

MORPHOLOGICAL CHANGES IN CUT DANDELION

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INTRODUCTION

This paper is concerned with the nature technology and biomechanics of plants to obtain inspiration for innovative engineering technology from nature. Seed plants have flowers containing reproductive organs which produce the seeds. In general, a fertilize ovule develops into a seed contained in a fruit. In this stage, various morphological changes are observed in plant systems. Morphological changes of plants and flowers are especially focused in this paper. They show some efficient characteristics as deployable structure systems such as high packaging efficiency, high redundancy, sequential deployment, usage of gravity forces, and so on [1]. Taiz attempted to integrate some of the major biophysical and biochemical components of wall extension, with an emphasis on the events occurring within the wall itself [2]. Engineers and physicists can learn a great deal from studying plants [3].

In this paper, the structural morphology of dandelion seeds and the growth of dandelion shoot are studied through the measurements of some morphological parameters. The unfolding of dandelion seeds into a spherical clock is observed by the low-speed photographing method. The process of the dandelion clock unfolding is revealed.

EXPERIMENTAL APPARATUS AND PROCEDURES

The folding and unfolding phenomena in cut dandelion flower heads are observed by the low-speed photographing method. The time interval of photographing is controlled by the computer. Movements of plants are observed as the movies. The movies of folding and unfolding of dandelion flower heads are analyzed by the personal computer. Test dandelions are *Taraxacum officinale*. Test dandelions examined in the experiment are collected in the fields in Yurihonjo, Japan. The experiments are performed under the condition of the room temperature (20-23°C).

EXPERIMENTAL RESULTS AND DISCUSSION

The mature flower heads of dandelions are developed into spherical clocks containing many single-seeded fruits called achenes. Figure 1 shows a sequence of photographs showing the evolution of the cut dandelion flower head into a spherical clock. It can be seen that cutting of a stalk of dandelion serves as a trigger of development into the spherical clock. In this experiment, wire is inserted in the stalk for prevention of dandelion collapse. Figure 2 shows also the sequence of photographs showing the evolution of the mature flower bud into spherical clock. The cut mature dandelion bud which lay rises by the development into the spherical clock. Figure 3 shows the motion trajectories of the tip of the fine hairs in a pappus at the coordinate system fixed to camera view (Two dimensional Cartesian coordinate system is chosen at the fixed point in the camera view). In Figure 3, the arrows show the direction of hair tip movement. The hair tip shows dynamic movement like an animal.

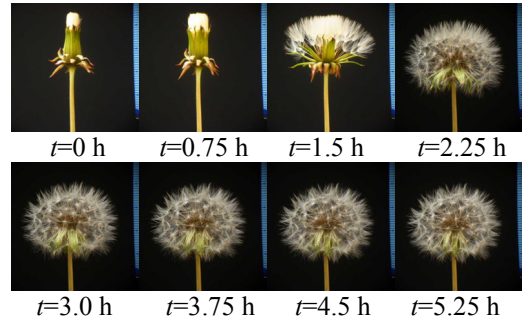


Figure 1: A sequence of photographs of stages in unfolding of a cut dandelion clock.

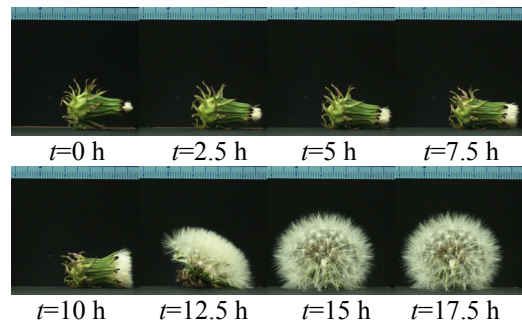


Figure 2: A sequence of photographs of stages in unfolding of a dandelion inflorescence.

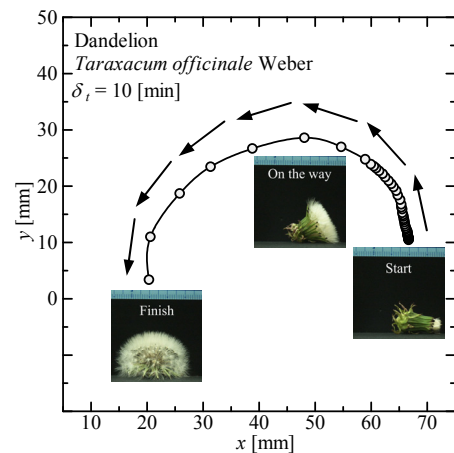


Figure 3: Opening process of dandelion clock.

CONCLUSIONS

The unfolding of dandelion seeds into a spherical clock was observed by the low-speed photographing method. It was found that the unfolding into dandelion clock can be accomplished even if water is not supplied. The dandelion pappus opened by dryness.

REFERENCES

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