Advanced application of electrospun polycaprolactone fibers for seed germination activity

ABSTRACT

The increasing intensity of coronavirus (COVID-19) spreading emphasizes the significant development in home food production to reduce the incoming socioeconomic impact from soaring food prices, supply chain fragility, and severe economic crisis. This preliminary study was initiated to demonstrate the possibility of using electrospun fibers as a potential substrate in the application of seed germination activity. The drive of this preliminary study was to integrate the electrospun nanofiber-based material in exploring the current surge in home food production via seed germination in order to introduce cheap source of food without being distracted by the pandemic impact in general. Mung bean (Vigna radiata L. Wilczek) was chosen as it is easy and fast to sprout. Four samples of poly (ε-caprolactone)- (PCL-) based fibers were prepared by means of electrospinning technique, with the optimized flow rate between 0.05 and 0.20 ml/min at a fixed distance of 10 cm needle tip to collector. Mung bean seeds were allowed to germinate on the fabricated electrospun PCL fibers for 96 hours. Our observations include germination percentage, seedling weight, radicle length, and plumule growth. The highest radicle length and plumule length of seedlings were 27.8 mm and 6.7 mm, respectively. There were no inhibitory effects on seed germination and minimal structural fragmentation of smaller diameter electrospun fibers as revealed by FESEM. These results show that the seeds were able to germinate on electrospun PCL fiber substrate, owing to the properties of high surface area and excellent fluid water uptake of PCL fibers.