Norton is an important grape cultivar that is native to Missouri and grown widely because of disease resistance and wine quality. Wine quality is related to levels of flavonoids, and vineyard practices influence flavonoid accumulations. However, little research has examined accumulation of flavonoids in Norton fruit over the growing season. A two-year (2012-2013) study was initiated using Norton and Cabernet Sauvignon vines at Mountain Grove, MO, and a one year study in (2013) using Norton vines at Rocheport, MO. Cabernet Sauvignon, a well-studied grape cultivar was monitored for flavonoid accumulation as a comparison to Norton. Berry samples were collected at six stages of maturation from green berries at 43 days after flowering (DAF) to harvest (125 DAF). Levels of sugars, acids, and flavonoids such as anthocyanins, tannins, and total phenolics were estimated from berry skins at each harvest date. Compared to Cabernet Sauvignon, Norton had 15% higher sugars, 9% higher acids, 72% higher anthocyanins, 40% lower tannins, and 9% lower total phenolics averaged over six stages. High levels of anthocyanins in Norton would contribute to higher quality wine based on color. However, lower tannin levels will result in a less astringent wine; tannins are added during fermentation to adjust astringency. Lower total phenolic content can decrease the stability of wine limiting storage. Documentation of Norton berry flavonoid content will allow future research to determine how vineyard practices can alter the concentration of flavonoids during berry development.