ISSN 2250-3153

# Effect of Hormone and Cutting Length on the Rooting of Tinospora Crispa

**H. Aminah, M. S. Ahmad Fauzi, H. Tariq Mubarak & M. Hamzah**

Universiti Malaysia Kelantan, Kampus Jeli, Beg Berkunci No. 100, 17600 Jeli Kelantan, Malaysia

***Abstract-*** An experiment on *Tinospora crispa* cuttings using three cutting lengths, two hormone treatments and control (without hormone) was carried out in the nursery of Forest Research Institute Malaysia (FRIM). The length of cutting used was: 7.5 cm, 15 cm and 22.5 cm. The base of each cutting was treated with two types of powdered hormones: 1) Seradix 1 (0.1% indole butyric acid-IBA), 2) Seradix 2 (0.3% IBA) and 3) control (without hormone). These cuttings were planted in cleaned river sand medium in a non mist propagation system. Results twelve weeks after planting showed that cuttings of 22.5 cm length produced significantly higher rooting (81%) than the other two length (59% and 38%). Similar results were obtained with the number of roots where 22.5 cm length had significantly most number of roots (1.9) compared to the other two lengths (1.3 and 1.2). This experiment showed that *Tinospora crispa* can be propagated by cuttings as an alternative source of planting materials for domestication purposes.

***Index Terms***- Vegetative propagation, rooting percentage, non mist propagation system

## I. INTRODUCTION

*Tinospora cripsa* belongs to the family of Menispermaceae. It is an indigenous plant which grows wild in Malaysia, known by vernacular names such as 'akar patawali'or 'akar seruntum' (Noor &Ashcroft 1989). It is also known by its numerous synonyms, *Menispermum crispum* Linn., *Tinospora cordifolia* F. Vill., *Tinospora tuberculata*, *Tinospora rumphii* and other local names like Makabuhai, Andawali, Putarwali, Kattukkodi, Vasanavalli, Boraphet and Wan kab hoi yai (Asif Iqbal *et al*. 2012). This plant is a woody climber with shiny green leaf, can be found in tropical and subtropical India and parts of the Far East, and in primary rainforests or mixed deciduous forests throughout the Philippines, tropical Asia at altitudes up to 1000 m. It is also widely distributed in Indonesia including Borneo, Thailand and Vietnam (Dweck *et al*. 2012). It has being cultivated as a medicinal plant in Thailand, Sri Lanka and India (Umi Kalsom *et al*. 1999). In Malaysia, its stem has been traditionally used for various therapeutic purposes such as treatment for diabetes, hypertension, stimulation of appetite and protection from mosquito bites

Recent studies have shown that *T. crispa* has the potential to be a source of natural antioxidants and nutrients, besides having a moderate anti-proliferative effect on selected human cancer cell lines (Zulkhairi *et al*. 2008). Besides that, supplementation of *T. crispa* extract was able to reduce or retard the progression of atherosclerotic plaque development induced by dietary cholesterol (Zulkhairi *et al*. 2009). Due to its potential uses, the demand for this species in increasing yearly. The present experiment was carried out to observe the effect of hormone and cutting length on the rooting of *T. cripsa* cuttings. Hormone and length of cuttings are among the important factors that affect the rooting ability of cuttings (Hartmann *et al*. 1990).

## II. MATERIALS AND METHODS

An experiment using leafless cuttings of *Tinospora crispa* was carried out in the nursery of Forest Research Institute Malaysia (FRIM) on 9 August 2011. The cutting materials were obtained from two year old plants planted in the nursery of FRIM (Figure 1). Three cutting lengths were used: 7.5 cm, 15 cm and 22.5 cm. The base of cutting is cut at right angle and treated with different commercial powdered hormones: 1) Seradix 1 (0.1% indole butyric acid-IBA), 2) Seradix 2 (0.3% IBA), and 3) control (without hormone). The Seradix was purchased from Agrimart Sdn Bhd, Petaling Jaya, Selangor, Malaysia. A total of 270 cuttings were used and they were arranged in Randomised Complete Block Design in 3 blocks with 90 cuttings per block. These cuttings were planted in cleaned river sand medium in a non mist propagation system constructed based on the system used by Leakey *et al*. 1990. The whole system was shaded with black plastic netting with 20% light intensity. The relative humidity in the system was more than 80%. The light was measured with a SKP 215/200 light sensor (Skye Instrument, UK). The relative humidity was measured using Hobo LCD Datalogger, USA.

Observations on cuttings were made fortnightly starting two weeks after planting and the experiment was terminated at week twelfth since most of the cuttings had rooted. Variables collected were number of cuttings rooted, unrooted and dead cuttings. Data collected had been subjected to analysis of variance followed by Duncan Multiple Range Test (DMRT) to see the effect of treatments on rooting. The statistical package use was SAS version 9.1.3. The results were considered significant when $p \leq 0.05$.


**Figure 1 Cuttings of *Tinospora crispa* taken from the stock plants**

## III. RESULTS AND DISCUSSION

Analysis of variance showed that there was significant difference among the length of cuttings. The cuttings with 22.5 cm length produced significantly higher rooting than the 7.5 and 15 cm length. Similar results were obtained with the number of roots where 22.5 cm length had significantly most number of roots (1.9) compared to the other two lengths (1.3 and 1.2) (Table 1). The plant growth regulator treatments did not have any significant effect on all the variables measured (Table 2). The use of hormones also did not accelerate the rate of rooting since rooting started at week four in all treatments. There was also no significant different in the interaction between hormone and length of cuttings. Figure 2 shows the rooted cutting of *Tinospora crispa* and Figure 3 is the potted rooted cuttings two years after potting,

**Table 1 Effect of cutting length on rooting ability of *Tinospora crispa* twelve weeks after planting.**

| Cutting length (cm) | Rooted cuttings (%) | Unrooted cuttings (%) | Dead cuttings (%) | Mean number of roots per rooted cutting |
|---|---|---|---|---|
| 7.5 | 37.8a | 36.7a | 25.6a | 1.2a |
| 15.0 | 58.9a | 25.6ab | 15.6a | 1.3a |
| 22.5 | 81.1b | 14.4b | 4.4a | 1.9b |

Means followed by the same letters in each column are not significantly different at P≤0.05

**Table 2 Effect of hormones on rooting ability of *Tinospora crispa* twelve weeks after planting.**

| Hormones | Rooted cuttings (%) | Unrooted cuttings (%) | Dead cuttings (%) | Mean number of roots per rooted cutting |
|---|---|---|---|---|
| Seradix 1 | 56.7a | 24.4a | 18.9a | 1.3a |
| Seradix 2 | 62.2a | 23.3a | 14.4a | 1.5a |
| Control (without hormone treatment) | 58.9a | 28.9a | 12.2a | 1.6a |

Means followed by the same letters in each column are not significantly different at P≤0.05

**Figure 2 Rooted cutting of *Tinospora crispa***

**Figure 3 Rooted cuttings of *Tinospora crispa* two years after potting**

The difference in rooting percentage with the length of cuttings could be due to the carbohydrates reserves in the longer cuttings which is more compared to the shorter ones (Hartmann *et al*. 1990). In other species such as *Khaya ivorensis*, its long cuttings rooted in higher percentages than short cuttings (60% versus 45%) (Tchoundjeu & Leakey 1996). Similar results were obtained with *Azadirachta indica* where cutting length of 25 cm significantly produced more rooting than the 12 cm and 5 cm cuttings. In fact no rooting was obtained with 5 cm cuttings (Palanisamy &Kumar 1977). Further evidence showed that a cutting's storage capacity of carbohydrates is an important determinant of rooting has been found in stem cuttings of *Eucalyptus grandis* (Hoad & Leakey 1996).

Experiments with other tree species have indicated highly contrasting responses to hormone treatments. The effect of hormones on rooting of cuttings varies with species. Some species like *Gonystylus bancanus* (Nor Aini *et al.* 2010), *Hibiscus tiliaceus* ( Aminah *et al*. 2007), *Milicia excelsa* (Ofori *et al*. 1996) and *Nauclea diderrichii* (Leakey 1990) could produce high rooting percentage without hormone treatment. On the other hand, only 10% rooting was obtained if cuttings of *Cordia alliodora* were not treated with hormone (Mesen *et al*. 1997). In some species, for example *S. macrophylla* (Lo 1985), *S. leprosula* (Aminah *et al*. 1995) and *Casuarina equisetifolia* (Aminah *et al*. 2009), hormone treatment only accelerated the rate of rooting. However in *Shorea parvifolia* and *S. macroptera*, hormone treatment not only increased rooting percentage but it also accelerated the rate of rooting (Aminah *et al*. 2006).

## IV. CONCLUSION

Results of this experiment showed that *Tinospora crispa* can be propagated from cuttings and the recommended length is 22.5 cm. Seradix 2 can be used as hormone treatment. The technique will be more useful for production of elite clones.

## ACKNOWLEDGEMENTS

The authors would like to thank the Ministry of Science, Technology and Innovation (MOSTI), Malaysia for the financial support.

## REFERENCES

[1] AMINAH, H., DICK, J. McP., LEAKEY, R.R.B., GRACE, J. & SMITH, R.I. 1995. Effect of indole butyric acid (IBA) on stem cuttings of Shorea leprosula. Forest Ecology and Management 72(2&3): 199–206.

[2] AMINAH, H., NOR HASNITA, R.M.N., HAMZAH, M. 2006. Effects of indole butyric acid concentrations and media on rooting of leafy stem cuttings of Shorea parvifolia and Shorea macroptera. Journal of Tropical Forest Science 18(1): 1–7.

[3] AMINAH, H., JAMALUDDIN O. & MOHD YUSOFF A.R. 2008. Rooting ability of short cuttings of Bebaru (Hibiscus tiliaceus). Pp. 126–129 in Aminah, H., Wan Rashidah, K, Nik Zanariah, N.M., Azian, M. & Marryanna, L (Eds.). Proceedings of the Coastal Forest of the Country: Awareness and Plan of Action Workshops. Paka, Terengganu, Malaysia. Forest Research Institute Malaysia, Kepong, Malaysia.

[4] AMINAH, H., AHMAD FAUZI, M.S., LOKMAL, N. & MOHD YUSOFF, A.R. 2010. Rooting Ability of Branch Cuttings of Coastal Ru (Casuarina equisetifolia). Pp. 133–138 in Abd Rahman, A. R., Jefri, A.R., Jinis, A., Suhaili, H.R., Norzalyta, M.G., Nora Azlina, M., Nabilah Hamidah, S., Khairunnisa, M. & Ain Nur Nadillah, D (Eds.). Proceedings of the National Seminar on Coastal Forest of the Country: Conservation of the Coastline with the Communities. Kuching, Sarawak, Malaysia. Forest Research Institute Malaysia, Kepong, Malaysia.

[5] ASIF IQBAL, C.M., GUNJAN, M. & CHELLAPPAN KUMAR, D. 2012. Antimicrobial activity of Tinospora crispa root extracts. International Journal of Research in Ayurveda and Pharmacy, 3(3): 417–419.

[6] DWECK, A.C., CAVIN, J.P. & ANDAWALI. (Tinospora crispa). 2012 - A Review. Personal Care Magazine 7. http://www.dweckdata.com/Published_papers/Tinospora crispa.pdf (Accessed October 9, 2012).

[7] HARTMANN, H.T., KESTER, D.E. & DAVIS, Jr. F.T. Plant propagation-Principals and Practices. 1990.5th ed.; Prentice-Hall International Editions. Englewood Cliffs, New Jersey.

[8] HOAD, S.P. & LEAKEY, R.R.B. 1996. Effect of pre-severance light quality on vegetative propagation of Eucalyptus grandis W. Hill ex Maiden: Cutting morphology, gas exchange and carbohydrate status during rooting. Trees 10: 317–324.

[9] LEAKEY, R.R.B. 1990. Nauclea diderrichii: rooting of stem cuttings, clonal variation in shoot dominance, and branch plagiotropism. Trees 4: 164–169.

[10] LEAKEY, R.R.B., MESEN, J. F., TCHOUNDJEU, Z., LONGMAN, K.A., DICK, J. McP., NEWTON, A.C, MATIN, A., GRACE, J., MUNRO, R.C. & MUTHOKA, P.N. 1990. Low technology techniques for the vegetative propagation of tropical trees. Commonwealth Forestry Review 69: 247–257.

[11] LO, Y.N. 1985. Root initiation of Shorea macrophylla cuttings: Effect of node position, growth regulators and misting regime. Forest Ecology and Management 12: 42–52.

[12] MESEN, F., NEWTON, A.C. & LEAKEY, R.R.B. 1997. Vegetative propagation of Cordia alliodora (Ruiz & Pavon) Oken: the effects of IBA concentration, propagation medium and cutting origin. Forest Ecology and Management 92: 45–54.

[13] NOOR, H. & ASHCROFT, S.J.H. 1989. Antidiabetic effects of Tinospora crispa in rats. Journal of Ethnopharmacol 27: 149–161.

[14] NOR AINI, A.S., GUANIH, V.S. & ISMAIL, P. 2010. Effect of cutting positions and growth regulators on rooting ability of Gonystylus bancanus. African Journal of Plant Science 4(8): 290–295.

[15] OFORI, D., NEWTON, A.C., LEAKEY, R.R.B. & GRACE, J. 1996. Vegetative propagation of Milicia excelsa by leafy stem cuttings: effects of auxin concentration, leaf area and rooting medium. Forest Ecology and Management 84: 39–48.

[16] PALANISAMY, K. & KUMAR, P. 1977. Effect of position, size of cuttings and environmental factors on adventitious rooting in neem (Azadirachta indica A. Juss). Forest Ecology and Management 98: 277–280.

[17] TCHOUNDJEU, Z. & LEAKEY, R.R.B. 1996.Vegetative propagation of African Mahogany: effects of auxin, node position, leaf area and cutting length. New Forests 11:125–136.

[18] UMI KALSOM, Y., HORSTEN, S.F.A.J. & LEMMENS, R.H.M.J. 1999. Plant Resources of South-East Asia Medicinal and Poisonous Plants. Pp. 479–484 in De Pandula, L.S., Bunyapraphatsara, N. & Lemmens, R.H.M.J. (Eds.). Prosea Foundation, Bogor, Indonesia, No. 12(1).

[19] ZULKHAIRI A., ABDAH M.A., M KAMAL, N.H., NURSAKINAH I., MOKLAS, M.A.M., HASNAH, B., FAZALI, F., KHAIRUNNUR, F.A., KAMILAH, K.A.K., ZAMREE, M.S. & SHAHIDAN, M.M.A. 2008. Biological Properties of Tinospora crispa (Akar Patawali) and its anti proliferative activities on selected human cancer cell lines. Malaysian Journal of Nutrition 14(2): 173–187.

[20] ZULKHAIRI, A., HASNAH, B., ZAMREE, M.S., SHAHIDAN, M.A., NURSAKINAH, I., FAUZIAH, O., MAZNAH, I., TAUFIK HIDAYAT, M., MOKLAS, M.A. & KHAIRUL KAMILAH, A.K. 2009. Potential of Tinospora crispa as a hypocholesterolemic agent in rabbits. Malaysian Journal of Medicine and Health Science 5(2): 1–10.

## AUTHORS

**First Author** – H. Aminah, Universiti Malaysia Kelantan, Kampus Jeli, Beg Berkunci No. 100, 17600 Jeli Kelantan, Malaysia, Email: draminah55@gmail.com, Tel: 019 6456882
**Second Author** – M. S. Ahmad Fauzi, Universiti Malaysia Kelantan, Kampus Jeli, Beg Berkunci No. 100, 17600 Jeli Kelantan, Malaysia
**Third Author** – H. Tariq Mubarak, Universiti Malaysia Kelantan, Kampus Jeli, Beg Berkunci No. 100, 17600 Jeli Kelantan, Malaysia
**Fourth Author** – M. Hamzah, Universiti Malaysia Kelantan, Kampus Jeli, Beg Berkunci No. 100, 17600 Jeli Kelantan, Malaysia