# ABSTRACTS (MASTER THESIS)

## Research on the morphosis of gravitropic bending using a model plant

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### Introduction

The plant shoot grows upwards by the gravity sensing. While reaction wood is the characteristic wood formed as part of the gravitropic response of trees, primary tissues such as herbaceous plants and young shoots of trees bend upward by differential growth. It is understood that differential growth is caused by different growth rates between upper and lower side of stem. Despite the stem under the apical meristem grows well, there is no clear evidence of where the bending occurs in the stem. Therefore, I examined if the elongation growth occurred at the bending zone by gravitropism.

### Methods

Inflorescence stems of *Arabidopsis thaliana* grown on 10 to 20 cm were marked at intervals of 3 mm from the base of the flower and then inclined at 55 °. Photographs were taken after inclination and 24 hours after inclination. The distance between the marks was measured by image processing software; ImageJ. We hereby confirmed the distance of the elongating growth zone from the top of the stem. The bending point was defined as the center of an arc of an inscribed circle to the bending zone.

Next, using a dental impression silicon, replicas of epidermis cells of inflorescence stems were made, and changes of same cell shapes before and after bending were confirmed. Replicas were made from upper and lower side from 3 zones; above bending zone, bending zone, and below bending zone, and observed with a light microscope.

Furthermore, in order to suppress the auxin-induced elongating growth, the polar transport inhibitor; NPA (*N*- (1-Naphthyl) phthalamic acid) 0.1% lanolin paste was applied on above bending zone. These experiments were carried out similarly on no-inclination condition.

### Results and discussions

From the measurement of surface extension (marking experiment), it was confirmed that the elongating rate gradually decreased from the shoot tips to the basal of stem, and at the macroscopic level, no elongation was observed in the bending zone. In addition, regardless of the inflorescence stem length, the bending positions were 3 to 4 cm from the tips.

As a result of surface replicas observation, at above bending zone, only longitudinal cell elongation was confirmed. On the other hand, at bending zone, while epidermis cells on upper side did not change in any direction, the cells on lower side expanded in the longitudinal direction and also in the tangential direction. Furthermore, gravitropic bending also occurred even though auxin transport was inhibited, and similar changes in cell shape were observed in epidermal cells of bending zone.

These lines of experiments, it is suggested that the gravitropic bending of inflorescence stem of *Arabidopsis thaliana* is not due to the differential growth induced by auxin.