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**RESEARCH PAPER**

# Assessment of new different colored onion $F_1$ hybrids for yield and quality parameters

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**Abstract:** The research work was carried out to study the performance of 31 onion $F_1$hybrids with respect to different agronomic traits on black soils of HREC, Devihosur farm in summer 2021.The maximum bulb diameter (63.51 mm), weight of ten bulbs (1.72 kg) and dry weight of 10 bulbs (1.22 kg) was recorded from the hybrid RH-13.The high TSS of 14.87 per cent was recorded in RH-3 and WH-5 hybrid. The hybrid RH-9 was least susceptible to thrips infestation (18.10%). The hybrids with good storage were RH-2, RH-3,WH-1,WH-5 and WH-7.

**Key words:** *Allium cepa*, $F_1$hybrid, Onion, Yield

## Introduction

Onion (*Allium cepa* L.) is a high volume and high value vegetable crop belonging to family Alliaceae with chromosome number is 2n=16.India is second largest producer of onion in the world after China with 22.81 million tonnes of production from 1.22 million ha area (Singh and Khar, 2021). It possesses various health promoting properties like lipid-lowering, anti-diabetic, anti-hypertensive, anti-microbial, immune-protective and anti-obesity properties (Galavi *et al.,*2020). Although India ranks first in area and second in production, but its productivity and yield potential is lower when compared to other countries like USA, Japan, China etc. The reasons for lower productivity in onion are cultivation of open pollinated varieties (OPVs), locally grown seed with no proper quality control and lack of hybrids in the market (Khar and Singh, 2020).

Onion is highly cross pollinated crop and it is grouped under severe inbreeding depression category of crops. Heterosis has been widely exploited in various crops that are manifested by the genetic expression of the developmental differences among hybrids and their respective parents (Singh and Khar, 2021). Onion hybrids exhibit higher heterosis over open pollinated varieties in terms of yield and agronomical characteristics. The exploitation of heterosis breeding is an alternative way to increase productivity in onion.The hybrid varieties have higher yield potential compared to a local variety. It is necessary to test the newly evolved hybrids for commercial cultivation (Singh and Bhonde, 2011). To meet out the domestic requirement as well as export demand, selection of suitable hybrids under different agro climatic conditions is required. Hence, keeping these in view, the Horticultural Research and Extension Centre evaluated newly CMS based $F_1$ hybrids of onion developed by I & B Seeds Pvt. Ltd. Bengaluru at Devihosur.

## Material and methods

The experiment was laid out in randomized block design with two replications at Horticultural Research and Extension Center, Devihosur (University of Horticultural Sciences, Bagalkot) during the summer 2020-2021. The 26 onion $F_1$ hybrids (RH-Red Hybrid, WH- White hybris and YH- Yellow hybrid) developed by I & B Seeds Pvt. Ltd., Bengaluru along with 5 check hybrids were evaluated for different agronomic traits in northern transitional zone-8 of Karnataka under irrigated condition.The seeds were sown in the pro-trays filled with sterilized cocopeat in the nursery on 15$^{th}$ December 2020 and 45 days old seedlings were transplanted in to main field at a spacing of 15 x 10 cm in the plot size of 0.9 x 0.9 m on flat bed. Recommended package of practices and plant protection measures were followed to raise the successful crop. Observations were recorded on five randomly selected plants in each hybrid per replication. The data of different hybrid characters were statistically analysed and presented in tables.

## Results and discussion

The plant height at 60 days after transplanting was maximum (67.52 cm) in the hybrid YH-2 and it was equivalence to the hybrid RH-9 (63.13 cm) (Table 1). The maximum number of leaves per plant (10.70) were evidenced in the hybrid WH-5 which was at par with RH-14 (10.40). Similar results were recorded by Utagi *et al.* (2015); Suhas (2016) and Manjunathgowda *et. al*. (2019). The vigorous plant height and more number of leaves in these hybrids are innate capabilities of plant that could be the reason for higher photosynthetic activity, which might cause more photosynthetic assimilation which intern causes vigorous growth of onion plants (Manjunathgowda *et al*., 2019).

Increase in bulb morphological traits like bulb diameter and bulb length influence on bulb weight, the maximum diameter of bulb (63.51 mm) was observed in the hybrid RH-13 and it was *on par* with RH-14 (62.13) (Table 1). Significantly highest bulb length (55.53 mm) was witnessed in the hybrid RH-14 which was *on par* with RH-13 (55.13 mm). The variation in bulb length and diameter resulted by the photosynthetic activity, efficient translocation and assimilation of photosynthesis in the bulb

Table-1. *Per se* performance of onion hybrids for growth characters, bulb characters and thrips incidence

| Genotypes | Plant height (cm) | No. of leaves | Thrips incidence (%) | No.of days to neck fall | Bulb length (mm) | Bulb diameter (mm) | Avg.Ten Fresh bulb weight(kg) | Total fresh bulb weight/ plot (kg) | Average dry bulb weight (g) |
|---|---|---|---|---|---|---|---|---|---|
| RH-1 | 58.44 | 9.50 | 11.67 | 80.00 | 49.24 | 56.14 | 1.17 | 5.00 | 80.00 |
| RH-2 | 56.40 | 8.60 | 13.50 | 82.50 | 49.80 | 57.91 | 1.17 | 6.35 | 85.00 |
| RH-3 | 57.89 | 8.70 | 13.85 | 80.00 | 53.66 | 53.91 | 1.27 | 4.85 | 80.00 |
| RH-4 | 62.42 | 9.60 | 14.50 | 80.50 | 49.93 | 54.00 | 1.30 | 6.07 | 85.00 |
| RH-5 | 61.34 | 9.30 | 17.15 | 82.50 | 53.18 | 59.22 | 1.26 | 5.90 | 95.00 |
| RH-6 | 62.70 | 10.10 | 16.17 | 80.50 | 52.75 | 61.30 | 1.42 | 7.16 | 105.00 |
| RH-8 | 57.57 | 8.50 | 16.00 | 83.00 | 51.60 | 55.58 | 1.07 | 6.39 | 115.00 |
| RH-9 | 63.13 | 10.10 | 12.33 | 80.50 | 50.76 | 61.91 | 1.36 | 6.74 | 105.00 |
| RH-10 | 59.96 | 10.30 | 10.67 | 80.00 | 52.87 | 60.48 | 1.39 | 6.65 | 100.00 |
| RH-11 | 56.29 | 9.70 | 14.67 | 80.50 | 51.40 | 60.78 | 1.23 | 6.18 | 135.00 |
| RH-12 | 62.50 | 9.70 | 16.50 | 80.50 | 47.22 | 61.33 | 1.43 | 5.91 | 95.00 |
| RH-13 | 62.94 | 10.37 | 15.50 | 80.50 | 55.13 | 63.51 | 1.72 | 7.11 | 120.00 |
| RH-14 | 59.01 | 10.40 | 14.83 | 80.50 | 55.53 | 62.13 | 1.32 | 4.84 | 100.00 |
| RH-16 | 60.70 | 10.30 | 17.33 | 81.00 | 50.94 | 56.53 | 1.28 | 6.81 | 140.00 |
| RH-17 | 62.01 | 9.80 | 17.34 | 84.00 | 53.56 | 61.29 | 1.46 | 6.96 | 105.00 |
| WH-1 | 56.82 | 10.00 | 15.17 | 80.50 | 50.18 | 55.27 | 1.19 | 6.31 | 85.00 |
| WH-3 | 61.36 | 10.00 | 10.50 | 85.50 | 52.28 | 55.24 | 1.32 | 7.50 | 85.00 |
| WH-4 | 61.76 | 10.10 | 12.17 | 87.00 | 49.96 | 55.41 | 1.30 | 7.29 | 85.00 |
| WH-5 | 57.91 | 10.70 | 17.33 | 85.50 | 51.10 | 54.81 | 1.20 | 7.46 | 85.00 |
| WH-7 | 53.02 | 10.07 | 11.21 | 84.50 | 52.04 | 53.58 | 1.05 | 6.01 | 75.00 |
| WH-8 | 57.46 | 9.70 | 12.34 | 83.50 | 51.11 | 54.91 | 1.07 | 6.42 | 75.00 |
| YH-1 | 61.58 | 8.80 | 15.50 | 86.00 | 50.03 | 56.29 | 1.12 | 5.79 | 85.00 |
| YH-2 | 67.52 | 9.40 | 18.00 | 80.50 | 51.53 | 56.31 | 1.51 | 6.33 | 90.00 |
| YH-3 | 59.34 | 9.40 | 17.33 | 83.50 | 54.13 | 60.16 | 1.13 | 5.98 | 80.00 |
| YH-4 | 62.65 | 9.50 | 15.17 | 82.50 | 52.19 | 58.90 | 1.25 | 6.86 | 90.00 |
| YH-5 | 58.01 | 9.70 | 14.67 | 83.50 | 50.74 | 57.86 | 1.19 | 6.07 | 90.00 |
| VIRAT | 61.20 | 9.30 | 14.00 | 85.50 | 51.19 | 57.26 | 1.12 | 5.88 | 90.00 |
| DHAWAL | 61.92 | 9.90 | 13.50 | 82.50 | 52.50 | 55.70 | 1.22 | 6.63 | 85.00 |
| VEGA | 53.81 | 9.80 | 10.67 | 80.50 | 51.84 | 58.37 | 1.30 | 5.65 | 95.00 |
| 16/20 | 56.63 | 9.70 | 14.50 | 80.50 | 48.86 | 54.64 | 1.41 | 6.09 | 80.00 |
| 16/7Y | 58.08 | 8.30 | 15.17 | 80.50 | 47.07 | 56.84 | 1.17 | 4.90 | 90.00 |
| Mean | 59.75 | 9.66 | 14.49 | 82.21 | 51.43 | 57.66 | 1.27 | 6.26 | 93.87 |
| SEM± | 1.56 | 0.46 | 2.06 | 0.41 | 1.96 | 1.51 | 0.11 | 0.39 | 12.15 |
| CD(0.05%) | 4.51 | 1.32 | 5.95 | 1.17 | 5.67 | 4.36 | 0.33 | 1.14 | 35.09 |
| CV (%) | 3.70 | 6.68 | 20.11 | 0.70 | 5.40 | 3.70 | 12.69 | 8.90 | 18.30 |

could lead to enlargement of bulb horizontally as well as vertically depending upon the genotypes, as these components influence the weight of the bulb, which ultimately contributes to the yield (Khar *et al*., 2007).

The maximum fresh weight of ten bulbs (Table-1) were observed in hybrid RH-13 (1.72 kg) which was on par with YH-2 (1.51 kg).The maximum dry weight of ten bulbs was in RH-13 (1.22 kg) which was *on par* with RH-6 and RH-17 (1.08 kg each). The maximum average dry bulb (cured) weight was recorded in hybrid RH-16 (140 g) which is followed by RH-11(135 g). The hybrid RH-6 documented highest (5.33 kg) dry bulb weight per plot and which was followed by RH-9 (5.11 kg) similar results were recorded by Mahanthesh *et al.* (2008) and Bindu and Bindu (2015). Variation in bulb yield among different hybrids might be attributed by difference in weight and size of individual bulb and might due to genetic character of individual (Manjunathgowda *et al*., 2019).

Leaf colour is associated with colonization of thrips, typically higher lightness and yellowness of leaves attracts thrips (Pobozniak *et al*. 2021). TSS is significantly correlated with thrips infestation, the hybrids recorded lower thrips population have low TSS and *vice versa*. The variation among different hybrids with respect to thrips infestation was recorded at 60 days after transplanting (Table-1). The hybrid WH-3 had lowest thrips incidence (10.50 %) as compared to rest of the hybrids followed by RH-10 and Vega (10.67%) hybrids. However, highest thrips incidence (18.00%) was recorded with a hybrid YH-2. Similar results were also reported by Raghupati *et al*. (2011) and Tripathy *et al*. (2013).

Neck fall is the indication of maturity in onion for harvesting and observed significant variation in maturity among all the hybrids. The range for this trait varied from 80 to 87 days (Table-1). The maximum number of days to attain maturity was required by hybrid WH-4 (87.00 days) which was statistically

Table 2. *Per se* performance of onion hybrids for quality characters and shelf life

| Genotype | Avg. Ten Dry Bulb weight (kg) | Dry bulb weight/plot (kg) | TSS (%) | Per cent good bulbs | Sprouting per cent | Rotting per cent |
|---|---|---|---|---|---|---|
| RH-1 | 0.80 | 3.15 | 11.97 | 71.07 | 9.80 | 16.99 |
| RH-2 | 0.88 | 4.28 | 12.82 | 82.98 | 8.51 | 6.38 |
| RH-3 | 0.82 | 2.94 | 14.87 | 74.19 | 16.86 | 12.91 |
| RH-4 | 0.85 | 3.98 | 13.64 | 63.23 | 5.26 | 26.31 |
| RH-5 | 0.93 | 4.42 | 12.50 | 47.77 | 10.67 | 35.41 |
| RH-6 | 1.08 | 5.33 | 13.13 | 23.33 | 51.40 | 28.04 |
| RH-8 | 0.85 | 4.62 | 13.40 | 48.55 | 4.67 | 34.58 |
| RH-9 | 1.06 | 5.11 | 12.30 | 37.35 | 37.42 | 22.90 |
| RH-10 | 1.02 | 4.88 | 12.99 | 40.15 | 15.20 | 35.24 |
| RH-11 | 0.98 | 4.52 | 13.17 | 58.22 | 22.22 | 19.00 |
| RH-12 | 1.07 | 4.31 | 11.95 | 40.76 | 19.68 | 40.16 |
| RH-13 | 1.22 | 4.94 | 11.85 | 34.02 | 27.27 | 38.82 |
| RH-14 | 1.06 | 4.04 | 13.67 | 41.15 | 26.46 | 29.49 |
| RH-16 | 1.01 | 5.06 | 11.87 | 43.59 | 16.55 | 34.93 |
| RH-17 | 1.08 | 5.09 | 13.60 | 49.04 | 10.98 | 36.14 |
| WH-1 | 0.76 | 4.26 | 13.82 | 72.60 | 9.46 | 17.58 |
| WH-3 | 0.84 | 4.39 | 13.32 | 35.90 | 20.80 | 41.56 |
| WH-4 | 0.88 | 4.49 | 12.74 | 57.37 | 10.75 | 31.05 |
| WH-5 | 0.86 | 4.78 | 14.87 | 78.70 | 2.78 | 17.60 |
| WH-7 | 0.79 | 3.97 | 14.10 | 74.81 | 4.68 | 18.70 |
| WH-8 | 0.78 | 4.40 | 13.54 | 58.33 | 6.49 | 29.63 |
| YH-1 | 0.91 | 4.25 | 12.00 | 46.77 | 15.90 | 34.58 |
| YH-2 | 0.90 | 4.42 | 14.12 | 14.32 | 16.20 | 62.88 |
| YH-3 | 0.85 | 4.17 | 12.94 | 33.01 | 24.57 | 37.79 |
| YH-4 | 0.94 | 4.86 | 12.12 | 52.00 | 16.95 | 30.17 |
| YH-5 | 0.89 | 4.11 | 13.08 | 31.87 | 17.55 | 44.64 |
| VIRAT | 0.88 | 4.16 | 12.30 | 65.74 | 18.52 | 13.89 |
| DHAWAL | 0.86 | 4.42 | 11.67 | 52.38 | 14.58 | 31.05 |
| VEGA | 0.93 | 3.97 | 12.54 | 56.77 | 1.89 | 36.83 |
| 16/20 | 0.77 | 4.07 | 13.97 | 56.07 | 12.14 | 28.06 |
| 16/7Y | 0.88 | 3.78 | 10.63 | 51.94 | 18.96 | 29.71 |
| Mean | 0.92 | 4.36 | 12.95 | 51.42 | 15.97 | 29.77 |
| S.Em± | 0.06 | 0.35 | 0.71 | 5.39 | 1.77 | 2.11 |
| C.D. @5% | 0.17 | 1.01 | 2.05 | 15.55 | 5.11 | 6.10 |
| C.V. % | 8.90 | 11.30 | 7.74 | 14.81 | 15.67 | 10.03 |

at par with YH-1 (86.00 days) whereas the minimum number of days to attain maturity were observed in hybrids RH-1, RH-3 and RH-10 (80.00 days in each). Earliness is the most important trait in any crop improvement programme. The genotypes having high yield coupled with earliness are preferred. Moreover, duration of the crop is mainly depending on genotype. Total soluble solids are important criteria for onion contributes towards dry matter content. In the present investigation, TSS content ranged from 10.63 % to 14.87% (Table-2). Highest TSS of 14.87% was recorded in RH-3 and WH-5 followed by YH-2 (14.12%).The increased TSS was due to enhanced physiological activity and availability of nutrients and the development of a strong source to sink relationship (Yadav *et al* 2010). These results conform with the findings of Yadav *et al*. (2010) and Dewangan *et al*. (2012).

The quality of bulbs depends on TSS and dry matter content. About 29.77% and 15.97% bulbs were lost during storage due to rotting and sprouting respectively. From the present study, average data on rotting percentage of bulbs after 100 days of storage noted within the range from 6.38% to 62.88% (Table 2). The highest rotting percentage of bulbs (62.88%) was recorded in hybrid YH-2 (Yellow coloured bulbs) while, the minimum rotting percentage of bulbs (6.38%) was recorded in hybrid RH-2.The lowest sprouting per cent (1.89 %). was recorded with the Vega hybrid.The highest number of good bulbs were recovered from the hybrid RH-2 (82.98%) followed by WH-5 (78.70%) after 100 days of storage.These results were in association with the findings of Ko *et al*. (2002) and Gorrepati *et. al*. (2018). It was also observed that the hybrids with high TSS content had better keeping quality and were less susceptible to storage losses. (Gorrepati *et al*., 2018).

**Conclusion**

From the results of onion hybrids evaluation experiment, it is concluded that, the onion hybrids RH-1, RH-3 and RH-10 were early maturing while RH-13 was the highest yielder on ten bulb weight bases. For high TSS, WH-5 and RH-3 hybrids were

best and for thrips resistance at 60 days after transplanting hybrid WH-3 was recorded lowest thrips incidence. The recovery of good bulbs after 100 days storage was in RH-2 and WH-5 hybrids.

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