

**Title** Effect of vacuum cooling and different storage temperature storage temperatures on physico-chemical properties of broccoli

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### **Abstract**

The study revealed the optimum operating process parameters during vacuum cooling of broccoli and investigated the effect of vacuum cooling and different storage temperatures on the physico-chemical of broccoli. The study results illustrated that the optimum operating process parameters for broccoli precooled to 5 °C with initial temperature of 15-20 °C were at the final pressure of 5.5 mbar and the vacuum pressure reserving for 25 minutes. Storage at low temperatures helped reduce the loss of fresh weight, vitamin C and chlorophyll as well as the change of color of broccoli heads whereas the amounts of phenolic compounds and antioxidant in broccoli stored at low temperatures were lower than those found in broccoli stored at high temperatures. The fresh weight loss of precooled broccoli stored at the temperature of 0 °C accounted to 1.42 percent, which was significantly ( $p<0.05$ ) smaller than that of broccoli stored at the temperatures of 5° and 10° C. Broccoli heads changed the color from green to yellow when stored at the temperatures of 10° C for 5 days, and remained green when stored at the temperatures of 5° and 10° C. The amounts of vitamin C and chlorophyll tended to decrease with storage time, which correlated with the diminishing green color. It was found that storage at the temperatures of 0° and 5° C caused a significantly ( $p<0.05$ ) smaller loss of vitamin C and chlorophyll than storage at 10° C. Broccoli stored at the temperatures of 0°, 5° and 10°C had a vitamin C content of 95.51, 82.05 and 32.69 mg/100 g fresh weight basis, respectively. The amounts of phenol and antioxidant in broccoli stored at 10° C were higher than in broccoli stored at the temperatures of 5° and 0° C, measuring 1,426.32 and 114.26 micrograms gallic acid equivalent per gram fresh weight basis, respectively. Broccoli stored at the temperature of 0° C had the longest storage life of 15 days, which differed significantly ( $p<0.05$ ) from that stored at 5° and 10° C.