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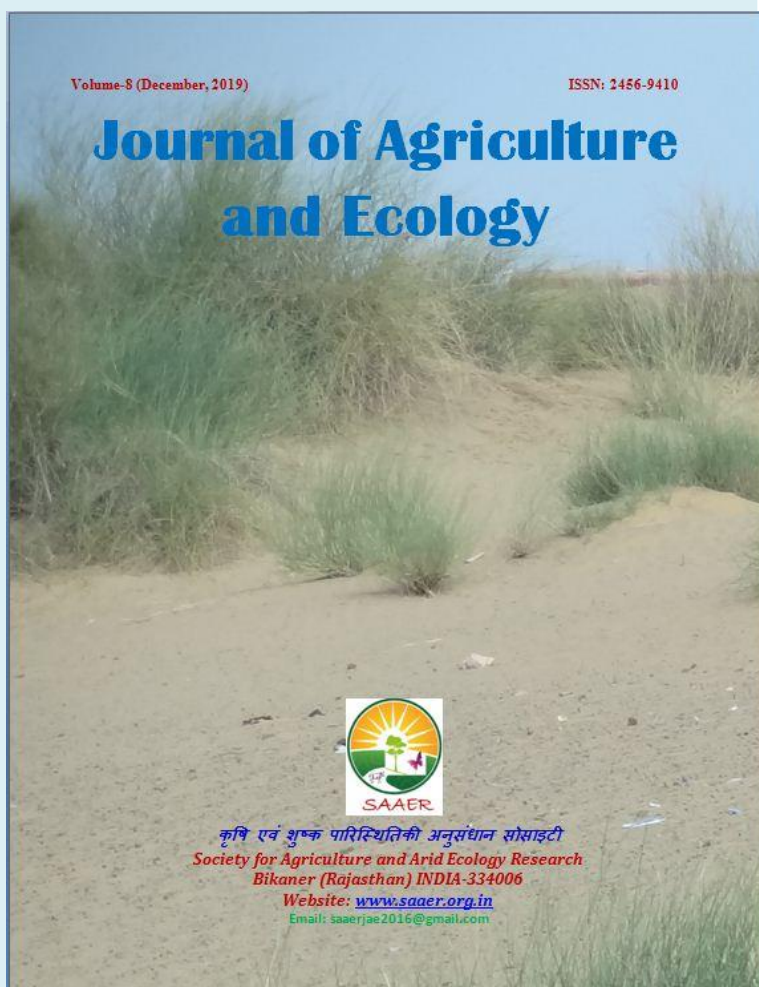
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## Evaluation of aggregatum onion (*Allium cepa* L.var. *aggregatum* Don.) genotypes for yield and quality traits

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### Abstract

Field experiment was conducted with twenty local genotypes of aggregatum onion (*Allium cepa* L.var.*aggregatum* Don.) collected from Tamil Nadu during 2017-2018 at the experimental field of Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam to identify the superior aggregatum onion genotypes for high yield and quality. Among the 20 genotypes evaluated, significant variations were observed for the traits viz., Plant height (cm), leaf length (cm), number of leaves per plant, bulb length (cm), bulb diameter (cm), bulb colour, number of bulbs per clump, fresh weight of bulb (g), dry weight of bulb (g), total soluble solids (°brix), pyruvic acid ( $\mu\text{mol g}^{-1}$ ). On the basis of high *per se* performance the genotype Puttarasal (Aca2) recorded the highest plant height, leaf length, bulb diameter, number of bulbs per clump, dry weight of bulb, total soluble solids, and pyruvic acid content. This genotype could be further carried out for producing high yield and best quality onion variety through further breeding programmes.

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### Introduction

Onion (*Allium cepa* L.) is one of the important vegetable crops of the Alliaceae family. Two types of onions are commercially grown in India. The first type is common onion *Allium cepa* L. and the second type is multiplier onion *Allium cepa* var. *aggregatum* which produces small sized bulbs, many in number; to form an aggregated cluster. Multiplier onion is preferred for their tolerance to pest and diseases and longest storage life than common onion.

(Brewster 2008). The major aggregatum onion growing states of India are Tamil Nadu, Andhra Pradesh and Karnataka. In Tamil Nadu more than 70 per cent of the cultivated area is under small onion. Around 90 percent of country's small onion is produced from Tamil Nadu and 10 per cent from Karnataka. (Visalakshi et al. 2018). The present research was conducted to evaluate the performance of twenty aggregatum onion genotypes collected from different districts of

Tamil Nadu with the objective of identifying high yielding aggregatum onion variety.

### Materials and Methods

Field experiment was conducted in the western farm, Department of vegetable crops, Horticultural college and Research Institute, Periyakulam. The area is located on 10.126' North latitude, 77.58 East longitude and at an altitude of 426.76 m above Mean Sea Level. Twenty aggregatum onion genotypes were collected from various districts in Tamil Nadu. Details of the genotypes are furnished in table 1. These Twenty genotypes were evaluated and studied for their growth, yield and quality performance based on morphological and quality parameters. The genotypes were planted in a randomized block design. The bulbs of each variety were sown on December 2017 and June 2018 in rows at spacing of 20 cm and a plant spacing of 15 cm. Observations were recorded from 5 randomly selected plants of each genotype and in each replication. Morphological characters,

bulb characters and quality parameters were recorded. The statistical parameters like mean, range were calculated as per the standard methods of analysis (Panse & Sukhatme 1957).

### Results and discussion

The pooled analysis data revealed significant variations for yield and quality characters studied during *Rabi* and *Kharif* season. Among the twenty aggregatum onion genotypes studied, the genotypes Puttarasal (Aca2) have recorded highest dry bulb weight (50.15g) in both the seasons. The genotype also recorded higher values for yield contributing characters viz., leaf girth (2.82 cm), bulb diameter (3.54cm) and number of bulbs per clump (3.25) when compared to CO-(On) 5. The genotype CO-(On) 5 has recorded highest number of leaves (32.50) followed by Puttarasal which recorded 29.38 number of leaves per plant. The genotype Mutlur has recorded lowest number of leaves (15.10) (Table 2-7).

**Table 1.** Details of aggregatum onion genotypes collected from different districts of Tamil Nadu

S. No.	Genotypes	Source	Colour of bulb
1.	Kundadam	Dindigul	Dark Red
2.	Puttarasal type	Palladam (Coimbatore)	Pink
3.	Aalandhurai	Aalandhurai (Coimbatore)	Light red
4.	Kedayarumbu	Dindigul	Pink
5.	Ambilikai	Palani (Dindigul)	Dark Red
6.	Ottanchathiram-1	Dindigul	Medium red
7.	Thurayur-1	Thurayur (Trichy)	Dark Red
8.	Thurayur-2	Thurayur (Trichy)	Light red
9.	Thurayur-3	Thurayur (Trichy)	Medium red
10.	Surandai	Tirunelveli	Dark Red
11.	Theni local	Theni	Medium red
12.	Rottupudhur	Theni	Light red
13.	P.N.Patti	Theni	Pink
14.	Aathakovil	Aundipatti (Theni)	Dark Red
15.	Namakkal	Namakkal	Pink

16.	Gnanmedu	Cuddalore	Pink
17.	Mutlur	Cuddalore	Pink
18.	Ottanchathiram-2	Dindigul	Medium red
19.	CO-On (5)	Dindigul	Light red
20.	Alagupatti	Nilakottai (Dindigul)	Dark Red

**Table 2.** Mean Performance of onion genotypes for plant height and leaf length

Genotypes	Plant height (cm)			Leaf length (cm)		
	Season I	Season II	Pooled Mean	Season I	Season II	Pooled Mean
Aca1	36.11	33.40	30.94	32.17	32.81	34.46
Aca2	43.67	40.64	32.95	36.80	34.81	39.24
Aca3	38.67	35.30	30.48	32.89	32.31	35.49
Aca4	37.00	37.74	31.96	34.85	34.44	35.72
Aca5	49.42	36.25	27.99	32.12	30.03	39.73
Aca6	41.25	32.97	30.64	31.81	33.48	37.37
Aca7	44.53	42.13	28.69	35.41	30.47	37.50
Aca8	46.06	43.45	31.95	37.70	33.86	39.96
Aca9	40.23	37.69	30.24	33.97	32.87	36.55
Aca10	39.75	37.24	28.55	32.90	30.48	35.12
Aca11	40.29	37.48	30.81	34.15	32.81	36.55
Aca12	38.75	37.41	31.47	34.44	33.54	36.15
Aca13	32.12	31.97	30.82	31.40	34.02	33.07
Aca14	40.71	37.72	32.80	35.26	35.13	37.92
Aca15	42.65	39.61	29.46	34.53	31.34	37.00
Aca16	39.26	36.26	30.79	33.53	32.84	36.05
Aca17	43.00	39.87	30.25	35.06	32.47	37.74
Aca18	41.36	37.82	31.83	34.83	33.82	37.60
Aca19	35.72	32.86	29.51	31.19	30.84	33.28
Aca20	39.40	36.81	26.02	31.42	28.18	33.79
Mean	40.49	37.23	30.41	33.81	32.53	36.51
SEd	2.44	2.47	1.53	1.03	1.61	1.04
CD (0.05)	5.12	5.18	3.20	1.46	3.38	1.46

**Table 3.** Mean Performance of onion genotypes for number of leaves and leaf girth

Genotypes	Number of leaves			Leaf girth (cm)		
	Season I	Season II	Pooled Mean	Season I	Season II	Pooled Mean
Aca1	24.45	1.72	1.88	1.80	24.80	24.63
Aca2	29.90	2.94	2.70	2.82	28.85	29.38
Aca3	24.95	2.11	2.30	2.21	23.70	24.33
Aca4	26.10	2.38	2.36	2.37	24.85	25.48
Aca5	22.70	2.52	2.25	2.39	23.75	23.23
Aca6	20.60	1.92	2.49	2.21	22.85	21.73
Aca7	29.25	2.35	2.86	2.61	27.40	28.33
Aca8	21.00	2.21	2.32	2.27	23.95	22.48
Aca9	26.50	2.25	2.14	2.20	26.55	26.53
Aca10	21.20	2.22	2.58	2.40	23.55	22.38
Aca11	25.30	2.07	2.73	2.40	26.95	26.13
Aca12	31.25	1.85	2.90	2.38	25.05	28.15
Aca13	21.75	1.85	1.60	1.73	22.90	22.33
Aca14	16.35	2.78	2.55	2.67	20.00	18.18
Aca15	25.20	2.06	2.91	2.49	24.80	25.00
Aca16	22.30	2.25	2.36	2.31	24.30	23.30
Aca17	16.85	2.26	2.67	2.47	15.10	15.98
Aca18	20.70	2.36	2.94	2.65	22.65	21.68
Aca19	36.60	2.03	2.80	2.42	28.40	32.50
Aca20	29.90	2.12	2.31	2.22	25.90	27.90
Mean	24.14	2.21	2.48	2.35	24.32	24.64
SEd	1.5856	0.2731	0.2873	0.1401	1.1266	1.5856
CD (0.05)	3.3191	0.5716	0.6015	0.1982	2.3582	3.3191

**Table 4.** Mean Performance of onion genotypes for bulb length and diameter

Genotypes	Bulb length (cm)			Bulb diameter (cm)		
	Season I	Season II	Pooled Mean	Season I	Season II	Pooled Mean
Aca1	3.22	2.98	3.10	3.03	2.78	2.91
Aca2	3.62	3.42	3.52	3.60	3.48	3.54
Aca3	3.29	2.73	3.01	3.18	2.48	2.83
Aca4	3.19	3.60	3.40	2.72	3.36	3.04
Aca5	3.41	2.70	3.06	3.35	3.19	3.27
Aca6	3.33	2.77	3.05	3.04	3.28	3.16
Aca7	3.40	2.92	3.16	2.80	2.78	2.79
Aca8	3.32	2.35	2.84	3.16	3.11	3.14
Aca9	3.83	3.39	3.61	3.30	3.13	3.22
Aca10	3.64	2.97	3.31	3.34	3.09	3.22
Aca11	3.30	3.20	3.25	3.03	3.01	3.02
Aca12	3.27	2.55	2.91	3.07	2.98	3.03
Aca13	3.55	2.93	3.24	3.40	2.54	2.97
Aca14	3.02	2.26	2.64	3.27	2.85	3.06
Aca15	3.49	3.05	3.27	3.60	2.36	2.88
Aca16	3.38	2.70	3.04	2.96	3.09	3.03
Aca17	2.86	3.03	2.95	3.02	2.07	2.55
Aca18	3.29	2.63	2.96	2.99	2.24	2.62
Aca19	3.41	3.46	3.44	3.23	3.30	3.27
Aca20	3.34	2.91	3.13	3.33	3.21	3.27
Mean	3.36	2.93	3.14	3.17	2.91	3.04
SEd	0.1999	0.2166	0.1079	0.0864	0.2773	0.1047
CD (0.05)	0.4185	0.4535	0.1527	0.1808	0.5804	0.1452

**Table 5.** Mean Performance of onion genotypes for number of bulbs per clump

Genotypes	Number of bulbs per clump		
	Season I	Season II	Pooled Mean
Aca1	2.90	2.90	2.90
Aca2	3.30	3.20	3.25
Aca3	2.60	3.00	2.80
Aca4	3.00	3.20	3.10
Aca5	2.50	2.90	2.70
Aca6	2.70	2.90	2.80
Aca7	2.80	2.70	2.75
Aca8	2.50	2.90	2.70
Aca9	2.50	2.60	2.55
Aca10	2.90	3.00	2.95
Aca11	2.60	2.80	2.70
Aca12	2.80	2.90	2.85
Aca13	2.60	2.90	2.75
Aca14	2.30	3.00	2.65
Aca15	2.90	3.00	2.95
Aca16	2.50	2.90	2.70
Aca17	2.70	2.80	2.75
Aca18	2.80	3.00	2.90
Aca19	3.00	3.20	3.10
Aca20	2.90	2.80	2.85
Mean	2.74	2.93	2.84
SEd	0.2072	0.1686	0.0945
CD (0.05)	0.4338	0.3529	0.1336

**Table 6.** Mean Performance of onion genotypes for fresh and dry weight

Genotypes	Fresh weight (g)			Dry weight (g)		
	Season I	Season II	Pooled Mean	Season I	Season II	Pooled Mean
Aca1	62.11	71.19	66.65	39.30	42.65	40.98



Aca2	85.05	61.25	73.15	57.10	43.20	50.15
Aca3	72.66	46.00	59.33	42.90	29.95	36.43
Aca4	67.42	62.81	65.12	47.30	38.65	42.98
Aca5	60.46	46.94	53.70	36.50	37.70	37.10
Aca6	52.56	49.69	51.13	37.40	40.40	38.90
Aca7	43.66	47.69	45.68	32.70	36.65	34.68
Aca8	39.86	51.69	45.84	29.70	34.75	35.23
Aca9	88.78	47.19	67.98	35.70	35.00	35.35
Aca10	70.84	47.00	59.00	33.90	34.70	34.30
Aca11	101.60	44.00	72.80	32.10	30.80	31.45
Aca12	68.77	55.31	62.16	35.20	29.75	32.48
Aca13	86.04	60.50	73.25	34.00	43.20	38.60
Aca14	56.35	53.44	54.72	37.90	40.95	39.43
Aca15	56.90	53.38	55.14	34.60	33.65	34.13
Aca16	52.61	43.00	47.80	30.25	35.20	32.73
Aca17	75.96	37.50	56.73	33.50	28.70	31.10
Aca18	48.93	41.88	45.40	37.70	30.28	33.99
Aca19	65.17	86.50	75.83	60.20	45.15	49.93
Aca20	49.68	47.88	48.78	39.00	37.90	38.45
Mean	65.28	52.74	59.01	38.35	36.46	37.42
SEd	0.0108	0.0090	0.0050	0.0027	0.0013	0.0011
CD (0.05)	0.0226	0.0189	0.0070	0.0057	0.0028	0.0015

**Table 7.** Mean Performance of onion genotypes for biochemical analysis

Genotypes	Total Soluble Solids (°Brix)			Pyruvic acid ( $\mu$ mol g <sup>-1</sup> )		
	Season I	Season II	Pooled Mean	Season I	Season II	Pooled Mean
Aca1	10.46	10.04	10.88	2.28	2.08	2.18
Aca2	17.88	18.54	17.21	2.69	2.57	2.63





Aca3	11.87	11.69	12.04	2.20	2.26	2.23
Aca4	10.67	10.44	10.89	2.69	2.55	2.62
Aca5	11.45	11.81	11.08	2.22	2.42	2.32
Aca6	16.90	17.04	16.75	2.27	2.45	2.36
Aca7	8.92	9.47	8.36	2.68	2.41	2.55
Aca8	11.00	10.94	11.06	2.58	2.50	2.54
Aca9	15.00	15.99	14.00	2.29	2.21	2.25
Aca10	12.27	13.14	11.39	2.49	2.37	2.43
Aca11	12.67	13.32	12.01	2.28	2.39	2.34
Aca12	10.23	9.25	11.20	2.47	2.57	2.52
Aca13	10.75	10.75	10.74	2.48	2.28	2.38
Aca14	15.64	16.20	15.07	2.53	2.38	2.46
Aca15	17.45	17.50	17.39	2.50	2.42	2.46
Aca16	15.37	15.99	14.74	2.21	2.53	2.37
Aca17	12.20	12.18	12.22	2.50	2.38	2.44
Aca18	12.51	12.87	12.15	2.41	2.34	2.38
Aca19	15.35	15.97	14.73	2.59	2.31	2.45
Aca20	13.23	12.73	13.72	2.40	2.49	2.45
Mean	13.08	13.29	12.88	2.44	2.39	2.41
SEd	0.44	0.67	1.07	0.10	0.11	0.05
CD (0.05)	0.63	1.41	2.25	0.21	0.23	0.08

The variation in number of leaves per plant was mainly due to genetic makeup of the plant and due to difference in cultivar as reported by Boukary et al. (2012) and Dwivedi et al. (2012). Quality parameters viz., Pyruvic acid and Total soluble solids were also found to be high in the genotypes collected from Puttarasal. High amount of pungency in fresh onion is also considered as an important criterion for dehydration (Singh et al.1984; Vinodhini et al. 2019). The higher

TSS value in this genotype may be due to its inherent characteristics as reported by Thingalmaniyan et al. (2017). Based on the present results, it can be concluded that the onion genotypes can be easily differentiated due to their distinctive morphological characters and their performance under local climatic condition as reported by Thingalmaniyan et al. (2017). The local genotype collected from Puttarasal performed well when compared to other genotypes. This



is associated with highest plant height, leaf girth, bulb diameter and maximum number of bulbs per clump. Hence, further investigation on growth and yield performance of this genotype can be carried out for future studies.

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