Journal of
Bioremediation & Biodegradation

$\RGHOH HW DO - %LRUHPHG %
'2,

5HVHDUFK $UWLFOH 2SHQ $F

%LRGHJUDGDWLRQ RI 3RO\F\FOLF $URPDWLF +
&RQWDPLQDWHG ZLWK &UXGH 2LO

$\RGHOH 5RVWDPL\ 'RUOD 2Q\LZD\XHJERUG 6DPXHO 2PRUYLOH $NSRULGR
'HSDUWPHQW RI &KHPLVWU\ 8QLYHUVLW\ RI ,EDGDQ ,EDGDQ 1LJHULD
'HSDUWPHQW RI &KHPLVWU\ 'HOWD 6WDWH 8QLYHUVLW\ $EUDND 1LJHULD
&RUUHVSRQGLQJ $XWKRU 5RWLPL ,SHDL\HGD 'HSDUWPHQW RI &KHPLVWU\ 8QLYHUVLW\ RI ,EDGDQ ,EDGDQ 1LJHULD
5HF 'DWH \ $FF 'DWH 3XE 'DWH -XQH

&RS\ULJKW ‹ $\RGHOH 5, HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WH
XVH GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRX

$EVWUDFW

&RQWDPLQDWLRQ RI HQYLURQPHQW K\GURFDUERQV KDV UHQGHUHG VRLO IURP RLO H[SORULQ
DJULFXOWXUDO SUDFWLFHV %HFDXVH RI WKH FDUFLQRJHQLF SURSHUWLHV RI WK
DQ DEVROXWH QHFHVVLW\ WR SURPRWH D VXVWDLQDEOH GHYHORSPHQW IRU VRFLH
HIIHFWLYH PHWKRG RI ELRGHJUDGDWLRQ RI 3RO\F\FOLF $URPDWLF +\GURFDUERQ
HPSOR\HG 6RLO VDPSOHV ZHUH FROOHFWHG IURP DJULFXOWXUDO VLWHV LQ $NS
DQDO\VHG IRU VL[WHQ 3$+V E\ *DV &KURPDWRJUDSK\ *& 7KH WRWDO 3$+V FRQ
PJ NJ 8VLQJ WKH UDWLRV RI SKHQDQWKUHQH WR DQWKUDFHQH 3KH $QW DQG IO
VRXUFHV RI FRQWDPLQDWLRQ 3$+V FRQFHQWUDWLRQV LQ $NSDQ VRLOV SRVVLE
7KHVH VRXUFHV LQFOXGHG FUXGH RLO SHWURROHXP FRPEXVWLRQ DQG VSLOOV
UHGXFWLRQ LQ 3$+V FRQFHQWUDWLRQV DIWHU ZHHNV RI LQFXEDWLRQ

.H\ZRUGV &UXGH RLO VSLOO 6RLO

*RV"—FLG o GHJULG o V„dÂ‰G o 9U¸ LO o 0%b)dÓ O 5 à VO %gZQG !• SR@L%QL W LD DB„p ¢ € EL„R UbH" P HG VU DW W L@ ZL K L F K K
KDV WKH SRWHQWLDO WR SROOXWH QHDUE HV VU F Q H Z D G G 3 $ V Q > L Q J V X S S O L H F D
EHFRPH GHWULPHQWDO WR KXPDQ XWLOLWLQ U W W U H V H G E F @ X V K R V H G H
LPSDFWV FDQ ODVW GHFDGHV EHFDXVH RIXW H R U L D Q L F R O X
PDQ IHDUV ZKHUH LW LV VORZO UHPRYHG E DWXUDO SURFHVVHV VXFK DV
PLFURELDO GHJUDGDWLRQ YRODWLOL]DWLRQ 5HPHGLDWLRQ RI VRLO ECNWDPLQDWHG
%LRUHPHGLDWLRQ RI WKHVH PROHFXOHV LV DQ HFRORJLFDOO\ VRXQG DSSURDFK WR
EHVW RSWLRQV WR UHVWRUH SHWURROHXP FRQWDPLQDWHG VRLO 7KLV LV
ELRUHPHGLDWLRQ SURFHVV LV ZLGHO\ EDVHG RQ &DQDGLDQ WHFKQLFDO
FRQWDPLQDQWV +RZHYHU WKH HQ]\PDWLF FDSDELOLWLHV RI ERDWHULD DUH
OLPLWHG E\ HQYLURQPHQWDO FRQGLWLRQV VXFK DV S+ WHPSHUDWXUH DQG
HWDO LRQV DQG FRQVHTXHQWO\ UHFDOFLWUDQW FRPSRXQGV RU WRIL
SURGXFWV UHDLQ LQ WKH VRLO > @ 7R RYHUFRPH WKLV GUDZEDFN IXQJL
H IRXQG WR KDYH FDSDELOLW\ WR GHJUDGH PROHFXOHV VXFK DV
O\DURPDWLF DQG FKORULQDWHG QLWURDURPDWLF SUHY LRXVO\ WKURXJKW WR EH
GOLFXOW WR HIIRUW WR ILOG WHFKQLFDO D
HQYLURQPHQWDO LVVXH W LV H[SHGLHQ
ELRGHJUDGDWLRQ RI 3$+V XVLQJ IXQJ
FRQWDPLQDWHG ECA0 UP%°0ð P%°

RI WKH Q€`€ À.€4ð$%ZðWIWR HQ€Pðp°€4ð•
ECAtðVSLO<O_p €ð Ā tð p tðNJUVFR RLO_X
RI 20 IRU 20 UHIYWDO 20 @ UR[S20 \DHFRQWDPLQDV

*3OHXURWXV RYDWUL EDVLGLRPLFHWHV ZD
FKRLFH RI WKLV IXQJXV LV GXH WR LWV FD
RI ZDVWHV $OVO LW KDV DQ DGYDQWDJH
WHPSHUDWXUHV HVSHFLDOO\ LQ WKLV WHP

WKH WRWDO 3$+V FRQFHQWUDWLRQV DQG WKH VRLO RUJDQLF FRQWHQWV VKRZH
SRVLWLYH H[SRQHQWLDO UHODWLRQVKLSV ZLWK VRLO RUJDQLF
LPSOLHV WKDW KLJK DPRXQWV RI 3$+V PDLQO\ RFFXU LQ VRLO ZLWK KLJK
RUJDQLF FRQWHQW

&RQFOXVLRQ

%HHQ6LVK,PUDQ + 0RKDPPHG $$ +DELE 1 %RKHU 3.' %XUQV :$ 3DJH '6 %HQFH $(0DQ
'LVWULEXWLRQ WR[LFLW\ OHYHO DQG FRQ7RWDOLDWLRQ RI FDUE\RQ DQ DPSRDWDF
K\GURFDUERQV 3$+V LQ VXUIDFH VRLO DQG JURFXQGZDWHU RI 5DZQJHSLSQGLQWLQJ (QY
3DNLVWDQ 'HVDOLQDWLRQ DQG :DWHU 7UHDWPHQW
%DXP3DU%XG]LQVNL + 0LFKRQ 4 *DUULJXHV 3 %XUJHRW 7 HW DO
2ULJLQ DQG ELRDYDLODELOLW\ RI 3$+V LQ WKH 0HGLWHUUDQHDQ 6HD IURP PXVVHO
DQG VHGLPHQW (VWXDULQH &RDVWDO 6KHOI 6FLHQFH