



IMPROVING LIVES THROUGH
AGRICULTURAL RESEARCH

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R & D *in* AGRICULTURE



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A Bulletin on Information Resources



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Improving Lives Through Agricultural Research

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R&D in Agriculture: a bulletin on information resources

AIMS AND SCOPE

The **R&D in Agriculture: a bulletin on information resources** aims to guide CARDI staff and other agricultural stakeholders in the Caribbean Community (CARICOM) and abroad to articles, journals, books, audio-visual materials, institutions and events on the following:

Commodities

- Roots & tubers (cassava, sweet potatoes)
- Cereals & grain legumes
- Hot peppers
- Fruits & vegetables
- Small ruminants

Thematic Areas

- Protected agriculture
- Emerging issues (agro-energy, herbals, organics)
- Soil & water management
- Risk management (climate change, invasive species)
- Germplasm
- Biotechnology
- Feeds and feeding systems

These are the priority commodities and thematic areas in the Medium-Term Plan (2011/2013) of the Caribbean Agricultural Research and Development Institute (CARDI). They were identified after consultation with our CARICOM member states and contribute to the implementation of the Jagdeo Initiative and the Regional Transformation Programme (RTP) for Agriculture.

Short bibliographic references to publications, brief descriptions of the research and services of relevant institutions, as well as lists of events are presented in this publication. Where possible a web address (URL) is provided so that readers may visit the webpage / website and access the full abstract, summary, document, or details for the acquisition of the resource.

Issues of this publication are available on our website, www.cardi.org, under the Publications section.

Frequency: 3 times a year - April, August, December

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COMMODITIES: Cereals & Grain Legumes

Comparison of canopy temperature-based water stress indices for maize

Kendall C. DeJonge, Saleh Taghvaeian, Thomas J. Trout, Louise H. Comas

2015. Agricultural Water Management 156:51–62

Abstract

Infrared thermal radiometers (IRTs) are an affordable tool for researchers to monitor canopy temperature. In this maize experiment, six treatments of regulated deficit irrigation levels were evaluated. The main objective was to evaluate these six treatments in terms of six indices (three previously proposed and three introduced in this study) used to quantify water stress. Three are point-in-time indices where one daily reading is assumed representative of the day (Crop Water Stress Index – CWSI, Degrees Above Non-Stressed – DANS, Degrees Above Canopy Threshold – DACT) and three integrate the cumulative impact of water stress over time (Time Temperature Threshold–TTT, Integrated Degrees Above Non-Stressed – IDANS, Integrated Degrees Above Canopy Threshold – IDACT). Canopy temperature was highly correlated with leaf water potential ($R^2 = 0.895$). To avoid potential bias, the lowest observation from the non-stressed treatment was chosen as the baseline for DANS and IDANS indices. Early afternoon temperatures showed the most divergence and thus this is the ideal time to obtain spot index values. Canopy temperatures and stress indices were responsive to evapotranspiration-based irrigation treatments. DANS and DACT were highly correlated with CWSI above the corn threshold 28 °C used in the TTT method, and all indices showed linear relationship with soil water deficit at high temperatures. Recommendations are given to consider soils with high water-holding capacity when choosing a site for non-stressed reference crops used in the DANS method. The DACT may be the most convenient index, as all it requires is a single canopy temperature measurement yet has strong relationships with other indices and crop water measurements.

Keywords: Infrared thermometry; Crop water stress index (CWSI); Degrees above non-stressed (DANS); Deficit irrigation; Soil water deficit

<http://www.sciencedirect.com/science/article/pii/S0378377415001067>

COMMODITIES: Roots & Tubers

Distributions, *ex situ* conservation priorities, and genetic resource potential of crop wild relatives of sweetpotato [*Ipomoea batatas* (L.) Lam., *I. series Batatas*]

Khoury CK, Heider B, Castañeda-Alvarez NP, Achicanoy HA, Sosa CC, Miller RE, Scotland RW, Wood JR, Rossel G, Eserman LA, Jarret RL, Yencho G, Bernau V, Juarez H, Sotelo S, de Haan S and Struik PC
2015. Front. Plant Sci. 6:251. doi: 10.3389/fpls.2015.00251

Abstract

Crop wild relatives of sweetpotato [*Ipomoea batatas* (L.) Lam., *I. series Batatas*] have the potential to contribute to breeding objectives for this important root crop. Uncertainty in regard to species boundaries and their phylogenetic relationships, the limited availability of germplasm with which to perform crosses, and the difficulty of introgression of genes from wild species has constrained their utilization. Here, we compile geographic occurrence data on relevant sweetpotato wild relatives and produce potential distribution models for the species. We then assess the comprehensiveness of *ex situ* germplasm collections, contextualize these results with research and breeding priorities, and use ecogeographic

information to identify species with the potential to contribute desirable agronomic traits. The fourteen species that are considered the closest wild relatives of sweetpotato generally occur from the central United States to Argentina, with richness concentrated in Mesoamerica and in the extreme Southeastern United States. Currently designated species differ among themselves and in comparison to the crop in their adaptations to temperature, precipitation, and edaphic characteristics and most species also show considerable intraspecific variation. With 79% of species identified as high priority for further collecting, we find that these crop genetic resources are highly under-represented in *ex situ* conservation systems and thus their availability to breeders and researchers is inadequate. We prioritize taxa and specific geographic locations for further collecting in order to improve the completeness of germplasm collections. In concert with enhanced conservation of sweetpotato wild relatives, further taxonomic research, characterization and evaluation of germplasm, and improving the techniques to overcome barriers to introgression with wild species are needed in order to mobilize these genetic resources for crop breeding.

<http://journal.frontiersin.org/article/10.3389/fpls.2015.00251/abstract>

<http://journal.frontiersin.org/article/10.3389/fpls.2015.00251/full#h5>

The genome of cultivated sweet potato contains *Agrobacterium* T-DNAs with expressed genes: An example of a naturally transgenic food crop.

Tina Kyndt, Dora Quispe, Hong Zhai, Robert Jarret, Marc Ghislain, Qingchang Liu, Godelieve Gheysen, and Jan F. Kreuze.

2015. PNAS 112: 5844-5849

Abstract

Agrobacterium rhizogenes and *Agrobacterium tumefaciens* are plant pathogenic bacteria capable of transferring DNA fragments [transfer DNA (T-DNA)] bearing functional genes into the host plant genome. This naturally occurring mechanism has been adapted by plant biotechnologists to develop genetically modified crops that today are grown on more than 10% of the world's arable land, although their use can result in considerable controversy. While assembling small interfering RNAs, or siRNAs, of sweet potato plants for metagenomic analysis, sequences homologous to T-DNA sequences from *Agrobacterium* spp. were discovered. Simple and quantitative PCR, Southern blotting, genome walking, and bacterial artificial chromosome library screening and sequencing unambiguously demonstrated that two different T-DNA regions (*IbT-DNA1* and *IbT-DNA2*) are present in the cultivated sweet potato (*Ipomoea batatas* [L.] Lam.) genome and that these foreign genes are expressed at detectable levels in different tissues of the sweet potato plant. *IbT-DNA1* was found to contain four open reading frames (ORFs) homologous to the tryptophan-2-monooxygenase (*iaaM*), indole-3-acetamide hydrolase (*iaaH*), C-protein (*C-prot*), and agrocinopine synthase (*Acs*) genes of *Agrobacterium* spp. *IbT-DNA1* was detected in all 291 cultigens examined, but not in close wild relatives. *IbT-DNA2* contained at least five ORFs with significant homology to the *ORF14*, *ORF17n*, rooting locus (*Rol*)*B/RolC*, *ORF13*, and *ORF18/ORF17n* genes of *A. rhizogenes*. *IbT-DNA2* was detected in 45 of 217 genotypes that included both cultivated and wild species. Our finding, that sweet potato is naturally transgenic while being a widely and traditionally consumed food crop, could affect the current consumer distrust of the safety of transgenic food crops.

Keywords: [horizontal gene transfer](#); [Agrobacterium spp.](#); [food safety](#); [sweet potato](#); [transgenic crops](#)

<http://www.pnas.org/content/112/18/5844>

<http://www.pnas.org/content/112/18/5844.full.pdf>

COMMODITIES: Hot Peppers

Water use efficiency and productivity of habanero pepper (*Capsicum chinense* Jacq.) based on two transplanting dates.

Rutilo López-López, Marco Antonio Ibarra, Ignacio Sánchez Cohen, Andrés Fierro Álvarez and Ernesto Sifuentes-Ibarra

2015. *Water Science & Technology* 71:885-91

Abstract

Habanero pepper production was assessed with drip irrigation and plastic mulch, based on two transplanting dates. The objectives of the study were: (i) to evaluate the effect of two transplanting dates and the use of plastic mulch on water productivity and habanero pepper fruit yield under drip irrigation conditions; and (ii) to determine the profitability and economic viability of the product in the regional market. The work was conducted in the municipality of Huimanguillo, state of Tabasco, Mexico, in loam soils classified as Eutric Fluvisol. The Jaguar variety of habanero pepper, developed by INIFAP and possessing better genetic and productive characteristics, was used. Two transplanting dates were studied, (i) 30 January 2013 and (ii) 15 February 2013, with and without plastic mulch. The conclusions were: (i) application of irrigation depths based on crop evapotranspiration (ET_c) and plastic mulch transplanted on 30 January increased the fruit yield of the crop and improved the benefit–cost ratio of the production system; and (ii) water use efficiency based on the 30 January transplanting date was 8.68 kg m^{-3} of water applied with plastic mulch, 6.51 kg m^{-3} without plastic mulch, and 3.65 kg m^{-3} for the 15 February transplanting date with plastic mulch.

Keywords: crop productivity; drip irrigation; plastic mulch; profitability; water use efficiency

<http://www.iwaponline.com/wst/07106/wst071060885.htm>

COMMODITIES: Fruits & Vegetables

BANANA:

Musa Germplasm Information System (MGIS)

The Musa Germplasm Information System (MGIS) contains key information on Musa germplasm diversity, including passport data, botanical classification, morpho-taxonomic descriptors, molecular studies, plant photographs and GIS information on **2330 accessions managed in 6 collections** around the world, making it the most extensive source of information on banana genetic resources.

<http://www.crop-diversity.org/mgis/>

Comparative analysis of the *in vitro* and *in planta* secretomes from *Mycosphaerella fijiensis* isolates.

Lina Escobar-Tovar, Mauricio Guzmán-Quesada, Jorge A. Sandoval-Fernández, Miguel A. Gómez-Lim. *Fungal Biology* 119: 447–470

Abstract

Black Sigatoka, a devastating disease of bananas and plantains worldwide, is caused by the fungus *Mycosphaerella fijiensis*. Several banana cultivars such as ‘Yangambi Km 5’ and Calcutta IV, have been known to be resistant to the fungus, but the resistance has been broken in ‘Yangambi Km 5’ in Costa

Rica. Since the resistance of this variety still persists in Mexico, the aim of this study was to compare the *in vitro* and *in planta* secretomes from two avirulent and virulent *M. fijiensis* isolates using proteomics and bioinformatics approaches. We aimed to identify differentially expressed proteins in fungal isolates that differ in pathogenicity and that might be responsible for breaking the resistance in ‘Yangambi Km 5’. We were able to identify 90 protein spots in the secretomes of fungal isolates encoding 42 unique proteins and 35 differential spots between them. Proteins involved in carbohydrate transport and metabolism were more prevalent. Several proteases, pathogenicity-related, ROS detoxification and unknown proteins were also highly or specifically expressed by the virulent isolate *in vitro* or during *in planta* infection. An unknown protein representing a virulence factor candidate was also identified. These results demonstrated that the secretome reflects major differences between both *M. fijiensis* isolates.

Keywords: Ascomycete fungus; Black Sigatoka; Pathogen resistance breakdown; Proteomic analysis; Virulence

<http://www.sciencedirect.com/science/article/pii/S1878614615000136>

Effective control of black Sigatoka disease using a microbial fungicide based on *Bacillus subtilis* EA-CB0015 culture.

Jaime A. Gutierrez-Monsalve, Sandra Mosquera, Lina Maria Gonzalez-Jaramillo, John J. Mira, Valeska Villegas-Escobar.

2015. Biological Control 87:39-46

Abstract

Black Sigatoka disease caused by the fungus *Mycosphaerella fijiensis* Morelet is the most devastating disease of bananas worldwide. Its management is reliant on protectant and systemic fungicides despite their environmental concerns. This study evaluated the effect of a microbial fungicide (MF) based on *Bacillus subtilis* EA-CB0015 and its metabolites for the control of black Sigatoka disease on banana plants in greenhouse and field conditions. The MF applied at 1.5 L/ha and 3.0 L/ha provided control of the disease comparable to the protectant fungicide chlorothalonil in greenhouse. In the field, the MF applied in solution with water at 0.15 L/ha and 1.5 L/ha every 11 days during 10 weeks reduced black Sigatoka disease severity in 20.2% and 28.1% respectively; reductions comparable to those obtained with the protectant fungicides chlorothalonil (1.5 L/ha) and mancozeb (3.8 L/ha). The MF incorporated into different programs with systemic fungicides reduced disease level up to 42.9% with no significant differences with the conventional program. To determine which component of the MF is responsible for the activity against *M. fijiensis*, greenhouse and *in vitro* tests were set up to evaluate individually the spores, vegetative cells and secondary metabolites of *B. subtilis* EA-CB0015. All components reduced the severity of the disease and the germination of ascospores. For both trials the activity of the metabolites was higher and comparable to the activity obtained with the MF, indicating that the efficacy of the MF depends mainly on the metabolites and in lesser extent to *B. subtilis* EA-CB0015 cells.

Keywords: *Mycosphaerella fijiensis*; Microbial fungicide; Metabolites; Biological control; Banana plants

<http://www.sciencedirect.com/science/article/pii/S1049964415000596>

Management of Fusarium wilt of banana: A review with special reference to tropical race 4.

Randy C. Ploetz. [Randy C. Ploetz, University of Florida, 18905 SW 280th Street, Homestead, FL 33031-3314, USA]

2015. Crop Protection 73:7–15

Abstract

Banana (*Musa* spp.) is an important cash and food crop in the tropics and subtropics. Fusarium wilt, which is also known as Panama disease, is caused by *Fusarium oxysporum* f. sp. *cubense* (Foc). It is one of the most destructive diseases of this crop, and has a relatively wide host range. Its greatest impact was on the early ‘Gros Michel’-based export trades. Resistant cultivars of the Cavendish subgroup were used to replace ‘Gros Michel,’ but are now succumbing to a new variant of the pathogen, tropical race 4 (TR4).

Although TR4 is only found in the Eastern Hemisphere, it threatens global export and small-holder production of the Cavendish cultivars. Management of this disease is largely restricted to excluding the pathogen from non-infested areas and the use of resistant cultivars where Foc is established. The perennial production of this crop and the polycyclic nature of this disease hinder the development of other management strategies. Measures that are effective against annual or short-lived hosts of these diseases are usually ineffective against Fusarium wilt of banana. Effective biological, chemical and cultural measures are not available, despite a substantial, positive literature on these topics. Critical evaluations of, and realistic expectations for, these measures are needed. Better resistance is needed to this disease, especially that that is caused by TR4.

Keywords: Banana; *Musa* spp.; *Fusarium oxysporum* f. sp. *cubense*; Panama disease; Cavendish subgroup
<http://www.sciencedirect.com/science/article/pii/S0261219415000228>

Propagating quality planting material to improve plant health and crop performance, key practices for dessert banana, plantain and cooking banana: Illustrated guide.

2015. Bioversity International

http://www.bioversityinternational.org/fileadmin/user_upload/online_library/publications/pdfs/Propagating_quality_planting_material_to_improve_plant_health_and_crop_1894.pdf

A SCAR marker for identifying susceptibility to *Fusarium oxysporum* f. sp. *cubense* in banana

Cristiane M.S. Cunha, Robert H. Hinz, Adriana Pereira, Fernando A. Tcacenco, Eliza C. Paulino, Marciel J. Stadnik

2015. Scientia Horticulturae 191:108-112

Abstract

Fusarium wilt (also known as Panama disease) caused by *Fusarium oxysporum* Schlechtend. f. sp. *cubense* (E.F. Smith) W.C. Snyder & H.N. Hansen (*Foc*) is an endemic disease in all banana (*Musa* spp. L.) producing areas. The use of resistant cultivars is the recommended method for the disease control. The development of resistant or tolerant cultivars is expensive and time-consuming since the results must be confirmed by many years of field evaluation. In this situation, DNA markers show a great potential to improve the efficiency and precision of conventional plant breeding. Thus, the objective of this work was to develop a SCAR marker able to discriminate between resistant and susceptible genotypes to *Foc* infection. Using genomic DNA from resistant or susceptible genotypes and 78 × 10-mer arbitrary primers, one RAPD band associated to susceptibility was selected and used to generate the SCAR marker SuscPD-F/SuscPD-R. This marker was validated on 28 banana cultivars which were resistant or susceptible to infection by *Foc*. The results indicated a high degree of specificity of the marker, which was able to discriminate between the two contrasting groups (resistant or susceptible). The discriminatory power of the new marker was 93%.

Keywords: Diagnostic; Genetic improvement; Molecular marker; *Musa*; Panama disease

<http://www.sciencedirect.com/science/article/pii/S0304423815002526>

CUSTARD APPLE:

Combined effects of chemical and physical elicitors on postharvest quality of custard apple (*Annona squamosa* L., cv. Balanagar)

Pinal B. Vyas, T.V. Ramana Rao, V.R. Thakkar

2015. Scientia Horticulturae 187:50-57

Abstract

The effect of the hot water (i.e. 45 °C and 50 °C) with six different combination treatments of 2 mM salicylic acid and 1% calcium chloride on the qualitative properties of custard apples stored at 25–27 °C (60–70% R.H.) were investigated at a regular interval of 2 days under the present conditions. The biochemical analyses of the custard apples of the experimental set revealed that they retained the higher amount of ascorbic acid and showed delay in their ripening as compared to that of the fruits of the control set. The fruits treated by the hot water treatment (45 °C) were effective in the maintenance of the lower activity of some of the enzymes responsible for the cell wall degradation and softening. Among all of the treatments tested under the current study, the treatment of 50 °C + 2 mM salicylic acid and 1% calcium chloride could preserve the custard apples for up to 8 days as compared to only 4 days of the untreated custard apples

<http://www.sciencedirect.com/science/article/pii/S0304423815001156>

PAPAYA:

Functional uncoupling of the tonoplast proton pump and its effect on the flesh gelling physiological disorder in papaya fruit

I.G. Azevedo, A.R. Facanha, F.L. Olivares, J.G. Oliveira

2015. *Scientia Horticulturae*, 187:115-121

Abstract

A physiological pre-harvest disorder known as flesh gelling has been verified in the ‘Golden’ papaya culture in the main papaya-producing regions of Brazil. While this disorder has been described in the literature, its cause has not been identified yet. There is evidence in other works which associated papaya gelling with cell plasmolysis in fruit tissue. The primary system of ion and sugar transport by proton pump enzyme activity of papaya fruit was investigated in this work and may help identify the cause of this disorder. A reduction in the P-ATPase activity of flesh gelling pulp was verified, which was more evident in the activity of ATP hydrolysis than in the H⁺ transport. On the other hand, the V-ATPase exhibited a strong increase in its ATP hydrolysis activity, but completely uncoupled to the H⁺ pumping capacity, which markedly decreased compromising the establishment of the ATP-dependent proton gradient in tonoplasts of flesh gelling fruits. Our results indicated a drop in cellular capacity for sugar and ion compartmentalization and water retention in cells, which could be the cause of cell plasmolysis and the soaked tissue appearance, among other alterations observed in the flesh gelling disorder.

<http://www.sciencedirect.com/science/article/pii/S0304423815001235>

Resistance to multiple foliar diseases in papaya genotypes in Brazil

Marcelo Vivas, Silvaldo F. Silveira, Alexandre Pio-Viana, Antônio T. Amaral-Júnior, Geraldo A.

Ferregueti, Messias G. Pereira

2015. *Crop Protection* 71:138-143

Abstract

The absence of cultivars with satisfactory levels of genetic resistance justifies the search for genotypes incorporating disease-resistance genes in the papaya-breeding program. In this study, two field-plot experiments were carried out in the municipality of Linhares, Espírito Santo State, Brazil, to evaluate resistance to foliar diseases in a papaya germplasm collection. The variables incidence and severity of leaf diseases and black spot incidence and severity on fruits were considered for uni- and multivariate variance analyses. The Mahalanobis distance was calculated for each pair of genotypes, and the distance matrix was used for clustering methods. Papaya genotypes were grouped by the Tocher method and the hierarchical method of Un-weighted Pair Group with Arithmetic Mean (UPGMA) was used for

dendrogram construction. Although no immune reaction was observed among the genotypes for any of the leaf diseases, the data analyses highlight the following genotypes as potential sources of resistance genes for use in a papaya breeding program: ‘STZ 23 PL’, ‘Maradol’, ‘Maradol GL’, ‘JS 11’, ‘Americano’, ‘Caliman SG’, ‘Sekati’, ‘Sekati FLM’, ‘Waimanalo’, ‘Caliman AM’, ‘Papaya 46’, ‘Tailândia’ and ‘SH 12-06’. This is the first time multivariate analyses were employed to evaluate multiple disease resistance in a papaya crop

Keywords: *Carica papaya*; *Asperisporium caricae*; *Streptopodium caricae*; *Stagonosporopsis caricae*; Genetic resistance

<http://www.sciencedirect.com/science/article/pii/S0261219415000575>

VEGETABLES:

Proceedings of the Regional Symposium on Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security (SEAVEG2014), 25-27 February 2014, Bangkok, Thailand. Families, Farms, Food

Hughes J d’A, Kasemsap P, Dasgupta S, Dutta OP, Ketsa S, Chaikiattiyos S, Linwattana G, Kosiyachinda S, Chantrasmi V. eds.

2015. AVRDC – The World Vegetable Center, Taiwan. Publication No. 15-785

http://203.64.245.61/fulltext_pdf/EB/2011-2015/eb0227.pdf

FUSARIUM DISEASES

Ecology and management of Fusarium diseases. Special issue of Crop Protection Volume 73, Pgs 1-108, (July 2015)

<http://www.sciencedirect.com/science/journal/02612194/73>

- Introduction to the special issue of “Management of Fusarium Diseases” for the Journal of Crop Protection Pages 1 Wade Elmer

- Fusarium wilt of chickpeas: Biology, ecology and management by Rafael M. Jimenez-Diaz, Pablo Castillo, Maria del Mar Jimenez-Gasco, Blanca B. Landa, Juan A. Navas-Cortes . Pages 16-27

- Fusarium wilt of cotton: Management strategies by Amanda N. Cianchetta, R.M. Davis. Pages 40-44

- Management of Fusarium wilt of lettuce by Thomas R. Gordon, Steven T. Koike. Pages 45-49

- Fusarium wilts of ornamental crops and their management by M. Lodovica Gullino, Margery L. Daughtrey, Angelo Garibaldi, Wade H. Elmer. Pages 50-59

- Research advances and management of soybean sudden death syndrome by G.L. Hartman, H.-X. Chang, L.F. Leandro. Pages 60-66

- Management of tomato diseases caused by *Fusarium oxysporum* by R.J. McGovern. Pages 78-92

- Fusarium wilt of watermelon: Towards sustainable management of a re-emerging plant disease. Kathryn L. Everts, Jennifer C. Himmelstein. Pages 93-99

SARGASSUM SEAWEED USE IN CROP PRODUCTION

Sargassum Seaweed and Extracts: Evaluation of their potential use in Crop Production Systems in Barbados

Gloria Lavine

2015. Barbados: Ministry of Agriculture. May 2015.

A review submitted to National Working Group on Sargassum seaweed

http://www.agriculture.gov.bb/agri/images/Seaweed/seaweed_review.pdf

COMMODITIES: Livestock

Impact of water addition, germination, ensiling and their association on sorghum grain nutritive value

M. Aguerre, C. Cajarville, J.L. Repetto

2015. Animal Feed Science and Technology 205:75-81

Abstract

The objective of this study was to evaluate the effects of water addition, germination, ensiling and/or their association with respect to chemical composition and nutritive value of dry sorghum grain. Five commercial paddocks of sorghum grain were harvested dry and evaluated for chemical composition, digestion site and *in vitro* gas production under six treatment conditions: dry ground (dry), soaked for 24 h (SG), germinated for 5 days (G), germinated for 5 days and then ensiled for 21 days (G&E), ensiled for 21 days as whole grain (EWG) or ensiled for 21 days as ground grain (EGG). Soaked, EWG and G&E treatments led to a lower starch content compared to dry grains ($P<0.05$). Reconstituted and ensiled treatments (either as whole or ground grain) decreased the tannin concentration compared to dry grains ($P<0.05$). The dry matter (DM) digestion site and total tract digestibility were similar among dry grains, G and EWG. However, compared to these treatments, G&E and EGG increased ruminal and total DM digestibility ($P<0.05$). Total tract DM digestibility did not differ between SG and dry grains; however, SG affected DM digestion site ($P<0.05$). Starch digestion site and total tract digestibility were similar between dry grains and EGG. Although G&E and EWG had similar total starch digestibility in comparison with dry grains, these treatments affected the digestion site ($P<0.05$). Soaked and G treatments reduced total tract digestibility and changed the starch digestion site compared to dry grains ($P<0.05$). *In vitro* fermentation of dry grains was similar to SG and EWG. Although the total *in vitro* gas production was less for G&E and EGG than dry grains ($P<0.05$), these treatments fermented more rapidly than dry grains ($P<0.05$). The soaking, the germination process, or the ensiling of whole sorghum grain as sole factors, produced changes in the chemical composition but did not improve the nutritive value of sorghum grain. However, the combination of germination and ensiling resulted in changes in the chemical composition and improved the digestibility of sorghum grains. The grinding of grain before reconstitution

and ensiling is an alternative to increase the sorghum grain digestibility and nutritive value.
Keywords: Grain reconstitution; Grain germination; Ruminal degradability; Intestinal digestibility; Starch digestion

<http://www.sciencedirect.com/science/article/pii/S0377840115001431>

Small Ruminant Research 127:1-102, (June 2015)

<http://www.sciencedirect.com/science/journal/09214488/127>

- Growth performance and carcass characteristics of lambs grazing forage mixes inclusive of plantain (*Plantago lanceolata* L.) and chicory (*Cichorium intybus* L.)

S.C. Somasiri, P.R. Kenyon, P.D. Kemp, P.C.H. Morel, S.T. Morris

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-Comparison of different methods of goat sperm selection and capacitation for optimization of assisted reproductive technologies

Carolina Cerqueira Sarmiento Olivares, Jeferson Ferreira da Fonseca, Luiz Sergio de Almeida Camargo, Joanna Maria Goncalves de Souza-Fabjan, Andre Luis Rios Rodrigues, Felipe Zandonadi Brandao

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-Effect of intermittent administration of neurokinin 3 receptor agonist on luteinizing hormone secretion, estrus, and ovulation in feed-restricted goats

Natsumi Endo, Tomomi Tanaka

Pages 50-57

-Evaluation of a targeted selective treatment scheme to control gastrointestinal nematodes of hair sheep under hot humid tropical conditions

P. Medina-Perez, N.F. Ojeda-Robertos, M.E. Reyes-Garcia, R. Camara-Sarmiento, J.F.J. Torres-Acosta

Pages 86-91

LivestockPlus: Forages, sustainable intensification, and food security in the tropics.

Thomas K. Rudel, Birthe Paul, Douglas White, I. M. Rao, Rein Van Der Hoek, Aracely Castro, Maryline Boval, Amy Lerner, Laura Schneider, Michael Peters

2015. *Ambio*. June 2015. Published online 28 Jun 2015

Abstract

The increased use of grain-based feed for livestock during the last two decades has contributed, along with other factors, to a rise in grain prices that has reduced human food security. This circumstance argues for feeding more forages to livestock, particularly in the tropics where many livestock are reared on small farms. Efforts to accomplish this end, referred to as the 'LivestockPlus' approach, intensify in sustainable ways the management of grasses, shrubs, trees, and animals. By decoupling the human food and livestock feed systems, these efforts would increase the resilience of the global food system. Effective LivestockPlus approaches take one of two forms: (1) simple improvements such as new forage varieties and animal management practices that spread from farmer to farmer by word of mouth, or (2) complex sets of new practices that integrate forage production more closely into farms' other agricultural activities and agro-ecologies.

<http://link.springer.com/article/10.1007%2Fs13280-015-0676-2>

THEMATIC AREAS: SOIL AND WATER MANAGEMENT

Effective microorganisms modify protein and polyamine pools in common bean (*Phaseolus vulgaris* L.) plants grown under saline conditions

Neveen B. Talaat

2015. *Scientia Horticulturae* 190:1-10

Abstract

No information is available regarding the influence of effective microorganisms (EM) on protein synthesis and polyamine balance in plants grown under saline conditions. Thus, as a first approach, this study sheds light on some different mechanisms that may protect EM-treated plants against salt excess. The response of common bean (*Phaseolus vulgaris* L.) cv. Nebraska to soil salinization [0.1 dS m⁻¹ (non-saline), 2.5 and 5.0 dS m⁻¹] and/or EM application was investigated. Plants grown in saline soils exhibited a significant decline in productivity, membrane stability index, nitrate reductase activity, nitrate and protein content, K⁺ concentration, and K⁺/Na⁺ ratio. However, EM application ameliorated the deleterious effects of salinity and significantly improved the above parameters. Soil salinity induced oxidative damage through increased lipid peroxidation and hydrogen peroxide content. EM application significantly reduced the oxidative damage. Polyamines responded to salinity stress by increasing its content, particularly putrescine level. The EM treatment changed the polyamine balance under saline conditions, a high increase in spermidine and spermine levels was observed. Moreover, EM application significantly reduced the activities of diamine oxidase and polyamine oxidase in salt-stressed plants. Both the modulation of polyamine pool and the regulation of protein synthesis can be one of the most important mechanisms used by EM-treated plants to improve plant adaptation to saline soils.

Keywords: Effective microorganisms; *Phaseolus vulgaris*; Polyamine pool; Protein content; Saline conditions

<http://www.sciencedirect.com/science/article/pii/S0304423815001958>

Managing water and fertilizer for sustainable agricultural intensification

Drechsel, P., Heffer, P., Magen, H., Mikkelsen, R., Wichelns, D. (Eds.) 2015. *Managing Water and Fertilizer for Sustainable Agricultural Intensification*. International Fertilizer Industry Association (IFA), International

2015. Water Management Institute (IWMI), International Plant Nutrition Institute (IPNI), and International Potash Institute (IPI). Paris, France.

A reference guide to improve general understanding of the best management practices for the use of water and fertilizers throughout the world to enhance crop production, improve farm profitability and resource efficiency, and reduce environmental impacts related to crop production.

http://www.iwmi.cgiar.org/Publications/Books/PDF/managing_water_and_fertilizer_for_sustainable_agricultural_intensification.pdf

Soil erosion in the humid tropics: A systematic quantitative review

Nicolas Labrière, Bruno Locatelli, Yves Laumonier, Vincent Freycon, Martial Bernoux 2015. *Agriculture, Ecosystems & Environment* 203:127–139

Abstract

Healthy soils provide a wide range of ecosystem services. But soil erosion (one component of land degradation) jeopardizes the sustainable delivery of these services worldwide, and particularly in the humid tropics where erosion potential is high due to heavy rainfall. The Millennium Ecosystem Assessment pointed out the role of poor land-use and management choices in increasing land degradation.

We hypothesized that land use has a limited influence on soil erosion provided vegetation cover is developed enough or good management practices are implemented. We systematically reviewed the literature to study how soil and vegetation management influence soil erosion control in the humid tropics. More than 3600 measurements of soil loss from 55 references covering 21 countries were compiled. Quantitative analysis of the collected data revealed that soil erosion in the humid tropics is dramatically concentrated in space (over landscape elements of bare soil) and time (e.g. during crop rotation). No land use is erosion-prone per se, but creation of bare soil elements in the landscape through particular land uses and other human activities (e.g. skid trails and logging roads) should be avoided as much as possible. Implementation of sound practices of soil and vegetation management (e.g. contour planting, no-till farming and use of vegetative buffer strips) can reduce erosion by up to 99%. With limited financial and technical means, natural resource managers and policy makers can therefore help decrease soil loss at a large scale by promoting wise management of highly erosion-prone landscape elements and enhancing the use of low-erosion-inducing practices.

Keywords: Ecosystem services; Systematic review; Quantitative analysis; Landscape; Land use; Land-use type; Management practices

The article is open-access and is available at

<http://www.sciencedirect.com/science/article/pii/S0167880915000468>

THEMATIC AREAS: NATURAL RESOURCE MANAGEMENT

CLIMATE CHANGE:

Coping with climate change: the roles of genetic resources for food and agriculture.

2015. FAO: Rome.

<http://www.fao.org/3/a-i3866e.pdf>

Demand for complementary financial and technological tools for managing drought risk

Ward, Patrick S.; Spielman, David J.; Ortega, David L.; Kumar, Neha and Minocha, Sumedha

2015. International Food Policy Research Institute (IFPRI): Washington, D.C. IFPRI Discussion Paper 1430

<http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/129092>

OTHER AGRICULTURAL ASPECTS

AGRICULTURAL DEVELOPMENT:

CGIAR's 2015 – 2030 Strategy and Results Framework (SRF): Harnessing New Opportunities.

CGIAR's Consortium Board

2015. version 18 May 2015, as approved by CGIAR's Consortium Board in May 2015.

<https://library.cgiar.org/bitstream/handle/10947/3865/CGIAR%20Strategy%20and%20Results%20Framework.pdf?sequence=1>

IFPRI 2014 Annual Report

2015. International Food Policy Research Institute (IFPRI)

[http://www.ifpri.org/publication/ifpri-2014-annual-](http://www.ifpri.org/publication/ifpri-2014-annual-report?utm_source=New+At+IFPRI&utm_campaign=410e7aebb5-)

[report?utm_source=New+At+IFPRI&utm_campaign=410e7aebb5-](http://www.ifpri.org/publication/ifpri-2014-annual-report?utm_source=New+At+IFPRI&utm_campaign=410e7aebb5-)

[New at IFPRI May 21 2015&utm_medium=email&utm_term=0_7b974d57a5-410e7aebb5-68946154](http://www.ifpri.org/publication/ifpri-2014-annual-report?utm_source=New+At+IFPRI&utm_campaign=410e7aebb5-)

Making Jamaica's Agriculture Sustainable

by Hon. Derrick Kellier, CD, MP, Minister of Agriculture, Labour and Social Security. Sectoral debate 2015-2016. Presented on Tuesday, April 21, 2015.

2015. Jamaica Information Service, April 2015

http://www.moa.gov.jm/Speeches/2015/Minister_Sectoral_Presentation_2015.pdf

OECD-FAO Agricultural Outlook 2015-2024

OECD/Food and Agriculture Organization of the United Nations

2015. OECD Publishing: Paris

<http://www.fao.org/3/a-i4738e.pdf>

Executive summary and key findings from the 2015-2024 edition

- Diverging price movements at the start of the Outlook
- Based on market fundamentals, real prices to resume their long-term secular decline
- Demand for animal protein drives global food markets
- Flat biofuel production in the United States and the European Union, growth in Brazil and Indonesia
- Yield improvements drive growth in crop production
- Export concentration increases market risks for important food
- Over the decade, at least one severe shock to world markets likely

Prices for crops and livestock products showed diverse trends in 2014. Among crops, two years of strong harvests put further pressure on prices of cereals and oilseeds. Tighter supplies due to factors including herd rebuilding and disease outbreaks supported record high meat prices, while the prices of dairy products dropped steeply from historic highs. Further adjustments to short-term factors are expected in 2015, before the medium-term drivers of supply and demand take hold.

Special Feature: Brazil

- Continued productivity improvements in Brazil support fast growing exports.
- Brazilian agriculture holds opportunities to reduce poverty in rural area
- Environmental and conservation initiatives in Brazil are expected to alleviate resource pressure of agricultural growth.

This year's Outlook contains a special focus on Brazil. This country ranks among the world's ten largest economies and is the second largest global supplier of food and agricultural products. Brazil is poised to become the foremost supplier of additional global demand, much of it coming from Asia. Supply growth is projected to be driven by continued improvements in productivity, with higher crop yields, some conversion of pasture to cropland and more intensive livestock production. Structural reforms and a reorientation of support towards productivity enhancing investments, for example in infrastructure, could foster these opportunities, as could trade agreements that improve access to foreign markets.

MARKET SURVEYS - Caribbean

PROPEL sponsored market analyses in Guyana, Trinidad & Tobago and Jamaica in 2014/2015. The market studies which analysed market failure and market coordination are available by request from the Canadian Hunger Foundation (CHF) Caribbean (send an e-mail to admin@chfcaribbean.com).

Market Study - Guyana. Canadian Hunger Foundation (CHF) Caribbean commissioned report. Final Report
Kelvin Craig, Consultant
2015. Promotion of Regional Opportunities for Produce through Enterprises and Linkages (PROPEL). February 11, 2015.

Market Study - Jamaica. Canadian Hunger Foundation (CHF) Caribbean commissioned report. Final Report
Brac Consultants
2015. Promotion of Regional Opportunities for Produce through Enterprises and Linkages (PROPEL). March 31, 2015

Market Study - Trinidad and Tobago. Canadian Hunger Foundation (CHF) Caribbean commissioned report. Final Report
Arnold Babwah & Associates
2015. Promotion of Regional Opportunities for Produce through Enterprises and Linkages (PROPEL). January 9, 2015.

See also PROPEL Newsletter Spring 2015, pp.2 "CHF COMMISSIONS MARKET ANALYSES ACROSS THE REGION"

http://www.chf.ca/documents/Studies_And_Reports/PROPELNewsletter_final.pdf