

Table 2 The characteristics of known HMA associated with copper transport in plant

Species	Gene	Express parts	Induced expression	Subcellular localization	Reference
<i>Arabidopsis thaliana</i>	<i>AtHMA1</i>	Green organization	-	Chloroplast envelope	Boutigny et al., 2014
	<i>AtHMA5</i>	Roots, flower	High copper up	Plasma membrane	Patterson et al., 2006
	<i>AtHMA6</i>	Roots, shoots	-	Chloroplast	Catty et al., 2011 Gayomba et al., 2013
	<i>AtHMA8</i>	Overground part	High copper degradation	Thylakoid membrane	Zhang et al., 2018 Tapken et al., 2012
<i>Oryza sativa</i>	<i>OsHMA5</i>	Root column sheath cell, the xylem area of the vascular bundle at the node, pedicel, petiole, vascular tissue of fruit shell	High copper up	Plasma membrane	Patterson et al., 2006 Deng et al., 2013
	<i>OsHMA9</i>	Xylem and phloem vascular tissue	High copper up	Plasma membrane	Lee et al., 2007 Patterson et al., 2006 Deng et al., 2013
<i>Brassica napus</i>	<i>BnHMA1</i>	Leaf	Up in copper deficient leaf	-	Billard et al., 2014
<i>Glycine max</i>	<i>GmHMA8</i>	Leaf	-	Thylakoid membrane Chloroplast	Bernal et al., 2007
<i>Hordeum vulgare</i>	<i>HvHMA1</i>	Leaf, seeds	High copper down	envelope, the cell cavity of grain aleurone	Mikkelsen et al., 2012
<i>Vitis vinifera</i>	<i>VvPAA1</i>	-	High copper down	-	Martins et al., 2014