

# 3KDUPDFRORJ\ RI 0DULMXDQD

7KHUVLOOD 2EHUEDUQVFKHLGW 0LOOHU  
&HQWUDO 0LFKLDQ 86\$  
&(2 RI +HDOWK \$GYRFDWHV 3//& (DVW /DQVLQJ 0, &OLQLFDO 3URIHVVRU RI 3V\FKLDWU\ 'HSDUWPHQW  
\*HRUJLD 86\$  
&RUUHVSRRGLQJ 2EHUEDUQVFKHLGW 'HSDUWPHQW RI 3V\FKLDWU\ &HQWUDO 0LFKLDQ 8QLYHU  
5HFHLYHG 100% \$FFHSWHG'GDPHEHU 3XEOLVKHG GDWH 'HFHPEHU  
&RSULJKW < 2EHUEDUQVFKHLGW 7 HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQG  
XQUHVWULFWHG XVH GLVWULEXWLRQ DQG UHSURGXFWRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO D

\$EVWUDFW

7KH ROORZLQJ UHYLHZ RI OLWHUDWXUH UHJDUGLQJ WKH SKDUPDFRORJ\ RI PDUL  
DQG SK\VLFD SKDUPDFRORJLFD HHHFWV 0DULMXDQD UHUV VSHFLILFDOO\ W  
FDQQDELV' WKH QDWXUDO IRUP RI FDQQDELV VORWKHG WHP WKH PDULMXDQD  
ZRUG FDQQDELV RU KHPS

.HIZRUGV 0DULMXDQD H 730V\HQW &DQQDELV

## ,QWURGXFWRQ

0DULMXDQD FRQVLVW RI PRUH WKDQ FRPSRQHQWV DQG  
SKDUPDFRORJLFD\ DF\WZRH FDQDELVLEHG  
FDQQDELQRLGV DUH 7+& DQG FDQQDELGLRO &%' 0RVW RI WKH RWKHU  
FRPSRXQGV DUH QRW \HW XQGHUVWRRG DQG WKHLU PHQWDO DQG SK\VLFD  
HvHFW\ XQNQRZQ > @

0DULMXDQD LV KLJKO\ OLSRSKLOLF ZKLFK OHGTV WR LWV VWRUDJH LQ DGLSRV  
WLVVXH OLYHU PXVFOH DQG VSOHHQ DQG UHGLVWULEXWHG LQWR WKH XVHUV E  
VWUHD\ 0DULMXDQD %HFDXVH RI WKH SHUVLVWHQFH LQ WKH ERG\  
PDULMXDQD FDQ FDXVH KLJKO\ SRVHW PHQWDO SK\VLFD DQG WR[LF  
WKH XVHUV WKDW DUH KDUG WR FRQWURO RU SUHGLFW > @

,Q DGGLWLRQ 0DULMXDQD FDXVHV GHSHQGQHFH WROHUDQFH DQG DGGLFWLRQ  
H DWWHPSW WR GLVFRQLQXH LWV XVH FDXVHV ZLWKGUDZDO V\PSWRPV  
FRVLVWLQJ RI DQ[LHW\ GHSUHVLRQ GHFUHDVHG DSSHVLWH KHDGDFKHV  
LQVRPLD LUULWDELOLW\ PXVFOH WHQVLRQ QDXVH QLJKWPDUHV DQG  
XQSOHDVDQW YLYLG GUHDPV > @

## &KHPLVWU\ RI 0DULMXDQD

0DULMXDQD DV XVHG LQ WKH JHQHUDO SRSXODWLRQ IRU VPRNHG  
FRQVXPSWLRQ LV DQ &HQWUDO FDUWVHESQW  
,W FRQVLVW RI PRUH WKDQ FRPSRQHQWV DQG PRUH WKDQ  
SKDUPDFRORJLFD\ DF\WZRH FDQDELVLEHG  
FDQQDELQRLGV LQ PDULMXDQD DUH GHOWD WHWUDK\GURFDQQDELQRO 7+&  
DQG FDQQDELGLRO &%' > @ &%' GRHV QRW SURGXFH DQ\ RI WKH  
SV\FKRDFWLYH UHVSRRQHV DQGHVSRVUWR EORFN VRRP RI WKH  
7+& E\ DFWLQJ DV DQ DQWJRQLVW DW WKH FDQQDELQRLG UHFHSWRUV > @



S\URO\VLV GXULQJ VPRNHVHFKNRIPLFDULM XLQFQ XGH  
GLvHUHQW

IROG FRQFHQWUDWLRQ LQ PLON FRPSDUHG WR WKH PRWKHUdV SODVPD OHYHO >  
7DEOH

2YHUDOO &OHDUDQFH UDSRWH RI H[FUHWLRQ	&RQMXJDWLRQ	3ULPDU\ PHWDEROLWHV
:RPDQ / K )HFHV	+HSDWLF ZDWHU VROXEOH PHWDEROLWH DIWHU FRQMXJDWLRQ ZLWK JOYFXURQLF DFLG 2+ 7+&	
0HQ / K 8ULQH	5HQDO 7XEXODU UHDEVRSWLRO DQG ORZ UHQDO H[FUHWLRQ RI WKH XQFKDQJHG GUXJ 7+ & 22+	

ODULMXDCHPMKH VDPH UHZDUG VIVWHPV LQ WKH EUDLQ DV DOFRKRO  
FRFDLQH DQG RSLVRIUZHQWQ @ZRODULMXDQD LQGXFHV WKH  
UHOHDVH RI HQGRUSKLQV LQ WKH EUDLQ IURP WKH QXFOHXV DFFXPEHQV DQG WK  
RUELWR IURQWDO FRUWH[ ZKLFK SURGXFH WKH IHOLQJ RI SOHDVXUH DQG  
UHZDUG (QGRUSKLQV DUH KRUPRQHV WKDW DUH QDWXUDOO\ SURGXFHG LQ WKH  
EUDLQ WKDW KDWYMHDFW BSGRLVGLRQNDULMXDQD DFWV DV D  
GRSDPLQH DJRQLVW LQ WKH EUDLQ VWLPXODWLQJ UHLQIRUFHPHQW UHJLRQV LQ  
WKH PHVR WHOHQFHSKDOLF GRSDPLQH '\$ VIVWHP > @

'XH WR WKH GHYHORSLQJ WROHUDQFH JUHDWHU DPRXQW RI FDQQDELV DUH  
UHTXLUH G RYHU WLPH HWRHFWSHUDHQQFHWRKFDVQDFELV  
RFFXUV LQ UHODWLRQ WR PRRG SV\FKRPRWRU SHUIRUPDQFH VOHHS DUWHULD  
SUHVXUH ERG\ WHPSHUDWXUH DQG DQWLPHPHWLF SURSHUWLHV > @

,Q DGGLFWLYH XVH DWWHPSWV DUH PDGH WR FXW EDFN RQ WKHLU XVH DQG D  
JUHDW DPRXQW RI WLPH LV VSHQW WR REWDLQ WKH GUXJ 'XULQJ SHULRGV RI  
DEVWLQHQQFH WKH XVHU LV H[SHULHQFLQJ FUDYLQJV RU D VWURQJ GHVLUH WR  
FDQQDELV > @

:LWK GLVFRQWLQXDWLRQ RI WKH XVH RU LQ EHWZHHQ GRVHV ZLWKGUDZDO  
V\PSWRPV RFFXU 6\PSWRPV RI PDULMXDQD ZLWKGUDZDO DUH FRQVLVWHQW RI  
DQ[LHW\ GHSUHVLRQ GHFUHDVHG DSSHVLWH KHDGDFKHV LQVRPQLD  
LUULWDELQW\ PXVFOH WHQVLRQ QDXVHD QLJKWPDUHV DQG XQSOHDVDQW YL  
GUHDPV > @

,Q HDUOLHU VWXGLHV LW ZDV GHVFULEHG WKDW V\PSWRPV RI ZLWKGUDZDO VWD  
DVHUK DQG UHWXUQVQVJ VFDV, BOWQH UHFHQW VWXGLHV  
WKH ZLWKGUDZDO WISLFDQO\ RFFXUUHG EHWZHHQ GDIV DQG SHDNV EHWZHHQ  
GDIV 0RVW LQWR[LF BWHLEWVHQGDZLWKGJUDZDOR  
GDIV GSHQGLQJ RQ WKH IUHTXHQF\ RI XVH GRVH DQG URXWH RI  
DGPLQLVWUDWLRQ > @

LVORQJ GDMWFO J&0p À ÀVWUDWL DQG D



\*XQGHV'VHQUJHQQVHQ 1 \$QGHUVVRQ \$0 %DQJH\$PEHURJHONOSHUVVHHDQ 6' \$[HOURG - .RSL  
\$VVRFLDWLRQ EHWZHHQ XVH RI PDULMVDQDHDQGRPDOWKHWHSGLRGSRFVWVWLRQ DQG  
KRUPRQHV DQG VHPHQ TXDOLW\ \$ VWXG\ DPHQWUDK\GKURDQVQDERXQDRLQOPDQ 6FLHQFH  
\$P - (SLGHPLRO +ROOLVWHU /(.DQWHU9HUL}FRWDEGDDWRDU  
+DUFOHURGH (QGRFHEH/V PDULMXDQD LQ WOLJKRDOXVHUV RI FDQQDELV 'UXJ \$OFRKRO  
3UHFOLQLFDO VWXGLHV 1,'\$ 5HV 0RQRJU H 6XEVWDQFH \$EXVH DQG 0HQWDO +HDOWK  
(OOJUHSDQR 60 +XUG </ \$GROHVFHQW FDQQDELV H[SRVXUH  
DOWHUV RSLDWH LQWDNH DQG RSLRLG OLPELF QHXURQDO SRSXODWLRQV LQ DGXOW UDV  
1HXURSV\FKRSKDUPDFRORJ\  
1RFRQ :LWWFK3)QW+BU=LPPHUPDQQ 3 /LHE 5  
'HSHQGHQFH V\PSWRPV LQ \RXQJ FDQQDELV XVHUV" \$ SURVSHFWLYH  
HSLGHPLRORJLFDO VWXG\ - 3V\FKLDWU 5HV

7KLV DUWLFOH ZDV RULJLQDOO\ SXEOLVKHG DQD VSHFLDO LVVXH HQWLWOHG  
&OLQLFDO 5HVHD\GELWH3RELIRUPDQ 6 0LOOHU.