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Research article

Open top chamber: an innovative screening technique for temperature stress tolerance of morpho-physiological and fodder yield traits in forage cowpea varieties

S.N. Dheeravathu[1*], Prabha Singh[1], Srinivasan R.[1], Anup Kumar[1], Dibyendu Deb[2], Thulasi Bai Vadithe[3] and V.K. Yadav[1]

[1]ICAR-Indian Grassland and Fodder Research Institute, Jhansi-284003, India
[2]ICAR-Indian Agricultural Research Institute, Gogamukh-787034, India
[3]Acharya Nagarjuna University, Guntur-522510, India
*Corresponding author e-mail: sevanayak2005@gmail.com

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Abstract

A proper screening technique was needed to identify fodder crops with high green fodder yield suitable for elevated temperature. Accordingly, the changes in morpho-physiological characteristics and green fodder yield of forage cowpea [*Vigna unguiculata* (L.) Walp.] varieties (Kohinoor, BL-1, BL-2, BL-4 and EC-4216), were investigated under ambient as well as elevated (2 °C higher than ambient) temperatures at vegetative to maturity stage in open-top chambers. Elevated temperature decreased plant height, leaf length, leaf width, shoot fresh weight, leaf fresh and dry weights. Leaf length reduction (15.89 to 23.81%) was more than leaf width reduction (8.57 to 11.67%) and the highest leaf fresh weight reduction was recorded as (28.6%). Highest shoot dry weight reduction was observed in variety BL-2 (22%) followed by BL-4 (21%), EC-4216 (16%), BL-1 (15%) and least reduction was recorded in Kohinoor (13%). The long duration varieties' life cycles were shortened under elevated temperatures compared to ambient conditions, the highest percentage of reduction was observed in BL-2 (24%) and the least was recorded in BL-4 (17%). Significant interactions were found between variety and elevated temperature in leaf length and leaf width, total chlorophyll, relative water content and membrane stability index. Shoot biomass showed a highly positive significant correlation with elevated temperature, leaf fresh weight and ambient leaf width and a positive significant correlation with ambient leaf fresh weight, leaf length and elevated temperature leaf width. Kohinoor and BL-1 varieties were found relatively tolerant to temperature stress than EC-4216, BL-2 and BL-4.

Keywords: Dry weight, Elevated temperature, Forage cowpea varieties, Open top chamber