



Benguet State University

RESEARCH JOURNAL

ISSN 0117-5297

No. 71

January-June 2014

TABLE OF CONTENTS

MORPHOLOGICAL VARIATIONS, YIELD PERFORMANCE, AND G X E INTERACTION ANALYSIS IN ARABICA COFFEE CULTIVARS FOR ORGANIC PRODUCTION IN BENGUET.....	5-22
<i>B. A. Tad-awan and J. D. Doco</i>	
MANAGEMENT OF CLUBROOT (<i>Plasmodiophora brassicae</i> Wor.) on CABBAGE USING <i>Trichoderma</i> KA AND LIME IN NATUBLENG, BUGUIAS, BENGUET.....	23-31
<i>J. M. Bulcio and A. L. Nagpala</i>	
COLLECTION, IDENTIFICATION AND CHARACTERIZATION OF INDIGENOUS FRUITS IN BENGUET AND MOUNTAIN PROVINCE.....	32-48
<i>A. G. Ladilad , F. G. Bawang , F. R. Gonzales, S. L. Kudan and A. C. Amado</i>	
PATHOLOGIC REACTION OF GARDEN PEA (<i>Pisum sativum</i> L) CULTIVARS/ ADVANCED BREEDING LINES TO <i>Fusarium oxysporum</i> f sp <i>pisi</i> (Linford) Synder and Hansen.....	49-56
<i>J. R. P. Dimaguiba, L. M. Villanueva, and J. S. Luis</i>	
PROFITABILITY OF CHIPPED ALDER AS SUBSTRATE FOR SHIITAKE PRODUCTION.....	57-63
<i>B. S. Tad-awan</i>	



All communications should be addressed to:

THE EDITOR

BSU Research Journal

Benguet State Univeristy

La Trinidad, Benguet 2601, Philippines

Telefax:(+6374) 422-5547

Email address: bsupublications@gmail.com

repo@bsu.edu.ph

Website: www.bsu.edu.ph



Benguet State University RESEARCH JOURNAL

This multidisciplinary scientific journal publishes selected papers but not limited to those presented during the annual Benguet State University Agency In-House Review (Agriculture, Forestry and Natural Resources, Social and Education Sectors).

Editorial Board

EDITOR

Editor

Bernard S. Tad-awan, PhD
College of Agriculture

Lay-out Artist

Marie Fe B. Wance
Office of the Vice President for Research and Extension

Circulation Manager

Jenina P. Balatong
OVPRE-Publication Office

Proofreaders

Jenina P. Balatong
Herman B. Danis
Jonalin April R. Simeon
Sandra P. Picardo
Office of the Vice President for Research and Extension

Technical Editors

Percival B. Alipit, PhD
Ines C. Gonzales, PhD
Janet S. Luis, PhD
Danilo P. Padua, PhD
Belinda A. Tad-awan, PhD

Referees

Teodora D. Balangcod, PhD	University of the Philippines, Baguio City
Nancy S. Bantog, PhD	Department of Science and Technology - CAR
Lily Ann D. Lando, PhD	World Fish Philippines
Lorenza G. Lirio, PhD	Retired Professor, Benguet State University
Teresita S. Mangili, PhD	Bureau of Plant Industry-CAR

Editorial Consultants

Luciana M. Villanueva, PhD
Vice President for Research and Extension

Ben D. Ladilad, PhD, CESO III
University President

This is a refereed Journal

**MORPHOLOGICAL VARIATIONS, YIELD PERFORMANCE,
AND G X E INTERACTION ANALYSIS IN ARABICA COFFEE CULTIVARS
FOR ORGANIC PRODUCTION IN BENGUET**

Belinda. A. Tad-awan¹ and Joyce. D. Doco²

¹Professor and ²Research Assistant
HERRC
Benguet State University

ABSTRACT

The three-year evaluation of Arabica coffee cultivars for organic production in La Trinidad was concluded through exhaustive gathering of other morphological characters, cupping quality and reaction to pests in order to identify stable cultivars and recommend potential cultivars for organic production. Genotype x environment analysis through the AMMI model was done using the three-year green bean yield of the Arabica coffee cultivars. Correlation analysis was done for both *in-situ* and *ex-situ* morphological characters in Arabica coffee cultivars and accessions. Correlation analysis revealed significant and positive associations of green bean yield with weight of 100 bean seeds, seed length, fruit length and width, leaf width, and number of fascicles per axil, flowers per fascicle, fascicles per node and days from fruit setting to harvesting. Potential Arabica coffee cultivars for recommendation under organic production based on stability of green bean yield, resistance to pests and cupping quality are Granica Broad, Mondo Nuvo, Red Bourbon and MSAC Selection No. 1.

Keywords: *Arabica Coffee Cultivars, G X E Interaction Analysis Organic Production*

**MANAGEMENT OF CLUBROOT (*Plasmodiophora brassicae* Wor.) on
CABBAGE USING *Trichoderma* KA AND LIME IN NATUBLENG, BUGUIAS,
BENGUET**

Jake M. Bulcio and Asuncion L. Nagpala

College of Agriculture
Benguet State University

ABSTRACT

The study validated the effect of *Trichoderma* KA as biological control against clubroot on cabbage (Scorpio variety) in seedbed and under field condition. Rates of 10, 15 and 30 g and 10, 15 and 20 g of *Trichoderma* at spore concentrations of 1.4×10^6 were applied in $1 \times 10 \text{ m}^2$ in seedbed and in field plots, respectively. Lime was applied at 6 t ha^{-1} in plots where it is needed while flusulfamide at 300 kg/ha served as the check fungicide. Seeds were sown and seedlings were transplanted two weeks after the application of *Trichoderma* KA. Clubroot severity, incidence, percent clubroot control, fresh top and root weight, oven dry top and root weight and yield were recorded.

In the seedbed, 30 g *Trichoderma* effected the lowest clubroot severity and incidence and provided a control of 89.50% and was comparable to flusulfamide. Eighty-two days after transplanting in the field, the treatment comparable to the check was 20 g *Trichoderma* KA plus CaO. Plants receiving this treatment had the highest heaviest roots and tops. At harvest, this treatment also effected the widest polar circumference of 47.91 cm and produced the highest mean marketable yield of $9.5\% \text{ t ha}^{-1}$ with 80.8% clubroot control. This treatment is comparable to flusulfamide.

COLLECTION, IDENTIFICATION AND CHARACTERIZATION OF INDIGENOUS FRUITS IN BENGUET AND MOUNTAIN PROVINCE

Araceli G. Ladilad , Franklin G. Bawang , Fernando R. Gonzales
Silvestre L. Kudan and Alma C. Antonio-Amado

Benguet State University

ABSTRACT

Survey and collection of indigenous fruits that are abundantly found in 12 municipalities of Benguet and four municipalities in Mountain Province were conducted from July 2008 to June 2009. These fruits were found abundant in the study sites and are eaten by the people. Parameters considered were habit, phenology and morphological characteristics such as plant height, stem, leaf, flower and fruit characteristics. The method of propagation and their ethno botanical uses were likewise included. *Degway (Suararia sp)* is the tallest indigenous fruit tree while *Gumbayas (Physalis peruviana)* is the shortest. *Kamias (Averrhoa balimbi)* has the biggest stem diameter while *Masaprula (Passiflora edulis)* has the thinnest stems; and six have sap on their stems/trunks. All have odorless green leaves; while eight plants have hairs on their leaves. Eleven have small flowers that are fragrant at full bloom. All have medium sized fruits with sweet aroma and taste. *Mabolo (Diospyrus edulis)* and *Masaprula (Passiflora edulis)* were the biggest fruits; while the smallest was the fruits of *Ayosip (Vaccinium corymbosum)* and *Bugnay (Antidesma bunius)*. Flowering is usually during the summer months. Propagation is done by seeds, or by stem cuttings, marcotting and layering. The fruits are collected for fresh consumption or processed into jams/jellies or wine/juice. Some have medicinal uses and are used as firewood, for making handicraft and as used as ornamental plants.

Keywords: *Indigenous, exotic, staple food, thickets*

**PATHOLOGIC REACTION OF GARDEN PEA (*Pisum sativum* L)
CULTIVARS/ ADVANCED BREEDING LINES TO *Fusarium oxysporum* f
sp pisi (Linford) Synder and Hansen¹**

J. R. P. Dimaguiba², L. M. Villanueva³ and J.S. Luis⁴

¹A portion of the PhD dissertation of the senior author

²School of Natural Sciences, Saint Louis University,

³Office of the Vice President, Research and Extension, Benguet State University

⁴College of Agriculture, Benguet State University

ABSTRACT

Pot experiments were carried out under greenhouse conditions to evaluate the resistance of eight garden pea cultivars/ advanced breeding lines to *Fusarium oxysporum* f. sp. *pisi* (FOP). The effect of FOP inoculation on plant height, fresh and dry weights of shoots and roots and number and weight of pods were assessed 60 days after planting. Stems were examined for necrotic lesion scores.

Based on the necrotic lesion score and pathologic reaction of plants at 60 days after inoculation, Betag, CGP 110 and 154 were rated as resistant; CGP 59, 11, and 34 as intermediate; and CLG and CGP 13 as susceptible to *Fusarium* wilt.

Keywords: *resistance, inoculation, Fusarium oxysporum f sp pisi, plant parameters, necrotic lesion score*

PROFITABILITY OF CHIPPED ALDER AS SUBSTRATE FOR SHIITAKE PRODUCTION

Bernard S. Tad-awan

Prof. 2, Department of Plant Pathology
Benguet State University

ABSTRACT

Substrate mixture having the greatest amount (63%) of chipped Alder (*Alnus japonica*) with mesh sieve size between #8 (2.38 mm) and #6 (3.33 mm) combined with small amount (21%) of commercial sawdust having mainly mesh sieve size ≤ 1.41 mm, produced shiitake fruiting bags with the shortest incubation period of 50.8 days, and highest biological efficiency of about 50%. The same mixture had the highest additional benefits (PhP8,452.50 per 300 fruiting bags) and return above variable cost (16.57). This trend is followed by mixing equal part of chipped alder and sawdust.

Conversely, the use of commercial sawdust alone resulted in the longest incubation period as well as lowest yield of 137 g and biological efficiency of 31.12% ; consequently having the lowest additional benefits and return on variable cost of PhP2,577 per 300 fruiting bags and 10.74, respectively.

The technology of utilizing chipped pruned twigs of alder as substrate for producing shiitake as a high valued crop would add to promoting alder as a well-adopted multi-purpose tree species in the highlands to address climate change and promote resource-based mushroom industry.

Keywords: *Shiitake, alder, wood chip particle size, growing bags, biological efficiency, profitability*

INFORMATION FOR CONTRIBUTORS

(Abridged/improved from the editorial policies of the Benguet State University)

1. All manuscripts must be the result of research activities (technical or social) that are relevant to the development thrust of the University and should not have been published elsewhere.
2. Acceptance of manuscript is on the basis of the review and approval by a corps of technical editors and selected referees.
3. Original photos should be submitted in PNG or JPEG format with corresponding captions.
4. The manuscript should not exceed 40 pages, typed double spaced in 12-point Times New Roman on one side of 8 1/2" paper with margins of 3.81 cm on the left and 2.54 cm top, right and bottom and must be submitted in hard and electronic copy via bsupublications@gmail.com using MS Word Program.
5. The manuscript should be organized in the following order: (a) Title; (b) Authors/s; (c) Authors/s position; (d) Abstract; (e) Introduction; (f) Materials and Methods; (g) Results and Discussion; (h) Conclusions and Recommendations; (i) Acknowledgment, optional; and (j) Literature Cited ; and written all centered.
6. The title should be a precise and concise description of the contents of the manuscripts without abbreviations and typed in upper case. If the paper is a portion of a larger manuscript, which shall be serialized and will be indicated in a superscript followed by a brief explanation.
7. The author(s) name(s) is/are written in this way: initial letter for the middle names only, first and family names in full and typed in title case. Senior author comes first in case of more than one author.
8. The abstract must be 200 words or less, summarizing the main points of the articles.
9. The introduction should contain scope and statement of the problem, brief survey of previous work and objectives and importance of the study.
10. Citations in the text follows the name and year system, e. g.

Single Author:

(Adeyemo, 2010), Yeo (2009) or Boquiren (n.d.)

Two Authors:

Pladio and Villasenor (2004), (Pladio and Villasenor, 2004)

More than Two Authors:

Folbre *et al.* (2011) or (Folbre *et al.*, 2011).

11. Materials and methods should describe very concisely but comprehensively the materials used, techniques, and lay-out of the research.
12. Scientific names and other foreign expressions such as *in situ*, *et al.*, *i.e.*, and other similar expressions are italicized. Technical terms, abbreviations and acronyms must be defined.
13. In abbreviating or using acronyms, the System International-Units (SI) of the metric system should be followed. Such abbreviations or acronyms should be written first in full before the truncated terms in parenthesis, e.g. thin-layer chromatography (TLC). If this information is given in the abstract, it should be re-identified when mentioned the first time.
14. The results should be presented logically and in objective way and conclusions stated as valid facts.
15. The discussion of results should lead to interpreting significance and /or possible similarity or discrepancy from previous findings.

-
16. A statement on conflict of interest should be declared by authors before the Acknowledgment section. Where appropriate, Conflict of Interest statements may be in instances such as: "There are no known conflicts interests associated with the publication" or "There has been no significant financial support for the work that could have influenced its outcome." Whenever appropriate, acknowledgements are made relevant for contributions in terms of financial and technical support.
 17. Literature cited in the text should be indicated as follows: Consolacion (2000) or (Consolacion, 2000); for two authors, Colting and Maddul (1999) or (Colting and Maddul, 1999); for more than two authors, Bucu *et al.* (1999) or (Bucu *et al.*, 1999).
 18. Electronic sources must be cited as follows: author (s), year, title, date of retrieval and the complete Uniform Resource Locator (URL) of the site.
 19. Listing of literature cited is by author(s) in alphabetical order. The list contains: author (s), year, title of literature, publisher, address of publisher, volume and issue numbers and inclusive pages (printed as 1(2):1-9). Names of authors are typed in upper case: for single author, surname (separated by a comma) first before the initials of the given and middle names; for multiple authors, surname then initials of senior author followed by initials then surnames of succeeding authors. Authors are separated by commas.

Single author:

- Mondejar, L.A. 1998. Understanding Student Judgments of Teaching Performance: A Conjoint Approach. Unpublished Doctoral Dissertation, University of the Philippines. Diliman. Quezon City.
- Durano, M. 2008. From profit to provisioning: A gender equitable public policy. Development Alternatives with Women for a New Era. QC: Miriam College.
- Eriksen, T. 2001. Small Places, Large Issues. An introduction to Social and Cultural Anthropology. 2nd ed. London: Pluto Press.

Two authors:

- Hallauer, A. R. and F. O. Miranda. 1980. Quantitative Genetics in Maize Breeding. Iowa State University Press. Ames, Iowa. Pp. 49-52.
- Carrasco, C. and M. Serrano. 2011. Lights and Shadows of Household Satellite Accounts: The Case of Catalonia, Spain. *Feminist Economics* 17 (2): 68-85. IAFFE: Routledge Taylor and Francis Group.
- Crisologo, L. C. and L. Berlage. 2006. Bargaining in rural households: a study of decision on labor market participation in the Cordillera. *The Philippine Review of Economics*. 48 (2): 249- 537.

More than two authors:

- Linsley, R., J. Franzini, D. Freyburg and G. Tchobanoglous. 1992. *Water Resources Engineering*. 4th ed. McGraw-Hill, Inc. New Jersey, USA. Pp. 510-532.
- Aguilar, N. O., B. L. Cardenas and M. A. O. Cajano. 2000. Spore and Seed bearing Plants of Mount Pulag, Benguet, Philippines. Museum of Natural History. UPLB, College, Laguna, Philippines.
- Braunstein, E. B., I. P. Van Staveren and D. Tavani. 2011. Embedding care and unpaid work in Macroeconomic Modelling. A structural Approach. *Feminist Economics*. 17, 4-31.

20. If necessary, protocols for manuscript preparation can be requested from the Editorial Board.
21. Please see the latest issue of the Journal for concrete details as to format.

VISION

A premier State University in Asia.

MISSION

Development of people imbued with academic excellence, social conscience and productivity; and actively generating and promoting environment-friendly, useful technologies to improve quality of life.

GOALS

1. Strengthen and sustain a working environment conducive for excellence;
2. Provide quality education that will produce globally competitive and well-rounded graduates;
3. Provide quality and client-responsive research and extension services;
4. Strengthen and enhance institutional capability in generating revenue towards self-reliance
5. Develop and strengthen quality management system towards economy; and
6. Strengthen and expand private public partnership.

PURPOSE

- * To provide quality education that will produce globally-competitive graduates;
- * To generate and disseminate appropriate knowledge and technologies that will promote sustainable resource development;
- * To strengthen and enhance institutional capability in generating revenue towards self-reliance;
- * To establish competent and effective services geared towards efficiency and economy; and
- * To develop harmonious and cooperative University Community relationships.



Benguet State University RESEARCH JOURNAL

All communications should be addressed to:

THE EDITOR

BSU Research Journal
Benguet State University
La Trinidad 2601 Benguet, Philippines
Telefax: (+6374) 422-5547
Email address: bsupublications@gmail.com
Website: www.bsu.edu.ph