sequences throughout the genome is discussed in relation to resistance and susceptibility of soybean cultivars to SMV-CN18.

1-27. Silencing of *CaCDPK4* (*Capsicum annuum Calcium Dependent Protein Kinase*) and ItsOrtholog, *NbCDPK5* Induces Cell Death in *Nicotiana benthamiana*.

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We have isolated a full-length cDNA clone, *CaCDPK4* encoding a typical calcium-dependent protein kinase (CDPK) from hot pepper cDNA library. Genomic southern blot analysis showed that it belongs to a multigene family, but represents a single copy gene in hot pepper genome. RNA expression pattern of this gene revealed that it is induced by infiltration of *Xanthomonas axonopodis* pv. *glycines* 8ra into hot pepper leaves but not by water deficit stress. However, high salt treatment of NaCl (0.4 M) solution to hot pepper plants strongly induced *CaCDPK4* gene. In addition, this gene is weakly responsive to the exogenous application of salicylic acid or ethephon. Biochemical study of the GST-CaCDPK4 recominant protein showed that it autophosphorylates *in vitro* and the presence of EGTA, a calcium chelater, eliminates the kinase activity of the recombinant protein. As a way to identify the *in vivo* function of *CaCDPK4* in plants, VIGS (Virus-Induced Gene Silencing) was employed. *Agrobacterium*-mediated TRV silencing construct containing the kinase and calmodulin domain of *CaCDPK4* resulted in cell death of *Nicotiana benthamiana* plants. A highly homologous *N. benthamiana CDPK* gene, *NbCDPK5*, to *CaCDPK4* was cloned from *N. benthamiana* cDNA library. VIGS of *NbCDPK5* also resulted in cell death. The molecular characterization of this cell death phenotype is being under investigation.

1-28. Cloning And Characterization of Pathogen-Inducible EREBP-Like Transcription Factor (*CaNR19*) From Hot Pepper (*Capsicum annuum L.*)

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An EREBP/AP2-type transcription factor (*CaPF1*) was isolated by DDRT-PCR following inoculation of soybean pustule pathogen *Xanthomonas axonopodis* pv. *glycines* 8ra which induces HR on pepper leaves. Genomic Southern blot analysis revealed that the *CaPF1* gene is present as a single copy within the hot pepper genome. The deduced amino acid sequence of *CaPF1* has two potential nuclear localization signals, a possible acidic activation domain, and an EREBP/AP2 motif that could bind to a conserved *cis*- element present in promoter region of many stress-induced genes. The mRNA level of *CaPF1* was induced by both biotic and abiotic stresses. We observed higher-level transcripts in resistance-induced pepper tissues than diseased tissues. Expression of

CaPF1 is also induced upon various abiotic stresses including ethephon, MeJA, cold stress, drought stress and salt stress treatments. To study the role of *CaPF1* in plant, transgenic *Arabidopsis* and tobacco plants which express higher level of pepper *CaPF1* were generated. Global gene expression analysis of transgenic *Arabidopsis* by cDNA microarray indicated that expression of *CaPF1* in transgenic plants affect the expression of quite a few GCC box and DRE/CRT box-containing genes. Furthermore, the transgenic *Arabidopsis* and tobacco plant, expressing *CaPF1* showed tolerance against freezing temperature and enhanced resistance to *Pseudomonas syrnigae* pv. *tabaci*. Taken together, these results indicated that *CaPF1* is a novel EREBP/AP2 transcription factor in hot pepper plant and it may has a significant role(s) in regulation of biotic and abiotic stresses in plant.

1-29. A pathogen-induced osmotin-like protein gene, *CAOSM1*, from pepper : Differential expression and in situ localization in pepper tissues during pathogen infection and abiotic stresses

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An osmotin-like protein (*CAOSM1*) gene was isolated from pepper leaves infected with the avirulent strain Bv5-4a of *Xanthomonas campestris* pv. *vesicatoria*. The cDNA encodes a polypeptide of 250 amino acids with a molecular mass of 27, 361 Da. Its amino acid sequence is highly homologous to various osmotin-like proteins from other plant species. The *CAOSM1* gene expression was organ- and tissue-specifically regulated in pepper plants. The *CAOSM1* mRNA was intensely localized in the endodermis area of root tissue and in the phloem cells of vascular bundles of red fruit tissue, but not in leaf, stem, and green fruit tissues of healthy pepper plants. Infection by *X. c.* pv. *vesicatoria*, *Colletotrichum coccodes*, or *Phytophthora capsici* iinduced *CAOSM1* transcription in the leaf or stem tissues. Expression of the *CAOSM1* gene was somewhat higher in the incompatible than the compatible interactions of pathogens with pepper. The *CAOSM1* mRNA was prevalently localized in the phloem cells of the vascular bundle of leaf tissues infected by *C. coccodes*. The CAOSM1 gene was activated in leaf tissues by treatment with ethylene, methyl jasmonate, high salinity, cold acclimation and mechanical wounding, but not by abscisic acid (ABA) and drought. These results indicate that the pepper CAOSM1 protein functions in response to pathogens and some abiotic stresses in pepper plants

1-30. Differential expression and *in situ* localization of a pepper defensin (*CADEF1*) gene in response to pathogen infection, abiotic elicitors and environmental stresses in *Capsicum annuum*

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