E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(10): 36-39
Received: 04-08-2024
Accepted: 10-09-2024

Kasarla Shreya
Department of Vegetable Science, Post Graduate Institute of Horticultural Sciences, Mulugu, Siddipet, Telangana, India

AVN Lavanya
Assistant Professor, College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

R Preetham Goud
Senior Scientist, Department of Agronomy, Vegetable Research Station, Rajendranagar, Hyderabad, Telangana, India

Veena Joshi
Associate Professor, College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

V Suresh
Scientist, Department of Plant Pathology, Vegetable Research Station, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
Kasarla Shreya
Department of Vegetable Science, Post Graduate Institute of Horticultural Sciences, Mulugu, Siddipet, Telangana, India

Evaluation of varieties and standardization of planting time on quality and storage attributes in multiplier onion (*Allium cepa* var. *aggregatum* Don.) under southern Telangana region

Kasarla Shreya, AVN Lavanya, R Preetham Goud, Veena Joshi and V Suresh

DOI: https://doi.org/10.33545/2618060X.2024.v7.i10a.1694

Abstract
A study titled evaluation of varieties and standardization of planting time on quality and storage attributes in multiplier onion (*Allium cepa* var. *aggregatum* Don.) under Southern Telangana region was conducted during *rabi* season of 2023-24 at Vegetable Research Station, Rajendranagar, Hyderabad. The research aimed to assess the effect of varieties, planting time and their interaction on quality and storage attributes of multiplier onion. The experiment followed is Factorial Randomized Block Design (FRBD) with two factors: varieties (CO-6, CO (on) 5, Aca-15) and planting time (16th November, 1st December, 15th December, 1st January). Quality parameters including Total Soluble Solids and ascorbic acid were recorded during the study. The study revealed that the variety Aca-15 recorded maximum TSS (19.04 ^{0}Brix) and ascorbic acid (8.53 mg/100g) and 1st December planting recorded maximum TSS (20.25 ^{0}Brix) and ascorbic acid (8.93 mg/100 g). The study also evaluated storage parameters, including Physiological Loss in Weight and storage rot at 15 and 30 days after harvest (DAH). Notably, minimum PLW at 15 and 30 DAH was recorded in the variety CO (On) 5 (4.56 and 8.56%) and storage rot was also minimum in CO (On) 5 (3.02 and 7.38%) and 16th November planting resulted in minimum PLW (3.88 and 7.88%) at 15 and 30 DAH and minimum storage rot (3.00 and 6.77%). The interaction between varieties and planting time significantly influenced TSS, ascorbic acid, Physiological Loss in Weight and storage rot. Local evaluation of onion varieties identifies top performers and optimal planting times, helping farmers improve quality, reduce waste, and boost sustainability of multiplier onion production in the Southern Telangana region.

Keywords: Varieties, multiplier onion, planting time, Physiological Loss in Weight, onion quality, onion storage

Introduction
The genus *Allium* contains seven cultivated species of economic importance of which, aggregatum onion *Allium cepa* var. *aggregatum* (2n = 16) is one of the important species of *Allium* vegetables, as it forms an indispensable part of many diets for its unique flavor, odour (Fritsch and Friesen, 2002) [2] and pungency (Sekara *et al*., 2017) [6], in both vegetarian and non-vegetarian dishes. It is known by different names such as small onion, potato onion, underground onion, shallots, nesting onions and ever-ready onion. Multiplier onion is widely used in the South Indian kitchen mainly for seasoning of curries and preparation of different lentil-based dishes. It contributes significant nutritional value to the human diet due to the presence of organo-sulphur compounds, quercetin and also a number of mineral compounds including calcium, magnesium, sodium, potassium, selenium and phosphorus (Kumar *et al*., 2010) [4]. Quercetin, a flavonoid compound provides various therapeutic properties including anti-allergic, anti-inflammatory, cardio-protective, vasodilatory, anti-carcinogenic, antioxidant, antibacterial and antifungal (Upadhyay, 2016; Shafiq *et al*., 2017) [12, 7]. The aggregatum onion *Allium cepa* var. *aggregatum* produces small bulbs which form an aggregated cluster. It is propagated vegetatively through bulblets and also by seeds. Seed rate of bulblets (12-15 t ha^{-1})

which costs around ₹ 24,000-32,000, handling and transportation of planting material are found to be biggest financial constraints in cultivation of multiplier onion. To reduce the farmer cost of cultivation on seed material, advanced technology like utilization of seed for raising multiplier onion is advisable. In Southern Indian conditions, multiplier onion is cultivated in two main seasons' *viz.,* Early *kharif i.e*., May to August and *rabi i.e*., October to December. However, *rabi* is the main crop as like common onion. For successful cultivation of *Alliums*, time of sowing is one of the important factors which may also vary with the locality, as it is a thermo-sensitive and photo sensitive crop (Thompson and Kelly 1957) [11]. The age of seedlings at the planting time may influence various growth characters and the yield parameters (Verma *et al*., 1971) [13]. Early planting in a season may also help in production of higher yield than late planting (Thompson and Kelly 1957) [11]. Hence, a systematic study to find out the suitable variety and an optimum sowing date was felt necessary to initiate multiplier onion cultivation under Telangana conditions. The research findings regarding suitable variety and sowing time were limited for satisfactory production of multiplier onion in Telangana. Thus, this study aims to investigate the effect of varieties and planting time on multiplier onion cultivation.

Materials and Methods

The experiment was conducted during the year 2023-24 at Vegetable Research Station, Rajendranagar, Hyderabad, Telangana during *rabi* season. The experimental site comes under sub-tropical zone and is situated at latitude of 17^{O} 19^{1} N and longitude of 79^{O} 23^{1} E. The altitude of the place is 542.3 m above the mean sea level. The field experiment was laid out in factorial randomized block design (FRBD) with two factors (varieties and planting time). There were twelve treatments with a combination of three varieties (CO-6, CO (on) 5, Aca-15) and four planting dates (16th November, 1st December, 15th December, 1st January), replicated thrice. Five onion bulbs were cut into pieces from each treatment and five readings were recorded from the extract for the estimation of TSS with the help of hand refractometer. The mean value was worked out and expressed in terms of percentage (^{0}Brix). Ascorbic acid content was determined by using 2,6- Dichloro-phenol Indophenol Visuals titration method (Ranganna,1986) [5]. The ascorbic acid content was expressed as mg/100g of fresh sample.

$$\text{Ascorbic acid (mg/100 g)} = \frac{\text{Titre value} \times \text{dye factor} \times \text{volume made-up} \times 100}{\text{Aliquot of extraction taken} \times \text{weight of sample for estimation}}$$

Physiological loss of weight was recorded at 15th and 30th day after harvest with an initial sample of 500 g per treatment and it was calculated by the following formula

$$\text{Physiological loss in weight (\%)} = \frac{W_1 - W_2}{W_1} \times 100$$

Where, W_1 = weight of bulb at the time of harvest.
W_2 = weight of bulb recorded after 15th or 30th day after harvest.

The storage rot percent was recorded at 15th and 30th day after harvest with a sample size of 50 bulbs per treatment and was calculated by formula

$$\text{Storage rot (\%)} = \frac{\text{Number of infected bulbs} \times 100}{\text{Total number of examined bulbs}}$$

Data recorded on TSS (ºBrix), ascorbic acid (mg/100 g), Physiological Loss in Weight (%) and storage rot (%) was subjected to statistical analysis, the test of significance (F-test) and critical difference (C. D.) at 0.05.

Results and Discussion

A. Quality parameters

Total Soluble Solids (^{0}Brix): The data revealed that there was significant variation among varieties and planting dates with respect to the Total Soluble Solids. Among the varieties, maximum Total Soluble Solids was recorded in Aca-15 (19.04 ^{0}Brix) followed by CO (On) 5 (18.32 ^{0}Brix) and minimum Total Soluble Solids was recorded in CO 6 (17.93 ^{0}Brix). Among the different dates of planting 1st December planting recorded the maximum Total Soluble Solids (20.25 ^{0}Brix) followed by 16th November (18.61 ^{0}Brix) and 15th December (18.05 ^{0}Brix) and the minimum Total Soluble Solids was recorded in 1st January (16.81 ^{0}Brix) planting. The interaction effect of varieties and planting time had shown that there is significant variation with respect to Total Soluble Solids. The treatment combination of Aca-15 with 1st December recorded maximum Total Soluble Solids (21.27 ^{0}Brix) followed by CO (On) 5 with 1st December (20.01 ^{0}Brix). However minimum Total Soluble Solids was recorded in CO 6 with 1st January planting (16.10 ^{0}Brix). Among varieties, Aca-15 recorded highest TSS. The higher TSS value in this genotype may be due to its inherent characteristics as reported by Thingalmaniyan *et al*. (2017) [10] in multiplier onion. Among different planting dates, 1st December planting recorded highest TSS. This may be due to slower maturation of bulbs utilizing less carbohydrates resulting in increased TSS. Due to the delayed planting TSS decreased. The reasons might be environmental factors and less bulbing time. The superior bulb quality resulting from early sowing can be attributed to the robust vegetative growth and deep green foliage, which enhances photosynthetic activity, leading to increased Total Soluble Solids (TSS) production and ultimately, better bulb quality. Conversely, delayed planting compromises bulb quality due to reduced vegetative growth and photosynthetic activity. These results were confirmed with Kaur *et al*. (2022) [3] in garlic.

Ascorbic Acid (mg/100 g): The data illustrated that there was significant variation among varieties and planting dates with respect to the ascorbic acid. Among the varieties, maximum ascorbic acid was recorded in Aca-15 (8.53 mg/100 g) which was significantly higher than other two varieties and it was followed by CO (On) 5 (8.35 mg/100 g) which was on par with CO 6 (8.30 mg/100 g). Among the different planting dates, 1st December planting recorded the maximum ascorbic acid (8.93 mg/100 g) which was on par with 16th November (8.80 mg/100 g) and it was followed by 15th December (8.35 mg/100 g) and minimum ascorbic acid was recorded with 1st January planting (7.48 mg/100g). The interaction effect of varieties and planting time had shown that there is significant variation with respect to ascorbic acid. The treatment combination of CO (On) 5 with 16th November planting recorded maximum ascorbic acid (8.99 mg/100g) which was on par with Aca-15 with 16th November planting (8.96 mg/100 g). However minimum ascorbic acid was recorded in Aca-15 with 1st January planting (7.20 mg/100g). Among varieties Aca-15 recorded maximum ascorbic acid content. This might be due to the inherent characteristics of the variety. Suthanthira *et al*. (1979) [9] in onion also found similar results wherein among different planting dates, ascorbic acid content decreased with delayed planting dates. The reasons might be due to the increased degradation of vitamin-c due to prolonged exposure to light, environmental stress.

B. Storage parameters

Physiological Loss in Weight (%): The data reveals that there was significant variation among varieties and planting dates with respect to the PLW. Among the varieties, minimum PLW at 15 and 30 DAH was recorded in the variety CO (On) 5 (4.56 and 8.56%) which was significantly superior to other varieties and it was followed by Aca-15 (4.85 and 8.86%) and maximum PLW was recorded in CO 6 (4.95 and 8.95%). Among different planting dates, 16th November planting resulted in minimum PLW (3.88 and 7.88%) at 15 and 30 DAH and it was followed by 1st December planting (4.57 and 8.57%), 15th December planting (5.02 and 9.02%) and maximum PLW at 15 and 30 DAH was recorded in 1st January planting (5.68 and 9.69%). The interaction effect of varieties and planting time had shown that there is significant variation with respect to PLW at 15 and 30 DAH. The treatment combination of variety CO (On) 5 with 16th November planting recorded minimum PLW (3.43 and 7.43%) followed by Aca-15 with 16th November planting (4.01 and 8.01%) which was on par with CO 6 with 16th November planting (4.21 and 8.21%). However maximum PLW at 15 and 30 DAH was recorded in Aca-15 with 1st January planting (5.94 and 9.96%).

Table 1: Effect of varieties and planting time on quality and storage attributes in multiplier onion

	TSS (^{0}Brix)	Ascorbic acid (mg/100 g)	PLW at 15 DAH (%)	PLW at 30 DAH (%)	Storage rot (%) at 15 DAH	Storage rot (%) at 30 DAH
Factor-1 (Varieties)						
CO 6	17.93	8.30	4.95	8.95	3.42	7.94
CO (On) 5	18.32	8.35	4.56	8.56	3.02	7.38
Aca-15	19.04	8.53	4.85	8.86	3.55	8.20
SEm ±	0.11	0.05	0.03	0.05	0.03	0.05
CD (0.05)	0.31	0.14	0.10	0.15	0.08	0.16
Factor-2 (Planting time)						
16th November planting	18.61	8.80	3.88	7.88	3.00	6.77
1st December planting	20.25	8.93	4.57	8.57	3.12	7.01
15th December planting	18.05	8.36	5.02	9.02	3.55	8.50
1st January planting	16.81	7.48	5.68	9.69	3.65	9.08
SEm ±	0.12	0.05	0.04	0.06	0.03	0.06
CD (0.05)	0.36	0.16	0.07	0.15	0.09	0.19
Interaction						
V_1P_1	18.38	8.76	4.21	8.21	3.05	7.50
V_1P_2	19.46	8.85	4.82	8.82	3.05	6.07
V_1P_3	17.79	8.14	5.11	9.11	3.72	8.97
V_1P_4	16.10	7.45	5.67	9.67	3.85	9.20
V_2P_1	18.51	8.82	3.43	7.43	2.71	5.77
V_2P_2	20.01	8.96	4.44	8.44	2.89	7.37
V_2P_3	18.15	8.43	4.95	8.95	3.20	8.03
V_2P_4	16.59	7.20	5.43	9.43	3.29	8.34
V_3P_1	18.94	8.83	4.01	8.01	3.24	7.04
V_3P_2	21.27	8.99	4.44	8.44	3.42	7.58
V_3P_3	18.21	8.50	5.01	9.01	3.73	8.49
V_3P_4	17.73	7.80	5.94	9.96	3.82	9.70
SEm ±	0.21	0.10	0.07	0.11	0.06	0.11
CD (0.05)	0.62	0.29	0.20	0.31	0.16	0.32

Storage rot (%)

The data suggested that there was significant variation among varieties and planting dates with respect to the storage rot. Among the varieties, least storage rot at 15 and 30 DAH (3.02 and 7.38%) was recorded in the variety CO (On) 5 which was significantly superior to the other varieties and it was followed by CO 6 (3.42 and 7.94%) and maximum storage rot of was recorded in Aca-15 (3.55 and 8.20%). Among different planting dates, 16th November planting recorded the minimum storage rot (3.00 and 6.77%) followed by 1st December planting (3.12 and 7.01%), 15th December planting (3.55 and 8.50%) and maximum storage rot at 15 and 30 DAH was recorded in 1st January planting (3.65 and 9.08%). The interaction effect of varieties and planting time had shown that there is significant variation with respect to PLW at 15 and 30 DAH. The treatment combination of the variety CO (On) 5 with 16th November planting recorded minimum PLW (2.71 and 5.77%) followed by CO 6 with 1st December planting (3.05 and 6.07%). However maximum PLW at 15 and 30 DAH was recorded in Aca-15 with 1st January planting (3.82 and 9.70%). Among the varieties, least Physiological Loss in Weight and storage rot at 15 and 30 DAH was recorded in the variety CO (On) 5 this might be due to the genetic factors and thinner neck of the bulblet which hindered the moisture loss. Among different planting dates, 1st January planting recorded the maximum Physiological Loss in Weight and storage rot at 15 and 30 DAH. This might be due to the delayed planting which leads to increased storage rot and weight loss due to warmer temperatures, higher humidity. Delayed planting also resulted in higher neck thickness of bulbs which may provide congenial micro-climate for fungal growth resulted in greater storage rot. These results are confirmed with the findings of Sharma *et al*. (2024) [8].

Conclusions

The multiplier onion varieties Aca-15 which recorded higher TSS, high ascorbic acid content and CO (On) 5 which demonstrated minimum storage losses and planting during second fortnight of November and First fortnight of December may be recommended for getting quality multiplier onions in Telangana.

References

1. Bharathi CS, Mohan B. Community small onion or multiplier onion (*Allium cepa* var. aggregatum) nursery as a contingency measure for delayed planting in NICRA village of Namakkal district, Tamil Nadu, India. Int J Curr Microbiol App Sci. 2018;7(3):1974-1984.
2. Fritsch RM, Friesen N. Evolution, domestication and taxonomy. In: Allium crop science: recent advances. c2002. p. 5-30.
3. Kaur K, Kaur A, Singh M. Effect of planting time and planting methods on the performance of garlic (*Allium sativum* L.) under Punjab conditions. The Pharma Innovation Journal. 2022;11(9):2431-5.
4. Kumar KS, Bhowmik D, Chiranjib B, Tiwari P. Allium cepa: A traditional medicinal herb and its health benefits. J Chem Pharm Res. 2010;2(1):283-91.
5. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. New Delhi: Tata McGraw-Hill Education Pvt. Ltd.; c1986.
6. Sekara A, Pokluda R, Del VL, Somma S, Caruso G. Interactions among genotype, environment and agronomic practices on production and quality of storage onion (*Allium cepa* L.): A review. Horticult Sci. 2017;44(1):21-42.
7. Shafiq S, Shakir M, Ali Q. Medicinal uses of onion (*Allium cepa* L.): An overview. Life Sci J. 2017;14(6):100-7.
8. Sharma D, Chauhan A, Thakur N. Effects of set size and planting date on yield, quality and shelf life of *kharif* onion under low hill region of Himachal Pradesh. Bangladesh J Bot. 2024;53(1):17-23.
9. Suthanthira Pandian IR, Palanisamy KP, Muthukrishnan CR. CO-3: A high yielding onion variety for Tamil Nadu. Madras Agric J. 1979;66(8):501-11.
10. Thingalmaniyan KS, Rohini N, Arumugam T. Performance evaluation of aggregatum onion genotypes (*Allium cepa* var. aggregatum) for yield, quality and resistance characters. Int J Curr Microbiol App Sci. 2017;6(6):634-42.
11. Thompson HC, Kelly WC. Vegetable crops. New Delhi: McGraw-Hill; c1957. p. 215-25.
12. Upadhyay RK. Nutraceutical, pharmaceutical and therapeutic uses of Allium cepa: A review. Int J Green Pharm. 2016;10(1):46-64.
13. Verma OP, Rathore SVS, Jadav BS. Performance of bulb crop of onion as affected by sowing dates and age of transplants. Progressive Horticulture. 1971;3(2):29-33.