per Panse and Sukhatme (1985).

Results and discussion

The results on bulb yield of GJOR-11 (JDRO-07-13) along with three checks *viz.*, Pilli Patti, Talaja Red and AGFL-Red are presented in Table1. On the basis of bulb yield data from the state trials at Junagadh, Mahuva, Talaja and Navsari centers, GJOR–11 had proven its superiority by giving higher bulb yield at all the centers except Talaja. On the basis of mean bulb yield, GJOR-11 recorded the highest bulb yield of 323.55 q/ha as compared to check varieties; AGFL-Red (266.15 q/ha), Pilli Patti (272.55 q/ha) and Talaja Red (280.34 q/ha), which was 21.57, 18.71 and 15.41 per cent higher respectively (Table1). Similar findings have also been reported for bulb yield in onion by Ram *et al*. (2011); Dewangan and Sahu (2014) and Sachin *et al*. (2015). This variety was also tested in All India Net Work Research Project on Onion and Garlic during 2012-13 and 2013-14 and data are given in Table 2 as supporting data.

The per cent disease index (PDI) of purple blotch diseases in this variety (GJRO-11) was found less (12.67%) as compared to check varieties AGFL-Red (20.33%), Pilli Patti (23.56%) and Talaja Red (24.28%) (Table-3). This variety was found superior in case of damage due to thrips (Table 4) as it has recorded less number of thrips per leaf (5.7) than all the three check varieties; AGFL-Red (8.3), Pilli Patti (8.9) and Talaja Red (9.4). Similar results have also been observed by Hegde *et al.* (2016a) and Hegde *et al.* (2016b) for thrips and Pradhan *et al*. (2016) and Kulkarni *et al*. (2016) for purple blotch in onion. The bulbs of this variety are medium in size, flat globe in shape and red in colour. Regarding quality parameters this variety contain higher T.S.S. (12.94%) total carbohydrate (9.3%), total protein (1.16%), ascorbic acid (3.89 mg/g), total phenol (13.66 mg/100g), pyruvic acid (1.22%) and total soluble sugar (1.22%) as compared to check varieties. This variety also recorded lower jointed bulb (1.74%) as compared to check varieties (Table5). These findings are in accordance with Sachin *et al*. (2015).

This variety had recorded a mean bulb yield of 323.55 q/ha, which was 21.57, 18.71 and 15.41 per cent higher over check varieties AGFL-Red (266.15 q/ha), Pilli Patti (272.55 q/ha) and Talaja Red (280.34 q/ha), respectively. The purple blotch (12.67 %) was less as compared to check varieties AGFL-Red (20.30), Pilli Patti (23.56) and Talaja Red (24.28). Damages due to thrips (5.7/leaf) were found less as compared to check varieties. It was found less pungent (Pyruvic acid: 1.22%) as compared to check varieties; AGFL-Red and Talaja Red. In this variety, 12.94 per cent total soluble solids was recorded. The bulbs of GJRO-11 are medium in size with flat globe shape and red in colour. By virtue of all the superior performance, Gujarat Junagadh Red Onion-11 (GJRO-11) has been recommended for commercial cultivation in the *rabi* season of Gujarat State by Gujarat State Variety Release Committee.

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Table 1. Performance of Red Onion GJRO-11 in Station trials in Gujarat state

Year & Season	Name of Trial	Locations	Bulb yield of GJRO-11 (q/ha)	Bulb yield of check varieties (q/ha)			S. Em. ±	C. D. at 5%	C. V. %
				AGFL-Red (a)	Pilli Patti (b)	Talaja Red (c)			
2007-08	PET	Junagadh	290.80	-	260.00	271.70	18.05	51.82	11.20
		Mean (1)	**290.80**	**-**	**260.00**	**271.70**	**-**	**-**	**-**
		% increased over	**-**	**-**	**11.85**	**7.03**	**-**	**-**	**-**
2009-10	SSVT	Junagadh	245.48	230.81	226.07	224.63	15.30	45.13	11.14
		Mean (1)	**245.48**	**230.81**	**226.07**	**224.63**	**-**	**-**	**-**
		% increased over	**-**	**6.36**	**8.59**	**9.28**	**-**	**-**	**-**
2010-11	LSVT	Junagadh	297.89	-	-	282.00	14.92	45.27	9.19
		Mahuva	303.70	-	-	349.41	15.49	47.00	9.93
		Navsari	323.85	-	-	323.26	34.32	NS	17.77
		Mean (3)	**308.48**	**-**	**-**	**318.22**	**-**	**-**	**-**
		% increased over	**-**	**-**	**-**	**-**	**-**	**-**	**-**
2011-12	LSVT	Junagadh	409.9*[bc]	355.00	349.01	341.00	19.79	58.04	10.11
		Mahuva	307.4*[ab]	218.50	244.40	290.70	15.98	46.86	11.00
		Navsari	307.4*[bc]	274.10	218.5	244.40	15.04	44.13	10.41
		Mean (3)	**341.57**	**282.53**	**270.67**	**292.03**	**-**	**-**	**-**
		% increased over	**-**	**20.90**	**26.19**	**16.96**	**-**	**-**	**-**
2012-13	LSVT	Junagadh	363.33*[abc]	280.00	326.65	317.26	3.59	10.54	9.02
		Talaja #	180.86	195.53	223.23	189.20	13.26	38.91	13.31
		Navsari #	188.55	157.40	166.29	270.18	33.02	102.78	29.30
		Mean (1)	**363.33**	**280.00**	**326.65**	**317.26**	**-**	**-**	**-**
		% increased over	**-**	**29.76**	**11.23**	**14.52**	**-**	**-**	**-**
2013-14	LSVT	Junagadh	346.11*[abc]	282.44	295.78	288.52	16.66	48.89	9.52
		Mahuva	285.19*[a]	222.22	247.43	255.85	19.70	57.81	13.23
		Navsari #	147.93	197.26	204.89	162.59	18.09	53.07	16.87
		Mean (2)	**315.65**	**252.33**	**271.61**	**272.18**	**-**	**-**	**-**
		% increased over	**-**	**25.09**	**16.21**	**15.97**	**-**	**-**	**-**
		Mean (11)	316.46	-	-	289.88	-	-	-
		% increased over	-	-	-	9.17	-	-	-
		Mean (8)	319.46	-	270.98	-	-	-	-
		% increased over	-	-	17.89	-	-	-	-
		Mean (7)	323.55	266.15	272.55	280.34	-	-	-
		% increased over	-	21.57	18.71	15.41	-	-	-
Freq. in top non-signi. group			9/11	2/7	0/8	5/11	-	-	-

*Significant at 5% level than checks a=AGFL-Red, b=Pilli Patti and c= Talaja Red

Data were not included due to below state average (State average: 244.15 q/ha)

Table 2. Performance of onion variety GJRO-11 under All India Network Research Project on Onion and Garlic

Year & Season	Name of Trial	Locations	Bulb yield of GJRO-11 (q/ha)	Bulb yield of check varieties (q/ha)			C. D. at 5%	C.V. %
				Line-355	Bhima Kiran	Bhima Shakti		
Rabi-2012-13	IET	Junagadh	282.00	346.41	256.00	310.00	55.47	12.07
		Nasik	251.48	333.33	350.00	361.11	5.57	1.09
		Rahuri	395.31	419.79	468.36	429.39	71.33	9.97
		Rajgurunagar	289.44	341.11	315.83	361.67	49.81	10.33
Mean (4)			**304.56**	**360.16**	**347.55**	**365.54**		
% increase Over				-	-	-		
Rabi-2013-14	AVT-I	Junagadh	299.93	332.52	290.37	300.74	47.94	10.01
		Rahuri	216.90	313.10	312.50	321.50	5.29	10.58
		Rajgurunagar	194.52	331.71	333.96	324.37	13.92	8.93
Mean (3)			**237.12**	**325.77**	**312.27**	**315.54**		
% increase Over				-	-	-	-	-
Over all Mean (7)			**275.65**	**345.42**	**332.43**	**344.11**	-	-
% increase Over					-	-	-	-

Table 3. Reaction to Purple blotch diseases recorded at Junagadh center under field condition

Entry	PDI (%)			
	2011-12	2012-13	2013-14	Mean
GJRO-11	14.33	12.00	11.67	12.67
AGFL-Red (C)	18.67	20.33	22.00	20.33
Pilli Patti (C)	22.67	25.00	23.00	23.56
Talaja Red (C)	24.00	22.33	26.50	24.28

Reaction	Percent disease intensity (PDI)
Immune (I)	0
Resistant (R)	< 1%
Moderately Resistant (MR)	1 -4.9%
Moderately susceptible (MS)	5 – 24.9%
Susceptible (S)	25 – 50%
Highly susceptible (HS)	> 50%

Table 4. Reaction to pests recorded at Junagadh center under field condition

Entry	No. of thrips/leaf			
	2011-12	2012-13	2013-14	Mean
GJRO-11	5.3	6.5	5.4	5.7
AGFL-Red (C)	8.3	9.1	7.5	8.3
Pilli Patti (C)	7.9	8.3	10.5	8.9
Talaja Red (C)	9.5	10.2	8.5	9.4

Table 5. Quality parameters

Sr. No.	Characters	GJRO-11	AGFL-Red (C)	Pilli Patti (C)	Talaja Red (C)
1	Moisture (%)	89.44	89.94	91.94	88.76
2	Total Carbohydrate (%)	9.3	6.4	6.85	8.64
3	Reducing Sugar (%)	0.36	0.34	0.32	0.25
4	Non Reducing Sugar (%)	0.86	0.60	0.71	0.85
5	Total Protein (%)	1.16	1.04	1.01	1.07
6	Acidity (%)	0.34	0.75	0.56	0.34
7	Ascorbic Acid (Vit. C) (mg/g)	3.89	3.36	2.23	3.27
8	Total Phenol (mg/100g)	13.66	13.04	5.96	11.87
9	Total Soluble Sugar (%)	1.22	0.94	1.04	1.11
10	Pyruvic Acid (%)	1.22	1.33	1.17	1.32
11	Total Soluble Solids (%)	12.94	12.71	12.79	12.62
12	Joint Bulbs (%)	2.04	3.19	3.01	2.74