Rooting of Cuttings and Growth of Nursery Stocks of MKR1, a Dwarfing Rootstock for Kaki©

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INTRODUCTION

Miyazaki Kaki Rootstock No. 1 (MKR1), formerly named Rootstock-b and OD-1, are promising dwarfing rootstock for kaki (*Diospyros kaki* Thunb.). We previously showed the results of cutting propagation of MKR1 and growth of 'Fuyu' and 'Hiratanenashi' trees grafted on MKR1 (Tetsumura et al., 2011, 2012, 2013). In Japan an evaluation test of kaki rootstocks is planned and 17 prefectural research stations will participate in the test. In the test, other promising kaki dwarfing rootstocks such as 'Shizukadai 1 gou', 'Shizukadai 2 gou', and SH-1 will be provided as well as MKR1. However, timing of rooting of MKR1 cuttings and growth of MKR1 nursery stocks soon after grafting have not been reported yet. Hence, the objective of this study is to investigate the above-mentioned characteristics of MKR1 and to discuss future experiments which are necessary for commercial use of the kaki dwarfing rootstocks.

MATERIALS AND METHODS

Rooting of Cuttings

Root-suckers of MKR1, Rootstock-a, KD-3, and 'Jiro', and shoots of MKR1 hedges were collected on mid-June in 2012, 2013, and 2014. Single-node stem cuttings with one leaf and one bud were prepared from the root-suckers and the shoots, dipped at their bases in 50% aqueous ethanol with 3000 ppm indole-3-butyric acid (IBA) for 5 s, planted singly in a plastic pot (EG-90, 300 ml, Minamide Inc., Japan) which was filled with Metro-Mix®360 (Sun Gro, Horticulture Distribution Inc., Washington D.C.), and then placed under a vaporized aluminum netting in a propagation frame covered with plastic film. The propagation frame was intermittently misted (30-s mist and 15-min stop in the daytime) and was ventilated with fans when the ambient air reached 38°C. A data logger (TR-72i, T&D Corporation, Japan) measured the temperature in the frame. Twenty-four cuttings per cutting source were used. When the roots were visible at the bottom of the pot, the cutting was considered as "rooted," and then the rooted cuttings were transplanted singly to a plastic pot (EG-105, 400 ml, Minamide Inc., Japan). The pots were filled with Metro-Mix® 360 and were placed in a propagation frame covered with plastic film but opened at the sides. The percentages of survival of rooted cuttings were investigated in April of the following year.

Growth of Nursery Stocks

Both the rooted MKR1 cuttings and seedlings of 'Yamagaki' (*D. kaki*) which grew for one growing season were planted singly in a plastic pot (CSM-180 L, 3.5l, Minamide Inc., Japan) which was filled with a mixture of Andosol (volcanic tephra) and Boratsuchi (volcanic tuff) (1:1, v/v). On 21 Mar. 2013, 'Fuyu', 'Hiratanenashi', and 'Taishuu' were veneer-grafted on the 1-year-old rootstocks. The percentages of graft establishment and the growth of nursery stocks were investigated. Eight MKR rootstocks and four seedling rootstocks per cultivar were used.

RESULTS AND DISCUSSION

Rooting of Cuttings

In 2012, some of the cuttings from MKR1 root-suckers started rooting from 1 month after the planting and all of the cuttings had rooted by the end of 2 month after the planting (Fig. 1). Similar tendencies were observed in 2013 and 2014. The cuttings from root suckers of Rootstock-a, KD-3, and 'Jiro' rooted well and the terminations of rooting were between 2 and 3 months after the planting. Although the rooting speed of the cuttings from MKR1 hedges was slower than that from MKR1 root-suckers, rooting of the cuttings from MKR1 hedges occurred even when the average daily temperature in the propagation frame decreased 20°C. Such root growth might relate to earlier bud break of the young kaki trees grafted on MKR1 rootstocks in spring than that on *D. kaki* seedlings. The survival percentages of the rooted cuttings from MKR1 hedges were lower (2013, 41%; 2014, 35%), whereas those from the root suckers were higher (MKR1, 100 and 96%; Rootstock-a, 90 and 71%; KD-3, 91 and 60%; 'Jiro', 100 and 90%). These results were the same as the previous ones, which suggested that the cuttings should be collected from root-suckers (Tetsumura et al., 2011).

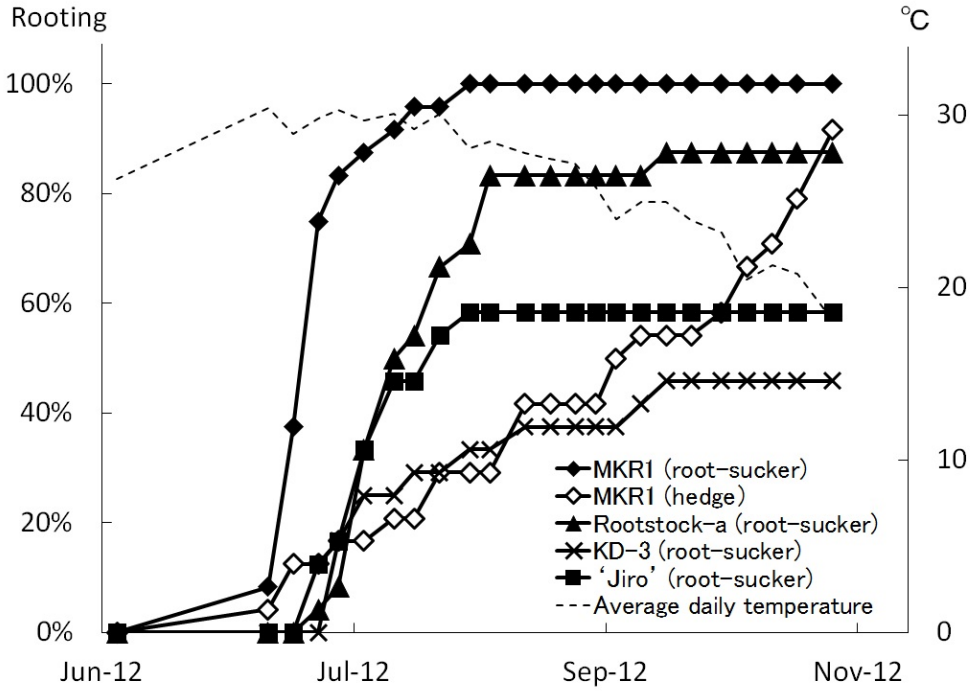

Fig. 1. Rooting percentages of the cuttings and average daily temperature in the propagation frame in 2012.

Growth of Nursery Stocks

The greatest difference in the percentage of graft establishment between the rootstocks was observed in 'Taishuu' (Table 1). Although 60% of the shoots of 'Taishuu' on MKR1 showed secondary growth like 'Fuyu' and 'Hiratanenashi' on MKR1, the total shoot length of 'Taishuu' on MKR1 was almost the same as 'Taishuu' on seedlings, which showed that only 25% of the shoots occurred as secondary growth. These results imply that there is a graft-incompatibility between 'Taishuu' and MKR1. However, the quality of the fruit produced by 6-year-old 'Taishuu' trees on MKR1, which were dwarfed, was as well or better than that on seedling (Tetsumura et al., pers. commun.). Moreover, the yield efficiency, such as yield per canopy volume, of 'Taishuu' trees on MKR1 was the same as that on seedling. Hence, productivity of dwarfed 'Taishuu' trees seemed not to relate to the

graft-incompatibility. The growth of nursery stocks of 'Fuyu' and 'Hiratanenashi' on MKR1 was better than that on seedling (Table 1), although the growth of trees of both cultivars on MKR1 are expected to be dwarfed (Tetsumura et al., 2010). In conclusion, the growth characteristics of kaki trees on MKR1 varied with the scion cultivar and will varied with age. Hence, like dwarfing rootstocks of other fruit trees, the long-term field evaluation of MKR1 rootstocks will be needed in each combination of scion cultivar.

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Table 1. Graft establishment and growth of 'Fuyu', 'Hiratanenashi', and 'Taishuu' nursery stocks on rootstocks of *Diospyros kaki* seedling and MKR1.

Cultivar	Rootstock	Graft establishment (%)	Total shoot length (cm)	Leaves (no)	Rate of secondary shoot occurrence (%)
Fuyu	Seedling	75	17.3	8.0	0
	MKR1	75	38.3	13.5	67
Jiro	Seedling	75	19.3	8.0	0
	MKR1	88	34.1	16.3	57
Taishuu	Seedling	100	17.3	6.3	25
	MKR1	63	14.6	5.5	60

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