Identification of Vectors for *In-vivo* Protein Overexpression in Introducing Drought Resistance: A Review

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The prolonged lack of rainfall is a major abiotic stress affecting crop productivity in Sri Lanka. *In vivo* protein overexpression to induce drought resistance is frequently studied globally however; the selection of a most suitable vector for gene transfection has been a challenge for high protein yield. This study aims to review such possible vectors, through a thorough published literature survey at 'Google scholar' and 'PubMed' with search terms 'drought resist*', 'drought tolerant*', 'vector', 'overexpression'. A late embryogenesis abundant protein gene *OsLEA3-1* overexpressed with three binary expression constructs (*OsLEA3-S/A/H*), by inserting the full length cDNA into backbone vectors pCAMBIA1301-S/A/H respectively, with double *CaMV* 35S, rice Actin1 and HVA1-like promoter, followed by *Agrobacterium* transformation. All other constructs OsLEA3-S/-H had higher grain yield than wild type under stress except OsLEA3-A. Over expression levels are 63% 56% and 46% for *OsLEA3-S/A/H*, respectively. Protein coding region of OsbZIP72 in vector pCAMBIA1300S to construct pCAMBIA1300S-OsbZIP72; and a promoter of drought tolerance rice cultivar IRAT109 in a pCAMBIA1381xb-GFP vector to control GFP expression and *Arabidopsis* BnLEA4-1 in pGEMT-BnLEA4-1 vector transfected via *Agrobacterium* are few examples at global scale. However, no published studies in Sri Lanka were found during the literature search. Therefore, cloning of drought tolerant gene to a crop plant followed by *in vivo* overexpression to stimulate the drought tolerance is a promising biotechnological advancement in agriculture. Literature showed vectors can be modified to fit to an individual crop product for *in vivo* overexpression of drought tolerant genes. It is recommended to extend the review to analyse characteristics for a suitable vector include compatibility, linker region, and screening genes to develop a complete guide for selection of vector in *in vivo* protein overexpression for drought resistance.

Keywords: Drought tolerance, Agriculture, Overexpression, Vector.