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COMPARATIVE ANALYSIS OF POLYPHENOL BIOSYNTHESIS AND ACCUMULATION PATTERNS IN DIFFERENT APPLE GENOTYPES: SIZE MATTERS

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The rising interest in the nutraceutical properties of apple relies on the positive effects of dietary polyphenols on human health particularly in the prevention of degenerative diseases, due to their antioxidant action. In order to increase the daily intake of this phytochemicals, one of the most effective strategies is breeding new apple varieties, able to accumulate permanently higher amount of valuable secondary metabolites. Wild apple species are generally thought to be richer in polyphenols. In contrast the modern cultivar domestication process seems to have led to a depletion of antioxidant compound. Therefore, growers are nowadays interested in developing new commercial breeding programs that can exploit the wild genotypes. Anyway, the usage of wild species (e.g. *Malus siversii* and *Malus baccata*) as source of variability for increasing the polyphenol content can lead to the introgression of unwanted features, such as poor storability, post-harvest disorder susceptibility, hard texture, the presence of off-flavors and astringent taste. Hence, understanding the real contribution of wild species genotype in the regulation of the polyphenol accumulation is essential, before to undertake an expensive and time consuming breeding program. Therefore, fruit from five domesticated apple cultivars and from two wild species, distinguished by different fruit size and polyphenols accumulation patterns, were collected at the commercial harvest. Skin and pulp were used for transcript and polyphenol quantification. A correlation analysis based on bivariate covariance highlighted the differences existing between the two groups of *Malus* species. As expected, our results indicate that the higher amount of polyphenols detected in *M. siversii* and *M. baccata* is mainly correlated with the small fruit size, rather than with a specific expression profile of the genes devoted to the polyphenol biosynthesis. Our findings, as far as we have observed, suggest that the size of the fruit mainly accounts for the final total polyphenol concentration in apple, making almost pointless crossing domesticated apple varieties with wild species, considering that the average fruit size will match the commercial standard that is significantly larger than the wild species caliber.

On the contrary, reducing the fruit size (by means of pruning and thinning) could be much more effective, limiting the 'dilution factor' as result of the continuous consumers demand for bigger fruits.