CHARACTERIZATION AND AUTHENTICATION OF TAIHE BLACK-BONED SILKY FOWL MUSCLES USING LC/MS-BASED LIPIDOMICS

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I. INTRODUCTION

Taihe black-boned silky fowl (*Gallus gallus domesticus Brisson*) has been highly valued as a curative food with many desirable nutritional and functional properties, such as anti-aging [1], immune-enhancing [2], anti-fatigue and anti-hypoxic effects [3]. In spite of the long history and well-accepted curative properties, there is no clear-cut answer yet for the health-beneficial components in Taihe black-boned silky fowl. Moreover, Taihe black-boned silky fowl is sold at a higher price due to its well-known health benefits. However, these benefits are accompanied by a slower growth rate and lower body weight. Driven by higher financial profits, the Taihe black-boned silky fowl has been exposed to a wide range of fraudulent practices in the marketplace.

The objectives of the present work were to establish the lipid profiles of Taihe black-boned silky fowls according to different ages, genders and parts, as well to identify the potential lipid markers for the authentication of Taihe black-boned silky fowl.

II. MATERIALS AND METHODS

Lipid extraction was performed according to the published methods [4, 5]. A UPLC/MS/MS analysis was performed using an ACQUITY UPLC 1-Class system (Waters, Manchester, UK) with a Xevo G2-S Q-TOF mass spectrometer (Waters, Manchester, UK). The identification and analysis of lipid compounds were achieved by using the Progenesis® QI software (version 3.0.1.) and searched against LIPID MAPS Lipid Structure Database (LMSD) (http://www.lipidmaps.org/). All statistical analyses were performed using R software version 2.9.1.

III. RESULTS AND DISCUSSION

A total of 1127 lipids were detected in Taihe black-boned silky fowl muscles. Among them, 88, 11 and 1 lipid species were found to have both a variable influence on a projection (VIP) value greater than 1 and a *p*-value smaller than 0.05 between different age, gender and part groups. The OPLS-DA score plots of different groups of muscles were shown in Figure 1. These results illustrate that the influence of the 3 investigated factors on the lipid profiles of Taihe black-boned silky fowl decreased in the order of age>gender>part. Lipid profile differences will facilitate a better understanding of the curative properties of Taihe black-boned silky fowl.
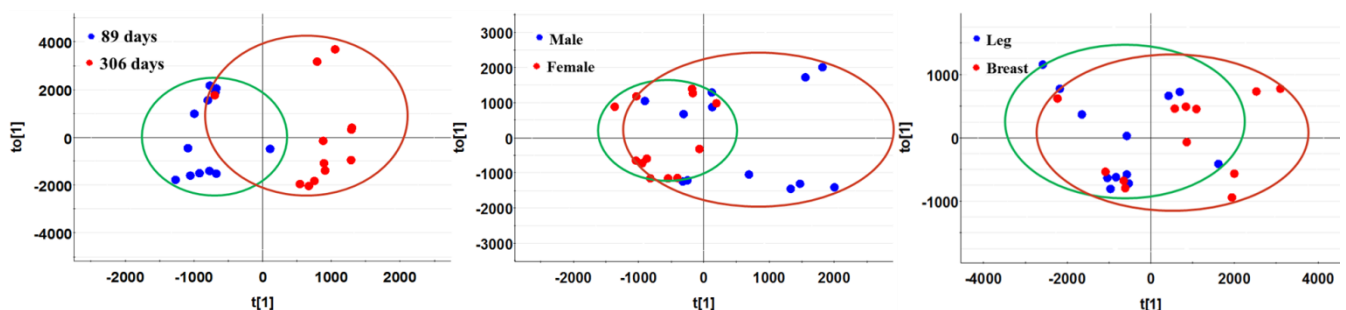

Figure 1. The OPLS-DA score plots based on the lipidomic data in the Taihe black-boned silky fowl in the groups of 89-day and 306-day (R^2Y=0.78 and Q^2=0.75), male and female (R^2Y=0.40 and Q^2=0.06), as well as leg and breast (R^2Y=0.21 and Q^2=0.30).

Taihe and crossbred black-boned silky fowls were compared in terms of their lipid compositions based on the same strategy. A comparison of the percentage data between the Taihe and crossbred black-boned silky fowls is

illustrated in Figure 2. The OPLS-DA results showed that the two groups were able to discriminate from each other effectively (Figure 3). Forty-seven lipid compounds were determined to be potential markers for the authentication of Taihe black-boned silky fowl.
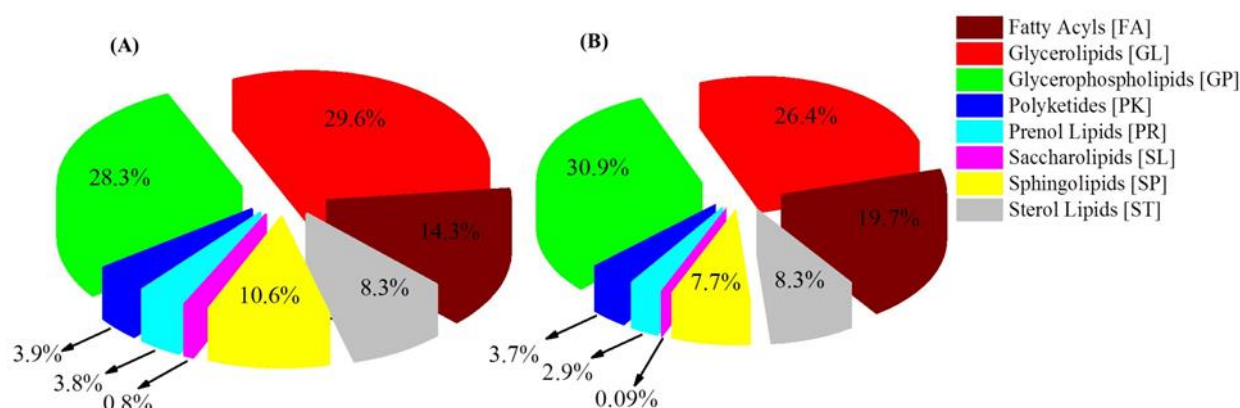

Figure 2. Lipid class composition in Crossbred (A) and Taihe (B) black-boned silky fowls.
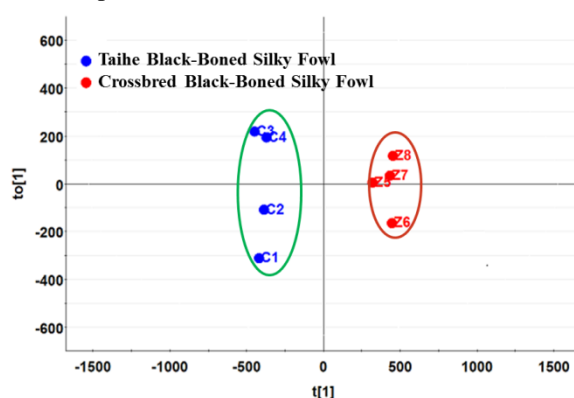

Figure 3. The OPLS-DA score plot based on the lipidomic data in the muscles of Taihe and crossbred black-boned silky fowls.

IV. CONCLUSION

The statistically significant differences in bioactive lipid levels between different ages, genders and muscles types facilitate a better understanding of their curative properties. A total of 47 potential lipid markers with VIP≥1 and $p \leq 0.05$ were found for the authentication of Taihe black-boned silky fowl. Our work demonstrates that lipidomic analysis is a workable approach to be applied to food raw materials with different purposes. It is beneficial for food labeling regulations and standards system establishment.

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