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Incidence and Molecular Mechanism of Human Pathogenic Bacterial Interaction with Phylloplane of Solanum lycopersicum

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Abstract : The concept of organic agriculture has been accepted as novelty in Indian society, but there is no data available on the human pathogens colonizing plant parts due to such practices. Also, the pattern and mechanism of their colonization need to be understood in order to devise possible strategies for their prevention. In the present study, human pathogenic bacteria were isolated from organically grown tomato plants and five of them were identified as Klebsiella pneumoniae, Enterobacter ludwigii, Serratia fonticola, Stenotrophomonas maltophilia and Chryseobacterium jejuense. Tomato plants were grown in controlled aseptic conditions with 25±1˚C, 70% humidity and 12 hour L/D photoperiod. Six weeks old plants were divided into 6 groups of 25 plants each and treated as follows: Group 1: K. pneumonia, Group 2: E. ludwigii, Group 3: S. fonticola, Group 4: S. maltophilia, Group 5: C. jejuense, Group 6: Sterile distilled water (control). The inoculums for all treatments were prepared by overnight growth with uniform concentration of 108 cells/ml. Leaf samples from above groups were collected at 0.5, 2, 4, 6 and 24 hours post inoculation for the colony forming unit counts (CFU/cm2 of leaf area) of individual pathogens using leaf impression method. These CFU counts were used for the in vivo colonization assay and adherence assay of individual pathogens. Also, resistance of these pathogens to at least 12 antibiotics was studied. Based on these findings S. fonticola was found to be most prominently colonizing the phylloplane of tomato and was further studied. Tomato plants grown in controlled aseptic conditions same as mentioned above were divided into 2 groups of 25 plants each and treated as follows: Group 1: S. fonticola, Group 2: Sterile distilled water (control). Leaf samples from above groups were collected at 0, 24, 48, 72 and 96 hours post inoculation and homogenized in suitable buffers for surface and cell wall protein isolation. Protein samples thus obtained were subjected to isocratic SDS-gel electrophoresis and analyzed. It was observed that presence of S. fonticola could induce the expression of at least 3 additional cell wall proteins at different time intervals. Surface proteins also showed variation in the expression pattern at different sampling intervals. Further identification of these proteins by MALDI-MS and bioinformatics tools revealed the gene(s) involved in the interaction of S. fonticola with tomato phylloplane.

Keywords : cell wall proteins, human pathogenic bacteria, phylloplane, solanum lycopersicum
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