



Supplementary Table 1: Characterization of Three-Dimensional modeling of the NRAMP proteins in maize

Gene ID	Alpha helix (%)	Beta strand (%)	TM helix (%)	Disordered (%)	Confidence (%)	Coverage (%)
ZmNRAMP1	74		52	18	100	85
ZmNRAMP2	80		50	8	100	97
ZmNRAMP3	69		53	22	100	85
ZmNRAMP4	71	0	52	22	100	85
ZmNRAMP5	70		48	22	100	80
ZmNRAMP6	70		52	22	100	85
ZmNRAMP7	69		51	24	100	84

Supplementary Table 2: Analysis of transmembrane domains in NRAMP gene family in maize

	NRAMP1	NRAMP2	NRAMP3	NRAMP4	NRAMP5	NRAMP6	NRAMP7
TM1	89-108	36-55	91-108	49-65	78-95	56-73	96-120
TM2	123-142	80-99	121-139	84-103	112-136	90-109	125-149
TM3	167-186	126-143	170-193	124-140	149-168	130-146	162-181
TM4	201-218	172-190	202-220	159-176	183-202	151-175	206-228
TM5	229-246	203-221	231-248	187-204	215-234	194-213	249-273
TM6	273-292	228-247	275-294	231-254	261-282	234-258	304-327
TM7	317-335		319-337	275-292	313-330	277-299	350-367
TM8	362-379		368-386	333-352	371-395	341-365	372-391
TM9	408-425		411-429	377-394	426-443	384-401	406-428
TM10	440-459		442-461	399-416	452-471	406-425	445-469
TM11	476-494		478-496	437-456	486-508	444-463	
TM12	509-526		511-528	473-491	525-549	480-503	
	544	265	540	550	586	551	521

Correspondence to: Md. Numan Islam, Department of Nutrition and Food Technology, Jashore University of Science and Technology, Jashore, Bangladesh, Email: 160902.nft@student.just.edu.bd

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Supplementary Table 3: The numbers of different cis-elements in the *ZmNRAMP* genes

Category	Growth and Development				Plant Hormones/phytohormone responsive										Stress				
	Cis elements	Meristem expression	Specific to the endosperm	Seed-specific regulation	Zein metabolism	Auxin	Abscisic acid	Methyl jasmonate (MeJA)	Gibberellin	Salicylic acid	MYB-binding sites involved in drought inducibility	Low-temperature responsiveness	Defense and stress responsiveness						
Motif	CAT-box	GCN4_motif	RY-element	O2-site	TGA-element	AuxRR	ABRE	CGTCA-motif	TGACG-motif	P-box	TATC-box	GARE	TCA-element	MBS	LTR	TC-rich repeat	Total Motif	Motif shown in figure	Comment
<i>ZmNRAMP1</i>		1		1	2		1	4	4				1	1	1		16	12	8 MeJA responsive in 4 position
<i>ZmNRAMP2</i>	2	1		1	1	1		1	1				1		2		11	10	2 MeJA responsive in 1 position
<i>ZmNRAMP3</i>	2				2	1	3	3	3				1	1			16	12	8 MeJA responsive in 4 position
<i>ZmNRAMP4</i>				1			5	1	1				1		1		10	7	2 MeJA responsive in 1 position, 3 ABRE in 1 position
<i>ZmNRAMP5</i>	2				1		1	1	1			1			1	2	10	9	2 MeJA responsive in 1 position
<i>ZmNRAMP6</i>	1						1	3	3		1			1			10	7	6 MeJA responsive in 3 position
<i>ZmNRAMP7</i>					1		1	2	2			2		1	1		10	8	4 MeJA responsive in 2 position
Total	7	2		3	9		12	30		4			4	4	6	2	83		