



Research Article

Global Genetic Diversity of ZYMV Coat Protein Isolates in Cucurbits: Comparative Sequence Analysis and Phylogenetic Insights for Diagnostic Applications

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Received | April 22, 2025; **Revised** | May 21, 2025; **Accepted** | June 08, 2025; **Published** | June 12, 2025

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Citation | Farag, S.E.E., S. Ibrahim, M.H. Abdel-Gaffar and A. Sadik. 2025. Global genetic diversity of ZYMV coat protein isolates in cucurbits: Comparative sequence analysis and phylogenetic insights for diagnostic applications. *Novel Research in Microbiology Journal*, 9(3): 178-197.

DOI | <https://dx.doi.org/10.17582/journal.NRMJ/2025/9.3.178.197>

Keywords | Coat protein, Diagnostic tools, Diverse agro-ecosystems, Regional variations, ZYMV



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BFZ76578.1	1	MLQSGTQPTVADAGATKKDKEDDKGKNKDVTGSGSGEKTVAAVTKDKDVNAGSHGKIVPR	60
CAD12316.1	30	.....	89
WAH71612.1	42	.....	101
BAA00596.1	163	S.....	222
AEG79281.1	41	.....	100
QJB23285.1	78	N.....	137
WAH71613.1	34	D.....	93
AII82115.1	38	E.....S.....A.....	97
AII82116.1	38	E.....S.....A.....	97
AII82113.1	38	A.E.....D.....	97
ADD82934.1	1	.....	57
AFV41125.1	1	.....	57
AFV41129.1	1	.....	57
AEL12187.1	1	.....	57
QDM54312.1	1	.....	57
AFM56038.1	1	.....	57
BAB82974.1	1	.....	57
BAH97118.1	1	.....	57
AUI80735.1	1	.....	57
AHX74049.1	1	.....	57
AFV41128.1	1	.....	57
AQV03192.1	1	...T.....R.....A.....	57
AQV03194.1	1	...T.....R.....A.....	57
AFR54052.1	209	S.....	268
QNS28118.1	1	S.....R.....	57
AFB82650.1	1	...T.....R.....A.....	58
AND76649.1	1	NN.....A.....M.....	57
XNJ64408.1	1	A.....A.S.....	57
QIQ61125.1	118	...T.....R.....	177
AOG61165.1	1	...A.....A.....A.....	57
XOK19327.1	1	..I.....E.....NN.....M.....	57
XNJ64410.1	1	...Q.....A.....A.S.....	57
AFB82651.1	1	...Q.....A.....A.S.....D.....	58
AEL12188.1	1	E.....R.D.G.....D.....	57
AFM56042.1	1	...H....N..S.QF..QN.....I.....	57
QNS28120.1	1	.A.....S.....R.....	57
QNS28121.1	1	.A.....S.....R.....	57
XOK19328.1	1	..Y..N..A.....NN..R.....M.....	57
QNS28119.1	1	S.....S.....	57
QIQ61126.1	118	I.....T.....E.ER.....A.....	177
AAX89507.1	208	S.....A.....	266
UZN89765.1	2799	E.....S.....	2858
AEQ38911.1	1	.D..TKE.....DE..D.K..AS.ST.V.....	57
AEQ38918.1	1	.D..TKE.....DE..D.K..AS.ST.V.....	57

BFZ76578.1	61	LSKITKKMSLPRVKGNVILDIDHLLLEYKPDQIELYNTRASHQQFASWFNQVKTEYDLNEQ	120
CAD12316.1	90	.....	149
WAH71612.1	102	.....	161
BAA00596.1	223	.....	282
AEG79281.1	101	.....	160
QJB23285.1	138	.....	197
WAH71613.1	94	.....	153
AII82115.1	98	.....	157
AII82116.1	98	.....	157
AII82113.1	98	.....	157
ADD82934.1	58	.....	117
AFV41125.1	58	.....	117
AFV41129.1	58	.....	117
AEL12187.1	58	.....	117
QDM54312.1	58	.....	117
AFM56038.1	58	.....	117
BAB82974.1	58	.....	117
BAH97118.1	58	.....	117
AUI80735.1	58	X.....	117
AHX74049.1	58	.....	117
AFV41128.1	58	Q.....	117
AQV03192.1	58	.....	117
AQV03194.1	58	.....	117
AFR54052.1	269	S.....	328
QNS28118.1	58	.....	117
AFB82650.1	59	T.N.....	118
AND76649.1	58	.....	117
XNJ64408.1	58	D.....	117
QIQ61125.1	178	L.....	237
AOG61165.1	58	N.....D..	117
XOK19327.1	58	.....	117
XNJ64410.1	58	R.....D.	117
AFB82651.1	59	R.....D.	118
AEL12188.1	58	.....	117
AFM56042.1	58	.....	117
QNS28120.1	58	.....	117
QNS28121.1	58	.....	117
XOK19328.1	58	.....	117
QNS28119.1	58	C.....	117
QIQ61126.1	178	DK	237
AAX89507.1	267	K.....S.....R.....	326
UZN89765.1	2859	.....	2918
AEQ38911.1	58	K...S...N.....A...DD.	117
AEQ38918.1	58	K...S...N.....A...DD.	117

BFZ76578.1	121	QMGVVMNGFMVWCIENGTSPDINGVWVMMDGNEQVEYPLKPIVENAKPTLRQIMHHFSDA	180
CAD12316.1	150	.....	209
WAH71612.1	162	.....	221
BAA00596.1	283	.....	342
AEG79281.1	161	D.....	220
QJB23285.1	198	.....	257
WAH71613.1	154	.....	213
AII82115.1	158	.....	217
AII82116.1	158	.....	217
AII82113.1	158	.....	217
ADD82934.1	118	.....	177
AFV41125.1	118	.....	177
AFV41129.1	118	.....	177
AEL12187.1	118	.....	177
QDM54312.1	118	.....	177
AFM56038.1	118	.....	177
BAB82974.1	118	.....	177
BAH97118.1	118	.....	177
AUI80735.1	118	.....	177
AHX74049.1	118	D.....	177
AFV41128.1	118	.....	177
AQV03192.1	118	.....	177
AQV03194.1	118	.....	177
AFR54052.1	329	.....	388
QNS28118.1	118	X.....X.....	177
AFB82650.1	119	.....	178
AND76649.1	118	.....	177
XNJ64408.1	118	.....	177
QIQ61125.1	238	.....	297
AOG61165.1	118	.....	177
XOK19327.1	118	.....	177
XNJ64410.1	118	.....	177
AFB82651.1	119	.....	178
AEL12188.1	118	.....	177
AFM56042.1	118	.....	177
QNS28120.1	118	V.X.....H.....X.....	177
QNS28121.1	118	V.X.....H.....X.....	177
XOK19328.1	118	.....	177
QNS28119.1	118	V.X...|.H.....X.....	177
QIQ61126.1	238	A.....	297
AAX89507.1	327	D.....F.....D.....	386
UZN89765.1	2919	.....	2978
AEQ38911.1	118	D.....	177
AEQ38918.1	118	D.....	177

BFZ76578.1	181	AEAYIEMRNAEAPYMPRYGLLRNLRDRSLARYAFDFYEVNSKTPERAREAVAQMKA	236
CAD12316.1	210	.....	265
WAH71612.1	222	.....	277
BAA00596.1	343	.....	398
AEG79281.1	221	.....	276
QJB23285.1	258	.....	313
WAH71613.1	214	.....	269
AII82115.1	218	.....	273
AII82116.1	218	.....	273
AII82113.1	218	.....	273
ADD82934.1	178	.....	233
AFV41125.1	178	.....	233
AFV41129.1	178	.....	233
AEL12187.1	178	.....	233
QDM54312.1	178	.....	233
AFM56038.1	178	.....	233
BAB82974.1	178	.....	233
BAH97118.1	178	.....	233
AUI80735.1	178	.....	233
AHX74049.1	178	.....	233
AFV41128.1	178	T.....	233
AQV03192.1	178	.....	233
AQV03194.1	178	.....	233
AFR54052.1	389	.....	444
QNS28118.1	178	.....	233
AFB82650.1	179	.....	234
AND76649.1	178	.....	233
XNJ64408.1	178	.....	233
QIQ61125.1	298	T.....	353
AOG61165.1	178	.....	233
XOK19327.1	178	.....	233
XNJ64410.1	178	.....	233
AFB82651.1	179	.....	234
AEL12188.1	178	.....	233
AFM56042.1	178	.....	233
QNS28120.1	178	.....	233
QNS28121.1	178	.....	233
XOK19328.1	178	.....	233
QNS28119.1	178	.....	233
QIQ61126.1	298	Q.....	353
AAX89507.1	387	.....	442
UZN89765.1	2979	.....	3034
AEQ38911.1	178	D.....	233
AEQ38918.1	178	D.....	233

Supplementary Figure S1: Protein sequence alignment of the ZYMV ASSM-2025 strain (LC866761.1) with global ZYMV strains from Africa, Asia, Europe, North America, South America, and Oceania, which was conducted to identify variations in the +1 reading frame across multiple GenBank accessions. This analysis highlights the genetic diversity in the virus; with a focus on identifying key sequence differences that could affect viral behavior, host interactions, or diagnostic applications across various regions.