Evaluation of rabi onion genotypes for morphological and biochemical characters

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ABSTRACT

The present investigations were undertaken on onion (*Allium cepa* L) for evaluation of onion rabi crop genotypes for morphological and biochemical characters during rabi season 2017-18 at the Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, Maharashtra to identify promising genotypes for yield and storage quality for rabi season. The experiment was carried out in randomized block design with seventeen genotypes and one check variety replicated three times. The results indicated that the genotypes RHROR-7, RHROR-10 and RHROR-11 had significantly better morphological characters viz plant height and average bulb weight. The TSS in genotypes ranged between 12.57 and 13.55°B. The maximum TSS was recorded in RHROR-6 (13.55°B). The maximum reducing sugar was recorded in RHROR-8 (2.29%) which was at par with RHROR-4 (2.13%), RHROR-6 (2.03%) and check variety N-2-4-1 (1.97%). Non-reducing sugar in onion genotypes ranged between 3.21 and 4.50 per cent with maximum in genotype RHROR-5 (4.50%). Among the seventeen tested genotypes, RHROR-7, RHROR-10 and RHROR-11 were found promising for further evaluation.

Keywords: Onion; genotypes; yield; storage quality

INTRODUCTION

Onion (*Allium cepa* L) is most important bulbous vegetable crop. It is an important vegetable crop grown in India. India exported onions worth $ 198 million. Exports generated a total of $ 440 million up to 2019-2020. Bangladesh, Malaysia, the UAE and Sri Lanka are the main importers of Indian onions (https://www.freshplaza.com/article/9290922/overview-global-onion-market/).

The demand for onion is worldwide. Onions are found in most markets of the world throughout the year and can be grown under wide range of agro-climatic conditions. Irrespective of prices, the demand remains almost constant in the market as it is primarily used for seasoning a wide variety of dishes in many homes. Among the different states, Maharashtra is leading state in terms of area and production of onion followed by Madhya Pradesh, Karnataka and Gujarat (https://www.mapsofindia.com/top-ten/india-crops/onion.html).

It is a biennial plant, but is usually grown as an annual shallow-rooted crop. It is basically long day plant for bulb production. Rabi is the most favourable and ideal season for onion production and it accounts for 50-60 per cent of total area under cultivation. For good vegetative growth, lower temperatures (daily mean 13-21°C) and short photoperiod are required while for bulb development high temperatures (daily mean 15-25°C) and long photoperiod are required and these conditions are fulfilled in rabi season. Coelo et al (1996) reported that highest commercial bulb yield was observed at higher planting density and the highest proportion of large bulb and average bulb weight at lower planting density.

The important contents like allicin, allin and sulphites etc are present in onion. These compounds help in fighting cancer, high blood cholesterol, sugar, liver problems and intestinal problems. It has diuretic and stimulant property. The antifungal property of onion is due to presence of catechol a phenolic compound. Onion is used for treating problems including loss of appetite, upset stomach, gall bladder disorder, heart and blood vessel problems including chest pain (angina), high blood pressure and for preventing hardening of the arteries atherosclerosis. It is used in processed form ie its flakes powder is used for making pickles (Bhagchandani et al 1980).

Basically onion is rabi season crop. But only few varieties have been useful for rabi plantation. Amongst them, N-2-4-1, AFLR, Arka Niketan, Pusa Red etc are the major ones. Cultivation of white onion is also undertaken in rabi season with cultivars N-257-9-1, Phule Safed, Pusa White Flat, Pusa White Round etc. There is need to develop a new cultivar for better yield and storability.

MATERIAL and METHODS

The present field investigations were carried out during rabi season under the scheme for Research on Onion Storage operational in the Department of Horticulture, MPKV, Rahuri, Maharashtra in 2017-18. The experiment was laid out in randomized block design with three replications having seventeen genotypes and one check variety ie N-2-4-1.

Mahatma Phule Krishi Vidyapeeth, Rahuri is situated between 19°47' and 19°57' North latitude and 74°19' and 74°42' East longitude at an elevation of 525 m amsl. The plots selected for planting had a uniform soil depth and fertility. The soil was medium black, calcareous and well drained.

Seventeen genotypes; RHROR-1, RHROR-2, RHROR-3, RHROR-4, RHROR-5, RHROR-6, RHROR-7, RHROR-8, RHROR-9, RHROR-10, RHROR-11, OPS-1, OPS-2, OPS-3, OPS-4, OPS-5, OPS-6 and one check variety N-2-4-1 available under scheme for Research on Onion Storage were utilized in the experimentation. Observations were recorded on morphological and biochemical characteristics of onion bulbs. The plant height was recorded on ten randomly selected plants from each treatment at harvesting of the crop. The height was measured from ground level to the tip of the lastly emerged leaves. After harvesting, bulb weight of ten randomly selected bulbs was recorded. Days to harvest were recorded after transplanting of different genotypes.

Total soluble solids were recorded with the help of hand refractometer having Erma-Japan scale in the range of 0-32°B. The onion bulbs were cut and the extracted juice was used for reading on hand refractometer. The reducing sugar was determined by calorimetric method (Nelson 1944). The non-reducing sugar was estimated by subtracting reducing sugar from the total sugar and multiplied by 0.95.

The data recorded in respect of various observations were subjected to the statistical analysis as per procedure given by Panse and Sukhatme (1989).

RESULTS and DISSCUSSION

Morphological characters of onion genotypes (Table 1)

Plant height: Significant differences were recorded in plant height in onion genotypes. The maximum plant height was found in genotype RHROR-11 (66.43 cm) followed by RHROR-7 (65.53 cm), RHROR-10 (64.82 cm) and RHROR-8 (64.37 cm). The minimum plant height was found in the genotype OPS-6 (54.43 cm). Khan et al (2007) observed that nitrogen and zinc level significantly affected the plant height. The results revealed that maximum plant height (50.15 cm) was noted in plots applied with nitrogen at the rate of 100 kg per hectare while minimum plant height (45.82 cm) was recorded in plots received no nitrogen (control).

Average bulb weight: The genotypes differed significantly for bulb weight. The average bulb weight ranged between 62.80 and 83.10 g. The genotype RHROR-11 recorded the highest bulb weight of 83.10 g. This was followed by RHROR-7 (82.67 g) and RHROR-10 (81.13 g). The genotype OPS-3 recorded the lowest average bulb weight of 62.80 g.

Hosamani et al (2010) showed that onion genotype PKV selection had the maximum bulb weight of 84.00 g followed by Arka Niketan (77.33 g) and Agrifound White recorded the minimum bulb weight of 30.67 g.

Trivedi and Dhumal (2010) revealed that among eighteen onion genotypes and four varieties evaluated during kharif season at Pune, the genotype

Hy-3667 recorded maximum bulb weight of 94.19 g which was on par with Baswant-780 (93.29 g) followed by NRCOG-5749040 g) and NRCOG-581 registered minimum bulb weight of 46.62 g.

Days to harvest: The significant differences were recorded in days to harvest by onion genotypes. The minimum days to harvest were recorded in genotype RHROR-7 (120.00) followed by RHROR-11 (121.00), OPS-5 (122.33) and OPS-2 (123.33). The maximum days to harvest were recorded in check variety N-2-4-1 (127.67).

Bhonde et al (1992) reported that kharif season varieties (Agrifound Dark Red, Arka Kalyan and Kharif Local) matured earlier compared to the other varieties recommended for the rabi season during late Rangda at Nasik conditions during 1987. N-53 and Baswant-780 (105 days) also matured earlier than rabi varieties. However among rabi cultivars, N-2-4-1 (111 days) matured earliest followed by Agrifound Light Red and Nasik Red. The varieties Line 102-1 and Pusa Red matured late.

Biochemical characters (Table 2)

TSS: The TSS (in various genotypes ranged between 12.57 to 13.55°B. The maximum TSS was recorded by genotype RHROR-6 (13.55°B). While the minimum TSS was recorded in RHROR-1 (12.57°B).

Padda et al (1973) observed wide variability of biochemical constituents for TSS 7.4 to 17.5 per cent. Ketiku (1976) observed 6.4 to 19.6 per cent protein, 13.2 to 71.8 per cent total sugars. Percent dry matter varied from 10.66 to 14.80. Bajaj et al (1980) analysed five white and seven red varieties of onion and found that total water soluble sugar, reducing sugar and total phenols ranged from 41.50 to 74.00, 12.00 to 22.25 and 1.75 to 2.95 per cent (on dry weight basis) respectively. Sarada and Tamoskozi (1977) studied 40 cultivars and classified them into five categories on the basis of dry matter percentage which ranged from 8.0 to above 14.0 per cent. The dry matter showed little fluctuation with year or locality.

Patil and Kale (1985) reported that onion varieties (Shiroli, Adsuli and Pusa Red) with higher TSS and dry matter (13.1 to 14.0) had lowest storage losses. This indicates the selection for better storage quality.

Table 1. Plant height, bulb weight and days taken to harvest of different onion genotypes

Genotype	Plant height (cm)	Average bulb weight (g)	Days to harvest
RHROR-1	61.77	68.13	127.33
RHROR-2	60.50	72.07	125.67
RHROR-3	60.20	68.53	127.33
RHROR-4	60.40	77.87	126.00
RHROR-5	61.50	77.13	125.00
RHROR-6	61.20	77.80	126.33
RHROR-7	65.53	82.67	120.00
RHROR-8	64.37	69.20	126.33
RHROR-9	61.70	76.40	124.67
RHROR-10	64.82	81.13	125.00
RHROR-11	66.43	83.10	121.00
OPS-1	55.80	80.53	124.67
OPS-2	58.33	63.00	123.33
OPS-3	57.43	62.80	125.00
OPS-4	57.07	70.07	124.33
OPS-5	56.83	66.40	122.33
OPS-6	54.43	66.33	123.67
N-2-4-1 (check)	56.80	77.73	127.67
SE±	1.47	1.39	1.06
$CD_{0.05}$	4.22	4.00	3.05

Table 2. Biochemical characteristics of onion bulbs

Genotype	TSS (°B)	Reducing sugar (%)	Non-reducing sugar (%)
RHROR-1	12.57	1.00	4.30
RHROR-2	12.62	1.92	3.63
RHROR-3	13.05	1.72	3.96
RHROR-4	13.07	2.13	3.21
RHROR-5	13.13	1.64	4.50
RHROR-6	13.55	2.03	3.40
RHROR-7	12.74	1.15	4.42
RHROR-8	12.71	2.29	3.72
RHROR-9	12.86	1.55	4.03
RHROR-10	13.35	1.50	3.99
RHROR-11	12.76	1.21	4.25
OPS-1	13.43	1.38	3.71
OPS-2	13.26	1.73	4.19
OPS-3	13.48	1.77	3.83
OPS-4	13.00	1.18	4.23
OPS-5	12.93	1.94	3.29
OPS-6	12.99	1.51	3.93
N-2-4-1 (check)	13.19	1.97	3.42
SE±	0.33	0.19	0.33
$CD_{0.05}$	NS	0.55	NS

Reducing sugar

Significant differences were recorded in reducing sugar in onion genotypes. The maximum reducing sugar was recorded in genotype RHROR-8 (2.29%) which was at par with RHROR-4 (2.13%), RHROR-6 (2.03%) and check variety N-2-4-1 (1.97%). The minimum reducing sugar was recorded in genotype RHROR-1 (1.00).

Non-reducing sugar

Non-reducing sugar ranged between 3.21 to 4.50 per cent. The maximum non-reducing sugar was recorded in RHROR-5 (4.5%) and the minimum in RHROR-4 (3.21%).

Bajaj et al (1980) and Magdum (1981) observed that good storage capacity appeared to be associated with high content of dry matter and sugars with high proportion of sucrose and low proportion of reducing sugar and low content of protein.

In the present study, among seventeen genotypes, T_7 (RHROR-7), T_{10} (RHROR-10) and T_{11} (RHROR-11) were found promising for further evaluation.

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