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**Manuka (*Leptospermum scoparium*) as a  
Remediation Species for Biosolids  
Amended Land**

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## Abstract

The application of biowastes such as biosolids to land is a viable means of recycling valuable nutrients in an otherwise useless waste product. With this practice comes the risk of introducing contaminants such as heavy metals and pathogenic microorganisms into the soil system, posing a risk to humans and animals. A land-management system is needed to mitigate any potential risk. One such system finding application at many locations around the world is phytoremediation, the use of plants to remove, degrade or render harmless environmental contaminants. The plant species *Leptospermum scoparium* (Manuka) is a hardy native New Zealand plant resistant to heavy metals, with the ability to grow on degraded and erosion prone sites, and encourage re-vegetation in zones of impaired soil quality. In addition, manuka products have been shown to have antiseptic and antimicrobial properties. The aim of this research was to investigate the potential use of manuka in the remediation of contaminated land, through the use of manuka's antiseptic properties to aid in pathogen control, and on the extraction or stabilisation of heavy metals in soil.

Experiments were carried out using water extracts of manuka, as well as soil from underneath manuka stands, to test for antimicrobial activity of manuka against a number of pathogenic bacteria potentially found in biosolids. Results found that the presence of prepared manuka-water extracts significantly reduced the growth of the five bacterial strains tested, in some cases exhibiting complete die off. However, in-situ effects of antimicrobial ability in soil from underneath manuka were not observed. Further research using whole plants, and different plant components would be useful.

Research was also conducted to investigate the effect of manuka growth on Zn and Cu bioavailability in soil. Three plant species, (manuka, *Coprosma robusta* and rye grass), were grown for six months and one year in Zn - and Cu - spiked soil to assess their effect on metal availability. Results clearly showed that the three plant species investigated differ in their ability to uptake and accumulate both metals, but have no apparent effect on HM bioavailability over a one year time period.

The experiments in this research were able to closely evaluate the potential of manuka as a remediation species for biosolids-amended land. Results indicate that further research into the potential use of manuka in this way is warranted, particularly with respect to manuka's ability to manage levels of pathogenic soil microorganisms. In addition, manuka components are economically valuable, and in future, biosolids disposal systems may be able to combine with that of manuka production to produce a sustainable disposal system with potential for economic return. The solution may be to develop manuka plantations on otherwise unuseable land, where biosolids application can help recondition soil and enhance manuka growth, whilst manuka acts as a means of 'treating' both the bacterial and inorganic contaminants in the biosolids. Continual leaf fall or rotational cropping and mulching of manuka biomass would aid in the attenuation of introduced bacteria, and manuka roots may help stabilise metals. In an age where waste reduction and contaminant control are top priority, remediation systems such as this may represent an economically, socially and environmentally acceptable solution.

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# TABLE OF CONTENTS

ABSTRACT.....	ii
AKNOWLEDGEMENTS.....	iv
LIST OF FIGURES.....	ix
LIST OF TABLES.....	xii
<b>1. RESEARCH OVERVIEW .....</b>	<b>1</b>
<b>2. LITERATURE REVIEW.....</b>	<b>2</b>
2.1. INTRODUCTION.....	2
2.2. BIOSOLIDS APPLICATION TO LAND .....	4
2.2.3. CONTAMINANTS IN BIOSOLIDS .....	7
2.2.3.1. PATHOGENIC MICROORGANISMS .....	7
2.2.3.2. HEAVY METALS .....	12
2.2.4. PHYTOREMEDIATION .....	18
2.2.4.1. INTERACTIONS BETWEEN PLANTS AND HEAVY METALS IN SOIL .....	18
2.3. MANUKA ( <i>LEPTOSPERMUM SCOPARIUM</i> ) .....	19
2.3.1. REHABILITATING DEGRADED LAND.....	21
2.3.2. ANTISEPTIC PROPERTIES .....	23
2.3.3. ECONOMIC USES .....	29
2.4. STUDY AIMS.....	30
2.5. OVERVIEW OF STUDY.....	30
<b>3. PRELIMINARY ANTIMICROBIAL INVESTIGATION.....</b>	<b>32</b>
3.1. INTRODUCTION.....	32
3.2. AIM .....	33
3.3. METHODS .....	33

3.3.1. PREPARATION OF PLANT EXTRACTS .....	33
3.3.1.1. <i>MANUKA LEAF EXTRACTS</i> .....	33
3.3.1.2. <i>MANUKA ROOTS (LEPTOSPERMUM SCOPARIUM)</i> .....	34
3.3.1.3. RYE GRASS (LOLIUM PERENNE) .....	34
3.3.2. AGAR PLATE ENUMERATION TECHNIQUES .....	34
3.3.2.1. SEWAGE SLUDGE COLONY COUNTS .....	34
3.3.2.2. PURE CULTURE COLONY COUNTS .....	35
3.3.3. BACTERIAL BIOLUMINESCENCE-BASED BIOASSAY .....	35
3.3.4. MICROPLATE ASSAY .....	36
3.3.4.1. SALMONELLA TYPHIMURIUM.....	38
3.3.4.2. LISTERIA MONOCYTOGENES.....	38
3.3.4.3. ESCHERICHIA COLI 0157.....	38
3.3.4.4. CAMPYLOBACTER JEJUNI .....	38
3.3.4.5. CLOSTRIDIUM PERFRINGINS .....	39
3.3.5. STATISTICAL ANALYSIS .....	39
<b>3.4. RESULTS.....</b>	<b>40</b>
3.4.1. AGAR PLATE ENUMERATION TECHNIQUES.....	40
3.4.1.1. SEWAGE SLUDGE COLONY COUNTS.....	40
3.4.1.2. PURE CULTURE COLONY COUNTS.....	40
3.4.2. <i>E. COLI</i> LUX BIOSENSOR.....	42
3.4.3. MICROPLATE ASSAY .....	43
3.4.3.1. SALMONELLA TYPHIMURIUM.....	43
3.4.3.2. LISTERIA MONOCYTOGENES .....	46
3.4.3.3. ESCHERICHIA COLI 0157 .....	49
3.4.3.4. CAMPYLOBACTER JEJUNI .....	52
3.4.3.5. CLOSTRIDIUM PERFRINGINS.....	54
<b>3.5. DISCUSSION .....</b>	<b>55</b>

<b>4. IN-SITU EFFECTS OF MANUKA GROWTH ON SURVIVAL OF BACTERIAL PATHOGENS IN SOIL.....</b>	<b>57</b>
4.1. INTRODUCTION.....	57
4.2. AIM .....	60
4.3. METHODS.....	60
4.3.1. SOIL COLLECTION .....	60
4.3.2. CHEMICAL AND BIOCHEMICAL ANALYSIS .....	61
4.3.3. BIOLOGICAL ANALYSIS .....	61
4.3.4. PATHOGEN EXPERIMENT.....	62
4.3.4.1. EXPERIMENT SET UP .....	62
4.3.4.2. SOIL HARVESTING.....	63
4.3.4.3. PATHOGEN ENUMERATION .....	63
4.3.4.3.1. CAMPYLOBACTER .....	63
4.3.4.3.2. SALMONELLA .....	64
4.3.5. STATISTICAL ANALYSIS .....	64
<b>4.4. RESULTS.....</b>	<b>65</b>
4.4.1. CHEMICAL AND BIOCHEMICAL ANALYSIS .....	65
4.4.2. BIOLOGICAL ANALYSIS .....	68
4.4.2.1. MICROBIAL BIOMASS .....	68
4.4.2.2. SOIL MICROBIAL COMMUNITY .....	69
4.4.3. PATHOGEN ENUMERATION.....	71
4.4.3.1. CAMPYLOBACTER .....	71
4.4.3.2. SALMONELLA .....	72
<b>4.5. DISCUSSION .....</b>	<b>75</b>
<b>5. METAL SALT POT TRIAL.....</b>	<b>81</b>
5.1. INTRODUCTION.....	81



<b>5.2. AIM .....</b>	<b>85</b>
<b>5.3. METHODS.....</b>	<b>85</b>
5.3.1. SOIL COLLECTION.....	85
5.3.2. EXPERIMENT SET UP .....	85
5.3.2.1. METAL SALT AMENDMENT OF SOIL.....	85
5.3.2.2. POT EXPERIMENT PREPARATION.....	86
5.3.3. SOIL AND PLANT HARVESTING.....	87
5.3.4. SOIL AND PLANT ANALYSIS .....	88
5.3.4.1. SOIL TOTAL CU AND ZN.....	88
5.3.4.2. PLANT TOTAL CU AND ZN.....	88
5.3.4.3. CU AND ZN FRACTIONATION OF SOIL (SEQUENTIAL EXTRACTION).....	89
5.3.5. SOIL CHEMICAL ANALYSIS .....	91
5.3.6. STATISTICAL ANALYSIS .....	91
<b>5.4. RESULTS.....</b>	<b>91</b>
5.4.1. SOIL CHEMICAL ANALYSIS .....	91
5.4.2. SOIL TOTAL CU AND ZN.....	92
5.4.3. HERBAGE TOTAL CU AND ZN .....	96
5.4.4. COPPER AND ZINC FRACTIONATION OF SOIL.....	99
<b>5.5. DISCUSSION .....</b>	<b>105</b>
<b>6. GENERAL DISCUSSION AND CONCLUSION.....</b>	<b>111</b>
<b>7. REFERENCES.....</b>	<b>114</b>
<b>APPENDIX 1: METHODOLOGY.....</b>	<b>132</b>
<b>APPENDIX 2: MEDIA RECIPES.....</b>	<b>146</b>

## List of Figures

<b>Figure 2.1.</b> The standard process of sewage sludge production .....	5
<b>Figure 2.2.</b> Manuka ( <i>Leptospermum scoparium</i> ) flowers and leaves.....	20
<b>Figure 2.3.</b> The difference in cell structure between gram-positive and gram negative bacteria.....	26
<b>Figure 2.4.</b> Chemical structure of leptospermone.....	28
<b>Figure 3.1</b> The layout of each 96 well plate. Plant extracts were the last to be added and were diluted in a 1:2 serial dilution with deionised water.....	37
<b>Figure 3.2</b> Average total colony numbers counted on tryptic soy agar plates spread with sewage sludge dilutions and five manuka products .....	40
<b>Figure 3.3</b> Average total colony numbers counted on tryptic soy agar plates spread with a) <i>E. coli</i> 0157 and b) <i>S. typhimurium</i> in the presence of five manuka products.....	41
<b>Figure 3.4</b> pH of ryegrass, manuka leaf and manuka root extracts before and after dilution to a 1:9 ratio with DI water.....	42
<b>Figure 3.5</b> Luminescence of the <i>E. coli</i> lux bacterial biosensor in the presence of manuka root and leaf water extracts.....	43
<b>Figure 3.6</b> Growth of <i>S. typhimurium</i> over 24 hours in the presence of a) manuka leaf extract and b) ryegrass extract.....	44
<b>Figure 3.7</b> The effect of increasing manuka extract concentration on growth of <i>S. typhimurium</i> .....	45
<b>Figure 3.8</b> The effect of increasing ryegrass extract concentration on growth of <i>S. typhimurium</i> .....	45
<b>Figure 3.9</b> Growth of <i>L. monocytogenes</i> over 24 hours in the presence of a) manuka leaf extract and b) ryegrass extract.....	47
<b>Figure 3.10</b> The effect of increasing manuka extract concentration on growth of <i>L. monocytogenes</i> .....	48
<b>Figure 3.11</b> The effect of increasing ryegrass extract concentration on growth of <i>L. monocytogenes</i> .....	48

<b>Figure 3.12</b> Growth of <i>E. coli</i> 0157 over 24 hours in the presence of a) manuka leaf extract and b) ryegrass extract.....	50
<b>Figure 3.13</b> The effect of increasing manuka extract concentration on growth of <i>E. coli</i> 0157.....	51
<b>Figure 3.14</b> The effect of increasing ryegrass extract concentration on growth of <i>E. coli</i> 0157.....	51
<b>Figure 3.15</b> <i>C. Jejuni</i> after 48 hours in a 96 well plate with manuka leaf extracts at 12 concentrations.....	52
<b>Figure 3.16</b> The effect of increasing manuka extract concentration on growth of <i>C. jejuni</i> .....	53
<b>Figure 3.17</b> The effect of increasing ryegrass extract concentration on growth of <i>C. jejuni</i> .....	53
<b>Figure 3.18</b> The effect of increasing manuka extract concentration on growth of <i>C. perfringins</i> .....	54
<b>Figure 3.19</b> The effect of increasing ryegrass extract concentration on growth of <i>C. perfringins</i> .....	55
<b>Figure 4.1</b> Average soil enzyme activity for a) Sulphatase and b) Phosphatase in six soils.....	66
<b>Figure 4.2</b> Microbial biomass carbon by fumigation extraction of six soil samples taken at varying depths from underneath manuka.....	68
<b>Figure 4.3</b> MDS plot of T-RFLP soil profiles showing the entire microbial community (bacteria, fungi, archaea and rhizobia).....	69
<b>Figure 4.4.</b> MDS plot of T-RFLP soil profiles for fungi.....	70
<b>Figure 4.5</b> MDS plot of T-RFLP soil profiles for bacteria.....	70
<b>Figure 4.6</b> Decline of inoculated <i>Campylobacter jejuni</i> in six soil samples over 14 days.....	73
<b>Figure 4.7</b> Length of time (days) required to achieve a 90% reduction in <i>Campylobacter</i> (D-value) for the six soils.....	73
<b>Figure 4.8</b> Decline of inoculated <i>Salmonella typhimurium</i> in six soil samples over 42 days.....	74
<b>Figure 4.9</b> Length of time (days) required to achieve a 90% reduction in <i>Salmonella</i> (D-value) for the six soils.....	74

<b>Figure 4.10</b> Die off of <i>Salmonella</i> in soil from underneath manuka 10-20 cm depth over 42 days.....	75
<b>Figure 5.1</b> Polypails containing ryegrass, manuka and coprosma after six months of growth.....	87
<b>Figure 5.2</b> A comparison of the metal concentrations calculated by sum of fractions (blue) and total digest (red) for a) Zn and b) Cu .....	100
<b>Figure 5.3</b> Relationship between the sum of all metal fractions and the total metal concentration determined by acid digestion for a) zinc and b) copper, after six months (time one).....	101
<b>Figure 5.4</b> Relationship between the sum of all metal fractions and the total metal concentration determined by acid digestion for a) zinc and b) copper, after one year (time two).....	102
<b>Figure 5.5</b> Percentage distribution of Cu fractions (a) and Zn fractions (b) in soil samples after six months (time one).....	103
<b>Figure 5.6</b> Percentage distribution of Cu fractions (a) and Zn fractions (b) in soil samples after one year (time two).....	104

## List of tables

<b>Table 2.1</b> New Zealand soil limit or ceiling concentrations.....	11
<b>Table 2.2</b> Pathogenic bacteria that may be found in biosolids.....	15
<b>Table 4.1</b> Soil chemical and biochemical properties.....	67
<b>Table 4.2</b> Soil phosphatase and sulphatase activities and microbial biomass.....	67
<b>Table 4.3</b> Length of time (days) required to achieve a 90% reduction (1-log decrease) in inoculated bacterium (D-value) in six soil samples.....	71
<b>Table 5.1</b> Total copper ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) and zinc ( $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ ) sulphate added to bulk soil samples in 1L $\text{H}_2\text{O}$ .....	86
<b>Table 5.2</b> A brief overview of the sequential extraction procedure.....	90
<b>Table 5.3</b> Total copper and zinc concentrations in bulk soil samples after spiking (time zero).....	93
<b>Table 5.4</b> Soil pH of fresh soil samples after six months (time one) and one year (time two).....	94
<b>Table 5.5</b> Percent carbon and nitrogen (mean $\pm$ s.e., n=3) in air-dried soil samples after one year (time two).....	94
<b>Table 5.6</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried soil samples after six months (time one).....	95
<b>Table 5.7</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried soil samples after one year (time two).....	95
<b>Table 5.8</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried shoot and leaf samples after six months (time one) .....	97
<b>Table 5.9</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried root samples after six months (time one).....	97
<b>Table 5.10</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried shoot and leaf samples after one year (time two).....	98
<b>Table 5.11</b> Total copper and zinc concentrations (mean $\pm$ s.e., n=3) in oven dried root samples after one year (time two).....	98