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^{14}C DATING OF HISTORICAL JAPANESE MUSICAL INSTRUMENT SACKS

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ABSTRACT. The radiocarbon (^{14}C) dating method was applied to a survey of treasured items related to the ruins of the Imperial Residence in Anou, Nara Prefecture, which was one of the capitals of Japan during the 14th century. In this work, we dated two storage bags for Japanese musical instruments that are believed to be from the period of Emperor Go-Daigo who established the Southern Court. The ^{14}C dating of these treasures proved that the musical instrument sacks are contemporaneous with the dating of the Imperial Residence ruins designated as an Important Cultural Property of Japan. In addition, there are limited surviving examples of silk fabrics from the Middle Ages compared to the Ancient and Early Modern periods, making this a valuable resource in the history of silk fabrics in Japan.

KEYWORDS: AMS, radiocarbon dating, fabric, musical instrument, silk.

INTRODUCTION

Historical chronologies have been underpinned by relative dating derived from varied sources. However, historical evidence from the Middle Modern Period in Japan, which witnessed several wars, is particularly scarce, making empirical research difficult. In this study, we obtained the remains of musical instrument sacks, in which historical objects are believed to have been kept in the Middle Ages and applied the radiocarbon (^{14}C) dating method.

In the Middle Ages of Japanese history (Brittanica 2022), Anou in Nara Prefecture was a strategic location. In Japanese history, the 14th century was a period of upheaval due to the enmity between the emperors presiding over the Northern and Southern Dynasties. The history of the Imperial Court in Kyoto, called the Northern Dynasty, as well as the Southern Dynasty, which was primarily located in Nara, was brought forward by Emperor Meiji (CE 1852–1912) who deemed the Southern Dynasty as the legitimate mediator. However, surviving materials related to the Southern Court are limited, which has hindered historical research.

Therefore, we have begun research on historical materials, focusing on dating the treasures of the Hori family who were closely associated with the Southern Court, especially with Emperor Go-Daigo (CE 1288–1339) who established the Southern Dynasty.

In 2017, we launched a research project entailing ^{14}C dating of the Hori family treasures. In the first attempt, we dated the flag of the rising sun. This is the oldest known flag and, thus, regarded as the original Japanese national flag believed to be from the period of Emperor Go-Daigo. Additionally, compared to the Ancient and Early Modern periods, there are limited surviving examples of silk fabrics from the Middle Ages, thereby making this a valuable resource in the history of fabrics in Japan.

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Figure 1 A bag for a traditional musical instrument (photo by Mr. Katsuya Yamano).

Figure 2 A flute sack (left) and a traditional Japanese flute Hitoyogiri (right) (photo by Mr. Akihiko Yoshida).

In this research, we dated two storage bags for Japanese musical instruments that belonged to the Hori family and are believed to be from the period of Emperor Go-Daigo.

MATERIALS AND METHODS

Methods

We obtained the remains of certain items, including two sacks for traditional musical instruments, and identified the materials by recording Fourier-Transform Infrared (FT-IR) spectra on an FTIR spectrometer (IRAffinity-1, Shimadzu Corporation), using the Attenuated Total Reflectance (ATR)-FTIR method.

We prepared samples for radiation analysis using the standard acid-base-acid method, i.e., treatment with an organic solvent—hexane, 2-propanol, and acetone—and acid-alkali-acid, and neutralized and washed with pure water, filtrated, and dried them. Next, we converted the treated samples to graphite and partially cementized them before ^{14}C dating, using AMS (NEC 1.5SDH) at Paleo Labo Co., Ltd., Japan. In addition, we conducted stable isotope analysis $\delta^{13}C_{VPDB}/\delta^{15}N$, using the Mass Spectrometer DELTA V (Thermo Fisher Scientific Co., Ltd.)

SAMPLES

We targeted two samples from the Hori family treasures held by the Anou History and Folklore Museum. Figure 1 shows a storage bag for a traditional musical instrument; however, the contents were lost. The double chrysanthemum crest with 32 petals embroidered on the bag's fabric is known to be the imperial crest. Figure 2(left) shows a flute sack. It was the sack

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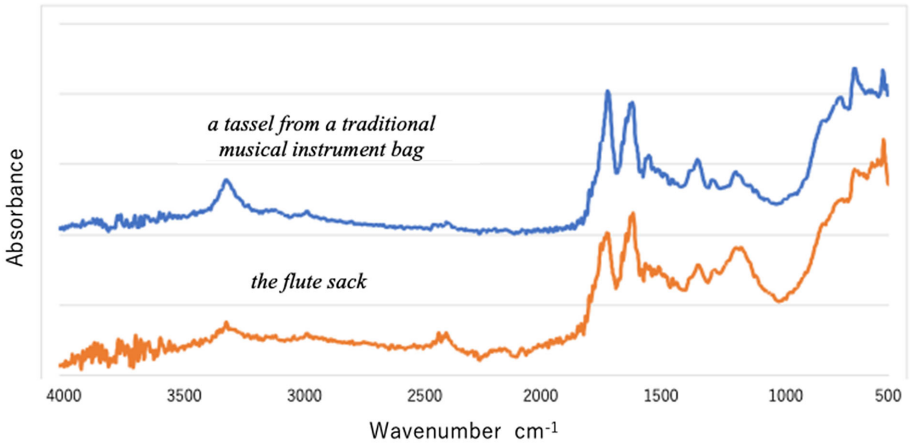

Figure 3 ATR-FTIR spectra of a tassel from a traditional musical instrument bag (blue), the flute sack (orange). Scanned 16 times at a resolution of 4 cm^{-1}.

for a traditional Japanese flute, Hitoyogiri, made of bamboo and Japanese lacquer (see Figure 2(right)).

We obtained part of a cord fringe from this storage bag. The cord fringe comprises red silk thread, as indicated by an ATR-FTIR spectrum, in the wavelength range of 1620 cm^{-1}, which was attributed to parallel β-sheet conformation (Amide I), 1514 cm^{-1}, which was attributed to peptide bond 60 % N-H bending and 40 % C-N bending (Amide II), and 1230 cm^{-1}, which was attributed to random coil conformation (Amide III; Koperska et al. 2014). We also obtained a part of the inner fabric lining. The lining is made of silk, as indicated by the ATR-FTIR spectrum. Figure 3 shows ATR-FTIR spectrum of each sample.

RESULTS

The ^{14}C dates were calibrated against the IntCal20 calibration curve (Reimer et al. 2020), using OxCal v4.4.2 (Bronk Ramsey 2009).

The Tassel of the Traditional Musical Instrument Bag

Figure 4 shows the result of the ^{14}C dating of a tassel from the traditional musical instrument bag. This measurement does not reveal the period; however, they were likely replaced in a later period. We also included stable isotope analysis $\delta^{13}C_{VPDB}/\delta^{15}C_{Air}$ of the tassel thread in Table 1.

A Flute Sack

Figure 5 shows the result of the ^{14}C dating of the flute sack. The results for the fragment of the flute sack indicated CE 1445–1595 or 1435–1555. The results for one of the Hori family's treasures indicated the same age as in our previous study. The flag, which was a symbolic banner of the Southern Court forces led by Emperor Go-Daigo, is believed to be the origin of the design of the Japanese national flag, the Hinomaru, or the rising sun, as it is the oldest known material (H. Takaya personal communication).

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Table 1 Stable isotope analysis of the sack's tassel thread.

Sample ID	$\delta^{13}C_{VPDB}$ (‰)	$\delta^{15}N_{Air}$ (‰)	Carbon content (%)	Nitrogen content (%)	C/N ratio
PLD-47259	–22.5	5.59	44.6	17.5	2.97

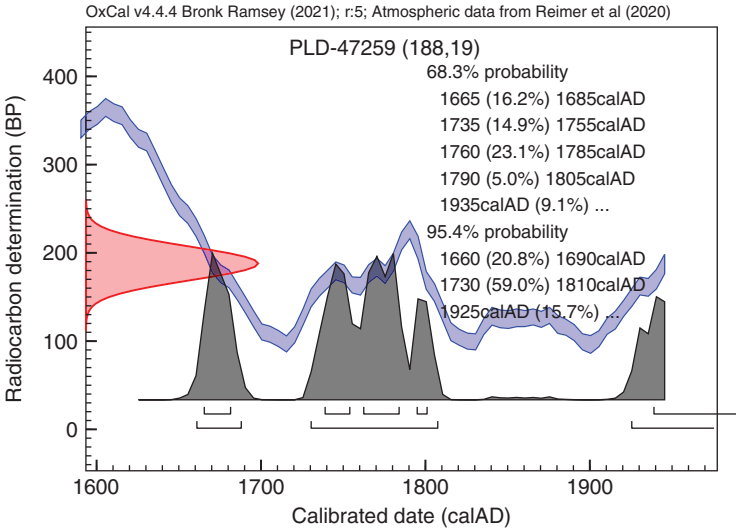

Figure 4 ^{14}C dating of a tassel from a traditional musical instrument bag.

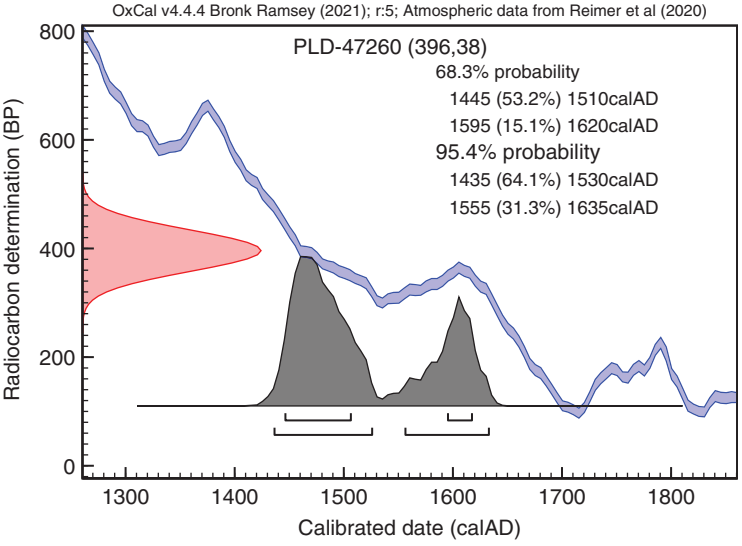

Figure 5 ^{14}C dating of the flute sack.

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^{14}C dating was applied to the Hori family residence to understand the trajectory of the building (Nakao 2018). According to the transitional history of the Hori family residence, the dating of the flute sack and the symbolic flag indicated contemporaneity with the building reconstruction in the 17th century to encourage tourism in Anou. It is inferred from the age of these materials that, in the 17th century, Anou became a tourist destination, symbolizing Emperor Go-Daigo who was responsible for the Southern Dynasty's power. Although ^{14}C dating did not provide evidence that these treasures belonged to Emperor Go-Daigo, it was an important finding in understanding the history of Anou, the former capital of the Southern Court.

CONCLUSIONS

The ^{14}C dating method was applied to a survey of treasured items related to the Imperial Residence ruins in Anou, Nara Prefecture, which was one of the capitals of Japan during the 14th century. No evidence of a direct relationship between these treasures and Emperor Go-Daigo was found; however, as mentioned above, historical evidential materials from the Middle Modern Period in Japan are particularly scarce, making empirical research difficult. Specifically, there are limited surviving examples of silk fabrics from the Middle Ages compared to the Ancient and Early Modern periods, making this a valuable resource in the history of silk fabrics in Japan.

Therefore, these results enrich the understanding of ^{14}C dating for cultural property preservation and those interested in the area's history. The ^{14}C dating of the symbolic flag of the rising sun, the first attempt in our research project, aimed at ^{14}C dating the Hori family treasures and is reported in a separate paper.

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