Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(5): 185-187
Received: 16-07-2019
Accepted: 18-08-2019

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Performance of short-day onion genotypes for nutritional quality traits of bulb

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Abstract
The experiment was conducted to evaluate the short-day onion genotypes for quality attributes during kharif 2017. Among thirty genotypes evaluated, the highest reducing sugars were recorded from the genotype COHBON03 (3.83%). The highest non-reducing sugars were recorded from the genotype COHBON08 (3.52%). The highest total sugars were recorded from the genotype COHBON03 (6.45%). The highest pyruvic acid content was recorded from the genotype COHBON17 (2.31 µmol/g). These genotypes can be used for commercial cultivation with high non reducing sugars, since those genotypes having high non reducing sugars and high pungency could have longer storability. Furthermore, these genotypes can be used as parental material in the quality improvement of bulb onion.

Keywords: Onion, reducing sugars, total sugars, pungency

Introduction
Onion (*Allium cepa* L.) is vegetable crop of the family *Alliaceae* used in daily diet of human in almost all the countries of the world. It used both the green and mature bulb stages as a salad, vegetable and spices (Mahanthesh *et al*. 2008) [7]. It has immense acceptance owing its flavour, pungent taste, nutritional and medicinal value (Kale and Ajjappalavara, 2015) [5], important source of phytonutrients, flavonoids, fructo-oligo-saccharides (FOS) and sulfur compounds (Slimestad *et al*., 2007) [12]. Onions are restrained higher levels of phenolic compounds that is flavonoids, which are classified into subclass flavones, flavanones, flavonols, isoflavones, flavanonols, flavanols, chalcones, and anthocyanins based on degree of unsaturation and degree of oxidation of the central ring (Perez-Gregorio *et al*., 2010) [8], these are effective against degenerative pathologies like cardiovascular and neurological diseases are dysfunctions based on oxidative stress of antioxidant properties (Grifths *et al*., 2003). The quantum of pyruvate synthesized by the *alliinase* activity allows judge the pungency of onions (Bacon *et al*., 1999; Schwimmer, 1969) [1, 9]. The flavour compounds are produced by the spontaneous reactions of sulfenic acids. These further rearranged to form combination of sulfur-containing compounds namely thiosulfinates, thiosulfonates, and mono-, di-, tri-sulfides and specific compounds such as thiopropanal S-oxide and lachrymatory factors are responsible for the typical flavour of onions (Grifths *et al*., 2003). Sugars were added to sensory profiling, the soluble sugars directed to the sweetness of onions so the acceptability rose by the consumer as salad, carbohydrates play in the taste preference (Terry *et al*., 2005) [14]. Onion being important vegetable crop needs proper attention for producing better quality bulbs. The lower yields are attributed to limited availability of good cultivars, genotypes and improved varieties. Improved varieties would contribute to better crop yield. The present study was undertaken to examine the onion genotypes for better yielding of nutritional qualities traits.

Material and methods
An experiment was carried during *kharif* 2017 at Vegetable Research Block, Department of Vegetable Science, College of Horticulture (CoH), Bengaluru, University of Horticultural Sciences (UHS), Bagalkot, Karnataka, India. As per the Randomized Complete Block Design (RCBD) with two replications along with thirty open pollinated genotypes. Performance of genotypes was compared with the check variety Bhima Super. The experiment laid of plots of size of 1.5 m × 1.2 m with spacing of 15 cm × 10 cm for bulb crop. Crop production and management practice were performed with the guide lines of UHS, Bagalkot package of practice (UHS Package of Practice, 2013).
Reducing sugars were estimated by obtaining of fifteen grams of onion bulb were crushed into paste, the paste diluted in distilled water volume was made up to hundred milliliter and filtered through muslin cloth.

The filtrate juice was taken in burette and titrated against ten milliliter of Fehling's solution titrate till the blue colour turns in to brick red color. Fehling's solution was prepared by adding five milliliter of Fehling's solution No-1 and five milliliter of Fehling's solution No-2 in twenty-five milliliter of distilled water subjected for flame heating, while add methylene blue indicator during boiling of solution. Total sugars were estimated from fifteen grams of onion bulb were crushed into paste, the paste diluted in distilled water volume was made up to hundred milliliter and filtered through muslin cloth. Take twenty-five milliliter of filtrate in a beaker and add ten milliliter of HCL (1:1) and keep it overnight for inversion of non-reducing sugars. Adjust the neutral pH of filtrate using NaOH and the filtrate was taken in burette and titrated against ten milliliter of Fehling's solution titrate till the blue colour turns in to brick red color. The percentage of reducing sugars and total sugars computed by using the formula (Sadasivam and Manickam, 1996). The non-reducing sugars were obtained by subtracting the reducing sugars from total sugars.

Pungency was estimated according to method suggested by Anthon and Barrett (2003). One hundred gram of onion bulb was homogenized without any addition of water in pestle and mortar. One milliliter of raw onion juice was diluted and volume made up to two milliliter (ml). From the final volume, 50 µL aliquot was placed into a glass test tube and added one milliliter of solution DNPH (2, 4-dinitrophenylhydrazine dissolved in 1 M HCl (2.5 g/l)). The test tube was then placed into a water bath kept at 37 °C. After ten minutes, the sample was removed from the water bath and one milliliter of 1.5 M NaOH was then added. The absorbance at 515 nm was then determined within ten minutes with use of spectrophotometer. The observations recorded at were subjected for statistical analysis. The analyses of variance (ANNOVA) for RCBD are performed with use of OPSTAT open access software and results are interpreted with significance at five per cent (Sheoran *et al*., 1998) [10].

Result and Discussion

The experimental data on reducing sugars, non reducing sugars and total sugars of onion genotypes are differed significantly ($p<0.05$) during *kharif* season of 2017 (Table 1). The highest reducing sugars was recorded from the genotype COHBON03 (3.83%), which are on par with the genotypes namely COHBON10 (3.47%), COHBON15 (3.59%) and COHBON33 (3.71%). The highest non-reducing sugars was recorded from the genotype COHBON08 (3.52%), which is on parity to the variety Bhima Super (3.50%), genotypes namely COHBON01 (3.21%), COHBON18 (3.42%), COHBON23 (3.38%) and COHBON27 (3.30%). The highest total sugars was recorded from the genotype COHBON03 (6.45%), which is on equivalence with the genotypes namely COHBON08 (5.93%) and COHBON23 (5.94%). The total sugars content reduced from 6.4 to 5.2 and to 5.3% under natural and forced ventilated storage, respectively. (Dabhi *et al*., 2008) [3] The conversion of non reducing sugar into reducing sugars under non ventilated stored onion, which were resulted in more use of reducing sugars for respiration.

The highest pyruvic acid was recorded from the genotype COHBON17 (2.31 µmol/g), which was on par with the variety Bhima Super (2.86 µmol/g), genotypes namely COHBON14 (2.22 µmol/g), COHBON21 (2.22 µmol/g), COHBON09 (2.23 µmol/g), COHBON19 (2.18 µmol/g), COHBON02 (2.16 µmol/g) and COHBON25 (2.15 µmol/g). The pungency varied from 4.51 to 6.34 µmole per gram. The maximum pungency was registered in Bengaluru Rose onion (6.34 µmol/g). While, Thumbaraguddi Local recorded minimum pungency of 4.51 µmole per gram of fresh weight (Lakshmipathy *et al*. 2017) [6]. The pyruvic acid content was reduced from 6.5 to 6.2 and 6.0 µmole/g under natural and forced ventilated storage, respectively (Dabhi *et al*., 2008) [3]. The bioaccumulation of organo-sulfur compounds in onions depends on different factors like response to fertilization, growing environment, and the genetic character of the cultivars or vareities [Yoo *et al*., 2006; Chope *et al*., 2007; Soumya *et al*. 2016] [16, 2, 13]. Total soluble solids were not differed significantly among the genotypes.

Table 1: Performance of onion genotypes for quality traits during *kharif* 2017

Genotypes	TSS (^{0}B)	Reducing sugars (%)	Total Sugars (%)	Non reducing Sugars (%)	Pyruvic acid (µ mol/g)
COHBONC01	13.50	2.64	5.85	3.21	1.91
COHBONC02	14.00	2.87	5.45	2.58	2.16
COHBONC03	14.50	3.83	6.21	2.38	1.96
COHBONC04	13.50	2.93	5.56	2.64	1.72
COHBONC05	13.50	2.59	5.68	3.09	1.82
COHBONC06	13.50	3.12	5.57	2.45	1.72
COHBONC07	13.50	2.96	5.68	2.71	1.77
COHBONC08	13.50	2.41	5.93	3.52	1.77
COHBONC09	14.50	3.53	5.45	1.92	2.23
COHBONC10	15.00	3.47	5.61	2.14	1.80
COHBONC11	15.00	3.08	5.48	2.40	1.96
COHBONC12	14.00	3.24	5.60	2.37	1.79
COHBONC14	13.50	3.23	5.54	2.31	2.22
COHBONC15	14.50	3.59	5.84	2.26	1.79
COHBONC17	14.50	3.26	5.64	2.39	2.31
COHBONC18	13.50	2.47	5.89	3.42	1.86
COHBONC19	13.50	2.91	5.56	2.65	2.18
COHBONC20	15.00	3.41	5.84	2.44	1.80
COHBONC21	13.50	2.85	5.56	2.71	2.22
COHBONC22	15.00	3.22	5.60	2.37	1.69
COHBONC23	13.50	2.57	5.94	3.38	1.91
COHBONC24	14.50	3.24	5.48	2.24	1.74
COHBONC25	13.50	3.18	5.60	2.41	2.15
COHBONC26	14.50	2.91	5.50	2.60	1.72
COHBONC27	14.00	2.58	5.88	3.30	1.74

COHBONC28	14.00	3.02	5.55	2.53	1.77
COHBONC32	15.00	3.18	5.63	2.45	1.78
COHBONC33	15.50	3.71	5.83	2.12	1.72
COHBONC34	13.50	2.64	5.64	3.00	1.80
COHBONC35	13.50	2.67	5.69	3.02	1.74
Bhima Super	13.50	2.33	5.83	3.50	2.30
S.E.m±	0.50	0.12	0.10	0.14	0.10
C.D. at 0.05	NS	0.36	0.30	0.40	0.29
C.V. (%)	5.02	5.82	2.60	7.29	7.45

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