Translocation of host materials to parasite: Stomatal response and photosynthetic capacity of *Striga hermonthica* and sorghum under water stress

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Abstract: The root parasitic weed *Striga hermonthica* is a major biotic constraint to cereal production in the semi-arid sub-humid tropics of Africa, including Sudan. *Striga* species rely upon host plants for most of their nutrients, carbohydrates and water supply. *Striga* infestation in crops causes losses in yield, and the damage is more serious under drought. To identify the mechanisms fostering the devastating effects of the parasite on its host under drought, stomatal response and photosynthetic capacity of the upper fully expanded leaves in *S. hermonthica* and its host plants sorghum were investigated under wet and dry conditions. Reduction in photosynthetic rate of the leaf under dry condition was more severe in sorghum than in *S. hermonthica*. Maximal quantum yield and photochemical quenching were higher in *S. hermonthica* than in sorghum, which may indicate that photosystem II in *S. hermonthica* is more tolerant to heat and drought. Soil water stress did not affect leaf respiration rate in both *S. hermonthica* and infected sorghum, however, the ratio of respiration rate to photosynthetic rate increased considerably. These results indicated that under dry condition increased reliance on host carbon by *S. hermonthica*, in addition to a decreased net carbon gain for sorghum, may result in severe damage to sorghum. Transpiration rate in *S. hermonthica* on adaxial and abaxial surfaces of the leaf, a major driving force for assimilate withdrawal from host, was higher and less affected by water stress than that of infected sorghum. *S. hermonthica,* irrespective of soil water status, had higher stomatal aperture on adaxial and abaxial surfaces of the leaf than infected sorghum. Water stress-induced reduction in stomatal aperture on the adaxial surface of the leaf was greater in infected sorghum than in *S. hermonthica*. Soil water stress decreased leaf relative water content in both sorghum and *S. hermonthica*, but the reduction was more severe in *S. hermonthica* than in sorghum. Abscisic acid concentration in leaves was about 8 times higher in *S. hermonthica* than in sorghum under both wet and dry conditions. Insensitivity of stomatal response in *S. hermonthica* to high ABA concentration and low relative water content of the leaf, may explain maintenance of water and solutes transfer from the host to the parasite.

Keywords: root parasitic weeds, drought, quantum yield, photosystem II