Vegetable Science (2024) 51(1): 49-55

doi: 10.61180/vegsci.2024.v51.i1.07

ISSN- 0970-6585 (Print), ISSN- 2455-7552 (Online)

www.isvsvegsci.in

RESEARCH ARTICLE

Trait association and variability study for biochemical and yield related traits in onion (*Allium cepa* L.)

Amar J. Gupta*, Ashwini Benke, K. Gorrepati, V. Mahajan and Major Singh

Abstract

The present investigation assessed trait association and variability in biochemical and yield-related parameters in seventeen onion genotypes at ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune, during *rabi* seasons. The studied material included varieties, hybrids and promising lines of onion. On the basis of two years of pooled data, DOGR-344 recorded the highest marketable and total yield (385.53 and 398.55 q/ha, respectively) as well as the maximum average bulb weight (62.23 g). The hybrid BSS-133 recorded the highest pyruvic acid content (5.49 µmol/g), followed by Bhima Shweta (5.22 µmol/g) and hybrid DOGR WHY-2 (4.89 µmol/g). The DOGR Hy-8 (3.92%) and Bhima Kiran (2.91%) recorded the highest amount of reducing and non-reducing sugar content, respectively. Total soluble solids content was highest in L-355 (11.72%) followed by DOGR-361 (11.65%) and RGP-2 (11.63%). Marketable and total yield showed a significant positive correlation with average bulb weight, days to harvest, pyruvic acid content, non-reducing sugar content and total soluble solids. These traits have a significant negative correlation with neck thickness, percentage doubles and bolter bulbs. Findings from this investigation will be helpful in the selection of trait-specific genotypes for further improvement in onion.

Keywords: *Allium cepa*, Biochemical analysis, Pyruvic acid, Sugar, TSS, Correlation, Onion.

ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune, Maharashtra, India.

***Corresponding author;** Email: guptaaj75@yahoo.co.in

Citation: Gupta, A. J. , Benke, A., Gorrepati, K., Mahajan, V. and Singh, M. (2024). Trait association and variability study for biochemical and yield related traits in onion (*Allium cepa* L.). Vegetable Science, 51(1), 49-55.

Source of support: Nil

Conflict of interest: None.

Received: 16/02/2024 **Revised:** 29/05/2024 **Accepted:** 30/05/2024

Introduction

Onion (*Allium cepa* L.) is the most widely cultivated species of the genus *Allium and* family Alliaceae. India is the largest producer of onion in the world. Maharashtra, Karnataka and Madhya Pradesh are the top onion-producing states of the country. Onion possesses a wide range of benefits for humanity, such as antibiotic effects, anti-cough and cold activity, cardiovascular help and induction of appetite (Griffiths *et al*., 2002; Mahajan & Gupta, 2023). Onion is a unique vegetable used throughout the year in the form of salad, condiment, and cooking with other herbs (Katyal, 1985). Onion bulbs and greens are both vital sources of vitamin C, potassium, dietary fiber, minerals and folic acid. It has many medicinal values and is used for the preparation of various homeopathic, Unani and Ayurveda medicines (Nadkarni, 1927). It has antioxidant and anti-inflammatory effects and may lower blood sugar levels, improve bone health and reduce the risk of several types of cancers. They also prevent coronary heart disease, obesity and hypercholesterolemia (Griffiths *et al*., 2002; Lee *et al*., 2015). Therefore, worldwide onion consumption is increasing significantly day by day. The cultivars grown in Indian climatic conditions are short day type and require 10-12 hours daylight for bulbing.

The onion from India is famous for its typical intense flavor and taste. They differ in pungency because cultivars accumulate different amounts of the flavor precursors (Schwimmer & Weston, 1961). These compounds are flavonoids, oligosaccharides and alkyl cysteine sulphoxides (ACSOs) (Slimestad & Vagen, 2009). Pungency and other flavous are derived from the hydrolysis of S-alkyl cysteine sulfoxide (ACSOs) precursor molecules by allinase. The mechanical chopping or maceration of onion tends to release such compounds. This cleavage produces s-alk(en) sulfenic acid, pyruvic acid and ammonia (Liu *et al*., 2009; Anthon; Barret, 2003). Thus, pyruvate production is correlated with pungency in onions (Schwimmer & Weston, 1961). The environmental growing conditions, genotypes and storage influence pyruvic acid (Yoo *et al*., 2006). The genetic background also seems to be the most important factor because different cultivars have different abilities to control sulfur uptake and assimilation in the biosynthesis pathway that results in the flavor (Randle, 1992; Randle *et al*., 1994). One significant QLT *frc* related to bulb carbohydrate content during storage was identified by McCallum *et al*. (2006) from F_2, F_3 interspecific population. This marker mapped on chromosome 8 and interspecific crosses intentionally made to study the genomic variation of carbohydrates and fructan levels among high to low dry matter content populations. Further, McCallum *et al*. (2007) found QTL for bulb pungency and soluble solid content that have a pleiotropic effect on bulb carbohydrate composition. They developed a PCR marker for assessing the population for low pungency using marker-added selection. Significant differences in sulfate and cysteine pools in the mild and pungent genotypes, as well as differences in sulfur assimilatory gene expression, have been noticed by McCallum *et al*. (2011).

During storage, an increase in the flavoring compound is observed due to metabolic activity in the bulbs. The increase in sulfur compounds is highest at the time of sprouting of bulbs (Lawande, 2001). Cultivars that have poor storage quality are generally less pungent. A total of 60–80% part of the dry matter in onion comprises of non-structural carbohydrates (glucose, fructose, sucrose and fructans), which is essential for maintaining bulb quality (Brewster, 2008). The amount of pyruvic acid present is also necessary to determine the quality of onion. Estimation of pungency in bulbs is important for assessing bulb quality in onion (Dhumal *et al*., 2007). Onion contains glucose (reducing sugar), sucrose (non-reducing sugar) and other oligosaccharides, which also influence the sweetness in onion flavor. Glucose, fructose and sucrose as well as low molecular weight fructans, are essential non-structural carbohydrates of onion consisting of about 80% of dry matter content (Sharma *et al.* 2014; Mota *et al*., 2019). The sugar content is influenced by various measures, including storage temperature and post-harvest treatments, which result in either a constant or a fluctuating pattern (Bogevska *et al*., 2016). The high sugar content is considered to retain freshness in onion (Sharma *et al*., 2014). In onions, biochemicals such as pyruvic acid, sugars and reducing sugar content in storage trials was reported by Hamilton *et al*. (1997), Yoo & Pike (2001), Dhumal *et al*. (2007), Gallina *et al*. (2012). The present study aims to assess of variation and association of various morphological and biochemical parameters with yield in different varieties, hybrids and lines of short-day onions grown during the *rabi* season.

Materials and Methods

Biological materials

Screening of seventeen onion genotypes including varieties, hybrids and lines *viz*., DOGR Hy-8, DOGR Hy-5, RGP-1, RGP-2, DOGR-344, DOGR-361, DOGR WHY-1, DOGR WHY-2, KH-M-3, KH-M-4, Bhima Kiran, Bhima Shakti, Bhima Shweta, L-355, BSS-133, BSS-441 and PKV White were carried out at ICAR-Directorate of Onion and Garlic Research, Rajgurunagar, Pune for two successive years during *rabi* 2016-17 and 2017-18. The experiment was laid out in a Randomized Block Design with three replications. Eleven morphological traits (marketable yield, total yield, average bulb weight, neck diameter, doubles, bolters and rotten bulbs, uniformity in bulbs, days to harvest, bulb color and bulb shape) along with four biochemical parameters (pyruvic acid, total soluble solids, reducing and non-reducing sugar content) were assessed. The correlation analysis was applied to see the correlation between marketable yield and its component, along with biochemical and morphological parameters. The software SAS JMP Pro 10 was used for the analysis.

Morphological traits

Eleven morphological characters were recorded during this study. Total yield (q/ha) includes both marketable and unmarketable bulb weight. Doubles (split), bolters and rotted bulbs were recorded by weighing after harvesting. The average bulb weight was calculated based on randomly selected five plants from the net plot and calculating the mean of fresh bulb weight after harvesting and curing. Days to harvest was recorded after transplanting or days taken to harvest after toppling of vegetative growth. Neck thickness was measured with the help of a Vernier caliper just above the top of the bulb and presented in millimeters. Bulb colour and bulb shape was observed visually after curing.

Biochemical traits

The pyruvic acid was estimated using 2,4 di-nitrophenyl hydrazine (DNPH) reagent (Anthon & Barrett, 2003) with a slight modification to the Schwimmer & Weston (1961) method. The total soluble solids content in the onion juice was recorded with the help of a hand refractometer and expressed in percent. Total sugar content estimation was carried out using the Anthrone reagent at 630 nm. The onion bulbs were cut longitudinally into two pieces, then sliced and blended in the grinder to make a fine paste. About 0.1 g of the sample was used to calculate the total sugar content in the onion. Each tube containing 10 ml of 2N HCl was incubated in a water bath for 3 hours. After incubation, the samples were neutralized by adding sodium carbonate until the effervescences stopped. The volume of samples was finalized to 50 mL each.

Further, about 5 mL of samples were centrifuged and pipetted out 0.5 mL of each sample and an equal amount of distilled water was added. Anthrone reagent was freshly prepared in 95% cold sulphuric acid, and about 4 mL was added in each of the samples and recorded readings using a spectrophotometer at a wavelength of 630 nm. The concentration of sugar present was calculated by plotting a standard graph of glucose. The reducing sugar content was determined according to the Nelson & Somogyi method (1944 & 1952).

Results and Discussion

Variability among morphological traits

The experimental results revealed a wide range of variation among the seventeen genotypes for both morphological and biochemical characteristics. The marketable yield and total yield ranged from 251.01 and 267.44 q/ha (BSS-441) to 385.53 and 398.55 q/ha (DOGR-344), respectively. Maximum average bulb weight was recorded in line DOGR-344 (62.23 g) followed by BSS-441 (61.75 g), Bhima Shakti (60.98 g), PKV White (60.06 g) and DOGR WHY-1 (59.35 g). However, double bulbs were absent in KH-M-4, DOGR-344, DOGR-361, DOGR WHY-1, Bhima Shweta, Bhima Kiran and Bhima Shakti, while minimum bolters were recorded in lines DOGR Hy-8 and Bhima Shakti (0.08%). The minimum numbers of rotten bulbs were observed in KH-M-3 (0.16%). Similar results in variations of bulb weight were observed by Sarada *et al.* (2009), Hirave *et al.* (2015), Gupta *et al.* (2019); Gupta *et al.* (2021a) and the same trend in different varieties at different locations were noticed. Thus, various breeding programs of onion variability can be accelerated using these genotypes.

Concerning the storage life of onions, the neck thickness of harvested bulbs plays an important role. In general, bulbs with thin neck thickness possess longer shelf life, as large neck thickness provides more surface area for microbial infection. The bulb with thin neck thickness can be stored for a longer period (Ratan *et al*., 2017; Gupta *et al*., 2021b, Gupta *et al*., 2022). Although all the genotypes used were categorized under the thin neck while, minimum neck thickness was observed in line KH-M-3 (3.48 mm) followed by Bhima Kiran (3.63 mm), DOGR-344 and L-355 (3.83 mm). These results are in general agreement with the findings of Hirave *et al*. (2015); and Umamaheswarappa *et al*. (2018). Minimum days to harvesting were recorded in DOGR Hy-5, KH-M-3, KH-M-4, DOGR-361, BSS-133, DOGR WHY-1 and DOGR WHY-2 (114.33 days). Similar results were also reported by Hirave *et al*. (2015) and Umamaheswarappa *et al*. (2018).

The uniformity in bulb color and shape decides the quality of the onion bulb. The line RGP-2 (92.38%) recorded maximum uniformity in a bulb shape, followed by DOGR WHY-1 (90.68%), Bhima Shakti (90.63%), DOGR WHY-2 (89.93%) and DOGR Hy-8 (89.42%). In general, dark red colored onion varieties are highly preferred by consumers but it also depends on area and location. Among all, DOGR Hy-5, RGP-2 and KH-M-4 possess dark red color bulbs. However, medium red colored bulbs were observed in the DOGR Hy-8, RGP-1, KH-M-3, BSS-133, Bhima Shakti and L-355, whereas BSS-441 and Bhima Kiran possessed light red colored bulbs. White color bulbs were observed in Bhima Shweta, DOGR-344, DOGR-361, DOGR WHY-1, DOGR WHY-2 and PKV White. Two types of bulb shapes *viz*., globe and flat globe, were observed among the population. Six genotypes *viz*., DOGR Hy-8, RGP-1, KH-M-3, DOGR WHY-1, Bhima Shakti and PKV White were flat globe-shaped (Table 1) while the rest of the genotypes had globe-shaped.

Variability among biochemical traits

Pungency and total soluble solids content are important parameters to determine the quality of the onion and vary according to cultivar, stage of maturity, type of soil, soil moisture level and other growing conditions (Dhumal *et al*., 2007). Highly pungent onions are popular in India, while less pungent ones are preferred in Western countries. The onion pungency is measured by pyruvic acid content, which ranges between 1.63 µmol/g (mild) to 5.49 µmol/g (moderately pungent). The hybrid BSS-133 noted the highest pyruvic acid content (5.49 µmol/g) followed by Bhima Shweta (5.22 µmol/g) and DOGR WHY-2 (4.89 µmol/g) and were statistically at par. The lowest amount of pyruvic acid content was recorded in BSS-144 (1.63 µmol/g). The lower amount of pyruvic acid indicates less pungency and a lesser amount of sulfur-containing flavor precursor compounds and sulfur volatiles (Lee *et al*., 2015). McCallum *et al*., (2007) evaluated pungency as pyruvic acid or lachrymatory factor. Total soluble solids (TSS) are an important attribute of onion bulb quality for processing and storage and it ranged between 10.84 to 11.72%. The total soluble solids content was highest in L-355 (11.72%), followed by DOGR-361 (11.65%) and RGP-2 (11.63%). The lowest amount of total soluble solids was observed in DOGR Hy-5 (10.84%). Other studies also revealed the difference in total soluble solids content among the different cultivars of onion (Dhumal *et al*., 2007; Elrab *et al*., 2013; Mota *et al*., 2019). Figure 1 represents the total soluble solids content and pyruvic acid concentration in studied onion genotypes.

Glucose, fructose, sucrose and fructo oligosaccharides are the most important non-structural carbohydrates present in onion bulbs. These carbohydrates are used as an energy source to carry out usual cell metabolism and regulation of gene expression. The concentration of sugar in mature bulbs

Table 1: Performance of growth, yield and biochemical traits of onion genotypes

Variety	*MY q/ha*	*TY q/ha*	*ABW (g)*	*% DB*	*% BB*	*% RB*	*N (mm)*	*Unif. in bulb shape(%)*	*DTH*	*PA (µ mol/g)*	*RS %*	*Non RS%*	*% TSS*	*BC*	*BS*
DOGR Hy-5	318.03	337.97	58.50	0.35	1.08	1.44	4.68	83.70	114.33	2.64	3.12	2.14	10.84	DR	G
DOGR Hy-8	309.49	328.27	57.11	0.00	0.08	0.68	4.65	89.42	118.00	2.95	3.92	1.22	11.38	MR	FG
RGP-1	295.93	314.11	54.50	0.51	0.19	1.04	5.02	83.42	118.33	1.96	3.25	1.81	11.03	MR	FG
RGP-2	330.64	344.75	59.08	0.63	0.26	0.63	4.18	92.38	118.67	3.77	3.80	1.56	11.63	DR	G
KH-M-3	291.54	311.96	56.64	0.13	0.61	0.16	3.48	86.73	114.33	1.77	3.66	1.65	11.39	MR	FG
KH-M-4	256.30	279.05	55.96	0.00	0.69	1.02	5.11	89.04	114.33	3.07	3.54	1.27	11.34	DR	G
DOGR-344	385.53	398.55	62.23	0.00	0.79	1.05	3.83	87.90	118.33	2.46	3.73	2.62	11.45	W	G
DOGR-361	325.00	341.27	59.04	0.00	0.66	1.04	5.03	85.91	114.33	1.73	3.05	2.16	11.65	W	G
DOGR WHY-1	352.68	368.43	59.35	0.00	0.70	1.26	4.29	90.68	114.33	4.02	3.46	2.62	11.43	W	FG
DOGR WHY-2	324.21	340.11	58.35	0.08	0.81	1.73	5.22	89.93	114.33	4.89	3.30	2.63	11.51	W	G
Bhima Shweta	331.83	350.83	58.83	0.00	1.97	0.34	4.87	84.10	114.67	5.22	3.14	2.23	11.58	W	G
BSS-133	287.54	323.96	58.11	2.01	2.16	2.98	4.39	88.55	114.33	5.49	3.85	1.93	11.30	MR	G
BSS-441	251.01	267.44	61.75	1.76	2.24	0.61	4.69	89.21	114.67	1.63	3.29	1.92	11.26	LR	G
Bhima Kiran	325.56	337.12	56.03	0.00	0.25	0.08	3.63	84.36	118.67	4.64	3.14	2.91	11.50	LR	G
Bhima Shakti	363.34	372.45	60.98	0.00	0.08	0.00	4.32	90.63	118.00	4.66	3.12	2.78	11.38	MR	FG
L-355	324.22	335.19	56.23	0.22	0.49	0.00	3.83	88.65	115.00	3.03	3.11	2.61	11.72	MR	G
PKV White	282.33	321.42	60.06	4.34	1.56	1.12	5.21	84.25	118.33	3.26	3.21	2.69	11.41	W	FG
Mean	315.01	333.70	58.40	0.59	0.86	0.89	4.50	87.58	116.06	3.36	3.39	2.16	11.40		
C.V. (%)	10.86	9.42	4.11	13.03	19.55	25.06	16.59	3.22	0.65	8.05	8.95	14.83	1.67	-	-
C.D. at 5%	18.15	16.25	3.97	0.91	1.73	2.28	1.18	1.45	1.14	0.81	0.15	0.27	0.32	-	-

MY-Marketable Yield, TY-Total Yield, ABW-Average Bulb Weight, %DB- %Double bulbs, %BB-% Bolters bulbs, %RB-%Rotten bulbs, N-Neck diameter, DTH-Days to harvest, PA-Pyruvic acid content, RS-Reducing sugar content, TSS-Total soluble solids, BC-Bulb colour, BS-Bulb shape, MR-Medium Red, DR-Dark Red, LR-Light Red, W-White, G-Globe, FG-Flat globe.

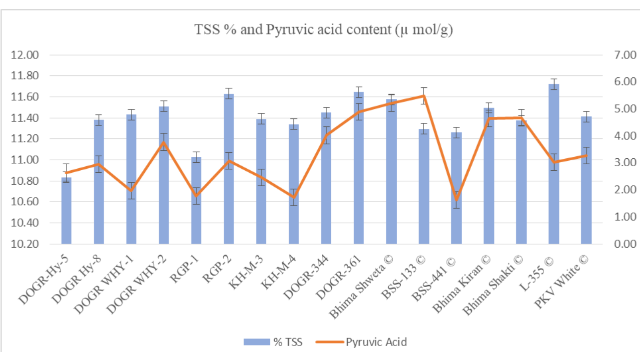

Figure 1: Graph of total soluble solids content and pyruvic acid concentration in onion genotypes

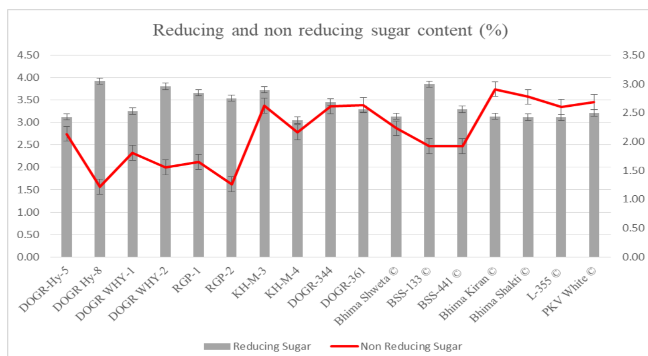

Figure 2: Graph of reducing (RS %) and non-reducing (Non-RS %) sugar content in onion genotypes

tends to be lesser than in the developmental stage of onion (Mota *et al*., 2019). The reducing sugar content was recorded highest in DOGR Hy-8 (3.92%) followed by BSS-133 (3.85%), whereas minimum reducing sugar content was recorded in DOGR-361 (3.05%) followed by L-355 (3.11%). Non-reducing sugar content was recorded as highest in Bhima Kiran (2.91%) followed by Bhima Shakti (2.78%), whereas the lowest amount was recorded in DOGR Hy-8 (1.22%) (Figure 2).

Correlation studies

The results of correlation analysis revealed that total yield (0.98), average bulb weight (0.34), and non-reducing sugar content (0.56) were highly significant and positively correlated with marketable yield (Table 2). In addition, days to harvest (0.30), pyruvic acid content (0.29) and TSS (0.31) were significant and positively correlated with the marketable yield. Singh *et al*. (2010) also reported similar

Table 2: Correlation between marketable yield and its component and biochemical parameters

Parameter	*MY (q/ha)*	*TY (q/ha)*	*ABW (g)*	*% DB*	*% BB*	*% RB*	*N (mm)*	*Unif. in bulb*	*DTH*	*PA (µmol/g)*	*RS (%)*	*Non RS (%)*	*% TSS*
MY (q/ha)	1.00												
TY (q/ha)	0.98**	1.00											
ABW (g)	0.34**	0.37**	1.00										
% DB	-0.48**	-0.33*	0.26	1.00									
% BB	-0.41*	-0.31*	0.40*	0.56	1.00								
% RB	-0.18	-0.04	0.07	0.33	0.44	1.00							
N (mm)	-0.38*	-0.32*	0.02	0.31	0.28	0.40	1.00						
Unif. in bulb	0.16	0.11	0.30**	-0.19	-0.19	0.03	-0.17	1.00					
DTH	0.30*	0.30*	0.05	0.15	-0.47**	-0.32*	-0.18	-0.04	1.00				
PA µmol/g	0.29*	0.35*	0.02	0.00	0.15	0.24	0.00	0.20	0.02	1.00			
RS (%)	-0.06	-0.01	0.01	0.00	-0.05	0.33*	-0.25	0.50**	0.14	0.03	1.00		
Non RS (%)	0.56**	0.57**	0.35**	0.09	0.03	-0.11	-0.19	-0.16	0.13	0.36*	-0.58**	1.00	
% TSS	0.31*	0.28*	0.10	-0.14	-0.13	-0.34*	-0.24	0.37**	0.04	0.26*	0.01	0.24*	1.00

(*) and (**) indicates significance at 5% and 1%, respectively

MY-Marketable Yield, TY-Total Yield, ABW-Average Bulb Weight, %DB- %Double bulbs, %BB-% Bolters bulbs, %RB-%Rotten bulbs, N-Neck diameter, DTH-Days to harvest, PA-Pyruvic acid content, RS-Reducing sugar content, Non RS-Non Reducing sugar content, and TSS-Total soluble solids,

results for total yield and average bulb weight. Dewangan & Sahu (2014) found a significant positive correlation between marketable yield and total yield with average bulb weight. Nikhil *et al*. (2016) & Aliyu *et al*. (2007) also reported similar results for average bulb weight with bulb yield. Neck thickness (-0.38), double bulbs (-0.48) and bolter bulbs (-0.41) were significant and negatively correlated with the marketable yield. These significantly positive related parameters will be helpful to improve the bulb quality and their increment will lead to increase in marketable yield. Negatively correlated parameters need to keep in check so that yield should not get affected and cause reduction.

In biochemical parameters, the highly positive significant correlation of non-reducing sugar with marketable yield, total yield, average bulb weight and pyruvic acid was observed. On the other hand, the reducing sugar had a significant positive correlation with the uniformity in the bulb (0.50) and rotten bulbs (0.33). Higher reducing sugar content leads to an increase in respiration rate and sprouting during storage (Raut *et al*., 2017).

The total soluble solids showed a significantly positive correlation with uniformity in the bulb (0.37), marketable yield (0.31), total yield (0.28), pyruvic acid (0.26) and non-reducing sugar (0.24). Srivastava *et al*. (2017) also reported a positive correlation of TSS with yield. TSS showed a significant negative correlation with rotten bulbs (-0.34). The total soluble solids at harvest could be used as a preliminary selection criterion to identify good storability. TSS in any variety is a function of genotype, environment and cultural practices. Long-day onions grown in mild climates recorded high TSS, whereas short-day onions did not develop high TSS (Lawande *et al*., 2009). Pyruvic acid content showed a significant positive correlation with marketable yield and total yield. Pyruvic acid is synthesized enzymatically upon tissue homogenization of *Allium* vegetables and correlates positively with pungency (Wall & Corgan 1992). Highly pungent onions are popular in India, while less pungent ones are preferred in other countries. The determination of pyruvate as an indicator of pungency is perhaps the most established method for pungency assessment in onion (Kallai *et al*., 2015). The different patterns of phenotypic correlation observed between sites and families suggest that the loci conditioning pleiotropic effects on solids and pungency are heterozygous in the parent and affected by the environment (McCallum *et al*., 2007). In general, overall varieties recorded higher amounts of TSS and pyruvic acid content (Figure 3), while breeding lines were good for non-reducing sugar content (Figure 4). Reducing sugar was found positively correlated with uniformity in the bulb and rotten bulbs where former parameters can be considered as a positive and the later one (rotten bulbs) for a yield-reducing trait in onion. Therefore, the lesser the sugar content, the more is the marketable yield of onion. In addition, non-reducing sugar is not only a qualitative parameter for onion but also its quantitative increase can help in increasing the marketable and total yield as it is significantly correlated with them. Thus, studies on pungency, TSS, water-soluble carbohydrates and their association will definitely help to improve the quality of bulbs and enhance the commercial value of onion.

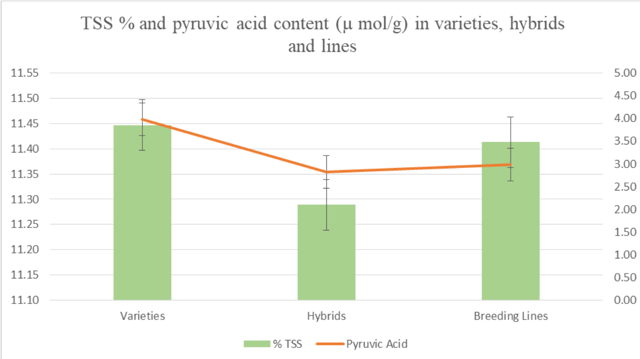

Figure 3: Total soluble solids and pyruvic acid content comparison in onion varieties/ hybrids/ lines

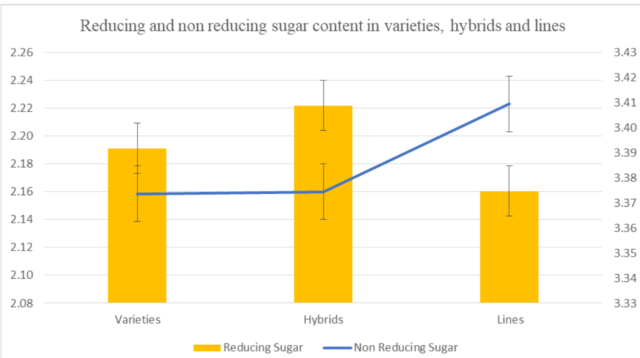

Figure 4: Reducing and non-reducing sugar content comparison in onion varieties/ hybrids/ lines

Conclusion

It can be concluded that on the basis of two years of mean data, the pyruvic acid content ranged from 1.63 to 5.49 µmol/g and BSS-133 recorded maximum pyruvic acid content (5.49 µmol/g) followed by Bhima Shweta (5.22 µmol/g) and DOGR WHY-2 (4.89 µmol/g). Also, it was found to be positively correlated with marketable yield. Non-reducing sugar content ranged from 1.22 to 2.91% and recorded maximum in Bhima Kiran (2.91%). It was also significantly correlated with marketable yield, average bulb weight and pyruvic acid content. TSS content ranged from 10.84 to 11.72% and was found maximum in L-355 (11.72%) followed by DOGR-361 (11.65%) and RGP-2 (11.63%). It showed a significantly positive correlation with marketable yield, pyruvic acid content and non-reducing sugar. Pungency level and total soluble solids are important quality attributes of onion bulbs for table purposes, processing and storage. The reducing and non-reducing sugar content values are helpful in determining the storage life of bulbs.

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सारांश

वर्तमान परीक्षण में रबी मौसम के दौरान आईसीएआर-प्याज एवं लहसुन अनुसंधान निदेशालय, राजगुरुनगर, पुणे में प्याज के सत्रह जीनोटाइप में जैव रासायनिक और उपज संबंधी मापदंडों में सहसंबंध और आनुवंशिक परिवर्तनशीलता का आकलन किया गया। अध्ययन की गई सामग्री में प्याज की किस्में, संकर और आशाजनक लाइनें शामिल थीं। दो साल के एकत्रित आंकड़ों के आधार पर, डीओजीआर-344 ने उच्चतम विपणन योग्य और कुल उपज (क्रमशः 385.53 क्विंटल/हेक्टेयर और 398.55 क्विंटल/हेक्टेयर) के साथ-साथ अधिकतम औसत कंद वजन (62.23 ग्राम) दर्ज किया। हाइब्रिड BSS-133 में सबसे अधिक पाइरुविक एसिड सामग्री (5.49 μmol/g) दर्ज की गई, इसके बाद भीमा श्वेता (5.22 μmol/g) और हाइब्रिड डीओजीआर WHY-2 (4.89 μmol/g) दर्ज की गई। डीओजीआर हाई-8 (3.92%) और भीमा किरण (2.91%) में क्रमशः घटाने वाली और गैर-घटाने वाली शर्करा सामग्री की उच्चतम मात्रा दर्ज की गई। कुल घुलनशील ठोस पदार्थ की मात्रा एल-355 (11.72%) में सबसे अधिक थी, इसके बाद डीओजीआर-361 (11.65%) और आरजीपी-2 (11.63%) थे। विपणन योग्य और कुल उपज ने औसत कंद वजन, कटाई के दिन, पाइरुविक एसिड सामग्री, गैर-घटाने वाली शर्करा सामग्री और कुल घुलनशील ठोस पदार्थों के साथ एक महत्वपूर्ण सकारात्मक सहसंबंध दिखा। इन लक्षणों का गर्दन की मोटाई, प्रतिशत डबल और बोल्ट कंद के साथ महत्वपूर्ण नकारात्मक सहसंबंध है। इस परीक्षण के निष्कर्षों से प्याज में और सुधार के लिए लक्षण-विशिष्ट जीनोटाइप के चयन में सहायता मिलेगी।