

Table S1. qRT-PCR primer sequences

Name	Forward Primer (5'→3')	Reverse Primer (5'→3')
StMAPK1	TAGTATGCTCTGCGTATG	CGAGAAGGAGGTAACAAT
StMAPK4	CAGTATAATGTGTATGGTAATC	TGCCAATCTTCTTGATAG
StMAPK5	GGAAGCATTATTACACAAT	CTATTCAGTGAAGAACAA
StMAPK6	ATTGATGTCTGGTCTGTT	CCAAGGATATTGAGAATAAGTT
StMAPK7	TCTGGTATATGAACTGATGGA	CGAAGCAACTGGAATAGG
StMAPK8	TATGTGGAGTATAGGATGTAT	ATAACTTCAGTGGATGGA
StMAPK9	TTCATCGTCGTTCAAGTA	GCTCTCCTTCTTCTTCTT
StMAPK10	GCTAATGATGACTTGACT	TAGGTGTATCGTTGAATG
StMAPK13	GGAAGTTATGGAGTAGTT	GAAGGTGGTAAGATGATT
StMAPK14	TGCTTATGGAGTTGATTG	AGGAAGTTGTCTGATGTA
StMAPK15	TCAATATCCTAAGCAACAAT	CCTCATCAACTGTAATCC
StMAPK16	CACGCCTCTGATGCTATT	ATTCTCTTGATGTCCACGATAT
StMAPK18	AGACGAAGGAGGAGATAG	CTCATACACAATATACACATCAT
StMAPK19	CATTACGCCTACTTGAAC	TTGATATTGGTGGTCTACA
StMAPK20	GCGTCTTATTATGGAGTTGAT	AGGAAGTTGTCCGATGTAT
StMAPKK1	CGCTTCTACTACTACTATCTC	GACTTCATACACAGTTCCA
StMAPKK2	TGGACTGGAGGAATTGAAG	ATCGGATGTAGAGGTAGGT
StMAPKK4	ATCCAGATGAATATACAAGAAGA	ACGGTCCATATACTCCAA
StMAPKK7	TTAATCGCATCGGTAGTG	ACAGAATCCTCATGGTTAC
StMAPKK8	CAGTTATACAGCCATCAGACAA	CCGCACAATACCACCATT

Table S2. *MAPK* and *MAPKK* family gene in potato

Gene name	Gene ID	Chromosome location
StMAPK1	Soltu.DM.01G034030.1	chr01:73636278-73638378(-)
StMAPK2	Soltu.DM.08G028240.1	chr08:57608479-57606379(+)
StMAPK3	Soltu.DM.11G025980.1	chr11:45978202-45980302(+)
StMAPK4	Soltu.DM.12G019640.1	chr12:46885325-46883225(+)
StMAPK5	Soltu.DM.08G006040.1	chr08:8386394-8388494(-)
StMAPK6	Soltu.DM.02G024700.1	chr02:37976290-37974190(+)
StMAPK7	Soltu.DM.02G024700.2	chr02:37976308-37974208(+)
StMAPK8	Soltu.DM.04G035830.1	chr04:67074236-67076336(-)
StMAPK9	Soltu.DM.01G023820.3	chr01:62811782-62808782(+)
StMAPK10	Soltu.DM.07G022020.3	chr07:52137364-52135264()
StMAPK11	Soltu.DM.07G023200.1	chr07:53221698-53223798(-)
StMAPK12	Soltu.DM.10G003160.1	chr10:2415719-2413619(+)
StMAPK13	Soltu.DM.07G022020.1	chr07:52137364-52135264(+)
StMAPK14	Soltu.DM.07G022020.2	chr07:52137364-52135264(+)
StMAPK15	Soltu.DM.01G023820.1	chr01:62811782-62808782(+)
StMAPK16	Soltu.DM.01G023820.2	chr01:62811081-62808081(+)
StMAPK17	Soltu.DM.10G003160.2	chr10:2415719-2413619(+)
StMAPK18	Soltu.DM.12G011730.1	chr12:12361310-12359210(+)
StMAPK19	Soltu.DM.06G024930.1	chr06:50904920-50907020(-)
StMAPK20	Soltu.DM.05G004980.1	chr05:4325857-4323757(+)

StMAPKK1	Soltu.DM.03G033980.1	Chr03:57465461-57467561(-)
StMAPKK2	Soltu.DM.03G033980.2	Chr03:57465461-57467561(-)
StMAPKK3	Soltu.DM.03G019540.1	chr03:44266677-44264577(+)
StMAPKK4	Soltu.DM.12G025970.1	chr12:55975774-55973674(+)
StMAPKK5	Soltu.DM.03G033980.3	chr03:57465461-57467561(-)
StMAPKK6	Soltu.DM.03G023940.1	chr03:49232546-49230446(+)
StMAPKK7	Soltu.DM.03G023940.2	chr03:49232546-49230446(+)
StMAPKK8	Soltu.DM.03G037580.1	chr03:60296915-60294815(+)

Table S3. The *cis*-elements responsive to stresses and hormones in the promoter regions of *StMAPK* and *StMAPKK* genes

Name	ABRE	MBS	HSE	LTR	TC-rich repeats
StMAPK1	1	1	0	0	0
StMAPK2	2	0	0	0	0
StMAPK3	1	1	0	0	0
StMAPK4	1	0	0	0	0
StMAPK5	1	1	1	0	0
StMAPK6	1	1	1	0	0
StMAPK7	0	0	0	0	0
StMAPK8	5	2	0	0	0
StMAPK9	1	2	0	0	0
StMAPK10	3	0	0	1	0

StMAPK11	3	0	0	1	0
StMAPK12	3	0	0	1	0
StMAPK13	0	1	0	2	1
StMAPK14	0	0	0	0	0
StMAPK15	0	0	0	0	0
StMAPK16	2	0	0	1	0
StMAPK17	2	0	0	1	0
StMAPK18	1	2	0	1	0
StMAPK19	0	0	0	1	0
StMAPK20	4	3	0	0	0
StMAPKK1	6	0	0	0	0
StMAPKK2	1	0	0	1	0
StMAPKK3	1	0	0	1	0
StMAPKK4	0	2	0	1	0
StMAPKK5	0	2	0	1	0
StMAPKK6	0	2	0	1	0
StMAPKK7	0	0	0	0	0
StMAPKK8	2	3	0	0	0

Table S4. Physical and Chemical Properties of StMAPK and StMAPKK protein

Gene Name	Amino Acid (aa)	Molecular weight (kD)	Isoelectric poin (pI)	Instability index (II)	Aliphati c index	Grand average of hydropathicity
StMAPK1	373	42817.77	5.86	42.62	87.56	-0.357
StMAPK2	379	43454.69	5.91	44.95	92.59	-0.305
StMAPK3	372	42685.76	4.97	42.93	93.82	-0.297
StMAPK4	396	49957.41	5.49	45.71	87.98	-0.309
StMAPK5	468	52974.55	5.52	40.69	87.37	-0.293
StMAPK6	370	42708.53	8.02	39.36	97.78	-0.150
StMAPK7	376	43481.36	8.02	38.69	96.22	-0.191
StMAPK8	372	42825.56	6.32	46.01	95.40	-0.252
StMAPK9	423	48892.33	8.69	39.98	83.26	-0.449
StMAPK10	476	54980.10	9.09	35.37	82.79	-0.504
StMAPK11	603	68234.42	9.37	38.96	81.84	-0.399
StMAPK12	470	53868.89	9.20	32.59	84.04	-0.403
StMAPK13	613	69709.84	9.25	34.59	78.94	-0.510
StMAPK14	612	69638.76	9.25	34.63	78.91	-0.514
StMAPK15	565	64379.58	8.85	42.64	77.88	-0.540
StMAPK16	565	64394.58	8.70	42.58	77.88	-0.517
StMAPK17	593	67184.24	9.22	31.42	83.73	-0.412
StMAPK18	575	65699.51	6.47	47.73	80.90	-0.549

StMAPK19	605	69042.25	7.07	42.31	78.36	-0.565
StMAPK20	504	57819.61	5.92	44.09	83.41	-0.434
StMAPKK1	354	39633.59	5.89	46.23	99.35	-0.103
StMAPKK2	309	34556.75	5.93	44.91	99.00	-0.062
StMAPKK3	333	37256.85	8.35	55.75	84.32	-0.290
StMAPKK4	357	39659.38	5.47	38.53	90.64	-0.110
StMAPKK5	361	40282.45	6.15	46.05	100.66	0.027
StMAPKK6	515	57453.54	5.56	36.56	89.18	-0.167
StMAPKK7	515	57453.54	5.56	36.56	89.18	-0.167
StMAPKK8	370	40819.35	8.87	65.07	79.35	-0.373
