



# Agricultural Biology

**INSECT DIVERSITY IN A REGENERATED FOREST, ABANDONED  
*CHENA* AND VEGETABLE AGRO-ECOSYSTEM IN *DAMBULLA*,  
SRI LANKA**

**S.A.D. Thakshila<sup>1</sup>, U.G.A.I. Sirisena<sup>1</sup>, N. Geekiyanage<sup>1</sup>, M.C.M. Iqbal<sup>2</sup>, and  
D.S.A. Wijesundara<sup>2</sup>**

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata  
University of Sri Lanka, Anuradhapura, Sri Lanka.*

<sup>2</sup>*National Institute of Fundamental Studies, Hanthana, Sri Lanka.*

Insects are the most diverse group of organisms in the world and they play a major role in ecosystem diversity and sustainability. The composition of plants in an ecosystem could be a major determinant on insect community because plants provide food, habitats and shelter for insects. The effect of agricultural practices on the diversity of insect fauna is poorly understood in the local context, therefore, this study was conducted to assess insect diversity and abundance in three different ecosystems; regenerated forest, abandoned *chena* and a vegetable agro-ecosystem located in *Dambulla*, Sri Lanka. Soil dwelling insects and aerial insects were collected using ten pitfall traps (200 ml) and two light traps (12V, 1.5W) installed in each location. Samples were taken after 24 hours at one month intervals. The insect abundance was compared using Poisson regression analysis and the diversity was compared using Shannon diversity and Bray Curtis similarity indices. The evenness of families was assessed using Pielou's index. A total of 2923 insects belonging to 64 families and 11 orders were collected during the study. The highest soil dwelling and aerial insect diversity was recorded in the regenerated forest ( $H' = 0.726, 0.986$ ), followed by abandoned *chena* ( $H' = 0.498, 0.878$ ) and vegetable agro-ecosystem ( $H' = 0.380, 0.782$ ). The evenness of the insect fauna of regenerated forest, abandoned *chena* and vegetable agro-ecosystem was 0.677, 0.536 and 0.442, respectively. Bray Curtis similarity index of insect community between regenerated forest and vegetable agro-ecosystem was higher ( $D = 54.6\%$ ) in compared to vegetable agro-ecosystem and abandoned *chena* ( $D = 25.6\%$ ). The insect abundance was significantly high ( $p < 0.05$ ) in the abandoned *chena* and vegetable ecosystem in compared to regenerated forest, however, which was not significantly different over time. It is concluded that the regenerated forests can be used to restore and conserve the insect diversity.

**Keywords:** Agro-ecosystem, Conservation, Diversity indices, Insect fauna,  
Regenerated forest



## EVALUATION OF NON-PESTICIDAL METHODS FOR MANAGEMENT OF BLISTER BLIGHT OF TEA

V.A.T. Prabashwara<sup>1</sup>, D.M. De Costa<sup>2</sup>, W.A.J.M. De Costa<sup>3</sup>, K.S.P.  
Amaratunga<sup>4</sup>, and U.G.A.I. Sirisena<sup>1</sup>

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of  
Sri Lanka, Anuradhapura, Sri Lanka.*

<sup>2</sup>*Department of Agricultural Biology and*

<sup>3</sup>*Department of Crop Science,*

<sup>4</sup>*Department of Agricultural Engineering,  
Faculty of Agriculture, University of Peradeniya, Sri Lanka.*

Blister blight caused by *Exobasidium vexans* is a highly destructive disease of tea (*Camellia sinensis* (L.) Kuntze). The disease is mainly controlled by the frequent application of copper-based fungicides, which could lead to serious environmental and health issues. The present study was conducted to evaluate potential use of non-pesticidal methods to reduce blister blight incidences, yield performances and changes of selected biochemical parameters. Field experiments were conducted in Queensberry Estate, *Nawalapitiya* using cultivar TRI 2024 to evaluate four treatments, spraying 2% sodium bicarbonate (SB) and 1 mM salicylic acid (SA), hot air (50°C) treatment and applying copper oxychloride (2g/l) spray. Treatments were applied six times in weekly intervals and blister blight incidence was recorded at two-day intervals while, the yield data was recorded at 7<sup>th</sup> day after each application. Separately, the effect of Infra-Red and UV radiation on the suppression of blister was tested by exposing tea leaves at 3, 5, 10 seconds in laboratory. Tea leaves of treated plants with sprays were analyzed for four defense enzymes, polyphenolic content and chlorophyll *a* and *b*. Percentage blister blight incidence was significantly ( $p < 0.05$ ) reduced by SB and SA spray treatments in comparison to the fungicide treatment, while no significant difference was observed between SB and SA. The reduction of disease incidence by SB and SA sprays was prominent from the second application onwards. Hot air treatment reduced the disease incidence significantly from the fourth application onwards. Leaves treated with Infra-Red and UV radiation was not effective as the leaf moisture content was reduced drastically. SB and SA treatments resulted significantly higher levels ( $p < 0.05$ ) of defense enzymes, polyphenolic compounds and leaf yield. Therefore, sodium bicarbonate, salicylic acid and hot air treatments could be identified as successful non-pesticidal measures to reduce blister blight incidence of tea.

**Keywords:** Blister blight, Chlorophyll, *Exobasidium vexans*, Defense enzymes, Tea

**SUITABILITY OF GELRITE, AGAR, ISUBGOL, THEIR BLENDS AND A LIQUID STATIC MEDIA IN *IN VITRO* PROPAGATION OF *Anubias barteri* var. *Nana***

**W.A.H.M. Wijethilaka<sup>1</sup>, K.P.N.N.S. Jayarathne<sup>2</sup>, and P.A. Weerasinghe<sup>1</sup>**

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.*

<sup>2</sup>*Ornamental Fish Breeding and Training Center, Rambadagalle, Panagamuwa, Sri Lanka.*

With the increase of aquarium keeping in worldwide, the ornamental aquatic plant industry of Sri Lanka has been developing rapidly and requires a continuous supply of high quality plants on a large scale. Although this demand could easily achieve by micro-propagation, high cost of production is one of the main barrier. Media cost plays an important role in production due to high cost of solidifying agents compared to other media ingredients. This study aims on finding a low cost medium using Gelrite, Agar, Isubgol, their blends and a liquid static medium on *in vitro* propagation of aquatic ornamental plant, *Anubias barteri* var. *nana*. Multiplication and rooting of the experimental plant was carried out using Murashige and Skoogbasal medium. Parameters such as number of shoots having more than 5 leaves, multiplication rate, root number per plant and total root length per plant were taken to evaluate efficiency of different media. No significant differences were observed among treatments ( $p > 0.05$ ) for multiplication rate and number of shoots having more than 5 leaves per explant. However, the best multiplication rate (3.68) and the highest number of shoots having more than 5 leaves (8.167) were recorded in static liquid medium. Significant differences among treatments ( $p > 0.05$ ) were observed in root number and total root length per plant. The highest total root length was observed in liquid static medium (33.54 cm), while the highest root number per plant (33.41) was observed in Isubgol-Agar blend (7.5 gL<sup>-1</sup> Isubgol + 3.5 gL<sup>-1</sup> Agar). However liquid static medium gave 13.81 number of roots per plant. However, apart from root number per plant, liquid static medium recorded highest results for all other investigated parameters. In conclusion, liquid static media can be used in *in vitro* propagation of *Anubias barteri* var. *nana* as low cost medium.

**Keywords:** Agar, *Anubias barteri* var. *nana*, Gelrite, Isubgol, Liquid static media

**DETERMINATION OF VOLATILE ORGANIC COMPOUND  
PROFILES OF DIFFERENT COCONUT VARIETIES IN RELATION TO  
COCONUT MITE *Aceria guerreronis* INFESTATION**

**G.G.T.M. Athapattu<sup>1</sup>, N.S. Aratchige<sup>2</sup>, N.T.P. Wijewardana<sup>2</sup>, A.D.N.T.  
Kumara<sup>3</sup>, P. Ranasinghe<sup>4</sup>, H.D. Weeratunge<sup>4</sup>, and L.K.W. Wijayarathne<sup>1</sup>**

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka.*

<sup>2</sup>*Crop Protection Division, Coconut Research Institute, Lunuwila, Sri Lanka.*

<sup>3</sup>*Department of Bio Systems Technology, Faculty of Technology, South Eastern University of Sri Lanka, University Park, Oluvil, Sri Lanka.*

<sup>4</sup>*Industrial Technology Institute, Malabe, Sri Lanka.*

Coconut mite (*Aceria guerreronis* Keifer) is a devastating pest in many coconut growing countries in the world. Infestation of the coconut mite has serious consequences on the economy and livelihood of people in the affected countries. Biological, chemical and physical management methods have been developed to manage the pest. However, there are issues on their practicability and cost. Therefore, cultivation of the coconut varieties which are resistant/ tolerant to coconut mite is a sustainable solution. Plant volatiles play a major role in their resistance to pest and diseases. Such information on coconut plants is scarce. This study was conducted to determine the differences in volatile compound profiles of young coconut fruits of four coconut varieties: Sri Lanka Green Dwarf and Ordinary Tall (putative susceptible varieties), and Sri Lanka Yellow Dwarf and *Gon Thembilli* (putative resistant varieties). The volatile profiles of 3-4 month old coconut fruits collected from uninfested and infested palms of the four varieties were compared to identify the changes following infestation by *A. guerreronis*. Furthermore, the volatile compounds were analyzed by using the GC-MS method. Differences in the volatile profiles were observed.

**Keywords:** *Aceria guerreronis*, Coconut, GC-MS, Host plant resistance, Plant volatiles

## EFFECT OF ECO-FRIENDLY NURSERY MANAGEMENT MEASURES OF *Camellia sinensis* ON SOIL MICROBIAL DENSITY AND DIVERSITY

G.L.T.A. Bandara<sup>1</sup>, D.M.De Costa<sup>2</sup>, G.D.N. Menike<sup>3</sup>, and  
T.D.C. Priyadarshani<sup>1</sup>

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.*

<sup>2</sup>*Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka.*

<sup>3</sup>*National Institute of Post harvest Management, Anuradhapura, Sri Lanka.*

Nursery management plays a vital role in producing healthy and vigorous tea plants for field establishment. Present study was conducted to determine the effect of eco-friendly nursery management practices on the density and diversity of microorganisms in nursery soil of tea. Soil samples were collected separately from soils, treated with two types of management practices (i.e. eco-friendly and existing) at *Kataboola* estate, *Nawalapitiya*. Composite samples were used for quantification of total bacterial and fungal counts by dilution plate technique. Bacterial diversity was determined in terms of Gram status, the ability of spore-formation, nitrogen- fixing and fluorescent pigment production using standard biochemical tests and diagnostic media. Bacteria having distinct colony morphology were subjected to molecular identification by PCR of the rRNA region, DNA sequencing and homology search. Soil pH, electrical conductivity (EC) and total dissolved solids (TDS) of the samples collected from two management practices were measured. The diversity and density of Bacteria were than that of fungi in soils under both management measures. Soils managed under eco-friendly measures resulted in higher colony diversity of bacteria (19) than the soil under existing management practices (14 ). Density and diversity of Gram-positive and spore- forming bacteria were higher in soils managed under eco-friendly measures (15) than in the soils under existing management (9). Diagnostic media identified *Rhizobium* spp.in both types of soils and *Azotobacter* spp. in soils under only eco-friendly management while fluorescent producing *Pseudomonads* were not detected in both soils. The soil pH, EC and TDS of the soil of the fields managed under eco-friendly measures were 6.00, 44.60  $\mu\text{scm}^{-1}$  and 20.98  $\text{mgL}^{-1}$ , respectively, while, in the existing management those were 4.0, 106.1  $\mu\text{scm}^{-1}$  and 49.7 $\text{mgL}^{-1}$ , respectively. As conclusion of the study, eco-friendly management practices could be recommended for tea nursery management in Sri Lanka.

**Keywords:** Diagnostic media, Dilution plate technique, Nitrogen fixing bacteria, Spore forming bacteria

## OPTIMIZATION OF A PROTOCOL FOR MICRO-PROPAGATION OF *Aloe vera*

H.H.A.C.K. Jayawardhana<sup>1</sup>, S.M. Nagahawaththa<sup>2</sup>, and P.A. Weerasinghe<sup>1</sup>

<sup>1</sup>Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka.

<sup>2</sup>Tissue Culture Division, Plant Virus Indexing Center, Department of Agriculture, Gabadawaththa, Homagama, Sri Lanka.

The medicinal plant *Aloe vera* naturally propagated through suckers is insufficient to meet the global demand. Rapid micro-propagation technique plays a vital role to overcome this problem. The present investigation was launched to maximize micro-propagation rate of *Aloe vera* by using different explant materials, optimizing surface sterilization and using different concentrations of growth regulators for induction and multiplication. Suitability of two types of explants materials (Type A- stem piece with one leaf and Type B- only the stem piece) were evaluated by the survival percentage. The explants were disinfected with different concentrations of Sodium hypochlorite (15%, 20%, 25%, and 30%) dipping in 10, 20 and 30 minutes. Further, explants were treated with 70% alcohol and three concentrations of Hydrogen peroxide (5%, 10%, and 15%) to reduce the contaminations. The contamination percentage and bleaching percentage were recorded to determine the most effective surface sterilization protocol. 6-benzylaminopurine (BAP) concentrations of 2 mgL<sup>-1</sup>, 3mgL<sup>-1</sup>, and 4mgL<sup>-1</sup> were selected as treatments with 30 replicates for each to assess the survival percentage, multiplication rate and the number of shoots per culture. The highest survival percentage (93.28%) was recorded in Type A explants. The explants sterilized with 25% Sodium hypochlorite for 20 minutes followed by 70% alcohol and 10% hydrogen peroxide were the best surface sterilization treatments that had the least contamination percentage of 2.22%. There was no significant difference ( $p>0.05$ ) among the survival rate of three treatments of induction. Significant difference was recorded between 2 mgL<sup>-1</sup> and 3 and 4 mgL<sup>-1</sup> of BAP for average shoot number and multiplication rate. The highest average shoot number (15.85) were recorded in 3mgL<sup>-1</sup> of BAP and the highest multiplication rate (3.0137) was recorded in 4mgL<sup>-1</sup> of BAP. It could be concluded that the protocols developed in this study can be used for the micro-propagation of *Aloe vera*.

**Keywords:** *Aloe vera*, Micro-propagation, Sterilization, Induction, Multiplication

**EFFECT OF ECO-FRIENDLY NURSERY MANAGEMENT MEASURES  
ON GROWTH PERFORMANCES AND INDUCTION OF HOST PLANT  
RESISTANCE OF *Camellia sinensis***

**S.S.N. Samarasinghe<sup>1</sup>, D.M.De Costa<sup>2</sup>, and T.D.C. Priyadarshani<sup>1</sup>**

<sup>1</sup>*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of  
Sri Lanka, Anuradhapura, Sri Lanka.*

<sup>2</sup>*Department of Agricultural Biology, Faculty of Agriculture, University of  
Peradeniya, Sri Lanka.*

Heavy dependency on chemical applications for the control of pest and diseases of tea poses threats to the quality standards of made tea. The present study was conducted in *Kataboola* estate, *Nawalapitiya*, to determine the effects of eco-friendly nursery management measures, which were introduced in the present study, on growth performances, incidence and severity of blister blight and induction of host plant resistance due to synthesis of defense enzymes, in comparison to the existing nursery management practices. Eco-friendly measures introduced by the present study included application of sodium bicarbonate, salicylic acid, sodium hypochlorite and a talc-based formulation of *Bacillus megaterium*. Shoot height, number of leaves, number of casualties, plants having active buds, plants with necrotic leaves and incidence and severity of blister blight were recorded in bi weekly intervals in three types of plant sets maintained after re-stacking. Defense enzymes namely, peroxidase, phenylalanine ammonia lyase (PAL),  $\beta$ -1, 3- glucanase, chitinase and total phenol content of the tender tea leaves were quantified by standard spectrophotometric methods. Findings revealed that number of casualties and necrotic lesions on leaves varied significantly due to interaction effect (type of nursery management methods x type of plant set). However, the other growth parameters varied significantly among the type of plant set but not by the type of management measures. Incidence and severity of blister blight did not differ significantly among the plant sets under two types of management. Tea leaves of the plants treated with eco-friendly measures resulted in significantly higher levels of peroxidase ( $p < 0.0006$ ), PAL ( $p < 0.0012$ ),  $\beta$ -1, 3- glucanase ( $p < 0.0003$ ) and chitinase ( $p < 0.034$ ). Total phenol content in tea leaves had no significant difference at  $p = 0.05$ . Eco-friendly measures introduced in the present study are successful in inducing host plant resistance in nursery plants of tea through activation of defense enzymes.

**Keywords:** Defense enzymes, Growth performance, Induced host plant resistance