ABSTRACT

The study conducted in this research involved the cultivation of *Aloe vera* plants, extraction of fibers from both the stem and leaf skin, and subsequent characterization of these fibers for various properties. The research aimed to explore the potential use of *Aloe vera* fibers in wound healing applications. The study began with the selection of *Aloe vera* nurseries in Kasur, Pakistan, and the collection of *Aloe vera* plants, specifically the *Aloe barbadensis miller* variety, which was commonly found in the nurseries. These plants were then cultivated in Botanical Garden Lahore, where various growth management practices were applied, including the addition of inorganic and organic fertilizers to enhance plant growth. Stem growth was also promoted by cutting lower leaves. After five months of growth, the *Aloe vera* plants were uprooted, cleaned, and the stem was separated from the leaves. The fibers were extracted from stem through water retting method and then subjected to various analyses. Moisture content and ash content analyses were performed to assess the presence of moisture and inorganic residue in the fibers, respectively. The results indicated a significant moisture content of approximately 55.35% and an ash content of around 6.99%. Antibacterial activity of the *Aloe vera* fibers was evaluated against four bacterial strains. Ethanol and water extracts of the fibers exhibited varying degrees of inhibition zones, suggesting potential antibacterial properties. Furthermore, the fibers were subjected to UV-Visible spectroscopy, FT-IR spectroscopy, scanning electron microscopy (SEM), and X-ray diffraction analysis to characterize their chemical, structural, and morphological properties. The UV-Visible spectrum showed a distinctive λmax at 247 nm, indicating specific electronic transitions. FT-IR analysis revealed information about the functional groups present in the fibers. SEM images demonstrated the smooth surface morphology of the *Aloe vera* fibers. X-ray diffraction analysis indicated a high degree of crystallinity, with a percentage crystallinity of approximately 90.5%, signifying a well-structured and crystalline nature of the fibers. Energy dispersive X-ray (EDX) analysis was performed to determine the elemental composition of the fibers. It revealed the presence of carbon, oxygen, calcium, and copper, with carbon being the predominant element. In summary, this comprehensive research explored the cultivation, extraction, and characterization of *Aloe vera* fibers, demonstrating their potential in wound healing applications. The results showed promising properties such as antibacterial activity, high crystallinity, and specific elemental composition, which make these fibers valuable for further investigation and potential use in medical and healthcare products such as wound healing.