Inhibition kinetics and theoretical studies on *Zanthoxylum chalybeum* Engl. dual inhibitors of α-glucosidase and α-amylase

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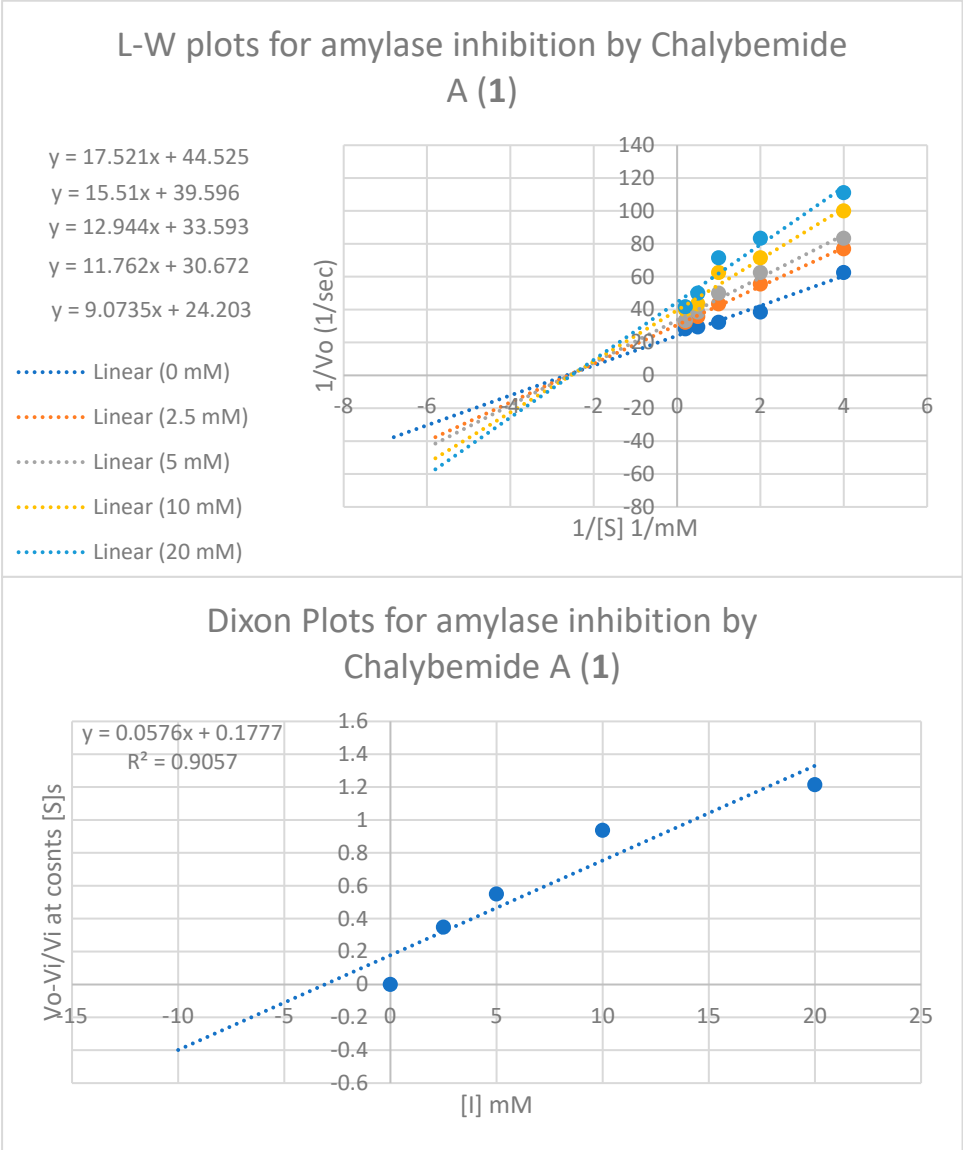


Figure S1: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (non-competitive inhibition, Km = 2.59 mM); B- Dixon plot for Chalybemide A (**1**), Ki = **13.36 mM.**

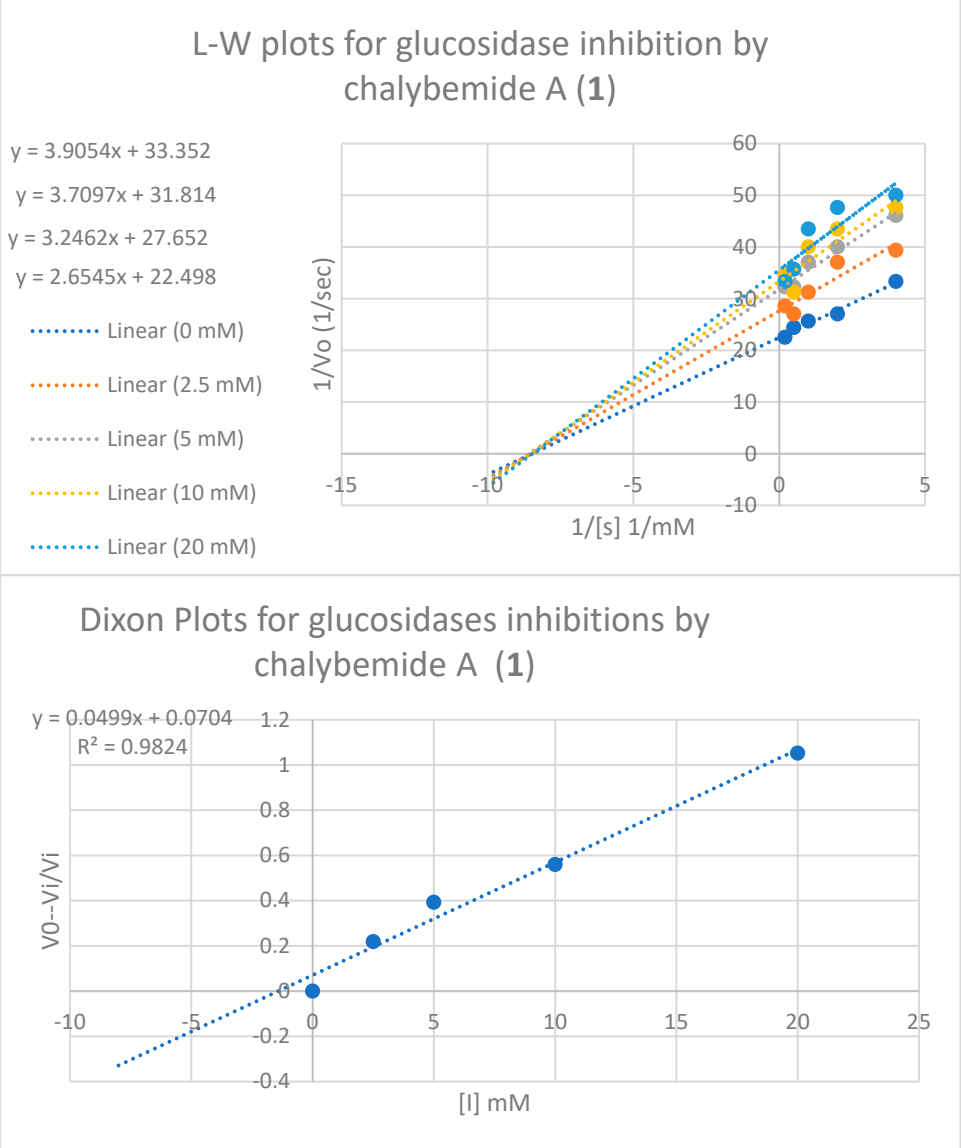


Figure S2: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 8.53 mM); B- Dixon plot for Chalybemide A (**1**), Ki = **20.95 mM.**

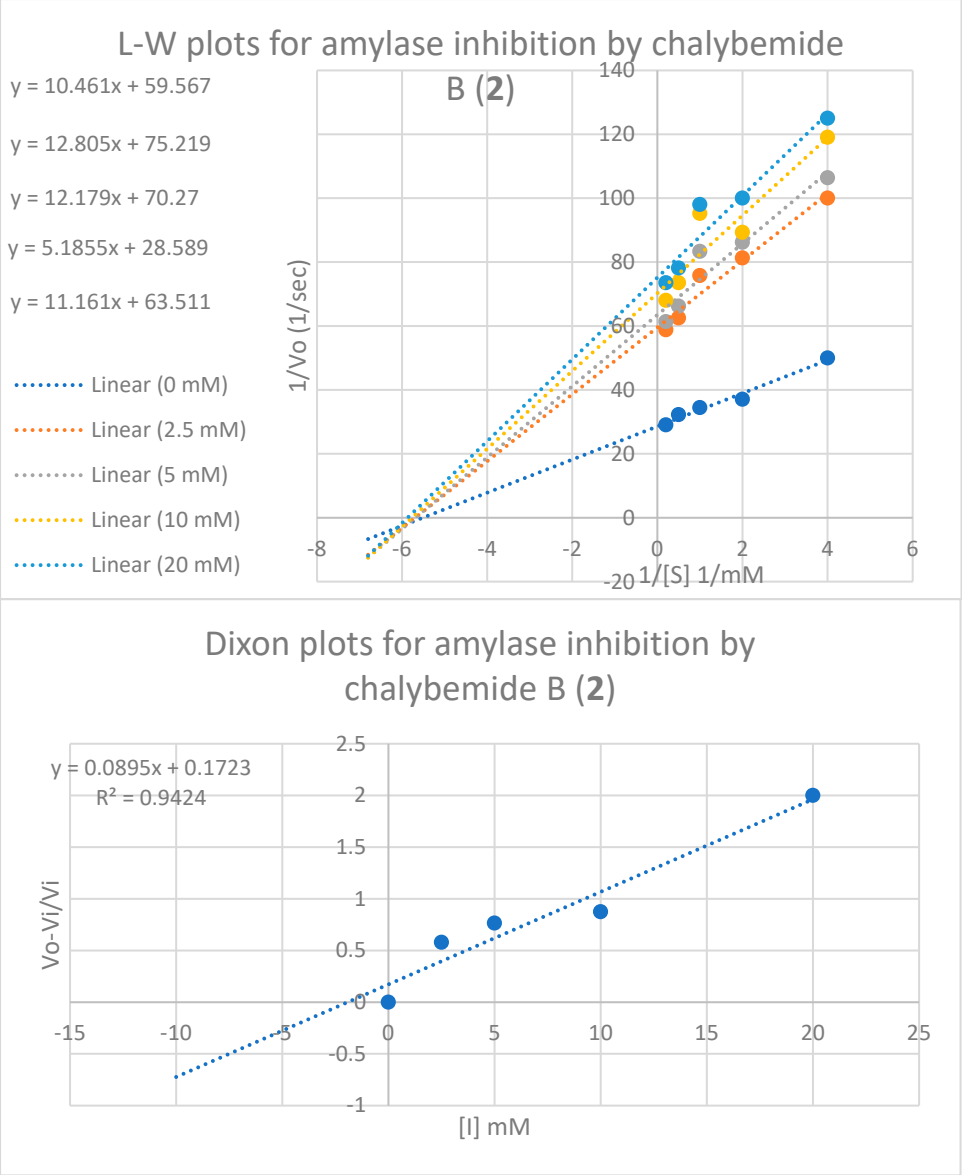
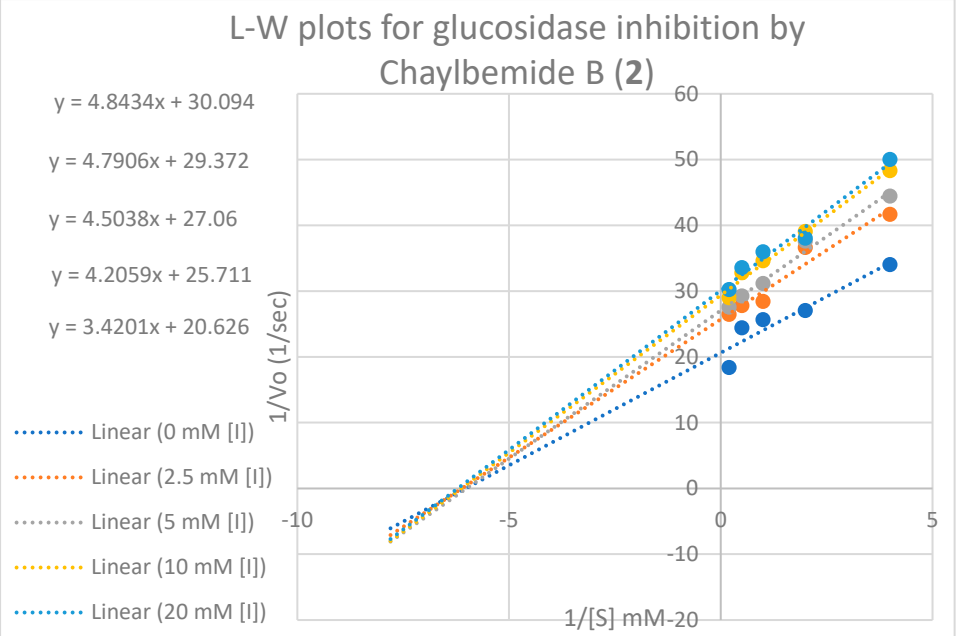


Figure S3: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (non-competitive inhibition, Km = 5.53 mM); B- Dixon plot for Chalybemide B (**2**), Ki = **11.05 mM.**



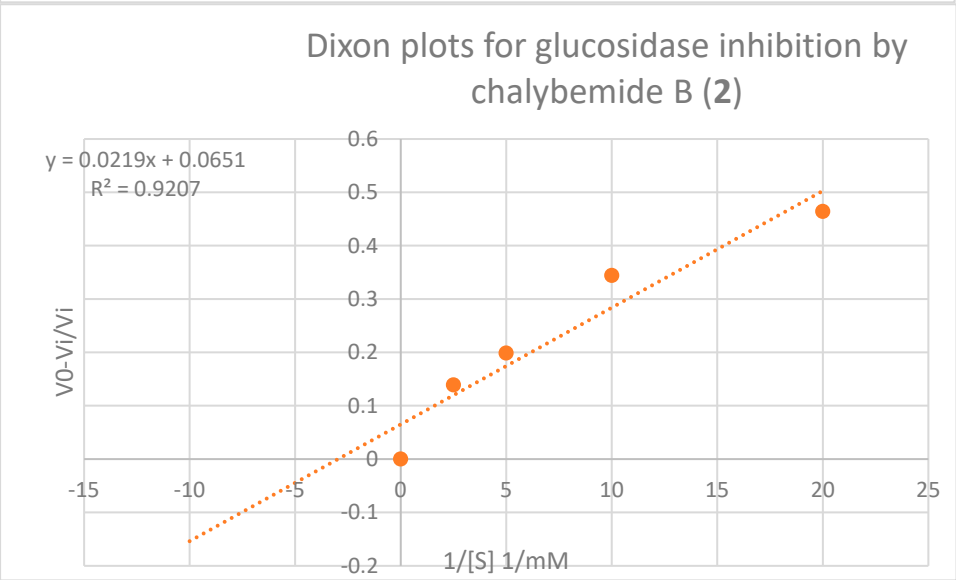


Figure S4: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 6.10 mM); B- Dixon plot for Chalybemide B (**2**), Ki = **44.58 mM.**

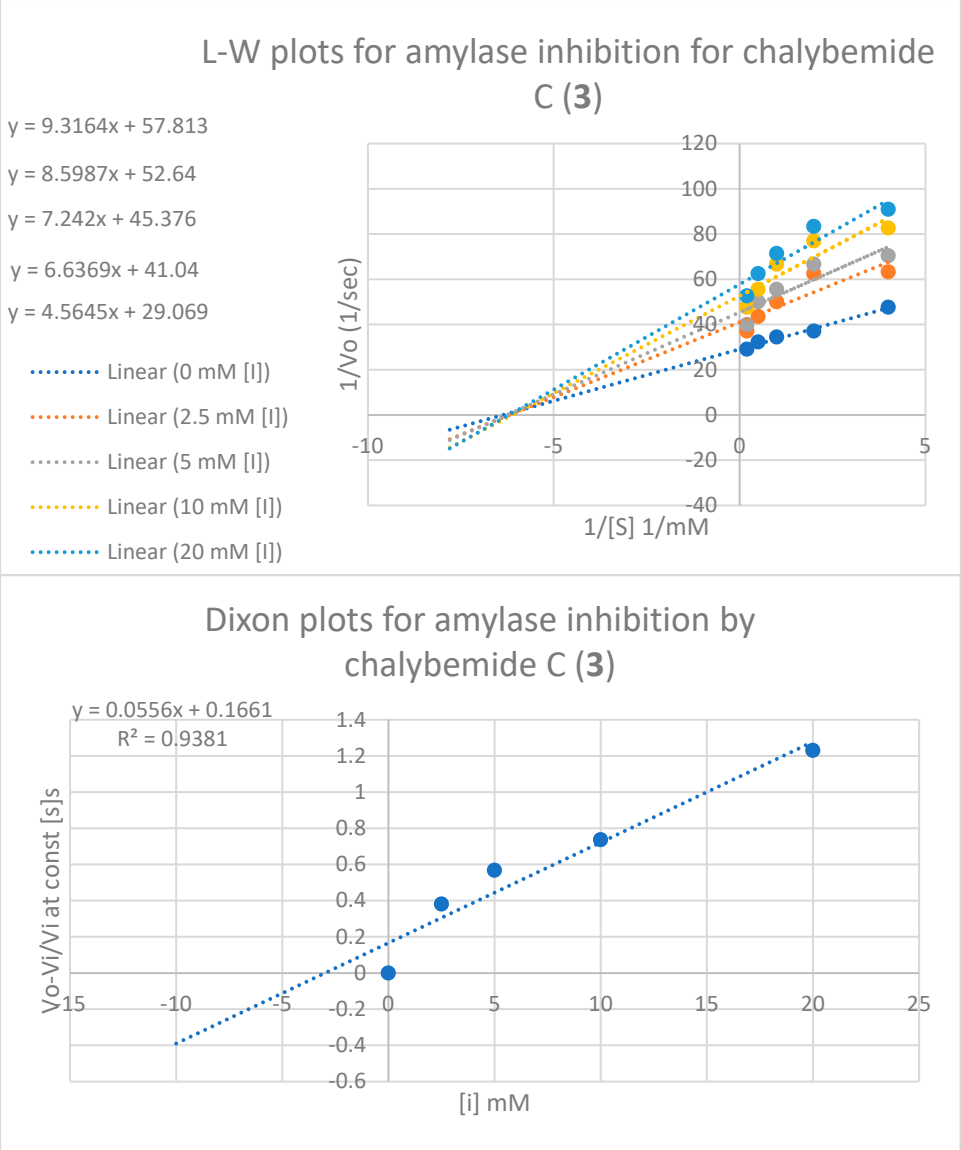


Figure S5: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (non-competitive inhibition, Km = 6.23 mM); B- Dixon plot for Chalybemide C (**3**), Ki = **26.96 mM.**

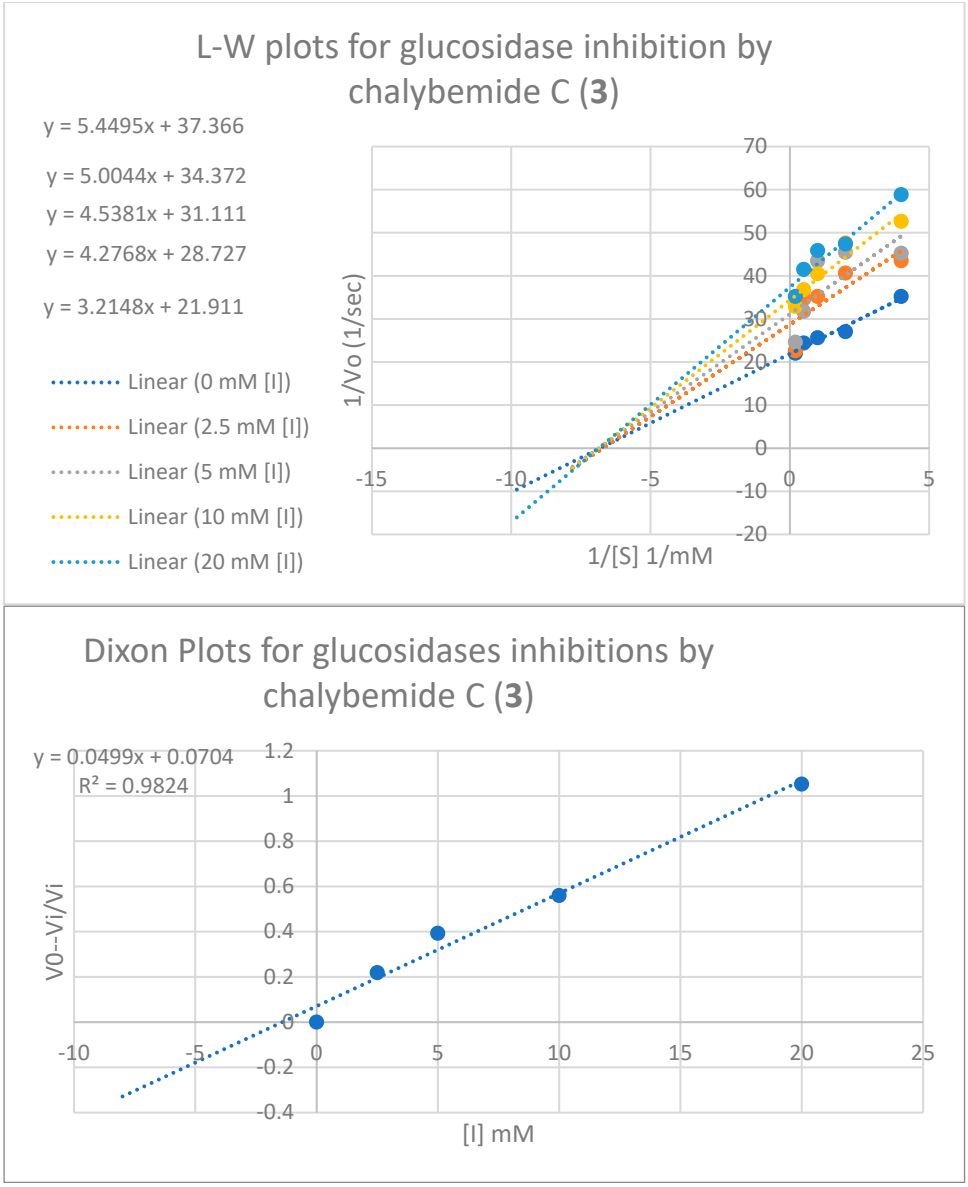
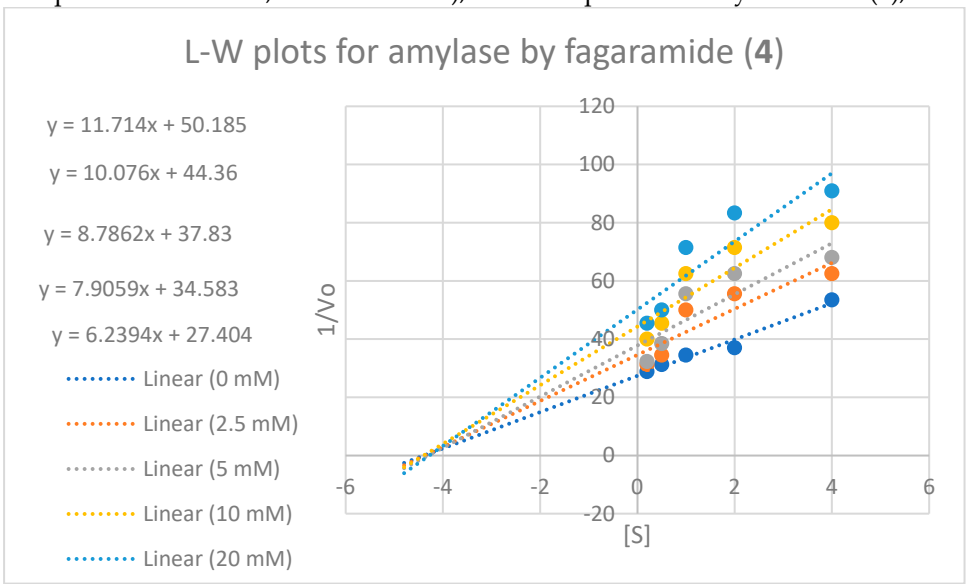


Figure S6: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 6.82 mM); B- Dixon plot for Chalybemide C (**3**), Ki = **34.73 mM.**



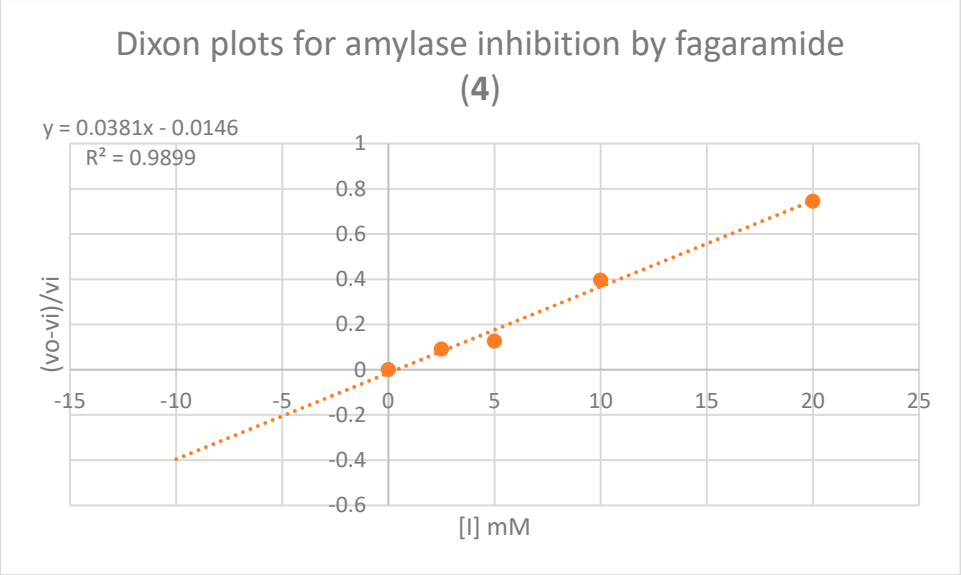


Figure S7: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (non-competitive inhibition, Km = 4.34 mM); B- Dixon plot for fagaramide (**4**), Ki = **26.96 mM.**

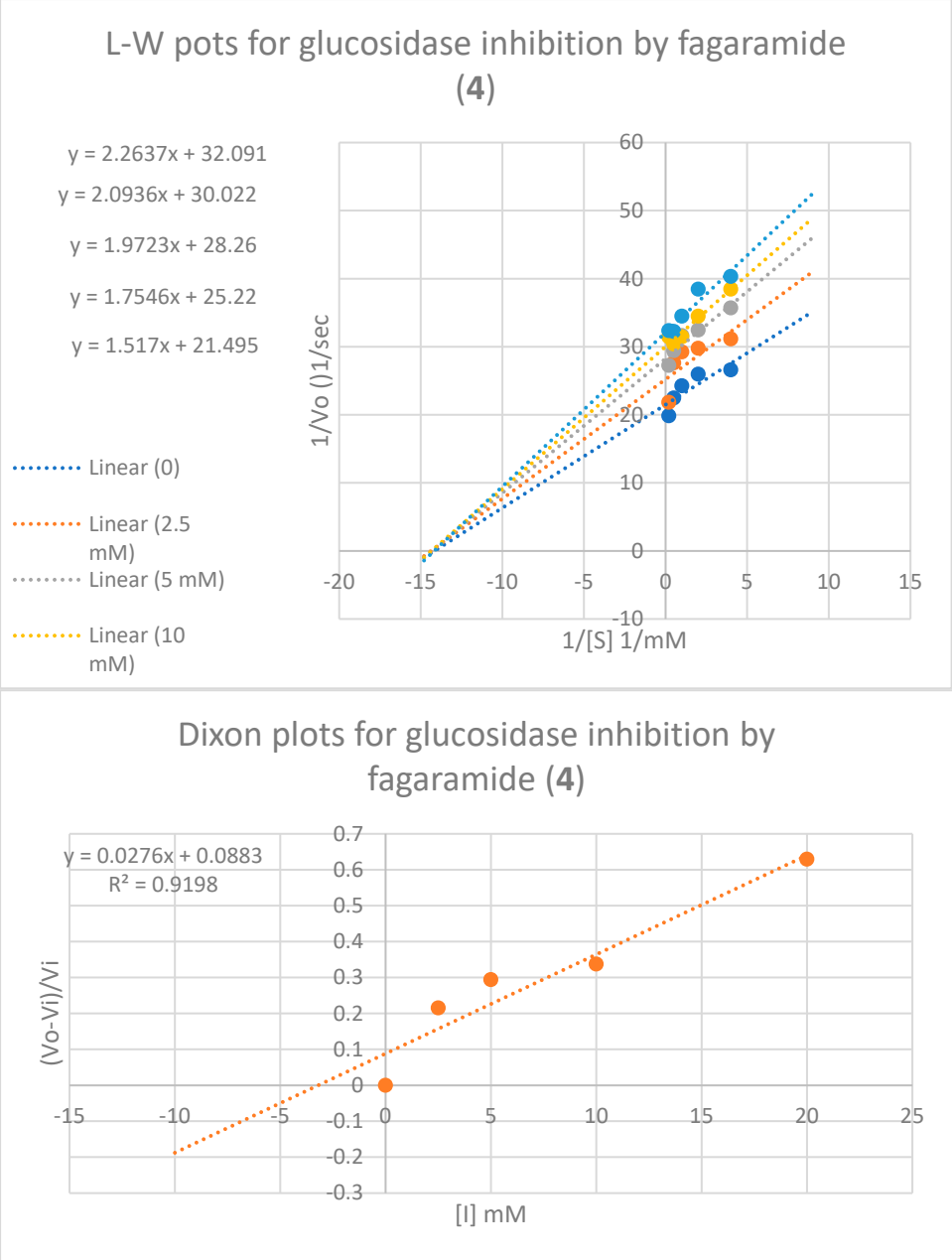


Figure S8: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 14.25 mM); B- Dixon plot for fagaramide (**4**), Ki = **26.96 mM.**

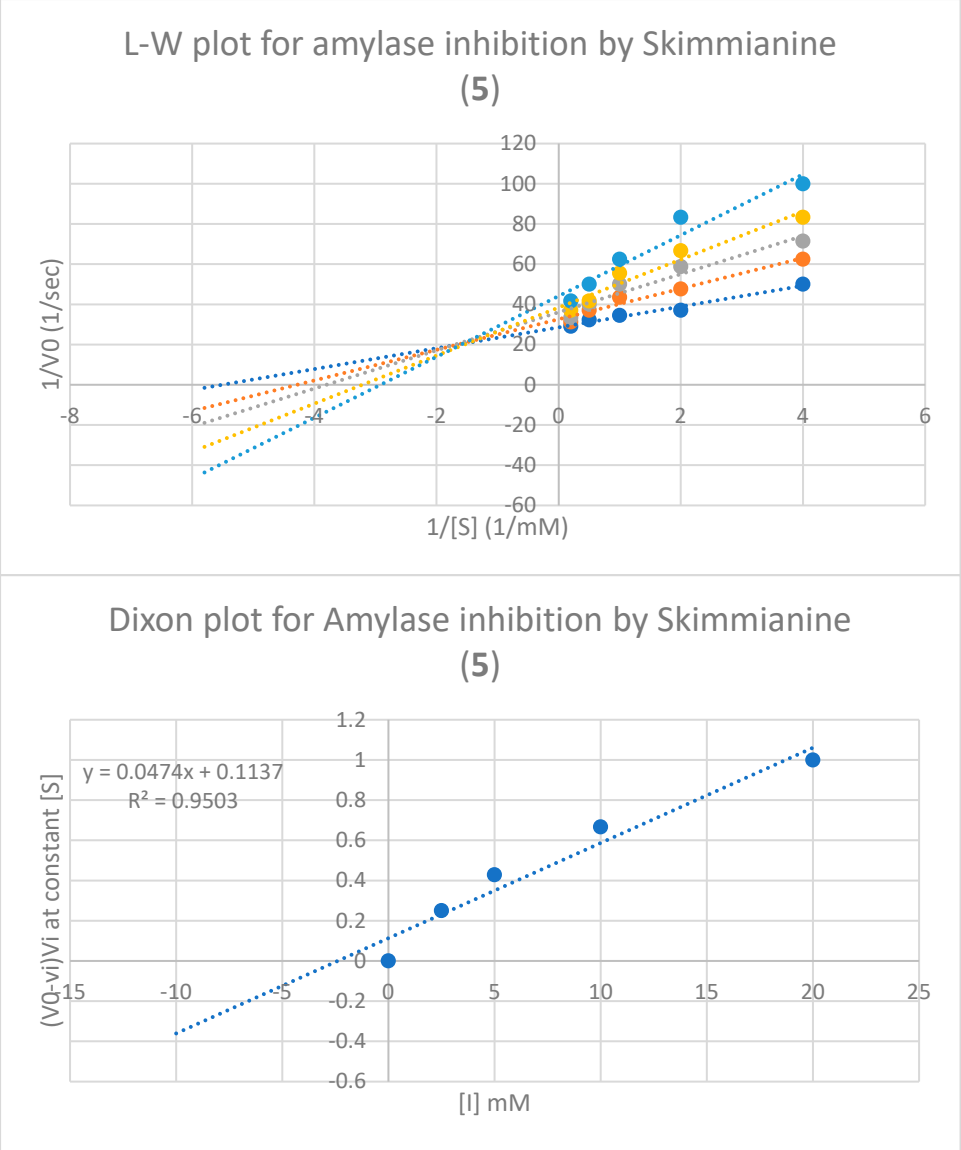


Figure S9: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (mixed inhibition, Varied Km); B- Dixon plot for Skimmianine (**5**), Ki = **2.74 mM.**

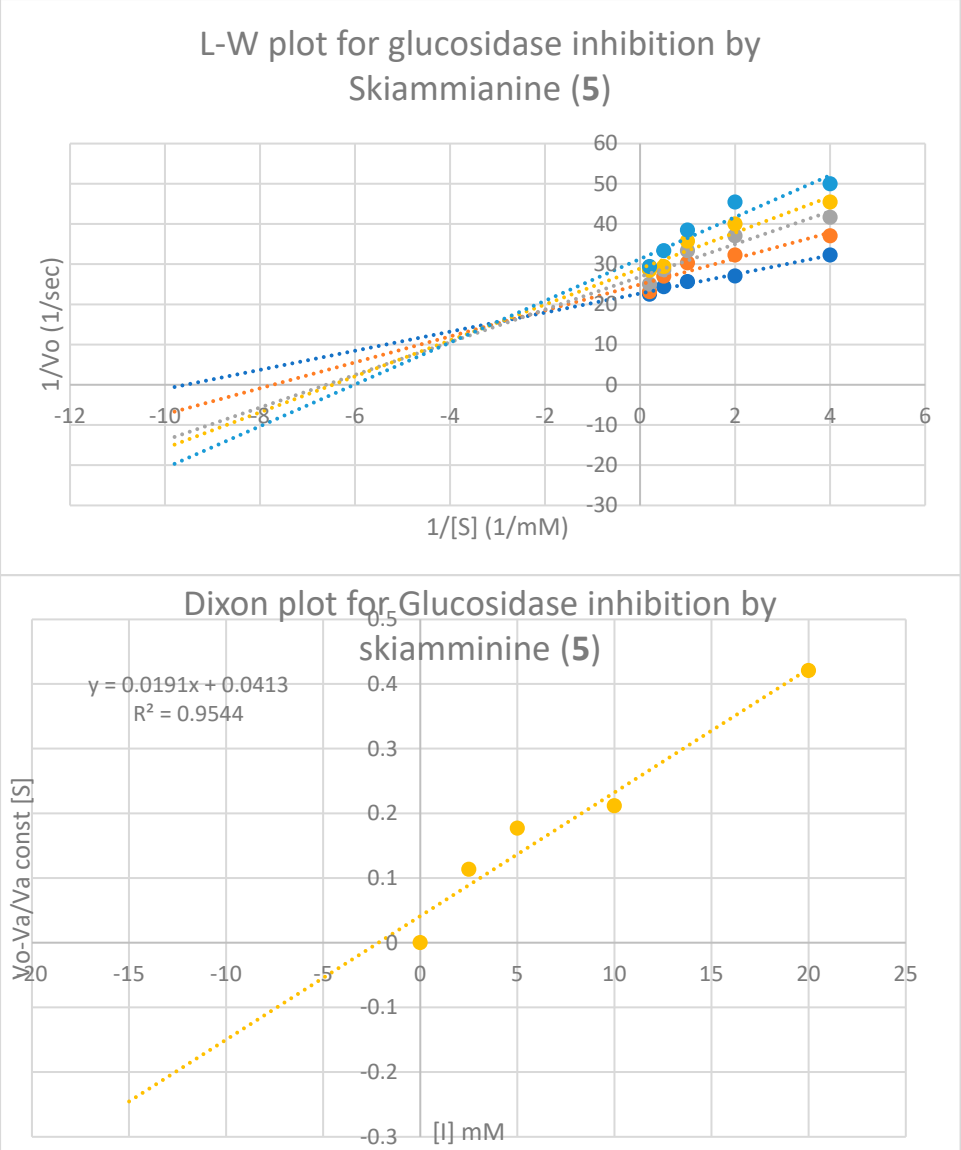


Figure S10: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (mixed inhibition, Varied Km); B- Dixon plot for Skiamminine (**5**), Ki = **7.64 mM.**

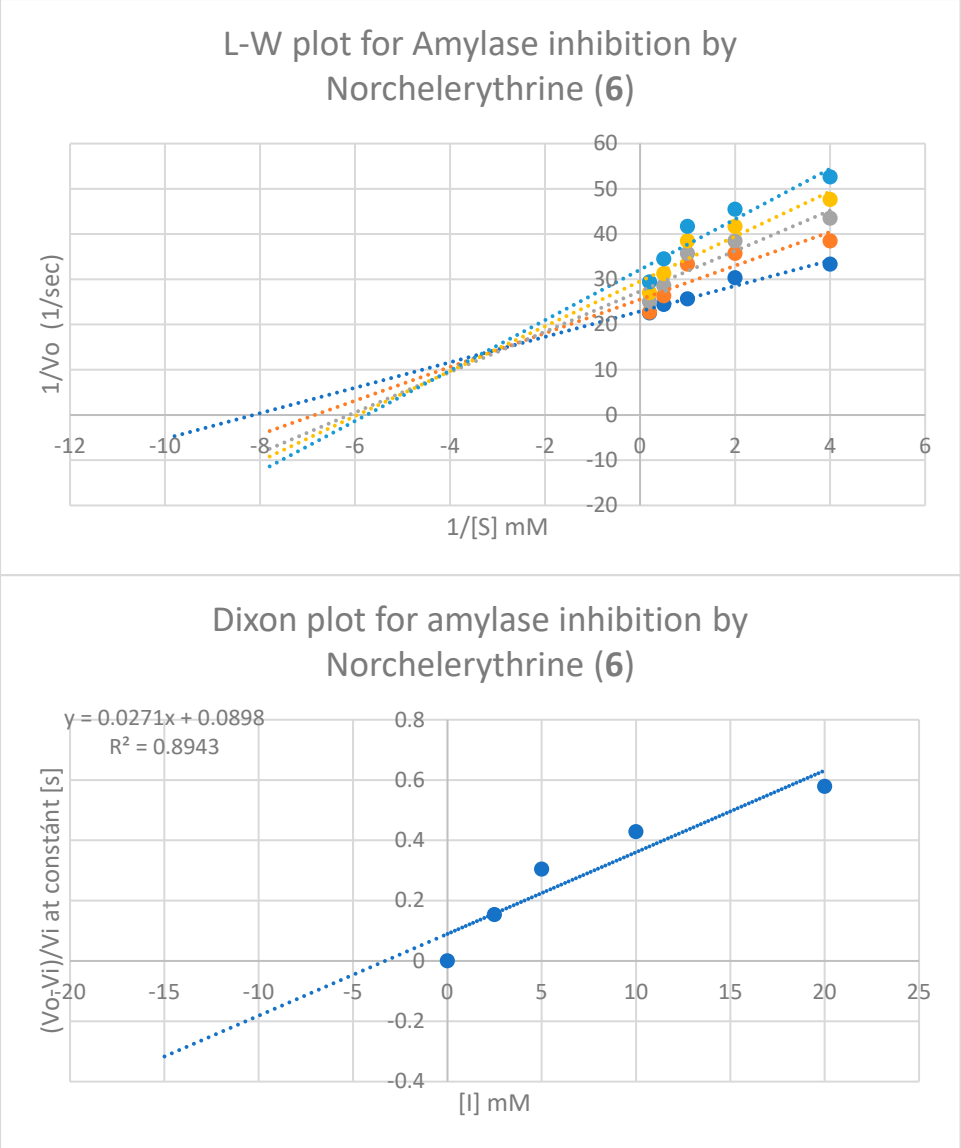


Figure S11: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (mixed inhibition, Varied Km); B- Dixon plot for Norchelerythrine (**6**), Ki = **6.51 mM.**

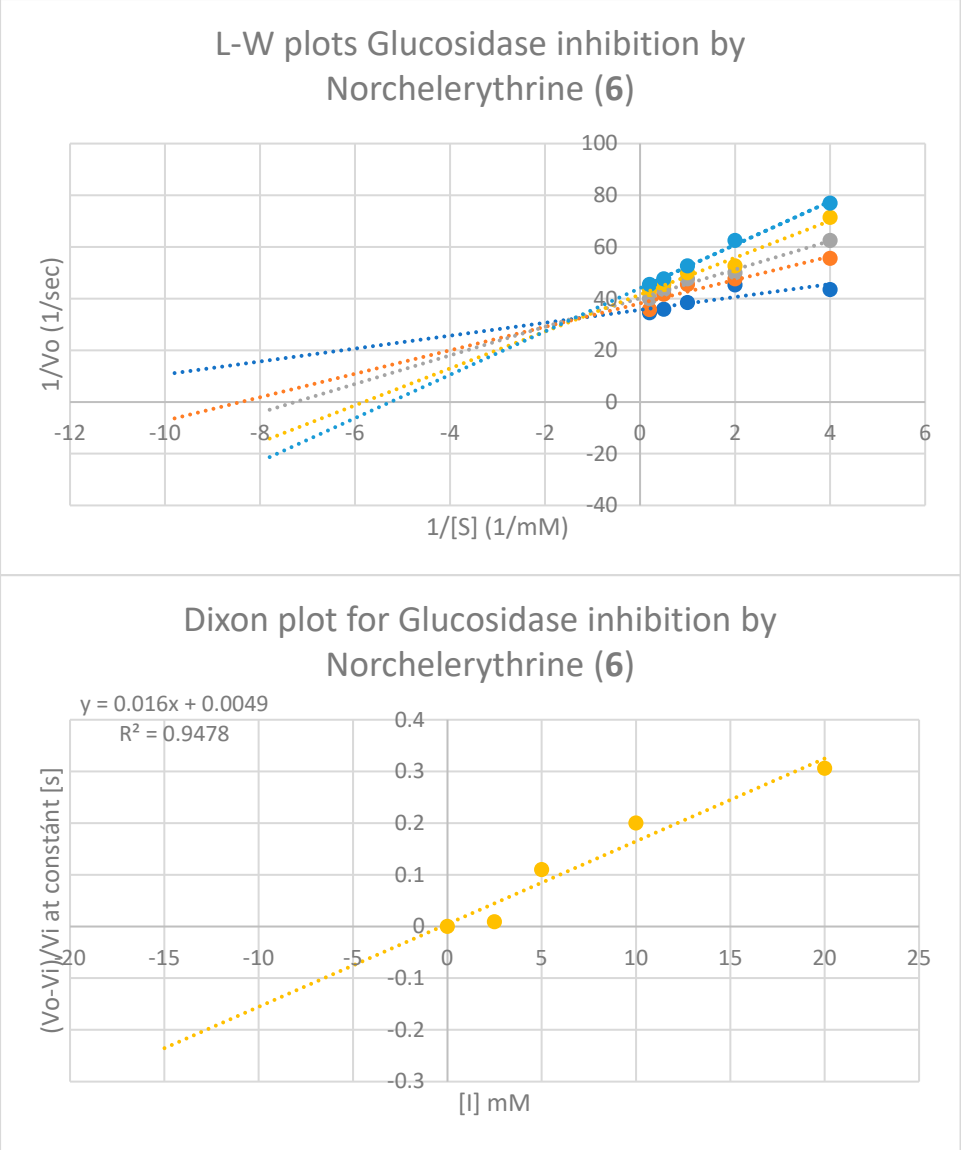


Figure S12: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (mixed inhibition, Varied Km); B- Dixon plot for Norchelerythrine (**6**), Ki = **7.68 mM.**

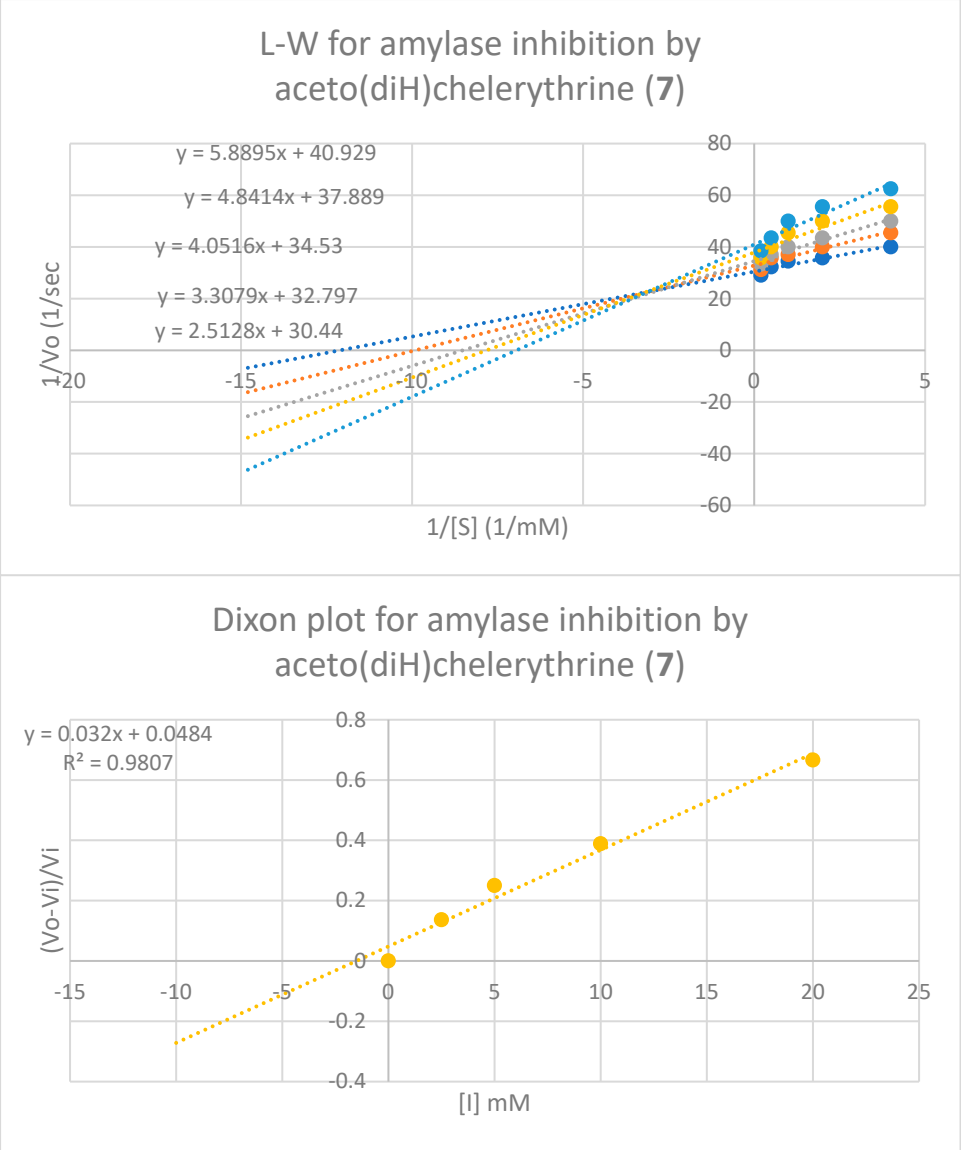


Figure S13: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (mixed inhibition, Varied Km); B- Dixon plot for 6-Acetonyldihydrochelerythrine (**7**), Ki = **3.34 mM.**

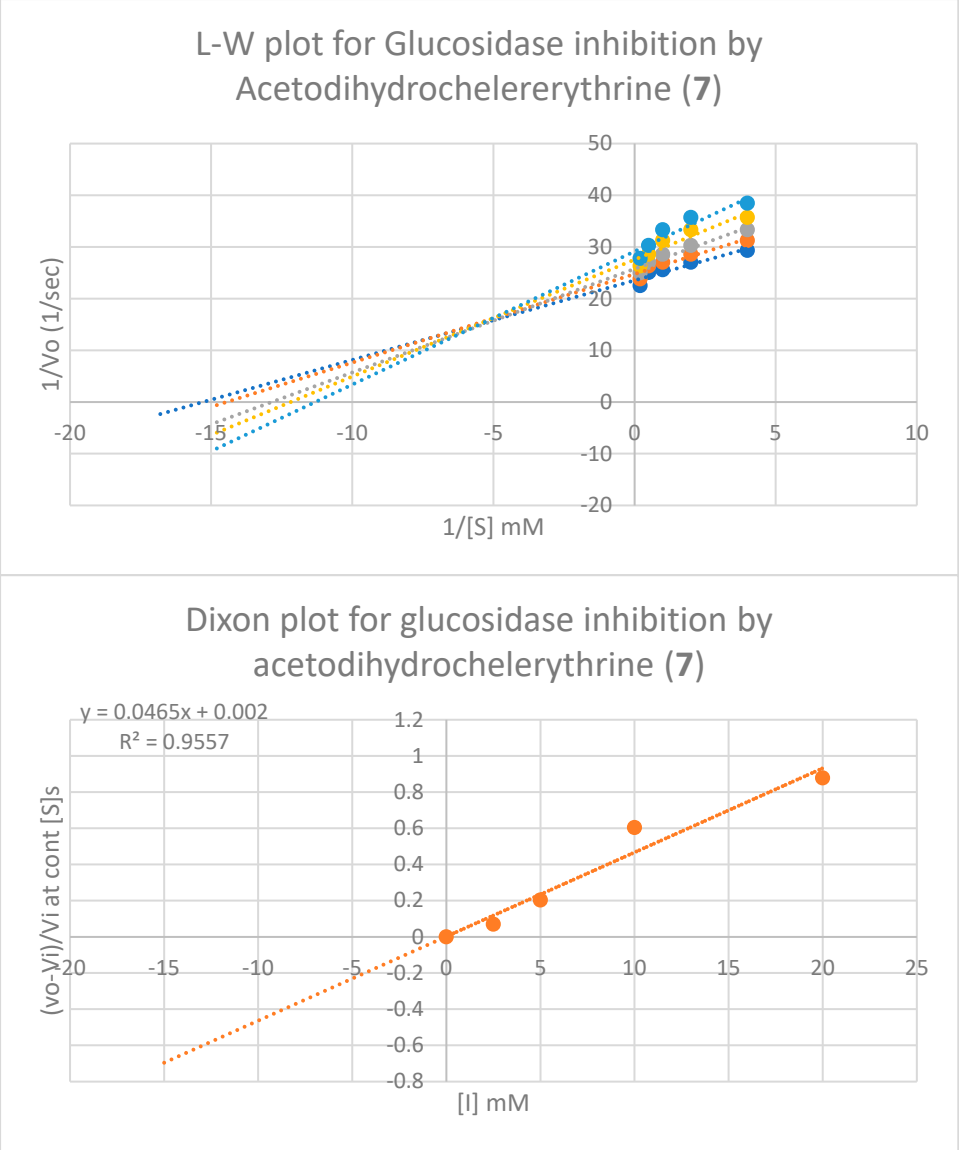


Figure S14: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (mixed inhibition, Varied Km); B- Dixon plot for 6-Acetonyldihydrochelerythrine (7), Ki = **4.73 mM.**

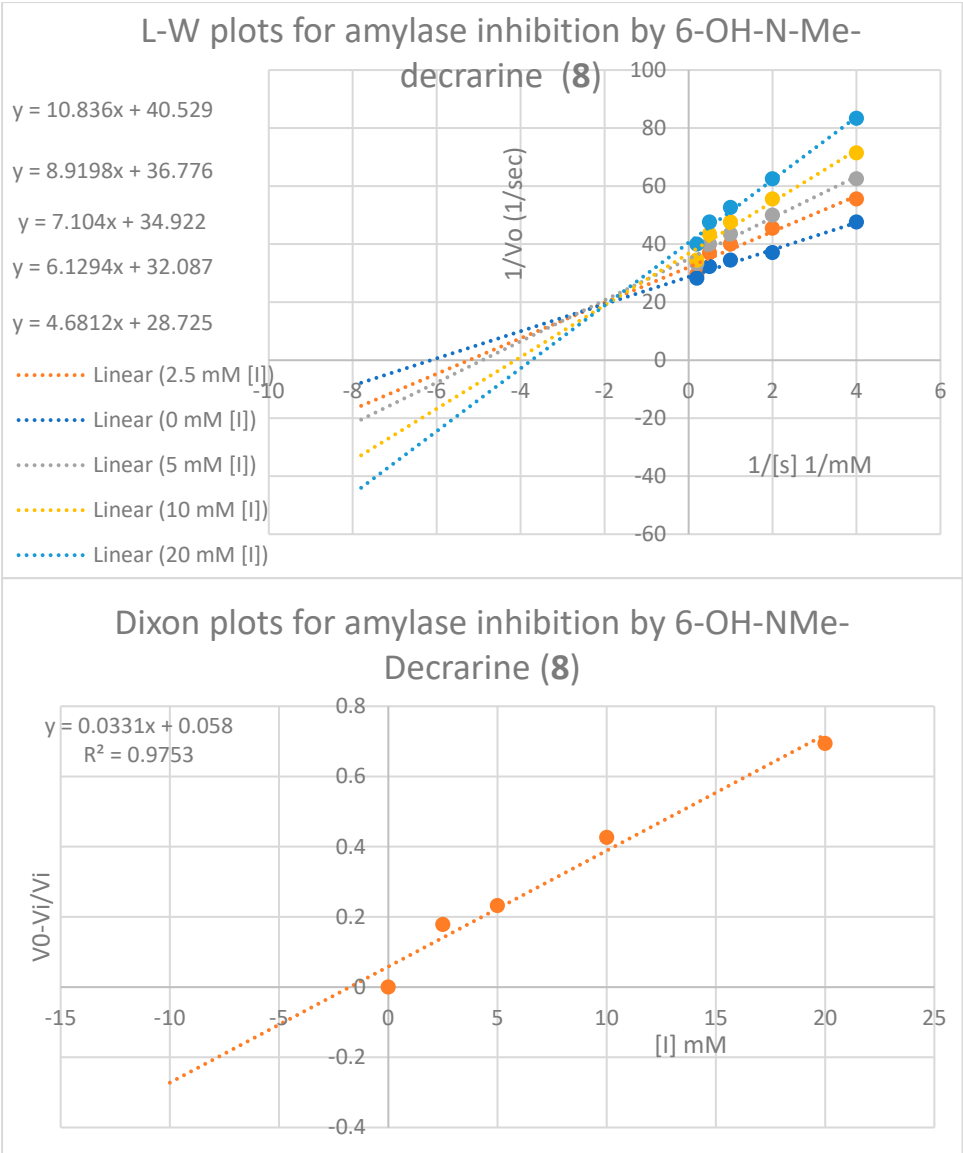


Figure S15: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (mixed inhibition, varied Km); B- Dixon plot for 6-hydroxy-N-methyldecarine (**8**), Ki = **3.10 mM.**

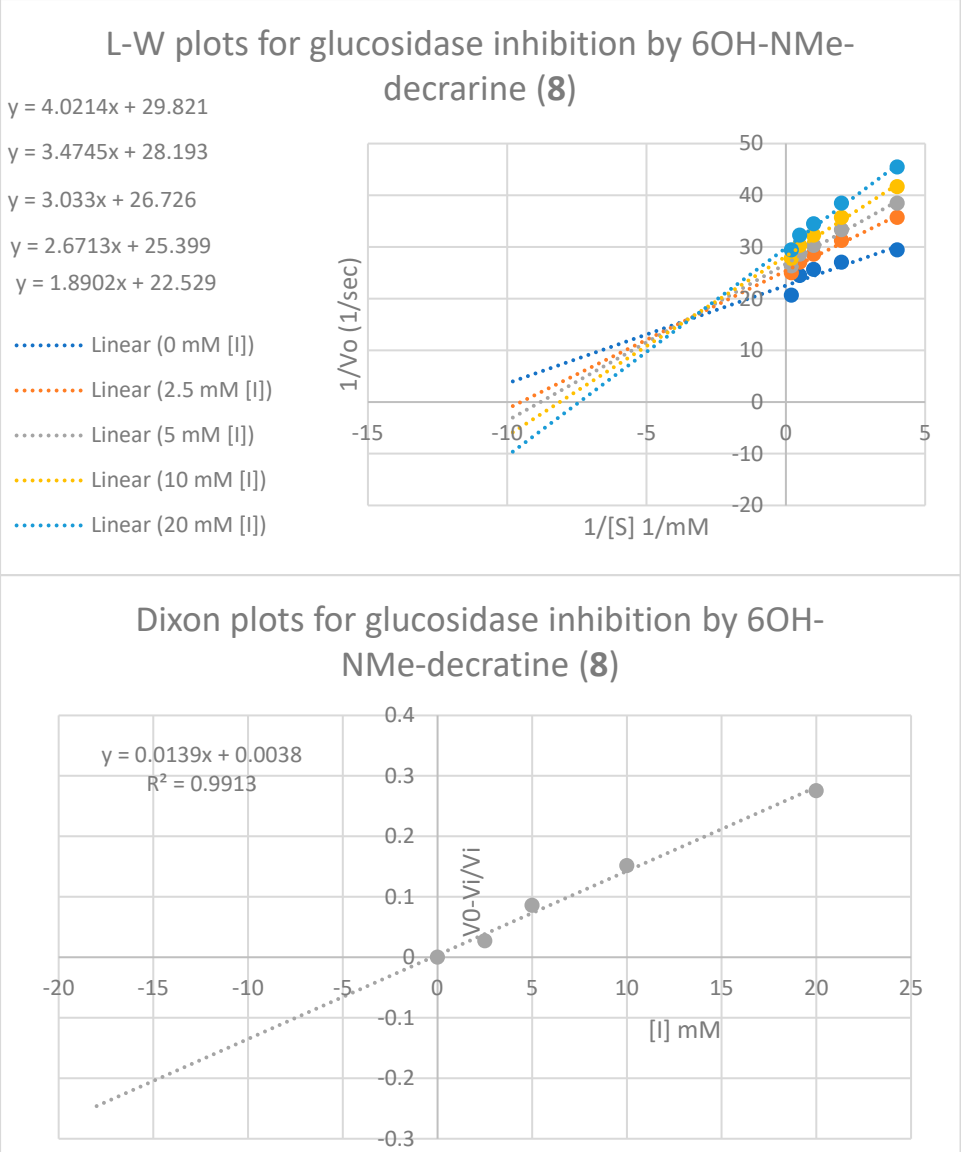


Figure S16: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (mixed inhibition, varied Km); B- Dixon plot for 6-hydroxy-N-methyldecarine (**8**), Ki = **9.17 mM.**

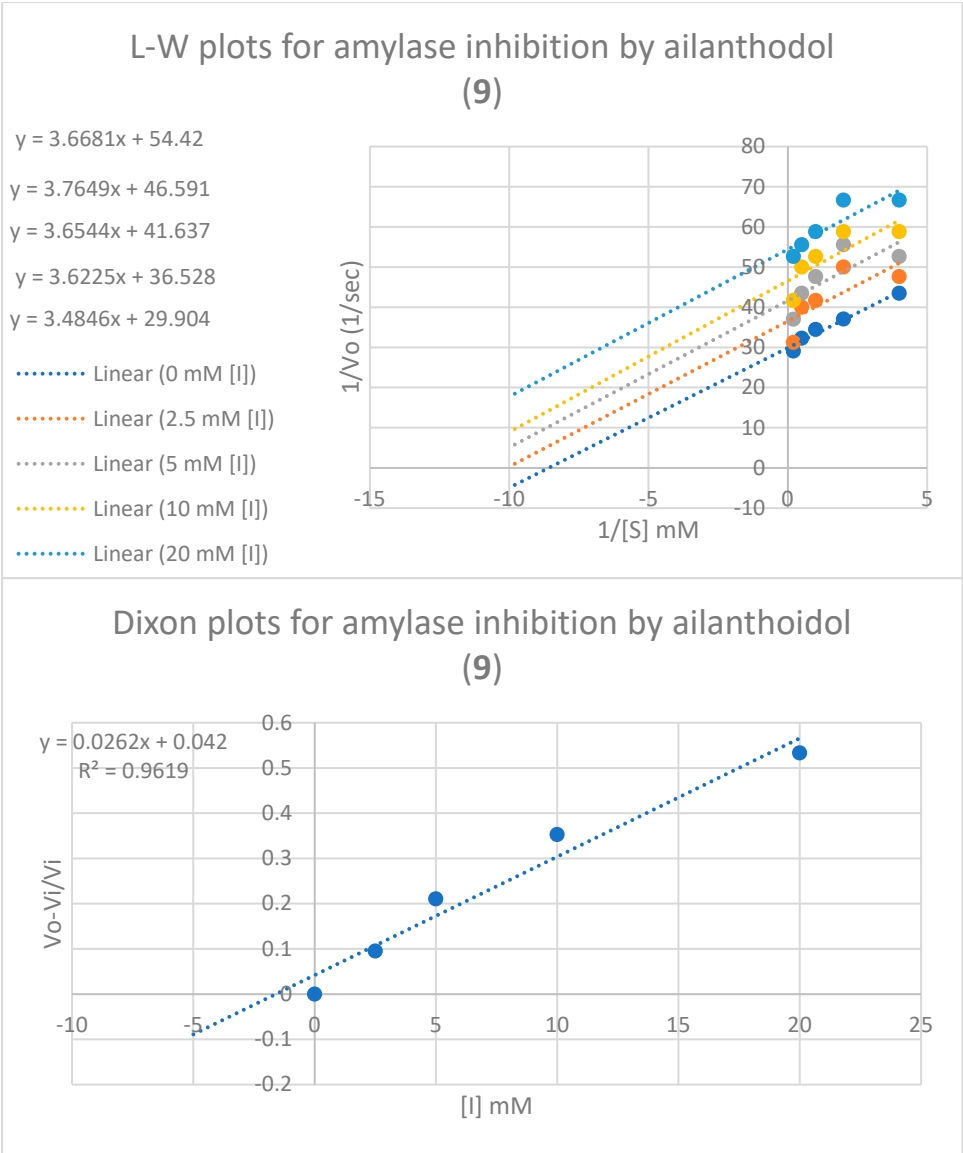


Figure S17: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (un-competitive inhibition, varied Km); B- Dixon plot for Ailanthodial (**9**), Ki = **26.28 mM.**

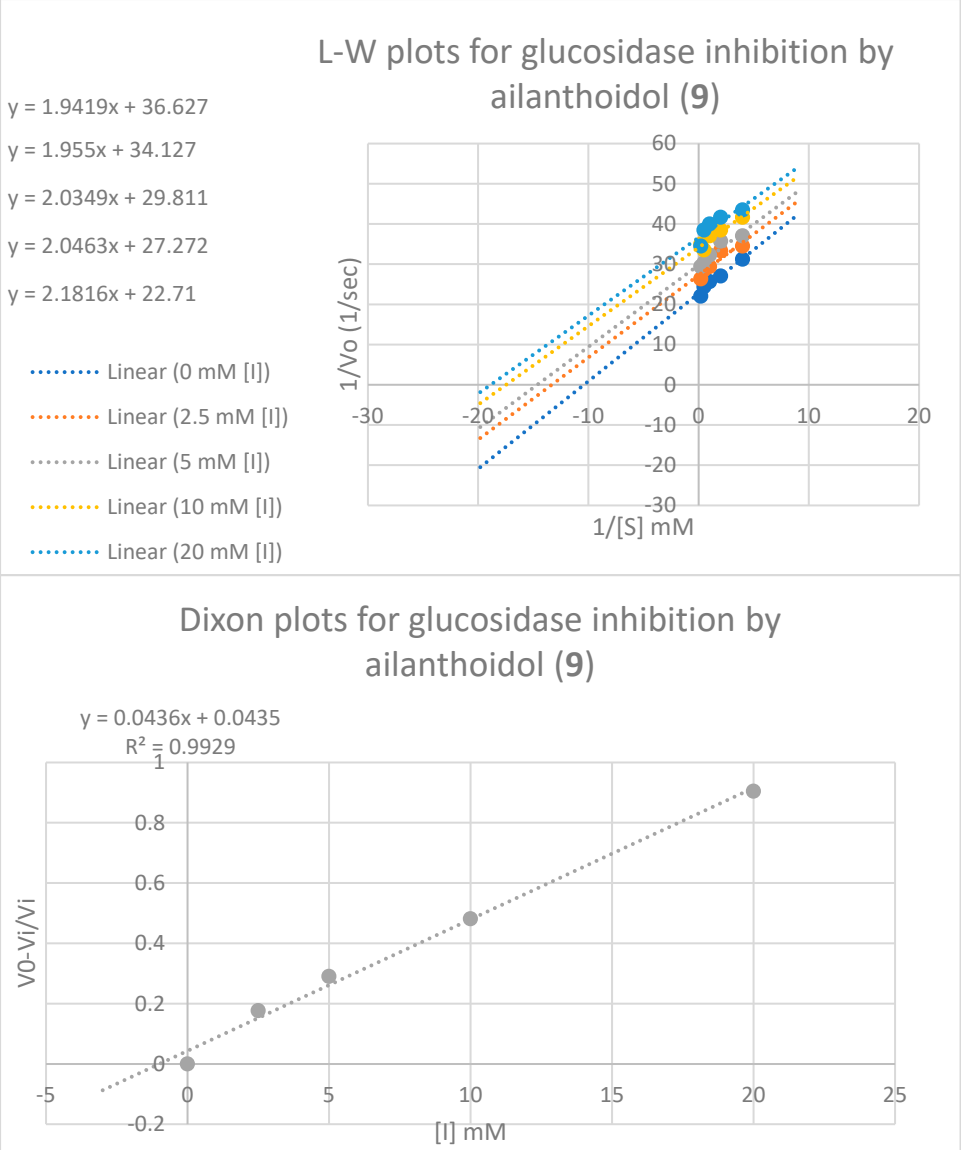


Figure S18: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 5.53 mM); B- Dixon plot for Ailanthoidol (**9**), Ki = **20.63 mM.**

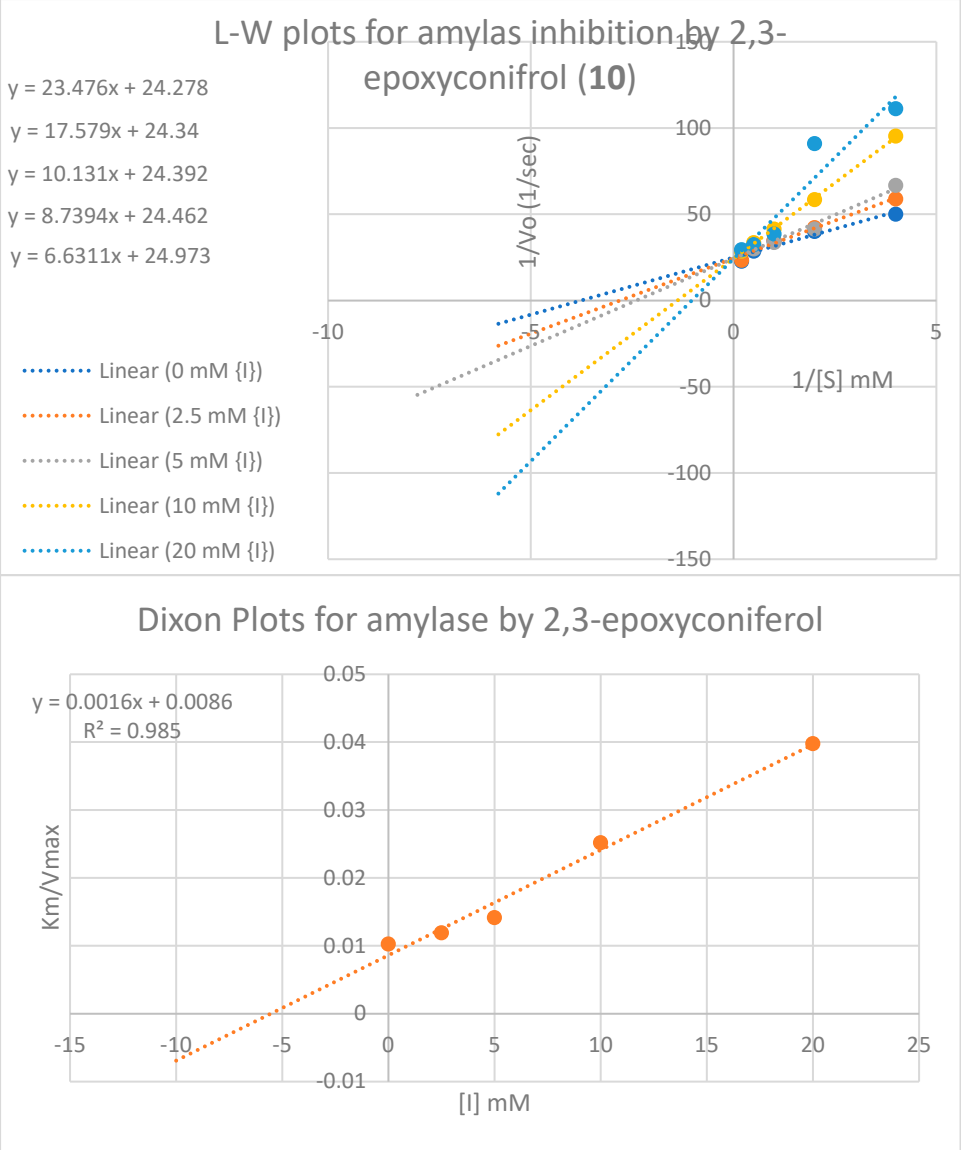


Figure S19: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (competitive inhibition, $1/V_{max}$ = 24.47 sec^{-1}); B- Dixon plot for 2,3-epoxy-6,7-methylenedioxyconiferol (**10**), K_i = **5.54 mM.**

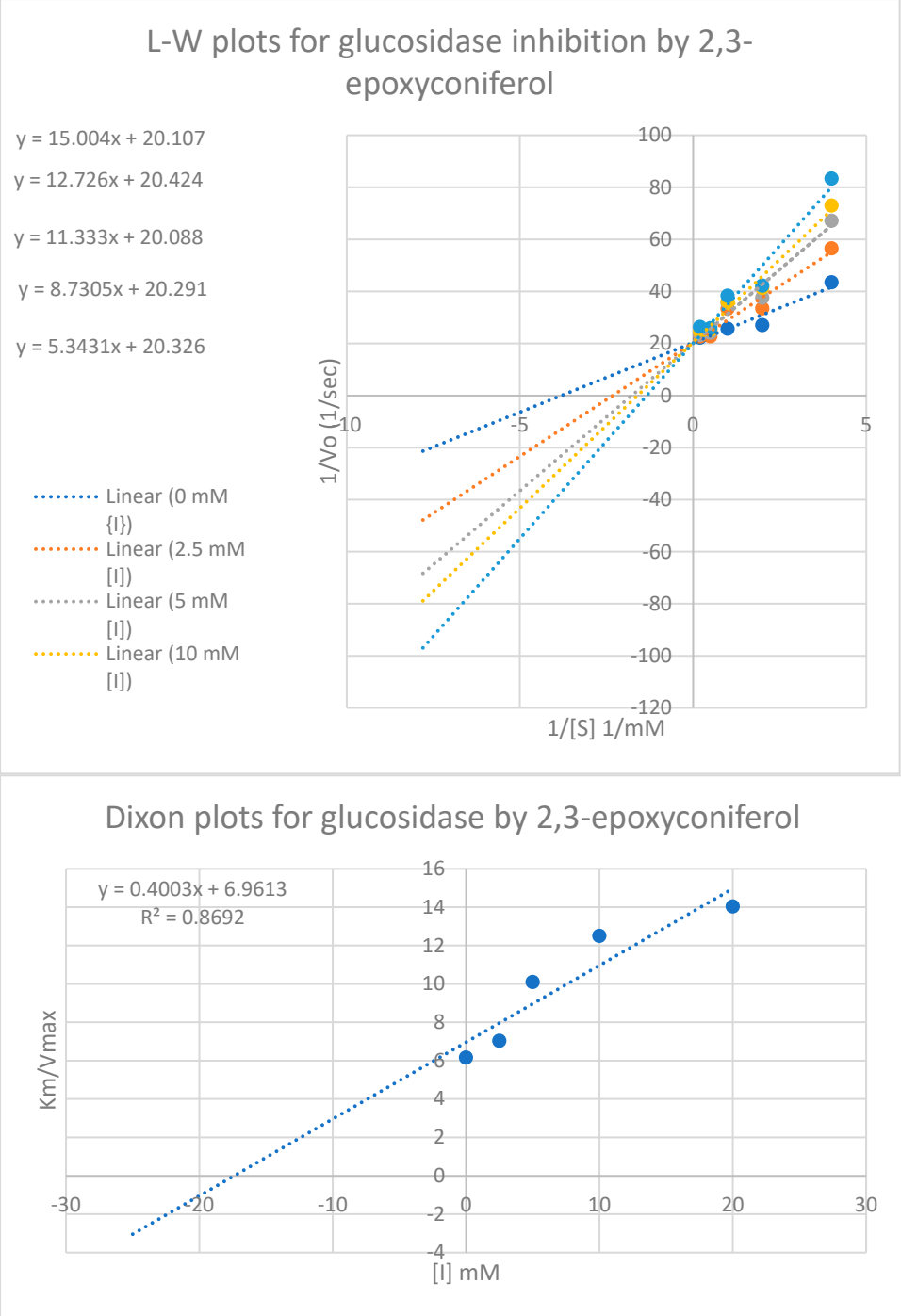


Figure S20: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (competitive inhibition, $1/V_{max}$ = 20.25 sec^{-1}); B- Dixon plot for 2,3-epoxy-6,7-methylenedioxyconiferol (**10**), K_i = **17.21 mM.**

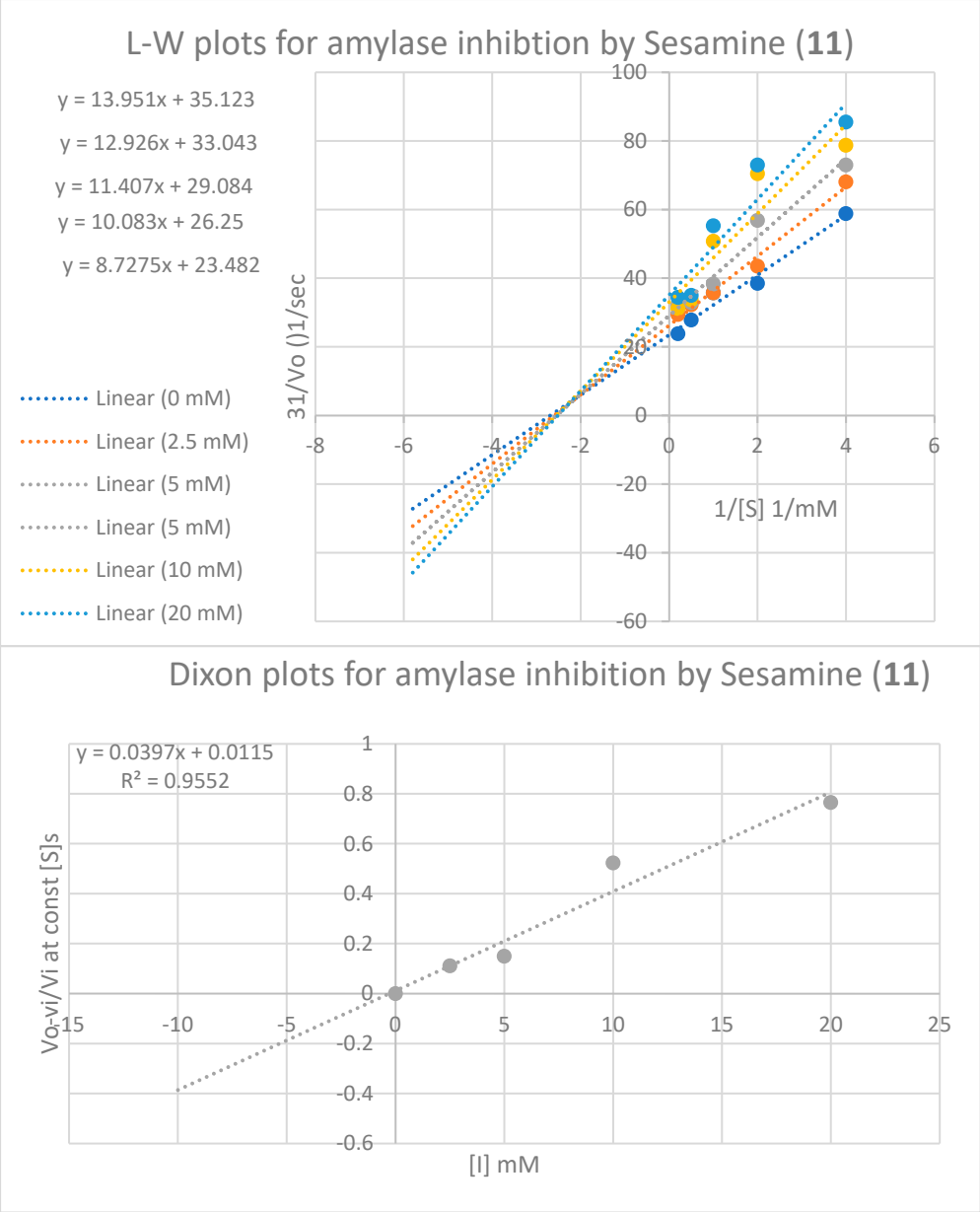


Figure S21: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (non-competitive inhibition, Km = 2.69 mM); B- Dixon plot for Sesamine (**11**), Ki = **12.53 mM.**

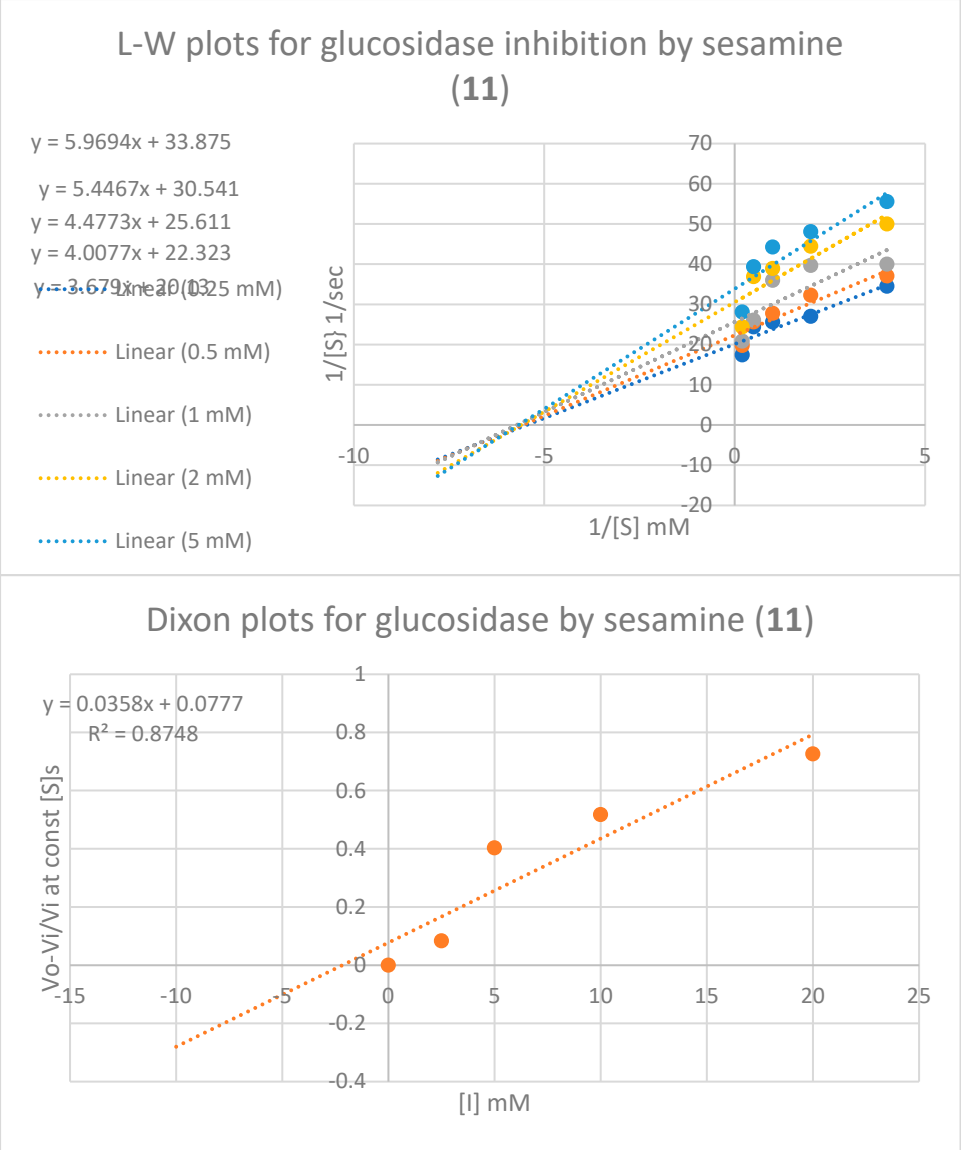


Figure S22: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (non-competitive inhibition, Km = 5.61 mM); B- Dixon plot for Sesamine (**11**), Ki = **24.33 mM.**

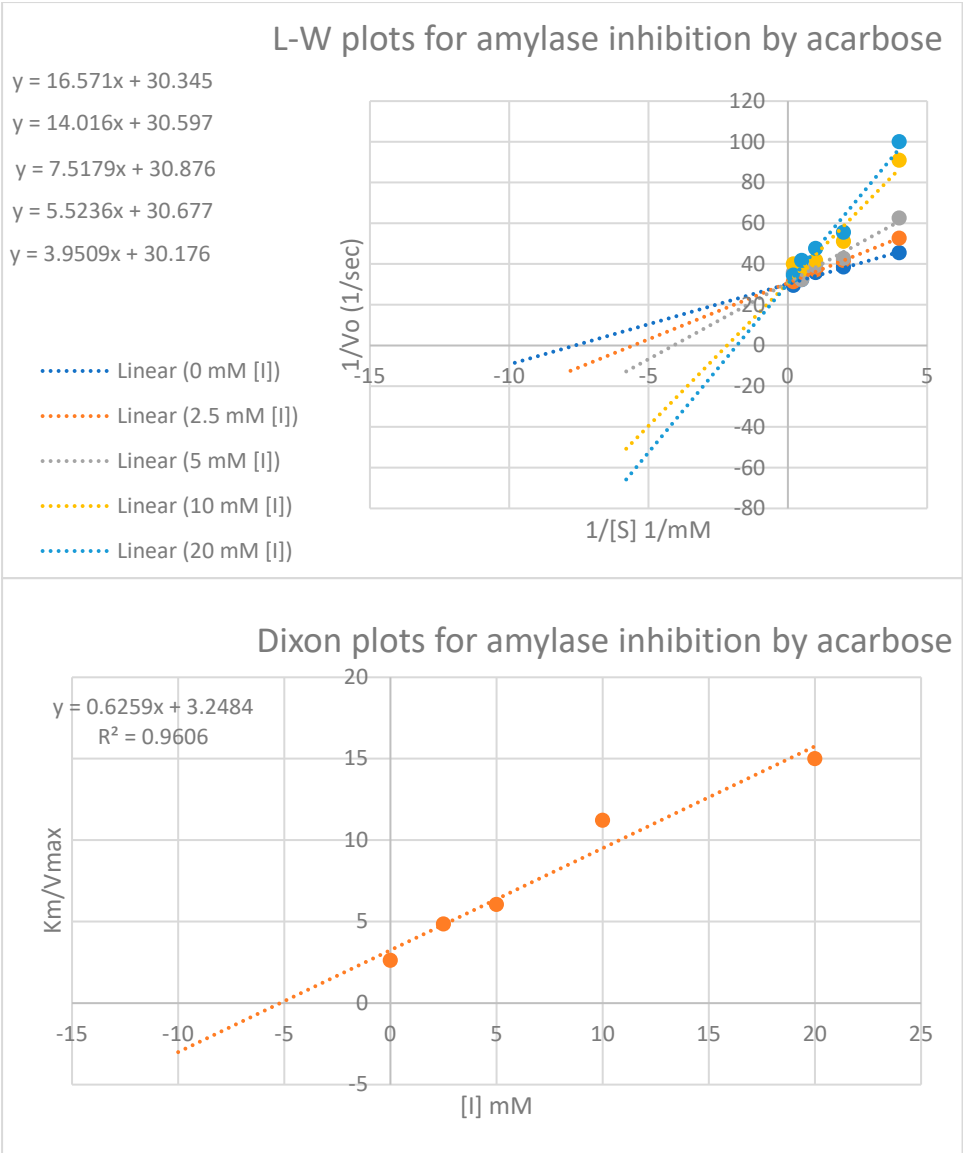


Figure S23: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-amylase (competitive inhibition, $1/V_{max} = 30.45\ sec^{-1}$); B- Dixon plot for acarbose $K_i = 6.14$ **mM.**

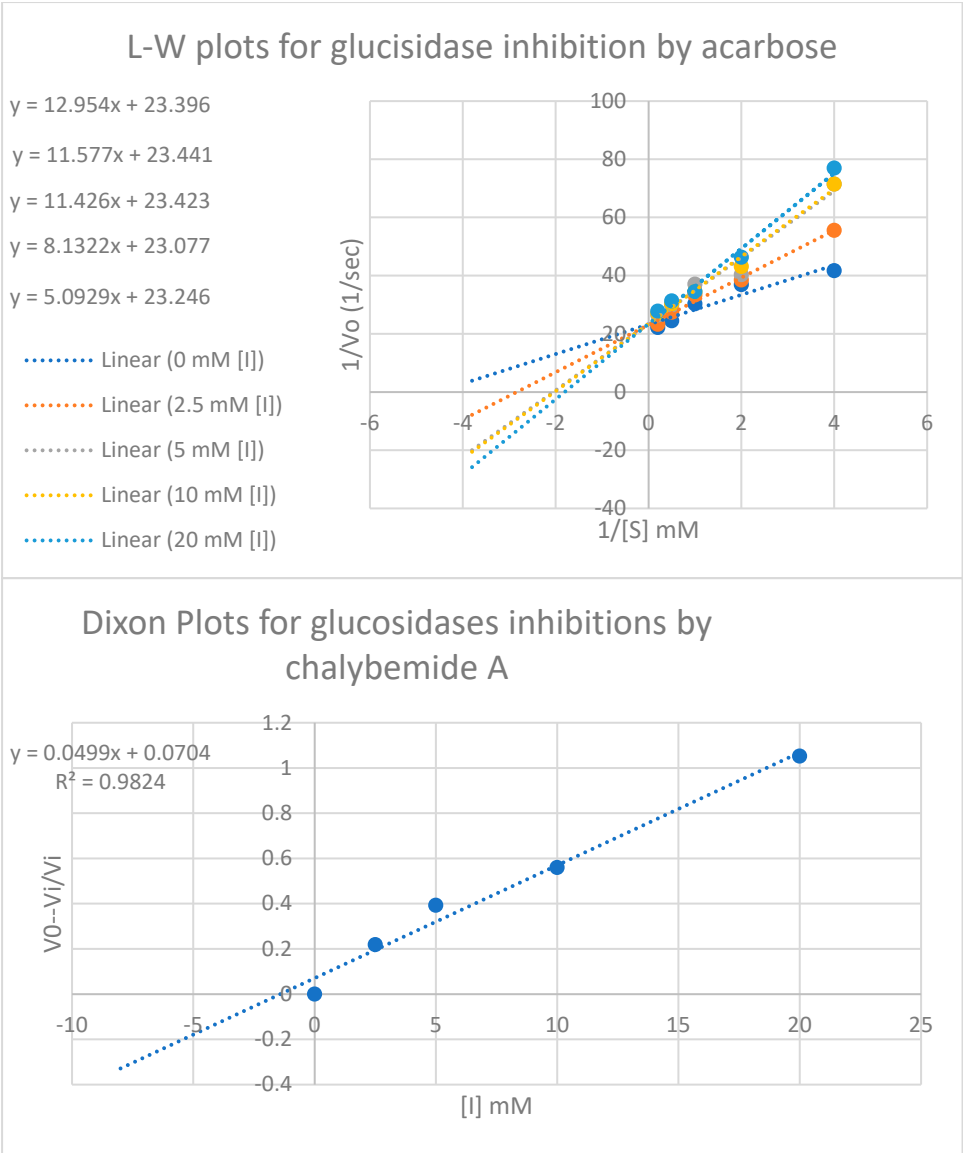


Figure S24: A- Double reciprocal (Lineweaver-Burk) plot for inhibition of α-glucosidase (competitive inhibition, $1/V_{max}$ = 23.32 sec^{-1}); B: Dixon plot for Acarbose, Ki = **22.40 mM.**

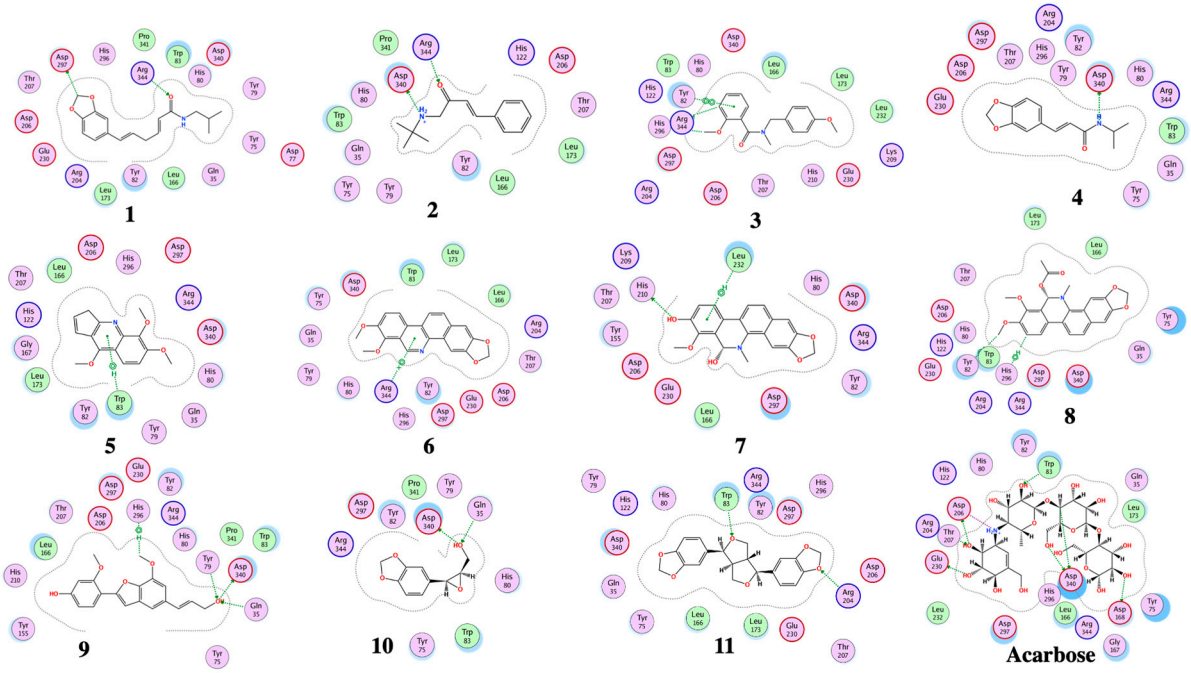


Figure S25: 2D interactions of compounds 1-11 and the reference Acarbose with α-amylase enzyme (PDB ID: 7TAA).

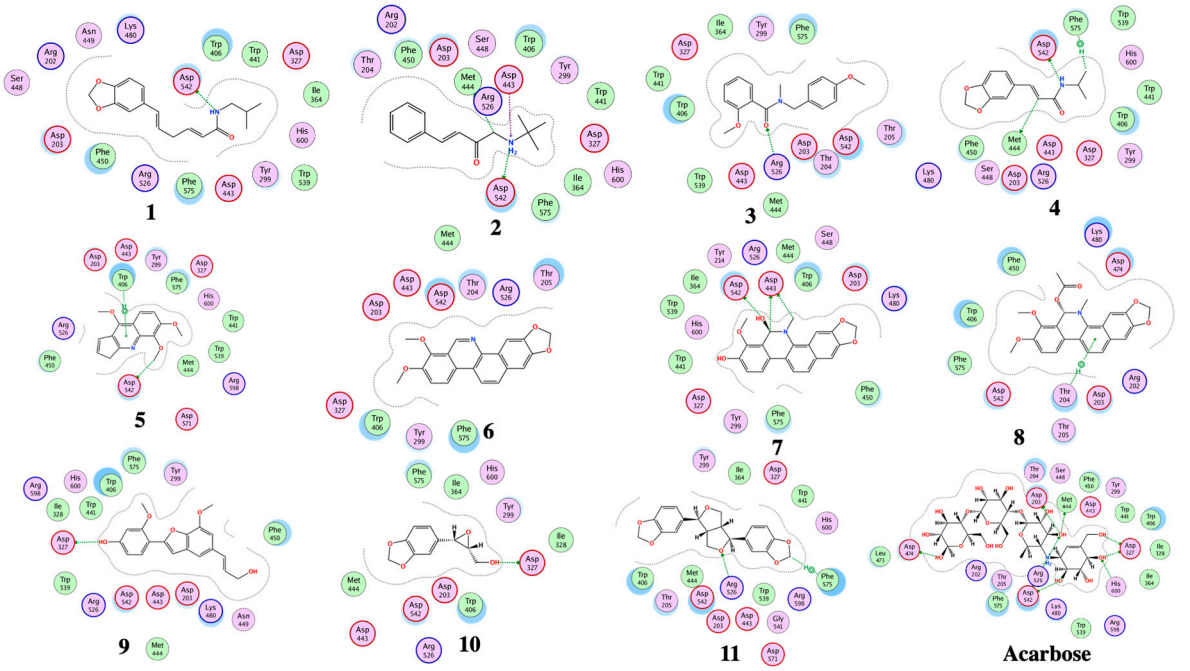


Figure S26: 2D interactions of compounds 1-11 and the reference Acarbose with α-glucosidase enzyme (PDB ID: 2QMJ).

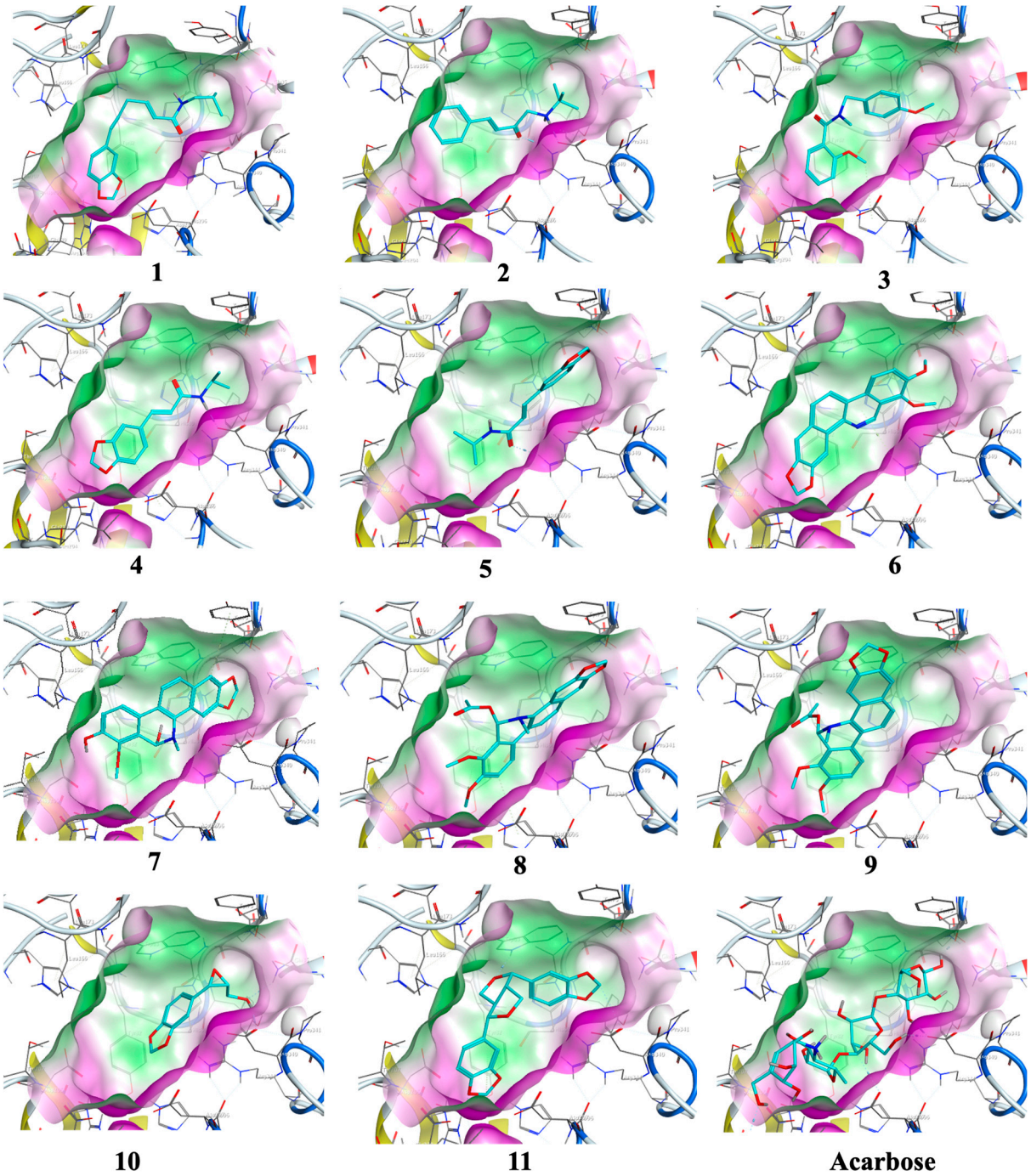


Figure S27: Docking conformation with the highest score for compounds **1-11** and the reference acarbose (carbon atoms in cyan) in the binding site of a-amylase (ID: 7TAA). Lipophilic areas on the molecular surface are colored green, while hydrophilic areas are colored purple.

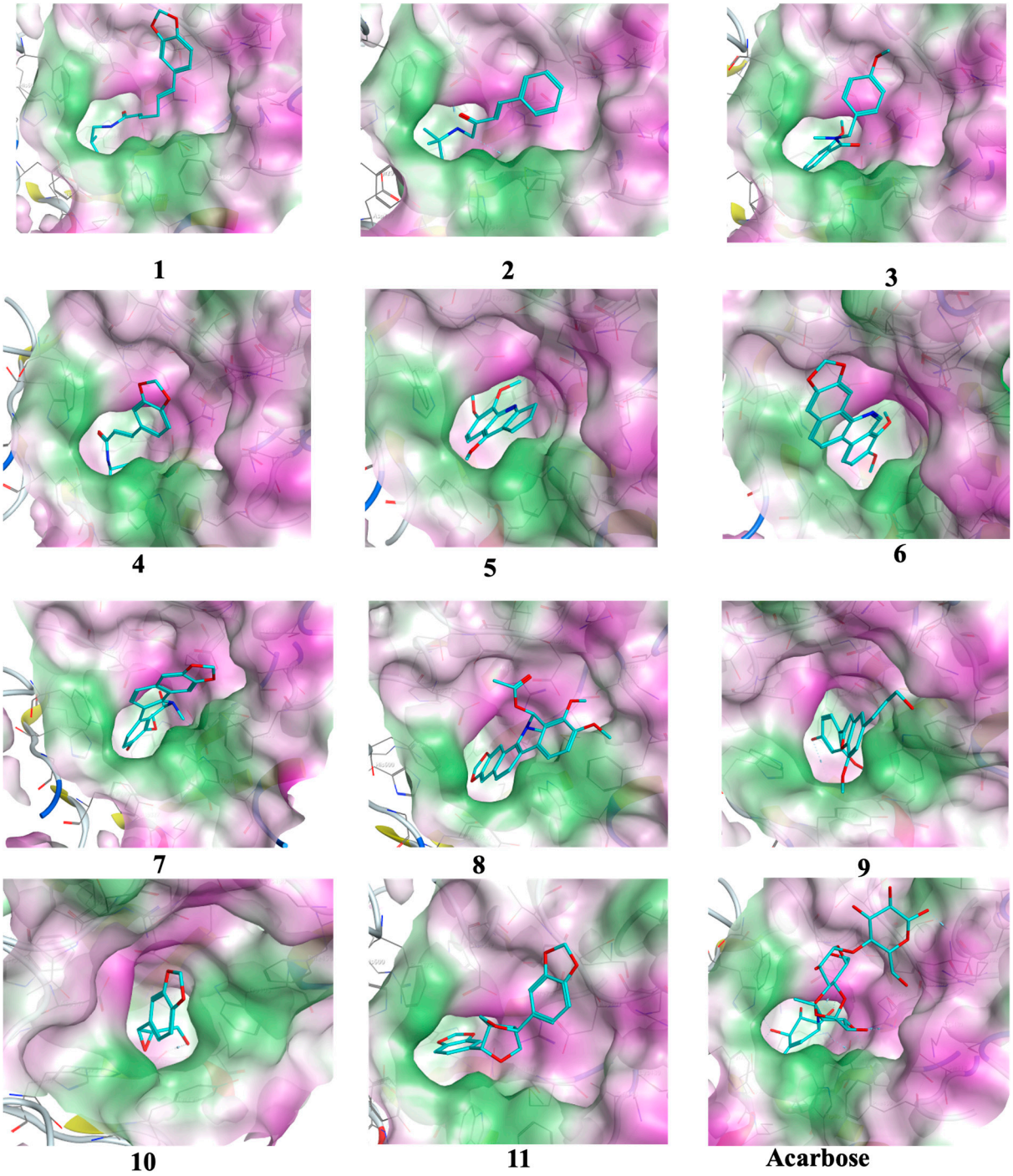


Figure S28: Docking conformation with the highest score for compounds 1-11 and the reference acarbose (carbon atoms in cyan) in the binding site of α-glucosidase (ID: 2QMJ. Lipophilic areas on the molecular surface are coloured green, while hydrophilic areas are coloured purple.