



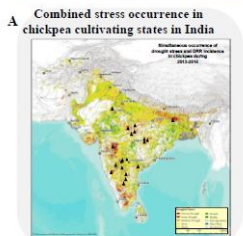
## Effect of drought stress on the severity of *Rhizoctonia bataticola* infection in chickpea

Vadivelmugan Irulappan and Muthappa Senthil-Kumar, National Institute of Plant Genome Research, New Delhi- 110067, Email: vadivelm@nipgr.ac.in and skmuthappa@nipgr.ac.in

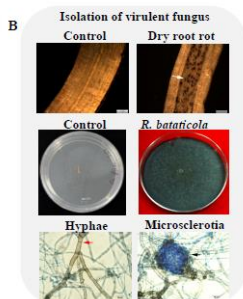


### Abstract:

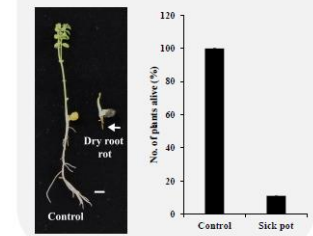
Chickpea is a cool season crop cultivated during Rabi season wherein it experiences yield limiting combined drought stress and dry root rot disease (caused by *Rhizoctonia bataticola*). A map showing combined stress occurrence in major chickpea growing regions (Madhya Pradesh, Karnataka, Maharashtra, Andhra Pradesh, and Telangana state) in India was developed and it showed the economic significance of this stress combination. A protocol to impose combined drought and *R. bataticola* infection on chickpea in a controlled condition was established in the lab to investigate the plant response and infection. Drought stress was imposed gravimetrically, and 35% field capacity was considered as severe drought stress, and the sick pot was employed to impose pathogen alone stress and combined stress. In the pot experiment, the severity of *R. bataticola* infection was aggravated under drought stress whereas well-irrigated condition did not intensify the infection. This study concluded that drought stress intensified the severity of *R. bataticola* infection under combined stress.



Dry root rot disease was prevalent in regions where drought stress was discernible



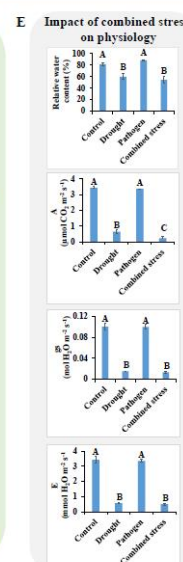
*R. bataticola* isolated from DRR infected plant was used in the further study



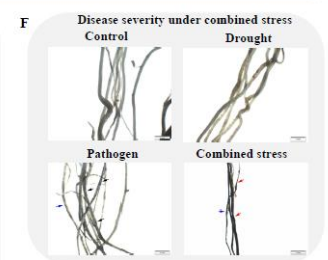
Sick pot was prepared to impose natural *R. bataticola* infection on chickpea and pathogenicity was analysed using DRR susceptible genotype



Control, drought, pathogen and combined stress were imposed on plants. Drought stress was imposed gravimetrically and pathogen and combined stress were imposed using sick pot



Combined stress had significant negative impact on RWCC and gas exchange parameters



Plants under combined stress lost more no. of lateral roots as compared to pathogen and drought stress.

### Results

- Virulence of isolated *R. bataticola* was confirmed with 90% plant death on sick pot
- Plant experiences greater reduction in growth under combined stress
- *R. bataticola* infection was intensified under drought stress as compared to well-irrigated condition
- Reduction in photosynthetic rate, stomatal conductance and transpiration rate was higher in plants under combined stress
- Loss in lateral roots was observed only in combined stress treated plants

### Conclusion

*R. bataticola* infection and its severity is determined by the drought stress in chickpea

### Acknowledgement

This work was supported by the core funding from the National Institute of Plant Genome Research and VI acknowledges the DBT-SRF (DBT/2015/NIPGR/430) for the doctoral programme.

### Reference

- Sinha, K., Irulappan, V et al. (2019). Scientific reports, 9(1), 5577.
- Srinivas, P. (2016). Doctoral dissertation, Professor Jayashankar Telangana State Agricultural University.
- Wagh, P. (2015). Doctoral dissertation, Indira Gandhi Krishi Vikas Vidyapeeth, Raipur. <http://dx.doi.org/10.1007/978-81-322-2222-2>

### Speculation

Going by the disease triangle, the dry root rot disease occurrence will be more prominent in the future as there is a drop in annual rainfall due to climate change. We speculate that changes in defense structures at root due to co-occurring drought stress in combined stress treatment might have predisposed the plants to severe disease.