

**THE USE OF AFLP TO DETERMINE IF A
SLIMES-TOLERANT INDIGENOUS SPECIES SHOWS
LOCAL ADAPTATION TO SLIMES DAM SOILS**

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DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

Signed: _____

On ___ day of _____ 2005

ABSTRACT

Plant populations show an ability to survive and adapt under varying environmental conditions. Adaptation to heavy metal contaminated soils usually results in a decrease in genetic variation. Slimes dams consist of the pulverized rock slurry left after the extraction of gold or uranium. High toxicity levels mean that these wastes often remain uncolonised and are therefore easily eroded through wind or water. Plant populations that will be viable for long-term vegetation of slimes dams will prevent erosion, and stabilise and improve the quality of the soil. Indigenous, locally adapted species are the most likely to be successful candidates for vegetation. Indigenous, slimes-tolerant species *Indigofera adenoides* and *Indigofera zeyheri* were therefore studied. The aim was to determine if plant populations show local adaptation to the adverse substrate conditions emanating from slimes dams, by investigating genetic and morphological variation between adjacent populations growing at different distances in relation to slimes dams. The AFLP technique was used to analyse genetic variation as it produces rapid results, is inexpensive, reproducible, and capable of screening the entire genome. Lower genetic diversity was observed in those areas of the dams with higher levels of slimes-associated contamination. This difference was observed in both species, and for all measures of genetic diversity (Shannon's information index, Nei's gene diversity, percentage of loci polymorphic). This may be due to a founder effect following colonisation, natural selection, flowering time differences, or a combination of these factors. Reduced morphological variation was observed in those areas of the dams with higher levels of slimes-associated contamination. Significant morphological differences were observed between groups of plants from different areas, some of which appear to have the capability to assist the plants in a slimes-contaminated environment. Some degree of adaptation to slimes-contaminated soil therefore seems to have occurred, with this being more pronounced in *Indigofera adenoides*, although it cannot be determined whether this is purely phenotypic, or a combination of phenotypic and genetic. These species therefore seem suitable as candidates for vegetation of slimes dams, although further work must be done to fully understand the effect of slimes-associated toxicity.

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CONTENTS	Page
DECLARATION.....	ii
ABSTRACT.....	iii
ACKNOWLEDGEMENTS	iv
LIST OF FIGURES	viii
LIST OF TABLES	xi
INTRODUCTION	1
1. Adaptation	1
1.1 Adaptation to novel environments	1
1.2 How does adaptation occur?	3
1.3 Studies on adaptation	6
1.4 Adaptation to metal-contaminated soil	9
2. Mining	13
2.1 Mine wastes	13
2.2 Slimes dams on the Witwatersrand	14
2.3 Revegetation	18
3. The amplified fragment length polymorphism technique	21
3.1 Advantages of AFLP	21
3.2 Examples of uses of the AFLP technique	23
4. Rationale, objectives, and predictions	27
4.1 Rationale for the study	27
4.2 Objectives	27
4.3 Expectations	28

METHODS AND MATERIALS	29
1. Species selection	29
2. Sampling	30
3. Seed germination	31
4. DNA extraction	31
5. AFLP analysis	32
5.1 AFLP protocol	32
5.2 Denaturing polyacrylamide gel electrophoresis	36
5.3 Silver staining	37
6. Data analysis	39
6.1 Morphological analysis	39
6.2 AFLP analysis	43
RESULTS	47
1. Species selection and DNA extraction	47
2. Sampling	49
2.1 <i>Indigofera adenoides</i>	49
2.2 <i>Indigofera zeyheri</i>	57
3. Seed germination	61
4. AFLP band patterns	62
4.1 <i>Indigofera adenoides</i>	62
4.2 <i>Indigofera zeyheri</i>	63
5. Analysis of <i>Indigofera adenoides</i> according to area	64
5.1 Morphological analysis	64
5.2 Genetic analysis	74
6. Analysis of <i>Indigofera zeyheri</i> according to area	83
6.1 Morphological analysis	83
6.2 Genetic analysis	87

7.	Analysis of <i>Indigofera adenoides</i> according to toxicity	88
7.1	Genetic analysis using plants from all areas	90
7.2	Morphological analysis using plants from all areas	93
7.3	Genetic analysis using plants from toepaddock areas	96
7.4	Genetic analysis using plants from the toepaddock only	98
7.5	Morphological analysis using plants from the toepaddock only	104
8.	Analysis of <i>Indigofera zeyheri</i> according to toxicity	111
8.1	Genetic analysis using plants from all areas	112
8.2	Morphological analysis using plants from all areas	114
8.3	Genetic analysis using plants from the toepaddock only	115
8.4	Morphological analysis using plants from the toepaddock only	116
	DISCUSSION AND CONCLUSIONS	120
1.	Genetic differentiation between areas	120
2.	Differences in morphology between areas	124
3.	Genetic and morphological differentiation	127
4.	Analysis according to ground water toxicity	129
5.	Applications and further study	132
6.	Conclusions	134
	REFERENCES	135

LIST OF FIGURES	Page
Figure 1: The different zones that make up a typical slimes dam	14
Figure 2: Summary of the AFLP technique	33
Figure 3: Agarose gel showing genomic DNA for selected plant species	47
Figure 4: Layout of the areas surrounding the South Complex slimes dam including the Vaal River, other slimes dams in the area, and the location of the RG Williams Game Reserve	49
Figure 5: The South Complex slimes dam and surrounding areas, and the South Complex slimes dam	50
Figure 6: The characteristics of <i>Indigofera adenoides</i> , including the overall structure and spreading nature of the plants and a close up of the leaves and flowers	52
Figure 7: The relative locations of the three <i>Indigofera adenoides</i> sampling areas	53
Figure 8: Locations of sampled <i>Indigofera adenoides</i> plants on the slimes dam and far off site A areas	54
Figure 9: Sampling of <i>Indigofera adenoides</i> occurring on the toepaddock of the South Complex slimes dam	55
Figure 10: The topography and vegetation cover of the area of the RG. Williams Game Reserve, Orkney, North West province, used for sampling of the far off site B group	56
Figure 11: A comparison of a map and an aerial photograph showing the New North Complex slimes dam and surrounding areas	58
Figure 12: The general morphological structure of <i>Indigofera zeyheri</i>	59
Figure 13: Locations of sampled <i>Indigofera zeyheri</i> plants in the toepaddock and off site areas	60
Figure 14: Silver stained gel showing the typical band pattern obtained with <i>Indigofera adenoides</i> samples	62
Figure 15: Silver stained gel showing the typical band pattern obtained	

	with <i>Indigofera zeyheri</i> samples	63
Figure 16:	Graphs showing the distribution of leaf width in the different areas	67
Figure 17:	Graphs showing the distribution of plant height in the different areas	68
Figure 18:	A comparison of canopy area and canopy volume in plants from the different areas	69
Figure 19:	Dendrogram based on pair-wise squared distances of morphological data, obtained through canonical discriminant analysis	72
Figure 20:	Dendrogram based on pair-wise Nei's genetic distances (<i>D</i>) between plant groups from different areas	76
Figure 21:	Dendrogram based on pair-wise Nei's genetic distances (<i>D</i>) between plant groups from different areas	81
Figure 22:	Graphs showing a comparison of canopy area and canopy volume between plants from the two area groups	84
Figure 23:	Zones of levels of total dissolved solids surrounding the South Complex slimes dam	89
Figure 24:	Depth to groundwater in metres below ground level for the toxicity zones studied	89
Figure 25:	Dendrogram based on pair-wise Nei's genetic distances (<i>D</i>) between plants in the different toxicity groups	92
Figure 26:	Dendrograms based on Nei's genetic distances (<i>D</i>) showing the genetic distance between plants in different toxicity group	101
Figure 27:	The distribution of canopy area in the different toxicity groups	106
Figure 28:	Dendrogram based on pair-wise squared distances of morphological data, obtained through canonical discriminant analysis	109
Figure 29:	Zones of sulphate surrounding the New North Complex slimes dam	111

Figure 30:	Zones of groundwater level in metres below ground level for the two toxicity zones	112
Figure 31:	The distribution of plant height in the two toxicity groups	117

LIST OF TABLES	Page
Table 1: Soil physical and chemical characteristics for the South complex slimes dam.....	16
Table 2: PCR profile used for pre-amplification of samples	35
Table 3: PCR profile used for selective amplification of samples	36
Table 4: Silver staining protocol	38
Table 5: Analysis of variance performed for all variables	65
Table 6: Canopy and leaf dimensions (mean \pm standard deviation) for plants in the various area groups	66
Table 7: A comparison of correlation coefficients between various variables in plants from the different areas	70
Table 8: Classification of plants from each area group into the different areas, obtained through discriminant analysis	71
Table 9: A comparison of coefficients of variation for each variable between groups of plants from the different areas	73
Table 10: Genetic structure of plants from the different areas in terms of sample size, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	74
Table 11: Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	75
Table 12: Permutation test for genetic differentiation among groups of plants from different areas, based on pairwise F_{ST} values between each pair of groups	75
Table 13: Percentage of plants from each area group that assign to the different groups, based on AFLPOP analysis	77
Table 14: Genetic structure of plants from the different areas in terms of sample size, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	78

Table 15:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	79
Table 16:	Permutation test for genetic differentiation among groups of plants from different areas, based on pairwise F_{ST} values between each pair of groups	80
Table 17:	Percentage of plants from each area that assign to the different area groups, based on relatedness values between individuals	82
Table 18:	T-test showing which variables are significantly different between plants from the different areas	83
Table 19:	A comparison of correlation coefficients between various variables in plants from different areas	85
Table 20:	A comparison of coefficients of variation for each variable in plants from the two area groups	86
Table 21:	Genetic structure of the groups of plants from the two areas in terms of sample sizes, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	87
Table 22:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	87
Table 23:	Genetic structure of the plants in the toxicity groups in terms of sample size, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	90
Table 24:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	91
Table 25:	Permutation test for genetic differentiation among toxicity groups, based on pairwise F_{ST} values between each pair of groups	91
Table 26:	Analysis of variance for all variables	93

Table 27:	Plant and leaf dimensions for plants in each of the toxicity groups	94
Table 28:	A comparison of correlation coefficients between various variables in plants in the different toxicity groups	95
Table 29:	Genetic structure of toxicity groups in terms of sample size, percentage of loci polymorphic, Nei's (1973) gene diversity, and Shannon's information index	96
Table 30:	Nei's gene diversity statistics for subdivided populations, indicating the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	97
Table 31:	Permutation test for genetic differentiation between plants from different toxicity groups, based on pairwise F_{ST} values between each pair of groups	97
Table 32:	Genetic structure of toxicity groups in terms of sample sizes, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	98
Table 33:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	99
Table 34:	Permutation test for genetic differentiation among toxicity groups of the set containing group 6/7, based on pairwise F_{ST} values between each pair of groups	100
Table 35:	Permutation test for genetic differentiation among toxicity groups of the set containing group 5/6/7, based on pairwise F_{ST} values between each pair of groups	100
Table 36:	Percentage of plants from each toxicity group in the set containing group 6/7 that assign to the different toxicity groups	102
Table 37:	Percentage of plants from each toxicity group in the set containing group 5/6/7 that assign to the different toxicity groups	103

Table 38:	Analysis of variance (ANOVA) for all variables	104
Table 39:	Plant and leaf dimensions for plants in the various toxicity groups	105
Table 40:	A comparison of correlation coefficients between variables in plants from different toxicity groups	107
Table 41:	Classification of plants from each toxicity group into different groups, expressed as a percentage of the total number of plants in each group, obtained through discriminant analysis	108
Table 42:	A comparison of coefficients of variation for each variable in plants from different toxicity groups	110
Table 43:	Genetic structure of plants from the two toxicity groups in terms of sample size, percentage of loci polymorphic, Shannon's diversity index, and Nei's (1973) gene diversity	113
Table 44:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	113
Table 45:	T-test showing which variables contribute significantly to differences between the toxicity groups	114
Table 46:	Genetic structure of plants from the two toxicity groups in terms of sample sizes, percentage of loci polymorphic, Shannon's information index, and Nei's (1973) gene diversity	115
Table 47:	Nei's gene diversity statistics for subdivided populations, showing the genetic structure of the overall population. An estimate of gene flow (Nm) is also shown	115
Table 48:	T-test showing which variables contribute significantly to differences between the toxicity groups	116
Table 49:	A comparison of correlation coefficients between various variables in plants from the different toxicity groups	118
Table 50:	A comparison of coefficients of variation for each variable in plants from the different toxicity groups	119