Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.7504

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **7 (3):** 52-57 (2019)

Research Article

Study of the Yield and Quality Characters of Different Onion Varieties for Crop Improvement Purposes

Santosh Kasera[1], Mukesh Kumar Meena[2], Mahendra Jadia[3*], S. S. Basediya[4]

[1]Department of Horticulture, RVSKVV, Gwalior, India

[2]Rural Horticulture Extension Officer, Department of Horticulture and Food Processing, Sheopur, India

[3]Research Scholar, MGCGVV, Chitrakoot, Satna, India

[4]Department of Soil and Water Engineering, JNKVV, Jabalpur, India

*Corresponding Author E-mail: mahendrajadia89@gmail.com

Received: 2.05.2019 | Revised: 5.06.2019 | Accepted: 11.06.2019

ABSTRACT

The Research Farm of Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Indore, (M.P.). The bulb and green top ratio percentage was significantly influenced by various genotypes. The significantly maximum bulb and green top ratio were recorded in genotypes Agrifound white and Mahasuper red and which were at par with each other. While, the lowest bulb and green top ratio was recorded in the Bhima Shakti. The Bhima shakti was noted early matureing genotype and recorded significantly minimum 203.0 day for mature followed by Bhima raj (204.67 days) and Akshda mahasuper (205.33 days). However, the genotype Agrifound white was required maximum (210.0) days for maturity. It is obvious from the data that the leaf area per plant was significantly influenced by the different genotypes of onion. Agrifound white was observed highest leaf area per plant which was followed by Mahasuper red and N-2-4-1 at 30, 60, 90 and 120DAT and which were at par with each other at 60, 90 and 120 DAT. The lowest leaf area per plant was recorded in Bhima shakti for the same. The leaf area index was significantly influence due to various onion genotypes. The Agrifound white was observed maximum leaf area index which was followed by Mahasuper red and N-2-4-1 at 30, 60, 90 and 120 DAT, and which were at par with each other at 60, 90 and 120 DAT. Whereas, the leaf area index was observed lowest in Bhima shakti at 30, 60, 90 and 120 DAT. The data clearly showed that there was non-significant difference amongst the genotypes at 120 DAT stages of observations. The NAR in general decreased at 90 DAT in all the genotypes. The significantly maximum net assimilation rate was observed under the genotype Agrifound white followed by Mahasuper red, N-2-4-1 and Bhima sweta at 60 and 90 DAT. The lowest NAR was recorded in Bhima shakti at 60 and 90 DAT. The highest NAR was found in Agrifound white and the lowest was observed in genotype Bhima shakti at 120 DAT. NAR declined as the crop advanced at 30-60 DAT and LAI increase at 60 DAT in comparison to 30 DAT.

Key words: *Onion, Vegetable crop, Thiamine, Riboflavin, Niacin and ascorbic acid*

Cite this article: Kasera, S., Meena, M.K., Jadia, M., Basediya, S.S., Study of the Yield and Quality Characters of Different Onion Varieties for Crop Improvement Purposes, *Int. J. Pure App. Biosci.* **7(3):** 52-57 (2019). doi: http://dx.doi.org/10.18782/2320-7051.7504

INTRODUCTION

Onion (*Allium cepa* L.) is widely grown vegetable crop belongs to the family Alliaceae used for daily human consumption in almost all the countries in the world. It is one of the most important vegetables crops and used both the green and mature bulb stages as a salad, vegetable and spices[1]. Moreover, it is the second important horticultural crop after tomatoes[2] and one of the most important vegetable crops whose leafy portion as a vegetable and bulbs as salad and spice are used daily[3]. It has a great demand due to its flavour, pungent taste, medicinal value and low price containing rich carbohydrates, protein, vitamin A, thiamine, riboflavin, niacin and ascorbic acid[4]. Onion being important vegetable crop needs proper attention for producing better quality seeds and bulbs. The lower yields are attributed to limited availability of good quality seeds and improved varieties. Improved seed varieties would contribute to crop yield[5] up to 30%. Onion yield could be regarded as a complex character, which is dependent on a number of agronomic characters especially bulb and leaf quality[6]. In some cases onion production influenced by many factors like pathogens which reduces the bulb quality[7], insect infestation hamper the yield[9] and could be genetic or environmental[10.11].

The pungency in onion is due to sulphur- bearing compound in very small quantity (about 0.005%) in the volatile oil allyl propyl disulphide ($C_6H_{12}O_2$). The colour of the outer skin of onion bulbs is due to quercetin. The quality of onion depends on shape, size, colour and pungency of bulbs. Highly pungent red coloured onions are preferred in India while less pungent, yellow or white skinned ones are demanded in European and Japanese market.

Onion has many medicinal values and used for preparation of various Homeopathic, Unani and Ayurvedic medicines. Consumption of onions may prevent gastric ulcers by scavenging free radicals and by preventing growth of the ulcer-forming microorganism, *Heliobacter pylori*, confirm the potency of the onion as a blood thinner and platelet inhibitor. Researchers found that the more pungent onions exhibit strong anti-platelet activity. Platelet aggregation is associated with diseases like atherosclerosis, cardiovascular disease, heart attack and stroke. Incremental increase in scientific publications on phenolics strongly advocates the consumption of polyphenolic rich food for management of degenerative diseases particularly cardiovascular diseases, cancer, Alzheimer's, neurodegenerative diseases and diabetes[13]. Phenolic compounds can offer significant anti-mellitus atherogenic protection by inhibiting the oxidation of low density lipoproteins (LDLs)[14].

Onion (*Allium cepa* L.) is one of the important major vegetable crops in India. Plant breeders are primarily concerned with the improvement of quantitative and qualitative characters of any crop. This can be achieved by quantifying the genetic variation available for various characters of economic importance and inter-relationship among them. To improve the yield through selection of better varieties, knowledge on the nature of association of bulb yield with yield contributing characters is very essential. A cultivar crop performs differently under different agro-climatic conditions and various cultivars of the same species grown even in the same environment give different yields as the performance of a cultivar mainly depends on the interaction of genetic makeup and environment[8]. Ijoyah *et al*.[12], evaluate the yield performance of four onion varieties and found that some other varieties performed better than the commonly grown onion varieties by the farmers. Tesfay *et al*.[15], conducted an evaluation trial of three onion cultivars and concluded that onion cultivar performed differently and Parachinar local variety resulted in higher yield. Hence, the present research was conducted to evaluate performance of fifty genotypes of aggregatum onion next to the commonly grown aggregatum onion varieties with the objective of identifying the variety/varieties with highest yield, quality, pest and disease resistant to replace or be used with the low yielding local variety under Tamil Nadu field conditions.

MATERIAL AND METHODS

The present experiment was laid out in the field of the Research Farm, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Indore during Kharif season, 2013-14. The land topography of the experimental site was almost uniform with an adequate surface drainage. The internal drainage of the experimental site is medium.

Indore is situated in Malwa plateau region in the Western part of the state of Madhya Pradesh at an altitude of 555.5 meters above mean sea level (MSL). It is located at latitude 22.43^{o} N and longitude of 75.66^{o} E. It has subtropical climate having a temperature range of 21^{o} C to 45^{o} C and 6^{o} C to 31^{o} C in summer and winter seasons, respectively. The rainfall in the region has been mostly inadequate and erratic in most of the recent past seasons. Late commencement, early withdrawal of monsoon and occurrence of two to three dry spells during the rainy season are the common features. The mean annual average rainfall is 964 mm. The meteorological data during crop growth period from the first week of 25th June, 2013 to last week of January, 2014

The data indicate that the total rainfall received during crop growth period was 1389.6 mm. There were no rains during SMW 42 to 47 and 49 – 04. The minimum and maximum temperature during crop growth period varied 6.5^{0}C to 23.0^{0}C and from 20.4^{0}C to 34.0^{0}C, with season's average values of 16.00^{0}C and 27.17^{0} C respectively. The relative humidity and wind speed ranged between 70.0 to 86.9 % and 1.4 to 10.0 km hrs^{-1} with season's average of 80.60% and 4.17 km hrs^{-1} respectively. The experiment was laid out in Completely Randomized Block Design (CRBD) with three replications. Each replication consists of 12 genotypes. All the genotypes were randomized separately in each replication.

RESULTS AND DISCUSSION

3.1. Fresh weight of bulb (g)

The average fresh weigh of bulbs of different varieties is given in Table 1. The fresh weight of bulb increased significantly by the different genotypes. The significantly maximum 97.67g fresh weight of bulb was recorded in the genotype Agrifound white followed by Mahasuper red (90.33 g), N-2-4-1 (82.0 g) and Bhima sweta (79.33 g) as compared to other genotypes. However, the genotype Bhima shakti was exhibited minimum fresh weight of bulb (40.33 g).

3.2. Polar diameter of bulb (cm)

The mean polar diameter of bulb was recorded treatment wise. The data have been depicted in Table 1. The polar diameter of bulb increased significantly due to different genotypes. Significantly maximum 6.93cm polar diameter of onion bulb were exhibited in the genotype Agrifound white and followed by Mahasuper red (6.50cm), N-2-4-1 (6.17 cm), Bhima sweta (6.00 cm) and Bhima kiran (5.87 cm) and which were at par with each other. However, the minimum polar diameter of bulb was observed in Bhima shakti (4.08 cm).

Table 1: Response of different onion genotypes on fresh weight of bulb (g), polar diameter of bulb (cm) and equatorial diameter of bulb (cm)

S. No.	Genotypes	Fresh weight of bulb (g)	Polar diameter of bulb (cm)	Equatorial diameter of bulb (cm)
1	Bhima shakti	40.33	4.08	5.10
2	Bhima sweta	79.33	6.00	6.67
3	Agrifound white	97.67	6.93	7.57
4	Bhima kiran	75.67	5.87	6.51
5	L 355	59.00	5.00	5.67
6	Bhima super	61.00	5.23	6.18
7	N-2-4-1	82.00	6.17	7.00
8	Bhima shubhra	60.67	5.13	5.97
9	Bhima red	66.00	5.55	6.35
10	Bhima raj	49.67	4.30	5.26
11	Akshda mahasuper	51.00	4.63	5.45
12	Mahasuper red	90.33	6.50	7.21
SEm±		1.55	0.37	0.23
C.D. at 5% level		4.55	1.10	0.69

3.3. Equatorial diameter of bulb (cm)

The average equatorial diameter of bulb was recorded and has been presented in Table 1. It is obvious from table 4.10 that the average equatorial diameter of bulb was significantly influenced by the different genotypes. Agrifound white, Mahasuper red and N-2-4-1 were observed significantly highest equatorial diameter of bulb 7.57, 7.21 and 7.0 cm), respectively and which were at par with each other. However, the lowest equatorial diameter of bulb (5.10cm) was found in the genotype Bhima shakti.

3.4. Bulb yield per hectare (q)

The yield of any crop is the final index of the experiment which indicates the success or failure of any treatment with this view the bulb yield of onion was recorded. The data for the bulb yield per plot under different genotypes were recorded and converted into bulb yield q/ha.

Table 2: Response of different onion genotypes on bulb yield per ha (q)

S. No.	Genotypes	Bulb yield per hectare (q)
1	Bhima shakti	119.80
2	Bhima sweta	314.23
3	Agrifound white	338.67
4	Bhima kiran	254.98
5	L 355	187.76
6	Bhima super	245.35
7	N-2-4-1	323.67
8	Bhima shubhra	236.83
9	Bhima red	246.83
10	Bhima raj	148.14
11	Akshda mahasuper	182.57
12	Mahasuper red	328.67
SEm±		10.47
C.D. at 5% level		30.73

The bulb yield per hectare as influenced by different genotypes is presented in Table 2. The significantly maximum 338.67 q per ha bulb yield was recorded under the genotype Agri found White and which was statistically superior and followed by Mahasuper red (328.67 q per ha), N-2-4-1 (323.67 q per ha) and Bhima sweta (314.67 q per ha). However, the minimum 119.80 quintal per hectare bulb yield was recorded under Bhima shakti.

3.5. Double bulb (%)

The mean percentage of doubles bulb of different genotypes is given in Table 3.

Table 3: Response of different onion genotypes on double bulb (%), crop duration and sulphur content (%)

S. No.	Genotypes	Double bulb (%)	Crop duration	Sulphur content (%)
1	Bhima shakti	2.08	148.00	0.365
2	Bhima sweta	0.82	153.33	0.360
3	Agrifound white	0.41	155.00	0.381
4	Bhima kiran	0.82	152.67	0.411
5	L 355	0.83	150.67	0.348
6	Bhima super	0.83	151.67	0.398
7	N-2-4-1	0.82	154.33	0.360
8	Bhima shubhra	0.83	151.33	0.331
9	Bhima red	1.25	152.33	0.316
10	Bhima raj	1.66	149.67	0.335
11	Akshda mahasuper	1.25	150.33	0.353
12	Mahasuper red	0.82	154.67	0.324
SEm±		0.03	0.23	0.0006
C.D. at 5% level		0.11	0.67	0.002

The significantly lowest 0.41 percentage of doubles bulb was recorded in the genotype Agrifound white followed by Mahasuper red (0.82 %), N-2-4-1 (0.82 %) and Bhima sweta (0.82%) as compared to other genotypes. However, the genotype Bhima shakti was exhibited maximum doubles bulb (2.08%).

3.6. Crop duration

Crop duration of different onion genotypes is given in Table 3. The minimum crop duration 148.0 days was observed for maturity in genotype Bhima shakti followed by Bhima raj (149.67 days) and Akshda mahasuper (150.33 days). However, the genotype Agrifound white was required maximum (155.0) days for maturity.

3.7. Sulphur content (%)

Sulphur content percentage of different onion genotypes is given in Table 3. The significantly maximum 0.411% sulphur content was recorded under the genotype Bhima kiran and which was statistically superior and followed by Bhima super (0.398%), Agri found White (0.381%) and Bhima shakti (0.365%) as compared to other genotypes. However, the minimum 0.316% sulphur content was recorded under Bhima red.

Effect of different genotypes of onion on yield parameters

Among yield parameter, the fresh weight of bulb, polar diameter of bulb, equatorial diameter of bulb, bulb yield per hactare ctare , doubles bulb percentage, crop duration and sulphur content per cent were studies in onion.

The fresh weight of bulb increased significantly by the different genotypes. The significantly maximum fresh weight of bulb was recorded in the genotype Agrifound white followed by Mahasuper red, N-2-4-1 and Bhima sweta as compared to other genotypes. However, the genotype Bhima shakti was exhibited minimum fresh weight of bulb. Probable region for increased fresh weight of bulb per plant due to humus substances could have mobilized the reserve food materials to the sink through increased activity of hydrolyzing and oxidizing enzymes.

CONCLUSION

Found that the onion genotype Agrifound white responded well in terms of growth, growth analytical, yield and quality parameters and suitable for commercial production in Malwa condition in kharif season. Genotypes Agrifound white was observed best for growth (i.e. significantly maximum plant height, number of leaves per plant, leaf length, dry weight per plant, bulb and green top ratio and minimum neck thickness, bolting per cent, duration of the crop), yield parameters (fresh weight of bulb, polar diameter of bulb, equatorial diameter of bulb, bulb yield per hectare and long crop duration and lowest percentage of doubles bulb,) was recorded maximum in this genotypes. It was also observed best quality. Higher money value and less cost of cultivation are desirable traits for getting higher returns. Hence economics of the treatments was work out. It is revealed form the date obtained that a significantly maximum bulb yield of 338.67q per ha was obtained in onion genotype Agrifound white with net return of Rs 2,87,656 per ha and cost benefit ratio 1:6.64 as compared to other genotypes.

REFERENCES

1. Akter, M.S., Biswas, A., Siddique, S.S., Hossain, S. and Ivy, N.A., Estimation of genetic diversity in onion (*Allium cepa* L.). Agriculturists, **13:** 26-34 (2015).
2. Ali, M.A., M.M. Hossain, M. Zakaria, A. Naznin and M.M. Islam, Effect of bulb size on quality seed production of onion in Bangladesh. *Int. J. Agron. Agric. Res.*, **6:** 174-180 (2015).
3. Ashok, P., Sasikala, K. and Pal, N., Association among growth characters, yield and bulb quality in onion, *Allium cepa* L. *Int. J. Farm Sci.*,**3:** 22-29 (2013).
4. Attri, B.L., Narayan, R., Ahmed, N., Mer and, M.S., Kumar, A., Evaluation of onion (*Allium cepa* L.) genotypes for growth, yield and quality under

Mukteshwar conditions. *Progr. Agric*., **15:** 272-276 (2015).

5. Azoom, A.A.A., Zhani, K. and Hannachi, C., Performance of eight varieties of onion (Allium cepa L.) cultivated under open field in Tunisia. *Notulae Scientia Biologicae*, **6:** 220-224 (2014).
6. Baliyan, S.P., Evaluation of onion varieties for productivity performance in Botswana. *World J. Agric. Res*., **2:** 129-135 (2014).
7. Bian, M., Zhou, M., Sun, D. and Li, C., Molecular approaches unravel the mechanism of acid soil tolerance in plants. *Crop J.*, **1:** 91-104 (2013).
8. Boukary, H., Haougui, A., Barage, M., Adam, T., Roumba, A., Saadou, M., Evaluation agro-morphology of onion varieties under ecotypes of Nigeria. *International Journal of Biological and Chemistry Science*, **6(6):** 3098-3106 (2012).
9. Dewangan, S.R. and Sahu, G.D., Evaluation of different kharif onion genotypes in Chhattisgarh plains. *Proceedings of the 3rd International Conference on Agriculture and Horticulture, October 27-29 Hyderabad, India* (2014).
10. Dwivedi, Y.C., Kushwah, S.S. and Sengupta, S.K., Evaluation of onion varieties for growth, yield and quality traits under agro-climatic conditions of kymore plateau region of Madhya Pradesh, India. *Agric. Sci. Digest*, **32:** 326-328 (2012).
11. Gill, H.K., Garg, H., Gill, A.K., Gillett-Kaufman, J.L. and Nault, B.A., Onion thrips (Thysanoptera: Thripidae) biology, ecology and management in onion production systems. *J. Integrated Pest Manage*., **6:** 10.1093/jipm/pmv006 (2015).
12. Ijoyah, M.O, Rakotomavo, H., Naiken, M.V., Yield performance of four onions (*Allium cepa* L.) varieties compared with the local variety under open field conditions at Anse Boileau, Seychelles. *Journal of Science and Technology*, **28(3):** 28-33 (2008).
13. Manach, C., Williamson, G., Morand, C., Scalbert, A. and Remesy, C., Bioavailability and bioefficacy of polyphenols in humans. A review of 97 bioavailability studies. *American Journal of Clinical of Nutrition*. **81:** 230S–242S (2005).
14. Scalbert, A., Manach, C., Morand, C., Remesy, C. and Jimenez, L., Dietary polyphenols and the prevention of diseases. *Critical Reviews in Food Science and Nutrition*. **45:** 287–306 (2005).
15. Tesfay, S.Z., Bertling, I., Odindo, A.O., Greenfield P.L., Workneh T.S., Growth responses tropical onion cultivars to photoperiod and temperature based on growing degree days. *African Journal of Biotechnology*, **10(71):** 15875-15882 (2011).