Ilmiy tadqiqotlar va ularning yechimlari jurnali
Aoka guvohnoma № 323759 ISSN: 3060-4818

UDC 634.37:631.53.03

FIG (FICUS CARICA L.) PRACTICAL RESULTS OF INTENSIVE SEEDLING CULTIVATION

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https://doi.org/10.5281/zenodo.23072672

Abstract. The article examines the scientific basis of intensive vegetative propagation of fig (Ficus carica L.) planting material through an analysis of the international literature, complemented by the results of an experiment conducted under the conditions of the Andijan region. Studies carried out by foreign researchers on rooting media based on perlite, peat, coconut coir and vermiculite, on mist propagation systems, and on auxin formulations (IBA, NAA) are reviewed. In the experiment reported here, the highest rooting percentage — 85–88% — was obtained in a perlite–coconut coir mixture under an intermittent mist unit.

Keywords: Ficus carica L., intensive technology, vegetative propagation, stem cutting, mist propagation unit, perlite, vermiculite, peat, coconut coir, auxin (IBA, NAA), rooting percentage, Andijan region.

Introduction

Fig (Ficus carica L.) is a heat-loving, drought-tolerant subtropical fruit tree with high nutritional and medicinal value. In recent years, scientific and commercial interest in the species has been growing worldwide owing to its tolerance of climatic variability and the health-promoting properties of its fruit (Mafrica et al., 2025). Although the climatic conditions of Uzbekistan, and of the Andijan region in particular, are favourable for fig cultivation, the supply of high-quality, disease-free and uniform planting material remains a pressing problem.

Under traditional open-field propagation the rooting percentage is low (30–40%) and the development of the resulting plants is uneven. Intensive technology, by contrast, makes it possible to raise the rooting percentage substantially through a controlled microclimate (greenhouse, mist propagation unit), an appropriately selected rooting medium and the use of growth-promoting substances. The present article analyses the international scientific literature on this subject and compares it with the results of an experiment carried out under the conditions of the Andijan region.

Materials and Methods

Numerous studies by foreign researchers confirm that the composition of the rooting medium has a decisive effect on the rooting of cuttings. In an experiment conducted in Malaysia, three media were compared: sand and soil (1:3), a mixture of soil, peat and sawdust (1:1:1), and peat with perlite (1:1). The peat–perlite mixture proved significantly superior to the other treatments in terms of root and shoot growth, and hardwood cuttings showed a higher survival rate than softer cutting types (Shamsuddin et al., 2021).

In a study carried out in Romania on five fig cultivars, peat–perlite (2:1), peat–coconut fibre (2:1) and pure perlite media were tested. Rooting reached 88.9% in pure perlite, whereas the peat-based media provided better subsequent growth of the young plants (Borsai et al., 2025). These data indicate that perlite is particularly valuable at the root-formation stage, while peat and coconut coir are of particular importance during the subsequent phase of vegetative development.

In an experiment conducted in Italy with cuttings of the fig cultivar 'Dottato', a perlite medium maintained at 23±2 °C on bottom-heated benches under a mist system in a greenhouse was used. The results showed that longer cuttings taken from the distal part of the shoot had markedly higher rooting efficiency and biomass accumulation (Mafrica et al., 2025).

The use of exogenous auxins — indole-3-butyric acid (IBA) and naphthaleneacetic acid (NAA) — is common practice for accelerating root formation. In an experiment on hardwood cuttings in India, in which various concentrations of IBA and NAA were applied, a concentration of 1500 ppm IBA gave the greatest shoot and root growth, the highest percentage of rooted cuttings and the best survival (Nale et al., 2024).

In a trial conducted with the cultivar 'Brown Turkey' in the Jammu and Kashmir region of India, an IBA concentration of 3500 ppm combined with planting on 1 February produced the highest survival rate (76.66%) (Kumari et al., 2020).

Mist systems have been widely used in greenhouse nursery production since the 1950s; by creating a microclimate with a low evaporation rate around the cuttings, they provide optimal conditions for root formation (Owen and Maynard, 2008).

At the same time, some studies have noted that prolonged operation of a mist system may leach nutrients, oversaturate the medium and increase the risk of fungal disease, for which reason alternative methods such as subirrigation have been proposed for certain species (Aiello and Graves). Nevertheless, for most subtropical fruit crops, including fig, rooting in perlite or a perlite–coir medium under an automatic mist system is recommended as the method giving the most stable and reproducible results.

The position of the cutting along the shoot and its length also have a marked effect on rooting efficiency. In the Italian experiment, comparatively long cuttings (20 cm, with 3–4 buds) taken from the distal part of the shoot showed higher rooting efficiency and biomass accumulation than short cuttings taken from the middle and basal parts (Mafrica et al., 2025). A similar result was recorded in the Malaysian study, where hardwood cuttings rooted more consistently than semi-hardwood cuttings (Shamsuddin et al., 2021). These data show that in intensive nursery production particular attention must be paid to the age and length of the shoot material and to the part of the shoot from which the cuttings are taken.

In addition, brief immersion of cuttings in a fungicide solution (for example, mancozeb-based formulations) to protect them from disease is a widely used practice in foreign research (Mafrica et al.,

2025), as it reduces the risk of fungal infection during the rooting period. The introduction of this measure is also recommended under the conditions of the Andijan region, especially in the warm and humid greenhouse environment.

Aim and Objectives of the Study

The aim of the study was to determine, on the basis of international scientific experience and in accordance with the climatic conditions of the Andijan region, the optimal technological parameters for the intensive rooting of fig cuttings in different rooting media under a mist propagation unit. The objectives were: (1) to study the effect of different medium compositions on the rooting percentage; (2) to monitor the dynamics of rooting at 30, 45 and 60 days; and (3) to identify the most effective treatment and develop practical recommendations.

Hardwood cuttings 15–20 cm long and bearing 2–3 buds were prepared from healthy one-year-old shoots, since, as shown in the literature review, hardwood cuttings have a higher survival rate than softer cutting types (Shamsuddin et al., 2021; Kumar et al., 2024). To stimulate root formation, the cuttings were dipped for 5–10 seconds in an IBA solution at a concentration of 1000 ppm (following the recommendation of Nale et al., 2024).

The experiment comprised four treatments: (1) control — open-field soil without supplementary moistening; (2) Treatment 1 — pure Peat under mist; (3) Treatment 2 — a mixture of perlite and coconut coir (1:1) under mist; and (4) Treatment 3 — a mixture of peat, vermiculite and coconut coir (1:1:1) under mist. One hundred cuttings were set in each treatment, and the experiment was carried out in three replications.

The mist unit was set to operate automatically 8–10 times a day for 5–8 seconds at a time. Air temperature in the greenhouse was maintained at 24–28 °C and relative humidity at 75–85%, while the temperature of the rooting medium was held at 22–24 °C by bottom heating of the benches; these parameters were chosen in accordance with the conditions recommended in foreign studies (Mafrica et al., 2025). Rooting was recorded at 30, 45 and 60 days and calculated as the ratio of the number of rooted cuttings to the total number of cuttings, expressed as a percentage.

Results and Discussion

The results of the experiment are presented in Table 1.

As the table shows, in the control group (open field, without mist) the rooting percentage after 60 days was only 38.0%, which corresponds to the results reported in the literature for the traditional method. In pure Peat under mist this figure rose to 73.0%; although lower than the 88.9% obtained by Borsai et al. (2025), this result confirms the general trend, namely that the porous, well-aerated structure of perlite promotes rooting.

The highest result was recorded in the mixture of perlite and coconut coir (1:1): after 60 days the rooting percentage was 88.0% and survival was 85.0%. This outcome arises from the complementary action of the water-holding capacity of coconut coir and the drainage properties of perlite, and is consistent with the findings of Shamsuddin et al. (2021) and Mafrica et al. (2025). Although the result in the peat–vermiculite–coir mixture was also high (80.5%), it was somewhat lower than in the perlite–coir treatment; this is explained by the observation of collar rot in some cuttings as a result of excessive

moisture retention by the peat — a risk associated with prolonged use of mist systems that has likewise been emphasised in the literature (Aiello and Graves).

Table 1. Dynamics of rooting of fig cuttings in different rooting media

Treatment	Rooting medium	Day 30 (%)	Day 45 (%)	Day 60 (%)	Survival (%)
Control	Open-field soil	14.0	26.5	38.0	34.5
Treatment 1	Peat (100%)	28.5	55.0	73.0	69.5
Treatment 2	Perlite + coconut coir (1:1)	35.0	68.5	88.0	85.0
Treatment 3	Peat + vermiculite + coir (1:1:1)	31.0	60.0	80.5	77.0

The observations further showed that plants raised by the intensive method, particularly in the perlite–coir medium, had a denser and better-branched root system, while their above-ground parts developed 1.5–2 times faster than those of the control group. These results demonstrate the synergistic effect of combining treatment of the cuttings with 1000 ppm IBA and the use of a mist system.

Economic Efficiency

Although intensive propagation requires additional expenditure at the initial stage for the mist unit and the rooting medium, the high rooting percentage reduces the total cost per unit of quality planting material by 20–25% compared with the traditional method. Moreover, the possibility of producing several batches of planting material a year under greenhouse conditions further increases the economic efficiency of the technology.

Practical Recommendations

- Prepare hardwood cuttings 15–20 cm long, with 2–3 buds, from healthy, undamaged one-year-old shoots, taken from the distal and middle parts of the shoot;
- Before setting, dip the cuttings for 5–10 seconds in an IBA solution of 1000–1500 ppm;
- Use a 1:1 mixture of perlite and coconut coir as the main rooting medium;
- Set the mist unit to operate automatically 8–10 times a day for 5–8 seconds at a time;
- Maintain an air temperature of 24–28 °C, relative humidity of 75–85% and a medium temperature of 22–24 °C in the greenhouse;
- Treat the cuttings briefly with a fungicide solution before setting in order to prevent fungal disease;
- Monitor the dynamics of rooting regularly at 30, 45 and 60 days.

Conclusion

The study carried out and the analysis of the international scientific literature show that, under the conditions of the Andijan region, the intensive propagation of fig planting material in a 1:1 mixture of perlite and coconut coir under a mist propagation unit gives the highest efficiency (85–88% rooting). The use of hardwood cuttings, their treatment with an IBA solution of about 1000 ppm and the maintenance of a temperature regime of 24–28 °C and a relative humidity of 75–85% are recommended.

The introduction of this technology in farms and commercial nurseries will help to ensure a supply of high-quality, uniformly developed and disease-free fig planting material and will also increase the economic efficiency of the nursery sector. In further research it would be advisable to study in greater depth the interaction between different auxin concentrations and medium ratios, and to conduct comparative experiments on local fig cultivars of the Andijan region.

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