Research on Fertilization Effects on *Sedum mexicanum*

Sawako UMEHARA[1)]　Shiro WAKUI[2)]　Kentaro IIJIMA[2)]

Faculty of Biomedical Engineering

(2008年3月15日　受理)

Abstract — *Sedum mexicanum* is a plant for rooftop gardening. Because the plant endured drying, it was expected as a plant material for it was a dry rooftop and the thickness of the soil. On the other hand, there are a lot of cases with the plant that wither in winter. Then, the effect of the fertilizer of the growth promotion was examined. The fertilizer given in autumn was assumed to be N:P:K=8:8:8. As a result, an increase in the number of shoots and the fresh weight was remarkably admitted. Especially, there were a lot of generation of the shoot from the base. When this phenomenon enlarges the possibility of hibernation, it is expected.

Keywords — *Sedum mexicanum*, Fertilizer, Growth, Hibernation

1. Purpose of research

In recent years, practices such as rooftop gardening and wall greening are being introduced in the larger cities of Japan to mitigate heat island effects. According to a survey of construction companies conducted by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), 3,280 rooftop gardens comprising a total area of 78 ha have been created across the country during the 5-year period from 2000 to 2004 [5]. For many buildings, however, load restrictions make it difficult to build a rooftop garden, making it necessary to modify greening techniques. Weight load can be mitigated by using less soil, and therefore zoysia, sedum and moss are being introduced as vegetation adaptable to thin soil layers of 10 cm or even less. Of these, sedums can grow in very limited rhizosphere soil and have the advantage of high drought tolerance. They have been extensively adopted and currently account for 35% of the total vegetated area in rooftop gardens.

Among the many sedums that are used as ground cover plants, *Sedum mexicanum* is often found in dry urban areas (Photo1,

1) Graduate School of Biomedical Engineering, Toin University of Yokohama
2) Faculty of Biomedical Engineering, Toin University of Yokohama

2), especially as rooftop greening material in urban architecture (Photo.3, 4) [1-4]. In some sites, however, sedum mortality is an issue. We have therefore conducted research on the effects of fertilization on the growth of *Sedum mexicanum* in order to find effective ways to enhance cold tolerance and promote overwinter survival. Experiments were conducted in autumn to study the growth of *Sedum mexicanum* in the presence and absence of fertilizer as well as the relevance of fertilizer to drought-adaptation mechanisms.

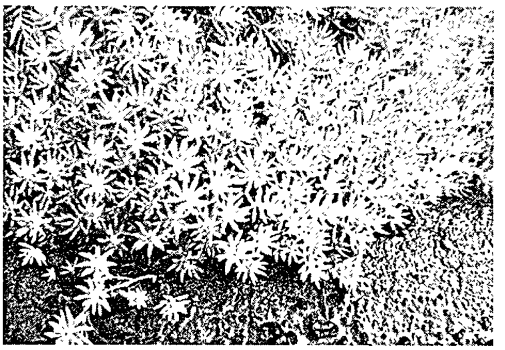

Photo.1 Colony of *Sedum mexicanum*

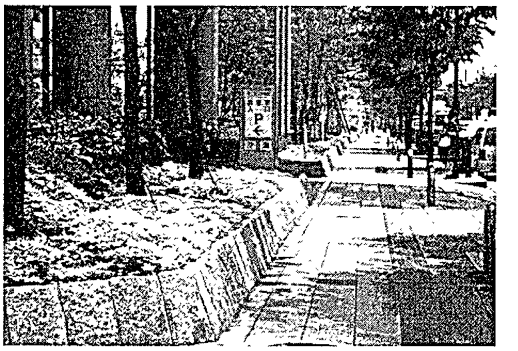

Photo.2 Sedum used for ground cover plants; Osaka Prefecture

Photo.3 Sedum used to green slanting roof

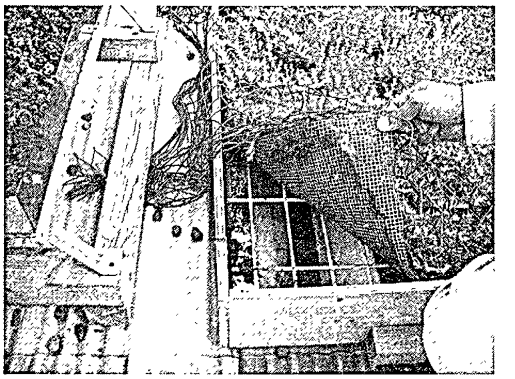

Photo.4 Technology on sheet green that used Sedum

2. Research material and method

To obtain research material, *Sedum mexicanum* shoots were collected in Atsugi City, Kanagawa Prefecture on August 20th, 2006. These shoots were planted as cuttings, 6 cuttings in each pot (Neubauer's pot 100cm^2), and were placed in the research yard of Toin University of Yokohama (1614 Kurogane-cho, Aoba-ku, Yokohama-city).

Two sections (one with fertilizer and the other without for control) were prepared in the experimental field. Half of the rooted cuttings, which were pre-grown in pots, were fertilized on September 7th, 2006. The amount of fertilizer was calculated so that 10kg of net nitrogen would be applied to 10a of land per application. The percent composition of the applied fertilizer in terms of N:P:K was 8:8:8. The experiment was continued for 3 months. The number of shoots, fresh weight and plant height were measured as indicators for evaluating growth.

3. Results

More shoots grew from the fertilized section compared to the control section, while the proportion of shoots growing from the base of the plant was larger in the control section. We also compared the increase in the number of shoots between two different time points: at one month and at 3 months after starting the experiment. The increase in the number of shoots was more pronounced in the first month than in the subsequent two months (Fig.1, 2).

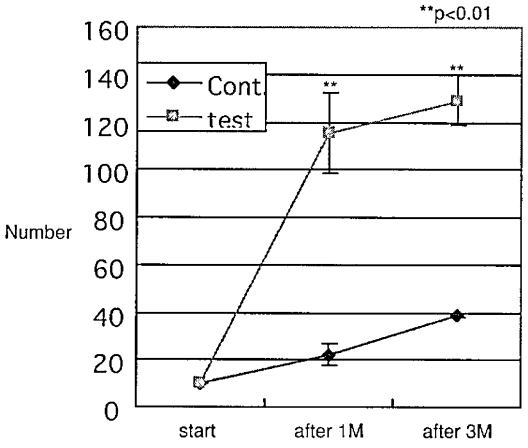

Fig.1 Number of shoot

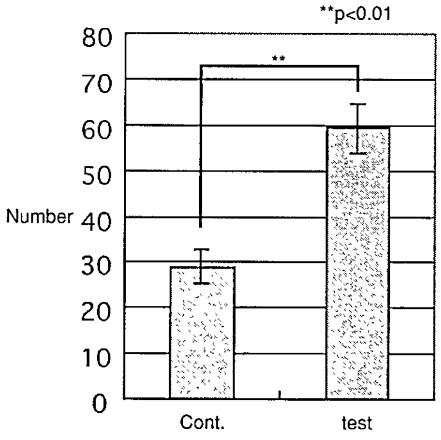

Fig.2 Number of shoot from base at 3M

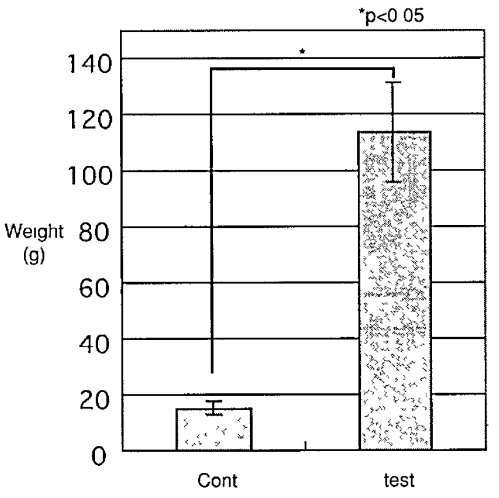

Fig 3 Fresh weight after 3M

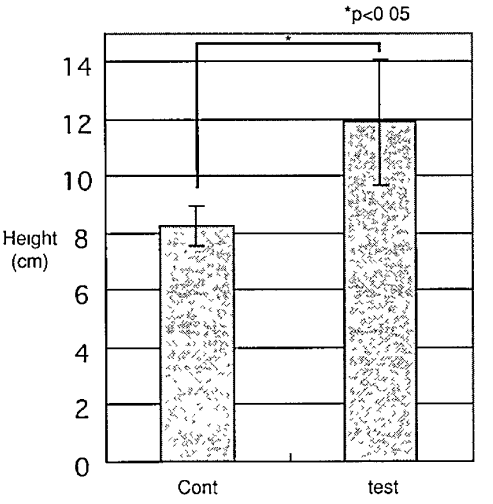

Fig 4 Plant height after 3M

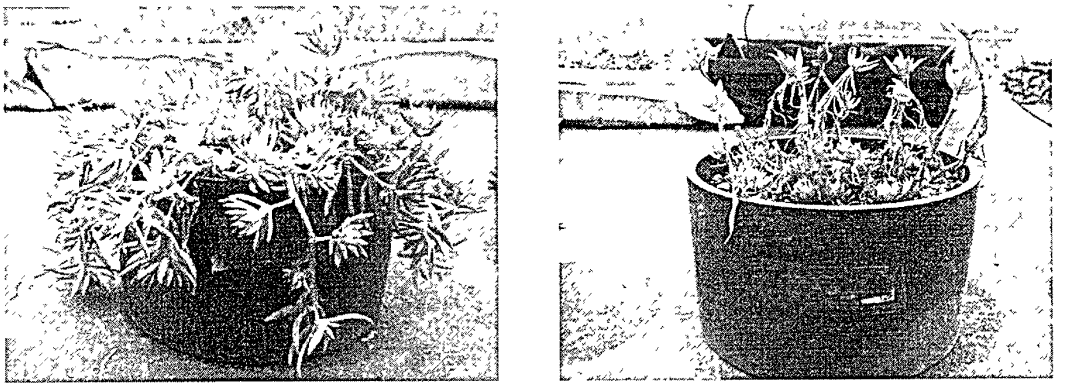

Photo 5 Growth situation after 3 month/December 7, 2006
Left, fertilized section / Right, control section

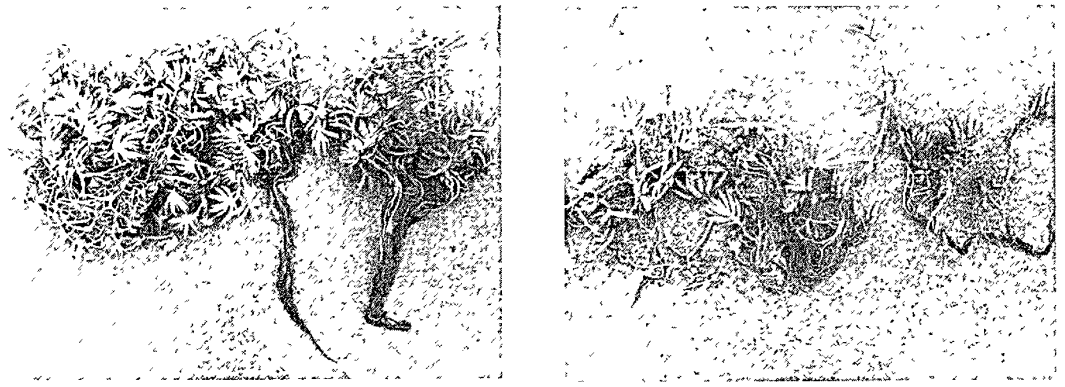

Photo 6 Root system after 3 month/December 7, 2006
Left, fertilized section / Right, control section

With regard to fresh weight and plant height, the shoots grew to be 7 times heavier (Fig.3 , Photo.5, 6) and 1.5 times higher in the fertilized section compared to the control (Fig.4). The above observations demonstrate that fertilization has a significant effect in promoting the growth of *Sedum mexicanum*, as manifested in a significant increase in the number of shoots. At the same time, growth responses, mainly the forming of overwintering buds, were observed in the control section.

We predict that the fertilized and rapidly growing *Sedum mexicanum* will evidence inferior drought-adaptation mechanisms

References

[1] K. IIJIMA (1995) On the Response of Water Stress of Sedum under Dry Conditions, Japanese Institute of Landscape Architects, 58 (5), 69-72

[2] K. IIJIMA, M. KONDO (1996) Effect of Soil Moisture and Air Temperature on Type of Photosynthesis and Growth of Sedum mexicanum, Jour. Agri. Scci., Tokyo Nogyo Daigaku, 41 (3), 156-163

[3] K. IIJIMA, M. KONDO (1998) Photosynthesis Response of Sedum mexicanum to Air Temperature and Light Intensities in Low Soil Moisture Condition, Jour. Agri. Scci., Tokyo Nogyo Daigaku, 42 (4), 274-286

[4] K. IIJIMA, M. KONDO (1998) On the Growth and Drought Resistance of Sedum mexicanum Grown under Different Light Intensity, Jour. Agri. Scci., Tokyo Nogyo Daigaku, 42 (4), 287-294

[5] Ministry of Land, Infrastructure and Transport (2005) How much amount is the greening space of the rooftop and the wall invented in recent years? Rooftop and wall greening construction area investigation of the whole country, Homepage in Ministry of Land, Infrastructure and Transport