

|        |   |     |
|--------|---|-----|
| OsVIR  | MGRPEPVVLFQAQTI LHSQ LDEYVDEVLFSEPVVITACEFLEQNASPSTPNISLVGATSP  | 60  |
| AtVIR  | MVRSEPCVLFQAQTFVHPQLDEYVDEVIFAEPVITACEFLEQNASSSSQAVSLVGATSP   | 60  |
| GhVIRA | MGRPEPCVLFSAQTFVHTHLDEYVDEVLFSEPVVITACEFLEQNASSASQAVSLVGATSP  | 60  |
| GhVIRD | MGRPEPCVLFSAQTFVHTHLDEYVDEVLFSEPVVITACEFLEQNASSASQAVSLVGATSP<br>* * * * * : * : * * * * * : * : * * * * * : * : * * * * *     | 60  |
| OsVIR  | SFALEV FVHCDGESFRRLCQPFLYSHSSSNVLEVEFNGPYSSSEATAIAAFSMFVLFYQ  | 120 |
| AtVIR  | SFALEV FVRCEGESKFKRLCNPFLYTPSAPYPLEVE-----  | 96  |
| GhVIRA | SFALEV FVQSEGETRFRRLCQPFLYSHSSSNVLEVE-----  | 96  |
| GhVIRD | SFALEV FVQSEGETRFRRLCQPFLYSHSSSNVLEVE-----<br>* * * * * : * : * * * * * : * : * * * * *                                       | 96  |
| OsVIR  | AIVTNHLVLRGTYSRLTLVIYGNTAEDLGQFNIELDLHSLANVSSPSEGKLEDLPPAL  | 180 |
| AtVIR  | AVVTNHLVVRGSYRSLSLVIYGNIVKDLGQYNIILEGR-SVTDI-VSSTEGNLEDLPLVL  | 154 |
| GhVIRA | AVVTNHLVVRGSYRSLSLVIYGNIAEDLGQFNIEFDDS-SLTNL-VGSADGKLEDLPLPL  | 154 |
| GhVIRD | AVVTNHLVVRGSYRSLSLVIYGNIAEDLGQFNIEFDDS-SLTNL-VSSADGKLEDLPLPL<br>* : * * * * * : * : * * * * * : * : * * * * * : * : * * * * * | 154 |
| OsVIR  | HSSKFTFEESLSSLKPLSLQATELDLSEVKKILLALTMYPNENLIPNLQSAVISA   | 240 |
| AtVIR  | HSVNRTIEECLSSLDIVSLPLAAVDLPVEVKRLQLLLKIFDKLATNDVNVKFVDTVVSG   | 214 |
| GhVIRA | RAFNRFTFEESLSSNLVSLPVVTLDLSEVEKQLLQQLKILELPNLGHEVHKVHTLALA  | 214 |
| GhVIRD | CAFNRFTFEESL-SLNLVSLPVVTLDLSEVEKQLLQQLKILELPNLGHEVHEVVHTLALA<br>: : * : * * * * * : * : * * * : * : * : * : * : * : * : *     | 213 |
| OsVIR  | VLKYPASTNCSRNWRNPANCFAE-DNVDSQGTSENTLMEASNELFDIWK-----  | 292 |
| AtVIR  | VSSVYTDNVDFFLKNK-----NCSAVTSSLD-SGLFHDIVDRVKEDILDNL-----EIQ   | 262 |
| GhVIRA | AASFVTFDLESNAINQ-----KHLTSGRNKDFKELNHGIS-EARKELLELYETLQRKSTN  | 268 |
| GhVIRD | AASFVTFDLDNAINQ-----KHLTSGRNKDFKELNHGIS-EAKELLELYETLQRKSMN<br>* : : * : * : * : * : * : * : * : * : * : * : *                 | 267 |
| OsVIR  | -----VNSIVDNITFDDNGLAFRLEELPTTKHLF-----   | 321 |
| AtVIR  | ESDVALGLFSFLESETYLATSQQLVVMLSPYIQFERDSLCTVLPKLSKGKATLLGLSLAF  | 322 |
| GhVIRA | KSSESLTECIFMESDADLASSKQLVEMLSPCFHFNRSSSNFGHGQLPESKNVILGLNVAL  | 328 |
| GhVIRD | ESSESLTECIFMESDADLASSKQLVEMLSPCFHFNRSSSNFGHGQLPESNNVILGLNVAL<br>* : : * : * : * : * : *                                       | 327 |
| OsVIR  | ---TLFDSCFPYRNCSSLLDLECFQ-----  | 344 |
| AtVIR  | LLCSGREGCLQFVNVSGGMDQLVYLFHGDGQNSTTITLLLLGVVEQATRHSVGCCEGLGWW   | 382 |
| GhVIRA | FLCSTKESCFHFVNCGGMDQLAYLFDHQTQNSITITLLLLGVIEQATRHSVGCCEGLGWW  | 388 |
| GhVIRD | FLCSAKESCFHFVNCGGMDQLAYLFDHQMNSITITLLLLGVIEQATRHSVGCCEGLGWW<br>: : * : * : * : * : *  | 387 |
| OsVIR  | -----PLVDL-----QSAVVNIVSN   | 359 |
| AtVIR  | PREDGIPSGKSEGYCLLLKLLMQKPCHEIASLAIYILRRLRIEYISRYEFAVLSALEG  | 442 |
| GhVIRA | PREDENIPSGTSDGYSYLLKLLQKPRHDVASLATYILHRLRFYEYISRYESEILSILGG   | 448 |
| GhVIRD | PREDENIPSGTSDGYSYLLKLLQKPRHDVASLATYILHRLRFYEYISRYESEILSILGG<br>* : : * : * : *  | 447 |
| OsVIR  | LPS-EELSSDGVNFLSSASIELAELLKMINMCVPIEDPSPVLTARRICKFGHLEGLLSYN  | 418 |
| AtVIR  | LSNSHGAAATHNLMNSDAKSQQLKLQNLMSKLSGVEDPSPSAYASRLVSDHSEGLSYK  | 502 |
| GhVIRA | LSATTKGNTAASNKLRGVGSLLKLLHLVISHGPIEDPSPVAHASRYFILGQTDGLVSYN   | 508 |
| GhVIRD | LSATTKGNTVASNKLRGVGSLLKLLHLVISHGPIEDPSPVAHASRYFILGQTDGLVSHK<br>* : : * * : * : * : * : * : *                                  | 507 |
| OsVIR  | LTIGLITSSKYSFLQFDADPYMLSLIQEDASGNLERRELVGPTGHTLPMRAPATHAYSS   | 478 |
| AtVIR  | ATSKLTSSWTCPFYSSGIDSHILALLKERGFPLSAALLSMPELH-----   | 547 |
| GhVIRA | ATSGLIASSNCCFSDWEIDLHLLALLKDRGFPLSAALLSTTVLH-----   | 553 |
| GhVIRD | ATSGLIASSNCCFSDWEIDLHLLALLKDRGFPLSAALLSTTILH-----<br>* * : * : * : * : * : *  | 552 |
| OsVIR  | SAPTTLCPCLPESSSGGILPAPPSFNPCRCDKPSSDVAHGTPAIPHYCLLSADGLSFL  | 538 |
| AtVIR  | -----SKV-----GDMVDFTDIAMFIGNIILSFMFSRTGLSFL   | 581 |
| GhVIRA | -----SEA-----ADVVDTSLEIVSSIGSIILSLLFCRSGLVFL  | 587 |
| GhVIRD | -----SEA-----ADVVDTSLEIVSSIGSIILSLLFCRSGLVFL<br>* : : * : * : *   | 586 |
| OsVIR  | LGQPEATELILSLQDGEDMSKTECMTLRQAFVLLSKGFFCRPQEVAMITELHLKVEHSL   | 598 |
| AtVIR  | LHHPELTATIIQSLKGSVDLNKEECVPLHYASTILSKGFTCSLLETGINLEMHLRVVSAV  | 641 |
| GhVIRA | LHQPDLTATLIALKGADAMNKEECVPLRYASVLSKGFTCNPQEVGIIVETHLRVVNAI  | 647 |

[illegible]

|        |   |      |
|--------|---|------|
| OsVIR  | -CRGAVTSIFSQIQTSNKDESQKSESEITCH-----DTSKVDNWCGFFLLKCWKRLQLQY                  | 1288 |
| AtVIR  | GQDGLVSLFLHFLS-GTEES--VSERWCD--TNSLSLDQLDMKNPPFLSCWIKLLNS                     | 1347 |
| GhVIRA | GCNALLSALLNSSS-STHDE--LESERGNEKNVNFHFLNESEWRKSPPLCCWIKLLKS                    | 1360 |
| GhVIRD | GRNALLSALLYSSS-STHDE--LESERGNEKNVNFHFLNESEWRKSPPLCCWIKLLKS                    | 1359 |
|        | . : : : . . . : . . . . . : * : * * * : * :                                   |      |
| OsVIR  | ICANR-PTDYLVEIVYALTLAGIALSQSQGNLE--GTIILRRLFGHPSVSPSSSEASDEVT                 | 1345 |
| AtVIR  | INSKDGLSSLAMKAVNVLSVGSIRLCLDGKSLDSKKVAALKSLFGLPSEFSGTDTFREEN                  | 1407 |
| GhVIRA | IDSKDHLPSTYLEAANVLSLGTGFCMGGNSLMNSVVALKFLFGLPDDTAGIGGFPEDN                    | 1420 |
| GhVIRD | IDSKDHLPPTYLEAANVLALGTGFCMGGNSWMNSVVALKFLFGLPDDTTGIGGFPEDN                    | 1419 |
|        | * : : : : . . * : : : : . . * : . : . * : * * * * . : . * .                   |      |
| OsVIR  | F-LLKTFQEKICQ--GFDNW-SPYVGKPLLHQVRSSVRLLCSEIENS GPFTDSVRMVL                   | 1400 |
| AtVIR  | IGLIEQMTLLSSMTSGSDSS-ATAEMKPYLHEASQLLS--LL--K-----                            | 1449 |
| GhVIRA | IKYIQEFSTLLSSRIDNDEYQTSSDIHSMHQVSESVKSLLLLFQNLTA-----                         | 1470 |
| GhVIRD | IKYIQEFSTLLSSRIHNDEYQTSSDIHSMHQVSESVKSLLLLFQNLTA-----                         | 1469 |
|        | : : : : : . . . : . : : : : * : . * : : : :                                   |      |
| OsVIR  | ESTIPVGVFHNIVMTSHLMPSIDFVSVNDPALLFTNAWKAFGDFAE---PFGCQVSDFS                   | 1457 |
| AtVIR  | ---DGNIDDIISCKGVF-----VSPGNLMDDLVSRNIEDDLYQRGLE                               | 1489 |
| GhVIRA | ---AVEVDDAILYGGLSFPQNN-VQ-----VPSGIQHFQGGLDGKADDSLYSGGFE                      | 1517 |
| GhVIRD | ---AVEVDDAILYGSLSFPQNN-VQ-----VPSGIQHFQGGLDGKADDSLYSGGFE                      | 1516 |
|        | : . * . . . . : : . : . : . : . :   |      |
| OsVIR  | KRMWELPDCSIDKQLIPSQSARRKLALGDSASRRVRDNQTH--EPGQGFSGRLNTPSA                    | 1514 |
| AtVIR  | DKFWWCEPETLPERLPQSSLPKRRKLPTLESSRRRAKGENSSVDIPTQNSIQRGMGVSLS                  | 1549 |
| GhVIRA | DKFSWELPETLPGRLLQTALPTRRKLQAADSANRSARGDNSVAEITNPTAFQRLGPSTA                   | 1577 |
| GhVIRD | DRFSWELPETLPGRLLQTALPTRRKLQAADSANRSARGDNSVAEITNPTAFQRLGPSTA                   | 1576 |
|        | . : : * * * : : : : * * * : * : . * : : : : : . * * : . :                     |      |
| OsVIR  | SIGHTRRDTFRQRKPNTSRPPSMHVDDYVARERNIEGASSASNIVSSTPRGALSGRPPSI                  | 1574 |
| AtVIR  | PPAPTRRDAFRQRKPNTSRPPSMHVDDYVARERSVDTAGNS-NAITISRAGSSSGRPPSI                  | 1608 |
| GhVIRA | SSGTTRRDSFRQRKPNTSRPPSMHVDDYVARERSVDGVSNNS-NVIAVPRVGSSSGRPPSI                 | 1636 |
| GhVIRD | SSGTTRRDSFRQRKPNTSRPPSMHVDDYVARERSVDGVSNNS-NVIAVPRVGSSSGRPPSI                 | 1635 |
|        | . * * * * : * * * * * * * * * * * * * * * * : : . . . : * : : * : . * * * * * |      |
| OsVIR  | HVDEFMARQRRERQNPVLAPS--GDATQVRSKATLDDNVSTKPEKPRQPKADLDDD-QEIN                 | 1631 |
| AtVIR  | HVDEFMARQRRERGQNPSTIVVGEAVVQVKNPTPARD-TERVAGKPKQFKADPDDDLQGLD                 | 1667 |
| GhVIRA | HVDEFMARQRRERQNPAAAGT--ETATQSKNAAPINGPDNEKVNKSKQLKSDLDDDLQGLD                 | 1694 |
| GhVIRD | HVDEFMARQRRERQNPAAAGT--ETAAQSKNAAPINGPDNEKVNKSKQLKSDLDDDLQGLD                 | 1693 |
|        | * * * * * : : : . . * : . : . . * : * * * * * * * *                           |      |
| OsVIR  | IIFDEE--SGSDDKLFPFPQDDSLQS-PPVIIGENSPGPVVDETENQQNGINLFSGTVV-                  | 1687 |
| AtVIR  | IVFDGEECEGPDCLKPFLQPDENLMQAPVMVEQNSPHSIVEETESDANGSSQFSHMGTP                   | 1727 |
| GhVIRA | IVFDGEESE-TDDKLFPFPQDDNLQQLAPVIFEQSSPQSVVEETESDVNGSSQFSHMATP                  | 1753 |
| GhVIRD | IVFDGEESE-TDDKLFPFPQDDNLQQLAPVIFEQSSPQSVVEETESDVNGSSQFSHMATP                  | 1752 |
|        | * : * * * . * * * * * * * : . * . * * : . : * * : * : * * : * * . * * .       |      |
| OsVIR  | --SESDEACETVISSQT-----AIRQESNIPSERKFSVSSPEKVMFPDHADESPFISP                    | 1738 |
| AtVIR  | VASNVDENAEQSEFSSRISVSRPEMSLIREPSISSDRKFVEQADEAK-----KMAPLKS                   | 1780 |
| GhVIRA | LASNADENAEQSEFSSRMSVSRPEMSLTREPSVSSEKKIFEQSDDSK-----NAVSIKN                   | 1806 |
| GhVIRD | LASNADENAEQSEFSSRMSVSRPEMSLTREPSVSSDKKFFEQSDDSK-----NAVSIKN                   | 1805 |
|        | * : * * : : : : * * : : : * : . : : : : : : :                                 |      |
| OsVIR  | TTGLKVIPGYSTHA-----AQ-----ATLRQLPPNMHRKRSPHKLAESSVSSGSH                       | 1783 |
| AtVIR  | A-----GISESGFIPA--YHMPGSSGQNSIDPRVGPQGFYSKSGQQHTGHIHGGFSGR                    | 1831 |
| GhVIRA | SSGFDSASGTNSSGFSAPIYSNTPATSVQLSLDSRITPQNFYPKSSAQYAGNIPVAAGSR                  | 1866 |
| GhVIRD | SSGFDSASGTNSSGFSAPIYSNTPATSVQLPLDSRITPQNFYPKSSAQYAGNIPVAAGSR                  | 1865 |
|        | : * . . . . * * : : * . : . . . . :   |      |
| OsVIR  | -GHDRTLYNSQPPLPPMPPVSSTSLQNPDISIQRQPSSYIARDGPPPPPPSYLMQSFDAC                  | 1842 |
| AtVIR  | GVYEQKVMPNPQPLPLVPPPSV-SPVIPHSSD-----S-----                                   | 1863 |
| GhVIRA | GMVELKVLPNQPLPPMPPPTILPVQSDYLS-----SVSGSPS----LLQSS----                       | 1910 |
| GhVIRD | GMVEQKVLPNQPLPPMPPPTILPVQSDYLS-----SVSGSPS----LLQSS----                       | 1909 |
|        | : : . : . * * * * * * * : : : *   |      |
| OsVIR  | MPSFVGHQVQTENVLPTSGDSSSNALPSVDAKFLWSTLPVNRIPMEHLSSGSSTRPVSP                   | 1902 |
| AtVIR  | -----LSNQSSPFISHG-----TQSSGGPTRLMPPL  | 1889 |
| GhVIRA | -----IPVSDSKFMRTS-----MPSPSGTTRPPPL   | 1936 |

|        |   |      |
|--------|---|------|
| GhVIRD | -----IPVSDSKFMRTS-----MPSPSGTTRPPPSL<br>: .: *: * . . ** *  | 1935 |
| OsVIR  | PLRPVLATQH----AAMDSGPPGSLYNQGGSGVLQPSP-PASLINDATLGTPASGGAL  | 1956 |
| AtVIR  | PSAIPQYSSNPYASLPRTSTVQSFQYNHAGVGTTEQQ--QSGPTIDHQS--NLSVTGM  | 1945 |
| GhVIRA | PSTPAPFASSPYNLASLNTSASQPALYNQSGMGKTELPGSIGPTIDARL---PTSAAGL   | 1993 |
| GhVIRD | PSTPPPFASSPYNLASLNTSASQPALYNQSVMGKTELPGSIGPTIDARL---PTSAAGL<br>* :. * **: * : . * * . :                   | 1992 |
| OsVIR  | ASNSLPSLASQYIIGRPSTP--PFFGTPLQIQLSSG----LAQSVSNPQPS-----LS  | 2003 |
| AtVIR  | TSYPPPNLMPSHNFSRPSLPVPFYGNP--SHQGGDKPQTMLLVPSIPQSLNTQSIQPLP   | 2003 |
| GhVIRA | ASYPPPLMQSLVFNRPSPVTPYGTSPALHQGENHPPGILQNPSIPQSSMQT-I--HS   | 2050 |
| GhVIRD | ASYPPPLMQSLVFNRPSPVTPYGTSPALHQGENHPPSILQNPSIPQSSMQT-I--HS<br>:* * * . :. **: :*: : . . : * **             | 2049 |
| OsVIR  | SMQ--P-RAPPPPPQPHPSQTFQGSLLQPPQEQ---PMPYPLN-----TIQPQVPL  | 2048 |
| AtVIR  | SMQLSQLRPMQPPQHVRPP--IQISQPSEQVSMQNPFQIPMHQMQLMQQTQ--VQPY   | 2058 |
| GhVIRA | LNQLQKLQRPLLPTQHLRPS--MQSSQLEQVSSQTPVQMQLQSLPMMHQAHSVNPY  | 2108 |
| GhVIRD | LNQLQKLQRPLQPTQHLRPS--MQSSQLEQVSSQTPVQMQLQSLPMMHQAHSVNPY<br>* : * * : : * : * * * * . : *                 | 2107 |
| OsVIR  | Q---FPNQLHVPQLQFYHQTQESVLQPTIGQSAQQQMDSGMNLNHFSSPEAIQSLLSDRD  | 2105 |
| AtVIR  | YHPPQQQEISVQVQQQHHHA---VQGGQGAGTSQQQESGMSLDYFKSPEAIQALLSDRD   | 2115 |
| GhVIRA | YQPQQP-EFSAAQQMQVELAQQAAPPQTGGTSQQQDSGMSLHEYFQSPEAIQSLLRDRE   | 2167 |
| GhVIRD | YLPQQP-EFSAAQQMQVELAQQAAPPQTGGTSQQQDSGMSLHEYFQSPEAIQSLLRDRE<br>: : * * . . . ** :***. *: . :*.*****:* **: | 2166 |
| OsVIR  | KLCKLLEQNPKLMQMLQDRIGQL   | 2128 |
| AtVIR  | KLCQLLEQHPKLMQMLQEKLGL  | 2138 |
| GhVIRA | KLCQLLEQHPKLMQMLQVQFLH-   | 2189 |
| GhVIRD | KLCQLLEQHPKLMQMLQVQFLH-<br>***:***:***** : : :  | 2188 |

Figure S1 Amino acid sequence alignment of four plant VIR proteins. Amino acid sequences are aligned by clustal omega server. Identical amino acids are shown in asterisk, and similar amino acids are shown by dot or double dot. The four domains was shaded by four colors. AtVIR: Arabidopsis VIRMA, GhVIRA: *Gossypium hirsutum* VIRMA-A, GhVIRD: *Gossypium hirsutum* VIRMA-D, OsVIR: *Oryza sativa* VIRMA.

|        |  |     |
|--------|--|-----|
| AtVIR  | —MVRSEPCVLFAQTFVHPQLD—EYVDEVIFAEPVITACEFLEQNAS—SSSQAVSLV       | 54  |
| GhVIRA | —MGRPEPCVLFSQTFVHTHLD—EYVDEVIFAEPVITACEFLEQNAS—SASQAVSLV       | 54  |
| GhVIRD | —MGRPEPCVLFSQTFVHTHLD—EYVDEVIFAEPVITACEFLEQNAS—SASQAVSLV       | 54  |
| DmVIR  | MADVDDGSELFFDFTFSHEEVT—DINLDLVQFPKPVFITQVRIIPLGARVQADFPGGVRL   | 59  |
| HsVIR  | —MAVDSAMELLFLDTFKHPSAEQSSHIDVVRFPVYINEVRVIPPGVRAHSSLPDNRAY     | 59  |
|        | :**:** * :* * * * . . :  |     |
| AtVIR  | GATSPPSFALEVVRCEGES—KFKRLCNPFLYTPSAP—YPLEVEAVVTNHLVVRGSY       | 109 |
| GhVIRA | GATSPPSFALEVVRQSEGET—RFRRLCQPFLYSHSS—NVLEVEAVVTNHLVVRGSY       | 109 |
| GhVIRD | GATSPPSFALEVVRQSEGET—RFRRLCQPFLYSHSS—NVLEVEAVVTNHLVVRGSY       | 109 |
| DmVIR  | GATNPSKFDLEFFVNDLGMPAASAFENLGL—LRYNQNDCIHLDCSQEKIVTDGLVLRGWY   | 118 |
| HsVIR  | GETSPHTQLDLFFNNVSKPSAPVFDRLGS—LEYDENTSIIIFR—PNSKVNTDGLVLRGWY   | 117 |
|        | * * . * * . * . * . * : * . . : * : ** : ** *                  |     |
| AtVIR  | RSLSLVIYGNIVKDLGQYNI-----LEGRSVTDIV                            | 140 |
| GhVIRA | RSLSLVIYGNIAEDLGQFNIE-----FDDSSLTNLV                           | 140 |
| GhVIRD | RSLSLVIYGNIAEDLGQFNIE-----FDDSSLTNLV                           | 140 |
| DmVIR  | STITLAIYGIFTSVTEPIASPTLPCEPVGPEIANLSGEVLLQEDVLKDEWQEPMAQELL    | 178 |
| HsVIR  | NCLTLAIYGSVDRVISHDRDSPPPPPPPPPPPQPPSL---KR-----NPKH---         | 161 |
|        | : : * : ** . : .   |     |
| AtVIR  | SSTEGNLEDPLV-----LHSVNRITIE-----CL                             | 165 |
| GhVIRA | GSADGKLEDPLP-----LRAFNRTFEE-----SL                             | 165 |
| GhVIRD | SSADGKLEDPLP-----LCAFNRTFEE-----SL                             | 165 |
| DmVIR  | TAHKGNSDYDPEDMEYGMSRDHYHQHAEQEQREMRRLRSTHSTDHSPPPRRSHTHS       | 238 |
| HsVIR  | -----ADGEKEDQFNGSPPR-----PQPRGPRTPPGPPPPDDDED---               | 196 |
|        | : .  |     |
| AtVIR  | SSLDIVSLPLAAVDLPVEVKRLQLLLKIF----DKLATNDVVNKFVDTVVSGVSS---     | 217 |
| GhVIRA | SSLNVLSLPVVTLDLSVEVKQLLQMLKIL----ELPNLGHEVHKVVHTLALAAAS---     | 217 |
| GhVIRD | —SLNVLSLPVVTLDLSVEVKQLLQMLKIL----ELPNLGHEVHEVVHTLALAAAS---     | 216 |
| DmVIR  | ESNDREYIRCSRDGSRDWSRSPEYSSHSRKRKRSERSRVVDEHKWPRTPPASIDS—PT     | 297 |
| HsVIR  | ---DPVPLPVSGDKEEDAPHR—EDYFEPISPD---RNSVPQEGQYSDEGEVEEEQEE      | 247 |
|        | : : . : :  |     |
| AtVIR  | —YVTDNVDFLKNKNCSAVTSSLD—SG-----L-----                          | 243 |
| GhVIRA | —FVTFDLESNAINQKHLTSGRNKDFKE-----L-----                         | 244 |
| GhVIRD | —FVTFDLDSNAINQKHLTSGRNKDFKE-----L-----                         | 243 |
| DmVIR  | RPRSPDTMDYED—EDSRSHYKMQSSHYRHSSSLHRGERDRDDEDRSCTPQEQFEPIL      | 354 |
| HsVIR  | GEEDDDVDVEEEDEDDRRRTVDSIP-----EEEEEEEEEDEEGEGDDGYEQIS          | 302 |
|        | : : : . :  |     |
| AtVIR  | —FHDIVDRVKEDILDNL-----EIQESDVALGLFSFLESETYLATSQQLVVMLSPY       | 293 |
| GhVIRA | —NHGIS—EARKELLELYE—TLQRKSTNKSSSLTECIFMESDADLASSKQLVEMLSPC      | 299 |
| GhVIRD | —NHGIS—EARKELLELYE—TLQRKSMNESSESLTECIFMESDADLASSKQLVEMLSPC     | 298 |
| DmVIR  | SDDEIIIGDDEDDAVDAAAIAEYERELE---AAAAAAPPAIDAFE-----PWQKPL       | 402 |
| HsVIR  | SDEGDIADLERETF---KYPNFDVEYT---AEDLASVPPMTYDPYD-----RELVPL      | 348 |
|        | . * . . : *  |     |
| AtVIR  | IQFERDS-----   | 300 |
| GhVIRA | FHFNRSS-----   | 306 |
| GhVIRD | FHFNRSS-----   | 305 |
| DmVIR  | LVFEGDMAAHFCKELETLLKLLFKKLVL-----QTRCENVNAFSEEHGASVDEREQFVY    | 455 |
| HsVIR  | LYFSCPYKTTFEIEISRMKDQGPDKENSGAIEASVKLTELDDLRYREDRGAKWVTA---LEE | 406 |
|        | : *  |     |
| AtVIR  | -----LCTVLPKL-----S-----KG                                     | 311 |
| GhVIRA | -----SNFGHGQL-----P-----ES                                     | 317 |
| GhVIRD | -----SSFHGQQL-----P-----ES                                     | 316 |
| DmVIR  | LGEQLNNQLGYLAQHYKRRNFVLQOFFGNDELHLRQAANVLQIALSFQAACMQPPAFKI    | 515 |
| HsVIR  | IPSLIIKGLSYLQLKNTKQ-----DSLGLVDWTMQALNLQVALR—QPIALNV           | 453 |
|        | :  |     |
| AtVIR  | KATLLGLSLAFLLCSGREGCLQFVNSG—GMDQLVYLFHGDGQNSTTITLLLLGVVEQAT    | 369 |
| GhVIRA | KNVILGLNVALFLCSTKESCFHFVNCG—GMDQLAYLFDHQTQNSITITLLLLGVIEQAT    | 375 |
| GhVIRD | NNVILGLNVALFLCSAKESCFHFVNCG—GMDQLAYLFDHQMQNSITITLLLLGVIEQAT    | 374 |
| DmVIR  | RHKLKGARMAELLGSSEELFQHLLEKHKFDIFEAVFRLYHEPYMALSIKLQLLKAVYALL   | 575 |
| HsVIR  | RQLKAGTKLVSSLAECGA—QGVGTGLLQAGVISGLFELLFADHVSSSLKLNFAKALDSVI   | 511 |
|        | . * : . * . . : . . : : . * : . :                              |     |

|        |                         |   |                     |
|--------|-------------------------|---|---------------------|
| AtVIR  | RHSVGCCEGFLGWWPREDGSI   | PSGKSEGYCLLLKLLMQKPCHEIASLAIYILRRLRIYEVI      | 429                 |
| GhVIRA | RHSVGCCEGFLGWWPREDENIP  | SGTSDGYSYLLKLLQKPRHDVASLATYILHRLRFYEVI        | 435                 |
| GhVIRD | RHSVGCCEGFLGWWPREDENIP  | SGTSDGYSYLLKLLQKPRHDVASLATYILHRLRFYEVI        | 434                 |
| DmVIR  | DTRMGIEHFMGAK-----      | NNGYQMIVEAIKTAKLTRTKYALQAI IKKLHLWEGL         | 624                 |
| HsVIR  | SMTEGMEAFLRGRQN-----    | EKSGYQKLELILLDQTVRVVTAGSAILQKCHFYEVL          | 563                 |
|        | * * *:                  | ..** : : :                                    | * : : : : * :       |
| AtVIR  | SRYEFAV-----            | LSALEGLSNHGAATHNLNMLS-----DAKSQLQKLQNLMKSLGS  | 476                 |
| GhVIRA | SRYESEI-----            | LSILGGLSATTKGTNAASNKLR-----GVGSLLKLLHLVISHGP  | 482                 |
| GhVIRD | SRYESEI-----            | LSILGGLSATTKGTNVASNKLR-----GVGSLLKLLHLVISHGP  | 481                 |
| DmVIR  | ESVQIWCRRFLVDRIIIPGNRD  | QMEDVTITCQIE-----FAFEMLDALFSSQLSYLQ           | 678                 |
| HsVIR  | SEIKRLGDHLAEKTSSLPNHSEP | DHDTAGLERTNPEYENEVEASMDMDLLESSNISEGE          | 623                 |
|        | . :                     | : . :   | : : : : . * *       |
| AtVIR  | VEDPSPSAYAERSLVSDHSEG   | -----WLSYKATSKLTSSWTCPFYSSGIDSHILALLKER       | 531                 |
| GhVIRA | IEDPSPVAHASRYFILGQTDG   | -----LVSYNATSGLIASSNCCFSDWEIDLHLLALLKDR       | 537                 |
| GhVIRD | IEDPSPVAHASRYFILGQTDG   | -----LVSHKATSGLIASSNCCFSDWEIDLHLLALLKDR       | 536                 |
| DmVIR  | PRRFLPVSK-KFE-----      | V-----VTDPTAQRSFGNALQSYLGQN                   | 712                 |
| HsVIR  | IERLINLLEEVFHLMETAPHTMI | QQPVKSFPMTAR-----ITGPPERDDPYPVLFRLYHSH        | 679                 |
|        | .                       | .   | : * ..              |
| AtVIR  | GFLPLSAALLSMPELH        | SKVGDIMDVFTDIAMFIGNIILSFMFSRTGLSFLHHPE-LTAT   | 590                 |
| GhVIRA | GFLPLSAALLSTTVLHSEAD    | VVDTSLEIVSSIGSIILSLLFCRSGLVFLLHQPD-LTAT       | 596                 |
| GhVIRD | GFLPLSAALLSTTVLHSEAD    | VVDTSLEIVSSIGSIILSLLFCRSGLVFLLHQPD-LTAT       | 595                 |
| DmVIR  | SLAESLLVMLAN-CKELPATT   | -----YLSMLDLMHTLLRSHVGYDYFVDDAFPVQT           | 763                 |
| HsVIR  | HFLELVTLLLSIPVTS        | AHPGV-----LQATKDVLFKLAQSKGLLFFMSEYEA-TNL      | 730                 |
|        | :                       | : *:  | : : : : * * : : . * |
| AtVIR  | IIQSLKGSVDLNKEECVPLHY   | --ASILISKGFT-----CSLLEIGINLEM                 | 633                 |
| GhVIRA | LIHALKGADAMNKEECVPLRY   | --ASVLISKGFT-----CNPQEVGIIVET                 | 639                 |
| GhVIRD | LIHALKGADAMNKEECVPLRY   | --ASVLISKGFT-----CSPQEVGIIVET                 | 638                 |
| DmVIR  | IVAILLGLDEVPRNP         | EEKEEKAESDAEDKAMEVENEAVEAGKEKTPPTADEEGKPVA-   | 822                 |
| HsVIR  | LIRALCHFY-----          | DQ-----DEEEGLQSD-                             | 750                 |
|        | : : *                   |   | * *                 |
| AtVIR  | HLRVVSAVDRLLKSIQQTEEF   | LWLWELRDVSRSDCGREALTLGVFPEALA-VLIEALH         | 692                 |
| GhVIRA | HLRVVNAIDRLLSATPQSEEF   | LWVLWELCGLARSDCGRQALLAMSFSEVLS-VLIEALH        | 698                 |
| GhVIRD | HLRVVNAIDCLLSATPQSEEF   | LWVLWELCGLARSDCGRQALLAMSFSEVLS-VLIEALH        | 697                 |
| DmVIR  | -----APISV-----         | PAPAAAPQVRP--RPILRPVLPRLARLGIEMSYKVQTRYHLDAIA | 870                 |
| HsVIR  | -----GVIDD-----         | AFALW-----LQDSTQTL-----QCIT-ELFSHFQ           | 779                 |
|        | : :                     | :   | : : : : . :         |
| AtVIR  | SA---KDMEPAVENSGISPLN   | LAICHSA--EIFEVIVSDSTASCLHAWIEHAPVLHKAL        | 747                 |
| GhVIRA | SV---KESEPIKNSGASPLN    | LAILHSA--EIVEVIVTDSTATSLSSWIGHAMELHKAL        | 753                 |
| GhVIRD | SV---KESEPIKNSGASPLN    | LAILHSA--EIVEVIVTDSTATSLSSWIGHAMELHKAL        | 752                 |
| DmVIR  | YAAAAPEYDAVKLATHMHA     | IYSQTCDPAGRQHTVEVLGLNNLKIFMDLIKKEQRLQTQR      | 930                 |
| HsVIR  | RCTASEETDHSDLLGTLHN     | LYLITFNPVGRSAVGHVFSLEKNLQSLITLMEYYSKEALGD     | 839                 |
|        | : :                     | : . . . . *                                   | : : : : : :         |
| AtVIR  | HTLSPGGSNRKDAPSRL       | LKWIDAGVVYHKHGVGGLLRYYAAVLASGGDAQLS---SSSILA  | 804                 |
| GhVIRA | HSSSPG--SNRKDAPTRL      | LEWIDAGLVYHKNGAVGLLRYYAAVLASGGDAHLT---STNILV  | 809                 |
| GhVIRD | HSSSPG--SNRKDAPTRL      | LEWIDAGLVYHKNGAVGLLRYYAAVLASGGDAHLT---STNILV  | 808                 |
| DmVIR  | QLSSPGTKYKSPVLSYAV      | DMVDACVRYCEQ-LDYLIEHGGVILELAKNHETFEPSVSAVL    | 989                 |
| HsVIR  | SK-----SKKSVAYNYACIL    | ILVVQSSSD-VQMLEQHAASLLKLCKADEN---NAKL         | 888                 |
|        | . : . . . :             | : : : . *                                     | : : : : . . . . .   |
| AtVIR  | LDLTPA--ENGAGESTNV      | SEMNVLDNLGK-----VIFEKSFEGVNLSDSSISQLTTALRIL   | 858                 |
| GhVIRA | SDLTDVDNIVGESSNASD      | INV MENLGS-----IISMKSFEQVNLRDSSIAQLTTAFRIL    | 864                 |
| GhVIRD | SDLTDVDNIVGESSNASD      | INV MENLGS-----IISMKSFEQVNLRDSSIAQLTTAFRIL    | 863                 |
| DmVIR  | QEMYVYMK--PLEA          | INV FVYDDIMPLVEVIGRSLDYLTTFPG-----DLIMAMRIL   | 1038                |
| HsVIR  | QELGKWLE--PLKNLRF-E     | INCPNLIEYVKQNTDNLMTPEGV-----GLTTALRVL         | 937                 |
|        | : : . :                 | : : * . :                                     | : : * * * : * :     |
| AtVIR  | ALISDNSTVAA-----        | ALYD-EGAVTVVYAILVNCSEFMFERSNSIYD              | 899                 |
| GhVIRA | AFISENPTVAA-----        | ALYD-EGAITVIYVVLVNCSEMLERSNSYD                | 905                 |
| GhVIRD | AFISENPTVAA-----        | ALYD-EGAITVIYVVLVNCSEMLERSNSYD                | 904                 |
| DmVIR  | RYLSIS-KPLAGQKAPPV      | TEELKHRFVALQLYAADGVQLCTQIMERLCAYFEQPGAHA--    | 1095                |
| HsVIR  | CNVACPPPPVEG-----       | QQKDLKWNLAVIQLFSAEGMDTFIRVLQKLSILTQPWRLH--    | 990                 |

|        |   |      |
|--------|---|------|
|        | :: * : *  |      |
| AtVIR  | YLVDHHCSSISDFLSERNREQSLVDLLIPSLVLLISVLQR-LQGTKEQYRNTKLMKAL    | 958  |
| GhVIRA | YLVDDEGTENSTSDLLERNREQCLVDLLIPSLVLLITLLQR-LQEAKEQHKNTKLMTAL   | 964  |
| GhVIRD | YLVDDEGTENSTSDLLERNREQCLVDLLIPSLVLLITLLQR-LQEAKEQHKNTKLMNAL   | 963  |
| DmVIR  | ---PA-----LMTIQGVHC-CQIMLPTLQILRELLSYAILCRDGTYKDLTAIDHL       | 1141 |
| HsVIR  | ---VNMGTTLH---RVTTISMARC-T-----LTLLKTMLTLLRGGSFEEKDMRVPSAL    | 1037 |
|        | : . :: * : * : . . :: *                                       |      |
| AtVIR  | LRLHREVSPKLAACAADLSSHYPDSALGFGAVCHLIVSALVCWPVYGWIPGLFHTLLSGV  | 1018 |
| GhVIRA | LRLHREVSPKLAACAADLSSPYPDSALGFEAVCHLSVSALAYWPVYGWSPGLFHTILASV  | 1024 |
| GhVIRD | LRLHREVSPKLAACAADLSSPYPDSALGFEAVCHLSVSALAYWPVYGWSPGLFHTILASV  | 1023 |
| DmVIR  | VKYYLLYYFPTRCQAGPEV-----EQCKM-----EVVQTLLAYT                  | 1176 |
| HsVIR  | VTLHMLCSIPLSGR.LSDE-----QKIQN-----DIIDILLTFT                  | 1072 |
|        | : :: : . :  |      |
| AtVIR  | QTSSVPALGP-----KETCSF---LCILSDILPEEGVFWKSGMPLLSGLRKLAVGTLMP   | 1071 |
| GhVIRA | QTSSSLALGP-----KETCSL---LCLLNDLFPEESIWRWKNGMPLLSALRSLAIGTLLGP | 1077 |
| GhVIRD | QTSSSLALGP-----KETCSL---LCLLNDLFPEESIWHWKNGMPLLSALRSLAIGTLLGP | 1076 |
| DmVIR  | QPN---EQDEESLHKSLWTLMIREVKNV---DGPAHFIPGLKLLAELLPLPLPM---     | 1225 |
| HsVIR  | QGVNEKLTISEETLANNTWSLMLKEVLSSIL---KVPEGFFSGLILLSELLPLPLPM---  | 1126 |
|        | * : . :: :* . : : * : * : * * :                               |      |
| AtVIR  | QKEKQINWYLEPGPLEK-----LINHLTPNLDKIAKIIQHHAVALVVIQDMLRVFIV     | 1124 |
| GhVIRA | HKERQVDWYLECGHLEK-----LFNQLTPHLDRIAQIIQHYAISALVVIQDMLRVFII    | 1130 |
| GhVIRD | HKERQVDWYLECGHLEK-----LFNQLTPHLDRIAQIIQHYAISALVVIQDMLRVFII    | 1129 |
| DmVIR  | -PQPLCD-QLQQQHKQRLITERKLWSAHLHPQSGQIAKLVEALAPSSFPQLSELLQRVCM  | 1283 |
| HsVIR  | -QTTQV---IEPHDISVALNTRKLSMHLHVQAKLLQEIVRSFSGTTCQPIQHMLRRICV   | 1182 |
|        | :: : . :* : : : : : : : : : : : *                             |      |
| AtVIR  | RIACQRVEHASILLRPIFSSIRDGILDQSSTRDEA--YMVYRYLNFLASLLEHPHAKGL   | 1182 |
| GhVIRA | RIACQKAEQASKLLRPILSWIHDHSSDLSLSDTEA--YKVYRCLDFLTSLLEHPYAKVL   | 1188 |
| GhVIRD | RIACQKAEQASKLLRPILSWIHDHSDLSLSDTEA--YKVYRCLDFLTSLLEHPYAKVL    | 1187 |
| DmVIR  | QLSDLAPNMTLLIAKTI TELLCNEYQTSNC-IPT----TNLERLLRFSTRLCAPAPLKSS | 1338 |
| HsVIR  | QLCDLASPTALLIMRTVLDLIVEDLQSTSE-DKEKQYTSQTTRLLALLDALASHKACKLA  | 1241 |
|        | :: : : : : : : . * * : * . *                                  |      |
| AtVIR  | LLE-----EGIVQLLVEVLERCYDATYPSENRVLEY--GIVSASSVIQWCIPAFRS      | 1231 |
| GhVIRA | LVG-----EGFPQILTRVLESCFDATDSDGRQASDCRDSAKYGVALISLCIPVFKS      | 1239 |
| GhVIRD | LVG-----EGFPQILTRVLESCFDATDSDGRQASDCRDFAKYGFALISLCIPVFKS      | 1238 |
| DmVIR  | MLSILS-----GKFWELFQSLLALN-----EF---NDVVSNCQEAVHR              | 1373 |
| HsVIR  | ILHLINGTIKGDERYAEIFQDLLALV-----RSPGDSVIRQQCVEYVTS             | 1285 |
|        | :: : : : *  |      |
| AtVIR  | I-SLLCDSQVPLLCFQK--KELLASLSAKDCALIFPFVLKFCQVLPVGNELLS-CLGAFK  | 1287 |
| GhVIRA | I-SLLCSSRTFSQYDERHEMHKFDLSLSPKDCSIFINQLLKFCQVLPVGKELVS-CLTAFR | 1297 |
| GhVIRD | I-SLLCSSLTFPQYDERHEMHKFDLSLSPKDCSIFINQLLKFCQVLPVGKELVS-CLTAFR | 1296 |
| DmVIR  | ILDSFLDSGISLISHKS-----TA---SPALNLAALPPKELIPRIIDAVFS           | 1417 |
| HsVIR  | ILQSLCDQDIALILPSS-----SEGSISELEQLSNSLPNKELMTSICDCLA           | 1332 |
|        | * . : . . : : : : : : : : ** : : :                            |      |
| AtVIR  | DLSSCGEGQDGLVSLLFHLFSGTEESVSRWCD---TNSLSLDQLDMKKNPPFLSCWIKL   | 1344 |
| GhVIRA | DMGSCTEGCNALLSALLNSSSSTHDELESERGNEKNVNFHFLNESEWRKSPPLCCWIKL   | 1357 |
| GhVIRD | DMGSCTEGRNALLSALLYSSSSTHDELESERGNEKNVNFHFLNESEWRKSPPLCCWIKL   | 1356 |
| DmVIR  | NLTSVEVTHGISILAVRN.LVI-----LTEHDFTFYHL-AQLLKQKITEFQAWMER      | 1466 |
| HsVIR  | TLANSESSYNCLLTCVRTMMF-----LAEHDYGLFHL-KSSLRKNSSALHSLLR        | 1381 |
|        | : . . : : *   |      |
| AtVIR  | LNSINSKDGL---SSLAMKAVNVLSVGSIKCLDGKSLDSKKV-----AALKS          | 1389 |
| GhVIRA | LKSIDSKDHL---PSYTLEAANVLSLGTGFCMGGNSLNMNSV-----VALKF          | 1402 |
| GhVIRD | LKSIDSKDHL---PPYTLEAANV.LALGTGFCMGGNSWNMNSV-----VALKF         | 1401 |
| DmVIR  | VILHNETVEYNANIESLILLRLSLTQIEPP-----PAMSAMPHRTLKLGATELAQ       | 1516 |
| HsVIR  | VVSTFSKDT-GELASSFLEFMRQILNSDTIGCCGDDNGLMEVEGAHTSRTMSINAAELKQ  | 1440 |
|        | : . . : :   |      |
| AtVIR  | LFGLPSEF-----SGTDT-----FREENIGLIEQMVTLLSSMTSGS-----           | 1425 |
| GhVIRA | LFGLPDDT-----AGIGG-----FPEDNIKIYIQEFSTLLSSRIDND-----          | 1438 |
| GhVIRD | LFGLPDDT-----TGIGG-----FPEDNIKIYIQEFSTLLSSRIHND-----          | 1437 |
| DmVIR  | LVEFQDIELAKPPVLSRILTVMEKHKAVANEALSCLKQLILLQASKQEILAGT-----S   | 1571 |



|        |   |      |
|--------|---|------|
| HsVIR  | LLQSKEES-----PENLFLELEKLVLEHSKDDDNLDSLDSVVG<br>* . * : : : : .              | 1479 |
| AtVIR  | --D-----SS-ATAEMKPYLHEASQSLLS---LL-----KDGNIDDI                             | 1456 |
| GhVIRA | --E-----DYQTSSDIHISMHQVSESVKSLLLLFQNL-----AAVEVDDA                          | 1477 |
| GhVIRD | --E-----DYQTSSDIHISMHQVSESVKSLLLLFQNL-----AAVEVDDA                          | 1476 |
| DmVIR  | TETPPEAGEANPSASSCSASLTVEPYLPQAEG----IVTQYEARPIFTRFCATAENAQL                 | 1627 |
| HsVIR  | LKQMLESSGDPLPL----SDQDVEPVLSAPES----LQNLFNRTAYVL---ADVMDQ<br>: : . :        | 1527 |
| AtVIR  | I-SCKGVF-----VSPGNL-----DMDDLVSRI-EDDLYQ-RGLEDKFWWECPE                      | 1498 |
| GhVIRA | I-LYGGLSFPQNNVQVPSGIQ-----HFGQGLDGKA-DDSLYS-GGFEDKFSWELPE                   | 1526 |
| GhVIRD | I-LYGGLSFPQNNVQVPSGIQ-----HFGQGLDGKA-DDSLYS-GGFEDRFSWELPE                   | 1525 |
| DmVIR  | TARYWLDPLPIEL---IEDMNEPIYERIACDLTDLANVCLN-PDLNVAGDSKRV---MNL-               | 1681 |
| HsVIR  | LKSMWFTFPQAE---IDTDL---DLVKVDLIELSEKCCSDFDLH---SELSRF-LSEP-<br>: : : . * :  | 1577 |
| AtVIR  | TLPERLPQ---SSLP---A-KRKL-PTLESSRRRAKGENSSVDIPTQNSIQRMGSVSLPF                | 1551 |
| GhVIRA | TLPGRLQ---TALP---T-RRKL-QAADSANRSARGDNSVAEITNPATFQRGLGPSTASS                | 1579 |
| GhVIRD | TLPGRLQ---TALP---T-RRKL-QAADSANRSARGDNSVAEITNPATFQRGLGPSTASS                | 1578 |
| DmVIR  | GSPQSNREMTPTAPCFRTRRVEVEPA---TGR---PE---KKMFVSS---VRGRGFAR                  | 1728 |
| HsVIR  | SSPGR---TKTTKGFKLGKHKHETFITSSGKSEYIEPA---KRAHVVPVPPRGRGRGFGG<br>* : : : : * | 1631 |
| AtVIR  | APTRRDAFRQRKPNTSRPPSMHVDDYVARERSVDTAGNSNAITISRAGSSSGRPPSIHVD                | 1611 |
| GhVIRA | GTTRRDSFRQRKPNTSRPPSMHVDDYVARERSVDGVSNNSNVIAPVRVGSSGGRPPSIHVD               | 1639 |
| GhVIRD | GTTRRDSFRQRKPNTSRPPSMHVDDYVARERSVDGVSNNSNVIAPVRVGSSGGRPPSIHVD               | 1638 |
| DmVIR  | PPSRGDLFRSRPPNTSRPPSLHVDDFLALETCGAQP-----TGPTGYNKIPSM---                    | 1777 |
| HsVIR  | GIRPHDIFRQRKQNTSRPPSMHVDDFVAAESKEVVP-----QDGIPPPKRPLKVSQ<br>* * * * * : *   | 1682 |
| AtVIR  | EFMARQRER-GQNPSTIVVGEAVVQVKNPTPARD-T--E-KVAGKPKQFKADPDDDLQGI                | 1666 |
| GhVIRA | EFMARQRER-QNPAASGT--ETATQSKNAAPINGPD--N-EKVNKSKQLKSDLLDLQGI                 | 1693 |
| GhVIRD | EFMARQRER-QNPAASGT--ETAAQSKNAAPINGPD--N-EKVNKSKQLKSDLLDLQGI                 | 1692 |
| DmVIR  | ---RGSRVGRNRGSRISAAAAFRQKKMM-----RI-GSPSSWA-----                            | 1811 |
| HsVIR  | KISSRGGFS-GNRGGRG---AFHSQNRFTTPASKGNYSRREGTRGSSWS-----<br>* : . * : . .     | 1728 |
| AtVIR  | DIVFDGEECEGPDDKLPFLQPDENLMQPAPVMVEQNSPHSIVEETESDANGSSQFSHMG                 | 1726 |
| GhVIRA | DIVFDGEESE-TDDKLPFPQDDNLQQLAPVIFEQSSPQSVVEETESDVNGSSQFSHMAT                 | 1752 |
| GhVIRD | DIVFDGEESE-TDDKLPFPQDDNLQQLAPVIFEQSSPQSVVEETESDVNGSSQFSHMAT                 | 1751 |
| DmVIR  | -----ESP---GS---YRSASD---SHFSSSD-   | 1829 |
| HsVIR  | -----AQNTPRGN---YNESRGGQSNFNRGPL<br>. . . *:*                               | 1752 |
| AtVIR  | PVASNVDNAQSEFSSRISVSRPEMSLIREPSISSDRKFVEQADEAKKMAPLKSA----                  | 1781 |
| GhVIRA | PLASNADENAQSEFSSRMSVSRPEMSLTREPSVSSEKKIFEQSDSKNAVSIKNSSGFDS                 | 1812 |
| GhVIRD | PLASNADENAQSEFSSRMSVSRPEMSLTREPSVSSEKKIFEQSDSKNAVSIKNSSGFDS                 | 1811 |
| DmVIR  | ---S-----HYSSPHYSGRPRGR-----  | 1844 |
| HsVIR  | PPLR-----PLSSTGYRPSRDR-----<br>* * *  | 1770 |
| AtVIR  | --GISESGFIPA--YHMPGSSGQNSIDPRVGPQGFYSKSGQHTGHIHGGFSGRGVYEQK                 | 1837 |
| GhVIRA | ASGTNSSGFSAPIYSNTPATSVQLSLDSRITPQNIFYPKSSAQYAGNIPVAAGSRGMYELK               | 1872 |
| GhVIRD | ASGTNSSGFSAPIYSNTPATSVQLPLDSRITPQNIFYPKSSAQYAGNIPVAAGSRGMYELK               | 1871 |
| DmVIR  | --GLRSR---PSYLR-----  | 1854 |
| HsVIR  | --ASRGRGGLGPSWASANSMSG-----GSRGKFVSGGSGRGRHVRS<br>.                         | 1809 |
| AtVIR  | VMPNQPLPLVPPPSV-SPVIPHSSD-----SLSNQSPFFISHGTQSSGGPTRL                       | 1885 |
| GhVIRA | VLPNQPLPPMPPPTILPVQSDYLSSVSGSPSLLQSSIPVSDSKFMRTSMPSPGTTRP                   | 1932 |
| GhVIRD | VLPNQPLPPMPPPTILPVQSDYLSSVSGSPSLLQSSIPVSDSKFMRTSMPSPGTTRP                   | 1931 |
| DmVIR  | -----   | 1854 |
| HsVIR  | FTR-----  | 1812 |
| AtVIR  | MPPLPSAIPQYSSNPYASLPRTSTVQSFQYNHAGVGTTEQQ--QSGPTIDHQSGLSVT                  | 1943 |
| GhVIRA | PPPLPSTPAPFASSPYNLASLNTSASQPALYNQSGMGKTELPKGSIGPTIDARL-PTSAA                | 1991 |
| GhVIRD | PPSLPSTPPPFASSPYNLASLNTSASQPALYNQSVMGKTELPQGSIGPTIDARL-PTSAA                | 1990 |



|        |   |      |
|--------|---|------|
| DmVIR  | -----   | 1854 |
| HsVIR  | -----   | 1812 |
| AtVIR  | GMTSYPPPNLMPSHNFSRPSSLVPFYGNP--SHQGGDKPQTMLLVPSIPQSLNTQSIPQ | 2001 |
| GhVIRA | GLASYPPPLMQSLVFNRPSPVTPYGTSPALHQGENHPPGILQNPSIPQSSMQT-I--   | 2048 |
| GhVIRD | GLASYPPPLMQSLVFNRPSPVTPYGTSPALHQGENHPPSILQNPSIPQSSMQT-I--   | 2047 |
| DmVIR  | -----   | 1854 |
| HsVIR  | -----   | 1812 |
| AtVIR  | LPSMQLSQLRPMQPPQHRPPIQISQPSEQVSMQNPFIQIPMHQMQLMQQTQ---VQPY  | 2058 |
| GhVIRA | HSLNQLQKLQRPLLPTQHLRPSMQSSQLEQVSSQTPVQMQLQSLPMMHQAHI SPVNPY | 2108 |
| GhVIRD | HSLNQLQKLQRPLQPTQHLRPSMQSSQLEQVSSQTPVQMQLQSLPMMHQAHI SPVNPY | 2107 |
| DmVIR  | -----   | 1854 |
| HsVIR  | -----   | 1812 |
| AtVIR  | YHPPQQQEISQVQQQQQHH---VQGGQGAGTSQQQESGMSLHDYFKSPEAIQALLSDRD | 2115 |
| GhVIRA | YQPQQP-EFSAAQQMQVELAQQQAPPQTGGTSQQQDSGMSLHEYFQSPEAIQSLLRDRE | 2167 |
| GhVIRD | YLPQQP-EFSAAQQMQVELAQQQAPPQTGGTSQQQDSGMSLHEYFQSPEAIQSLLRDRE | 2166 |
| DmVIR  | -----   | 1854 |
| HsVIR  | -----   | 1812 |
| AtVIR  | KLCQLLEQHPKLMQMLQEKLQQL                                     | 2138 |
| GhVIRA | KLCQLLEQHPKLMQMLQVQFLH-                                     | 2189 |
| GhVIRD | KLCQLLEQHPKLMQMLQVQFLH-                                     | 2188 |
| DmVIR  | -----   | 1854 |
| HsVIR  | -----   | 1812 |

**Figure S6 Amino acid sequence alignment of GhVIRs, AtVIR, DmVIR and HsVIR proteins.** Amino acid sequences are aligned by clustal omega server. Identical amino acids are shown in asterisk, and similar amino acids are shown by dot or double dot. The four domains was shaded by four colors. AtVIR: *Arabidopsis* VIRMA, GhVIRA: *Gossypium hirsutum* VIRMA-A, GhVIRD: *Gossypium hirsutum* VIRMA-D, DmVIR: *Drosophila melanogaster* VIRMA, HsVIR: *Homosapiens* VIRMA.