Detection of Adulteration of Pork Added with Water

M. T. Chen and C. C. Shu

Department of Bioindustry Technology, Da-Yeh University
112 Shan Jeau Rd., Da Tsuen, Changhua, Taiwan 515

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Introduction

Fresh meat contains approximately 75% of water at slaughter, depending on animal age, part of carcass, nutritional status and postmortem treatment. Loss of water in meat during processing not only causes economical loss, but affects meat quality such as juiciness, tenderness and flavour. Processors add water to many products as a part of the formulation. There are several reasons for adding water such as improving juiciness and tenderness. However, some of butchers intend to adulterate meats with water to increase the weight of carcass or raw meat only for increase in economical profits. Therefore, regulations for added water in processed meats and raw meat have to be established in our country to protect the consumers. In order to provide the government to establish the regulations, this study is to determine the moisture content of pork obtained from pigs of different age, sex, and breed as a criterion of moisture content of fresh pork. The methods of detecting the adulteration of pork injected water were also studied.

Materials and Methods

Loins were obtained from the pigs of Duroc, Yorkshire, Landrace, Black(native breed) and hybrid at age of 5.5, 6.5, 7.5 and 12 months, which were slaughtered at the local meat market. These meat samples were used for moisture determination only. Other loin samples were purchased from the local market and brought back to laboratory for injecting water. The pork samples were injected with 0, 10, 20, and 30% of water, and 10% of brine(10%salt) on the basis of meat weight by pumping, and frozen at -20℃ for 48 hr, then defrost at 4℃ for 24 hr for analysis.

The moisture content was determined by using the method of AOAC(1995), Crude protein content was determined according to Micro-Kjeldahl method, color of pork surface was measured by a Hunter spectrophotometer(SP60 Series X-Rite, USA), Conductivity was measured with portable conductivity-meter(Cond 330i, WTW, Weilheim, Germany), transverse sections of the muscle tissue(10um thick) were cut on cryostat and stained with H&E stain for histological examination. The drop loss% of the frozen of pork injected water was also measured. The analyses were performed in triplicate.

Results and Discussion

In order to propose a criterion for moisture content of pork, the range of moisture of pork obtained from the pigs at age of 5.5, 6.5, 7.5, and 12 months are from 70.34±0.81 to 75± 0.71 regardless of breed and sex(see Table 1 and 2).

Table 1 Comparison of moisture content(%) of porcine loin from different breeds.

Breeds	Hybrid	Black	Landrace	Duroc	Yorkshire	MSE
Moisture (%)	**72.85**	**71.09**	**72.68**	**71.41**	**73.73**	**4.00**

1. N＝9；2.pigs were fed for 6.5-7.5months.

Table 2 Comparison of moisture content(%) of porcine loin from gilts among different age.

Breeds	Black			Hybrid			
Age(months)	**6.5**	**7.5**	**12**	**5.5**	**6.5**	**7.5**	**12**
Moisture(%)	**71.28±0.7**	**70.34±0.8**	**72.75±0.8**	74.25±0.5	**73.24±0.6**	72.29±0.6	72.5±0.7

N=3

The moisture was 72.5% for the pork purchased from the market, which is located in the range of the moisture for the pork obtained from the pigs at age of 5.5 to 12 months. Normally, the age of pigs slaughtered for supplying pork consumption is not younger than 5.5 months due to quality of meat and economics. The younger the animal the lower the water content. Thus, if the moisture content is higher than 76% it can be regarded as the adulteration of pork added with water.

Drop loss% for the pork injected with water are shown in Table 3.

Table 3 Drop loss% and crude protein content of loin injected with water and brine

% of water injected	0	10	20	30	10%brine(10%salt)
Drop loss%	6.61±1.2	15.49±2.94	21.91±1.54	25.48±1.27	5.25±5.25
Crude protein%	22.2±2.2	18.7±2.3	16.7±2.1	14.0±2.9	19.2±1.2

N=8

The result indicated the drop loss% for pork injected brine and the control(without injection) is lower than those of the pork injected with water. The regulation of USDA for drop loss% limitation is not higher than 4%, and CAS standard is not higher than 7%. In this study the drip loss% for the pork without injecting water is no more than 7%.The crude protein contents of loin injected water and brine decreased with the amount of water injected increased. The conductivity for defrost pork is found lower in injected pork than the control and brine injected pork. It is found the higher water injected the lower the conductivity of the pork and drips. However, the conductivity of the brine injected pork is the highest among the treatments(Table 4).

Table 4 Conductivity of drip and loin after injected water and defrost

% of water injected	0	10	20	30	10%brine(10% salt)
Meat	6.6±0.3	5.9±0.3	5.2±0.3	4.6±0.5	18.0±1.8
Drip	12.3±2.2	10.8±0.5	10.1±0.3	8.9±0.8	31.6±9.3

N=6

Thus, if the butchers try to adulterate meat with brine we can not detect using conductivity measurement. From the pictures of slides of muscle it is shown the muscle fibers are distorted and separated by water injection(Fig.1). It is found that muscle fibers are separated seriously for the pork injected more water. The Hunter Lab-values are not significantly different between the control and pork injected with water. Thus, it can not be used to detect the water adulteration. A simple method is developed using finger touching for detection. The testers do not feel sticky or slimy when their fingers touch the surface of the pork injected water, but they do feel sticky for the control samples. This is a very simple and economical method for detecting the adulteration of meat injected with water to deceive the consumers.

Conclusion: We suggest that drip loss% and moisture content of pork are not higher than 7% and 76%, separately. The finger touching method can be used when the consumer purchases meat, but the fingers must be sanitized with 70% alcohol.

References

A.O.A.C. 1995. "Office Methods of Analysis." 15th ed. Asso. of Official Analytical Chemists, Washington, D. C.

Judge et al. 1989. Principles of Meat Sci., pp.52-54, Kendall/Hunt publishing Co., USA