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***Research article***

# A cherry tree's stress and recovery by inclusive intervention.

## - *Cerasus ×yedoensis (Matsum.) Masam. & Suzuki 'Somei-yoshino'* -

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## Abstract

**Background**: Plants based on different biological mechanisms from animals, "act" slowly in longer time series than animals. Meanwhile, plant biological functions are influenced by the environmental stress like animals. This report introduces one case in Yamaguchi Ube City facing the western Seto Island Sea, how the subject tree had gotten stressed and recovered after a tree doctor's qualitative observation and intervention to the ill tree and the surrounding environments.

**Method**: A tree of the Japanese national flower, cherry (Cerasus ×yedoensis (Matsum.) Masam. & Suzuki 'Somei-yoshino'), aged approximately 60 years old, appeared disease markers of some mushrooms on the branches and was diagnosed as "remarkably vulnerable state" according to the Japan Greenery Center criteria (2009). The pathogenetic factors were assumed to be some previous incidents in the soil at the building constructed eleven years ago. Water, nutrients and the air around the roots are essential materials to keep tree health and these factors were investigated by a method of digging holes, called 'Tsubohori'. It resulted in high risk conditions due to lack of the air and water with poor nutrition, involving many waste materials. The bark of trunk had been damaged and predicted its exfoliation in the near future.

**Results**: Thus, intervention to give the soil not only water and nutrients but also the air by adding actinomycete-rich compost and to cover damaged bark with black sheets were operated to promote and regulate root and trunk development. Consequently, a recovery symbol could be induced developing of the targeted young principal branch prominently with amount of leaves.

**Discussion**: These experiences of diagnoses and interventions empirically suggested that the soil air gaps important for roots but might be easily reduced by artificial environment stress, such as the pressure generated by many blossom lovers who stay on the earth near the tree roots. For our mutually sustainable society of plants and animals, we must consider removal of trees' stress in town.

**Keywords:** Tree stress, mushroom, the air for roots, actinomycete, shade branch, root development,

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### 1. Introduction

Our human lives cannot exist without trees that supply fundamental materials such as oxygen and organic nutrition for bodies. Human intrinsically prefer trees' psycho-cognitive factors in leaves, branches and blossoms. Generally, Japanese people believe that the typical spring flower is a cherry. The representative species of regional cherry is 'Somei-yoshino' (*Cerasus ×yedoensis (Matsum.) Masam. & Suzuki*) [1, 2]. More than two millions of the trees have been planted nationwide and supported by plenty of fanciers in Japan. The current report is about one case of degenerating Somei-yoshino tree which was treated by a tree doctor for recovery. The tree was estimated to be around 60 years old. It was planted in the courtyard of a nursing facility built eleven years ago.


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The earth around the cherry tree was landscaped and had been maintained thence. In the spring, the tree had had full of cherry blossoms and was appreciated by many participants, staffs and visitors in a few dedications previously, however, the efflorescence was getting less and less in the last several years. The present article reports an example of how the doctor found the possible stressors and intervention to improve the tree vitality.

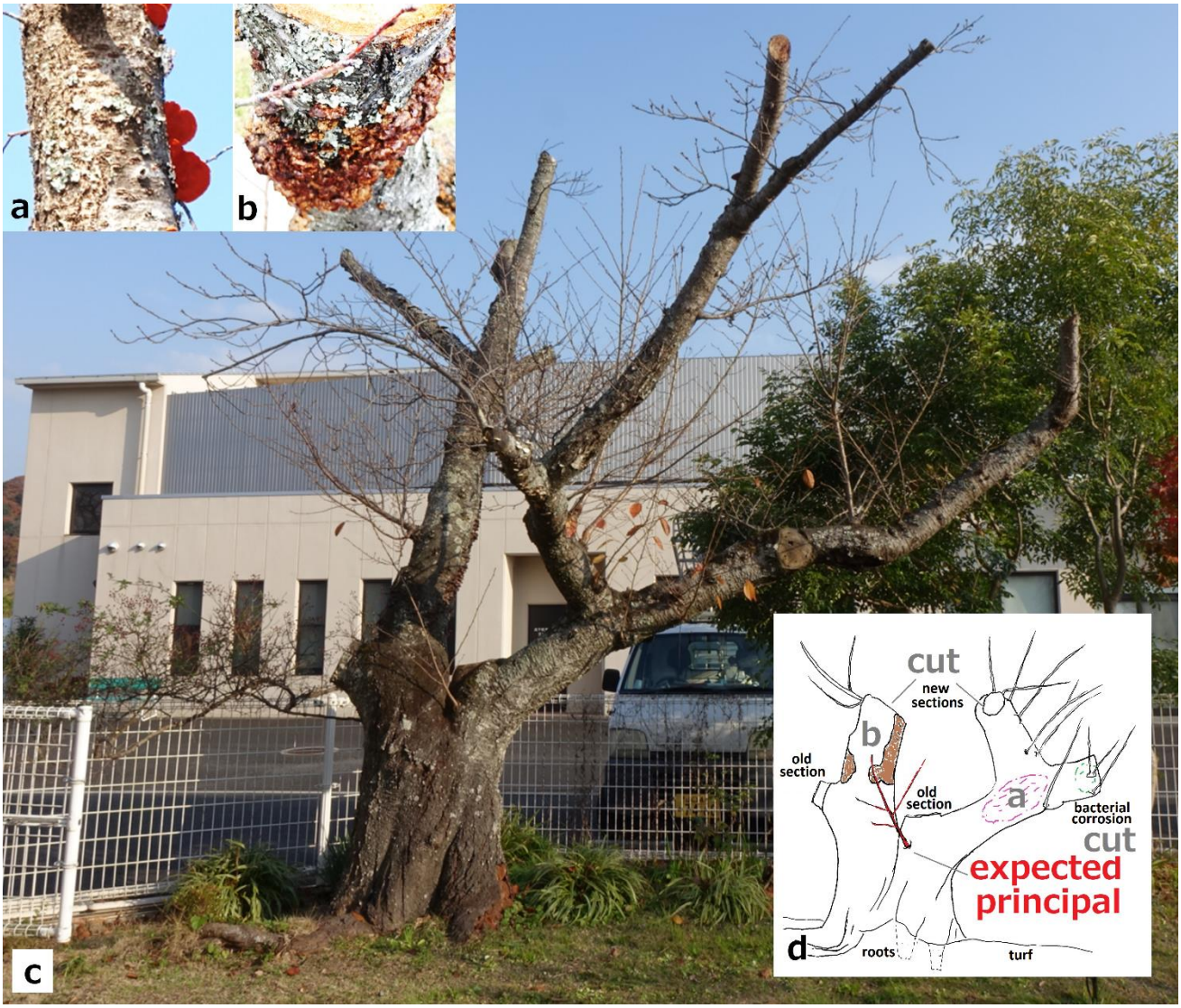


**Figure 1. The tree appearance observation**

This targeted tree had several kinds of fungous markers regarded as loss of the host vitality.

(a) Pycnoporus coccineus (Fr.) Bondartsev et Singer [3]
(b) Coriohous versicolor (LiFr.) Quel, [4]
(c) The west side viewed photo of the whole cherry tree.
(d) Schematic explanation about decay parts of branches with description of 3 cutting positions in this report. Note an expected principal branch.

## 2. Methods

### *2.1. Regional background history*

The institute was located on the hill and five kilometers northward from the Seto Island Sea coast where the major industry used to be pottery utilizing ascending kilns till the middle of the Showa Period. It had been previously famed for regional production of pots and plates whose clay materials were collected there. In the 60 years' period, the cherry tree grew beside a road of Yamaguchi prefecture. Then, the nursing institute was built with this beautiful tree present in the courtyard. The paved car parking ground had spread from a distance of approximately 80 centimeters to the east from the cherry tree.

### *2.2. Tree appearance investigation*

With the authority of the Japan Greenery Center criteria (2009) [5], the doctor observed appearance of the tree growth and measured the degenerating conditions above ground. This criterion consists of five stages, "Fine", "Slightly bad", "Bad", "Remarkably bad" and "Dying".

### *2.3. Soil investigation*

Water, nutrients and the air around the roots are

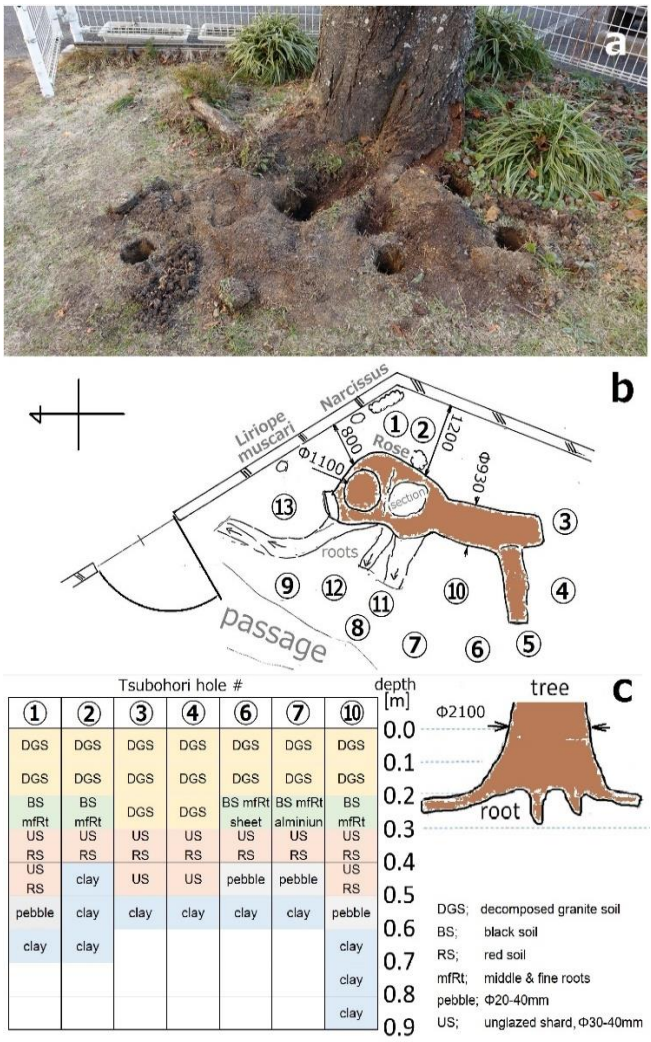


**Figure 2. Soil depth column investigation**
(a) The investigation appearance, (b) The hole positions around the cherry; Top view, (c) The representative soil column layer contents; Side view.

essential materials to keep tree healthy and these factors were investigated by a hole digging method, called 'Tsubohori'. The method was applied to diagnose the soil sections collected by 13 local column holes (diameter: 10 cm, depth: 90 cm) from the sward ground.

## 3. Results

### *3.1. Tree appearance investigation*

A tree of the Japanese national flower, cherry (Cerasus ×yedoensis (Matsum.) Masam. & Suzuki 'Somei-yoshino'), aged appropriately 60 year-olds, appeared disease markers of some mushrooms (Figure 1, (a) Pycnoporus coccineus (Fr.) Bondartsev et Singer and (b) Coriohous versicolor (LiFr.) Quel on the branches. The bark of trunk had been damaged and the imminent exfoliation was predicted. The main trunk had two sections (Figure 1d). Supposedly, it had been cut down before the institute was built and decayed. The other two boughs decayed four years ago and the ends of the boughs were cut off at 3 m high from the earth. It was concluded the diagnosis as "Remarkably bad" state according to the Japan Greenery Center criteria (2009).

### *3.2. Soil investigation*

The planted tree seemed to face more seriously damaged soil condition compared to natural forests. The representative horizon (a, b) / depth (c) map of the soil investigation, holes 1-4, 6,7,10 is described in Figure 2. The most surface layer consisted of 20 cm deep of decomposed granite soil (DGS) covered on the previous surface. The 30-50 cm deep of layers mainly contained unglazed shards and coarse fragments, which can be assumed to be a certain kind of waste site previously. The deeper layers rather consisted of light planting soil and pise clay. The cherry roofs could be confirmed within the 30 cm deep of layers. The pathogenetic factors in the cherry were assumed some previous incidents in the soil at the building constructed eleven years ago, supposedly with the partial roots cut. Furthermore, it was conducted as high risk conditions due to lack of the air and water with poor nutrition, involving many waste materials. The DGS is disadvantaged in water retention, tightly bound and extremely compacted without sufficient gaps to keep the water and air circulation as time proceeds. Covering DGS on the previous soil was thought to be a cause of disconnection for the water and air circulation. These stressful factors must have influenced the cherry's health under the negative cycle and led the tree body and leaves diminished to be for survival.

**Figure 3. The treatment of tree bark shielded.**
Note red arrows as the target estimated principal branch.

**Figure 4. The result of appearance in May of 2018**

### *3.3. Treatment for rooting and branching recovery*

The soil improvements to make conditions around the roots were treated locally by utilizing the 13 investigation holes (diameter: 10 cm, depth: 90 cm) to avoid excessive changes. The prepared actinomycetes-rich organic soil (Tsumurand, Tsumura & Co, Japan) was filled in these holes. The expected contribution by commensal microorganisms, actinomycetes was reported to be good producers of gaps in the soil but suppressors of tree pathogenic microorganisms, Rhizoctonia fungus and Fusarium.

Another treatment approach was simultaneously endeavored on the trunk to activate the estimated principal branch while keeping the damaged bark shielded by black plastic sheet (Figure 3). This intervention was aimed at facilitating not only for the branches but also the root. These treatments were cured in December of 2017.

The recent appearance in May of 2018 and April of 2019 showed being in full leaf (Figure 4) and blossoms (Figure 5), respectively, which suggested the well-functioning intervention although further follow-up observation should be needed for several years before conclusion.

## 4. Discussions

This case report showed a process instance of investigations and treatments for a sick cherry tree in the regional background, observation of disease markers, the soil investigation and intervention in the soil and trunk. The apparent recovery in branches and leaves could suggest that trees respire at the roots [6-13] and need the air and nutrition by some symbiotic relation between microorganisms and the tree in the surrounding soil [6, 11-13]. In this report, the basic mechanism of these treatments were still hypothetic and unclear without confirming any evidences in soil microorganisms, the estimated gaps to keep the air and nutrition around roots, or developmental results of roots themselves. Actinomycetes benefaction roles in soil and plant health [13] supposedly contributed to sustainable recycling of organic matters in environment, and the molecular mechanism of light shade was reported concentrative nitrogen [14,15].

Concerning the soil condition of a cherry blossom season in spring of Japan, many fancier people visit and stay, supposedly treading the ground at the tree, which might cause a stress for the roots during the tree's reproduction period [16]. To enhance sustainable symbiosis in the earth and to enjoy their blossoms, humans need to consider trees' stress and build a careful control system for the trees. Further studies are required to clarify the basic mechanisms for supporting trees' fine development. The recent scientific approach, such as visualization of tree's stress, helps humans to understand and initiate preventive care of the stressed trees [17].

## 5. Conclusion

This report suggested a possibility of tree's stress at the roots and branches in the surrounding environment affected by human societies. It is hypothesized that the following components are necessary: human's increased awareness of the tree's stress with consideration about the surrounding environments and further diversified researches of the symbiosis and scientific mechanisms.

**Figure 5. The result of appearance in April of 2019.**

**Conflict of interest**

The authors declare no conflicts of interest

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