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A high yielding white onion variety: Gujarat Junagadh white onion-3 (GJWO-3)

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Abstract

A white onion variety “Gujarat Junagadh White Onion-3” (GJWO-3) developed by Vegetable Research Station, Junagadh Agricultural University, Junagadh, which was evaluated under state trials during 2005-06 to 2014-15 at various locations along with check varieties; PWF-131, GWO-1 and GAWO-2. On the basis of mean bulb yield data, GJWO-3 recorded the highest bulb yield of 398.03 q/ha as compared to check varieties; PWF-131 (329.54 q/ha), GWO-1 (357.75 q/ha) and GAWO-2 (369.26 q/ha), which was 20.8, 11.3 and 7.8 percent higher, respectively. The bulbs of this variety are medium in size, flat globe in shape and white in color. Regarding quality parameters, this variety contains higher TSS (13.15%), total carbohydrates (7.97%), total protein (1.19%), ascorbic acid (3.19 mg/g), total phenol (18.23 mg/100 g), pyruvic acid (11.35) and total soluble sugar (1.04%) as compared to check varieties. This variety also recorded less jointed bulb percentage (1.70%) as compared to check varieties. It has good tolerance against purple blotch disease (13.88%) as compared to check varieties; PWF-131 (23.52%), GWO-1 (21.59%) and GAWO-2 (16.05%). Thrips population was also less (6.08/leaf) in GJWO-3 variety as compared to check varieties; PWF-131(9.43/leaf), GWO-1 (8.23/leaf) and GAWO-2 (7.40/leaf).

Keywords: GJWO-3, Onion

Introduction

Onion (*Allium cepa* L) is one of the most popular bulb as well as cash vegetables in the world. It belongs to the family *Alliaceae* or *liliaceae* and is one of the most important monocotyledonous, biennial, cross-pollinated and cool season vegetable crops. It is grown as annuals for bulb, but it takes two seasons for seed production. It produces dry bulb the first growing season and flower stalk the second season. It is semi-perishable in nature. The onions are used for condiments, salad, chutneys, pickles, curries, soups, sauces and seasoning foods. Onions are grown mainly as food materials however; onion has medicinal properties and has been used for the treatment of various ailments such as skin diseases, ear pain, heart attack and strokes. It also contains the vitamins thiamine, riboflavin and niacin and is used for its medicinal value especially in the case of heart problems (Mettananda and Fordham, 2001) [6]. They also contain a phytochemical called quercetin, which is effective in reducing the risk of cardiovascular disease, an anticancer, and has promise to be an antioxidant (Smith, 2003) [9]. Onion (*Allium cepa* L.) is widely grown vegetable crop in Gujarat and secured fourth rank after potato, brinjal and okra in area and second position in production after potato. Among the total vegetable cultivation in Gujarat, onion crop contributed 5.37% share in area and 6.70% share in production during 2012-13. The area under onion cultivation in Gujarat was 28.85 thousand hectares and production was 704.38 thousand metric tons in the year 2012-13. At present, productivity is about 24.42 tones/ha. The state contributes 2.74 and 4.19 percent shares of onion in total area and production of India, respectively. Gujarat ranks third position in production after Maharashtra and Karnataka. The major onion growing districts of Gujarat are Bhavnagar, Rajkot, Junagadh, Jamnagar, Amreli, Kutch, Porbandar, Dahod, Surendranagar, Anand and Mehsana. In white onion, GWO-1 variety was released in 2000 at state level. Continuous research efforts were made to develop high yielding genotypes in order to find-out alternative of presently grown variety GWO-1.

Materials and methods

The variety was tested in Preliminary Evaluation Trial (PET) during 2005-06 and in Small Scale Varietal Trial (SSVT) during 2007-08 at Junagadh. Due to its good performance, the variety was tested in Large Scale Varietal Trial (LSVT) at Junagadh, Mahuva, Talaja, Dhari, Anand and Navsari locations during the year of 2009-10 to 2014-15.

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The experiments were laid down in randomized block design with three replications. All the recommended package of practices was followed to raise good crop. The analysis was performed following standard procedures as per Panse and Sukhatma (1985) [7].

Results and discussion

The results on bulb yield of GJWO-3 along with two state checks; GWO-1 and GAWO-2 and one national check; PWF-131 are presented in Table-1. On the basis of mean bulb yield, GJWO-3 recorded the highest bulb yield of 398.06 q/ha as compared to check varieties; PWF-131 (329.54 q/ha), GWO-1 (357.75 q/ha) and GAWO-2 (369.26 q/ha), which was 20.8%, 11.3% and 7.8% higher over checks, respectively (Table-1). Similar results have also been observed by Priyadarshini *et al.* (2019) [8], Umamaheswarappa *et al.* (2019) [10], Jethava *et al.* (2018) [4], Acharya *et al.* (2016) [1], Mahajan, *et al.* (2016) [5], Ali *et al.* (2014) [2] and Baliyan (2014) [3]. This variety was also tested in All India Net Work Research Project on Onion and Garlic for IET during 2015-16 and it was evaluated in

AVT-I during 2016-17 and AVT-II during 2017-18, therefore data were not presented due to coding.

The percent intensity of purple blotch disease in the variety GJWO-3 was found less (13.85%) as compared to check varieties; PWF-131 (23.52%), GWO-1 (21.59%) and GAWO-2 (16.05%) (Table-2). This variety was found superior by recording less number of thrips per leaf (6.08) than all the three check varieties; PWF-131 (9.43/leaf), GWO-1 (8.23/leaf) and GAWO-2 (7.40/leaf) (Table-3). Similar results were observed by Jethava *et al.* (2018) [4] and Acharya *et al.* (2016) [1].

The bulbs of this variety are medium in size, flat globe in shape and white in colour. Regarding quality parameters, this variety contains higher T.S.S. (13.15%), total carbohydrate (7.97%), total protein (1.19%), Ascorbic acid (3.19 mg/g), total phenol (18.23 mg/100 g), Pyruvic acid (11.35) and total soluble sugar (1.04%) as compared to check varieties (Table-4). This variety also recorded lower jointed bulb (1.70%) as compared to check varieties.

Table 1: Year and Center wise yield performance of Onion Variety GJWO-3 in Gujarat state

Year & Season	Name of Trial	Location	Bulb yield (q/ha)				S. Em. ±	C.D. At 5%	C.V. %
			GJWO-3	PWF-131 (NC)	GWO-1 (SC)	GAWO-2 (SC)			
2005-06	PET	Junagadh	391.90	350.40	357.80	-	21.8	62.45	9.59
Mean (1)			391.90	350.40	357.80	-	-	-	-
% increased over			-	11.84	9.53	-	-	-	-
2007-08	SSVT	Junagadh	344.80 ^{sa}	267.80	283.30	-	22.23	65.59	13.21
Mean (1)			344.80	267.80	283.30	-	-	-	-
% increased over			-	28.75	21.71	-	-	-	-
2009-10	LSVT	Junagadh	299.26 ^{ab}	229.26	244.44	-	15.66	46.54	10.80
		Mahuva #	178.89	175.00	185.78	-	6.81	20.22	6.89
		Anand	675.56 ^a	525.93	674.07	-	40.55	120.47	11.40
Mean (2)			487.14	377.60	459.26	-	-	-	-
% increased over			-	29.01	6.07	-	-	-	-
2010-11	LSVT	Junagadh	285.22	272.44	285.26	286.63	14.90	44.28	8.98
		Mahuva	514.89	533.11	551.11	536.96	20.33	NS	6.79
		Anand	342.96	305.19	327.41	407.41	20.57	61.12	10.01
Mean (3)			381.02	370.25	387.93	410.33	-	-	-
% increased over			-	2.91	-	-	-	-	-
2011-12	LSVT	Junagadh	384.20 ^{ac}	328.10	338.40	286.60	20.02	60.04	10.42
		Mahuva	288.90 ^{ac}	231.50	285.20	218.50	15.71	47.09	10.90
		Anand	688.90 ^{ab}	437.00	555.60	666.70	32.75	98.18	9.57
Mean (3)			454.00	332.20	393.07	390.60	-	-	-
% increased over			-	36.66	15.50	16.23	-	-	-
2012-13	LSVT	Junagadh	434.96 ^{abc}	363.67	389.67	362.59	5.14	15.17	10.92
		Talaja #	184.30	179.96	182.04	219.70	13.89	40.98	12.78
		Anand	603.70 ^{ab}	411.11	485.18	537.03	35.87	105.84	11.80
Mean (2)			519.33	387.39	437.43	449.81	-	-	-
% increased over			-	34.06	18.72	15.46	-	-	-
2013-14	LSVT	Junagadh	370.22 ^{abc}	295.11	289.85	308.59	18.19	53.37	10.16
		Anand	391.11 ^{ab}	270.37	298.52	402.22	29.01	85.08	14.25
		Mahuva	328.89	275.56	282.22	274.07	22.14	64.95	14.53
		Dhari	333.00	321.00	373.00	392.00	23.29	68.32	11.51
		Navsari	264.30 ^{abc}	175.85	201.19	183.19	20.74	60.86	10.97
Mean (5)			337.51	267.58	288.96	312.01	-	-	-
% increased over			-	26.13	16.80	8.17	-	-	-
2014-15	LSVT	Junagadh	333.33 ^{ac}	318.52	301.93	281.48	17.73	51.56	10.79
		Anand	434.07	428.89	432.96	444.07	16.10	46.70	14.73
		Navsari	370.30	305.18	326.44	320.07	18.06	52.53	9.29
Mean (3)			379.23	350.86	353.78	348.54	-	-	-
% increased over			-	8.09	7.19	8.81	-	-	-
Mean (20)			404.01	332.30	364.18	-	-	-	-
% increased over			-	21.58	10.94	-	-	-	-
Overall Mean (16)			398.06	329.54	357.75	369.26	-	-	-
% increased over			-	20.79	11.27	7.80	-	-	-
No. of freq. in Top non-sign. group			17/20	1/20	6/20	3/16	-	-	-

* Significant at 5% level than checks and # = Data were not included due to below state average yield

Table 2: Reaction to purple blotch (%) disease

Entry	PDI				Mean
	2011-12	2012-13	2013-14	2014-15	
GJWO-3	12.33	14.00	15.00	14.17	13.88
PWF-131 (NC)	23.33	25.00	22.67	23.07	23.52
GWO-1 (SC)	20.33	23.67	21.00	21.36	21.59
GAWO-2 (SC)	14.29	17.02	16.29	16.58	16.05

Table 3: Reaction to thrips

Entry	No. of thrips/plant				Mean
	2011-12	2012-13	2013-14	2014-15	
GJWO-3	6.1	5.4	6.5	6.3	6.08
PWF-131(NC)	8.6	9.1	10.2	9.8	9.43
GWO-1 (SC)	7.8	8.1	8.5	8.5	8.23
GAWO-2 (SC)	6.9	8.8	6.8	7.1	7.40

Table 4: Quality Parameters

S. No.	Characters	GJWO-3	PWF -131 (NC)	GWO-1 (SC)	GAWO-2 (SC)
		Junagadh			Anand
1	Moisture (%)	90.73	91.05	89.04	88.64
2	Total carbohydrate (%)	7.97	6.98	7.39	10.61
3	Reducing sugar (%)	0.24	0.22	0.23	1.62
4	Non-reducing sugar (%)	0.79	0.60	0.75	3.58
5	Total protein (%)	1.19	0.79	1.27	1.24
6	Acidity (%)	0.37	0.53	0.42	0.64
7	Ascorbic acid (Vit. C) (mg/100g)	3.19	1.18	3.16	12.92
8	Total phenol (mg/100g)	18.23	9.63	14.12	1.56
9	Total soluble sugar (%)	1.04	0.82	0.99	4.90
10	Pyruvic acid (mg/100g)	11.35	9.84	9.65	36.47

Conclusion

The farmers of Gujarat state growing onion crop during *rabi* season are advised to grow onion variety Gujarat Junagadh White Onion -3 (GJWO-3). This white onion variety recorded bulb yield of 398.06 q/ha, which was 20.8%, 11.3% and 7.8% higher over check varieties *viz.*, PWF-131 (329.54 q/ha), GWO-1 (357.75 q/ha) and GAWO-2 (369.26 q/ha), respectively. The variety bulbs contain higher total soluble solid (13.15%) as compared to check varieties *viz.*, PWF-131 (12.80%), GWO-1 (12.88%) and GAWO-2 (12.18%). Bolting percent and jointed bulb percent were less as compared to check varieties and the bulbs of this variety were medium in size with flat globe shape and white in color preferred by industry.

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