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The 3rd International Conference on Environment, Sustainability Issues, and Community Development 9 September 2021, Semarang, Indonesia (Virtual)

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Published online: 12 November 2021

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IOP Conference Series: Earth and Environmental Science • *Open Access* • Volume 896, Issue 1 • 12 November 2021 • Article number 012021 • 3rd International Conference on Environment, Sustainability Issues, and Community Development, INCRID 2021 • Semarang, Virtual • 9 September 2021 • Code 174583

Document type
Conference Paper • *Bronze Open Access*

Source type
Conference Proceedings

ISSN
17551307

DOI
10.1088/1755-1315/896/1/012021

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Effect of leachate recirculation and bulking agent on leachate quality

Oktiawan W.[a]; Priyambada I.B.[a]; Purwono P.[b]

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[a] Department of Environmental Engineering, Faculty of Engineering, Diponegoro University, Jl. Prof. Soedarto, SH, Tembalang, Semarang, 50275, Indonesia

[b] Center for Science and Technology, UIN Raden Mas Said Surakarta, Jl. Pandawa, Pucangan, Kartasura, 57168, Indonesia

Abstract

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Abstract

The purpose of leachate processing is to reduce pollutants in leachate without using equipment that requires high investment and complicated maintenance. This research aims to determine the impact of leachate recirculation and bulking agents on leachate quality . Fresh solid waste recirculated using artificial leachate with a continuous flow of 1 L/h. The study is conducting for 14 days on a laboratory scale. On the 14th day, combination recirculation and bulking accelerate the increased pH value. Leachate recirculation increases the potential for contact between methanogenic bacteria and dissolved organic matter and contributes to buffering pH during the hydrolysis process. R3 produces a higher Electric Conductivity (EC) value than other reactors since the 7th day. This increase is probably due to the addition of dissolved salts from solid waste decomposition. The role of the bulking agent may not be too significant for changes in the EC value. On day 14, TDS at R1 was 11,748 mg/L, R2 was 12.144 mg/L, and R3 was 14.916 mg/L.

Bioefficacy of microbial antagonists against *Zymoseptoria tritici* on wheat

I Barakat[1*], N Chtaina[1], M E Guilli[2], B Ezzahiri[1]

[1]Laboratory of Phytopathology, Department of Production, Protection, and Biotechnology, Hassan II Institute of Agronomic and Veterinary medicine, Rabat 10010, Morocco.
[2]Laboratory of Phytopathology and Post-Harvest Quality, Regional Centre for Agronomic Research, Kenitra 14070, Morocco.

barakat.iavcha@gmail.com

Abstract. From our previous research of bio-control agents of the wheat pathogen *Zymoseptoria tritici* as an alternative to chemical control, one strain of *Bacillus amyloliquefaciens* and one strain of *Trichoderma harzianum* showed high antagonistic potential *in vitro* and *in vivo* as a foliar treatment on potted plants under greenhouse. The present work aimed to evaluate the antagonistic potential of these two strains of microorganisms in seed treatment. The results obtained showed that the two antagonists can reduce the severity of the disease assessed at three growth stages of the two wheat cultivars. *B. amyloliquefaciens* I3 reduced the severity of septoria leaf blotch by 56% and 58% compared to the checks on Aguilal and Karim respectively at the flag leaf stage, while in the case of *T. harzianum* A, this rate was 54% on Aguilal and 55% on Karim. These results suggest that the antagonistic potential is due to a distant mechanism of action such as induced systemic resistance. The viability tests of the two antagonists on coated seeds stored at 4 °C showed that they were viable after twelve months of conservation and preserved their antagonistic potential against *Z. tritici*.

1. Introduction

Septoria leaf blotch, caused by *Zymoseptoria tritici* (teleomorph: *Mycosphaerella graminicola*), is one of the most important foliar diseases of wheat worldwide, frequently causing severe yield reductions. Fungicides, including the triazole and strobilurin groups, are commonly used to control this disease. The risk of developing resistant strains to these fungicides and the potential danger of pesticide use on the health and the environment encourages the research of alternatives, including biological control using antagonists. Among these agents, there are species of non-phytopathogenic rhizobacteria of the genus *Bacillus* spp. such as *B. amyloliquefaciens*, *B. licheniformis* and *B. subtilis*. These bacteria colonize the roots of plants and produce lipopeptide molecules such as lipopeptide molecules (surfactins, iturins, and fengycins) that induce resistance in plants and increase their defensive capacities against subsequent infections through the phenomenon of induced systemic resistance [1]. In addition, these rhizobacteria could have strong direct antibacterial and antifungal activity [2,3,4]. Also, several strains of the filamentous fungi of the *Trichoderma* spp. have been used to control some telluric and aerial plant pathogenic fungi [5]. The biocontrol activity of these *Trichoderma* spp. Strains have been attributed to several mechanisms of action that act synergistically: competition for nutrients and space, antibiosis,

Risk analysis-based reliability assessment approach under epistemic uncertainty using a dynamic evidential network

M Bougofa[1]*, A Bouafia[2], A Baziz[1] , S Aberkane[3] , R Kharzi[1], A Bellaouar[1]

[1] Laboratory of Transportation Engineering and Environment, Frères Mentouri Constantine 1 University, BP 325 Constantine, 25017, Algeria.
[2] Chemical Engineering and Environment Laboratory, Skikda University, Skikda, 21000, Algeria
[3] Department of psychology, Khenchela University, BP 1252 Road of Batna Khenchela, 40004, Algeria

mohamed.bogoffa@umc.edu.dz

Abstract. Probabilistic modeling is widely used in industrial practices, particularly for assessing complex systems' safety, risk analysis, and reliability. Conventional risk analysis methodologies generally have a limited ability to deal with dependence, failure behavior, and epistemic uncertainty such as parameter uncertainty. This work proposes a risk-based reliability assessment approach using a dynamic evidential network (DEN). The proposed model integrates Dempster-Shafer theory (DST) for describing parameter uncertainty with a dynamic Bayesian network (DBN) for dependency representation and multi-state system reliability. This approach treats uncertainty propagation across conditional belief mass tables (CBMT). According to the results acquired in an interval, it is possible to analyze the risk like interval theory, and ignoring this uncertainty may lead to prejudiced results. The epistemic uncertainty should be adequately defined before performing the risk analysis. A case study of a level control system is used to highlight the methodology's ability to capture dynamic changes in the process, uncertainty modeling, and sensitivity analysis that can serve decision making.

1. Introduction

In the last century, many industries have been complex and involved in the latest technological innovation. This technological development is accompanied by a continuous improvement of safety, which stays one of the main concerns in this field. Nowadays, the need for safety measures should be emphasized due to the possibility of catastrophic accidents resulting from this high innovation and development [1–2]. The safety engineer used many quantitative or qualitative methods for risk analysis such as failure mode and effects analysis (FMEA), what-if analysis, hazard and operability analysis (HAZOP), fault tree analysis (FTA), and Bayesian networks (B.N.) … etc. Each method has its advantages and disadvantages. Most of these techniques are developed for treating aleatory and epistemic uncertainty using possibility theory, evidence theory, and fuzzy sets theory [3–4].

The B.N. has become more prevalent in reliability, availability, safety, and risk assessment for complex systems [5–7]. A review is presented in [8] that studied a recent brief statistical of B.N. applicability in the chemical and process industry. B.N. is applied as a dynamic safety analysis for a complex process. For example, Zarei et al. [9] applied a dynamic risk analysis approach for natural gas

Holistic perspective to knowledge integration for performance of renewable and sustainable energy business

V Yadwad[1*], S R Bharamnaikar[1], U Bhushi[1]

[1]Visvesvaraya Technological University, Jnana Sangama, Belgaum, Karnataka 590018, India

v_yadwad@hotmail.com

Abstract. Power generation and consumption globally has always been on the top agenda for any country since it contributes to the basic needs of human beings. In the race of bridging the supply and demand gap, human beings created side effects in the name of environmental pollution. The alternate source of energy is renewable energy, and many nations are committed to adopting these new forms of energy generation; these still contribute lesser than one-fourth of global energy consumption and power generation. This study aims to focus on knowledge integration for the performance of the renewable business segment. It creates a more practical alternative against other forms of energy generations like Thermal, natural gas-based. There are areas like a waste of energy as an example where it is still a lesser-known world. Many measurement techniques are still explored, which suggests Knowledge plays a vital role in the Business Performance of Renewable and Sustainable energy and in implementing Global Climate Control Strategies. The study results indicate the energy sector's transformation into the renewable energy sector, highlighting innovations, knowledge integration, effect on performance, and role of management & government.

1. Introduction

Energy has many usages like power generation for electricity purposes, heat exchange requirements in process industries, and other services. The most generated energy was coal (thermal), water (hydro), natural gas, nuclear, oil. As every nation needed energy for primary usage like electricity, they have invested a lot of money and decades on these forms of energy. As the gap between supply and demand, the investment expanded from the government to private in most countries. However, this also has invited climate issues like environmental pollution, which is the biggest survival challenge of the earth and a threat to the future generation.

Here comes the importance of the new form of energies or earlier lesser prioritized form of energy sources like solar, wind, biofuel, geothermal, hydro, wave, tidal. The volume of energy (MW or GW) generated by earlier forms like thermal was not easy or even sometimes impossible in the new form of energy like solar and wind. Depend on the geography and other resources each nation has. However, the technologies and investments in research have explored out-of-the-box thinking ideas, and many nations already started investing in renewable and sustainable energy. It has created opportunities for more considerable change on a global level, but due to a gap of resources, including knowledge, the target time to achieve the transformation committed by most nations is challenging. Hence knowledge

Optimization of recycled polyethylene terephthalate plastic bottle fibers in grasscrete

A Etyangat[1*], P Tiboti[2], M Kayondo[1], H Bakamwesiga[1]

[1]Department of Civil and Environmental Science, School of Engineering, CEDAT, Makerere University, Kampala, Uganda
[2]Department of Civil Engineering, Faculty of Engineering, Ndejje University, Kampala, Uganda

aetyangat@gmail.com

Abstract. Cement and concrete production account for between 5% to 8% of global CO_2. Waste PET plastic and glass waste have also brought about rapid environmental degradation. Glasscrete was developed with glass powder of fewer than 75 microns (has pozzolanic properties) that performed 14% better than concrete at 90 days. So, to further this effort, this experimental research considered the glass create C20 (at 10% cement replacement) and added PET fibers (of aspect ratio 25) at different percentages of 1%, 2%, 3%, and 4% the weight of cement in a bid to optimize the grasscrete performance and its ability to absorb PET waste. Glasscrete being extremely brittle alone, failed by cracking at all percentage PET additions, thus improving its safety factor. A 1% PET fiber addition to grasscrete exhibited the highest strength properties compared to other percentage additions while having a durability of 1.5% better than concrete. It is thus recommended for structural uses as it outperforms concrete. Despite this, a 1% fiber addition decreased grasscrete's compressive strength by at least 3.5% at 28 days and 6% at 90 days but improved the flexural strength by 5.4% at 28 days and 0.8% at 90 days testing.

1. Introduction

Globally, fourteen million tons of waste glass and three hundred and eighty-one tons of waste plastic are disposed of annually [1]. 11 billion tonnes of concrete are consumed annually, making it the most used construction material in the world and contributes between 5% and 8% global CO_2 emissions [2]. To conserve the environment, engineers have constantly developed various ways to utilize recycled materials such as glass and plastics in various civil engineering applications. Studies have employed recycled polyethylene terephthalate bottles (PET) fibers in concrete and have recorded significant improvements in their mechanical properties [3]–[5].

This research will focus on finding improvements in the mechanical properties of grasscrete by the addition of recycled PET plastic fibers. So, engineers can better understand its performance in the field, especially in structural members. It will increase not only the recycling capacity of grasscrete but also its sustainability.