

Supplementary data

Zinc finger protein (ZFP) in plants-A review

Wei-Tao Li*, Min He, Jing Wang, Yu-Ping Wang

Supplementary Table 1. The biological function of the ZFP in plants.

Type	Protein	Function description	Plant	Reference
C2H2	SUPERMAN	Flower development	Arabidopsis	(Sakai et al., 1995; Yun et al., 2002)
C2H2	AtZFP1	Shoot development	Arabidopsis	(Chrispeels et al., 2000)
C2H2	FIS2	Seed development	Arabidopsis	(Luo et al., 1999)
C2H2	SERRATE	Shoot development	Arabidopsis	(Prigge and Wagner, 2001)
C2H2	ZPT2-10	Pistil development	Petunia	(Kubo et al., 2000)
C2H2	BcZFP1	Leaf initiation	Chinese cabbage	(Takatsuji, 1998)
C2H2	ZPT3-2(TAZ1)	Tapetum development	Petunia	(Kapoor et al., 2002)
C2H2	ZPT3-3	Pistil development	Petunia	(Kubo et al., 2000)
C2H2	VRN2	Flower development	Arabidopsis	(Gendall et al., 2001)
C2H2	KNUCKLES	Basal pattern development	Arabidopsis	(Payne et al., 2004; Huang et al., 2005)
C2H2	ZFP15	Spike development	Rice	(Huang et al., 2005)
C2H2	STAMENLESS 1	Regulate floral organ identity	Rice	(Xiao et al., 2009)
C2H2	WRKY75	Root development	Arabidopsis	(Devaiah et al., 2007a)
C2H2	GmZFP1	Organ reproduction and late seed development	Soybean	(Huang et al., 2006)
C2H2	SUF4	Flower development	Arabidopsis	(Kim et al., 2006)
C2H2	MIF1	Multiple hormonal regulation	Arabidopsis	(Hu and Ma, 2006)
C2H2	TTL	Endosperm development	Arabidopsis	(Lu et al., 2012)

C2H2	ZFP5	Root hair development	Arabidopsis	(An et al., 2012)
C2H2	LATE	Flower development	Arabidopsis	(Weingartner et al., 2011)
C2H2	BcMF20	Pollen development	Brassicaceae	(Han et al., 2011)
C2H2	ZFP6	Trichome development	Arabidopsis	(Zhou et al., 2013)
C2H2	ZAT6	Root development	Arabidopsis	(Devaiah et al., 2007b)
C2H2	ZPT2-2	Abiotic stress	Petunia	(van Der Krol et al., 1999)
C2H2	ZPT2-3	Drought tolerance	Petunia	(Kubo et al., 1998; Sugano et al., 2003)
C2H2	OsZFP1	Salt induced	Rice	(Huang et al., 2002)
C2H2	OsZFP34	Salt induced	Rice	(Huang et al., 2002)
C2H2	STZ	Salt, cold induced	Arabidopsis	(Lippuner et al., 1996)
C2H2	AZF1, AZF3	Salt, cold induced	Arabidopsis	(Sakamoto et al., 2000)
C2H2	CSTZ	Salt induced	Cotton	(Wang and Yang, 2002)
C2H2	SCOF-1	Cold tolerance	Soybean	(Meissner and Michael, 1997)
C2H2	ZFP179	Salt stress	Rice	(Sun et al., 2010)
C2H2	GsZFP1	Cold and drought stress	Glycine soja	(Luo et al., 2012)
C2H2	StZFP1	Biotic and abiotic stress	Potato	(Tian et al., 2010)
C2H2	ThZF1	Drought and salt stress	Thellungiella halophila	(Xu and He, 2007)
C2H2	CAZFP1	Pathogen-induced early defense gene	Hot pepper	(Kim et al., 2004; Li et al., 2010)
C2H2	GhDi19-1,2	Salt and drought stress, abscisic acid	Cotton	(Li et al., 2010)
C2H2	PtaZFP2	Abiotic stress	Populus tremula	(Martin et al., 2009)
C2H2	ZFP182	Absciscic acid, antioxidant defense	Rice	(Zhang et al., 2012)
C2H2	AZF2	Absciscic acid, salt induced, seed development	Arabidopsis	(Sakamoto et al., 2000)
C2H2	Pszf1	Unknown	Pea	(Michael et al., 1996)
CCCH	PEI1	Heart-stage embryo formation	Arabidopsis	(Li and Thomas, 1998)
CCCH	HUA1	Flower development	Arabidopsis	(Li et al., 2001)
CCCH	OsDOS	Delay leaf senescence	Rice	(Kong et al., 2006)
CCCH	CsSEF1	Somatic embryogenesis	Cucumber	(Grabowska et al., 2009)
CCCH	AtTZF4,5,6	Seed germination	Arabidopsis	(Bogamuwa and Jang, 2013)
CCCH	SOMNUS	Seed germination	Arabidopsis	(Kim et al., 2008)
CCCH	OsLIC	Leaf angle, tiller angle and production	Rice	(Wang et al., 2008b)

CCCH	AtLOV1	Plant architecture, lignin content and flowering time	Arabidopsis	(Xu et al., 2012)
CCCH	AtOZF1	Oxidative stress	Arabidopsis	(Huang et al., 2011; Min et al., 2013)
CCCH	TaZnFP	Abiotic stresses	Wheat	(Min et al., 2013)
CCCH	AtSZF1,2	Salt stress tolerance	Arabidopsis	(Sun et al., 2007)
CCCH	GhZFP1	Salt stress tolerance and fungal disease resistance	Cotton	(Guo et al., 2009)
CCCH	OsTZF1	Delay senescence and stress tolerance	Rice	(Jan et al., 2013)
C3HC4	PtaRHE1	Plant development and induce defense-related responses	Tobacco	(Mukoko Bopopi et al., 2010)
C3HC4	MsRH2-1	Plant growth and development	Tobacco	(Karlowski and Hirsch, 2003)
C3HC4	KEG	Growth and development	Arabidopsis	(Stone et al., 2006)
C3HC4	RHA2a	Seed germination and early seedling development	Arabidopsis	(Bu et al., 2009)
C3HC4	RIE1	Seed development	Arabidopsis	(Xu and Li, 2003)
C3HC4	OsBIRF1	Growth and defense response	Arabidopsis	(Liu et al., 2008)
C3HC4	SIS3	Sugar response	Arabidopsis	(Huang et al., 2010)
C3HC4	XBAT32	Lateral root production	Arabidopsis	(Prasad et al., 2010)
C3HC4	EL5	Root development	Rice	(Koiwai et al., 2007)
C3HC4	RFI2	Seedling deterioration	Arabidopsis	(Chen and Ni, 2006)
C3HC4	SHA1	Shoot apical meristem	Arabidopsis	(Sonoda et al., 2007)
C3HC4	OsDSG1	Seed germination and stress in rice	Arabidopsis	(Park et al., 2010)
C3HC4	HOS1	Cold responses	Arabidopsis	(Dong et al., 2006)
C3HC4	XERICO	Drought tolerance	Arabidopsis	(Ko et al., 2006)
C3HC4	HOS1	Cold signal transduction	Arabidopsis	(Lee et al., 2001)
C3HC4	DRIP1,2	Drought stress	Arabidopsis	(Qin et al., 2008)
C3HC4	SDIR1	Stress-responsive ABA	Arabidopsis	(Zhang et al., 2007)
C3HC4	Rma1H1	Drought stress	Pepper	(Lee et al., 2009)
C3HC4	AtAIRP1	Drought stress	Arabidopsis	(Ryu et al., 2010)
C3HC4	CaRFP1	Disease susceptibility and osmotic stress tolerance	Pepper	(Hong et al., 2007)
C3HC4	AtAIRP2	Drought stress response	Arabidopsis	(Cho et al., 2011)
C3HC4	GmRFP1	Stress response	Soybean	(Du et al., 2010)

C3HC4	RGLG2	Drought stress	Arabidopsis	(Cheng et al., 2012)
C3HC4	PII-C02	Cold and drought	Citrus	(Sahin-Cevik and Moore, 2006)
C3HC4	TdRF1	Protective role against cellular dehydration	Wheat	(Guerra et al., 2012)
C3HC4	ZmRFP1	Drought stress	Maize	(Xia et al., 2012)
C3HC4	BrRZFP1	Cold, salt and dehydration stress	Turnip	(Jung et al., 2013)
C3HC4	BRH1	Brassinosteroid-responsive	Arabidopsis	(Molnar et al., 2002)
C3HC4	RHA2b	Abscisic acid signaling and drought response	Arabidopsis	(Li et al., 2011)
C3HC4	BrRZFP1	Abiotic stress	Cabbage	(Jung et al., 2013)
C4	OsDOG	Cell elongation	Rice	(Liu et al., 2011)
C4	RanBP2	Development of the cotton gland	Cotton	(Chang et al., 2007)

Reference

- An L, Zhou Z, Sun L, Yan A, Xi W, Yu N, Cai W, Chen X, Yu H, Schiefelbein J, Gan Y (2012) A zinc finger protein gene ZFP5 integrates phytohormone signaling to control root hair development in Arabidopsis. *Plant J* 72: 474-490
- Bu Q, Li H, Zhao Q, Jiang H, Zhai Q, Zhang J, Wu X, Sun J, Xie Q, Wang D, Li C (2009) The Arabidopsis RING finger E3 ligase RHA2a is a novel positive regulator of abscisic acid signaling during seed germination and early seedling development. *Plant Physiol* 150: 463-481
- Chang PA, Li B, Ni XM, Xie YF, Cai YF (2007) Molecular cloning and expression analysis of a RanBP2 zinc finger protein gene in upland cotton (*Gossypium hirsutum* L.). *Colloids Surf B Biointerfaces* 55: 153-158
- Chen M, Ni M (2006) RED AND FAR-RED INSENSITIVE 2, a RING-domain zinc finger protein, mediates phytochrome-controlled seedling deetiolation responses. *Plant Physiol* 140: 457-465
- Cheng MC, Hsieh EJ, Chen JH, Chen HY, Lin TP (2012) Arabidopsis RGLG2, functioning as a RING E3 ligase, interacts with AtERF53 and negatively regulates the plant drought stress response. *Plant Physiol* 158: 363-375
- Chrispeels HE, Oettinger H, Janvier N, Tague BW (2000) AtZFP1, encoding Arabidopsis thaliana C2H2 zinc-finger protein 1, is expressed downstream of photomorphogenic activation. *Plant Mol Biol* 42: 279-290
- Cho SK, Ryu MY, Seo DH, Kang BG, Kim WT (2011) The Arabidopsis RING E3 ubiquitin ligase AtAIRP2 plays combinatory roles with AtAIRP1 in abscisic acid-mediated drought stress responses. *Plant Physiol* 157: 2240-2257
- Dong CH, Agarwal M, Zhang Y, Xie Q, Zhu JK (2006) The negative regulator of plant cold responses, HOS1, is a RING E3 ligase that mediates the ubiquitination and degradation of ICE1. *Proc Natl Acad Sci U S A* 103: 8281-8286
- Devaiah BN, Nagarajan VK, Raghothama KG (2007b) Phosphate homeostasis and root development in Arabidopsis are synchronized by the zinc finger transcription factor ZAT6. *Plant Physiol* 145: 147-159
- Devaiah BN, Karthikeyan AS, Raghothama KG (2007a) WRKY75 transcription factor is a modulator of phosphate acquisition and root development in Arabidopsis. *Plant Physiol* 143: 1789-1801
- Du QL, Cui WZ, Zhang CH, Yu DY (2010) GmRFP1 encodes a previously unknown RING-type E3 ubiquitin ligase in Soybean (*Glycine max*). *Mol Biol Rep* 37: 685-693
- Gendall AR, Levy YY, Wilson A, Dean C (2001) The VERNALIZATION 2 gene mediates the epigenetic regulation of vernalization in Arabidopsis. *Cell* 107: 525-535
- Guo YH, Yu YP, Wang D, Wu CA, Yang GD, Huang JG, Zheng CC (2009) GhZFP1, a novel CCCH-type zinc finger protein from cotton, enhances salt stress tolerance and fungal disease resistance in transgenic tobacco by interacting with GZIRD21A and GZIPR5. *New Phytol* 183: 62-75
- Guerra D, Mastrangelo AM, Lopez-Torrejón G, Marzín S, Schweizer P, Stanca AM, del Pozo JC, Cattivelli L, Mazzucotelli E (2012) Identification of a protein network interacting with TdRF1, a wheat RING ubiquitin ligase with a protective role against cellular dehydration. *Plant Physiol* 158: 777-789
- Han Y, Zhang A, Huang L, Yu X, Yang K, Fan S, Cao J (2011) BcMF20, a putative pollen-specific transcription factor from *Brassica campestris* ssp. *chinensis*. *Mol Biol Rep* 38: 5321-5325
- Hong JK, Choi HW, Hwang IS, Hwang BK (2007) Role of a novel pathogen-induced pepper C3-H-C4 type RING-finger protein gene, CaRFPI, in disease susceptibility and osmotic stress tolerance. *Plant Mol Biol* 63: 571-588
- Hu W, Ma H (2006) Characterization of a novel putative zinc finger gene MIF1: involvement in multiple hormonal regulation of Arabidopsis development. *Plant J* 45: 399-422

- Huang F, Chi Y, Meng Q, Gai J, Yu D (2006) GmZFP1 encoding a single zinc finger protein is expressed with enhancement in reproductive organs and late seed development in soybean (*Glycine max*). *Mol Biol Rep* 33: 279-285
- Huang J, Wang J, Zhang H (2005) Rice ZFP15 gene encoding for a novel C2H2-type zinc finger protein lacking DLN box, is regulated by spike development but not by abiotic stresses. *Mol Biol Rep* 32: 177-183
- Huang P, Chung MS, Ju HW, Na HS, Lee DJ, Cheong HS, Kim CS (2011) Physiological characterization of the *Arabidopsis thaliana* oxidation-related zinc finger 1, a plasma membrane protein involved in oxidative stress. *J Plant Res* 124: 699-705
- Huang Y, Li CY, Pattison DL, Gray WM, Park S, Gibson SI (2010) SUGAR-INSENSITIVE3, a RING E3 ligase, is a new player in plant sugar response. *Plant Physiol* 152: 1889-1900
- Jan A, Maruyama K, Todaka D, Kidokoro S, Abo M, Yoshimura E, Shinozaki K, Nakashima K, Yamaguchi-Shinozaki K (2013) OsTZF1, a CCCH-tandem zinc finger protein, confers delayed senescence and stress tolerance in rice by regulating stress-related genes. *Plant Physiol* 161: 1202-1216
- Jung YJ, Lee IH, Nou IS, Lee KD, Rashotte AM, Kang KK (2013) BrRZFP1 a *Brassica rapa* C3HC4-type RING zinc finger protein involved in cold, salt and dehydration stress. *Plant Biol (Stuttg)* 15: 274-283
- Karlowski WM, Hirsch AM (2003) The over-expression of an alfalfa RING-H2 gene induces pleiotropic effects on plant growth and development. *Plant Mol Biol* 52: 121-133
- Kapoor S, Kobayashi A, Takatsuji H (2002) Silencing of the tapetum-specific zinc finger gene TAZ1 causes premature degeneration of tapetum and pollen abortion in *petunia*. *Plant Cell* 14: 2353-2367
- Kim DH, Yamaguchi S, Lim S, Oh E, Park J, Hanada A, Kamiya Y, Choi G (2008) SOMNUS, a CCCH-type zinc finger protein in *Arabidopsis*, negatively regulates light-dependent seed germination downstream of PIL5. *Plant Cell* 20: 1260-1277
- Kim S, Choi K, Park C, Hwang HJ, Lee I (2006) SUPPRESSOR OF FRIGIDA4, encoding a C2H2-Type zinc finger protein, represses flowering by transcriptional activation of *Arabidopsis* FLOWERING LOCUS C. *Plant Cell* 18: 2985-2998
- Kim SH, Hong JK, Lee SC, Sohn KH, Jung HW, Hwang BK (2004) CAZFP1, Cys2/His2-type zinc-finger transcription factor gene functions as a pathogen-induced early-defense gene in *Capsicum annuum*. *Plant Mol Biol* 55: 883-904
- Koiwai H, Tagiri A, Katoh S, Katoh E, Ichikawa H, Minami E, Nishizawa Y (2007) RING-H2 type ubiquitin ligase EL5 is involved in root development through the maintenance of cell viability in rice. *Plant J* 51: 92-104
- Ko JH, Yang SH, Han KH (2006) Upregulation of an *Arabidopsis* RING-H2 gene, XERICO, confers drought tolerance through increased abscisic acid biosynthesis. *Plant J* 47: 343-355
- Kubo K, Kanno Y, Nishino T, Takatsuji H (2000) Zinc-finger genes that specifically express in pistil secretory tissues of *petunia*. *Plant Cell Physiol* 41: 377-382
- Kubo K, Sakamoto A, Kobayashi A, Rybka Z, Kanno Y, Nakagawa H, Takatsuji H (1998) Cys2/His2 zinc-finger protein family of *petunia*: evolution and general mechanism of target-sequence recognition. *Nucleic Acids Res* 26: 608-615
- Lee H, Xiong L, Gong Z, Ishitani M, Stevenson B, Zhu JK (2001) The *Arabidopsis* HOS1 gene negatively regulates cold signal transduction and encodes a RING finger protein that displays cold-regulated nucleo--cytoplasmic partitioning. *Genes Dev* 15: 912-924
- Lee HK, Cho SK, Son O, Xu Z, Hwang I, Kim WT (2009) Drought stress-induced Rma1H1, a RING membrane-anchor E3 ubiquitin ligase homolog, regulates aquaporin levels via ubiquitination in transgenic *Arabidopsis* plants. *Plant Cell* 21: 622-641

- Liu H, Zhang H, Yang Y, Li G, Wang X, Basnayake BM, Li D, Song F (2008) Functional analysis reveals pleiotropic effects of rice RING-H2 finger protein gene OsBIRF1 on regulation of growth and defense responses against abiotic and biotic stresses. *Plant Mol Biol* 68: 17-30
- Li G, Tai FJ, Zheng Y, Luo J, Gong SY, Zhang ZT, Li XB (2010) Two cotton Cys2/His2-type zinc-finger proteins, GhDi19-1 and GhDi19-2, are involved in plant response to salt/drought stress and abscisic acid signaling. *Plant Mol Biol* 74: 437-452
- Li H, Jiang H, Bu Q, Zhao Q, Sun J, Xie Q, Li C (2011) The Arabidopsis RING finger E3 ligase RHA2b acts additively with RHA2a in regulating abscisic acid signaling and drought response. *Plant Physiol* 156: 550-563
- Lippuner V, Cyert MS, Gasser CS (1996) Two classes of plant cDNA clones differentially complement yeast calcineurin mutants and increase salt tolerance of wild-type yeast. *J Biol Chem* 271: 12859-12866
- Liu Y, Xu Y, Xiao J, Ma Q, Li D, Xue Z, Chong K (2011) OsDOG, a gibberellin-induced A20/AN1 zinc-finger protein, negatively regulates gibberellin-mediated cell elongation in rice. *J Plant Physiol* 168: 1098-1105
- Liu X, Li Y, Su Y, Liang Q, Meng H, Li S, Shen S, Fan Y, Zhang C (2012) An Arabidopsis gene encoding a C2H2-domain protein with alternatively spliced transcripts is essential for endosperm development. *J Exp Bot* 63: 5935-5944
- Luo M, Bilodeau P, Koltunow A, Dennis ES, Peacock WJ, Chaudhury AM (1999) Genes controlling fertilization-independent seed development in Arabidopsis thaliana. *Proceedings of the National Academy of Sciences* 96: 296-301
- Luo X, Bai X, Zhu D, Li Y, Ji W, Cai H, Wu J, Liu B, Zhu Y (2012) GsZFP1, a new Cys2/His2-type zinc-finger protein, is a positive regulator of plant tolerance to cold and drought stress. *Planta* 235: 1141-1155
- Meissner R, Michael AJ (1997) Isolation and characterisation of a diverse family of Arabidopsis two and three-fingered C2H2 zinc finger protein genes and cDNAs. *Plant Mol Biol* 33: 615-624
- Molnar G, Bancos S, Nagy F, Szekeres M (2002) Characterisation of BRH1, a brassinosteroid-responsive RING-H2 gene from Arabidopsis thaliana. *Planta* 215: 127-133
- Mukoko Bopopi J, Vandeputte OM, Himanen K, Mol A, Vaessen Q, El Jaziri M, Baucher M (2010) Ectopic expression of PtaRHE1, encoding a poplar RING-H2 protein with E3 ligase activity, alters plant development and induces defence-related responses. *J Exp Bot* 61: 297-310
- Park GG, Park JJ, Yoon J, Yu SN, An G (2010) A RING finger E3 ligase gene, *Oryza sativa* Delayed Seed Germination 1 (OsDSG1), controls seed germination and stress responses in rice. *Plant Mol Biol* 74: 467-478
- Payne T, Johnson SD, Koltunow AM (2004) KNUCKLES (KNU) encodes a C2H2 zinc-finger protein that regulates development of basal pattern elements of the Arabidopsis gynoecium. *Development* 131: 3737-3749
- Prigge MJ, Wagner DR (2001) The Arabidopsis serrate gene encodes a zinc-finger protein required for normal shoot development. *Plant Cell* 13: 1263-1279
- Prasad ME, Schofield A, Lyzenga W, Liu H, Stone SL (2010) Arabidopsis RING E3 ligase XBAT32 regulates lateral root production through its role in ethylene biosynthesis. *Plant Physiol* 153: 1587-1596
- Qin F, Sakuma Y, Tran LS, Maruyama K, Kidokoro S, Fujita Y, Fujita M, Umezawa T, Sawano Y, Miyazono K, Tanokura M, Shinozaki K, Yamaguchi-Shinozaki K (2008) Arabidopsis DREB2A-interacting proteins function as RING E3 ligases and negatively regulate plant drought stress-responsive gene expression. *Plant Cell* 20: 1693-1707
- Ryu MY, Cho SK, Kim WT (2010) The Arabidopsis C3H2C3-type RING E3 ubiquitin ligase AtAIRP1 is a positive regulator of an abscisic acid-dependent response to drought stress. *Plant Physiol* 154: 1983-1997

- Sakamoto H, Araki T, Meshi T, Iwabuchi M (2000) Expression of a subset of the Arabidopsis Cys(2)/His(2)-type zinc-finger protein gene family under water stress. *Gene* 248: 23-32
- Sahin-Cevik M, Moore GA (2006) Isolation and characterization of a novel RING-H2 finger gene induced in response to cold and drought in the interfertile Citrus relative Poncirus trifoliata. *Physiol Plant* 126: 9
- Sakai H, Medrano LJ, Meyerowitz EM (1995) Role of SUPERMAN in maintaining Arabidopsis floral whorl boundaries. *Nature* 378: 199-203
- Sun J, Jiang H, Xu Y, Li H, Wu X, Xie Q, Li C (2007) The CCCH-type zinc finger proteins AtSZF1 and AtSZF2 regulate salt stress responses in Arabidopsis. *Plant Cell Physiol* 48: 1148-1158
- Sun SJ, Guo SQ, Yang X, Bao YM, Tang HJ, Sun H, Huang J, Zhang HS (2010) Functional analysis of a novel Cys2/His2-type zinc finger protein involved in salt tolerance in rice. *J Exp Bot* 61: 2807-2818
- Sonoda Y, Yao SG, Sako K, Sato T, Kato W, Ohto MA, Ichikawa T, Matsui M, Yamaguchi J, Ikeda A (2007) SHA1, a novel RING finger protein, functions in shoot apical meristem maintenance in Arabidopsis. *Plant J* 50: 586-596
- Stone SL, Williams LA, Farmer LM, Vierstra RD, Callis J (2006) KEEP ON GOING, a RING E3 ligase essential for Arabidopsis growth and development, is involved in abscisic acid signaling. *Plant Cell* 18: 3415-3428
- Takatsuji H (1998) Zinc-finger transcription factors in plants. *Cell Mol Life Sci* 54: 582-596
- van Der Krol AR, van Poecke RM, Vorst OF, Voogt C, van Leeuwen W, Borst-Vrensen TW, Takatsuji H, van Der Plas LH (1999) Developmental and wound-, cold-, desiccation-, ultraviolet-B-stress-induced modulations in the expression of the petunia zinc finger transcription factor gene ZPT2-2. *Plant Physiol* 121: 1153-1162
- Wang D, Yang JS (2002) Cloning and characterization of cDNA encoding cotton STZ like protein. *J Fudan Univ* 41: 5
- Weingartner M, Subert C, Sauer N (2011) LATE, a C(2)H(2) zinc-finger protein that acts as floral repressor. *Plant J* 68: 681-692
- Xiao H, Tang J, Li Y, Wang W, Li X, Jin L, Xie R, Luo H, Zhao X, Meng Z, He G, Zhu L (2009) STAMENLESS 1, encoding a single C2H2 zinc finger protein, regulates floral organ identity in rice. *Plant J* 59: 789-801
- Xia Z, Liu Q, Wu J, Ding J (2012) ZmRFP1, the putative ortholog of SDIR1, encodes a RING-H2 E3 ubiquitin ligase and responds to drought stress in an ABA-dependent manner in maize. *Gene* 495: 146-153
- Xu R, Li QQ (2003) A RING-H2 zinc-finger protein gene RIE1 is essential for seed development in Arabidopsis. *Plant Mol Biol* 53: 37-50
- Yun JY, Weigel D, Lee I (2002) Ectopic expression of SUPERMAN suppresses development of petals and stamens. *Plant Cell Physiol* 43: 52-57
- Zhou Z, Sun L, Zhao Y, An L, Yan A, Meng X, Gan Y (2013) Zinc Finger Protein 6 (ZFP6) regulates trichome initiation by integrating gibberellin and cytokinin signaling in Arabidopsis thaliana. *New Phytol* 198: 699-708
- Zhang Y, Yang C, Li Y, Zheng N, Chen H, Zhao Q, Gao T, Guo H, Xie Q (2007) SDIR1 is a RING finger E3 ligase that positively regulates stress-responsive abscisic acid signaling in Arabidopsis. *Plant Cell* 19: 1912-1929