

Apel merupakan salah satu tanaman buah yang dibudidayakan di beberapa daerah dataran tinggi di dunia. Kualitas dan umur simpan buah apel ditentukan oleh berbagai faktor seperti jenis budidaya, latar belakang genetik, kondisi lingkungan saat prapanen, waktu panen dan kondisi penyimpanan. Mekanisme perubahan tekstur pada pelunakan buah cukup kompleks sehingga penelitian ini bertujuan untuk menunjukkan variasi kekerasan buah, produksi etilen, komponen dinding sel dan berat molekul pektin pada beberapa kultivar buah apel selama penyimpanan, serta menunjukkan variabel pengamatan yang berpengaruh langsung maupun tidak langsung terhadap kekerasan buah pada apel. Kultivar apel dipanen kemudian disimpan pada suhu 20°C selama 20 hari untuk dianalisis kekerasan buah, produksi etilen, komponen dinding sel dan berat molekul pektin. Ekstraksi polisakarida dilakukan menggunakan akuades, EDTA, Na<sub>2</sub>CO<sub>3</sub> dan 4 M KOH. Analisis regresi, *independent t-test* dan lintas digunakan untuk mengetahui variasi perubahan pada masing-masing kultivar serta untuk mengetahui variabel yang berpengaruh secara langsung ataupun tidak langsung terhadap kekerasan buah. Hasil penelitian menunjukkan bahwa setiap kultivar memiliki variasi kekerasan buah, produksi etilen dan modifikasi dinding sel yang berbeda-beda selama penyimpanan. Bagaimanapun, kandungan ASP (*Alkali- soluble polyuronides*) terbesar dalam apel diketahui memainkan peran penting pada integritas sel dalam menjaga daging buah agar tetap keras selama penyimpanan. Berdasarkan hasil analisis lintas, total poliuronida, hemiselulosa dan produksi etilen berpengaruh langsung terhadap kekerasan buah. Selain itu terdapat pengaruh tidak langsung terhadap kekerasan buah yaitu WSP (*Water- soluble polyuronides*), CSP (*Chelator- soluble polyuronides*) dan ASP melalui total poliuronida.

**Kata kunci:** Apel, kekerasan, komponen dinding sel, pelunakan, penyimpanan

Apple is one of the fruit plants that have been cultivated in several highland areas around the world. The quality and shelf-life period an apple is determined by numerous factors such as the type of cultivar, genetic background, environmental conditions during pre-harvest, time of harvesting, and storage conditions. The mechanism of texture change in fruit softening is complex, thus this study aims to show the variations in fruit firmness, ethylene production, cell wall components, and molecular weight of pectin in apple cultivars during softening, and show the variable that directly and indirectly affect the fruit firmness. Apple cultivars were harvested and then stored at 20°C for 20 days to analyze fruit firmness, ethylene production, cell wall components and molecular weight of pectin. Extraction of polysaccharides was carried out using distilled water, EDTA, Na<sub>2</sub>CO<sub>3</sub> and 4 M KOH. Regression, independent t-test and path analysis were used to determine the variation of changes in each cultivar and to determine the variables that directly or indirectly affect fruit firmness. The results showed that each cultivar had different variations in fruit firmness, ethylene production and cell wall modification during storage. However, the highest content of ASP (Alkali soluble polyuronides) in apples is known to play an important role in cell integrity in keeping the firmness during storage. Based on path analysis, total polyuronides, hemicellulose and ethylene production had a direct effect on fruit firmness. In addition, there is an indirect effect on fruit firmness, namely WSP (Water soluble polyuronides), CSP (Chelator soluble polyuronides) and ASP through total of polyuronides.

**Keyword:** Apple, firmness, cell wall component, softening, storage