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Fungal Inhibiting Capacity of an Ethnobotanical Plant From Imugan, Nueva Vizcaya Against *Fusarium oxysporum* and *Fusarium moniliforme*

James Kennard S. Jacob*[1], Eden S. David[2], Jerwin R. Undan[2]

[1]Master of Science in Biology Student, Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Nueva Ecija Philippines 3120
[2] Faculty, Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Nueva Ecija Philippines 3120

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Ethnobotany pertains to the scientific association between people and plants. In the Philippines, many researches have been upraised to review the current ethnobotanical state and pharmacological properties of plants thriving for many indigenous tribes. One specific plant used by the *Kalanguya* tribe of the Northeastern Philippines is *Derris elliptica*, locally known as *Derris elliptica*, used as a fish poison, and only minor information was known about this indigenous plant's taxonomy. This research was undertaken to evaluate the fungal-inhibiting capability of *Derris elliptica* against two fungal plant pathogens *Fusarium oxysporum* and *Fusarium moniliforme*. Hot water extracts of *Derris elliptica* exhibited fungal inhibition to *F. oxysporum* as indicated by a retarded mycelial growth response (26.35 mm) compared to its negative control (70.07 mm) after five (5) days of incubation. The same observation was also exuded against *F. moniliforme* which also exhibited slow mycelial growth (28.28 mm) compared to the negative control (70.86 mm). Furthermore, hotwater extracts of *D. elliptica* can be considered as a fungal-inhibitor against these common plant pathogens comparable to commercially available fungal-inhibitory drugs and chemicals.

Keywords: *Derris elliptica*, Ethnobotany, *Fusarium*, Kalanguya, Opay

Introduction

Ethnobotany is the scientific study of the relationships that exist between peoples and plants (Acharya and Anshu, 2008). Belonging to the Kalanguya-Ikalahan tribe, the Ikalahan community inhabits the Ikalahan ancestral domain, which includes Kalahan Forest reserve, which covers 38,000 ha in Nueva Vizcaya and about 10,000 ha in Nueva Ecija where the

entire area is mountainous and forested with dipterocarp species and mostly pine in western edge (Lasco and Villamor, 2005).

***Coressponding Author:** Jacob, JKS **E-mail address:** james.jacobmsc@gmail.com

Plant species that are considered to be fish poisons or coined as piscicidal plants are commonly used by native people for fishing (Burton, et al 2004). A known wild type plant which is being used as a fish poison called the *"Derris elliptica"*, is a newly discovered plant species collected from Imugan, Nueva Vizcaya, Philippines. The plant leaf extract of this tree has been known to have toxic effects to fishes. Conversely, the molecular identification of this plant is still under process, hence, there is still limited information available about this plant's taxonomy.

Recently, a number of fungicides are being used in human health care, however, many agencies are now promoting non-chemical, food-grade and non-toxic natural remedies instead of chemical fungal inhibitors which may partake in the serious devastation of human health (Seirotzki, 2000). Welsch, et.al., (2010) stated that sheath rot disease caused by a fungus known as *Fusarium* has been threating the fields since time immemorial and caused wilts on growing rice (*Oryza sativa*, L.). Onion (*Allium cepa*, L.), as well is an important crop for the Novo Ecijanos because they produce almost 57% of the total production of the different varieties of onion nationwide (Corpuz, 1999) and several threats have been found to kill this industry. With the aim of minimizing threats, specifically diseases that may lead in breaking rice and onion industry of Nueva Ecija, this current research was conducted to find a more efficient, less-expensive yet effective alternative indigenous fungicide that will promote better outcomes for human consumption.

Materials and Methods

Source of Derris elliptica Hot Water Extracts

Hot water extracts of *Derris elliptica* was obtained from Laboratory of Biotechnology, Department of Biological Sciences, College of Arts and Sciences, Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines in collaboration with Dr. Jerwin R. Undan, faculty of Biological Sciences.

Source of Test Organism

Pure cultures of *Fusarium moniliforme* and *Fusarium oxysporum f. sp cepae* was obtained from the Laboratory of fungal collection of RM-CARES, Research and Extension, CLSU.

Revival of the Fungal Pathogen

Approximately 10mm mycelial block from *F. moniliforme* and *F. oxysporum* was transferred on a clean sterile plate containing sterilized Potato Dextrose Agar (PDA) to allow proliferation until fully ramified.

Antifungal Bioassay

One (1) ml of the prepared *Derris elliptica* hot water extracts, Mycosil (suspension, positive control), BLB Stopper (fungicide, positive control) was poured aseptically on a sterile plate and approximately 15ml of a sterilized PSG was added aseptically swirled on a clockwise and counter clock wise motion to homogenize mixtures. Mixture was then allowed to cool and solidified.

Inoculation of the Test Organism

Each plates containing mixtures were inoculated with an 8-mm fungal disk. For mycosil and *Derris elliptica*, 2-point inoculation method was used to conserve extracts while single fungal disk was used on BLB mixture respectively. Inoculated plated were incubated on a room temperature and growth was measured using calibrated Vernier caliper for every 24-hours for 5 days.

Experimental Analysis

Analysis laid out Completely Randomized Design (CRD) with three (3) replications per treatment combination. Comparison among means was carried out using Duncan's Multiple Range Test (DMRT) using 5% level of significance.

Results and Discussions

Fusarium is a large genus of filamentous fungi, part of a group often referred to as hyphomycetes, widely distributed in soil and associated with plants which produces toxins known as fumonisins and trichothecenes (Nelson, et.al., 1994). Results exhibited by the treatments against two species of *Fusarium* showed significant effects. Table 1 and Figure 1 exhibited that BLB Stopper as the positive control, garnered the lowest mean of growth after 5^{th} day of incubation which means that it has the

highest capacity to inhibit the growth of *Fusarium oxysporum*. Followed by *D. elliptica* hot water extract with a mean average of 26.35 mm. However, Mycosil has an average mean of 32.96mm which signifies that it cannot totally inhibit the growth of *F. oxysporum*.

Table 1. Mean diameter (mm) of mycelial growth of *Fusarium oxysporum* against different treatments.

Treatments	**Days of Incubation (mm)**				
Fusarium oxysporum	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
***Derris elliptica* Hot Water Extract**	9.97[a]	13.66 [a]	15.96[a]	20.74[b]	26.35[b]
Mycosil (oral suspension)	9.96[a]	11.56[a]	17.76[a]	23.79[b]	32.96[c]
BLB	10.57[b]	11.55[a]	14.30[a]	16.67[a]	22.49[a]
Negative Control	12.64[c]	15.69[b]	20.12[b]	54.26[c]	70.07[d]

Note: Means having the same letter of superscript in the same column are not significantly different from each other at 5% level of significance**.**

Table 2 and Figure 2 shows the result of antifungal bioassay of *Derris elliptica* against *F. moniliforme*. *Derris elliptica* hot water extracts exuded an average mean diameter of 28.28mm after 5 days of incubation. While BLB Stopper, as negative control showed an average diameter of 22. 46 mm relatively lower than *Derris elliptica* hot water extract. However, Mycosil suspension has an average mean diameter of 34.15 mm all having significant effects against *F. moniliforme*.

Table 2. Mean diameter (mm) of mycelial growth of *Fusarium moniliforme* against different treatments.

Treatments	**Days of Incubation**				
Fusarium moniliforme	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**
***Derris elliptica* Hot Water Extract**	11.30[a]	12.57[a]	15.04[a]	19.8[a]	28.28[a]
Mycosil	10.46[a]	13.06[a]	20.51[b]	24.51[b]	34.15[b]
BLB	9.96[a]	13.06[a]	14.73[a]	17.07[a]	22.46[c]
Negative Control	11.74[a]	15.65[b]	21.34[c]	58.01[c]	70.86[d]

Note: Means having the same letter of superscript in the same column are not significantly different from each other at 5% level of significance.

The *Derris elliptica* extract had a positive results for tannins, terpenoids and high content of alkaloids. The presence of such phytochemical compounds can somehow explain the mechanism of action of the *Derris elliptica* extract. The presence of tannins in plants can cause negative effect on productivity, reduced nutrient availability, reduced

digestibility, impaired digestive physiology and may be mucosal perturbations for those who will intake such plants, e.g. ruminants (Frutos, et al. 2004). On the other hand, the occurrence of terpenoids in plants cause cytotoxic effects, growth hormones and tumor promoters (Zhang, et al. 2014). Plants containing alkaloids have high Nitrogen organic constituents which can be attributed to their ability to become poisonous and even addictive (Wooley, 2001).

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References

Acharya, D. and Anshu, S. (2008): Indigenous Herbal Medicines: Tribal Formulations and Traditional Herbal Practices, Aavishkar Publishers Distributor, Jaipur, India. ISBN 978-81-7910-252-7. pp 440

Burton, R., Cannon, J., Owen, N., and Wood, S. 2004. Naturally Occuring Fish Poisons from Plants. Journal of Chemical Education Volume 81 Issue 10:1457-1461

Corpuz, A.G. (1999). The Colonial Iron Horse: Railroads and Regional Development in the Philippines, 1875-1935. Quezon City: University of the Philippines Press. ISBN 9789715422208

Frutos, P., Hervas, G., Giraldez, F. and Mantecon, A. 2004. Review. Tannins and ruminant nutrition. Spanish Journal of Agricultural Research 2(2):191-202

Lasco, R. and Villamor, G. (2005). The Ikalahan Ancestral Domain, the Philippines. World Agroforestry Centre (ICRAF), Los Banos, Philippines. p. 43-50

Nelson, P.E., Dignani, M.C. and Anaissie, E.J. (1994). "Taxonomy, biology, and clinical aspects of Fusarium species". Clin Microbiol Rev 7 (4): 479–504. PMC 358338. Retrieved 3 December 2014.

Sierotzki, H. (2000). Mode of resistance to respiration inhibitors at the cytochrome bc1 enzyme complex of *Mycosphaerella fijiensis* field isolates Pest Management Science 56:833-841

Welch, J.R., Vincent, J.R., Auffhammer, M., Dobermann, A., Moya, P., Dawe, D. (2010). "Rice yields in tropical/subtropical Asia exhibit large but opposing sensitivities to minimum and maximum temperatures". Proc. Natl. Acad. Sci. U.S.A. 107 (33): 14562–7.

Wooley, J. (2001). Plant Alkaloids. Encyclopedia of Life Sciences. Nature Publishing Group. p. 1-11

Zhang, H., Qiu, M., Chen, Y., Chen, J., Sun, Y., Wang, C., Fong, H. (2014). Plant Terpenes. Phytochemistry and Pharmacognosy. Encyclopedia of Life Support Systems. p. 1-9