Problem Solving at Nursery Production Sites Using Biodegradable Pot

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1. Introduction

Plastic is an essential material for modern agriculture. However, petroleum, which is the raw material of plastic, does not decompose easily in nature, creating the problem of a significant environmental burden at the time of disposal. To solve these problems, Tokai Kasei Co., Ltd. of Mino City, Gifu Prefecture, has developed an environmentally friendly pot made of biodegradable plastic. Biodegradable plastic is a general term for plastic that is decomposed into water and carbon dioxide by bacteria in the soil or water. Planting with the pot can be done in flower beds, etc. to improve the efficiency of planting work and increase the added value of seedling products. For these reasons mentioned above, environmentally friendly biodegradable pots are considered useful at flower production sites. However, they are not yet widespread due to the difficulty in controlling the speed of decomposition and high cost. Therefore, we cultivated seedlings in biodegradable pots at our school and investigated the effect on growth and the durability of the pots during cultivation.

2. Marigold Cultivation Tests Using Biodegradable Pots

(1) Materials and Methods

On June 14, 2021, the marigold 'March Orange' was sown in 288-hole cell trays and germinated in a hotbed tunnel in a mist room; on June 28, 2021, the plants were potted in No. 3 pots. The pots used for potting up were Pot 1, Pot 2, Pot 3, Pot 4, and regular polypots, which have different biodegradable components, A total of 10 treatment wards were set up, using conditioned peat moss (Promix BX) and "Hana-gokoro" culture medium. After potting, the plants were kept on a pool bench in a No. 2 greenhouse (not heated), and the four plants in each treatment ward were photographed approximately every week to determine the degree of pot deterioration. Classifying the pots with no anomalies as "Degree of Deterioration 0," those with thinning surfaces as "Degree of Deterioration 1," those with tears as "Degree of Deterioration 2," and those with holes as "Degree of Deterioration 3," the investigation of the degree of deterioration was conducted until November 4, 2011. Temperature and solar radiation (MJ/m^2) in greenhouse No. 2 were recorded with a Profinder throughout the growing season. Grass height, number of flowers, and leaf color values of 12 plants in each treatment ward were examined on July 27, when more than half of the plants in all treatment wards flowered, and root length, as well as pH and EC values of the culture medium were examined on August 2.

(2) Results and Observation

Growth surveys showed no significant differences in grass height, leaf color, root length, and EC values among the treatment wards. Looking at the progress of pot deterioration in each treatment Ward (Figures-1 and 2), it can be seen that pot deterioration began on July 27 for pots 2, 3, and 4 of biodegradable pots in all of the culture media. Of these treatment wards, the degradation progressed faster in the treatment wards with biodegradable pots 2 and 3. In addition, biodegradable pot 1 began to degrade after late September. No degradation of the pots was observed in the normal polypots during the study period. Degradation of biodegradable pots occurs due to hydrolysis, microbial degradation, and UV degradation. Therefore, I summarized the date when degradation degree 2 was first observed in each treatment ward, the cumulative temperature, and cumulative amount of solar radiation at that time (Table-1). The cumulative temperature and cumulative amount of solar radiation on the day when Degree of Deterioration 2 pots were first observed could be an indicator that the biodegradable pots will begin to deteriorate. Therefore, going forward, it is necessary to conduct similar tests in marigold production in spring to further verify the relationship between pot deterioration and cumulative temperature and cumulative amount of solar radiation.

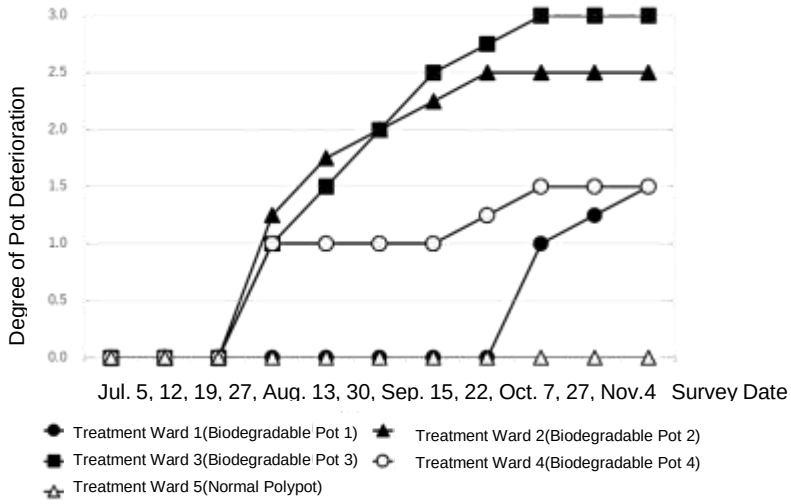

Figure-1: Transition of the Degree of Pot Deterioration in Each Treatment Ward (average value: n=4) (culture medium: adjusted peat moss)

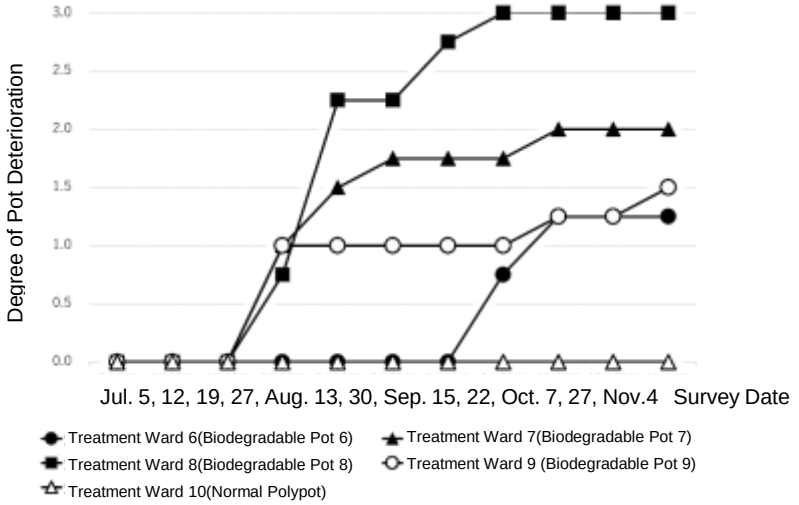

Figure-2: Transition of the Degree of Pot Deterioration in Each Treatment Ward (average value: n=4) (culture medium: Hana-gokoro)

Table-1: Dates When the Degree of Deterioration 2 Was Observed in Each Treatment Ward, and the Cumulative Temperature and Cumulative Amount of Solar Radiation at That Time

Treatment Ward	Pot Types	Dates when the Pots of Degree of Deterioration 2 Were Observed	Cumulative Temperature of the Dates When the Deterioration of Pots Were Observed	Cumulative Amount of Solar Radiation of the Dates When the Deterioration of Pots Were Observed
Treatment Ward1	Biodegradable Pot 1	Oct. 27	3008.7℃	579.5(MJ/㎡)
Treatment Ward2	Biodegradable Pot 2	Jul. 27	799.5℃	167.0(MJ/㎡)
Treatment Ward3	Biodegradable Pot 3	Aug.13	1274.7℃	262.9(MJ/㎡)
Treatment Ward4	Biodegradable Pot 4	Sep. 22	2282.7℃	419.3(MJ/㎡)
Treatment Ward5	Normal Polypot	-	-	-
Treatment Ward6	Biodegradable Pot 1	Oct. 7	2628.4℃	579.5(MJ/㎡)
Treatment Ward7	Biodegradable Pot2	Aug.13	1274.7℃	262.9(MJ/㎡)
Treatment Ward8	Biodegradable Pot3	Aug.13	1274.7℃	262.9(MJ/㎡)
Treatment Ward9	Biodegradable Pot4	Oct. 7	2628.4℃	579.5(MJ/㎡)
Treatment Ward10	Normal Polypot	-	-	-