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Proteomics analysis of strawberry fruits exposed to essential oils.

The fully-ripened and perishable strawberry fruits start to rot and grow fungus within a week after harvest even when stored in a chilled condition. Essential oil coating was reported to have the function to protect stored fruits against fungal spoilage, decaying and deterioration of stored fruits, and thus extending the shelf life and quality. This study aims to identify strawberry proteins that are responsive to surface treatments to delay or prevent fruit rot caused by fungal infection. Four strawberry varieties including Albion, Allstar, Jewel, and Sweet Charlie, were planted in a high tunnel on September 2020 and harvested in spring 2021. The fruits were packaged inside a separate air-tight container and exposed to 30ppm concentration of five essential oils (thymol, cinnamon oil, eugenol, clove bud oil, non-enal) by placing them in cotton ball. Fungicide Switch (30ppm) and no treatment were used as positive and negative control respectively. After one week of storage at 4ºC, fruit tissues were harvested and homogenized in acetone containing 10% TCA. Protein were precipitated after incubation at -20ºC overnight. Tryptic digested proteins were labeled using the 16-Plex TMT kit. The proteomes were identified using real time search selection and MS3 quantification. 4304 proteins were identified and proteins showing significant differences in relative protein abundance between treated and control samples were taken as differentially abundant proteins (DAPs); these DAPs were used to identify the biological processes associated with fruit rot, and plant defense against fungal infection. Protein-protein association networks were constructed for proteins involved in fruit flavor development, cell wall modification, antibiotic activities. Proteins associated with cell wall degradation (related to fruit softening and fungal infection) were identified. This research has provided novel information for understanding strawberry ripening and fruit softening processes, and the use of essential oil on extending the shelf life of the perishable fruits.

Keywords: Strawberry fruits, essential oils, proteomics, biological processes, fruit quality