Nano-silver treatments inhibit stem-end bacteria on vascular tissue of cut Rose hybrida

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Vase solutions are created to delay cut flowers senescence, and in roses this is due to: excessive transpiration and water loss; short supply of carbohydrate to support respiration; reduction of water absorption, diseases; ethylene; room temperature and humidity. Bacterial blockage of the stem vascular tissue, reduce water absorption and promotes dehydration. Nano silver particles (AgNPs) are well recognized as anti-microbial agent [1]. In order to contribute to the development of new preservative flower solutions the objective of our research was to study the antimicrobial effect of biologically synthesized AgNPs, on the blockages of vascular tissue at the stem-ends of *Rosa hybrida* cv. Freedom. Methodology: biosynthesis of AgNPs was performed using *Camelia sinensis* extracts and characterized with UV/vis spectroscopy and TEM (Tecnai 2G, FEI Company, Thermo Fisher Scientific's). AgNPs size was 21.509 ± 0.634 nm, and 81.6% was smaller than 30 nm. Three concentrations of AgNPs (1, 5 y 10 ppm) were tested on preservative solutions (0% and 2% sugar) at 3.40 pH. The number of bacterial colonies was counted in the vase solution at 3 d and 7 d using 3M™ PetrifilmTM according with the AOAC™ International (2016). Cross sections (0.5 cm) of the stem end were fixed in 2.5% glutaraldehyde in 0.1 M Sorensen's buffer pH 7.2, for 72 h at 4C°. After wash, samples were postfixed (1% OsO_4, 2 h), dehydrated in ethanol, critical point dried and coated with gold/palladium. Samples were observed with a SEM (JSM-6390, JEOL, Japan) at 15 kV. Vascular occlusion index was: VOI=(total vessel /blocked vessel) x 100, n=5 per treatment at day 7. Results: AgNPs reduced bacterial colonies in the preservative solution (Log 10 UFC mL^{-1}). No UFC were found in the solution with 10 ppm of Ag NPs at 3 d. After 7 d control solution showed 165% more bacterial colonies than treatment with 10 ppm Ag NPs. UFC were always reduced by AgNPs even in the presence of sugar: 5 ppm of Ag NPs inhibited bacterial growth by 40%. Control stems showed a VOI of 33.62%, SEM images showed bacteria aggregates in the vessels and protein clusters, forming defined networks (Fig. 1 B). In contrast, 10 ppm AgNPs reduced VOI to 8.99%, but 1 ppm and 5 ppm did not change VOI (17.04% and 16.36 %). Sugar (2%) in the solution promoted bacterial grow, but 1, 5 and 10 ppm AgNPs reduced its VOI to 25.34 %, 16.04 %, 11.38 %, respectively. Our results agree with those obtained in *Chrysanthemum* treated with AgNPs (10.3 nm), where no UFC were found in vase solutions with 0.01, 0.05 and 0.1, mM [2]. We conclude that AgNPs is an efficient antimicrobial agent in vase solution for cut roses that increase its vase life.

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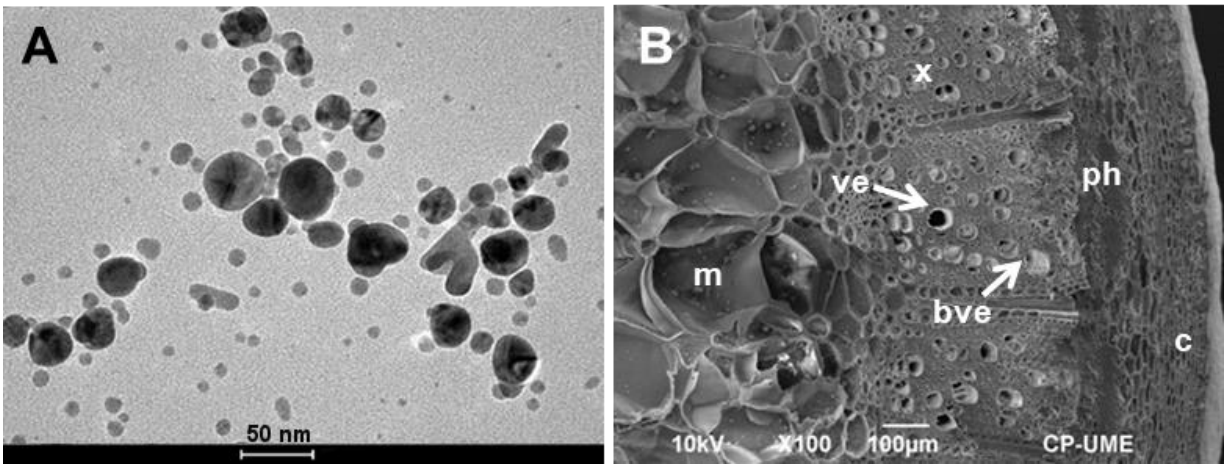

Fig.1. A: TEM image of Silver nanoparticles. B: SEM image of the stem end of *Rosa hybrida*. c:cortex; m: medulla; bve: blocked vessel; ph: phloem; ve: vessel of xylem; x: xylem.

References.

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