Analysis of Osmotin as Transcription Factor/Cell Signaling Modulator Using Bioinformatic Tools

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Abstract: Osmotin is an abundant cationic multifunctional protein discovered in cells of tobacco (Nicotiana tabacum L. var Wisconsin 38) adapted to an environment of low osmotic potential. It provides plants protection from pathogens, hence placed in the PRP family of proteins. The osmotin induced proline accumulation has been reported in plants including transgenic tomato and strawberry conferring tolerance against both biotic and abiotic stresses. The exact mechanism of induction of proline by osmotin is however, not known till date. These observations have led us to hypothesize that osmotin induced proline accumulation could be due to its involvement as transcription factor and/or cell signal pathway modulator in proline biosynthesis. The present investigation was therefore, undertaken to analyze the osmotin protein as transcription factor /cell signalling modulator using bioinformatics tools. The results of available online DNA binding motif search programs revealed that osmotin does not contain DNA-binding motifs. The alignment results of osmotin protein with the protein sequence from DATF showed the homology in the range of 0-20%, suggesting that it might not contain a DNA binding motif. Further to find unique DNA-binding domain, the superimposition of osmotin 3D structure on modeled Arabidopsis transcription factors using Chimera also suggested absence of the same. We, however, found evidence implicating osmotin in cell signaling. With these results, we concluded that osmotin is not a transcription factor but regulating proline biosynthesis and accumulation through cell signaling during abiotic stresses.

Keywords : osmotin, cell signaling modulator, bioinformatic tools, protein

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