

Factors Affecting the Rooting in Mulberry Hardwood Cuttings in the Bottom Heat Bins

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電熱溫床을 이용한 桑樹의 枯條插木에 관한 研究

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摘 要

電熱溫床下에서 桑樹의 枯條插木을 實施할 때 가장 適當한 β -indolylbutric acid (IBA) 處理濃度, 插穗의 採取時期(插木時期) 및 插床土等을 究明하기 爲해서 本 試驗을 實施한 結果 다음과 같은 結果를 얻었다.

1. 插穗를 IBA溶液에 5초간 浸漬할 경우 IBA 2,000~4,000 p.p.m. 으로 處理한 것이 活着率이 높았고 發根數도 많았다.
2. 가장 適當한 IBA 溶液의 處理深度는 插穗의 基部로부터 2.5 cm가량 이었다.
3. 12월부터 3月 사이에 插穗를 採取 插木할 수 있으나 3월에 插木한 것이 더욱 結果가 좋았다.
4. 電熱溫床에 使用하는 床土로서는 眞珠岩土(perlite)가 가장 理想的이었다.

Introduction

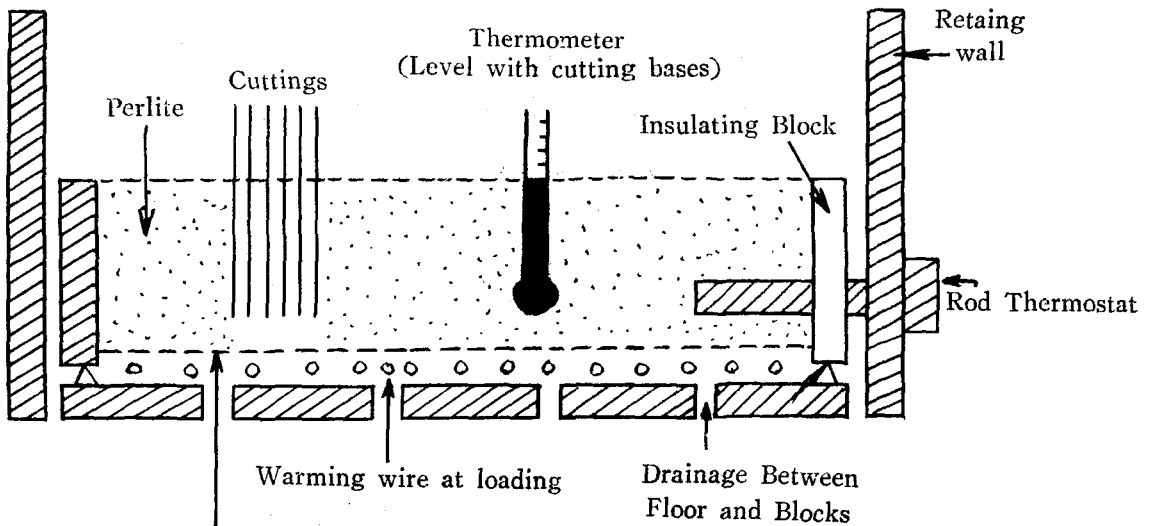
At present, Turkey has produced mulberry saplings by only bud grafting called T letter grafting conducted on the mulberry seedling nurseries in August and September. To get perfect mulberry saplings by this method takes at least three years and this gives Turkey sericulture has a lot of difficulties in the supply and the distribution of mulberry saplings to the sericultural farmers, as within very short period many saplings are necessary to establish mulberry plantations required by the farmer side. Now, the Horticulture Institute in Turkey (Konarli, 1974) and some European countries are producing such perennial plants as apples, plums, olives and hazels by bottom heat propagation system (Garner, 1966; Howard, 1968). This is a common system used successfully in rooting of hardwood cuttings. This method can be applied to mulberry sapling production, as mulberry has a high percentage of rooting power when compared with fruit trees mentioned above.

Auxin IBA, NAA and IAA have been known as high root-promoting regulators by Zimmerman since 1938 (Honda, 1969). Among these, growth regulator treatment with β -indolylbutyric acid (IBA) is known to enhance rooting in cuttings of many species and has been found to be effective with colonial fruit root stocks propagated by hardwood cuttings (Howard et al., 1968, 1969).

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Materials and Methods

Mulberry varieties used in the present experiment were provided by Sericulture Research Institute in Bursa to be Sariansi and Ichinose. In the experiment, one year old branches were used and one cutting of 20~30cm long from the base was made. The top of the cutting was cut horizontally just above a bud while the bottom was cut obliquely right below a bud. Randomized Block Design with three replication and ten cuttings in each plot was applied.



A Weldmesh screen can be laid above wires to protect them and facilitate sand and perlite

Cuttings prepared were put to take root by the method of "Bottom Heat Bins" under the mist-propagation in the nursery beds as shown in the figures above.

Perlite was put as rooting medium and heat was applied only to the base of cuttings by electrical soil warming wires controlled by a rod thermostat. Temperature in the medium was measured by a thermometer. The medium was irrigated completely by the nozzle of fine filter and irrigation was repeated at regular intervals until the cuttings were dug out.

The cuttings were treated with a root-promoting auxin of Indol butyric acid (IBA). In case of zero depth, only the part of 2~3 mm of the cutting from the bottom was dipped into IBA for 5 seconds, and in case of 2.5 cm and 5.0 cm depths, the cutting was dipped into IBA to the depths of 2.5 cm and 5.0 cm for 5 seconds, the other treatments except dipping depth were dipped in IBA to the depth of 2.5 cm for 5 seconds.

Cuttings were inserted in the nursery bed in three terms: the first term cuttings were inserted on 15 October 1976 and dug out on 17 November 1976, the second term cuttings were inserted on 23 November 1976 and dug out on 25 December

1976, the third term cuttings were inserted on 15 March 1977 and dug out on 16 April 1977. During the experiment, the temperature at the bottom of the cuttings was kept at 21°C (Fernquist, 1966; Howard et al., 1965, 1969; Marston, 1969; Sykes et al., 1959) and the air temperature of the green-house was made to remain on a low level by keeping the windows open all the time.

Results

1. Response to IBA concentration

Cuttings of two mulberry varieties were treated at a range of 0 to 4,000 p.p.m. of IBA and it was found that root stocks differed slightly in their rooting percentage. A response to IBA concentration was obtained, which was marked in case of Ichinose, showing an optimum of 2,000 and 4,000 p.p.m.

The Number of the root followed a similar trend to treat for rooting percentage with a large response from Ichinose to an optimum at 4,000 p.p.m., and Sariasi, however, gave almost the same response at 1,000 p.p.m., 2,000 p.p.m. and 4,000 p.p.m. (Fig. 2).

2. Response to dipping depth

Cuttings of Sariasi and Ichinose were treated at

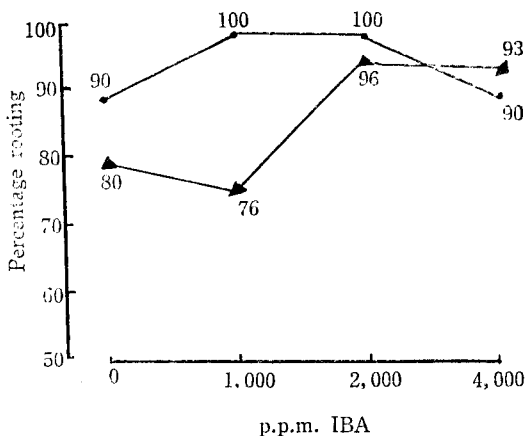


Fig. 1. Rooting response of mulberry varieties to IBA concentrations.
 • Sariasi ▲ Ichinose

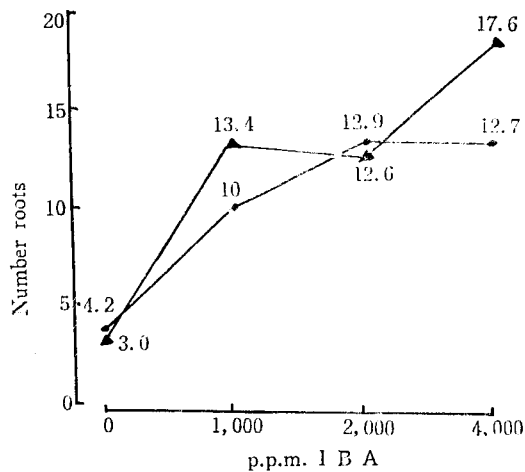


Fig. 2. Number of roots of mulberry varieties to IBA concentration.
 • Sariasi ▲ Ichinose

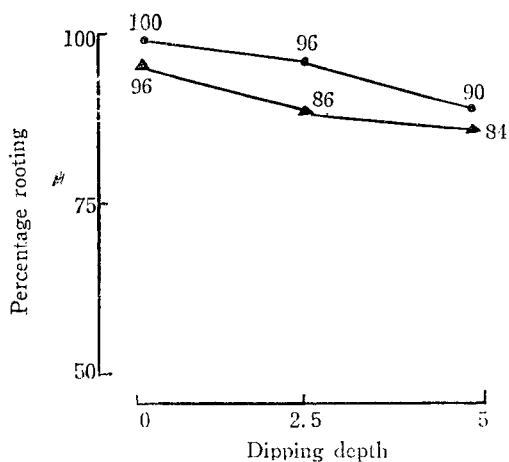


Fig. 3. Rooting response of mulberry varieties as influenced by the depth to which the cuttings were dipped into a 2,000 p.p.m. solution of IBA in 50% alcohol.
 • Sariasi ▲ Ichinose

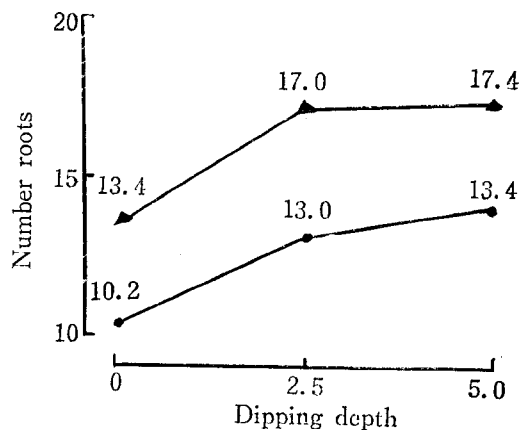


Fig. 4. Number of roots of mulberry varieties as influenced by the depth to which the cuttings were dipped into a 2,000 p.p.m. solution of IBA in 50% alcohol.
 • Sariasi ▲ Ichinose

their basal surface by dipping to zero depth (as shallow as possible), to 2.5 cm and 5.0 cm in a 2,000 p.p.m. IBA solution in 50% alcohol (Howard, 1970). Rooting was generally high in zero depth in both varieties, followed by 2.5cm and 5.0cm depth in that order.

On the other hand, not only many roots but also both of the two varieties and the greatest number of roots were produced at the deepest dipping depth. Generally, root numbers increased by

increasing dipping depth.

3. Response to time to take cuttings

There was a marked response according to the season of cutting collection (cutting date) in rooting percentage (Fig. 5). This figure shows that during late November and March a large number of Sariasi and Ichinose cuttings were capable of rooting in one month in 21°C basal temperature.

Root numbers generally followed the same trends as those for rooting percentage (Fig. 6).

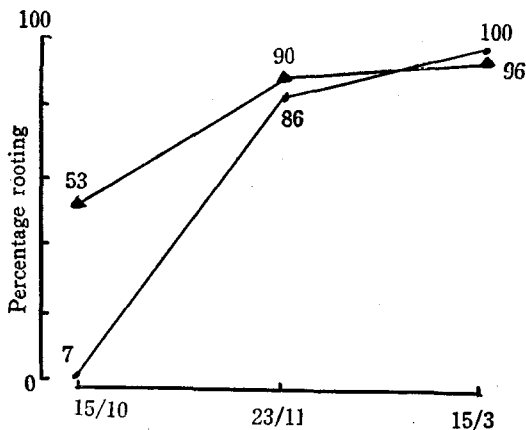


Fig. 5. Rooting response of mulberry varieties as influenced by cutting date to which the cuttings were dipped in a 2,000 p.p.m solution of IBA in 50% alcohol.

● Sariasia ▲ Ichinose

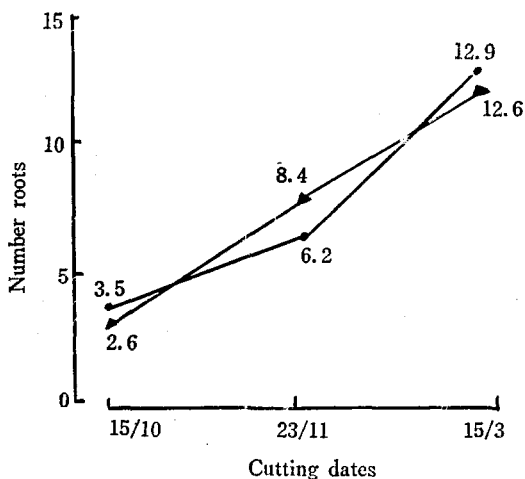


Fig. 6. Number of roots of mulberry varieties as influenced by cutting date on which the cuttings were dipped in a 2,000 p.p.m solution of IBA in 50 % alcohol.

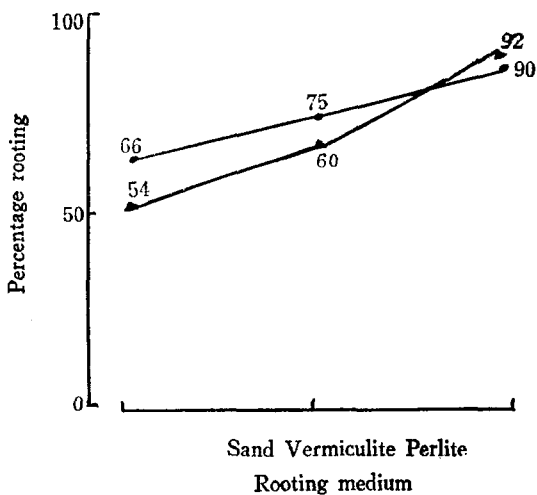


Fig. 7. Rooting response of mulberry varieties as influenced by a rooting medium which the cuttings were dipped in a 2,000 p.p.m solution of IBA in 50% alcohol.

● Sariasia ▲ Ichinose

4. Response to rooting medium

As shown in Fig. 7 and 8, perlite was the best medium for hardwood cutting of mulberry in Sariasia and Ichinose and was followed by vermiculite and sand in that order.

DISCUSSION

These results showed that an optimum range of

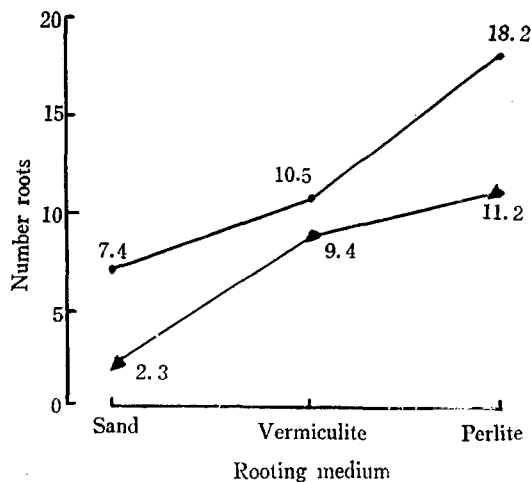


Fig. 8. Number of roots of mulberry varieties as influenced by a rooting medium which the cuttings were dipped in a 2,000 p.p.m solution of IBA in 50% alcohol.

● Sariasia ▲ Ichinose

IBA concentration was between 2,000 and 4,000 p.p.m. in the light of rooting percentage and number of roots which appeared in this experiment. These results followed almost the same trends as those for rootings of plums and apples (Garner et al., 1966; Howard et al., 1969, 1970).

Results demonstrate that dipping depth must be taken into account in treating root stock cuttings

with IBA by the quick-dip method. At optimum concentrations on IBA, high rooting percentages were obtained in shallowest dipping depth, on the other hand, more roots were produced in the deepest dipping depth. Therefore, the most optimum dipping depth was 2.5cm from the base of cutting.

The most favourable time to cuttings collection for high rooting percentage and more roots were in March. It is well known that it is the dormant season from October to November in mulberry tree, and during this period, mulberry buds cannot sprout even though they are given optimum temperature. Especially very poor rooting response on the 15th of October must be caused by a little preserved nutrition in the branch rather than growth-dormancy reaction.

Perlite is the best medium material to produce mulberry hardwood cuttings with high rooting percentage as it can contain much moisture.

Finally, these results suggest that hardwood cuttings of mulberry have propagation requirements similar to those of some fruit rootstocks under bottom heat propagation bins. Mulberry hardwood cuttings may provide an economical method of meeting any demand of mulberry saplings in turkey.

Summary

Optimum conditions for rooting of hardwood cuttings of two mulberry varieties have been determined with respect to the concentration of IBA applied to the base of cutting, dipping depth into IBA solution, season of cutting collection and rooting medium in the bottom heat bins.

1. Optimum range of IBA concentration was 2,000p.p.m.~4,000 p.p.m. in Sariasi and Ichinose.
2. Most optimum dipping depth of cutting was 2.5 cm from the base of cutting.
3. Rooting occurred most readily during December and March.
4. Perlite was the best medium to produce hardwood cuttings in the bottom heat bins.

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