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THE EFFECTS OF SEASONAL TEMPERATURE VARIATIONS ON PRIMAL CUTS PRODUCTION IN LANDRACE × YORKSHIRE × DUROC PIGS IN THE REPUBLIC OF KOREA

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I. INTRODUCTION

Pork is the second most consumed meat in the world [1], and various studies are being conducted to enhance meat production. Temperature is a significant factor influencing the weight gain of pigs [2]. The Republic of Korea experiences four distinct seasons each year, and the temperature fluctuations associated with these seasons impact pork production [3]. Non-destructive carcass analyzers can measure the production of primal cuts with high accuracy and are widely used in advanced livestock countries [4]. In this study, we analyzed pigs slaughtered over a period of one year using a non-destructive carcass analyzer, VCS2000, and investigated the effect of seasonal temperature changes on primal cuts. To evaluate the impact of temperature on pork production, an analysis was conducted on the monthly average weight of primal cuts and the average outdoor temperature in the Republic of Korea.

II. MATERIALS AND METHODS

In 2023, approximately 700,000 LYD (Landrace × Yorkshire × Duroc) pigs were slaughtered and assessed for the weight of five primal cuts (shoulder blade, shoulder picnic, loin, belly and ham) and carcass characteristics, including carcass weight and backfat thickness, using the automatic carcass analyzer VCS2000. To evaluate the impact of temperature on pork production, an analysis was conducted on the monthly average weights of primal cuts, adding the monthly average outdoor temperature in the Republic of Korea. Additionally, the Tukey HSD test was used to identify significant differences, with the significance level set at 0.05 or less. The Spearman correlation coefficient was calculated to quantify the relationship between temperature, carcass characteristics, and primal cut weights. All statistical analyses and data visualizations were conducted using Python version 3.11.4. The monthly sample sizes were as follows: January, 58,011 pigs; February, 60,702 pigs; March, 67,156 pigs; April, 55,607 pigs; May, 63,600 pigs; June, 54,292 pigs; July, 50,058 pigs; August, 57,627 pigs; September, 50,134 pigs; October, 62,688 pigs; November, 63,325 pigs; and December, 56,527 pigs.

III. RESULTS AND DISCUSSION

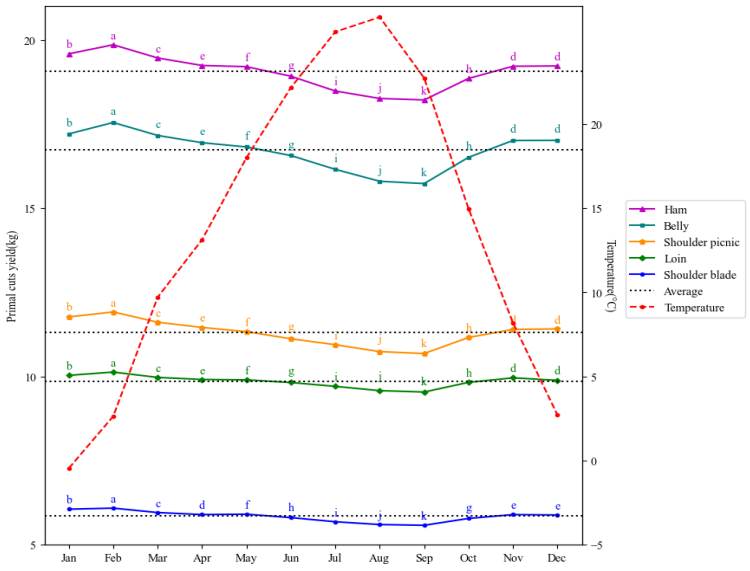


Figure 1. Monthly production of LYD pork primal cuts as affected by temperature in Republic of Korea
a-k Values with different alphabets among those on the same graph point indicate a statistically significant difference (p<0.05).

Figure 1 shows five primal cuts, which were measured in accordance with the monthly slaughtering period of pigs. All parts showed significantly lower weights in pigs slaughtered in September (p<0.05). The finishing phase of pigs slaughtered in September coincides with the high-temperature season in the Republic of Korea (June, July, August). Pigs exposed to high temperatures voluntarily reduce their feed intake to reduce heat production [5]. Conversely, the cold and dry conditions of winter promote increased feed intake [6], leading to higher carcass weight and primal cuts production yields. Therefore, it is thought that the decrease in feed intake due to the high temperature environment in Republic of Korea and the increase in feed intake due to the low temperature environment affected the production of primal cuts.



Figure 2. Heatmap of Spearman correlations between carcass weight, backfat thickness, and each primal cut of LYD pigs. Sample number was 699,727 pigs. All correlations are statistically significant (p<0.001).

Figure 2 is a Spearman correlation coefficient heatmap examining the relationship between temperature and LYD pig carcass weight, backfat thickness, and primal cuts. All variables showed negative correlation coefficients with temperature, indicating that an increase in temperature has a negative effect on pork production. However, a relatively weak correlation coefficient was found [7]. This may be due to the temperature difference between the inside and outside of the farm, where temperature control is possible [8]. Notably, backfat thickness showed a weaker correlation with temperature than other primal cuts did, possibly due to the high heritability estimates of backfat thickness in the Landrace, Yorkshire, and Duroc breeds that make up LYD pigs [9].

IV. CONCLUSION

All primal cuts were highest in pigs whose finishing period was winter (December, January, February) and lowest in pigs whose finishing period was summer (June, July, August). Spearman's correlation coefficient between temperature and all primal cuts by shipping month showed a negative correlation. Therefore, seasonal temperature increases have a negative impact on pig carcass production, which is more pronounced during the finishing period.

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