THE INFLUENCE OF POST-MORTEM TEMPERATURE AND TREATMENT ON MEAT TENDERNESS IN BROILERS

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INTRODUCTION

It is well known that the extensive mechanization of the poultry processing maydisparage the tenderness of the final product. Three phases during the process demand special attention if optimal tenderness is to be gained.

1. Scalding.
2. Feather plucking.
3. Aging.

As the aging for poultry reaches maximal effect between 12 - 24 hours the main problems are : scalding and feather plucking.

Pooi et al. (1959), Klose et al. (1959) found that stronger scalding (temp. and time) made the meat tougher. The same thing goes for stronger feather plucking which is necessary at mild scalding. These phyical effects (scalding and feather plucking) accelerate the post mortem process, that is pH decrease and ATP disapperarance, etc. These things lead to increased toughness of the aged meat. Fremery and Pool (1960) proved that increased scalding temperature from 53° - 60° C advanced the ATP disappearance. The process of the disappereance was slower by manual feather plucking than by mechanical. The quick onset of rigor mortis which is induced by scalding and machine plucking therefore means that more powerful muscle contractions rise (Bendall, 1960) and at the same time the combination of low pH and high temperature. Low pH and high temperature immedeately after killing are known to have a most unfortunate influence on watercapacity of pork. (Bendall and Wismer-Pedersen, 1962). The question now arises: will a delay of scalding and feather plucking until rigor mortis has established improve the tenderness? When birds are left undisterbed rigor is usually established 3 - 4 hours after killing (Dr. Fremery, 1966).

EXPERIMENTAL:

MATERIAL: 30 seven weeks old chickens from a connercial broiler-strain, intensively reared under normal conditions at the State Experimental farm, Hillerød and slaughtered at the Experimental Poultry Plant. Hillerød were divided into three treatment groups, ten in each.

NORMAL PROCESSING: The broilers were hung by their legs in a conveyor, stunned electrically, knifed and thereafter scalded in turbulent water (52° C during 50 sec.). The scalded carcasses were "wet plucked" mechanically, eviscerated and at last spin-chilled. After dripping the carcasses were wrapped into polythene and placed in a blast freezer with an air temperature of -38°C. The interval between electrical stunning and freezing was about 1 hour.

AGING PROCESSING: These chickens went through the same process as normally but the packed carcasses remained at a temperature of 19° C for 4 1/2 hours before freezing.

EXPERIMENTAL PROCESSING: After electrical stunning and killing the carcasses (with feathers) were placed into water holding temperature of 11° C. They remained there for five hours. Immedeately before scaldong the chickens were lowered for 30 sec. into water holding a temperature of 45° C in order to obtain approximately the same surface temperature by scalding as the other two treatment groups. The treatment hereafter was equal to the one given to the first group.

The carcasses were numbered at random and mixed to secure unprejudiced examination of tenderness.

Before grilling the carcasses were thawn for 24 hours at a temperature of 4° C plus for 4 hours at a temperature of 20° C. The grilling lasted 6 min. per 100 g meat at a temperature of 175°C.

The shear-force was examined in breast and thigh-meat with a Warner-Bratzler shear press. (the cross section of the meat sample is 1.2 x 1.2 cm.). Furthermore a subjective examination of the breast-meat was made by an untrained pane panel. (10 judges).

RESULTS AND DISCUSSION:

The results of the tenderness examination are shown in Table 1.

TABLE 1. Objective and Subjective Measuring of Tenderness in Breast and Thigh

Processing methods	Shear force (lb) breast mean	SE	Thigh mean	SE	Panel test breast (-5 to +5)
normal	7.8[a]	2.2	4.8[b]	1.0	0.1[c]
aging	6.0[a]	1.6	4.2[b]	0.7	0.8
experi-mental	4.2[a]	2.1	3.7[b]	0.7	1.8[c]

1) Figures with a. P 0.001 to have the same mean value
2) " " b. P 0.01 " " " " " "
3) " " c. P 0.05 " " " " " "

A varians analysis proved very high significans for theatment group both in breast and thigh meat. A T-test showed the lowest shear-force in both breast- and thigh meat of the experimental group. (P 0.001 and P 0.01). The highest shear force was found in the normal processing.

The subjective examination also proved the best tenderness was found in the experimenatl processed chicken. As the tenderness of thigh-meat generally was better than that of the breast-meat the experimental treatment has had the greatest effect on the breast-meat.

This experiment gives reason to soppose that delay of scalding and feather plucking till after rigor mottis increase a tenderness that cannot be gained by aging before freezing. At this experiment it has been decided how long this delay has to be and if it is necessary with chilling.

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