

## Seed Germination and Early Growth of Major Weed Species in Paddy Cultivation in Sri Lanka at Elevated Temperature and Carbondioxide Levels

Amarasinghe A.M.C.S., Herath H.M.S.<sup>1</sup> and Marambe B.\*

Department of Crop Science,  
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

The photosynthetic mechanism of crops and weeds will determine their competitiveness and level of resilience in a changing climate. The study assessed the impact of climate change on the germination and growth performance of *Oryza sativa* (var. Bg300; C3) and major weed species in paddy cultivation, i.e. *Echinochloa crus-galli* and *Ischaemum rugosum* (C4 grasses), and *Cyperus iria* and *C. difformis* (C3 sedges). Elevated temperature (T1: day/night 35/33 °C), elevated CO<sub>2</sub> concentration (T2: 550 ppm at day/night 28/26 °C) and the combination of temperature and CO<sub>2</sub> concentration (T3: 550 ppm at day/night 35/33 °C) were imposed separately in a growth chamber, coupled with parallel experiments in the laboratory (CO<sub>2</sub> 440 ppm; day/night 26/22 °C) and field conditions (CO<sub>2</sub> 440 ppm; day/night 28/23 °C). At 3 days after sowing (DAS), seed germination of paddy and grass weeds showed 100% germination, while the sedges showed about 90% germination in T1, T2, and T3 compared to laboratory and open field conditions. The growth parameters such as plant height, root length, number of leaves, and plant dry weight of paddy plants and sedge weeds were higher at 21 DAS of seed paddy in T2 with a high leaf greenness (SPAD reading) compared to T1, T3, laboratory, and field conditions. In a similar comparison, C4 grass weeds performed better ( $p < 0.05$ ) in T3 with a high SPAD value compared to the rest. The highest leaf area per plant of *O. sativa* and sedge weeds was recorded in T2, while that of grass weeds was recorded in T3, at 21 DAS. The results revealed that C4 grass weeds could pose a severe threat to paddy cultivation in a changing climate.

**Keywords:** Climate change, Elevated CO<sub>2</sub> concentration, Elevated temperature, Plant growth, Seed germination

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<sup>1</sup>Rice Research and Development Institute, Bathalagoda, Sri Lanka

\*bmarambe@yahoo.com