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## EFFECT OF CALCIUM CHLORIDE ON TENDERIZATION OF SPENT LAYERS MEAT

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**Keywords:** Calcium Chloride, spent layers meat, tnderization.

**Background and Objectives:**

Although spent layers are economically important, they are considered a by-product of the egg industry and efforts are therefore needed if better quality meat and higher returns are to be achieved. The poultry industry is faced with very large numbers of spent layers – about 21 thousand ton each year in Taiwan – and there is seen to be a need for this major resource to be used more efficiently and more profieably. Reports have indicated that tnderization effect of Calcium Chloride via activation of $Ca^{+2}$ dependent proteases. The purpose of this experiment was to study the application of Calcium Chloride in spent layers meat quality.

**Materials and Methods:**

One hundred and twenty-eight Sigle Comb White Leghorn layers (20 month-old ) were divided into two replications, 16 birds in each of four treatments groups per replication. The breast or thigh meat were soaked 10% ( wt / wt ) with a solution of either 0.3M $CaCl_2$, 0.6M NaCl, 0.15M $CaCl_2$ +0.3M NaCl, or distilled and deionized $H_2O$. The meat then were tumbled in –635 mmHg, 20 rpm, 4 °C for 1h. Four fillets of the same treatment were vacuum packed, stored at 0 °C and analyzed for proximate composition, pH value, total arobic plate count, color( L, a, b value ), cooking loss, shear value, thiobarbituric acid ( TBA value ), volatile basic nitrogen ( VBN value ), Calpain activity assay, Cathepsin activity assay, SDS Polyacrylaminde Gel Electrophoresis, and Myofibrillar Fragmentation Index at 0, 3, 6, 9 days. A five-member trained panel was used to evaluate tenderness, juiciness, flavor and acceptability using an 7 – point hedonic scale.

Treatments ( the various combinations of solution and storage days ) were analyzed as a completely randomized split plot design. Analysis of variance was conducted on these data using the General Linear Models procedure of SAS® ( SAS Institute, 1989 ) with the residual mean square as the error term. Main effect and interaction mean separations were tested using least square means analysis with a significance level of ( $P<5\%$ ).

**Results and Discussion:**

The $CaCl_2$ treatment has as compared to other treatments lower ( $p<5\%$ ) shear value ( Table 1 ). It means that the $CaCl_2$ treatments ( both 0.15M and 0.3M )were an effective mean in tenderizing spent fowl meat. The results for the percentage of change in myofibrillar fragmentation index (M.F.I.) was shown in Figure 1. The 0.3M $CaCl_2$ had the highest ( $p<5\%$ ) percentage of change in M.F.I. as compared to other treatments.

As indicated in figure 2 and figure 3, the amount of the molecular weight of 30,000-dalton subunit ( 20 K Subunit ) observed in the plyacrylamide gel of the 0.3M $CaCl_2$ treatment has greater solubilization than the other treatments at the same time. The more 30 K Subunit was the more myfibrillar protein solubilization. The result indicated 0.3M $CaCl_2$ can be an effective way in improving spent layers meat quality.

**Conclusions:**

The lower shear value and higher M.F.I. were observed in spent layers meat from $CaCl_2$ treatment group, which indicated that $CaCl_2$ has a greater tenderizing effect than the other treatments. And the result of Polyacrylaminde Gel Electrophoresis indicated 0.3M $CaCl_2$ can be an effective way in improving spent layers meat quality.

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**Tables and figures:**

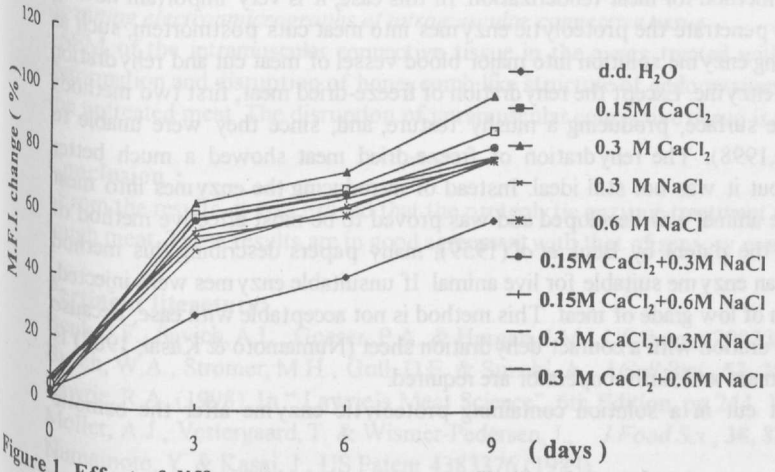


**Figure 1. Effect of different treatments on myofibrillar fragmentation Index ( M.F.I. ) of spent layers meat during storage.**

**Table 1. Effect of different treatments on shear value of spent layers meat during storage**

| Treatment | 0 | 3 | 6 | 9 (days) |
|---|---|---|---|---|
| | ( g /cm$^2$ ) | | | |
| d.d. $H_2O$ | $1425^{aX}$ | $1305^{aXY}$ | $1125^{aXY}$ | $1085^{aY}$ |
| 0.15M $CaCl_2$ | $1125^{bX}$ | $980^{abY}$ | $970^{abYZ}$ | $770^{eZ}$ |
| 0.3 M $CaCl_2$ | $1060^{bX}$ | $950^{bY}$ | $825^{bY}$ | $745^{eZ}$ |
| 0.3 M NaCl | $1405^{aX}$ | $1095^{abY}$ | $1105^{aY}$ | $945^{bcY}$ |
| 0.6 M NaCl | $1250^{abX}$ | $1080^{abY}$ | $1095^{aX}$ | $985^{bX}$ |
| 0.15M $CaCl_2$+0.3M NaCl | $1280^{abX}$ | $1020^{abY}$ | $980^{abY}$ | $990^{bY}$ |
| 0.15M $CaCl_2$+0.6M NaCl | $1395^{aX}$ | $1200^{abX}$ | $950^{abY}$ | $820^{cdeY}$ |
| 0.3 M $CaCl_2$+0.3M NaCl | $1270^{abX}$ | $995^{abXY}$ | $919^{abY}$ | $840^{bcdeY}$ |
| 0.3 M $CaCl_2$+0.6M NaCl | $1218^{abX}$ | $1050^{abXY}$ | $905^{abY}$ | $910^{bcdY}$ |

a-e Means within the same column without the same superscripts are significantly different ( $p<0.05$ ).

X-Z Means within the same rows without the same superscripts are significantly different ( $p<0.05$ ).

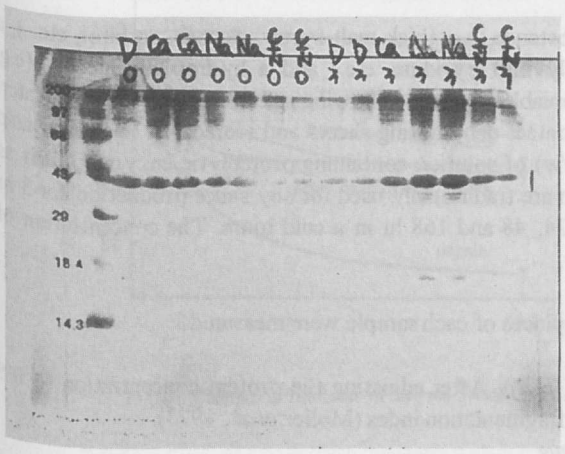


Figure 2. Polyacrylaminde gel electrophoresis of the proteins sdubilized from myofibrils after treated by four kinds of solution at 0 and 3 days. D: distilled and deionized $H_2O$; Ca: 0.3M $CaCl_2$; Na: 0.6M NaCl; C+N: 0.3M $CaCl_2$+0.6M NaCl.

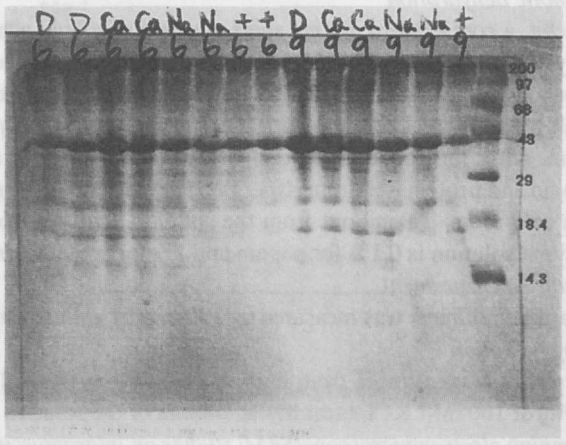


Figure 3. Polyacrylaminde gel electrophoresis of the proteins sdubilized from myofibrils after treated by four kinds of solution at 6 and 9 days. D: distilled and deionized $H_2O$; Ca: 0.3M $CaCl_2$; Na: 0.6M NaCl; C+N: 0.3M $CaCl_2$+0.6M NaCl.