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Performance of white onion varieties during late *kharif* in Telangana

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Abstract
A field experiment was conducted at Vegetable Research Station, SKLTSHU, Hyderabad, Telangana State, India during August, 2020 - January, 2021 to study the performance of white onion varieties under late *kharif* conditions in Southern Telangana. Experiment was conducted with five entries Bhima Safed, Bhima Shweta, Bhima Shubra, W-355 and W-361. The experiment was laid out in Randomized Block Design replicated four times. The predominant bulb colour and bulb shape of all the five varieties is white and round. High amount of uniformity in bulb size was noticed in W-361. Among the five entries tested, W-361 recorded significantly higher mean bulb weight (86.69 g), marketable yield (44.88 t ha^{-1}) and total yield (45.95 t ha^{-1}) over other entries followed by Bhima Shubra (82.71 g, 42.72 & 43.84 t ha^{-1}) and W-355(76.33 g, 39.05 & 40.61 t ha^{-1}). Highest TSS (11.35 ^{0}Brix) was observed in the variety W-355 followed by Bhima Safed and Bhima Shweta. No double bulbs were observed in W-355, Bhima Safed and Bhima Shubra. Least number of bolter bulbs was noticed in W-355 followed by W-361. Zero percent rotten bulbs were recorded in Bhima Safed, Bhima Shubra and W-361. Least incidence of thrips was noticed in Bhima Shweta followed by Bhima Shubra and W-361. Least incidence of purple blotch observed in Bhima Safed followed by Bhima Shubra and Bhima Shweta.

Keywords: late *kharif*, purple blotch, thrips, white onion, yield attributes, yield

Introduction
Onion is the most important crop among various alliums grown in India for thousands of years now (Pandita, 1994) [9]. It is also called as "Queen of Kitchen" (Selviraj, 1976) [12]. All plant parts of alliums can be consumed by humans except the seeds (Rabinowitch and Currah, 2002) [10]. It can be consumed raw, cooked, fried, dried or roasted. Onions are primarily consumed for their unique flavour or for their ability to enhance the flavour of other foods (Ketter and Randle, 1998) [6]. Besides being used as food, onions have a variety of medicinal properties. It prevents heart disease by lowering blood cholesterol and lipid level (Sharangi and Datta, 2005) [13]. India is a major supplier of onion with a production of 260 lakh metric tons (Anonymous, 2021) [2] and contributes 8.9% of global production. Among the total production about 71% is used for domestic consumption, 20% goes waste during post harvest handling, 5% is being exported, 3% for processing and 1% is used for seed production. Telangana is a newly formed state gaining importance in all aspects in India. In Telangana, onion is majorly grown in Gadwal, Sangareddy, Vikarabad, Nizamabad, Wanaparthy and Narayankhed areas in an area of 45,577 ha with a production of 4.5 lakh metric tons and a productivity of 9.8 t ha^{-1} (Anonymous, 2022-23) [3]. The national productivity of onion in late *kharif* and *rabi* is around 25 t ha^{-1}, Where As it is only 8-10 tha^{-1} in kharif (Singh *et al*., 2017) [14]. Both red and white onions are grown in Telangana, i.e., red onions in southern parts of Telangana and white onions in northern parts of Telangana. White onion is a type of onion that has pure white skin and sweet, mild white flesh having 42 calories, 1.3g protein, 1.2g fibre, 100g vitamin-C and acts as antioxidants. However, dehydration industries demand for white onion varieties with globe shape of bulb and high TSS (>18 ^{0}Brix), but Indian white onion genotypes are having TSS range from 11-13 ^{0}Brix. Whereas, sulfur compounds are responsible for typical odour cum flavour and are also active anti-microbial agents, which supports the immune health. Among the various foliar diseases affecting leaves and bulbs, purple blotch incited by *Alternaria porri*, while thrips (*Thrips tabaci* L.) are among the insects that are most devastating and prevalent in many parts of India (Gupta *et al*., 2011) [5]. Thrips is the key pest of onion causing 30-45% yield loss, besides it acts as vector for various plant viral diseases (Soumia *et al*., 2017) [15].

Purple blotch is more prominent in *kharif* and late *kharif* (Vanitha *et al*., 2017) [20]. In order to increase the production of onion in late *kharif*, it is essential to replace the low productive varieties with high yielding varieties with least thrips and purple blotch disease incidence, least bolter and rot bulbs. Thus a trial was conducted with five onion varieties procured from DOGR, Rajgurunagar, Pune at Vegetable Research Station, Rajendranagar, Hyderabad in Telangana State.

Materials and Methods

A field trail was carried out during late *kharif* (August, 2020 – January, 2021) conducted with five entries Bhima Safed, Bhima Shweta, Bhima Shubra, W-355 and W-361 at Vegetable Research Station, Rajendranagar, Hyderabad, Telangana State, India which is at an altitude of 545m above mean sea level and at 78º 39'93" E longitude and 17º32'27" N latitude. The experimental soil was clay loam in texture, neutral in reaction, low in available nitrogen and phosphorous, high in potassium and belongs to the order Alfisol of shallow to medium depth. The experiment was laid out in randomized block design (RBD) replicated four times. The seedlings were transplanted on to a raised bed i.e. broad bed and furrow with a plot size of 4.8 sq. m (4.0 mx1.2 m) replicated four times. For thrips and purple blotch screening 1.0 sq. m area was allotted. A plant spacing of 15 cmx10 cm was adopted. The crop was fertilized with recommended dose of 100:50:50:40 kg NPKS and 5 kg zinc per hectare as recommended by ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune. 50% N and 100% P2O5, K2O, S and ZnSO4 were added as basal dose and remaining 50% N in two equal splits at an interval of 30 and 45 days after transplanting. Recommended cultural practices were followed to raise the crop successfully.

At physiological maturity when 70% of neck fall or yellowing symptoms were noticed plants were harvested and used for determining yield attributes and yield. Average weight of marketable bulbs is calculated by dividing the total weight of marketable bulbs by total number of marketable bulbs. Bulbs less than 2.5 cm diameter are graded as under sized and bulbs more than 2.5cm diameter are taken into consideration for calculation of marketable yield. The total yield includes marketable and under sized bulbs. The TSS was calculated using Hand refractometer according to AOAC (1975) [1]. The thrips incidence was recorded on 1 - 5 scale and purple blotch severity was recorded with 0 - 9 scale. The PDI for purple blotch was determined by using the formula.

$$PDI = \frac{\text{Sum of numerical ratings}}{\text{Number of leaves observed x Maximum disease scale}} \times 100 \quad (1)$$

The data was analyzed statistically using *F*-test following Gomez and Gomez (1984) [4] LSD values at *P*=0.05 were used to determine the significance of difference between treatment means.

Table 1: Morphological bulb characteristics of white onion varieties tested during late *kharif* at Vegetable Research Station, Rajendranagar, Hyderabad.

Variety	Predominant bulb colour	Predominant bulb shape	Uniformity in bulb size
W-355	White	Round	Average
Bhima Safed	White	Round	Average
Bhima Shweta	White	Round	Average
Bhima Shubra	White	Round	Average
W-361	White	Round	High

Table 2: Performance of white onion varieties during late *kharif* at Vegetable Research Station, Rajendranagar, Hyderabad (Telangana).

Variety	Average Bulb Weight (g)	Total Yield (t ha^{-1})	Marketable Yield (t ha^{-1})	TSS (^{0}Brix)	Double bulbs (%)	Bolter Bulbs (%)	Rot Bulbs (%)	Thrips incidence*	PDI (%) Purple Blotch **
W-355	76.33	40.61	39.05	11.35	0.00	1.32	1.68	13.25 (3.77)	38.67 (38.40)
Bhima Safed	73.13	38.76	37.64	10.64	0.00	2.61	0.00	16.00 (4.12)	27.33 (31.49)
Bhima Shweta	69.65	36.91	35.44	10.31	0.89	6.46	2.35	11.50 (3.52)	30.00 (32.96)
Bhima Shubra	82.71	43.84	42.72	9.68	0.00	3.31	0.00	12.00 (3.60)	29.33 (32.77)
W-361	86.69	45.95	44.88	10.25	0.56	1.44	0.00	13.00 (3.74)	34.00 (35.62)
S.Em +	1.23	0.61	0.23	0.55				0.09	1.43
CD (p=0.05)	3.84	1.89	0.71	1.64				0.28	4.29

***** Figures in parenthesis are square root transformed values

** Figures in parenthesis are angular transformed values

Results and Discussion

The predominant bulb colour of all the varieties tested was white and the bulb shape of all the varieties was round. High amount of uniformity (more than 80% bulbs of same size) in bulb size was noticed in W-361 and the remaining varieties were average (50-80% of bulbs of same size) in uniformity (Table-1). Among the five entries tested, W-361 recorded significantly higher mean bulb weight (86.69 g) over other entries followed by Bhima Shubra (82.71 g) and W-355 (76.33 g). W-361 recorded significantly higher marketable yield (44.88 t ha^{-1}) and total yield (45.95 t ha^{-1}) over other entries followed by Bhima Shubra (42.72 and 43.84 t ha^{-1}) and W-355 (39.05 and 40.61 t ha^{-1}). The least mean bulb weight, marketable yield and total yield are recorded with Bhima Shweta. Maximum TSS was noticed with W-355 (11.35º Brix) followed by Bhima Safed and Bhima Shweta. Minimum TSS was reported in Bhima Shubra. No double bulbs were noticed in W-355, Bhima Safed and Bhima Shubra. Minimum percent of bolter bulbs were observed in W-355 followed by W-361. Maximum percent of bolter bulbs noticed in Bhima Shweta. No rotten bulbs were noticed in Bhima Safed, Bhima Shubra and W-361. Least incidence of

thrips (11.50) was observed in Bhima Shweta followed by Bhima Shubra and W-361. Least Percent Disease Index of purple blotch (27.33) was observed in Bhima Safed followed by Bhima Shubra (Table-2).

The differences in morphological characters, yield attributes and yield may be due to genetic makeup of variety and suitability under different climatic and soil condition. Similar variation in yield attributes and yield among the genotypes were observed earlier in onion by Umamaheswarappa *et al.* (2015) [18], Utagi *et al.* (2015) [19] Tripathy *et al.* (2016) [17]. The present results are in accordance with the findings of Mohanty (2001) [8], Tripathy *et al*. (2013) [16], Kushal *et al.* (2015) [7] and Sarkar *et al.* (2015) [11] in onion.

Conclusion

Among the five white onion varieties tested, W-361, a round onion variety with white predominant bulb colour which recorded maximum mean bulb weight, total yield, marketable yield, high amount of uniformity in bulb size and with less number of double bulbs, bolter bulbs and no rotten bulbs can be recommended for Telanagna during late *kharif* conditions followed by Bhima Shubra. Bhima Shweta is more tolerant to thrips incidence and Bhima Safed, Bhima Shubra and Bhima Shweta are less susceptible to purple blotch.

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