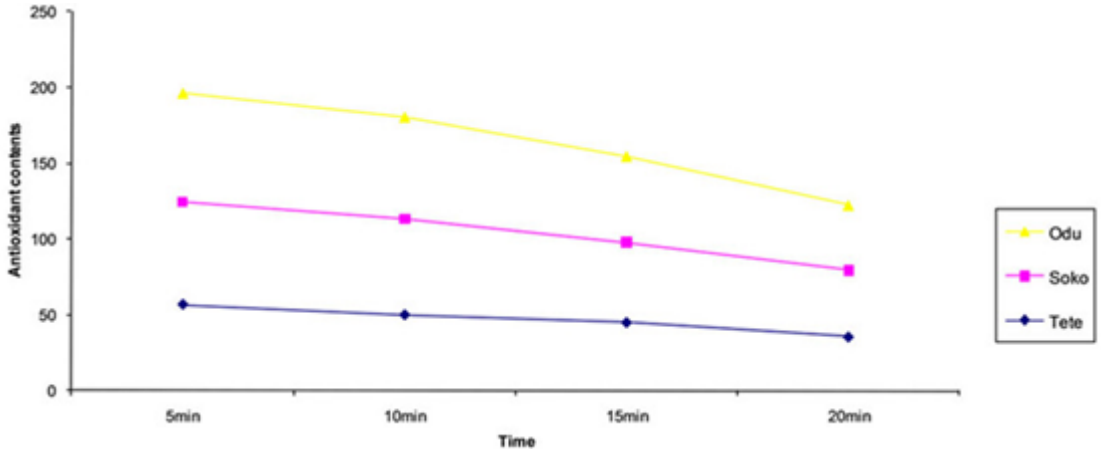
# The Influence of Blanching Time on Frozen Potatoes

The frozen vegetable technology is a vegetable processing preservation technology, first appeared in America in the 1930s. Compared with other processing and storage methods, it can maintain the original luster of vegetable, flavor and nutritional value. With the improvement of international cold chain technology and the shift of people's diet structure from subsistence to nutrition and health-based, the international market demand of frozen vegetable is increasing.

Before freezing the fruit and vegetable, the processes contain selecting, cleaning, slicing, blanching, cooling, de-watering etc. Blanching is an important pre-treatment of freezing vegetable and fruit, mainly to destroy the oxidation system and restrain enzyme, which can prevent further oxidation of vitamin C and producing browning in order to retain the beautiful luster of the vegetable. In the processing of frozen potato, if blanching is inadequate, not all enzyme is inactive and the quality of blanched potatoes may decrease faster than those without blanching during the frozen storage, and easier to brown. If blanching is overdone, it will make poor quality potatoes and increase the cost due to heating longer time and more fuel consumption. So, it is necessary to master the appropriate degree of blanching to avoid inadequate or overdoing blanching. This experiment is about the appropriate time of blanching in the process of frozen potato.



**Material and Method**

**1. Material**

Test potatoes are purchased in the local market

**The main equipment:** Kang Bavaria refrigerator, hand-held hardness tester, ultraviolet spectrophometer, thermostatic water bath

**2. Method**

**Processing Flow of Frozen Potatoes**

Potatoes--cleaning--peeling--slicing--blanching--cooling--dehydration--transferring to a plate--pre-freezing--freezing--packaging--frozen

**Testing and Evaluation**

Hardness Measurement: use the hand-held hardness tester to test

teat of the extent of the enzyme activity: use a knife to crosscut the blanching potatoes, and put them into guaiacol solution right now. pick them out after a moment, drip a few drops of 0.3 % hydrogen peroxide solution on the cut surface. Observed discoloration in a few minutes.

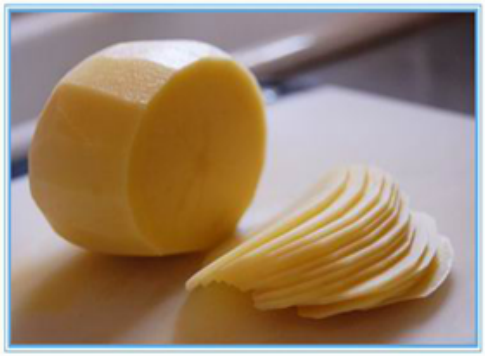
If blanching is inadequate, unspoiled enzyme will react with and become red-brown. If the color does not change, enzyme has been inactive.

***VC Determination:*** Determined by iodometic method.

***Determination Drowning:*** Mix the sample with distilled water at the ratio of 1:10 , homogenize at a low temperature for 2 minutes, extract supernatant after in centrifugal device for 15 minutes (4000 r.min-1). use the ultraviolet spectrophometer at 416nm wavelength to measure absorbance. That is the browning value.

**3. Experimental Design**

After cleaning and peeling, the potatoes are cut into the potato slices whose thickness is 0.5cm. Then put the potato slices into cool water to protect its original color, waiting for blanching. Put the slices into the 100℃boiling water for 0s, 20s, 40s, 60s, 80s, 100s and 120s respectively. Then cool the boiled potato slices with ice water to 0~5 ℃ quickly, and detect on each index, mark the blanching time to 0s as a blank control. The blanching time is determined by the hardness, vc content, the degree of enzyme inactivation, and browning degree.



**Results and Analysis**

**The Influence of Blanching Time on Hardness**

The experiment result shows that as the blanching time increases, the hardness of potato chips decreases. After 60s, the hardness of potato chips changed little and gradually tend to stable. If the hardness is too small, it will increase the breakage rate during the process of cooling and transfer to a plate.

**The Influence of Blanching Time on VC Content**

With the influence of blanching, vc content of potato chips decreases greatly. But the vc content will change little, if the blanching time is 20s, 40s, 60s, 80s, 100s, 120s. That means blanching time has little influence on vc content. The reason may be that the high content of starch gelatinates at high temperature and forms a protective film which hinders the dissolution of vc and has certain protective effect on vc.

**The Influence of Blanching Time on Enzyme Inactivation**

As the blanching time increases, the degree of discoloration potato chip section decreases. That means the enzyme inactivation increases. As peroxidase has strongest heat resistance, all other enzyme will be destroyed at the same temperature which can destroy peroxidase. When the blanching time is 60s and 80s, the color of potato chips changes little.

Most enzyme has been destroyed. When the blanching time is 100s, no color reaction occurs. It means all the enzyme has been inactive. Bottcher said, if peroxidase is completely passivated, it means excessive blanching. So it is better to choose 60s and 80s as the blanching time.

**The Influence of Blanching Time on Browning Degree**

Blanching time plays a great role in browning. As blanching time increases, the browning value of potato chips decreases. the browning value decreases from 0.08 at 0s to 0.02. at 60s. It tends to stable after 60s. The browning of potato chips has close relationship with polyphenol oxidase. From the former study of enzyme inactivation, we can see after the blanching reaches to 60s, most enzyme is destroyed. Polyphenol oxidase becomes inactive. So the browning decreases. It turns out that 60s and 80s blanching can meet the demands of enzyme inactivation.

**Conclusion**

(1) The hardness of potato slices decreases as the blanching time increases,

(2) It has no significant relationship with the blanching time.

(3) As the blanching time increases, the degree of discoloration decreases and the extent of enzyme inactivation increases.

(4) As the blanching time increases, browning degree of potato chips decreases and tends to stable after blanched 60s.

In consideration of the influences of potato chips blanching time on the hardness, vc content, enzyme inactivation, browning degree of potatoes and fuel cost ,etc., the best blanching time is 60s for blanching the potato slices with the thickness of 0.5cm in 100℃ boiling water and this blanching time can inactive enzyme and decrease the browning value and maintain a certain degree of hardness, which is beneficial for the following processing operation.