Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

Use of Sulfur Nanoparticles as Green Pesticide on *Fusarium solani* and *Venturia inaequalis* Phytopathogens

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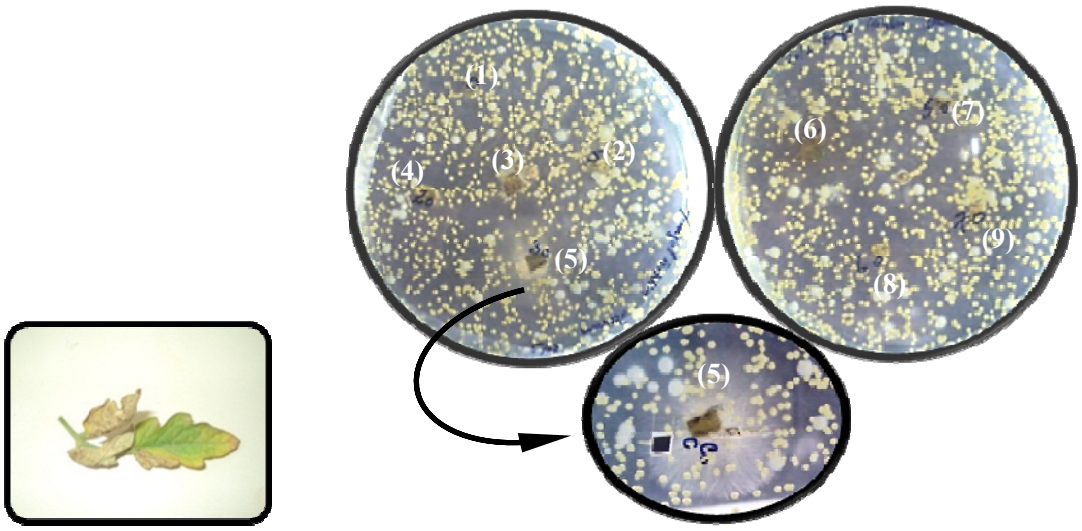
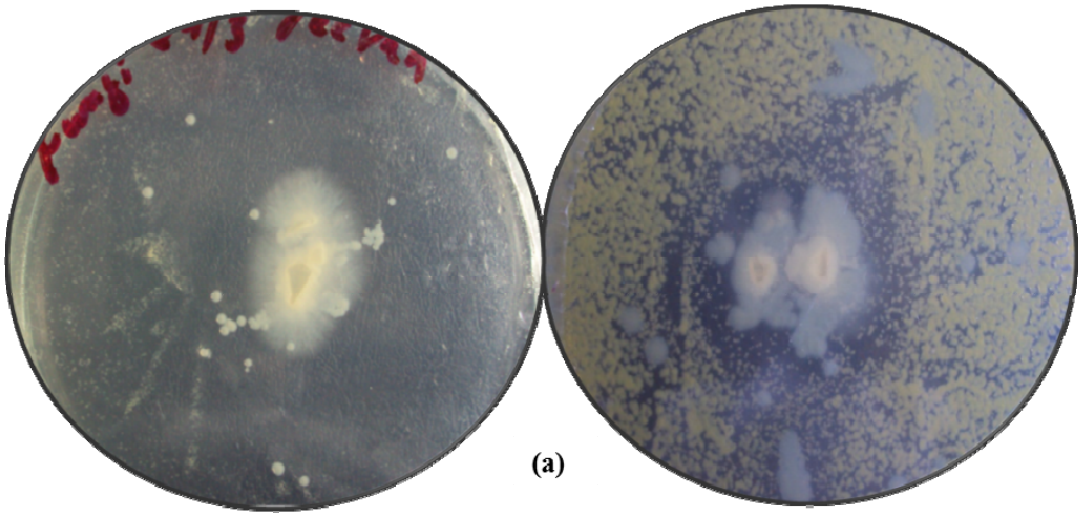
Microscopic characterization of F. solani: The microscopic characteristics of the isolated fungi were examined by an optical microscope (Hund-H600, Germany) and dimensions were calculated by Digisoft pormed 5.06 software. The morphology of the isolated fungi was examined by scanning electron microscope (SEM) (JEOL JSM-6480LV). Energy dispersive X-ray (EDX) analysis was performed at selective areas of the fungal biomass to know the presence of SNPs in selective regions of SEM samples.

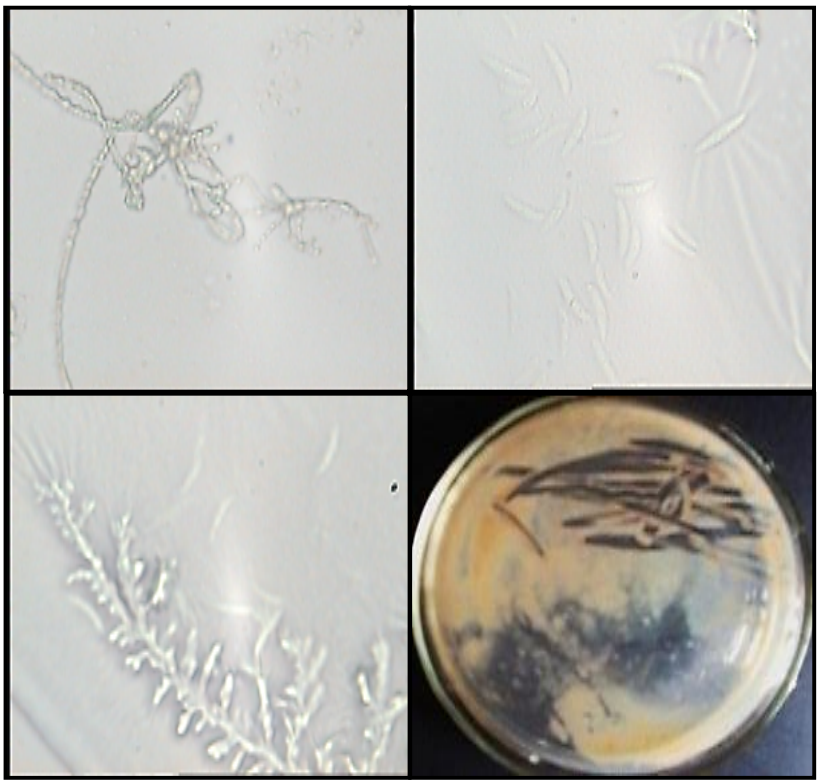


(a) **(b)**

Figure SI 1: (a) Photograph of tomato leaf with yellow spots. (b) Mycelial growth from surface sterilized leaf parts on PDA plates for different dip time intervals (from 1 – 9 in figure corresponds to 0, 5, 10, 20, 30, 40, 50, 60 and 70 seconds); leaf part with 30 seconds (sample no. 5) selected for isolation of fungi.

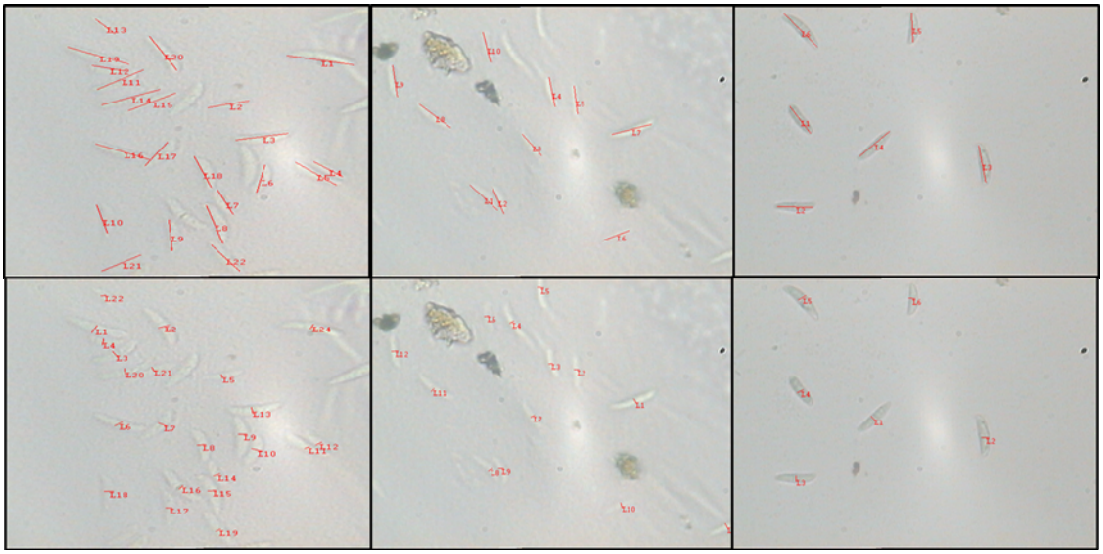


(a)

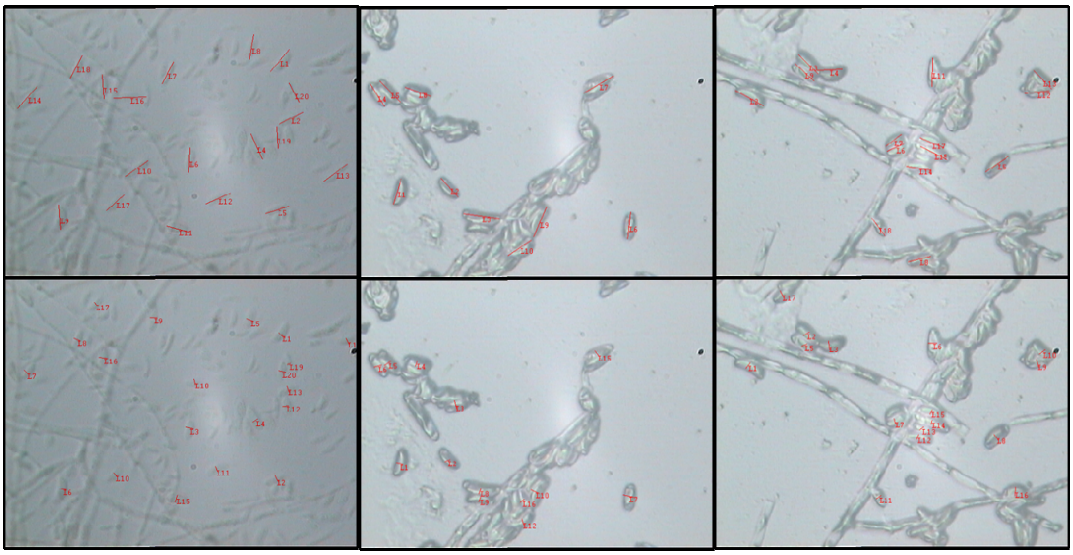


(b)

Figure SI 2: (a) Dimorphic *Fusarium* species on PDA plates (6 mM); grown at 25 °C (left) and 37 °C (right) for 3 days. (b) Microscopic images of the isolated *Fusarium* species in the liquid culture under optical microscope at 400 X magnification and brown pigment on PDA plate.

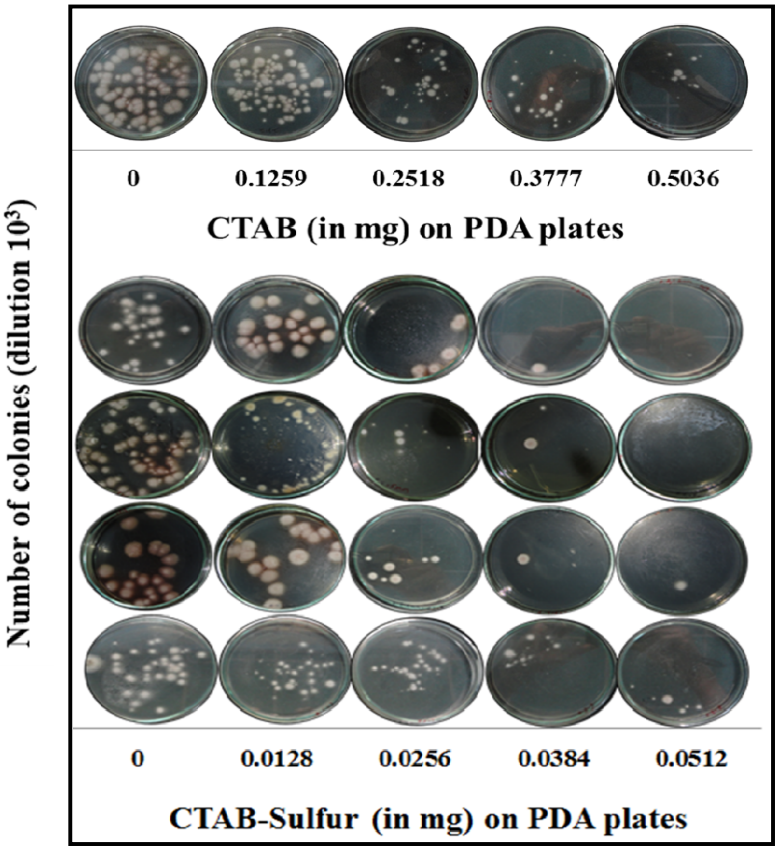


(a)

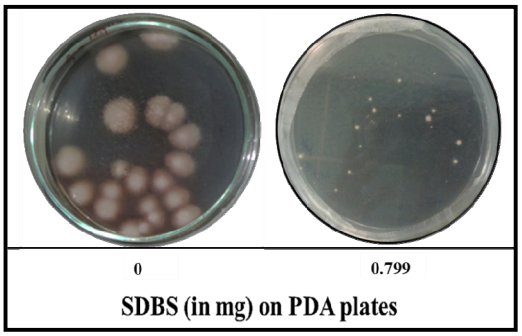


(b)

Figure SI 3: Comparison of fungal spore dimensions among isolated **(a)** and purchased **(b)** *Fusarium* sp. Average length and thickness of ~ 30 conidia are 49.1 ± 9.1 and 9.0 ± 1.9 µm for **(a)** and 41 ± 5.2 and 10 ± 2.3 µm for **(b)**.



(a)



(b)

Figure SI 4: a) Number of fungal spore colonies as a function of pure CTAB (2CMC i.e. 1.8 mM) and sulfur of CTAB – SNPs in mg when 0, 0.1, 0.2, 0.3 and 0.4 mL (of 4 mM) spreaded on potato dextrose agar (PDA) plates. b) Fungal colonies with/without 1 mL SDBS (2CMC i.e. 2.29 mM).

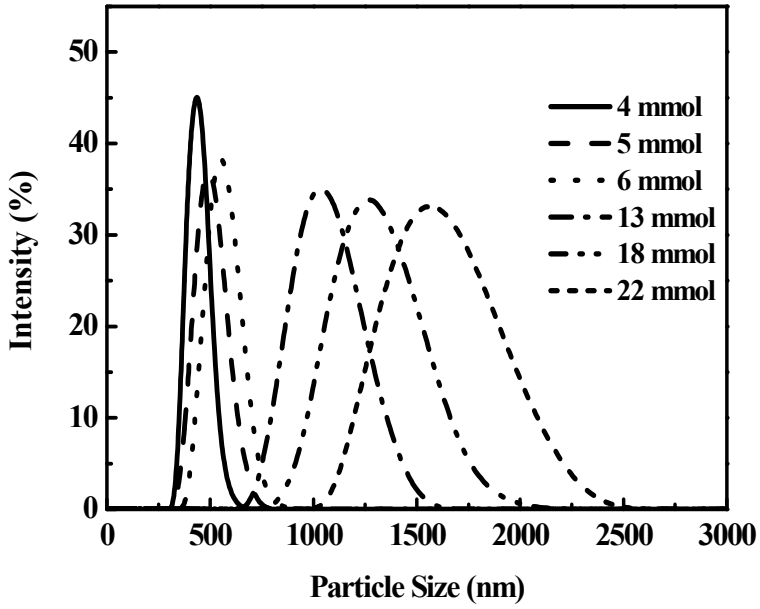


Figure SI 5: Particle size distribution of sulfur particles prepared in aqueous medium devoid of surfactants.

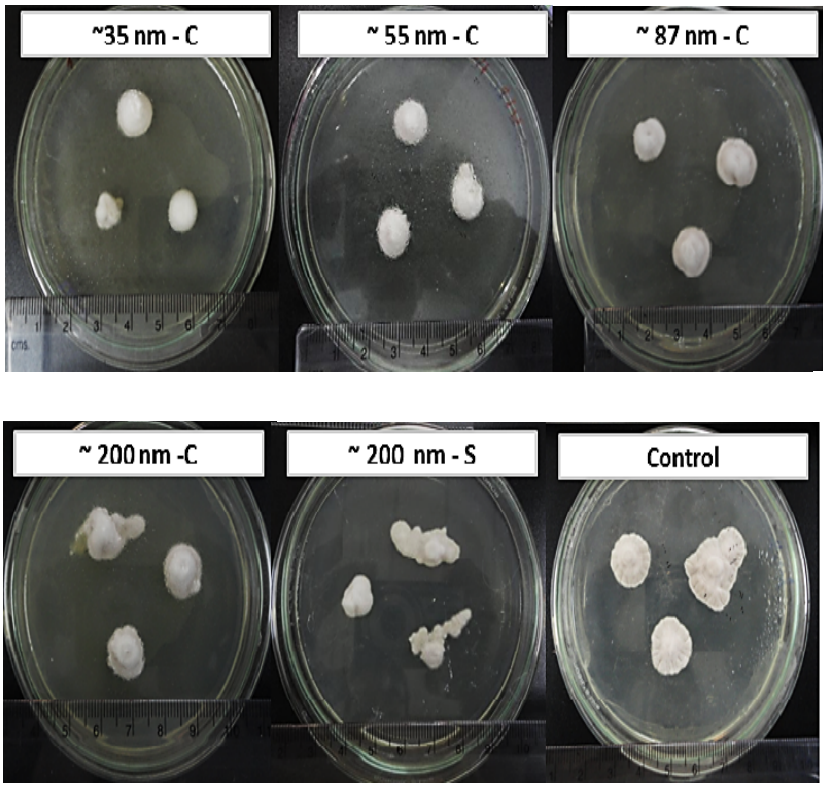


Figure SI 6: Fungal biomass discs grown at different size CTAB and SDBS – Sulfur systems of constant concentration (4 mM) on PDA plates (size indicated on the top of each figure). C, S – indicate CTAB and SDBS - SNPs system and 'Control' indicate no surfactants.

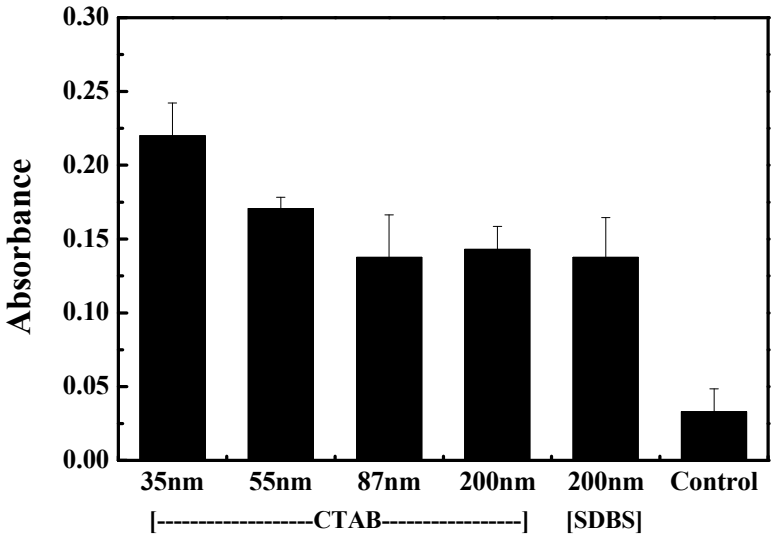


Figure SI 7: Absorbance values of different size SNPs (from ~35 to 200 nm) treated mycelial plugs with Biuret reagent. Nanosulfur in CTAB and SDBS environment indicated.

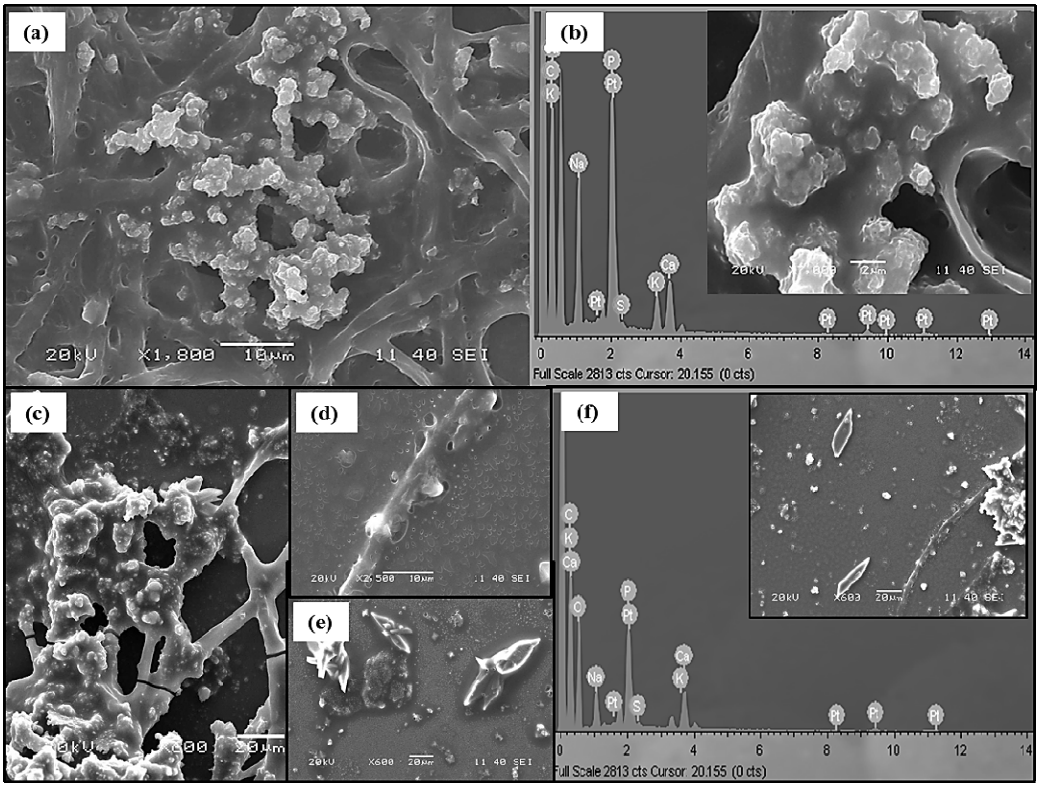


Figure SI 8: Fungal species treated with CTAB – sulfur particles of ~35 nm (a) and ~87 nm (c-e) with their EDX patterns of selective areas shown in b,f.

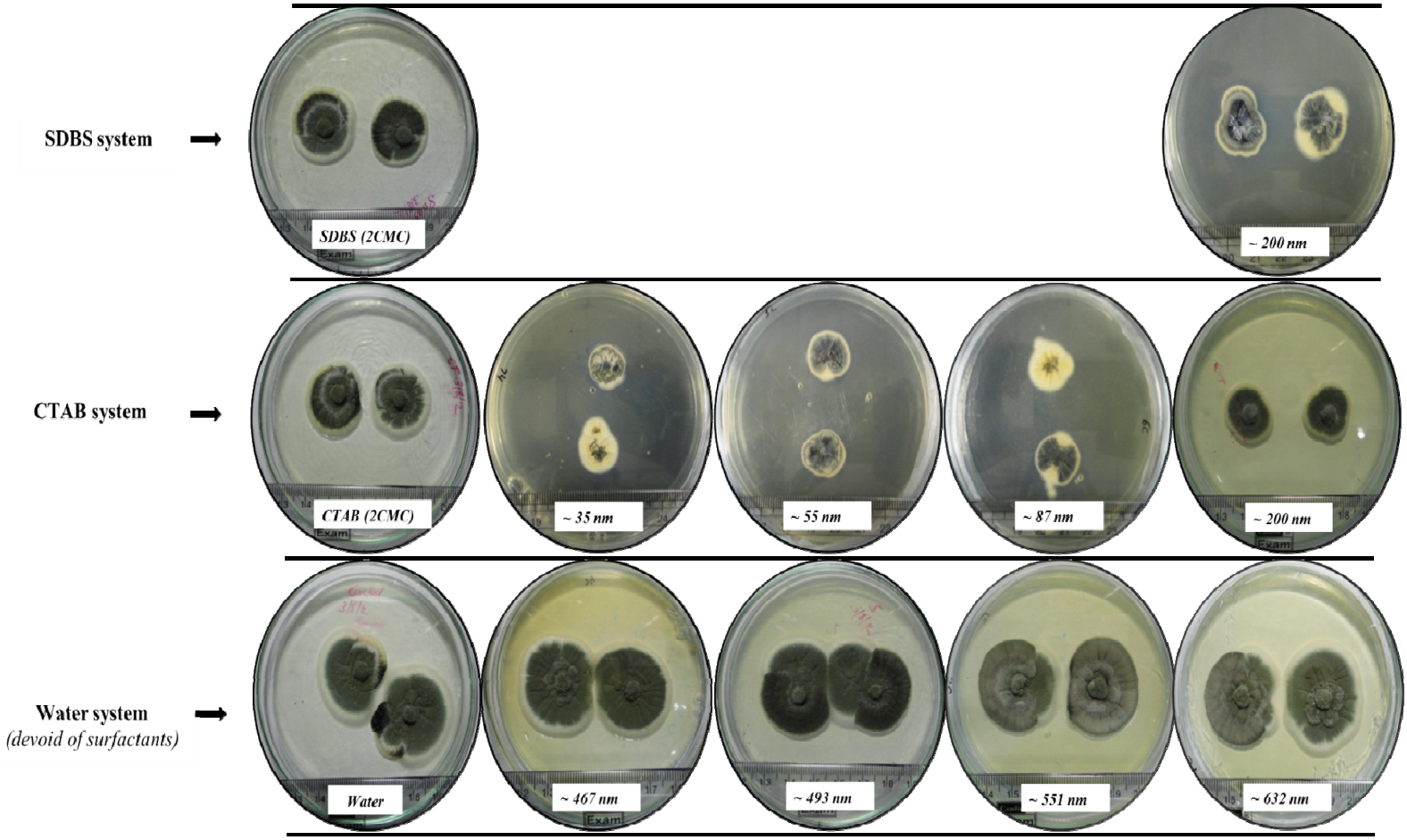


Figure SI 9: Radial growth of *V. inequalis* on PDA plates supplemented with various size SNPs prepared in SDBS, CTAB and water systems. First plates of each row are controls devoid of SNPs. Particle size given in respective box inserts.

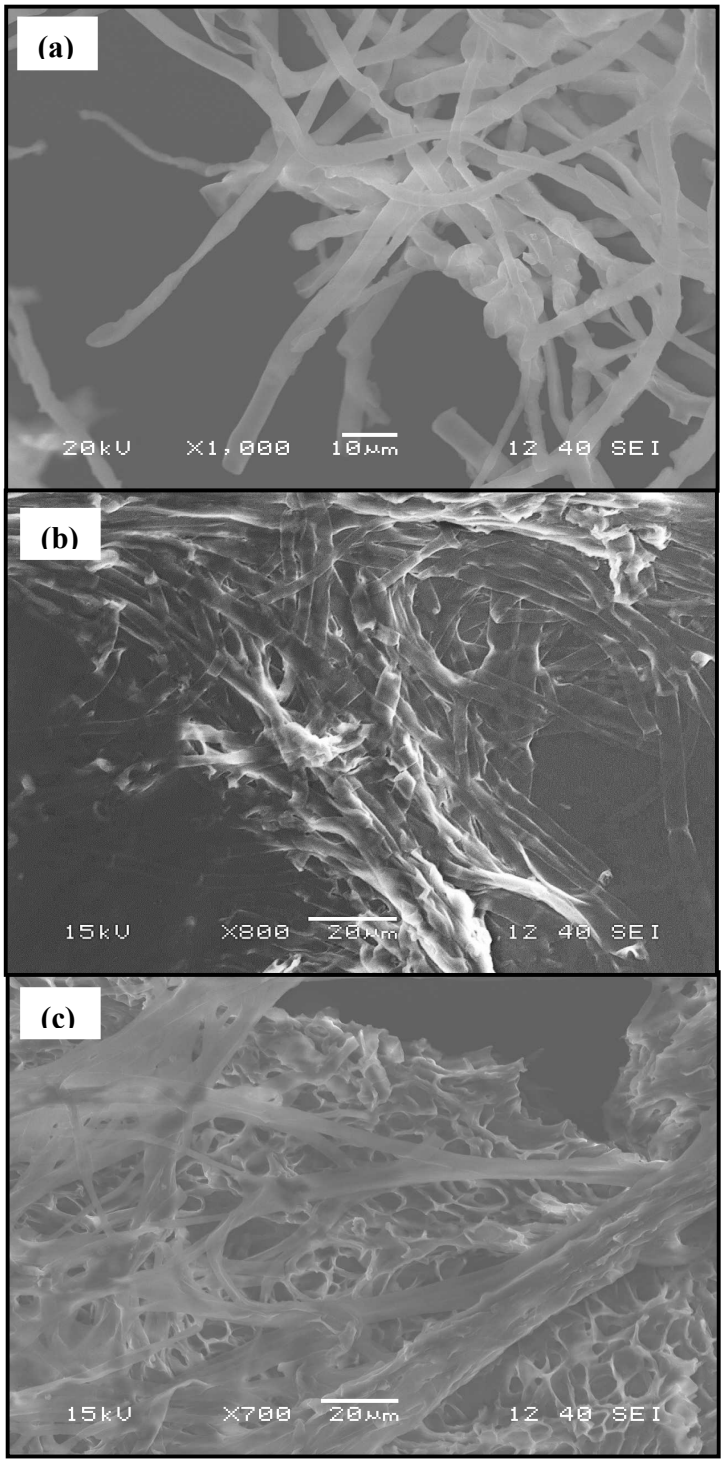


Figure SI 10: Low magnification SEM images of *V. inequalis* treated with water (a) and surfactants CTAB (b) and SDBS (c) 2CMC each.

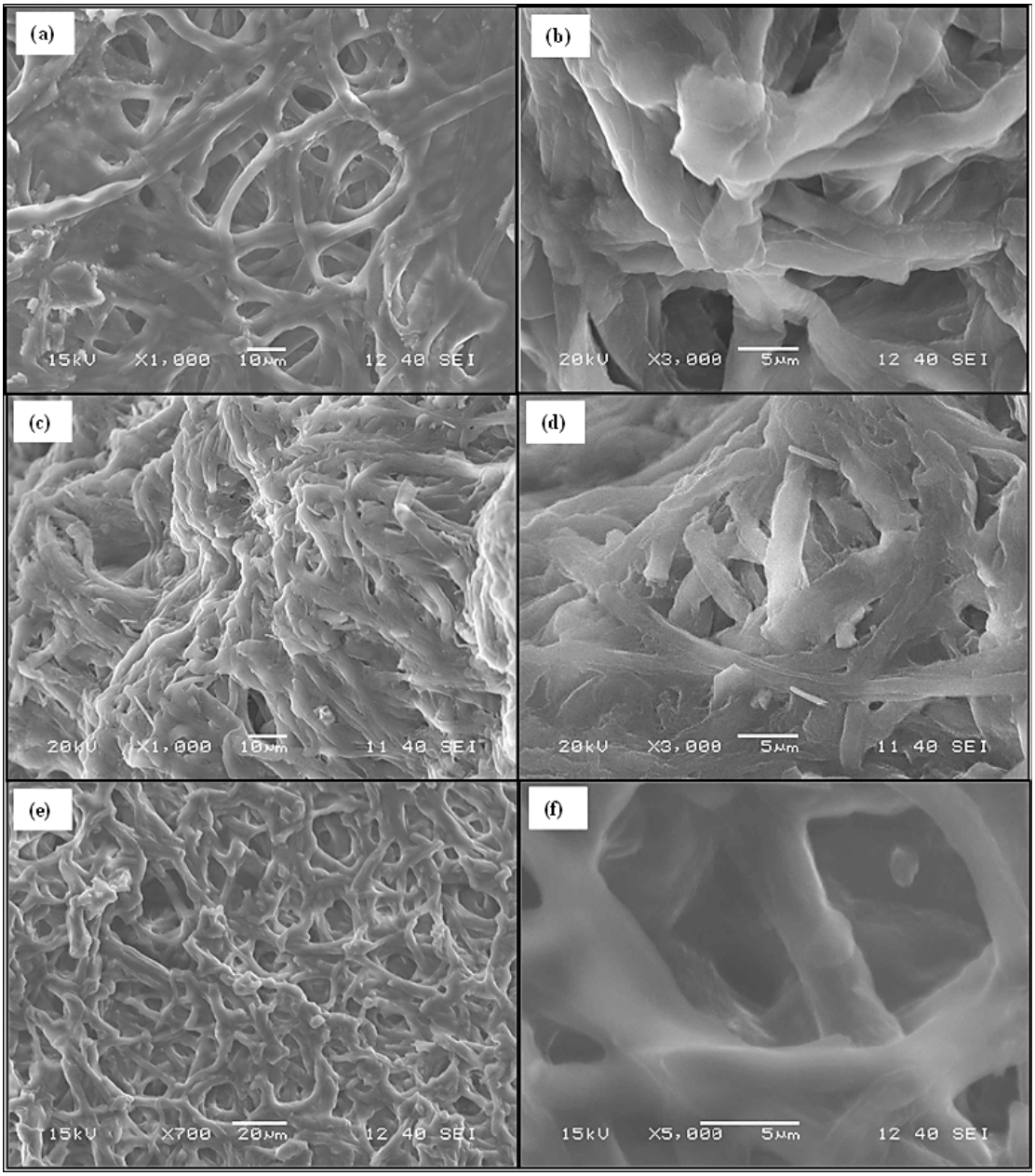


Figure SI 11: SEM images of *V. inequalis* treated with 4 mM SNPs prepared using surfactants (CTAB/SDBS). Fungal biomass exposed to ~ 35 nm (a, b) and ~ 87 nm (c, d) CTAB – SNPs and ~ 200 nm (e, f) SDBS – SNPs.

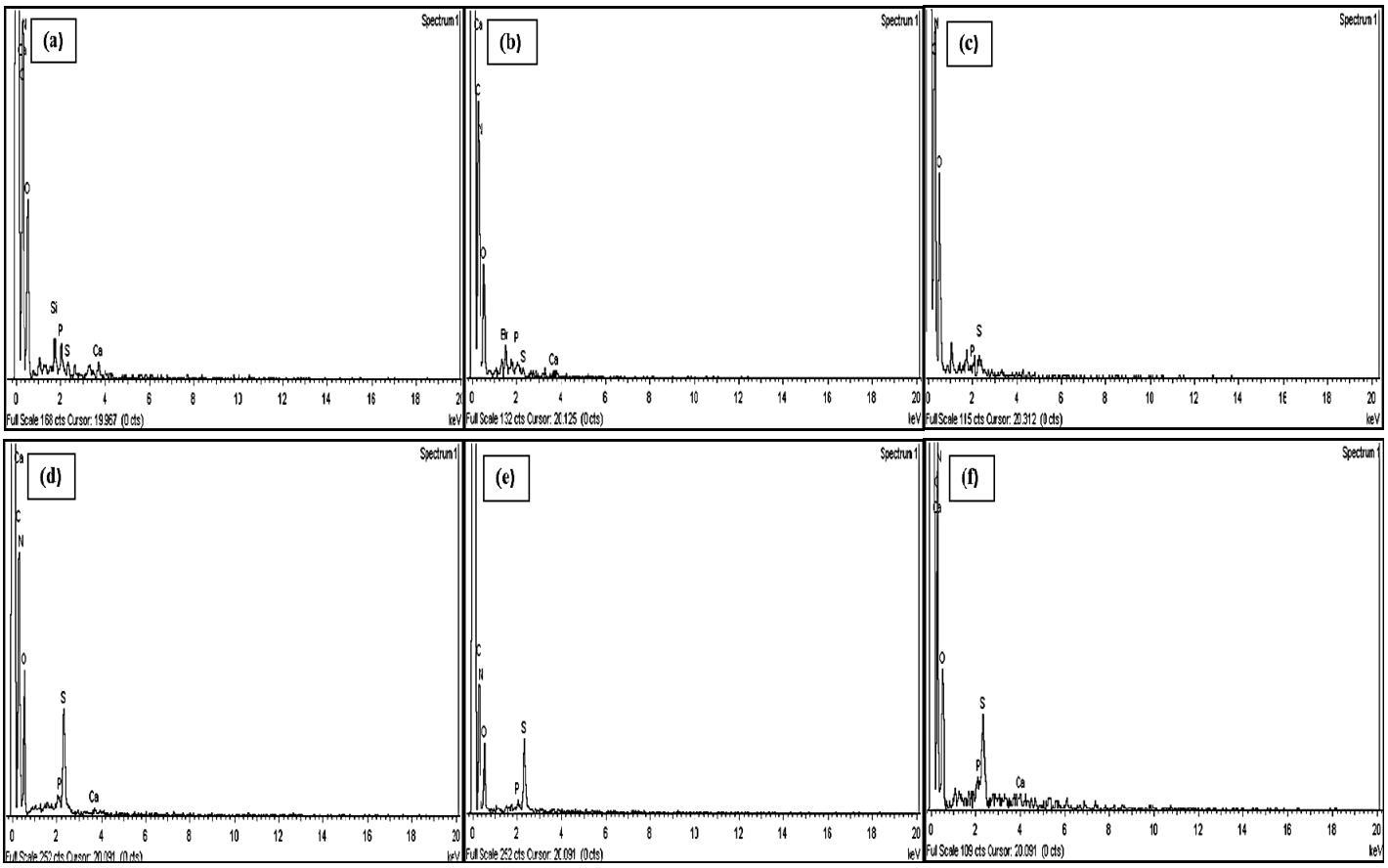


Figure SI 12: EDX profiles of *V. inequalis* biomass suspended in water, surfactants SDBS, CTAB (each 2CMC) – [a, b, c] which serve as controls plus ~ 35, 85 nm (CTAB – SNPs), and ~ 200 nm (SDBS – SNPs) – [d, e, f] prepared by diluting 4, 6 and 7 mM to 4 mM.