

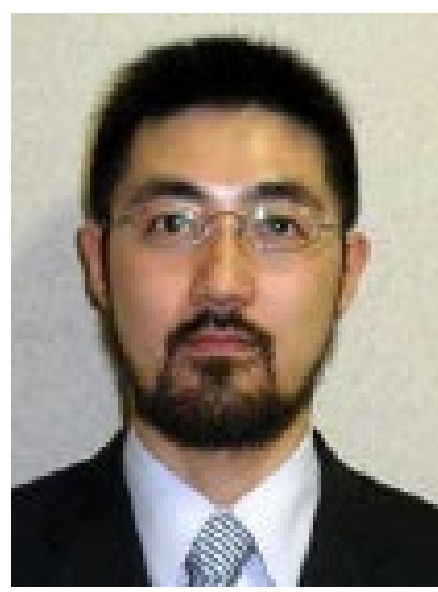
PRE-WILTING EFFECTS ON FORAGE SOYBEAN SILAGE

Shinkichi Goto¹, Kenji Hosoda¹, Mai Imanari¹, Yoshinao Mori¹, Daisuke Kawauchi¹, and Makoto Kaneko^{*,1,2}

1 NARO Kyushu Okinawa Agricultural Research Center, Suya 2421, Koshi, Kumamoto, 861-1192, Japan.

2 Present address; NARO Institute of Livestock and Grassland Science, Miyota, Nagano, Japan.

*Corresponding author :Email; kaneko.makoto045@naro.go.jp



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Implication After more than three hours of drying on a sunny autumn afternoon, the moisture content of forage soybean silage decreases to a level associated with a lower pH.

Introduction

- In Japan, imported feed such as alfalfa hay and soybean meal have been used as a high-protein feed. The rising price of imported feed has led to a growing demand for a stable supply of domestically produced high-protein feed.
- To develop technology to ensure a stable supply of domestically produced high-protein feed, the authors considered it useful to utilize soybean (*Glycine max* (L.) Merr.). It should be cultivated without herbicide due to no registered herbicide and harvested as whole crop silage (WCS) because rainy weather makes it difficult to prepare as hay in Japan.
- The effects of harvest management, especially field wilting on silage quality, remain unclear.



Photo. Forage soybean cultivated without herbicides.

Objective

We clarified effects of length of pre-wilting on the dry matter ratio and silage fermentation of forage soybean under the assumption that the harvested foliage would be roll-baled and plastic-wrapped on the day of cutting.

Materials and methods

Location : NARO Kyushu Okinawa Research Centre, Kumamoto, Japan (32° 53'N, 130° 44'E, 78 m a.s.l.) in the temperate zone (Figure 1) in 2024.

Cultivation: Soybean (cv. Fukuyutaka) seeds were sown directly into the Italian ryegrass sod without cultivation, with 48 rows to a plot at 30 cm row spacing, using a commercial no-till planter on 17 May.

Harvest & drying: During the three sunny days of September 2–4, soybeans were cut with a mower at 1 pm every day (8 rows per day). Then samples were taken immediately after cutting, and 1 hr, 2 hr, and 3 hr later. The collected samples were shaken in the laboratory and were separated into soybean foliage, shed soybean leaves, and others. The fresh weight of each was measured at three rows with 30 cm width. After they were then dried at 70°C for more than 72 hr, the dry weight was measured to ascertain the dry matter (DM) ratio.

Silage testing: Only for soybean foliage, after measuring the fresh weight, a portion was separated for laboratory-scale silage testing. Soybean foliage samples were shredded to a 47 mm cutting length using a cutting machine. Then 200 g of shredded soybean foliage was placed in a vacuum bag (24 cm × 350 cm, 75 μm thickness). Eight bags for each sample were sealed using a vacuum machine. The bags were stored in a storage room without temperature control for 60 or 90 days (4 bags for each sample). Silage soybean foliage was used to evaluate pH measurement.

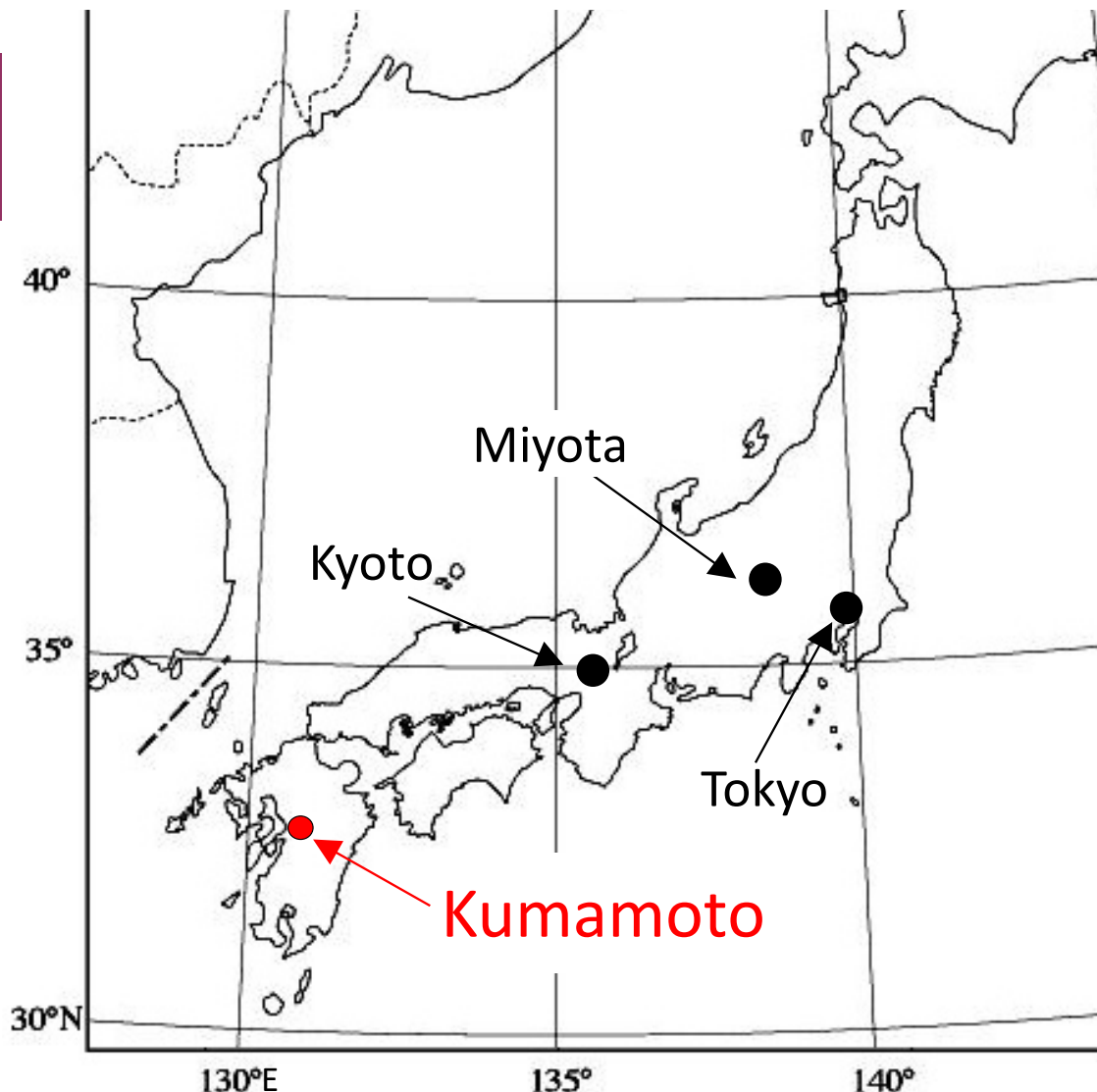


Figure 1. Location(●).

Results and Discussion

- The average temperature was approximately 31°C for each of the three hours. The values of solar radiation and relative humidity decreased gradually as time progressed (Figure 2).
- The soybean growth stage at the time of cutting was from R6 (full seed) to R7 (beginning maturity). The DM ratio of both soybean foliage and shed leaves were about 28.5% at the time of cutting (0 hr), increasing to about 35% within 3 hr ($P<0.01$, Figure 3).
- At 1, 2, and 3 hr after cutting, soybean foliage showed a lower DM ratio than shed leaves.
- From the silage test using degassing bags, the pH was found to be 4.9–5.7. No difference was found related to the storage period.
- Longer time after cutting was associated with lower pH values, but the difference was not significant (Figure 4).
- On Day3, the higher temperatures contributed to effective drying of soybean foliage, resulting in a decrease in silage pH.

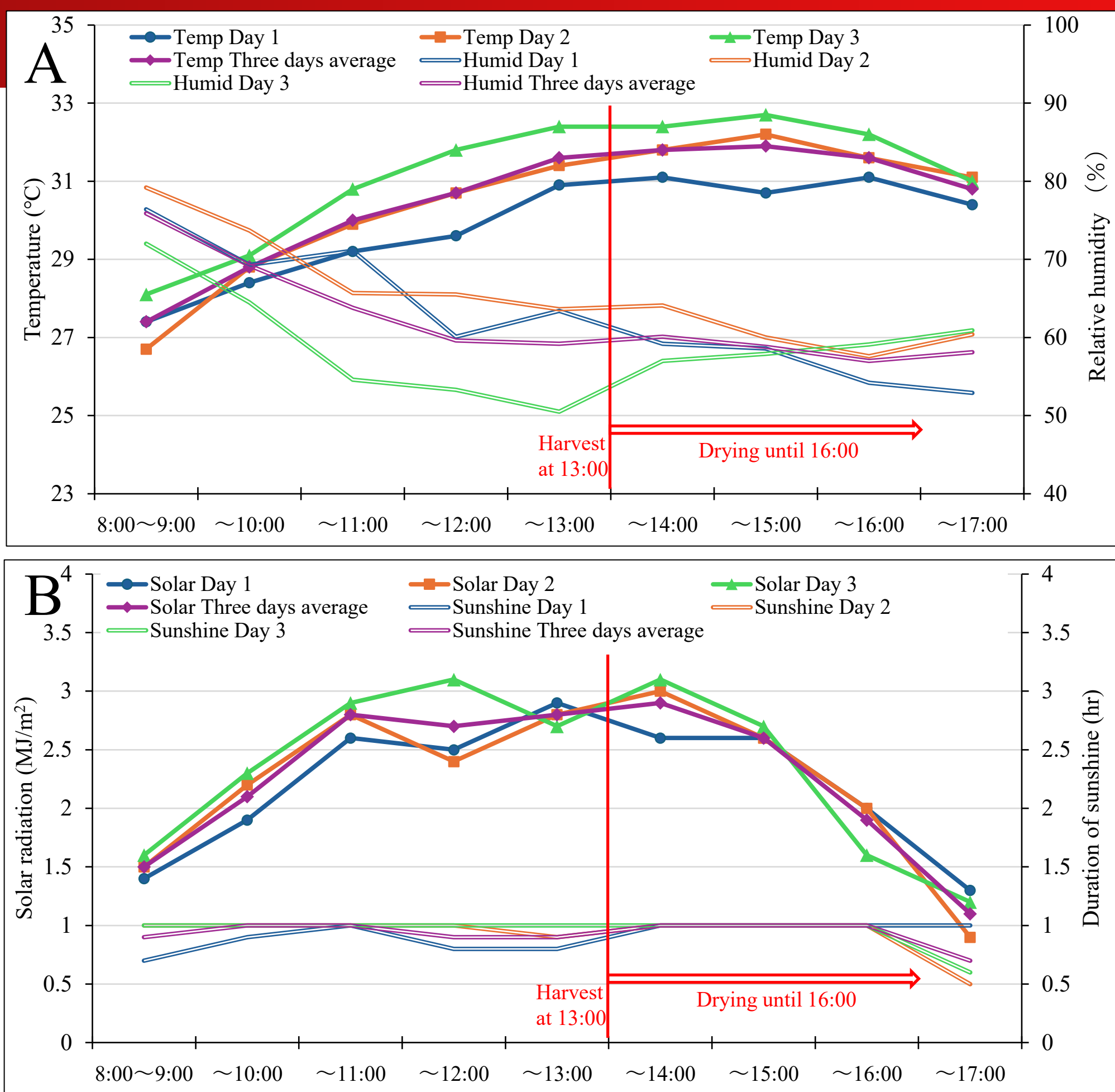


Figure 2. Weather conditions.
A: Temperature & relative humidity.
B: Solar radiation & duration of sunshine.

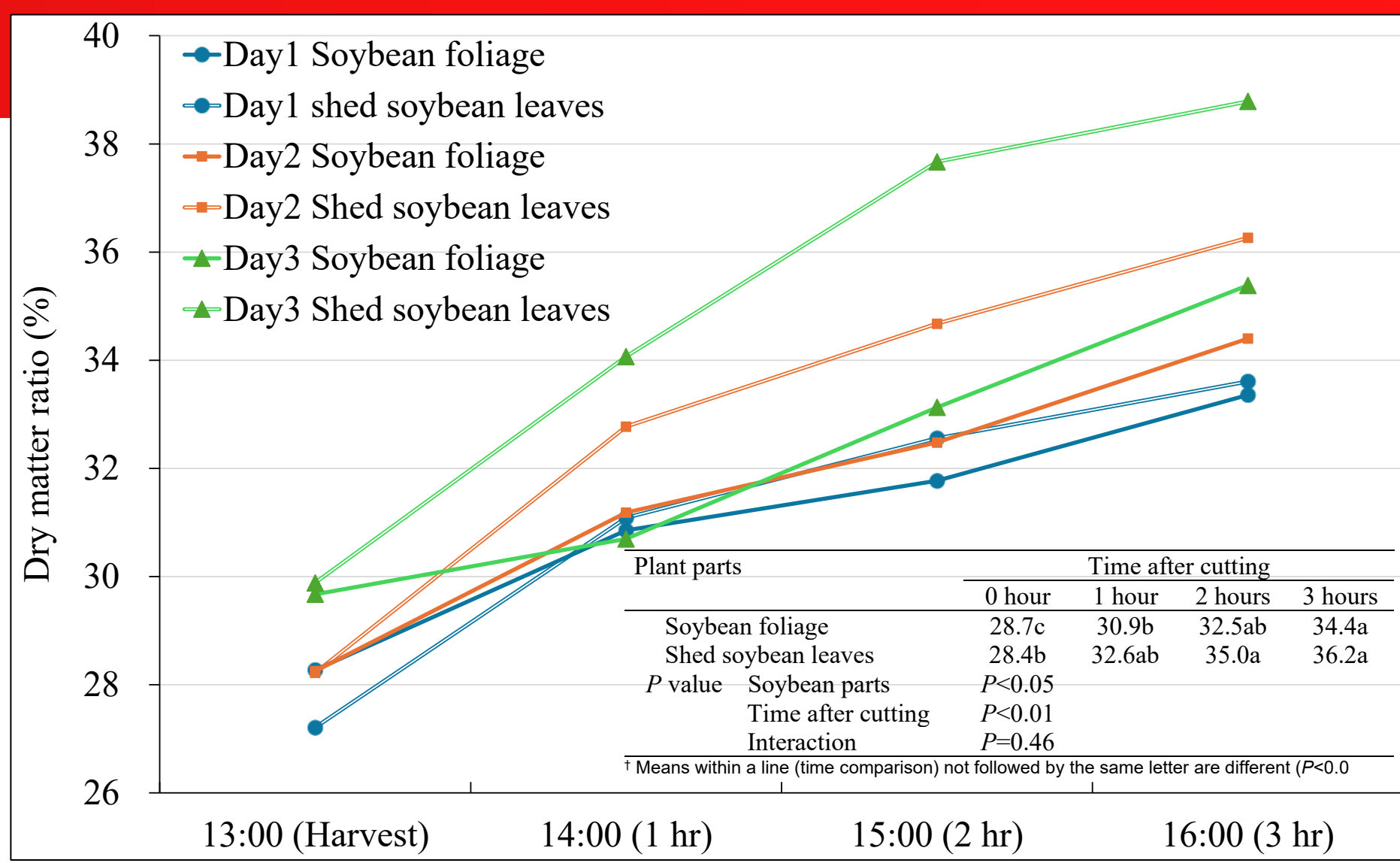


Figure 3. Dry matter (DM) ratio with a few hours of pre-wilting.

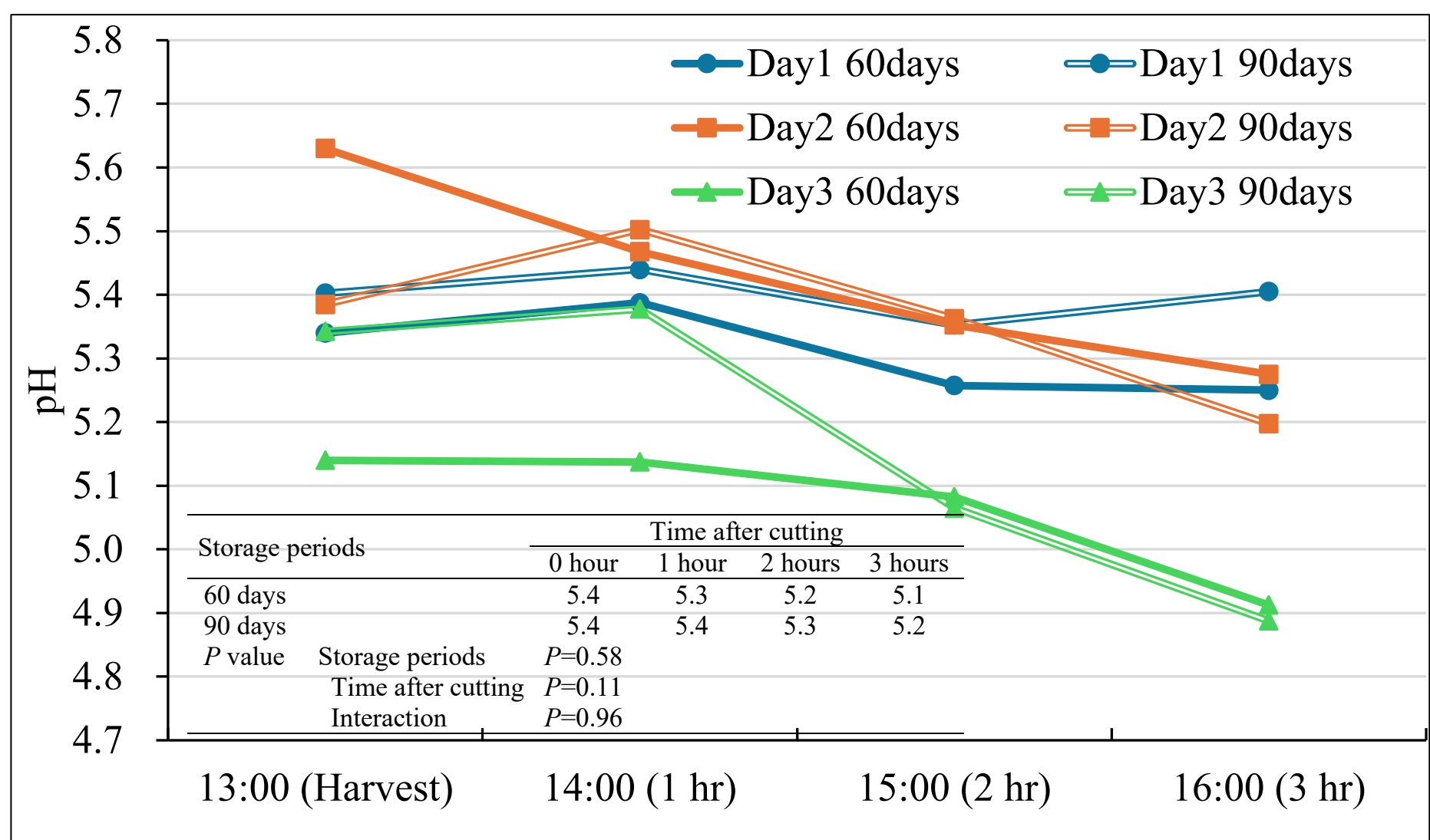


Figure 4. pH of silage soybean after 60 and 90 days of storage.