ICSAS 2017

UNS SEBELAS MARET UNIVERSITY

Certificate of Attendance

to

PARWI

as

Speaker

in

International Conference on Science and Applied Science 2017

Surakarta, Indonesia on July 29th, 2017

Chairman,

ICSAS Int. Conference on Science and Applied Science

Prof. Dra. Suparmi, M.A., Ph.D.
NIP 19520915 197603 2 001

ISSN 1742-6588

Journal of Physics

Conference Series

The 11th Biennial Conference on Classical and Quantum Relativistic Dynamics of Particles and Fields

1239

VOLUME 1239 – 2019

4–7 June 2018
Mérida, Yucatán, Mexico

EDITOR
Merlin Laird

The open access journal for conference proceedings

iopscience.org/jpcs

IOP Publishing

International Conference on Science and Applied Science 2017

Organizer of International Conference on Science and Applied Science 2017 (ICSAS 2017)

Organizer

Graduate Program, Physics Department, Sebelas Maret University, Indonesia
Jl. Ir. Sutami 36A Kentingan Jebres Surakarta 57126, Indonesia
Phone/fax : (0271) 632450 psw 308
Email : icsas@mail.uns.ac.id

Chairman

1. Prof. Suparmi, M.A., Ph.D, Sebelas Maret University, Indonesia
2. Dr. Fuad Anwar, S.Si., M.Si, Sebelas Maret University, Indonesia

Organizing Committee

1. Prof. Cari, M.A., M.Sc., PhD, Sebelas Maret University, Indonesia
2. Ahmad Marzuki, S.Si., Ph.D., Sebelas Maret University, Indonesia
3. Dr. Eng Budi Purnama, S.Si, M.Si., Sebelas Maret University, Indonesia
4. Dr. Fahru Nurosyid, S.Si., M.Si., Sebelas Maret University, Indonesia
5. Drs. Harjana, M.Si. M.Sc., Ph.D, Sebelas Maret University, Indonesia
6. Dr. Agus Supriyanto, S.Si, M.Si. Sebelas Maret University, Indonesia
7. Dr. Yofentina Iriani, S.Si., M.Si., Sebelas Maret University, Indonesia
8. Dr.Eng. Risa Suryana, S.Si, M.Si., Sebelas Maret University, Indonesia
9. Khairuddin, S.Si., M.Phil, Ph.D., Sebelas Maret University, Indonesia
10. Drs. Iwan Yahya, M.Si., Sebelas Maret University, Indonesia
11. Mohtar Yunianto, S.Si, M.Si., Sebelas Maret University, Indonesia
12. Nuryani,S.Si,M.Si, Ph.D., Sebelas Maret University, Indonesia
13. Beta Nur Pratiwi, S.Si., M.Si., Sebelas Maret University, Indonesia
14. Dewanta Arya Nugraha, S.Pd., M.Pd., M.Si., Sebelas Maret University, Indonesia

ICSAS 2017
International Conference on Science and Applied Science 2017

UNS SEBELAS MARET UNIVERSITY

OPEN ACCESS 012085

The effect of combination of sugar palm fruit, carrageenan, and citric acid on mechanical properties of biodegradable film

S A Rinanda, M Nastabiq, S H Raharjo, S K Hayati, M A Yaqin and Ratnawati

+ Open abstract View article PDF

OPEN ACCESS 012086

Synthesis of zeolite from rice husk ash waste of brick industries as hydrophobic adsorbent for fuel grade ethanol purification

A Purnomo, M Alhanif, C Khotimah, UA Zuhra, BR Putri and AC Kumoro

+ Open abstract View article PDF

OPEN ACCESS 012087

Swelling power and solubility of modified breadfruit flour using *Lactobacillus plantarum*

Istiana Norita Rahma, Raja Haris Pratama, Alfiyanti, Deo Reynaldo Alwi, Woro Indriani Setyo Tri Astuti and Dyah Hesti Wardhani

+ Open abstract View article PDF

Biology

OPEN ACCESS 012088

Screening and Characterization of Polygalacturonase as Potential Enzyme for Keprok Garut Orange *(Citrus nobilis var. chrysocarpa)* Juice Clarification

E Widowati, R Utami and K Kalistyatika

+ Open abstract View article PDF

OPEN ACCESS 012089

The effect of Taro (*Colocasia esculenta* L.) and Lesser Yam flour (*Dioscorea esculenta* L.) as thickener agent on physical characteristics of frozen wheygurt

E. Nurhartadi, R. Utami, E. Widowati and B.M. Karunawati

+ Open abstract View article PDF

OPEN ACCESS 012090

Diversity of arbuscular mycorrhiza in the rhizosphere of Cajeput in agroforestry system with different fertilizer management of maize

Parwi, B Pudjiasmanto, D Purnomo and VR Cahyani

+ Open abstract View article PDF

OPEN ACCESS 012091

Mycorrhizal diversity in the rhizosphere of sugarcane and grass on different soil types

Vita Ratri Cahyani, Dewi Rastikawati, Nestri Yuniardi, Jauhari Syamsiyah and Suntoro

+ Open abstract View article PDF

OPEN ACCESS 012092

Histology of Epiphyseal Plate of Adolescent Rat Stimulated by Laserpuncture

Selfi Handayani, Ari H Ramelan, Bambang Purwanto, Koosnadi Saputra and Didik G Tamtomo

+ Open abstract View article PDF

Diversity of arbuscular mycorrhiza in the rhizosphere of Cajeput in agroforestry system with different fertilizer management of maize

Diversity of arbuscular mycorrhiza in the rhizosphere of Cajeput in agroforestry system with different fertilizer management of maize.

Parwi, B Pudjiasmanto , D Purnomo and VR Cahyani

Doctoral Study Program of Agricultural Science, Graduate School, Sebelas Maret University

Email: vitaratri@staff.uns.ac.id

Abstract. This study investigated the diversity of arbuscular mycorrhiza in rhizosphere of cajeput with different fertilizer management of maize. This research was conducted by observation on cajeput agroforestry system in Ponorogo that have different fertilizer management of maize: conventional management (CM), universal management (UM) and alternative management (AM1, AM2, and AM3). The result showed that the highest infection of arbuscular mycorrhiza was observed in the plot of AM3, while the lowest colonization was observed in the plot of CM. Infection of arbuscular mycorrhiza in roots cajeput from five fertilizer management , ranging from 32.64% - 63.33%. In all fertilizer management, there were eight species of arbuscular mycorrhiza which five species were *Glomus* genus, one species was *Acaulospora* genus and two species were *Gigaspora* genus. *Glomus constrictum* was the dominant species in all fertilizer management. *Acaulospora favoeta* was found only in the plot of AM3. Spore density varies between 150-594 / 100g of soil. The highest spore density was observed in the plot of AM3, while the lowest spore density was observed in the plot of AM1. The highest diversity index value of arbuscular mycorrhiza (Species richness and Shannon-Wiener) was observed in the plot of AM3.

1. Introduction

Arbuscular mycorrhiza is favorable soil microorganisms to host plants and ecosystem. Arbuscular mycorrhiza obtains carbon from the host plant. On the other hand, arbuscular mycorrhiza has a role for growth and yield crop, namely: increase adsorption nutrient and water [1], can protect the plant from root pathogens [2], preventing stress plants from unfavorable environments [3]. Furthermore, arbuscular mycorrhiza can improve soil fertility on degraded soils [4].

The diversity of arbuscular mycorrhiza depends on soil type, plant type and climate condition. The diversity of arbuscular mycorrhiza is also dependent on fertilization management. High N fertilization has a negative impact on the diversity of arbuscular mycorrhiza [5]. On the other hand, fertilization of manure and straw have a positive effect on the diversity of arbuscular mycorrhiza [6].

Arbuscular mycorrhiza exist in rhizosphere Cajeput in an agroforestry system in Sukun Village, district of Ponorogo has an intercropping system with a permanent cycle of maize as the main plant, soybeans and fallow. Each farmer has differences in fertilizer management for maize cultivation. Suspected that different fertilizer management will affect the diversity of arbuscular mycorrhiza in the rhizosphere of cajeput. This study investigated the diversity of arbuscular mycorrhiza in rhizosphere of cajeput (*Melaleuca leucadendron* LINN) with different fertilizer management of maize (*Zea mays*

L). The information diversity of arbuscular mycorrhiza in cajeput rhizosphere can be used as a consideration in fertilizer management to create a sustainable agroforestry system

2. Materials And Methods

2.1. Location of sampling sites

This research was conducted by observation on cajeput agroforestry system in Ponorogo ($7^{o}52'$ S, $111^{o}35'$ E, altitude 265 m) that have different fertilizer management of maize: conventional management (CM), universal management (UM) and alternative management (AM1, AM2, and AM3). Conventional management (CM) used 360 kg Urea / ha + 200 kg NPK / ha +2 t of chicken manure / ha. Universal management (UM) used 650 kg Urea / ha + 330 kg NPK / ha + 3.3 t of chicken manure / ha. Alternative management of AM1 (650 kg Urea / ha + 330 kg NPK / ha + 4 t of chicken manure / ha), AM2 (730 kg Urea / ha + 430 kg NPK / ha + Maize straw) and AM3 (650 kg Urea / ha + 330 kg NPK / ha + 3.3 t of chicken manure / ha + Maize straw). In CM, UM, AM1 and AM2 managements used minimum tillage, whereas AM3 used intensive tillage

2.2. Collection of root and soil samples

Soil samples were taken randomly from the rhizosphere of cajeput on an agroforestry systems. Each treatment was done randomly by three replications. In each replication, the soil sample was taken randomly for about five sub samples, so that total samples were 5 x 3 x 5 = 75 sub samples. Each sub sample comprised of 2 kg soil, which was put into a polybag and kept in room temperature before having soil analysis. Before the implementation of soil analysis, the same replication was mixed to obtain soil samples as a composite of sub samples.

Root samples were cleaned with running water to remove soil particles, then inserted into bottles containing 60% alcohol.

2.3. Estimation infection of arbuscular mycorrhiza

The technique of Phillips and Hayman [7] was used to detect infection of arbuscular mycorrhiza in cajeput root. Infection of Arbuscular mycorrhiza was determined from fress root. Root samples were cut into 1 cm and inserted into a glass beaker containing 10% KOH at 70-80 ^{o}C for 10 minutes. The KOH solution was removed, and the sample was washed with water. Root samples were treated using 1% HCl and stained with with Staining solutions (glycerol : lactic acid : aquadest = 2 : 2 : 1 + trypan blue 0.05%). Infection of arbuscular mycorrhiza was observed under the microscope. Infection of arbuscular mycorrhiza percentage was calculated from the number root infection segment out of total root segment

$$\text{Infection of Arbuscular mycorrhiza (\%)} = \frac{\text{Number of AM positive segments}}{\text{Total number of segments observed}} \text{ X100}$$

2.4. Isolation of arbuscular mycorrhiza

Mycorrhiza spores were isolated by wet sieving [8] and decanting by sucrose centrifugation [9] procedures. 100 g soil was dissolved into 500 ml of water. The suspension was filtered with 250 µm, 90 µm, and 45 µm sieves filters. Filtrate on sieve 45 µm was added 60% sugar and stirred for 10 minutes. The spores were filtered with a 45µm sieve and placed in a petridish to be observed under a binocular stereomicroscope. Spores were sorted into groups and counted.

2.5. Identification of arbuscular mycorrhiza

Isolation of mycorrhiza spores was based on spore morphology including spore color, spore size, the number of spore walls, bolbours, hyphae and Melzer reagent. The identification is based on the morphological description provided by The international collection of vesicular arbuscular mycorrhizal fungi (*http:// invam.caf.wvu.edu*) and originally published species descriptions.

2.6. Statistical analysis

The diversity of arbuscular mycorrhiza was measured by spore density, Relative abundance, Species richness and Shanon Wiener index [10]. The formula used to calculate these parameters is given in Table 1. Data analysis was done using one-way analysis of variance (ANOVA) by SPSS program. LSD analysis (Students t least significant difference) was used to compare the treatments. The Pearson correlation coefficient was used to determine the relationship between spore density with Species Richness. Regression analysis was calculated to assess the significance of the relationship between spore density and species richness

Table 1. Diversity measures used to describe AM communities

Spore density	The number spores in 100 g soil
Relative abundance (RA)	(Spore number of species / total number of identified spore samples) x 100
Species Richness (SR) was estimated from Margalef Indeks (D_{Mg})	$D_{Mg} = S- 1/\ln N$
Shannon-Wiener index of diversity (H')	$H' = - \sum pi (\ln pi)$

Pi is the relative abundance of each identified species per sampling site and calculated by the following formula,

Pi = ni/Ni where n is the spore numbers of a species and N is the total number of identified species per sampling sites

3. Results And Discussion

3.1. Diversity of arbuscular mycorrhiza

Soil samples of cajeput rhizosphere were collected from five location that different of fertilization management revealed the presence of several arbuscular mycorrhiza species. A total of eight species of arbuscular mycorrhizas were wet sieved from the soil sample collected from five different of fertilization management. The identified species were *Glomus claroideum, Glamus lamellosum, Glomus coronatus, Glomus ambisporum, Glomus constrictum, Gigaspora rosea, Gigaspora margarita* and *Acaulospora favoeta* (Table 2). Similarly in this study also eight arbuscular mycorrhiza species were isolated by Pagano and Scotti [11] from two species of *Eucalyptus* plants in semiarid Brazilian. A number of arbuscular mycorrhiza species in this research was highest than in rhizosphere of *Eucalyptus globules* in Portugal (five species) was reported by Silvia *et al*, [12].

Spore abundance arbuscular mycorrhiza was highest *Glomus constrictum* (60.87% - 73.56%), followed by *Glomus claroideum* (13.61% - 26.81%), and lowest *Gigaspora rosea* (2.49% - 5.66%). Spore abundance arbuscular mycorrhiza was dominated genera *Glomus*. A similar observation of spore abundance arbuscular mycorrhiza was reported Pagano and Scotti [11] that the dominant arbuscular mycorrhiza on Eucalyptus is *Glomus sp.* Furthermore, Chen and Dell [13] proposed that spore abundance arbuscular mycorrhiza in Eucalyptus rhizosphere in China was highest *Glomus mossae* (67%), followed by *Glomus geosporum* (15.4%) and lowest *Acaulospora scrobicullata* (2.6%). On the other hand, Silvia *et al.* [12] which states that arbuscular mycorrhiza colonizing in the Eucalyptus rhizosphere was dominated by *Gigaspora margarita* (40%). Spore density in the agroforestry system of Cajeput ranges from 150 - 594/ 100g of soil. Spore density was highest in e plot of AM3 and lowest in the plot of CM (Figure 1).

Diversity indices (H' and SR) of arbuscular mycorrhiza was observed different on five kind fertilizer management. Shannon-wiener index (H') in the plot of CM (1.06 ± 0.11) was higher than in the plot of UM (0.94 ± 0.05), although the number spores in the plot of CM was lower than in the plot of UM. Shannon Wiener index was determined number spores and species distribution [14]. Shannon-Wiener index (H') was lowest (0.90 ± 0.07) in the plot of AM1 and highest (1.07 ± 0.03) in

the plot of AM3. Richness species (SR) was highest (7.17 ± 0.57) in the plot of AM3 and lowest (5.46 ± 0.58) in the plot of AM1 (Table 3). The correlation analysis found that the spore density was positively correlated with Richness species (r = 0.848) (Figure 2). A similar observation was reported by Kavitha and Nelson [15] that spore density is positively correlated with Richness species (r=0.618)

Table 2. Relative abundance arbuscular mycorrhiza

Species	CM	UM	AM1	AM2	AM3
Glomus Claroideum	23.34±6.92	13.61±4.93	17.41±5.23	23.00±1.43	26.81±2.21
Glomus lamellosum	0.41±0.71	1.93±0.76	0.42±0.72	1.06±0.64	0.46±0.42
Glomus coronatus	3.70±1.45	1.23±0.76	2.73±3.23	2.19±0.82	2.68±1.64
Glomus ambisporum	2.31±2.46	2.53±0.80	2.78±1.70	3.06±2.05	1.27±0.25
Glomus Constrictum	61.87±9.37	73.56±3.17	71.63±4.14	64.73±2.87	60.87±2.35
Gigaspora Rosea	3.03±2.76	4.35±1.79	3.20±2.29	2.49±2.14	5.66±1.63
Gigaspora Margarita	5.30±6.39	2.79±0.37	1.83±1.63	3.46±1.70	2.13±0.91
Acaulospora favoeta	0	0	0	0	0.02±0.006

CM: Conventional management, UM: Universal management, AM: Alternative management 1, AM2: Alternative management 2, AM3: Alternative management 3.

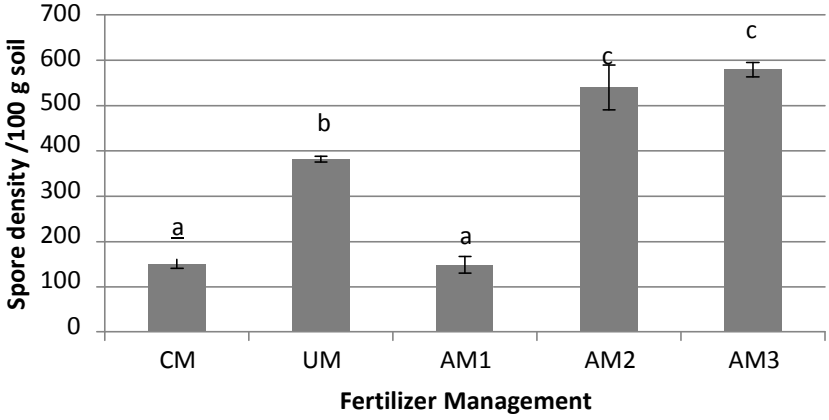

Figure1. Spore density (CM: Conventional management, UM: Universal management, AM: Alternative management 1, AM2: Alternative management 2, AM3: Alternative management 3).

Table 3. Diversity of arbuscular mycorrhiza

Fertilizer Mangement	Shannon –Wiener(H')	Species Richness (SR)
CM	1.06±0.11 c	5.47±0.58 a
UM	0.94±0.05 ab	6.50±0.58 b
AM1	0.90±0.07 a	5.46±0.58 a
AM2	1.05±0.03 bc	6.84±0.00 c
AM3	1.07±0.03 c	7.17±0.57 c

CM: Conventional management, UM: Universal management, AM1: Alternative management 1, AM2: Alternative management 2, AM3: Alternative management 3.

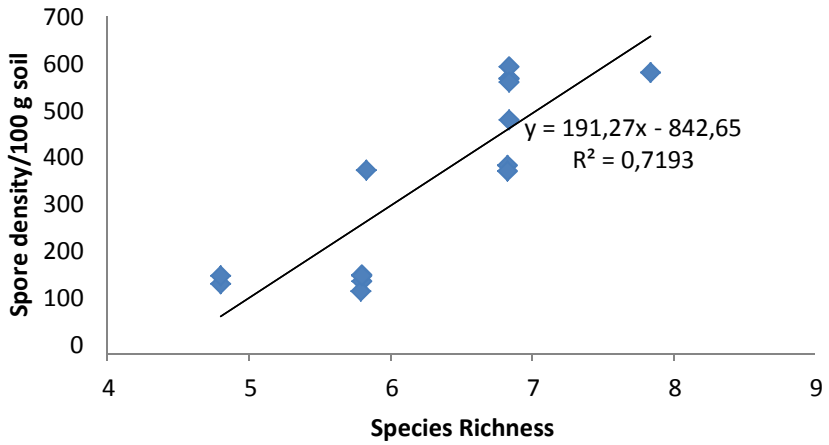

Figure 2. Linear regression between spore density with Species Richness

3.2. Infection of arbuscular mycorrhiza

Infection of arbuscular mycorrhiza was observed in the five plots studied with different infection of arbuscular mycorrhiza. Infection of mycorrhiza was highest in the plot of AM3(63%) and lowest in the plot of CM (36%) (Figure 3). A similar observation infection of arbuscular mycorrhiza (35-55%) in rhizosphere *Eucalyptus camaldulensis* and *E.grandis* in semiarid Brazil was reported Pagano and Scotti [11]. However, infection of arbuscular mycorrhiza only of 16-39% in rhizosphere of *Eucalyptus globules, E. maideni* and *E. sideroxylon* rhizosphere was repored from Northern Algeria [16] and only of 1 – 26% in rhizosphere of *Eucalyptus grandis* in native forest Northern Queensland Australia was reported Adams *et al*, [17]. Infection of arbuscular mycorrhiza in plant roots depends on host plants, soil, climate and land history [13].

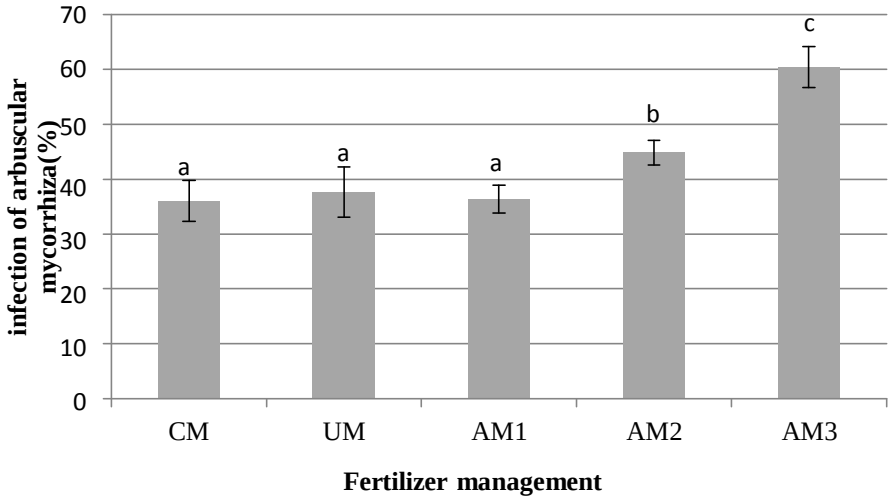

Figure 3. Infection of arbuscular mycorrhiza. (CM: Conventional management, UM: Universal management, AM1: Alternative management 1, AM2: Alternative management 2, AM3: Alternative management 3).

4. Conclusion

Communities of arbuscular mycorrhiza in the rhizosphere of cajeput in agroforestry system showed varies in diversity on different fertilizer management of maize. The highest infection of arbuscular

mycorrhiza, highest spore density and highest diversity index value of arbuscular mycorrhiza were found in the plot of AM3. The lowest colonization was observed in plot of CM, and lowest spore density was observed in the plot of AM1. In all fertilizer management, there were eight species of arbuscular mycorrhiza which five species were *Glomus* genus, one species was *Acaulospora* genus and two species were *Gigaspora* genus. Arbuscular mycorrhiza species were dominated by *Glomus constrictum* in all fertilizer management. Especially in the plot of AM3 was found *Acaulospora favoeta.*

References

[1] Cahyani VR 2009. Proceeding of International Seminar of Upland for Food Security. 7-8 November 2009, Faculty of Agriculture Jenderal Soedirman University. ISBN: 978-979-99046-1-4, 254-260
[2] Kamal R, Gusain YS and Kumar V 2014. *International Journal of Current Microbiology and Applied Sciences*, **3(7)**: 564-585
[3] Khalil SE and Yousef RMM 2014. *International Journal of Advanced Research*, **2(6)**: 723-737.
[4] Enkhtua B, Rydlova J and Vosatka M. 2000. *Applied Soil Ecology*, **14**: 201-211
[5] Tiana H, Drijberc RA, Zhang JL and Li XL 2013. *Agriculture, Ecosystems and Environment* **164**: 53– 61.
[6] Wu F, Dong M, Liu Y, Ma X, An L, Peter J, Young W and Feng H 2011. *Plant Soil* **342**: 233–247
[7] Phillips JM AND Hayman DS 1970. *Trans. Br, mycol. Soc.* **55 (I)**:158-161
[8] Gerdemann, JW and Nicolson TH 1963. *Trans. Br, Mycol. Soc*. ***46***: 235-244
[9] Walker C, Mize W, McNabb HS 1982. *Can J Bot* **60**:2518–2529
[10] Jefwa JM, Sinclair R and Maghembe JA 2006. *Agroforestry Systems* **67**:107–114
[11] Pagano MC, Scotti MR 2008. *Mycoscience* **49**:379–384
[12] Silva MCS, Mendes IR, Almeida T, Paula, Luz JMR, Cruz C, Soares DM, Bazzolli, Kasuya MCM 2014. *European Journal of Agriculture and Forestry Research* **(2) 3**: 25-42
[13] Chen YL, Liu S & Dell B 2007. *Mycorrhiza* **17**:527–535
[14] Songachan LS, Kayang H 2011. *Mycosphere* **2(4)**, 497–505.
[15] Kavitha T and Nelson R 2013. *American-Eurasian J. Agric. & Environ. Sci*., **13 (7)**: 982-987
[16] Adjoud D and Hargas RH 2000. *Mycorrhiza* **9**: 287-290.
[17] Adams F, Reddell P, Webb MJ and Shipton WA 2006. *Australian Journal of Botany* **54**: 271–281