Use of Nix colorimeter to detect the pale, soft, and exudative (PSE) meat in Ontario broiler flocks and look at the effects of chilling methods

Sunoh Che[1], Leonardo Susta[1], Shai Barbut[2]

[1] Ontario Veterinary College, University of Guelph, Guelph, Canada
[2] Ontario Agricultural College, University of Guelph, Guelph, Canada

Introduction: Color is one of the most important attributes for consumers' acceptance of meat [1]. Pale, soft, and exudative (PSE) meat has a negative impact on meat quality due to its pale color and poor water-holding capacity (WHC) [2]. It has been estimated in previous studies that the occurrence of PSE meat in poultry is 5% to 47% [3]. As the world's chicken consumption is rapidly increasing [4], the economic losses from PSE meat also increase. Several studies show that chilling methods affect the color and meat quality [5–7], but the data from Ontario flocks are scarce. The majority of journals (60%) have been using the Minolta Chroma Meter to measure meat color, including lightness (L*) values [8], but it is a larger and more expensive Meter (X20 times) compared to the Nix Color Sense which is also easier to use with its mobile app [9]. Thus, the aim of this study was i) to investigate the capabilities of the Nix as an objective color measurement of chicken meat in broiler flocks from Ontario ii) investigate the effects of chilling methods on the occurrence of PSE.

Material & Methods: 17 flocks processed at two plants were monitored for the occurrence of PSE meat (June 2019 to March 2020). A total of 1,700 boneless, skinless, *Pectoralis major* muscles (100/flock) were randomly sampled and tested for L* value in deboning areas at processing plants on the same day of slaughter. A total of 255 samples were placed in plastic bags and kept on ice while being transported to University of Guelph to evaluate technological properties (WHC, pH, cooking loss, and penetration force). Minolta Chroma Meter was used to measure 95 uncooked samples (4°C) to compare the L* values to the Nix values. Samples were classified as PSE when L* > 43. Correlations between the technological properties were analyzed using Spearman's rho correlation coefficient because of non-normal distribution of cooking loss and penetration force values. Linear regression analyses were used to determine the relationship between L* values and the technological properties; employing $P < 0.05$.

Results: The incidence of PSE meat was 12.5%. Breast fillets pH from the water-chill plant were significantly lower than that of the air-chill plant ($p < 0.001$). L* values and WHC of the breast fillets from the water-chill plant were significantly higher than those of the air-chill plant ($p < 0.001$). However, differences in cooking loss and penetration force between the plants were not significant. Correlations between pH and L* value ($r = - 0.25$), L* and WHC ($r = - 0.29$), L* and cooking loss ($r = 0.28$), L* and penetration force ($r = - 0.38$) were significant ($p < 0.001$). The average Nix L* value was 13.1 points lower than the Minolta. A strong positive correlation ($r = 0.75$) of L* values was observed between the Nix and the Minolta ($p < 0.001$).

Conclusions: Study demonstrated that PSE meat is still a significant concern in the broiler industry, because of poor meat quality. Furthermore, each chilling method affects the color and meat quality (water loss, and penetration force) differently. Lastly, the use of the Nix colorimeter which is objective, affordable, and convenient equipment for measuring chicken meat color may improve quality assessment efficiency for processors.

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