Journal of Plant Biota

Original Research Article
ISSN: 3048-4863
Journal homepage: https://plant.researchfloor.org/

Performance evaluation of aggregatum onion genotypes (*Allium cepa var.aggregatum*) for yield and quality under Coimbatore conditions in Tamil Nadu

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Abstract

Aggregatum onion (Allium cepa var. aggregatum) is mainly grown in Tamil Nadu, Andhra Pradesh and Karnataka. In TamilNadu it is cultivated in an area of 30,000 ha. It is well known for its use in sambar preparation, an important South Indian dish. It has demand in the international market due to its unique taste and flavor. The bulbs are produced in clusters and are smaller in size compared to the bellary onion. The present study was conducted at the College Orchard of the Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2021-2022. A total of 65 genotypes maintained at the Department of Vegetable Science were evaluated for yield, quality parameters, and disease index. Observations were recorded on Average bulb weight (g),Total Soluble Solids (%),Total Yield (t/ha),thrips damage(%), leaf spot (PDI) and Stemphyllium blight (PDI).Among the different genotypes evaluated for the performance of aggregatum onion, significant differences were observed for all the traits studied. Average bulb weight was the highest in the genotype, Agg-Sel-1 with 66.2g followed by Agg-Sel-3 with 64.4g.The genotypes, Agg 1522 and Agg 1692 recorded a total yield of 17.4t/ha which was higher than all other genotypes. The highest percent of Total Soluble Solids (15.3) was recorded in Agg1552 followed by Agg 1535 with 15.2% and Agg-Sel-4 with 15.0%.The genotypes evaluated also showed significant differences for disease scoring. The lowest percent of thrips (12.5) was observed in Agg 1528, the lowest leaf spot incidence was observed in Agg1532 with 11.5 and the lowest incidence of Stemphyllium blight was recorded in Agg-Sel-2 with 3.7.The genotypes showing better performance can be utilized for further breeding programmes.

Keywords: *Aggregatum onion- evaluation of genotypes-yield-quality-Disease index*

1. Introduction

Aggregatum group includes shallots and potato onions and are referred to as multiplier onions. The bulbs are smaller than those of common onions, and a single plant forms an aggregate cluster of several bulbs from a central bulb. They are propagated commercially from daughter bulbs, and varieties which set seeds under TamilNadu conditions are propagated through seeds. Shallots are the most important subgroup within this group and comprise the only cultivars cultivated commercially. They form aggregate clusters of small, narrowly ovoid to pear-shaped bulbs. Potato onions differ from shallots in forming larger bulbs with fewer bulbs per cluster, and having a flattened (onion-like) shape. Intermediate forms exist [5].

Diversity in plant genetic resources offers plant breeders the opportunity to develop novel and better cultivars with desirable characteristics, which include both farmer-preferred traits like yield potential and larger bulbs and breeder-preferred traits which include pest and disease resistance and photosensitivity [6]. The conservation of germplasm is necessary for maintaining genetic diversity, studying local genetic material and under-utilized species, and to choose species suitable for developing newer varieties [3]. No country in the world is self-sufficient in germplasm to fulfill its food requirements. Many countries predominantly depend on nonindigenous crops and imported germplasm for food and agricultural development [4]. Aggregatum onion (*Allium cepa* var. *aggregatum*) is mainly grown in Tamil Nadu, Andhra Pradesh and Karnataka. In TamilNadu it is cultivated in an area of 30,000 ha. It is well known for its use in sambar preparation, an important South Indian dish. It has demand in the international market due to its unique taste and flavor. Inorder to identify genotypes which perform better in terms of quality and yield, this study has been undertaken to evaluate the performance of genotypes available.

2. Materials and Methods

The present study was conducted at the College Orchard of the Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2021-2022. A total of 65 genotypes maintained at the Department of Vegetable Science were evaluated for yield, quality parameters, and disease index. (Table.1) The experiment was laid in randomized block design with two replications. The package of practices as recommended by the crop production guide of TamilNadu was followed. Observations were recorded on Average bulb weight (g), Total Soluble Solids (%), Total Yield (t/ha),thrips damage(%), leaf spot (PDI) and Stemphyllium blight (PDI). Ten plants were randomly selected from each plot for recording data

17 March 2025: Received | 16 April 2025: Revised | 12 May 2025: Accepted | 14 June 2025: Available Online

Citation: Usha Nandhini Devi Harinarayanan and Pugalendhi Lakshmanan (2025). Performance evaluation of aggregatum onion genotypes (*Allium cepa var.aggregatum*) for yield and quality under Coimbatore conditions in Tamil Nadu. *Journal of Plant Biota.* **143 to 146. DOI: https://doi.org/10.51470/JPB.2025.4.1.143**

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and the average was calculated. After curing, the total bulb fresh weight was measured for each plot. The total soluble solids (TSS) content of bulbs were recorded by hand refractometer. The disease (leaf spot and Stemphyllium blight) severity of onion was scored by following 0-5 scale, as described by [8]. The details of scales are as follows: 0-no disease symptoms, 1- a few spots towards tip covering 10% leaf area, 2- several dark purplish brown patch covering up to 20% leaf area, 3- several patches with paler outer zone covering up to 40% leaf area, 4- leaf streaks covering up to 75% leaf area or breaking of the leaves from center and 5- complete drying of the leaves or breaking of the leaves from the centre. Likewise, thrips infestation was also rated by following 0-5 scale. Observations were made at the first appearance of disease symptoms/thrips on plants, till the harvest at weekly intervals. Color of bulbs were identified by visual assessment method.

Table 1. Genotypes used

Agg 1512	Agg1522	Agg1532	Agg1542	Agg1552	Agg-Sel-14	Agg-Sel-38
Agg1513	Agg1523	Agg1533	Agg1543	Agg1690	Agg-Sel-22	Agg-Sel-39
Agg1514	Agg1524	Agg1534	Agg1544	Agg1691	Agg-Sel-23	Agg-Sel-40
Agg1515	Agg1525	Agg1535	Agg1545	Agg1692	Agg-Sel-27	Agg-Sel-42
Agg1516	Agg1526	Agg1536	Agg1546	Agg-Sel-1	Agg-Sel-29	Agg-Sel-43
Agg1517	Agg1527	Agg1537	Agg1547	Agg-Sel-2	Agg-Sel-30	
Agg1518	Agg1528	Agg1538	Agg1548	Agg-Sel-3	Agg-Sel-31	
Agg1519	Agg1529	Agg1539	Agg1549	Agg-Sel-4	Agg-Sel-32	
Agg1520	Agg1530	Agg1540	Agg1550	Agg-Sel-8	Agg-Sel-36	
Agg1521	Agg1531	Agg1541	Agg1551	Agg-Sel-12	Agg-Sel-37	

3.Results and Discussion

The genotypes used in the study exhibited a wide range of differences in the parameters measured. The observations recorded are given in Table 2.

Table 2. Performance of Multiplier onion genotypes under Coimbatore condition

Genotype	Average bulb weight (g)	TSS (%)	Bulb colour	Total yield (t/ha)	Thrips damage (%)	Leaf spot (PDI)	Stemphyllium Blight (PDI)
Agg 1512	55.2	11.3	Pink	17.6	23.2	18.3	5.5
Agg1513	50.5	11.2	Pink	13.5	22.5	15.2	5.2
Agg1514	53.5	11.4	Pink	12.0	27.4	17.1	5.8
Agg1515	55.0	11.0	Pink	16.3	29.9	18.9	4.1
Agg1516	45.6	11.2	Pink	14.3	27.9	19.0	4.3
Agg1517	44.2	12.8	Pink	11.9	35.1	23.0	4.7
Agg1518	47.2	12.9	Pink	15.0	27.1	20.0	4.8
Agg1519	33.2	12.7	Pink	13.9	21.8	18.3	4.2
Agg1520	52.0	13.5	Pink	12.7	30.5	17.2	5.0
Agg1521	58.2	11.0	Pink	13.9	23.2	12.0	5.6
Agg1522	59.2	13.3	Pink	17.4	18.9	13.3	4.7
Agg1523	42.9	12.5	Pink	10.5	16.2	16.5	4.4
Agg1524	44.6	12.3	Pink	12.3	20.5	17.9	4.8
Agg1525	44.6	13.6	Pink	13.3	27.9	16.8	5.2
Agg1526	42.5	14.6	Pink	12.9	31.6	24.0	5.1
Agg1527	46.5	12.5	Pink	13.9	23.2	20.0	4.2
Agg1528	59.2	13.2	Pink	14.5	12.5	16.9	4.6
Agg1529	51.2	13.1	Pink	15.0	23.5	14.2	4.7
Agg1530	60.1	11.9	Pink	15.2	18.4	14.9	4.1
Agg1531	62.4	12.0	Pink	12.9	17.8	13.2	3.3
Agg1532	60.5	12.2	Pink	13.4	15.6	11.5	4.4
Agg1533	61.6	12.9	Pink	14.9	18.9	14.2	3.6
Agg1534	56.5	14.0	Pink	16.3	16.1	13.2	5.2
Agg1535	51.7	15.2	Pink	13.9	21.8	14.9	5.6
Agg1536	51.5	14.8	Pink	12.4	23.5	18.3	5.5
Agg1537	58.2	10.2	Pink	16.4	23.5	17..4	5.8
Agg1538	51.5	11.7	Pink	15.4	22.1	18.3	5.4
Agg1539	55.5	11.5	Pink	14.5	22.3	16.5	5.1
Agg1540	56.5	10.7	Pink	14.9	23.5	14.9	6.3
Agg1541	49.8	12.5	Pink	16.5	22.3	17.9	3.5
Agg1542	48.0	11.6	Pink	14.7	28.3	18.0	5.0
Agg1543	51.2	14.8	Pink	15.4	30.2	25.1	5.2
Agg1544	53.0	14.6	Pink	14.6	28.2	20.3	4.7
Agg1545	52.5	14.5	Pink	14.9	19.3	18.2	4.8
Agg1546	62.0	13.8	Pink	15.3	20.9	15.3	5.2
Agg1547	60.5	12.8	Pink	16.1	21.2	12.3	5.9
Agg1548	45.2	7.5	Pink	15.5	18.2	16.5	5.3
Agg1549	47.2	10.9	Pink	15.7	28.2	18.9	5.1

Agg1550	47.3	14.0	Pink	15.4	18.5	20.2	4.9
Agg1551	44.1	10.1	Pink	15.2	24.3	15.2	5.4
Agg1552	47.6	15.3	Pink	15.3	22.4	23.3	5.5
Agg1690	63.4	13.2	Pink	15.4	32.1	20.2	4.6
Agg1691	54.2	13.0	Pink	16.3	28.2	18.2	5.2
Agg1692	62.2	13.4	Pink	17.4	15.8	14.3	5.4
Agg-Sel-1	66.2	13.9	Pink	16.4	22.7	15.2	4.4
Agg-Sel-2	62.5	11.0	Pink	16.5	16.5	13.5	3.7
Agg-Sel-3	64.4	12.1	Pink	15.9	19.4	12.2	4.7
Agg-Sel-4	62.0	15.0	Pink	15.4	17.3	14.8	4.2
Agg-Sel-8	52.5	13.2	Pink	16.4	18.7	14.3	5.1
Agg-Sel-12	53.2	10.4	Pink	13.9	16.9	15.3	5.6
Agg-Sel-14	48.0	13.2	Pink	15.3	18.1	18.2	5.5
Agg-Sel-22	53.2	10.7	Pink	14.7	23.5	17.1	5.3
Agg-Sel-23	56.5	11.9	Pink	17.8	22.1	14.4	4.4
Agg-Sel-27	55.1	13.8	Pink	15.4	18.7	13.1	4.6
Agg-Sel-29	63.6	14.8	Pink	16.3	14.2	14.4	5.3
Agg-Sel-30	63.4	14.0	Pink	16.2	17.3	18.5	5.2
Agg-Sel-31	44.5	13.9	Pink	16.7	20.9	33.4	5.1
Agg-Sel-32	46.3	13.7	Pink	13.9	23.5	23.0	5.5
Agg-Sel-36	46.2	12.8	Pink	16.7	23.4	17.9	6.0
Agg-Sel-37	47.9	13.0	Pink	15.9	23.5	15.2	5.8
Agg-Sel-38	48.3	13.1	Pink	14.7	28.2	18.2	4.1
Agg-Sel-39	62.2	12.9	Pink	14.9	28.1	18.2	4.8
Agg-Sel-40	44.3	13.2	Pink	17.38	24.7	16.5	4.3
Agg-Sel-42	40.6	12.8	Pink	12.70	22.1	14.8	5.1
Agg-Sel-43	61.9	12.4	Pink	6.80	19.3	16.6	5.4

3.1. Bulb weight

There were significant differences in bulb weight among the different genotypes (Table 2). The heaviest bulb weight (66.2g) was observed in the genotype Agg-Sel-1 followed by Agg-Sel-3 with 64.4g. The lightest individual bulb (33.2 g) was observed in Agg-1519. The difference in bulb weight could be attributed to the genetic potential of the different genotypes. The results of the present study confirms with the findings of [9].

3.2.Total soluble solid content

The total soluble solids (TSS) content differed significantly among the different genotypes. The highest percent of Total Soluble Solids (15.3) was recorded in Agg1552 followed by Agg 1535 with 15.2% and Agg-Sel-4 with 15.0%. The lowest TSS content (7.0%) was observed in Agg-1548. The variation in TSS content among the genotypes might be attributed to differences in the genetic potential of the genotypes used in the study. This is following the results of [1].

3.3.Yield

The genotypes expressed significant variation in yield per hectare. The genotypes, Agg 1522 and Agg 1692 recorded a total yield of 17.4t/ha which was higher than all other genotypes. The lowest yield per hectare (6.80t/ha) was observed in Agg-Sel-43 followed by Agg 1523 with 10.5t/ha. The superior performance of the genotypes could be due to their higher individual bulb weight. Similar results have been obtained by [2,7,10].

3.4.Skin and flesh colour of the bulb

The result of color measurement revealed that there was not much variation in the skin colour of the bulbs among the different genotypes evaluated.

3.5.Disease incidence and thrips infestation

The genotypes evaluated also showed significant differences for disease scoring.

The lowest percent of thrips (12.5) was observed in Agg 1528, the lowest leaf spot incidence was observed in Agg1532 with 11.5 and the lowest incidence of Stemphyllium blight was recorded in Agg-Sel-2 with 3.7.The apparent cause of the variation in disease severity and pest infestation expressed by the different genotypes might have been due to their genetic potential.

4.Conclusion

Based on the present study it can be concluded that the genotypes, Agg-Sel-1, Agg-Sel-3 Agg 1522, and Agg 1692 recorded higher yield compared to other genotypes and the genotypes, Agg 1528, Agg1532 and Agg-Sel-2 showed lesser disease incidence and pest infestation. Hence these genotypes showing better performance can be utilized for further breeding programmes.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Declaration of generative AI and AI-assisted technologies in the writing process.

The authors declare that they have not used AI tools in the writing process.

Author contribution

Usha Nandhini Devi Harinarayanan - performed the experiment, interpretation of results, manuscript preparation
Pugalendhi Lakshmanan – conception, supervision, Project administration, and Fund acquisition

Acknowledgement

The authors greatly acknowledge the Directorate of Onion and Garlic, Rajagurunagar, Pune, Maharashtra for providing funds to undertake this study.

References

1. Arya, J. S.; N. Singh; P. S. and A. Kant. 2017. Morphological variations and relationship among onion germplasm for quantitative and qualitative traits at trans-Himalaya Ladakh, India. Australian J. Crop Sci., 11(3):329-337.

2. Dwivedi, Y. C.; S. S. Kushwah and S. K. Sengupta. 2012. Evaluation of onion varieties for growth, yield and quality traits under agro-climatic conditions of Kymore Plateau region of Madhya Pradesh, India. Agril. Digest, 32(4):326-328.

3. Finetto, G. A. 2001. The importance of germplasm preservation and use for temperature zone fruit production in the tropics and sub-tropics. Acta Hortic., 565:25-32. NAAR, October 2022, Volume 5, Issue 10, 54-69 68 of 69

4. Flower, C.; M. Smale and S. Gaiji. 2000. Germplasm flows between developing countries and the CGIAR: an initial assessment. In: Strengthening Partnerships in Agril. Res. for Dev. in the Context of Globalisation. Proceedings of the GFAR-2000 Conference, 21 -23 May 2000, Dresden, Germany. GFAR/IPGRI, Rome, Italy, pp.86-105.

5. Fritsch, Reinhard M.; Friesen, Nikolai (2002). "Chapter 1: Evolution, Domestication, and Taxonomy". In Rabinowitch, Haim D.; Currah, Lesley (eds.). *Allium Crop Science: Recent Advances*. Wallingford, UK: CABI Publishing. doi:10.1079/9780851995106.0005

6. Govindaraj, M.; M. Vetriventhan and M. Srinivasan. 2015. Importance of genetic diversity assessment in crop plants and its recent advances: An overview of its analytical perspectives. Genetics Res. International, Hindawi Publishing Corporation, UK, 2015:1-14.

7. Lancaster, J. E.; E. P. McCartney; W. A. Jermyn and J. V. Johnstone. 1995. Identification of onion cultivars for commercial production in Canterbury, New Zealand. New Zealand J. Crop and Hort. Sci., 23:299-306.

8. Sharma, S. R. 1986. Effect of fungicidal sprays on purple blotch and bulb yield of onion. Indian Phytopath, 39(1):78-82.

9. Sirajo, S. A. and O. A. T. Namo. 2019.Morphogenetic studies of some genotypes of onion In Jos, Nigeria. Sustainable Agric. Res., 8(1):33-40.

10. Walle, T.; N. Dechassa and W/T. Kebede. 2018. Yield and yield components of onion cultivars as influenced by population density at Bir Sheleko, North-Western Ethiopia. Academic Res. J. Agril. Sci. and Res., 6(3):172-192