



Studies on Evaluation, Management practices on growth Attributes, yields and Economics of *Rabi* onion (*Allium cepa* L.)

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Abstract:

The field experiment was conducted during Rabi season of 2017-18 at Vegetable Research Farm, Chandra Shekhar Azad University of Agriculture & Technology Kanpur, Uttar Pradesh. The soil of the experiment of field was sandy loam with uniform topography. The experiment was laid out in a Randomized Block Design of factorial arrangement, three replications with twenty nine genotypes and nine checks. to assess the influence of intra-row to row and plant to plant spacing (15X10 cm) and recommended N:P:K (120:100:80 ha⁻¹) on growth, Plant Height (cm), Number of Leaves/ Plant, Gross yield (q/ha) and quality attributes of onion. The significantly prolonged days to maturity, enhanced average bulb weight, bulb diameter, bulb neck diameter, number of leaf per plant, Doubles percentage, Bolting percentage, Rotting percentage, Total Soluble Solid, Gross yield and Economic returns. Lack of recommended or released variety of high yielding as well as good keeping quality in the country, it create price fluctuation during off season arrival period selection of high yielding genotypes under different climatic conditions in nursery. The highest gross yield (300.00 q/ha), maximum gross return Rs.4,35,000.00/ha and B: C ratio 1:3.94 was found in genotypes -1248 but highest A grade bulbs (31.28%) was found in genotypes-1200.

Key words: Onion, intra-row spacing, nitrogen, marketable yield, bulb size distributions

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Introduction:

The Onion (*Allium cepa* L.) is an Important bulb crop, belonging to the family *Alliaceae* (Hanelt,1190). Onion is popularly known as 'Queen of the kitchen'. Onion is considered to be the second most important vegetable crop grown in the world next to tomato. It is indispensable element of almost every culture as a vegetable. Its consume as raw or a components of meals in many different cultures around the world. The main Onion growing states in India are Maharashtra, Gujarat, Karnataka, Tamil Nadu, Odisha, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Bihar and Punjab. They have high mineral and organic contains essential for human health (Raj and Yadav, 2005). Onion is rich in protein, calcium, phosphorus and carbohydrates (Bhattacharjee et al., 2013). India is



second Potassium plays important role in crop productivity by functioning as an activator of numerous enzymes like pyruvic kinase, cytoplasmic enzymes and therefore, cause pervasive effect on metabolic events. Therefore, onion is a commonly used ingredient in recipes. Most Onion cultivars are about 89% water, 9% carbohydrates (Including 4% and 2% dietary fiber), 1% protein and negligible fat. Onions contain low amounts of essential nutrients and have an energy value of 166 kJ (40 kilocalories) in a 100g (3.5 oz) amount. The application of different doses of sulphur improves plant height, number of leaves, bulb diameter, bulb weight and yield of onion (*Kumar et al., 2017*). It is to be recognized that India is the largest producer of short day onions globally, which are genetically less yielding compared to the long day types that are grown in China. Because of its high export potential, it comes under cash crop apart from vegetable. The reduction in bulb yield varies to the extent of 48 to 85 per cent depending upon the duration, intensity of weed growth and weed competition. It is predominantly a *Rabi* Season crop and most onion cultivars are sensitive to photoperiod and thus their range of adoption is limited (*Gupta and Singh, 2010*). Genetic and environment factors and the interaction between them affect onion growth and development. In onion, local genotypes play important role in development of new cultivars. NHRDF, Nashik, collected good number of germplasm and evaluated their performance regarding different attributes. Major emphasis in current onion breeding programs is being placed on mass selection among segregating populations. Newer methods of onion improvement have been concerned primarily with more efficient means of selection of desirable yield genotypes in segregating populations and selection within their selfed progenies. To meet out the domestic requirement and also to fulfill the export demand, selection of suitable high yielding varieties for growing under different agro climatic condition is required. Hence, under present study a total of 38 germplasm along with nine checks Bhima Shweta, Bhima Shubhra, Bhima Safed, Bhima Shakti, Bhima Kiran, Bhima Red, Bhima Dark Red, Bhima Raj and Bhima Supar 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 Vegetable Research Farm of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.) during *Rabi* 2017-18. The experiment was laid out in augment with three replications. The Kanpur is geographically located at 26° 29' 35''N latitude and 80° 18' 35'' E longitudes at an altitude of 125.9 meters above from mean sea level. It lies in the alluvial belt of Gangetic plain and is located in the central part of Uttar Pradesh. The experimental field had a fairly leveled topography and a good drainage system. The soil was sandy loam in texture and had pH of 7.5 with a low level of both accessible nitrogen and organic carbon. The total thirty eight onion genotypes were used. The study comprises 38 diverse onion genotypes along with nine checks Bhima Shweta, Bhima Shubhra, Bhima Safed, Bhima Shakti, Bhima Kiran, Bhima Red, Bhima Dark Red, Bhima Raj and Bhima Supar, selected among evaluated at this centre. 45 to 50 days old seedlings of each onion genotypes were transplanted in flat beds during the *Rabi* season. The experiment healthy matured seedlings were planted at a spacing of 10X15 cm in a plot of 2 m x 2 m size in flat beds. 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 height (cm), leaves per plant, neck thickness (cm), equatorial bulb diameter (cm), polar bulb diameter, weight of 5 bulbs (gm), days for harvesting, doubles (%), bolters (%), rotten %, total soluble solid (%), dry matter content, moisture (%), gross yield (q/ha), marketable yield (q/ha) "A" grade bulbs (%), "B" grade bulbs (%), "C" grade bulbs (%) under sized bulbs, thrips/plant, stemphylium blight intensity. The pooled data of both the years 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 presented in revealed that highest Plant Height (62.74 cm) was recorded in the genotypes-1217 and minimum found in check genotypes Bhima Shweta (46.30 cm). The highest number of leaves per plant (9.4) was recorded in the genotypes-1630 followed by check Bhima Red (9.04) and genotypes W-402 (9.0). The highest equatorial bulb diameter (6.89 cm) was recorded in the genotypes W-172 and polar bulb diameter (4.96 cm) recorded in the genotypes check Bhima safed. The highest A grade bulb percent (31.91%) in genotypes-1248 followed by (31.28%) in genotype-1200, the highest B grade bulb percent (41.00%) in genotypes-1640 and C grade bulb percent (44.47%) in W-172. The Bolting bulb percent (4.86%) in genotypes-1639 and Unmarketable bulb percent found in (19.05%) in genotypes 1210. The highest average bulb weight (71.63 gm) was recorded in genotypes-1627 and at par with the genotypes-1507, 1217 and check Bhima Shakti. It is observed that, the plant height, bulb diameter, weight of bulb positively correlated to increase for yield (Mohanty, 2001 and Singh et. al. 2010).The lowest doubles (0.00 %) were noted in the all genotypes. No bolters were noted in the genotypes 1200, 1203, 1209, 1210, 1248, 1473, 1475, 1501, 1508, 1627, 1628, 1629, 1630, 1640, 1664, 1665, 1667, 1668, W-172, W-340, W-355, W-402 check Bhima Shweta, Bhima shubhra, Bhima Safed, Bhima sakti, Bhima Red, Bhima dark Red and Bhima Raj, reported that incidence of premature bolting was significantly higher in range crop compared to *Kharif* and *Rabi* crop.The highest gross yield (300.00 q/ha) and marketable yield (257.00 q/ha) were recorded in the genotypes 1473 followed by (294.00 q/ha and 253.00 q/ha) in genotypes 1475. All genotypes harvested in 132 days. Respect of TSS (13.1%) was recorded in genotypes 1627.

Table 1 : Plant height, Number of Leaves/ plant, Polar & Equatorial diameter, Neck thickness, grading bulb, Bolting bulb and Unmarketable bulb in onion.

Entries	PH	NL/P	P	E	N	(%) AGB	(%) BGB	(%) CGB	(%) BB	(%) UMB
1200	55.78	7.93	4.48	4.71	0.69	31.28	27.67	28.58	0.00	12.48
1203	54.46	6.67	4.08	4.29	0.79	22.90	33.59	33.79	0.00	9.73
1209	49.22	6.06	4.49	4.75	0.61	29.18	28.51	27.49	0.00	14.83
1210	52.78	6.33	4.69	4.93	0.66	20.77	23.37	36.37	0.00	19.05
1217	62.74	8.03	4.35	4.50	0.81	28.82	30.53	28.16	2.87	9.62
1248	58.73	8.86	3.99	4.18	0.93	31.91	32.04	25.16	0.00	10.90
1473	53.08	6.96	4.66	4.97	0.91	23.18	29.85	32.65	0.00	14.32
1475	55.52	8.23	4.97	5.20	1.17	29.45	34.38	22.20	0.00	13.98
1501	48.41	6.34	4.04	4.38	0.64	17.03	25.11	43.54	0.00	14.32
1507	50.37	6.60	4.38	4.50	0.59	21.13	35.17	26.05	1.23	16.44
1508	57.78	5.36	4.75	4.90	0.81	18.69	29.47	39.09	0.00	12.75
1509	51.60	7.19	4.39	4.63	0.72	21.96	30.59	26.69	2.43	18.33
1627	48.39	7.78	4.49	4.75	0.59	25.10	24.09	42.33	0.00	8.48
1628	50.14	7.76	4.68	4.82	0.90	19.97	30.90	35.49	0.00	13.65
1629	51.58	8.30	4.22	4.34	0.78	18.14	34.86	37.96	0.00	9.05
1630	47.95	9.40	4.78	4.97	0.98	22.95	39.33	23.95	0.00	13.78
1639	50.28	6.03	4.42	4.62	0.83	25.61	33.21	25.09	4.86	11.24
1640	58.42	6.55	4.10	4.27	0.61	17.58	41.00	26.58	0.00	14.85



1664	50.42	8.03	4.78	4.96	0.53	29.43	33.71	25.16	0.00	11.71
1665	60.71	6.84	4.27	4.45	0.68	22.52	32.00	33.52	0.00	11.97
1667	53.76	8.83	4.12	4.32	0.54	28.15	33.03	25.81	0.00	13.02
1668	47.32	8.51	4.59	4.74	0.85	18.43	29.46	40.56	0.00	11.56
Bhima Shweta	46.33	8.27	4.69	5.02	0.71	24.13	30.22	32.26	0.00	10.39
Bhima Shubhra	52.10	6.89	4.30	4.43	0.89	19.45	31.40	35.05	0.00	14.01
Bhima Safed	54.04	6.74	4.96	5.18	0.61	27.30	33.43	26.38	0.00	12.90

W-408	0.00	200.00	232.00	12.50	132	66.26	8.55	5.92	3.98
W-440	0.00	229.00	262.00	11.29	132	61.96	7.68	5.78	3.80
Bhima Kiran	0.00	224.00	267.00	12.32	132	66.30	7.30	6.18	2.88
Bhima Shakti	0.00	195.00	226.00	13.02	132	70.36	7.80	6.40	4.32
Bhima Red	0.00	218.00	256.00	12.65	132	60.86	8.00	5.10	3.20
Bhima Dark Red	0.00	245.00	281.00	12.37	132	65.08	7.80	5.10	2.99
Bhima Raj	0.00	213.00	245.00	11.86	132	69.50	8.40	7.82	3.60
Bhima Super	0.00	217.00	256.00	12.14	132	67.89	9.02	6.35	4.02
CD @5%	-	0.40	0.47	0.39	-	4.98	0.77	0.98	0.60
CV %	-	9.48	9.53	1.57	-	3.77	3.98	6.93	7.70

Table-3 : Qualitative Characters(Uniformity in predominant bulb color, Bulbs of predominant shape and percent Bulbs of predominant size) of onion germplasm.

Entries	BC	SOB	BS (%)
1200	R	O	89.79
1203	R	O	91.38
1209	R	R	94.00
1210	R	R/O	84.41
1217	R	O	87.42
1248	R	R	89.67
1473	LR	R	94.55
1475	LR	R	88.95
1501	LR	O	86.23
1507	LR	R	92.06
1508	R	R/O	81.38
1509	R	R	88.14
1627	LR	R/O	82.50
1628	LR	R	91.58
1629	LR	R	88.89
1630	LR	R/O	80.09
1639	R	R	89.08
1640	LR	O	86.32
1664	LR	O/R	77.79
1665	LR	O	87.26



1667	R	O/C	81.83
1668	R	O	89.32
Bhima Shweta	W	R	91.86
Bhima Shubhra	W	R/O	80.04
Bhima Safed	W	R	93.46
W-172	W	R	89.88
W-340	W	R	89.74
W-355	W	R/O	82.32
W-396	W	R	90.73
W-402	W	R/O	78.84
W-408	W	R	92.41
W-440	W	R	89.67
Bhima Kiran	R	R	88.42
Bhima Sakti	R	O	87.80
Bhima Red	R	O	88.43
Bhima Dark red	R	R	90.37
Bhima Raj	LR	R	91.45
Bhima Super	R	O	91.42
CD @5%	-	-	3.89
CV %	-	-	2.19

Table-4 : Gross yield, Cost of cultivation, Gross income, Net return, B:C ratio and Economics in onion.

Entry	Gross Yield (q/ha)	Cost of Cultivation (Rs/ha)	Gross Income (Rs/ha)	Net Income (Rs/hs)	B:C ratio
1200	233.00	88000	337850	249850	1:2.83
1203	190.00	88000	275500	187500	1:2.13
1209	256.00	88000	371200	283200	1:3.21
1210	254.00	88000	368300	280300	1:3.18
1217	237.00	88000	343650	255650	1:2.90
1248	195.00	88000	282750	194750	1:2.21
1473	300.00	88000	435000	347000	1:3.94
1475	294.00	88000	426300	338300	1:3.84



1501	199.00	88000	288550	200550	1:2.27
1507	259.00	88000	375550	287550	1:3.26
1508	267.00	88000	387150	299150	1:3.39
1509	223.00	88000	323350	235350	1:2.67
1627	289.00	88000	419050	331050	1:3.76
1628	290.00	88000	420500	332500	1:3.77
1629	177.00	88000	256650	168650	1:1.91
1630	252.00	88000	365400	277400	1:3.15
1639	265.00	88000	384250	296250	1:3.36
1640	186.00	88000	269700	181700	1:2.06
1664	197.00	88000	285650	197650	1:2.24
1665	262.00	88000	379900	291900	1:3.31
1667	295.00	88000	427750	339750	1:3.86
1668	252.00	88000	365400	277400	1:3.15
Bhima Shweta	267.00	88000	387150	299150	1:3.39
Bhima Shubhra	238.00	88000	345100	257100	1:2.92
Bhima Safed	276.00	88000	400200	312200	1:3.54
W-172	241.00	88000	349450	261450	1:2.97
W-340	189.00	88000	274050	186050	1:2.11
W-355	228.00	88000	330600	242600	1:2.75
W-396	214.00	88000	310300	222300	1:2.52
W-402	230.00	88000	333500	245500	1:2.78
W-408	232.00	88000	336400	248400	1:2.82
W-440	262.00	88000	379900	291900	1:3.31
Bhima Kiran	267.00	88000	387150	299150	1:3.39
Bhima Shakti	226.00	88000	327700	239700	1:2.72
Bhima Red	256.00	88000	371200	283200	1:3.21
Bhima Dark Red	281.00	88000	407450	319450	1:3.63
Bhima Raj	245.00	88000	355250	267250	1:3.03
Bhima Super	256.00	88000	371200	283200	1:3.21
CD @5%	0.47	-	-	-	-
CV %	9.53	-	-	-	-

The lowest thrips per plant (5.4) was recorded in genotypes 1203 and found at par with all the genotypes except 1248, 1640, 1501, W- 172, w- 340. The incidence of thrips was found 100 % in all the Treatments. The lowest disease intensity of stemphylium blight (5.19 %) was recorded in the genotypes 1473. The lowest incidence of purple blotch (4.98 %) was recorded in genotypes 1667 and found at par with all the treatments. The highest percent Bulbs of predominant size (94.55%) was found in genotypes 1473. The uniformity in predominant bulb color (16 Red, 12 Light red and 10 White).



References:

1. Bhonde, S. R., Srivastava, K. J. and Pandey, U. B. (1992). Evaluation of varieties growing „rangda“ crop of onion (*Allium cepa* L) in Nashik area of Maharashtra. Maharashtra J. Hort. 6(2): 39-42.
2. Gupta, R.P. and R.K. Singh, 2010. Onion Production in India. Technical Bulletin. No-7, Published by National Horticultural Research and Development Foundation, Nashik, 1-80pp.
3. Kumar, et. al. (2017). Trends and constraints in onion production in Haryana. *Ind. J. Eco. Dev.*, 13(2a): 309–313.
4. Mohanty, B.K.(2001). Genetic variability, inter relationship and path analysis in onion. *Journal of Tropical Aquaculture*39:17-20.
5. Ray, N. and Yadav, D.S. 2005. Advance in vegetable production. Research book center. New Delhi. pp. 237-238. Research Report Number, 55, EARO, Addis Ababa, Ethiopia.
6. Singh, R. K., Dubey, B. K. Bhonde, S. R. and Gupta, R. P. (2010). Estimates of genetic variability, heritability and correlation in red onion (*Allium cepa* L.) advance lines. *Journal of Indian Agriculture Science*, 80 (2): 160-163
7. Shovon Bhattacharjee et. al. (2013). Analysis of the proximate composition and energy values of two varieties of onion (*Allium cepa* L.) bulbs of different origin: A comparative study. *International Journal of Nutrition and Food Sciences* 2013; 2(5): 246-253
8. Singh, R. K., S. K. Singh and Tailor, A. K. (2020). Studies on Evaluation, Conservation and Utilization of *Kharif* Onion Genotypes for Growth and Yield. *Int. J.Curr. Microbiol App. Sci.* 9(04): 877-883.