

Anbukkarasi V

Department of Vegetable Science
Horticultural College and Research
Institute
Tamil Nadu Agricultural University
Coimbatore
India

Dhandapani M

Tamil Nadu Rice Research Institute
Aduthurai, Tamil Nadu
India

Prabhu M

Department of Vegetable Science
Horticultural College and Research
Institute
Tamil Nadu Agricultural University
Coimbatore
India

Pugalendhi L

Department of Vegetable Science
Horticultural College and Research
Institute
Tamil Nadu Agricultural University
Coimbatore
India

Corresponding Author

Prabhu M

muthusamyprabhu@gmail.com

Published: October 31, 2022

Breeding for Organic Responsiveness in Aggregatum Onion (*Allium cepa* var. aggregatum)

Selection platforms for organic responsiveness need to be created by following incorporation of crop residues and allowing them to decomposition by application of crop waste decomposers or cow dung slurry mixed with cow urine (fermented form). The selected field plot should be analysed for available nutrients, microbial load and other chemical parameters initially. Soil physical, chemical and biological properties needed to be normalized before taking up the breeding programmes. Germplasm lines should be screened under organic responsive field plots created and extreme types should be identified followed by crossing, generation of segregating populations and fixing the selection parameters based on the breeding objectives.

INTRODUCTION

Small onion or aggregatum is cultivated in an area of 7.56 lakh ha with annual production of 12.16 mT with productivity of 16 tonnes per ha. In Tamil Nadu, the most important state cultivates in an area of 22000 ha with productivity levels of 12t/ha (Anon., 2018). Aggregatum or multiplier onion is an important culinary vegetable used as seasoning agent in both meat and vegetable based cooking dishes. It is rich in flavonoids, phenols, Vitamin C and other antioxidants and it is one of the important therapeutic and curative vegetables being consumed. Anti-oxidants and nutraceutical compounds have an important role in anti-cholesterol which reduces the heart related ailments and anticancer by preventing the tumours (Upadhyay, 2016). Due to its

importance in medicinal properties related to boosting innate immunity, consumption is gaining a lot of momentum under the pretext of COVID-19 and other viruses.

SCOPE OF ORGANIC RESPONSIVE ONION DEVELOPMENT THROUGH BREEDING

1. Onion is highly susceptible to *Fusarium* rot complexes which cause severe economic losses and increase the cost of cultivation. Chemical control is most of the time ineffective, as the disease incidence coincides with heavy downpour during North West monsoon season. Innate beneficial microbiome association in the rhizosphere can induce systemic acquired resistance against rot and wilt complexes, as there are no genetic sources of resistance available. (Ramesh *et al.*, 2011).
2. Consumer preference towards consumption and purchase of organically grown onions with premium price.
3. Small onion is inherently responsive to microbiome association, but because of the cost of cultivation of organic practices, farmers are forced to sell it at premium prices and low income group population unable to buy the organically grown onion.
4. Higher fertilizers cost, chemical input costs are a burden for the small farmers who cultivate onions in smaller scales. Price fluctuations also cause uncertainty in realizing assured income.
5. Onion varieties with organic responsiveness will be able to mobilize unavailable nutrients from soil which are present in fixed form as insoluble complexes under regular organic practices (Phosphorous, zinc, iron and other micro nutrients). Nitrogen fixing organisms with associative symbiosis will be mobilizing atmospheric nitrogen to ionic forms to be used in onion growth and development.
6. Organic responsive onions with higher levels of microbiome association will also have abiotic stresses tolerance *viz.*, drought, and salinity

STRATEGIES OF ORGANIC RESPONSIVE ONION DEVELOPMENT THROUGH BREEDING

Creation of organic responsive platform in the field plots

Soil fertility parameters should be analysed for chemical and biological properties by standard analytical methods. Multi green manure crops with mixture of legumes, and millets should be sown and incorporated through ploughing. The practice should be continued for two more seasons and the biological and chemical parameters should be analysed. Raised beds should be prepared with organic mulches and the mulches should be decomposed with spraying bio decomposers. Breeding trials should be conducted on this platform for stability and adaptations to organic cultivation practices.

Screening germplasm lines for organic responsiveness

Germplasm lines consists of popular varieties, exotic collections, pipeline cultures should be raised in the raised beds which were previously described as platforms. Efficient and inefficient lines should be identified based on the yield evaluation parameters followed by tolerance to diseases, abiotic stresses and quality parameters.

Effecting poly-crosses for improving the populations towards organic responsiveness

Efficient and inefficient types identified from the screening procedures will be allowed to open pollinate by inducing flowering under natural conditions. Seeds from all the parents will be raised in organic raised beds for evaluation. Populations will be reconstituted by the yield evaluation, biotic and abiotic tolerance levels followed by quality traits. Better performing populations with parental combinations will be promoted for varietal release.

CONCLUSION

Development of organic responsiveness in small onions is an easier process than any other crops. Analysis of root exudates, microbiome association and transcriptomics are not necessary to fix the organic responsiveness in onions. Procedure is simple yet very effective. It does not involve higher expenditures. The above mentioned strategies will be highly useful to develop organic responsive onions for yield stability and sustainable use of soil resources.

REFERENCES

Anonymous, 2018. Horticultural Statistics at a Glance 2018. Horticulture Statistics Division Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers' Welfare, Government of India,

Ramesh, K., A. S. Rao and A. B. Singh, 2011. Production of onion and garlic under organic farming. In: National symposium on Alliums: Current scenario and emerging trends at Pune, Volume 1.

Upadhyay, Ravi. (2016). Nutraceutical, pharmaceutical and therapeutic uses of *Allium cepa*: A review. *International Journal of Green Pharmacy*. 10. 46-64.