

## 学位論文の要旨

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学位論文 題 目	Vegetative propagation of persimmon by cutting, grafting, and micropropagation (挿し木、接ぎ木、およびマイクロプロパゲーションによるカキの栄養繁殖に関する研究)
<p>【論文の要旨】（和文の場合 1,200 字程度、英文の場合 800 語程度）</p> <p>Introducing persimmons (<i>Diospyros kaki</i>) to Afghanistan is credited to returning migrants from neighboring countries, leading to successful cultivation in the eastern and northern regions. The recent establishment of commercial orchards has bolstered local production, although imports persist. <i>Diospyros lotus</i> is the common rootstock, and grafting remains the primary propagation method. Astringent persimmons dominate the orchards, necessitating artificial ripening. Ethylene is increasingly used for ripening, while some still employ calcium carbide or allow natural ripening on trees. Afghan farmers sell the fruits to contractors, who subsequently market and sell the fruit to consumers. Despite facing obstacles, there is significant potential for improving the persimmon industry in this country. The general objective of this study was to enhance persimmon vegetative propagation by streamlining labor-intensive steps, considering efficiency, and aligning with sustainable development goals.</p> <p>Grafting, the sole method of persimmon propagation in Afghanistan, involves mud and polyethylene film covering, which is considered time-consuming and labor-intensive. Rootstocks were grafted onto persimmon cultivars to identify an efficient alternative using five treatments, including buddy tape, mud sealing, and others. The buddy tape consistently demonstrated the highest graft success and outperformed other treatments, including the traditional mud approach.</p> <p>‘MKR1’, a persimmon rootstock and patented variety in Japan, shows promise in dwarfing trees and enhancing yield efficiency. Traditional propagation with seedlings faces challenges, leading to genetic diversity and uneven sizes. Despite recent advances in cutting propagation, ideal conditions for ‘MKR1’ softwood cuttings remain unexplored. Softwood cutting also demands specialized equipment and substantial water volume, posing challenges in arid regions like remote Afghanistan. To address this, ‘MKR1’ cuttings quick-dipped in IBA solution were planted in plastic pots with four substrates in late June, July, and August. Cuttings were irrigated using an intermittent mist or water-conserving TPT system developed in this study. Late June plantings showed the highest survival and rooting rates, with improved winter survival. The rooting medium minimally affected survival, with perlite having the lowest rooting percentage.</p>	

While irrigation systems had no significant impact, the TPT proved an easily applicable and water-conserving alternative for resource-poor areas.

Plastic pollution poses a global threat, particularly in the nursery and greenhouse sectors, where 320 to 408 million pounds of plastic are used annually. Disposal of plastic waste is an environmental concern, especially in developing nations where recycling may not be practical. Compostable substrate-based pots, such as peat pots and peat pellets, promise to reduce plastic dependency for sustainable plant production. To assess the effectiveness of compostable pots in the rooting of 'MKR1' cuttings, considering the prior reliance on plastic pots, various factors were evaluated, including pot type, auxin application, and concentrations. Peat pots showed survival and rooting rates similar to plastic pots, suggesting their feasibility as an eco-friendly alternative. The highest rooting percentage among peat pellets was cuttings quickly dipped in 2000 mg·L<sup>-1</sup> NAA. A comparable rooting rate to the quick-dip was observed when cuttings were planted in pellets soaked with IBA 50 or 250 mg·L<sup>-1</sup> or when cuttings were sprayed with NAA 250 mg·L<sup>-1</sup>. These findings present compelling alternatives to the traditional auxin quick-dip method, offering efficiency and reducing the time and labor intensity associated with the process.

Efficient year-round 'MKR1' propagation faces challenges despite successful softwood cutting propagation. While micropropagation serves this purpose, the protocol requires optimization. Direct transplantation of 'MKR1' microcuttings into commercial substrates was explored to eliminate jiffy pots and save resources. Shoots grown in MS or MS (1/2N) medium supplemented with 5μM zeatin were transplanted into either MetroMix<sup>®</sup> or half of MS (1/2N) hormone-free artificial medium after a quick dip in an IBA 1.25 mM solution. The shoots of the artificial medium underwent a 10-day dark treatment. Subsequently, half of the shoots from each medium were transplanted into MetroMix<sup>®</sup>, while the remaining half was left in the same medium at 28 °C under a 16-hour photoperiod. Regardless of the medium, shoots that underwent dark treatment exhibited significantly higher rooting percentages than those directly transplanted into MetroMix<sup>®</sup> without dark incubation. After the dark treatment, shoots from the MS medium achieved a one hundred percent rooting, whether transplanted into MetroMix<sup>®</sup> or left in the artificial medium. Despite successful rooting, the quick-dip IBA method remained labor-intensive. To address this, microcuttings were exposed to a half MS (1/2N) rooting medium containing 1, 2, and 5 μM IBA solutions. Shoots quickly dipped in 1.25 mM IBA and planted in a hormone-free rooting medium served as a control. After a 10-day dark treatment, half of the shoots were transplanted into peat pellets, and the rest after 20 days. Optimal root and shoot growth were obtained with a 10-day transplantation and a medium containing 1 μM IBA, eliminating the need for the quick-dip method.

In conclusion, this comprehensive study explores sustainable alternatives, innovative techniques, and efficient protocols to enhance persimmon propagation, addressing challenges and fostering the growth of the persimmon industry.

- (注1) 論文博士の場合は、「専攻、入学年度」の欄には審査を受ける専攻のみを記入し、入学年度の記入は不要とする。
- (注2) フォントは和文の場合 10.5 ポイントの明朝系、英文の場合 12 ポイントの times 系とする。
- (注3) 学位論文題目が外国語の場合は日本語を併記すること。
- (注4) 和文又は英文とする。