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## Influence of different genotypes of onion on growth, yield and quality parameters

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### Abstract

An investigation was carried out on studies on Influence of different genotypes on growth, yield and quality parameters at ICAR-KVK, Hagari, Benchikottal, Ballari, during 2020-21 with thirty two onion genotypes in three replication. The growth characters appeared significant difference among the genotypes evaluated. The genotype ONVC-24 exhibited maximum plant height (68.26 cm). The genotype ONVC-04 exhibited maximum number of leaves per plant (14.12). The genotype ONVC-23 exhibited maximum leaf length (62.26 cm). The genotype ONVC-08 exhibited maximum leaf area (441.44 cm<sup>2</sup>) and leaf area index (3.32). The genotype ONVC-20 exhibited maximum average bulb weight (124.73 g), total yield per plot (15.22 kg), and marketable yield per hectare (76.11 t). The genotype ONVC-18 registered maximum longitudinal diameter of bulb (6.40 cm). The genotype ONVC-25 recorded maximum equatorial diameter of bulb (6.40 cm). The genotype ONVC-29 registered maximum number of rings per bulb (12.72). The genotype ONVC-05 recorded maximum thickness of onion scale (0.45 mm). The genotype ONVC-24 recorded highest days to maturity (120.81 days). The genotype ONVC-08 recorded maximum total soluble solids (13.76 °B). The genotype ONVC-14 recorded maximum bulb neck thickness (1.09 cm). The genotype ONVC-10 recorded highest bulb shape index (1.46). The genotype ONVC-04 recorded highest dry matter of onion percentage (17.55%). The onion is an important crop with many medicinal values, it has good yield and quality attributes. Thus identification of promising varieties as a commercial crop for the area with high yield and quality fruits would help the farmers in its adoption and improving their economic status.

**Keywords:** Onion quality, marketable yield and equatorial diameter

### Introduction

Onion (*Allium cepa* L.) is a prime vegetable crop of the genus *Allium* belongs to the family Amaryllidaceae under order Asparagales having chromosome number  $2n (2x) = 16$ . It is confounded to be originated from Central Asia as center of origin and near East and Mediterranean regions are considered as secondary centers of origin (Vavilov, 1926 and McCollum, 1976) [10, 5]. Onions are used as raw in the form of salad, vegetable and spice all over the world (Katyal, 1985) [4]. The bulb and greens are rich in vitamin C, dietary fiber, mineral potassium, folic acid and it is richest source of mineral vanadium. It is also contains calcium, iron and high quality protein with low sodium without fat (Roshania and Agrawal, 1981) [7]. Onion bulb contains 86.8 per cent of moisture, 11 g of carbohydrates, 1.2 g of protein, 0.6 g of fiber, 0.08 mg of thiamine, 11 mg of vitamin C, 180 mg of calcium, 50 mg of phosphorus, 0.7 mg of iron, 0.4 mg of nicotinic acid and 0.01 mg of riboflavin per 100 g of edible portion (Nadkarni, 1993) [6]. Onion has strong flavor due to presence of sulphur containing compound "allyl propyl disulphide" responsible for distinctive smell and pungency. Highly pungent red coloured onions are preferred in India, the yellow colour in onion is due to the presence of pigment "quercetin" and red colour in onion is due to the presence of pigment "anthocyanin". India is the second largest producer of onion in the world after china and occupies an area of 1,431.38 thousand hectares and production of 26,091.38 thousand metric tons with productivity of 18.23 t/ha. Maharashtra is the leading state in cultivation of onion and occupies an area of 618 thousand hectare with the production of 10,683 thousand metric tons, however the highest productivity is recorded from Sikkim with 56.11 ton/ha (Anonymous 2019-20) [2]. In Karnataka, onion is cultivated in an area of 160.00 thousand hectares and production of 2,275.00 thousand metric tons with a productivity of 14.22 t/ha. (Anonymous, 2019-20) [2]. The major onion growing districts in Karnataka are Chitradurga, Dharwad, Gadag, Ballari and Belagavi.

The purpose of breeding programme is to know the yield potential of a popular crop variety which are resistance to disease and pests which are being effectively used for determining the rate of various yield components in different crops, leading to the selection of superior genotypes.

### Materials and methods

The field experiment was conducted on onion (*Allium cepa*. L) at ICAR-KVK, Hagari, Benchikottal, Ballari during *rabi* season 2020-2021 using thirty two onion genotypes collected at different places and were taken for study (Table 1). Seedlings of 40 days old were transplanted to the main field during *rabi* season. The experiment was laid out by adopting Randomized Block Design with three replications with a spacing of 15 cm x 10 cm. One thirty three plants per genotype per replication were maintained. The cultivation was practiced as per package of practice in onion. Ten plants were selected randomly from each genotype and were tagged for identification and data was collected from tagged plants and averaged for statistical analysis.

**Table 1:** List of genotypes (Treatment)

ONVC-1	ONVC-12	ONVC-23
ONVC-02	ONVC-13	ONVC-24
ONVC-03	ONVC-14	ONVC-25
ONVC-04	ONVC-15	ONVC-26
ONVC-05	ONVC-16	ONVC-27
ONVC-06	ONVC-17	ONVC-28
ONVC-07	ONVC-18	ONVC-29
ONVC-08	ONVC-19	ONVC-30
ONVC-09	ONVC-20	BALLARY RED
ONVC-10	ONVC-21	BHIMA SUPER
ONVC-11	ONVC-22	

### Results and Discussion

The results of growth parameters in onion genotypes are presented in Table 2. A significant variations were observed among genotypes with respect to growth and yield. The highest plant height was recorded in genotype ONVC-24 (62.26 cm) and lowest was recorded in genotype ONVC-06 (40.08 cm). The maximum number of leaves per plant ONVC-04 (14.12) and lowest was recorded in genotype-12

(10.38). The highest leaf length was recorded in genotype ONVC-23 (62.26 cm) and lowest was recorded in genotype ONVC-06 (34.75 cm). The maximum leaf area registered in ONVC-08 (441.44cm<sup>2</sup>) and leaf area index ONVC-08 (3.32) and lowest leaf area registered in genotype ONVC-14 (90.20cm<sup>2</sup>) and leaf area index ONVC-14 (0.68). Similar reports were found with Lakshmipathi *et al.* (2017) [4], Ganiger *et al.* (2018) [3].

The results of yield parameters in onion genotypes are presented in Table 3 and 4. The highest average bulb weight recorded in genotype ONVC-20 (124.73g) and lowest was recorded in ONVC-15 (16.35g). The highest longitudinal diameter of bulb recorded in genotype ONVC-18 (6.40cm) and lowest was recorded in ONVC-06 (3.31cm). The highest equatorial diameter of bulb recorded in genotype ONVC-25 (7.24cm) and lowest was recorded in ONVC-19 (2.63cm). The highest number of rings per bulb recorded in genotype ONVC-29 (12.72) and lowest was recorded in ONVC-10 (7.58). The highest thickness of onion scale recorded in genotype ONVC-05 (0.45mm) and lowest was recorded in ONVC-16 (0.22mm). The highest total yield per plot recorded in genotype ONVC-20 (15.22kg) and lowest was recorded in ONVC-19 (1.71kg). The highest marketable yield per plot recorded in genotype ONVC-20 (76.11t) and lowest was recorded in ONVC-19 (8.54t). The longer days for maturity recorded in genotype ONVC-24 (120.81days) and lowest was recorded in ONVC-19 (91.00days). Similar reports were found with Amarananjundeshwara *et al.* (2020) [1], Upadhyay *et al.* (2020) [9] and Srivastav *et al.* (2017) [8].

The results of quality parameters in onion genotypes are presented in Table 5. The highest total soluble solids recorded in genotype ONVC-08 (13.76 °B) and lowest was recorded in ONVC-01 (9.35 °B). The highest bulb neck thickness recorded in genotype ONVC-14 (1.09cm) and lowest was recorded in ONVC-01 (0.33cm). The highest bulb shape index recorded in genotype ONVC-10 (1.46) and lowest was recorded in ONVC-20 (0.66). The highest dry matter of onion percentage recorded in genotype ONVC-04 (1.46%) and lowest was recorded in ONVC-16 (11.70%). The reports are in agreement with Amarananjundeshwara *et al.* (2020) [1], Ganiger *et al.* (2020) [3] and Lakshmipathi *et al.* (2017) [4].

**Table 2:** Performance of onion genotypes for growth parameters

Sl.no	Genotypes	Plant height(cm)	No. of leaves per plant	Leaf length(cm)	Leaf area(cm <sup>2</sup> )	Leaf area index
1	ONVC-01	50.77	12.75	44.60	287.52	2.16
2	ONVC-02	47.62	10.89	40.31	148.44	1.12
3	ONVC-03	48.79	11.89	42.87	305.15	2.29
4	ONVC-04	63.70	14.12	56.85	410.94	3.09
5	ONVC-05	52.04	12.06	46.12	283.87	2.13
6	ONVC-06	40.08	11.06	34.75	106.25	0.80
7	ONVC-07	43.23	12.32	37.24	132.64	1.00
8	ONVC-08	67.63	12.97	61.59	441.44	3.32
9	ONVC-09	48.49	11.53	43.37	153.59	1.15
10	ONVC-10	43.61	11.66	37.23	111.12	0.84
11	ONVC-11	48.83	12.26	43.50	259.95	1.95
12	ONVC-12	52.62	10.38	46.35	313.31	2.36
13	ONVC-13	44.08	12.26	39.65	131.87	0.99
14	ONVC-14	42.63	11.54	36.65	90.20	0.68
15	ONVC-15	43.33	11.27	38.21	101.37	0.76
16	ONVC-16	42.47	11.63	36.80	106.85	0.80
17	ONVC-17	45.34	13.24	41.05	159.50	1.20
18	ONVC-18	54.82	11.53	47.82	181.41	1.36
19	ONVC-19	41.26	13.57	35.99	116.77	0.88
20	ONVC-20	65.54	13.14	57.93	397.52	2.99

21	ONVC-21	43.24	12.11	37.29	92.83	0.70
22	ONVC-22	51.29	13.71	45.10	322.64	2.43
23	ONVC-23	67.97	12.33	62.26	372.80	2.80
24	ONVC-24	68.26	13.33	62.09	435.46	3.27
25	ONVC-25	65.82	13.84	58.81	391.45	2.94
26	ONVC-26	47.59	13.25	41.01	194.68	1.46
27	ONVC-27	62.74	12.33	55.82	403.54	3.03
28	ONVC-28	49.54	11.67	42.95	282.88	2.13
29	ONVC-29	51.24	13.37	44.26	298.82	2.25
30	ONVC-30	51.07	11.74	45.36	336.64	2.53
31	Bhima Super	59.89	13.88	53.34	328.53	2.47
32	Ballary Red	56.85	12.41	51.47	305.80	2.30
	Mean	51.95	12.38	45.90	250.18	1.88
	S.Em±	2.45	0.66	2.40	23.46	0.18
	CD(5%)	6.94	1.87	6.78	66.32	0.50

**Table 3:** Performance of onion genotypes for yield parameters

Sl.no	Genotypes	Average bulb weight(g)	Longitudinal diameter of bulb(cm)	Equatorial diameter of bulb(cm)	No. of rings per bulb
1	ONVC-01	80.82	5.67	5.78	10.50
2	ONVC-02	48.62	4.68	4.59	11.60
3	ONVC-03	63.30	5.01	5.79	10.77
4	ONVC-04	115.17	4.44	6.61	9.90
5	ONVC-05	74.45	5.29	5.17	10.69
6	ONVC-06	39.70	3.31	4.36	10.46
7	ONVC-07	34.10	4.45	3.76	10.78
8	ONVC-08	94.56	5.59	6.31	10.59
9	ONVC-09	44.93	4.03	4.32	9.58
10	ONVC-10	32.74	5.14	3.56	7.58
11	ONVC-11	59.49	4.78	5.12	8.62
12	ONVC-12	98.91	4.81	7.14	12.26
13	ONVC-13	35.83	3.37	4.49	9.41
14	ONVC-14	69.49	4.45	5.49	10.45
15	ONVC-15	16.35	3.89	3.38	7.59
16	ONVC-16	33.29	3.47	4.51	8.69
17	ONVC-17	41.83	3.85	4.77	8.62
18	ONVC-18	67.57	6.40	5.26	9.61
19	ONVC-19	20.17	3.18	2.63	6.58
20	ONVC-20	124.73	4.44	6.62	12.53
21	ONVC-21	25.80	3.32	3.72	9.41
22	ONVC-22	74.20	4.82	5.78	9.51
23	ONVC-23	93.05	5.17	5.51	9.61
24	ONVC-24	98.91	5.29	6.13	12.63
25	ONVC-25	111.49	5.25	7.24	12.42
26	ONVC-26	48.04	4.39	5.11	10.48
27	ONVC-27	94.73	5.24	6.41	11.45
28	ONVC-28	51.09	3.68	5.17	11.51
29	ONVC-29	73.59	5.71	5.60	12.72
30	ONVC-30	72.31	5.11	6.32	8.71
31	Bhima Super	94.22	4.84	7.13	10.24
32	Ballary Red	84.38	4.76	5.72	9.28
	Mean	66.18	4.62	5.30	10.15
	S.Em±	2.91	0.20	0.22	0.45
	CD(5%)	8.23	0.57	0.63	1.28

**Table 4:** Performance of onion genotypes for yield parameters

Sl.no	Genotypes	Thickness of onion scale(mm)	Total bulb yield per plot (kg)	Marketable bulb yield per hectare(t/ha)	Days to maturity
1	ONVC-01	0.30	9.68	48.41	108.31
2	ONVC-02	0.25	6.40	32.02	97.10
3	ONVC-03	0.42	6.45	32.24	102.26
4	ONVC-04	0.44	13.59	67.94	115.79
5	ONVC-05	0.45	8.54	42.72	106.60
6	ONVC-06	0.32	6.63	33.13	93.02
7	ONVC-07	0.25	4.63	23.13	94.22
8	ONVC-08	0.30	12.27	61.33	117.83
9	ONVC-09	0.25	5.75	28.75	97.18

10	ONVC-10	0.32	5.64	28.22	94.05
11	ONVC-11	0.34	6.41	32.06	103.08
12	ONVC-12	0.37	11.86	59.29	112.66
13	ONVC-13	0.35	3.77	18.85	94.01
14	ONVC-14	0.35	7.59	37.93	93.89
15	ONVC-15	0.25	5.89	29.45	92.56
16	ONVC-16	0.22	6.71	33.57	93.23
17	ONVC-17	0.31	6.68	33.42	94.89
18	ONVC-18	0.28	7.70	38.51	104.31
19	ONVC-19	0.25	1.71	8.54	91.00
20	ONVC-20	0.30	15.22	76.11	116.90
21	ONVC-21	0.32	5.92	29.60	93.33
22	ONVC-22	0.31	8.68	43.38	107.22
23	ONVC-23	0.24	10.82	54.10	119.69
24	ONVC-24	0.26	12.59	62.93	120.81
25	ONVC-25	0.26	13.54	67.69	116.82
26	ONVC-26	0.43	5.55	27.74	96.82
27	ONVC-27	0.37	11.76	58.79	111.51
28	ONVC-28	0.25	6.60	33.02	101.56
29	ONVC-29	0.25	8.66	43.30	107.91
30	ONVC-30	0.41	8.83	44.17	107.71
31	Bhima Super	0.33	11.52	57.60	105.90
32	Ballary Red	0.23	10.22	51.09	103.74
	Mean	0.31	8.37	41.85	103.62
	S.Em ±	0.02	0.58	2.89	1.85
	CD (5%)	0.05	1.63	8.17	5.23

**Table 5:** Performance of onion genotypes for quality parameters

Sl.no	Genotypes	TSS <sup>(°B)</sup>	Bulb neck thickness	Bulb shape index	Dry matter of onion (%)
1	ONVC-01	9.35	0.33	0.99	13.21
2	ONVC-02	11.43	0.86	1.02	12.70
3	ONVC-03	13.25	0.84	0.86	13.52
4	ONVC-04	12.46	0.67	0.67	17.55
5	ONVC-05	10.43	0.42	1.02	13.43
6	ONVC-06	11.52	0.54	0.75	12.47
7	ONVC-07	12.53	0.67	1.18	12.86
8	ONVC-08	13.76	0.52	0.89	16.60
9	ONVC-09	10.50	0.57	0.93	12.56
10	ONVC-10	11.59	0.35	1.46	12.61
11	ONVC-11	12.64	0.78	0.93	12.55
12	ONVC-12	13.45	1.01	0.67	12.39
13	ONVC-13	10.37	1.00	0.75	13.44
14	ONVC-14	11.39	1.09	0.81	12.53
15	ONVC-15	12.50	0.94	1.16	12.66
16	ONVC-16	13.35	0.76	0.77	11.70
17	ONVC-17	9.65	0.83	0.80	12.57
18	ONVC-18	10.78	0.71	1.21	12.44
19	ONVC-19	11.57	0.52	1.23	13.31
20	ONVC-20	12.29	1.02	0.66	15.67
21	ONVC-21	12.56	0.67	0.91	13.55
22	ONVC-22	9.38	0.85	0.83	13.51
23	ONVC-23	12.53	1.01	0.94	16.53
24	ONVC-24	13.28	1.01	0.86	17.27
25	ONVC-25	11.57	1.02	0.72	15.09
26	ONVC-26	12.49	0.68	0.86	13.33
27	ONVC-27	10.30	1.01	0.81	16.56
28	ONVC-28	13.43	0.66	0.71	12.53
29	ONVC-29	11.50	1.01	1.02	12.74
30	ONVC-30	10.70	0.77	0.80	12.39
31	Bhima Super	10.65	0.88	0.67	16.40
32	Ballary Red	9.60	0.73	0.83	16.38
	Mean	11.65	0.77	0.90	13.85
	S.Em±	0.60	0.04	0.06	0.58
	CD (5%)	1.70	0.12	0.18	1.63

## Conclusion

Genotypes ONVC-4, ONVC-8, ONVC-12, ONVC-20, ONVC-23, ONVC-24, ONVC-25, ONVC-27 and Bhimasuper genotypes observed highly significant for plant height (cm), number of leaves per plant, leaf length (cm), leaf area (cm<sup>2</sup>) and leaf area index, average bulb weight (g), longitudinal diameter of bulb (cm), equatorial diameter of bulb (cm), number of rings per bulb, thickness of onion scale (mm), total yield per plot (kg), marketable yield per hectare (t) and days to maturity, total soluble solids (<sup>0</sup>B), bulb neck thickness (cm), bulb shape index, dry matter of onion percent indicates highly vigours, high yielders and good quality character suitable for selection of genotypes.

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