BRIEF SUMMARY OF RESEARCH INTERESTS

Our group is analysing redox regulation and the mechanisms of adaptation to oxidative stress in plants. Protein disulphide-dithiol interchange is a universal mechanism of redox regulation in which thioredoxins (Trxs) play an essential role. In heterotrophic organisms, and non-photosynthetic plant organs, NADPH provides the required reducing power in a reaction catalysed by NADPH-dependent thioredoxin reductase (NTR). It has been considered that chloroplasts constitute an exception because reducing equivalents for redox regulation in this organelle is provided by ferredoxin (Fd) reduced by the photosynthetic electron transport chain, not by NADPH. This view was modified by the discovery of a chloroplast-localized NTR, denoted NTRC, a bimodular enzyme formed by NTR and Trx domains with high affinity for NADPH (Serrato et al., 2004). Further studies showed that NTRC is an efficient reductant of 2-Cys peroxiredoxins (Pérez-Ruiz et al., 2006). Based on these results, it was proposed that NTRC functions in the antioxidant defence mechanisms of plant chloroplasts. More recently, it was shown that NTRC is involved in redox regulation of starch (Michalska et al., 2009) and chlorophyll (Pérez-Ruiz et al., 2014) biosynthesis, suggesting a relevant function in chloroplast redox regulation for this enzyme. In addition, we are interested in antioxidant mechanisms operative in cereal seeds tissues, which undergo an intense oxidative stress during both seed desiccation and germination. We had evidence showing the nuclear localization of NTR and *h*-type Trxs in these cells (Serrato et al., 2001; Serrato and Cejudo, 2003). More recently, we showed that these redox systems may interact with the nuclear-localized 1-Cys Prxs, thus, forming an antioxidant system able to control the oxidant environment of the nucleus in seed cells suffering oxidative stress (Pulido et al., 2009), which may be important controlling the process of cell that takes place in these cells (Domínguez et al., 2004).

At present, our objective is to unravel the function of plant NTRs (NTRA, NTRB and NTRC) together with Trxs and Prxs in the antioxidant machinery of the plant. Moreover, since NTRC is localized in all types of plastids (Kirchsteiger et al., 2012), we are analysing the function of this enzyme in the relationship of redox regulation between phototsynthetic and heterotrophic plant tissues.

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