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ENHANCING THE POLYPHENOLIC CONTENT OF ELDERBERRIES BY PULSED ULTRAVIOLET TREATMENTS

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ABSTRACT Ultraviolet light has been used to enhance the nutritional properties of fruits and vegetables since reported research has indicated that ultraviolet light with adequate intensity and exposure time can stimulate secondary metabolites development in plant material. Pulsed ultraviolet light is typically used to decontaminate food surfaces as it has an antimicrobial effect. The present study aimed to explore the effect of pulsed UV light on the antioxidant behavior of elderberry (*Sambucus nigra*). The changes in total polyphenolics in elderberry treated with various pulsed ultraviolet rays were investigated. A pulsed UV system (Xenon Corporation model RC747) was used in the experiment. The system has the capacity of producing pulsed ultra violet light with maximum energy of 1.27 KJ/cm^2/pulse. All energy levels were maintained at the pulse rate of 3 pulses/ sec with a pulse width of 360µs. Four pulsed UV durations (i.e. 5, 10, 20, 30 seconds) at three energy dosages (i.e. 0.45, 0.6, 1.1 J/cm^2/pulse) were considered for the research. All treated elderberry fruits were incubated for 24 hours following treatment to ensure enough response duration for enhanced development of polyphenols by the berries. The total poly phenolic content was determined using Folin-Ciocalteu method. The absorbance was measured at 765 nm. The results were expressed in milligram equivalent of Gallic acid. Analysis of variance (ANOVA) was carried out with the confidence level of 95% to determine the significant effect between pulsed UV treatments on total polyphenolic content of elderberries using the Fisher method. A 20-second illumination treatment with an energy level of 0.45 J/cm^2/pulse increased total polyphenolics by 23.6%. The highest increment in total phenolics of 50% was found with 1.1J/cm^2/pulse for a 10-second treatment. A 40% increase in total phenolics was found at an energy dosage of 1.1J/cm^2/pulse after 5 seconds exposure. Even though most of the treatments indicated an increase in total polyphenols, some treatment expressed a decrease in phenolics when compared to the control. For instance, there was a decrease in total polyphenolics of 2 to 9% for a treatment of 0.45 J/cm^2/pulse at the maximum illuminated duration of 30 seconds, thus indicating that there is a limit to the positive response of the treatment. The total soluble solids of fruit were determined by handheld refractometer. Total soluble solids (TSS) of all treated elderberry samples were measured and compared with the polyphenolic content. No significant relationship was found between TSS and the total phenolic content. During the experiment there was no change in color of the ripened fruits, but immature fruits lost their color with the higher energy treatment of

1.1J/cm^2/pulse. This research illustrated the potential of pulsed UV light for increasing total phenolics in elderberries. This research did not however identify the specific phenolics which were responsive and specifically increased by the pulsed UV light. There is a possibility that some phenols might decrease and some phenols might increase following the pulsed UV treatment. Further research should explore and quantify the behavior of each phenolic compound in elderberry as it is subjected to pulsed UV light. Further investigation is thus required to define the type of phenolic profiles which are responsive to the pulsed UV treatment and the reasons for the color change in immature elderberry.

Keywords: Antioxidant, Elderberry, Pulsed UV light, Polyphenols