KOPI

TEEAL 2006-2008

SEED PRODUCTION AND PROCESSSING (3 JDL)

Coffee seedlings response to pot size and nitrogen and phosphorus fertilization at nursery condition
Agrociencia. 2008. 42 (1). 47-55
Author(s): Arizaleta-M. Pire-R
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Abstract:

The production of vigorous coffee plants at the nursery is the basis of their successful establishment in the field. The replacement of old plantations by the new high-yielding varieties requires a high production of good quality seedlings and good knowledge of the most appropriate size of the nursery bags. The response of seedlings of Coffea arabica L. 'Caturra' grown in bags with three sizes (13x15, 15x19 or 18x23 cm) under three doses of fertilization (2, 4 and 6 g plant-1 of fertilizer with 10% N and 50% P2O5) was assessed in Duaca, Lara State, Venezuela. The local soil, characterized by its high organic matter content, good fertility and proper permeability, was utilized as substrate. A factorial arrangement of treatments was used in a randomized complete block design with four replications and 10 bags per plot. The highest root and shoot growth of the seedlings (root length, plant height and biomass dry) was obtained in the largest bags. The different doses of fertilization affected the nutritional status of the plant but not its growth, since the substrate apparently provided the necessary nutrients. It is concluded that the largest bags allow sustained growth of the seedlings during the six months in the nursery and that small doses of fertilizer may be sufficient to bring them to completion before their final establishment in the field

Coffee seed processing and effects on physiological seed quality
Bragantia. 2008. 67 (4). 1011-1020
Author(s): Giomo-G-S. Nakagawa-J. Gallo-P-B
Author Affiliation: Centro de Cafe Alcides Carvalho, Instituto Agronomico (IAC), Caixa Postal 28, 13001-970 Campinas, SP, Brazil
Abstract:

The effects of seed processing in air-screen machines and gravity table on the physiological quality of coffee (Coffea arabica) seeds were studied. One seed lot of coffee cv. Yellow Catuai IAC 62 was processed in an air-screen cleaner and in a gravity table, working in several sequences and combinations. Seeds were evaluated for physiological quality based germination, accelerated aging, seedling emergence, height, and dry matter weight of seedlings and young plants. Seed moisture was determined at

the beginning of the evaluation. Mean comparisons were conducted by the Tukey test at 5% probability. Physiological seed quality was improved during the several phases of processing. Superior seed quality was obtained with complete operational sequence, where the lot was exposed to the air-screen cleaner and gravity table. The gravity table associated with the air-screen cleaner was effective in removing debris from the seed lot, improving physiological seed quality. Larger or denser seeds showed superior physiological quality than small or low-density seeds, and large pea berry seeds were on a par with large flat seeds in terms of physiological quality. The smallest or lightest seeds should be discarded to improve seed physiological quality, resulting homogeneous, high-quality seed lots, and more vigorous young plants

Coffee seedling production in potting mixtures from different disinfestations methods
Bragantia. 2006. 65 (2). 303-307
Author(s): Miranda-G-R-B. Guimaraes-R-J. Botrel-E-P. Campos-V-P. Almeida-G-R-R. Gonzalez-R-G
Author Affiliation: Setor de Cafeicultura do Departamento de Agricultura (DAG), Universidade Federal de Lavras (UFLA), Caixa Postal 3037, 37200-000 Lavras (MG), Brazil
Abstract:

The development of coffee seedlings grown in a bag mixture disinfected by different methods was studied in a high cover coffee nursery in Lavras, Minas Gerais, Brazil, in May 2004. The bag mixture was prepared using soil from a 20-year-old coffee field. Thirteen disinfestation methods were used. The cultivar Paraiso H 419-1 was used in all the treatments. The growth was evaluated when the plants had five pairs of mature leaves. The following parameters were analysed: height, girth diameter, root and shoot dry weights, number of orthotropic nodes, and total leaf area. Methyl bromide promoted the best coffee seedling development. The use of the solar collector was also considered promising for substrate disinfestations in commercial nurseries, as observed for the methyl bromide

PLANT GENETICS AND BREEDING (3 JDL)

Prediction of genetic additive values for development of a coffee cultivar with increased rust resistance
Bragantia. 2008. 67 (1). 133-140
Author(s): Petek-M-R. Sera-T. Fonseca-I-C-de-B
Author Affiliation: Instituto Agronomico de Campinas, Centro de Cafe Alcides Carvalho, Avenida Barao de Itapura, 1481, Caixa Postal 28, 13001-970, Campinas, SP, Brazil
Abstract:

The aim of this research was to estimate genetic parameters and predict the additive genetic values in the selection of Coffea arabica progenies (Sarchimor x (Icatu x Catuai)) carrying more than five rust resistance genes. The research was carried out with 27 F2 progenies derived from Sarchimor PR 75163-7 x (Icatu x Catuai) MRFPB-C-41-1 and the control IAPAR

59. The traits evaluated were vegetative vigour, rust resistance, bean size, fruit maturity and productivity. The selection was based on individual additive genetic effect for vegetative vigour and resistance to rust, characters that presented variability. The additive genetic gains with the 54 individuals plants selected (10% of selection intensity) were 3.1% for vegetative vigour and 10.3% for rust resistance. It is possible to obtain superior inbred lines with rust resistance and high vegetative vigour from this population. The selection of individual plants with additive genetic effects promotes the identification of genetically better individuals, and the maximization of the genetic per selection cycle

Diversity in coffee assessed with SSR markers: Structure of the genus Coffea and perspectives for breeding

Genome. 2008. 51 (1). 50-63

Author(s): Cubry-Philippe. (philippe.cubry@cirad.fr). Musoli-Pasca. Legnate-Hyacint. Pot-Davi. de-Bellis-Fable. Poncet-Valeri. Anthony-Francoi. Dufour-Magal. Leroy-Thierr

Author Affiliation: Cubry, Philippe ; CIRAD, UMR DAP, TA, A-96-03,Ave Agropolis, F-34398 Montpellier 5, France

Abstract:

The present study shows transferability of microsatellite markers developed in the two cultivated coffee species (Coffea arabica L. and C canephora Pierre ex Froehn.) to 15 species representing, the previously identified main groups of the genus Coffea. Evaluation of the genetic diversity and available resources within Coffea and development of molecular markers transferable across species are important steps for breeding of the two cultivated species. We worked on 15 species with 60 microsatellite markers developed using different strategies (SSR-enriched libraries, BAC libraries, gene sequences). We focused our analysis on 4 species used for commercial or breeding purposes. Our results establish the high transferability of microsatellite markers within Coffea. We show the large amount of diversity available within wild species for breeding applications. Finally we discuss the consequences for future comparative mapping studies and breeding of the two cultivated species

Plant regeneration via indirect somatic embryogenesis and optimisation of genetic transformation in Coffea arabica L. cvs. Caturra and Catuai

Electronic Journal of Biotechnology. 2008. 11 (1). 1-12

Author(s): Gatica-Arias-Andres-M. (agatica@biologia.ucr.ac.cr). Arrieta-Espinoza-Griselda. (griselda.arrieta@gmail.com). Esquivel-Ana-M-Espinoza. (amespino@gmail.com)

Author Affiliation: Gatica-Arias, Andres M. ; Univ Costa Rica, Ctr Invest Biol Celular and Mol, POB 2060, San Pedro, Costa Rica

Abstract:

A protocol for Coffea arabica L. cvs. Caturra and Catuaφ plant regeneration via indirect somatic embryogenesis (ISE) was established. Furthermore, a biolistic mediated genetic transformation protocol was optimized for Catuaφ callus aggregates. Maximum callus induction was obtained when Caturra (87%) and Catuaφ (67%) leaves were cultured on Murashige and Skoog medium with 18.56 ╡M kinetin and 4.52 ╡M2,4-dichlorophenoxyacetic acid (2,4-D). Catuaφ suspension cultures were established from embryogenic callus using liquid proliferation CP and Sli media and diffused light and darkness. The higher suspension cultures fresh weight was obtained using Erlenmeyer (1425.4 ▒ 354.9 mg) than Recipient for Automated Temporary

Immersion System (RITA«) (518.6 ▒ 55.1 mg), whereas the dry weight of suspension cultures was not significantly affected by the culture system used. Higher number of embryos per vessel (307.6 ▒ 49.0) and their fresh weight (9.6 ▒ 1.5 mg) were obtained with semisolid R medium than S3 medium. The highest somatic embryo development (25.0 ▒ 2.7) and fresh weight (780.0 ▒ 85.4 mg) were obtained with 1 min of immersion every 8 hrs. Higher fresh weight of regenerated plantlets was obtained with liquid Yasuda medium in RITA« (124.6 ▒ 16.3 mg) than semisolid media (36.3 ▒ 11.3 mg). For genetic transformation, the effect of helium pressure (900 and 1550 psi), and target distance (9 and 12 cm) and plasmid (pCAMBIA 1301, pCAMBIA 1305.2 and pCAMBIA 1301-BAR) on transient uidA expression Catuaφ suspension cultures were evaluated. The highest number of blue spots was obtained using 900 psi and 9 cm (125.8 ▒ 17.3). Stable uidA expression was observed on Catuaφ callus aggregates transformed with pCAMBIA 2301 and cultured on 100 mg l-1 of kanamycin

PEST OF PLANTS (1 JDL)

Comparison of five allopatric fruit fly parasitoid populations (Psyttalia species) (Hymenoptera: Braconidae) from coffee fields using morphometric and molecular methods
Bulletin of Entomological Research. 2008. 98 (1). 63-75
Author(s): Billah-M-K. Kimani-Njogu-S-W. Wharton-R-A. Woolley-J-B. Masiga-D
Author Affiliation: International Centre of Insect Physiology and Ecology (ICIPE), Box 30772-00100 GPO, Nairobi, Kenya
Abstract:

Morphometric studies of five allopatric parasitoid populations (genus Psyttalia Walker) from coffee plantations in Cameroon (Nkolbisson), Ghana (Tafo) and Kenya (Rurima, Ruiru and Shimba Hills) and one non-coffee population (from Muhaka, Kenya) were compared with individuals of Psyttalia concolor (Szepligeti), a species released in several biological control programmes in the Mediterranean Region since the 20th Century. Analyses of wing vein measurements showed the second submarginal cell of the fore wing and its adjoining veins had the heaviest principal component weights and served as the main contributing variables in the diagnostic differentiation of the populations. Two populations (Rurima and Ruiru) were found to be the closest to each other and with the strongest phenetic affinity toward P. concolor (and forming one cluster). Populations from Shimba Hills (of unknown identity), Nkolbisson (P. perproximus (Silvestri)) and Tafo formed a second cluster and were separated from P. concolor. Comparison using amplified fragment length polymorphism (AFLP) also showed the Shimba, Nkolbisson and Tafo populations forming a cluster in a dendrogram generated from their genetic distances, with the Shimba and Tafo populations placed as the most closely related species. Based on consistent morphological similarities, morphometric and ecological data coupled with the genetic evidence from AFLP data, the Shimba population is suggested as belonging to the P. perproximus group and, thus, represents a new occurrence record in Kenya. Our results also support earlier conclusion from cross mating data that populations from Rurima and Ruiru belong to the Psyttalia concolor species-group

PLANT DISEASES (2 JDL)

Prune efficiency in the control of Xylella fastidiosa in coffee trees
Bragantia. 2006. 65 (3). 433-440
Author(s): QueirozVoltan-R-B. Cabral-L-P. Paradela-Filho-O
Author Affiliation: AD:
Abstract:

Xylella fastidiosa bacteria colonize the host plant xylem vessels and block the water and nutrient flow with consequent yield reduction. Up to now, adequate coffee plantation management procedures have attenuated the disease incidence, such as the use of bacteria-free seedlings and insect vector control. Pruning is an important practice for optimization of coffee orchard production. Coffee growers refer to pruning as training; coffee tree training depends on the coffee plant type and environment, using traditional or drastic trimming. This research aimed at evaluating the efficiency of different prune procedures in the control of X. fastidiosa incidence in coffee commercial cultivars Acaiß IAC 474-19 and Catuaφ Vermelho IAC 81. Eight plants of each cultivar were submitted to three pruning types (traditional, "skeleton cut" and trunking); and eight plants were not pruned (controls). Prior to pruning, five plant branches were collected for anatomical studies. Thereafter, five other branches from all treatments were collected in October/2004 (rainy period) and June/2005 (dry period) for the anatomical studies. No significant differences were observed for `Acaiß IAC 474-19' that presented lower proportion of xylem vessel obstruction independent of the prune treatment. Prune treatments in `Catuaφ Vermelho IAC 81' were also not significantly different; however, plants submitted to dramatic trimmings such as the "skeleton cut" and trunking showed a trend for lower proportion of xylem vessel obstruction by the bacteria, in both rainy and dry periods. It was suggested that the drastic pruning procedures ("skeleton cut" and trunking) might be advantageous for the Xyllela control in situations of high disease incidence

Genetic variability of Cercospora coffeicola from organic and conventional coffee plantings, characterized by vegetative compatibility
Phytopathology. 2008. 98 (11). 1205-1211
Author(s): Martins-R-B. Maffia-L-A. Mizubuti-E-S-G
Author Affiliation: Departamento de Fitopatologia, Universidade Federal de Vicosa, MG, Brazil
Abstract:

Cercospora leaf spot is a destructive fungal disease that has become a threat to the coffee industry in Brazil. Nevertheless, little is known about populations of its causal agent, Cercospora coffeicola. We evaluated the potential of using nitrogen-nonutilizing (nit) mutants and vegetative compatibility groups (VCGs) to characterize the genetic variability of the C. coffeicola population associated with coffee plantings in Minas Gerais state (MG), Brazil. A total of 90 monosporic isolates were obtained from samples collected according to a hierarchical sampling scheme: (i) state geographical regions (Sul, Mata, and Triangulo), and (ii) production systems (conventional and organic). Nit mutants were obtained and 28 VCGs were identified. The 10 largest VCGs included 72.31% of all isolates, whereas each of the remaining 18 VCGs included 1.54% of the isolates. Isolates of the largest VCGs were found in the three regions sampled. Based on the frequencies of VCGs at each sampled level, we estimated the Shannon diversity

index, as well as its richness and evenness components. Genetic variability was high at all hierarchical levels, and a high number of VCGs was found in populations of C. coffeicola associated with both conventional and organic coffee plantings

SOIL BIOLOGY (1 JDL)

An assessment of nodulation and nitrogen fixation in inoculated Inga oerstediana, a nitrogen-fixing tree shading organically grown coffee in Chiapas, Mexico
Soil Biology & Biochemistry. 2006. 38 (4). 769-784
Author(s): Grossman-J-M. Sheaffer-C. Wyse-D. Bucciarelli-B. Vance-C. Graham-P-H
Author Affiliation: Department of Crop and Soil Sciences, Cornell University, 726 Bradfield Hall, Ithaca, NY 14853, USA
Abstract:

Coffee (Coffea arabica) production provides a source of income for small-scale farmers in Chiapas, Mexico. Organic production regulations prohibit the use of synthetic nitrogen (N) fertilizers, therefore farmers are dependent upon N-sources accepted by organic certification agencies. In the state of Chiapas, little is known about effectiveness of rhizobia and nodule development, location and structure of the common coffee shade tree genus Inga. The objectives of this study were to (1) evaluate the symbiotic effectiveness of selected rhizobia isolates as inoculants for Inga oerstediana under greenhouse and field conditions, (2) describe the morphological and histochemical characteristics of I. oerstediana root nodules, and (3) apply the 15N natural abundance technique to investigate nitrogen fixation in two stands of I. oerstediana of different ages intercropped with C. arabica. To meet objectives one and two, we assessed shoot biomass, nodule number, nodule mass and total shoot N of inoculated I. oerstediana seedlings at 90 and 150 days after planting (DAP) in the greenhouse and field. Light microscopy, and in situ hybridization of nodule sections for leghemoglobin and Nif H cDNA determination were used to describe nodule morphology and histology. Results indicated that tested isolates appear not to be fixing N2 150 DAP and inoculation with isolated bacteria, and that inoculated treatment nodules lacked leghemoglobin and Nif H mRNA transcript, however contained infected bacteroids. An unidentified brown-pigmented granular substance was present in all nodules examined. I. oerstediana appears slow to nodulate, with negligible nodulation at 90 DAP, and limited nodulation at 150 DAP. Using the natural abundance method to meet objective three, recycling of fixed N in older 5-7 year plots is thought to have caused great 15N value variation in both reference and leguminous trees and data could not be used to estimate % N derived from Biological Nitrogen Fixation (BNF). I. oerstediana found in younger 1-3 year old plots was found to derive 20% of its N from BNF. As fixation appears to be low in young Inga, recommendations for organic C. arabica shade tree management include supplementation of N during early growth of Inga-C. arabica intercrop, and longer-term nodulation studies combined with additional N2-fixation assessment using 15N natural abundance methods