

PROJECT TITLE

Responses of 'Dalle' chili (*Capsicum chinense* Jacq.) to drought and heat stress

CONSORTIUM

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SUMMARY OF THE REPORT

Capsicum annuum L. var. *cerasiforme*, a member of the *Solanaceae* family, is worldwide popular for its spicy fruits. The local landraces of *C. annuum* L. in Nepal are known as 'Dalle'. Recently, germplasm collection and screening activity for variety improvement of 'Dalle' chili has been initiated. The tolerance of 'Dalle' to dry weather has been reported in a few grey publications. It has been grown from plain to high hills for hot fruits. This genetic diversity of *C. annuum* has expanded up to North East Himalayan regions which are considered as one of the major repositories of cultivated species of *Capsicum*. 'Dalle' is one of the traditionally cultivated *annuum* genotypes and gaining popularity in national and international markets. Due to its diversity and socio-economic importance, a scientific study for stress-tolerant genotype screening is imperative. However, little is known about this crop especially on the processes responsible for acclimation and adaptation to drought and heat stress. Therefore, it would be interesting to observe the physiological responses of 'Dalle' to the aftermath of heat and drought. In this background, this transnational access project 'Dalle-Pheno' aimed at combining deep phenotyping with the analysis of physiological and agronomical parameters to select the best performing 'Dalle' genotype(s) under high temperature and water limiting environments for improved yield.

The 'Dalle' chili accessions collected and maintained at the Gene Bank of Nepal were used in a preliminary screening trial in Nepal to select top-performing genotypes under drought stress growing environments. From the trial, nine different genotypes were used for the study at Dynapheno, Aarhus University for further observations of the effects of drought and heat stresses on photosynthesis, stomatal conductance, leaf parameters, floral traits, dry matter production, and yield. The proposed experimental setup comprised a top-down approach, studying a variety of landraces for (combined) drought and heat responses in controlled conditions, with detailed physiological properties on a subset of contrasting genotypes up to field validation trials. The validation trial has to be set up the early next year 2022. After observing the data, we could summarize that the 'Dalle-Pheno' has been successful in segregating the genotypes based on their responses to thermal stress and water limiting conditions. In the end, the physiological mechanisms of stress response and adaptation of Dalle chili will be discussed. These insights will be valuable for developing drought and heat tolerance strategies for improved yield of 'Dalle'.