

PhoenixTemp56585.tmp.txt  
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<223> Variant

<220>  
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Leu Ser Ser Leu Gly Ile Thr Ala Leu Trp Leu Pro Pro Ala Tyr Lys  
35 40 45

Gly Thr Ser Arg Ser Asp Val Gly Tyr Gly Val Tyr Asp Leu Tyr Asp  
50 55 60

Leu Gly Glu Phe Asn Gln Lys Gly Ala Val Arg Thr Lys Tyr Gly Thr  
65 70 75 80

Lys Ala Gln Tyr Leu Gln Ala Ile Gln Ala Ala His Ala Ala Gly Met  
85 90 95

Gln Val Tyr Ala Asp Val Val Phe Asp His Lys Gly Gly Ala Asp Gly  
100 105 110

Thr Glu Trp Val Asp Ala Val Glu Val Asn Pro Ser Asp Arg Asn Gln  
115 120 125

Glu Ile Ser Gly Thr Tyr Gln Ile Gln Ala Trp Thr Lys Phe Asp Phe  
130 135 140

Pro Gly Arg Gly Asn Thr Tyr Ser Ser Phe Lys Trp Arg Trp Tyr His  
145 150 155 160

Phe Asp Gly Val Asp Trp Asp Glu Ser Arg Lys Leu Ser Arg Ile Tyr  
165 170 175

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Lys Phe Arg Gly Lys Ala Trp Asp Trp Glu Val Asp Thr Glu Phe Gly  
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 Asn Tyr Asp Tyr Leu Met Tyr Ala Asp Leu Asp Met Asp His Pro Glu  
 195 200 205  
 Val Val Thr Glu Leu Lys Ser Trp Gly Lys Trp Tyr Val Asn Thr Thr  
 210 215 220  
 Asn Ile Asp Gly Phe Arg Leu Asp Ala Val Lys His Ile Lys Phe Ser  
 225 230 235 240  
 Phe Phe Pro Asp Trp Leu Ser Asp Val Arg Ser Gln Thr Gly Lys Pro  
 245 250 255  
 Leu Phe Thr Val Gly Glu Tyr Trp Ser Tyr Asp Ile Asn Lys Leu His  
 260 265 270  
 Asn Tyr Ile Met Lys Thr Asn Gly Thr Met Ser Leu Phe Asp Ala Pro  
 275 280 285  
 Leu His Asn Lys Phe Tyr Thr Ala Ser Lys Ser Gly Gly Thr Phe Asp  
 290 295 300  
 Met Arg Thr Leu Met Thr Asn Thr Leu Met Lys Asp Gln Pro Thr Leu  
 305 310 315 320  
 Ala Val Thr Phe Val Asp Asn His Asp Thr Glu Pro Gly Gln Ala Leu  
 325 330 335  
 Gln Ser Trp Val Asp Pro Trp Phe Lys Pro Leu Ala Tyr Ala Phe Ile  
 340 345 350  
 Leu Thr Arg Gln Glu Gly Tyr Pro Cys Val Phe Tyr Gly Asp Tyr Tyr  
 355 360 365  
 Gly Ile Pro Gln Tyr Asn Ile Pro Ser Leu Lys Ser Lys Ile Asp Pro  
 370 375 380  
 Leu Leu Ile Ala Arg Arg Asp Tyr Ala Tyr Gly Thr Gln His Asp Tyr  
 385 390 395 400  
 Leu Asp His Ser Asp Ile Ile Gly Trp Thr Arg Glu Gly Val Thr Glu  
 405 410 415  
 Lys Pro Gly Ser Gly Leu Ala Ala Leu Ile Thr Asp Gly Pro Gly Gly  
 420 425 430  
 Ser Lys Trp Met Tyr Val Gly Lys Gln His Ala Gly Lys Val Phe Tyr  
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Asp Leu Thr Gly Asn Arg Ser Asp Thr Val Thr Ile Asn Ser Asp Gly  
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Trp Gly Glu Phe Lys Val Asn Gly Gly Ser Val Ser Val Trp Val Pro  
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35 40 45

Ala Val Ala Asp Thr Gln Val Pro Gly Asp Asn Thr Gln Val Gly Leu  
50 55 60

Ile Val Arg Lys Asn Asp Trp Ser Glu Lys Asn Thr Pro Asn Asp Leu  
65 70 75 80

His Ile Asp Leu Ala Lys Gly His Glu Val Trp Ile Val Gln Gly Asp  
85 90 95

Pro Thr Ile Tyr Tyr Asn Leu Ser Asp Ala Gln Ala Ala Ala Ile Pro  
100 105 110

Ser Val Ser Asn Ala Tyr Leu Asp Asp Glu Lys Thr Val Leu Ala Lys  
115 120 125

Leu Ser Met Pro Met Thr Leu Ala Asp Ala Ala Ser Gly Phe Thr Val  
130 135 140

Ile Asp Lys Thr Thr Gly Glu Lys Ile Pro Val Thr Ser Ala Val Ser  
145 150 155 160

Ala Asn Pro Val Thr Ala Val Leu Val Gly Asp Leu Gln Gln Ala Leu  
 165 170 175  
 Gly Ala Ala Asn Asn Trp Ser Pro Asp Asp Asp His Thr Leu Leu Lys  
 180 185 190  
 Lys Ile Asn Pro Asn Leu Tyr Gln Leu Ser Gly Thr Leu Pro Ala Gly  
 195 200 205  
 Thr Tyr Gln Tyr Lys Ile Ala Leu Asp His Ser Trp Asn Thr Ser Tyr  
 210 215 220  
 Pro Gly Asn Asn Val Ser Leu Thr Val Pro Gln Gly Gly Glu Lys Val  
 225 230 235 240  
 Thr Phe Thr Tyr Ile Pro Ser Thr Asn Gln Val Phe Asp Ser Val Asn  
 245 250 255  
 His Pro Asn Gln Ala Phe Pro Thr Ser Ser Ala Gly Val Gln Thr Asn  
 260 265 270  
 Leu Val Gln Leu Thr Leu Ala Ser Ala Pro Asp Val Thr His Asn Leu  
 275 280 285  
 Asp Val Ala Ala Asp Gly Tyr Lys Ala His Asn Ile Leu Pro Arg Asn  
 290 295 300  
 Val Leu Asn Leu Pro Arg Tyr Asp Tyr Ser Gly Asn Asp Leu Gly Asn  
 305 310 315 320  
 Val Tyr Ser Lys Asp Ala Thr Ser Phe Arg Val Trp Ala Pro Thr Ala  
 325 330 335  
 Ser Asn Val Gln Leu Leu Leu Tyr Asn Ser Glu Lys Gly Ser Ile Thr  
 340 345 350  
 Lys Gln Leu Glu Met Gln Lys Ser Asp Asn Gly Thr Trp Lys Leu Gln  
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 Val Ser Gly Asn Leu Glu Asn Trp Tyr Tyr Leu Tyr Gln Val Thr Val  
 370 375 380  
 Asn Gly Thr Thr Gln Thr Ala Val Asp Pro Tyr Ala Arg Ala Ile Ser  
 385 390 395 400  
 Val Asn Ala Thr Arg Gly Met Ile Val Asp Leu Lys Ala Thr Asp Pro  
 405 410 415  
 Ala Gly Trp Gln Gly Asp His Glu Gln Thr Pro Ala Asn Pro Val Asp  
 420 425 430  
 Glu Val Ile Tyr Glu Ala His Val Arg Asp Phe Ser Ile Asp Ala Asn

435

440

445

Ser Gly Met Lys Asn Lys Gly Lys Tyr Leu Ala Phe Thr Glu His Gly  
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 Thr Lys Gly Pro Asp His Val Lys Thr Gly Ile Asp Ser Leu Lys Glu  
 465 470 475 480  
 Leu Gly Ile Thr Thr Val Gln Leu Gln Pro Val Glu Glu Phe Asn Ser  
 485 490 495  
 Ile Asp Glu Thr Gln Pro Asp Thr Tyr Asn Trp Gly Tyr Asp Pro Arg  
 500 505 510  
 Asn Tyr Asn Val Pro Glu Gly Ala Tyr Ala Thr Thr Pro Glu Gly Thr  
 515 520 525  
 Ala Arg Ile Thr Glu Leu Lys Gln Leu Ile Gln Ser Leu His Gln Gln  
 530 535 540  
 Arg Ile Gly Val Asn Met Asp Val Val Tyr Asn His Thr Phe Asp Val  
 545 550 555 560  
 Met Val Ser Asp Phe Asp Lys Ile Val Pro Gln Tyr Tyr Tyr Arg Thr  
 565 570 575  
 Asp Ser Asn Gly Asn Tyr Thr Asn Gly Ser Gly Cys Gly Asn Glu Phe  
 580 585 590  
 Ala Thr Glu His Pro Met Ala Gln Lys Phe Val Leu Asp Ser Val Asn  
 595 600 605  
 Tyr Trp Val Asn Glu Tyr His Val Asp Gly Phe Arg Phe Asp Leu Met  
 610 615 620  
 Ala Leu Leu Gly Lys Asp Thr Met Ala Lys Ile Ser Asn Glu Leu His  
 625 630 635 640  
 Ala Ile Asn Pro Gly Ile Val Leu Tyr Gly Glu Pro Trp Thr Gly Gly  
 645 650 655  
 Thr Ser Gly Leu Ser Ser Asp Gln Leu Val Thr Lys Gly Gln Gln Lys  
 660 665 670  
 Gly Leu Gly Ile Gly Val Phe Asn Asp Asn Ile Arg Asn Gly Leu Asp  
 675 680 685  
 Gly Asn Val Phe Asp Lys Thr Ala Gln Gly Phe Ala Thr Gly Asp Pro  
 690 695 700  
 Asn Gln Val Asp Val Ile Lys Asn Gly Val Ile Gly Ser Ile Gln Asp  
 705 710 715 720

PhoenixTemp56585.tmp.txt

Phe Thr Ser Ala Pro Ser Glu Thr Ile Asn Tyr Val Thr Ser His Asp  
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 Asn Met Thr Leu Trp Asp Lys Ile Leu Ala Ser Asn Pro Ser Asp Thr  
                     740                    745                    750  
 Glu Ala Asp Arg Ile Lys Met Asp Glu Leu Ala His Ala Val Val Phe  
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 Thr Ser Gln Gly Val Pro Phe Met Gln Gly Gly Glu Glu Met Leu Arg  
                     770                    775                    780  
 Thr Lys Gly Gly Asn Asp Asn Ser Tyr Asn Ala Gly Asp Ser Val Asn  
                     785                    790                    795                    800  
 Gln Phe Asp Trp Ser Arg Lys Ala Gln Phe Lys Asp Val Phe Asp Tyr  
                     805                    810                    815  
 Phe Ser Ser Met Ile His Leu Arg Asn Gln His Pro Ala Phe Arg Met  
                     820                    825                    830  
 Thr Thr Ala Asp Gln Ile Lys Gln Asn Leu Thr Phe Leu Glu Ser Pro  
                     835                    840                    845  
 Thr Asn Thr Val Ala Phe Glu Leu Lys Asn Tyr Ala Asn His Asp Thr  
                     850                    855                    860  
 Trp Lys Asn Ile Ile Val Met Tyr Asn Pro Asn Lys Thr Ser Gln Thr  
                     865                    870                    875                    880  
 Leu Asn Leu Pro Ser Gly Asp Trp Thr Ile Val Gly Leu Gly Asp Gln  
                     885                    890                    895  
 Ile Gly Glu Lys Ser Leu Gly His Val Met Gly Asn Val Gln Val Pro  
                     900                    905                    910  
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PhoenixTemp56585.tmp.txt

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 Lys Pro Thr Gly Thr Gln Ile Ile Thr Thr Asp Leu Gln Asn Arg Glu  
 35 40 45  
 Tyr Asn Leu Pro Gly Thr Leu Val Ser Ser Thr Thr Asn Gln Phe Thr  
 50 55 60  
 Thr Ser Ser Gln Arg Ala Ala Val Asp Ala His Tyr Asn Leu Gly Lys  
 65 70 75 80  
 Val Tyr Asp Tyr Phe Tyr Gln Lys Phe Asn Arg Asn Ser Tyr Asp Asn  
 85 90 95  
 Lys Gly Gly Lys Ile Val Ser Ser Val His Tyr Gly Ser Arg Tyr Asn  
 100 105 110  
 Asn Ala Ala Trp Ile Gly Asp Gln Met Ile Tyr Gly Asp Gly Asp Gly  
 115 120 125  
 Ser Phe Phe Ser Pro Leu Ser Gly Ser Met Asp Val Thr Ala His Glu  
 130 135 140  
 Met Thr His Gly Val Thr Gln Glu Thr Ala Asn Leu Asn Tyr Glu Asn  
 145 150 155 160  
 Gln Pro Gly Ala Leu Asn Glu Ser Phe Ser Asp Val Phe Gly Tyr Phe  
 165 170 175  
 Asn Asp Thr Glu Asp Trp Asp Ile Gly Glu Asp Ile Thr Val Ser Gln  
 180 185 190  
 Pro Ala Leu Arg Ser Leu Ser Asn Pro Thr Lys Tyr Gly Gln Pro Asp  
 195 200 205  
 Asn Phe Lys Asn Tyr Lys Asn Leu Pro Asn Thr Asp Ala Ala Ala Thr  
 210 215 220  
 Thr Gly Thr Gly Thr Thr Leu Lys Gly Lys Thr Val Ser Leu Asn Ile  
 225 230 235 240  
 Ser Ser Glu Ser Gly Lys Tyr Val Leu Arg Asp Leu Ser Lys Pro Thr  
 245 250 255  
 Gly Thr Gln Ile Ile Thr Tyr Asp Leu Gln Asn Arg Glu Tyr Asn Leu  
 260 265 270  
 Pro Gly Thr Leu Val Ser Ser Thr Thr Asn Gln Phe Thr Thr Ser Ser  
 275 280 285

Gln Arg Ala Ala Val Asp Ala His Tyr Asn Leu Gly  
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Pro Asn Ile Val Ser Ala Val Gly Leu Asp Gln Ala Ala Val Ala Lys  
 20 25 30

Gly Leu Gln Tyr Phe Gly Thr Ala Thr Asp Asn Pro Glu Leu Thr Asp  
 35 40 45

Ile Pro Tyr Val Thr Gln Leu Asn Asn Thr Ala Asp Phe Gly Gln Ile  
 50 55 60

Thr Pro Gly Asn Ser Met Lys Trp Asp Ala Thr Glu Pro Ser Gln Gly  
 65 70 75 80

Thr Phe Thr Phe Thr Lys Gly Asp Val Ile Ala Asp Leu Ala Glu Gly  
 85 90 95

Asn Gly Gln Tyr Leu Arg Cys His Thr Leu Val Trp Tyr Asn Gln Leu  
 100 105 110

Pro Ser Trp Val Thr Ser Gly Thr Trp Thr Asn Ala Thr Leu Thr Ala  
 115 120 125

Ala Leu Lys Asn His Ile Thr Asn Val Val Ser His Tyr Lys Gly Lys  
 130 135 140

Cys Leu His Trp Asp Val Val Asn Glu Ala Leu Asn Asp Asp Gly Thr  
 145 150 155 160

Tyr Arg Thr Asn Ile Phe Tyr Thr Thr Ile Gly Glu Ala Tyr Ile Pro  
 165 170 175

Ile Ala Phe Ala Ala Ala Ala Ala Ala Asp Pro Asp Ala Lys Leu Phe  
 180 185 190

Tyr Asn Asp Tyr Asn Leu Glu Tyr Gly Gly Ala Lys Ala Ala Ser Ala  
 195 200 205

Arg Ala Ile Val Gln Leu Val Lys Asn Ala Gly Ala Lys Ile Asp Gly  
 Page 8

210

215

220

Val Gly Leu Gln Ala His Phe Ser Val Gly Thr Val Pro Ser Thr Ser  
 225 230 235 240

Ser Leu Val Ser Val Leu Gln Ser Phe Thr Ala Leu Gly Val Glu Val  
 245 250 255

Ala Tyr Thr Glu Ala Asp Val Arg Ile Leu Leu Pro Thr Thr Ala Thr  
 260 265 270

Thr Leu Ala Gln Gln Ser Ser Asp Phe Gln Ala Leu Val Gln Ser Cys  
 275 280 285

Val Gln Thr Thr Gly Cys Val Gly Phe Thr Ile Trp Asp Trp Thr Asp  
 290 295 300

Lys Tyr Ser Trp Val Pro Ser Thr Phe Ser Gly Tyr Gly Ala Ala Leu  
 305 310 315 320

Pro Trp Asp Glu Asn Leu Val Lys Lys Pro Ala Tyr Asn Gly Leu Leu  
 325 330 335

Ala Gly Met Gly Val Thr Val Thr Thr Thr Thr Thr Thr Thr Ala  
 340 345 350

Thr Ala Thr Gly Lys Thr Thr Thr Thr Thr Gly Ala Thr Ser Thr  
 355 360 365

Gly Thr Thr Ala Ala His Trp Gly Gln Cys Gly Gly Leu Asn Trp Ser  
 370 375 380

Gly Pro Thr Ala Cys Ala Thr Gly Tyr Thr Cys Thr Tyr Val Asn Asp  
 385 390 395 400

Tyr Tyr Ser Gln Cys Leu Ser Ile Ala Gln Pro Lys Pro Ala Gly Val  
 405 410 415

Leu Ala Ile Gln Ser Val Arg Phe Ile Tyr His Asn Thr Gln Asn Ser  
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Leu Leu Asp Leu Lys Lys Lys Thr Leu Glu His Thr Gly Gly Arg Ser  
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Ser Met His  
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PhoenixTemp56585.tmp.txt

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35 40 45

Ala Thr Ile Val Thr Ser Phe Val Gly Ser Lys Thr Gly Ile Gly Gly  
50 55 60

Tyr Val Ala Thr Asp Ser Ala Arg Lys Glu Ile Val Val Ser Phe Arg  
65 70 75 80

Gly Ser Ile Asn Ile Arg Asn Trp Leu Thr Asn Leu Asp Phe Gly Gln  
85 90 95

Glu Asp Cys Ser Leu Val Ser Gly Cys Gly Val His Ser Gly Phe Gln  
100 105 110

Arg Ala Trp Asn Glu Ile Ser Ser Gln Ala Thr Ala Ala Val Ala Ser  
115 120 125

Ala Arg Lys Ala Asn Pro Ser Phe Asn Val Ile Ser Thr Gly His Ser  
130 135 140

Leu Gly Gly Ala Val Ala Val Leu Ala Ala Ala Asn Leu Arg Val Gly  
145 150 155 160

Gly Thr Pro Val Asp Ile Tyr Thr Tyr Gly Ser Pro Arg Val Gly Asn  
165 170 175

Ala Gln Leu Ser Ala Phe Val Ser Asn Gln Ala Gly Gly Glu Tyr Arg  
180 185 190

Val Thr His Ala Asp Asp Pro Val Pro Arg Leu Pro Pro Leu Ile Phe  
195 200 205

Gly Tyr Arg His Thr Thr Pro Glu Phe Trp Leu Ser Gly Gly Gly Gly  
210 215 220

Asp Lys Val Asp Tyr Thr Ile Ser Asp Val Lys Val Cys Glu Gly Ala  
225 230 235 240

Ala Asn Leu Gly Cys Asn Gly Gly Thr Leu Gly Leu Asp Ile Ala Ala  
245 250 255

PhoenixTemp56585.tmp.txt

His Leu His Tyr Phe Gln Ala Thr Asp Ala Cys Asn Ala Gly Gly Phe  
260 265 270

Ser Trp Arg Arg Tyr Arg Ser Ala Glu Ser Val Asp Lys Arg Ala Thr  
275 280 285

Met Thr Asp Ala Glu Leu Glu Lys Lys Leu Asn Ser Tyr Val Gln Met  
290 295 300

Asp Lys Glu Tyr Val Lys Asn Asn Gln Ala Arg Ser  
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<211> 410

<212> PRT

<213> Artificial

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<223> Variant of *P. lycii* phytase

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<223> Phytase Ronozyme NP

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Val Thr Gln Val Asn Leu Ile Gln Arg His Gly Ala Arg Trp Pro Thr  
35 40 45

Ser Gly Ala Arg Ser Arg Gln Val Ala Ala Val Ala Lys Ile Gln Met  
50 55 60

Ala Arg Pro Phe Thr Asp Pro Lys Tyr Glu Phe Leu Asn Asp Phe Val  
65 70 75 80

Tyr Thr Phe Gly Val Ala Asp Leu Leu Pro Phe Gly Ala Asn Gln Ser  
85 90 95

Tyr Gln Thr Gly Thr Asp Met Tyr Thr Arg Tyr Ser Thr Leu Phe Glu  
100 105 110

Gly Gly Asp Val Pro Phe Val Arg Ala Ala Gly Asp Gln Arg Val Val  
115 120 125

Asp Ser Ser Thr Asn Trp Thr Ala Gly Phe Gly Asp Ala Ser Gly Glu  
130 135 140

Thr Val Leu Pro Thr Leu Gln Val Val Leu Gln Glu Glu Gly Asn Cys

145                      150                      155                      160  
 Thr Leu Cys Asn Asn Met Cys Pro Asn Trp Val Lys Gly Asp Glu Ser  
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 Thr Thr Trp Leu Gly Val Phe Ala Pro Asn Ile Thr Ala Arg Leu Asn  
                                  180                      185                      190  
 Ala Ala Ala Pro Ser Ala Asn Leu Ser Asp Ser Asp Ala Leu Thr Leu  
                                  195                      200                      205  
 Met Asp Met Cys Pro Phe Asp Thr Leu Ser Ser Gly Asn Ala Ser Pro  
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 Phe Cys Asp Leu Phe Thr Ala Glu Glu Tyr Thr Ser Tyr Glu Tyr Tyr  
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 Tyr Asp Leu Asp Lys Tyr Tyr Gly Thr Gly Pro Gly Asn Ala Leu Gly  
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 Pro Val Gln Gly Val Gly Tyr Val Asn Glu Leu Leu Ala Arg Leu Thr  
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 Gly Gln Ala Val Arg Asp Glu Thr Gln Thr Asn Arg Thr Leu Asp Ser  
                                  275                      280                      285  
 Asp Pro Ala Thr Phe Pro Leu Asn Arg Thr Phe Tyr Ala Asp Phe Ser  
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 His Asp Asn Thr Met Val Ala Ile Phe Ala Ala Leu Gly Leu Phe Asn  
                                  305                      310                      315                      320  
 Ala Thr Ala Leu Asp Pro Leu Lys Pro Asp Glu Asn Arg Leu Trp Val  
                                  325                      330                      335  
 Val Ser Lys Leu Val Pro Phe Ser Gly His Met Thr Val Glu Lys Leu  
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 Ala Cys Ser Gly Lys Glu Ala Val Arg Val Leu Val Asn Asp Ala Val  
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 Gln Pro Leu Glu Phe Cys Gly Gly Val Asp Gly Val Cys Glu Leu Ser  
                                  370                      375                      380  
 Ala Phe Val Glu Ser Gln Thr Tyr Ala Arg Glu Asn Gly Gln Gly Asp  
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 Phe Ala Lys Cys Gly Phe Val Pro Ser Glu  
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 35 40 45

Ser Ala Asp Ile Pro Gly Asn Pro Ser Gln Val Gly Ile Ile Val Arg  
 50 55 60

Thr Gln Asp Trp Thr Lys Asp Val Ser Ala Asp Arg Tyr Ile Asp Leu  
 65 70 75 80

Ser Lys Gly Asn Glu Val Trp Leu Val Glu Gly Asn Ser Gln Ile Phe  
 85 90 95

Tyr Asn Glu Lys Asp Ala Glu Asp Ala Ala Lys Pro Ala Val Ser Asn  
 100 105 110

Ala Tyr Leu Asp Ala Ser Asn Gln Val Leu Val Lys Leu Ser Gln Pro  
 115 120 125

Leu Thr Leu Gly Glu Gly Ala Ser Gly Phe Thr Val His Asp Asp Thr  
 130 135 140

Ala Asn Lys Asp Ile Pro Val Thr Ser Val Lys Asp Ala Ser Leu Gly  
 145 150 155 160

Gln Asp Val Thr Ala Val Leu Ala Gly Thr Phe Gln His Ile Phe Gly  
 165 170 175

Gly Ser Asp Trp Ala Pro Asp Asn His Ser Thr Leu Leu Lys Lys Val  
 180 185 190

Thr Asn Asn Leu Tyr Gln Phe Ser Gly Asp Leu Pro Glu Gly Asn Tyr  
 195 200 205

Gln Tyr Lys Val Ala Leu Asn Asp Ser Trp Asn Asn Pro Ser Tyr Pro  
 210 215 220

Ser Asp Asn Ile Asn Leu Thr Val Pro Ala Gly Gly Ala His Val Thr  
 225 230 235 240

PhoenixTemp56585.tmp.txt

Phe Ser Tyr Ile Pro Ser Thr His Ala Val Tyr Asp Thr Ile Asn Asn  
 245 250 255  
 Pro Asn Ala Asp Leu Gln Val Glu Ser Gly Val Lys Thr Asp Leu Val  
 260 265 270  
 Thr Val Thr Leu Gly Glu Asp Pro Asp Val Ser His Thr Leu Ser Ile  
 275 280 285  
 Gln Thr Asp Gly Tyr Gln Ala Lys Gln Val Ile Pro Arg Asn Val Leu  
 290 295 300  
 Asn Ser Ser Gln Tyr Tyr Tyr Ser Gly Asp Asp Leu Gly Asn Thr Tyr  
 305 310 315 320  
 Thr Gln Lys Ala Thr Thr Phe Lys Val Trp Ala Pro Thr Ser Thr Gln  
 325 330 335  
 Val Asn Val Leu Leu Tyr Asp Ser Ala Thr Gly Ser Val Thr Lys Ile  
 340 345 350  
 Val Pro Met Thr Ala Ser Gly His Gly Val Trp Glu Ala Thr Val Asn  
 355 360 365  
 Gln Asn Leu Glu Asn Trp Tyr Tyr Met Tyr Glu Val Thr Gly Gln Gly  
 370 375 380  
 Ser Thr Arg Thr Ala Val Asp Pro Tyr Ala Thr Ala Ile Ala Pro Asn  
 385 390 395 400  
 Gly Thr Arg Gly Met Ile Val Asp Leu Ala Lys Thr Asp Pro Ala Gly  
 405 410 415  
 Trp Asn Ser Asp Lys His Ile Thr Pro Lys Asn Ile Glu Asp Glu Val  
 420 425 430  
 Ile Tyr Glu Met Asp Val Arg Asp Phe Ser Ile Asp Pro Asn Ser Gly  
 435 440 445  
 Met Lys Asn Lys Gly Lys Tyr Leu Ala Leu Thr Glu Lys Gly Thr Lys  
 450 455 460  
 Gly Pro Asp Asn Val Lys Thr Gly Ile Asp Ser Leu Lys Gln Leu Gly  
 465 470 475 480  
 Ile Thr His Val Gln Leu Met Pro Val Phe Ala Ser Asn Ser Val Asp  
 485 490 495  
 Glu Thr Asp Pro Thr Gln Asp Asn Trp Gly Tyr Asp Pro Arg Asn Tyr  
 500 505 510

Asp Val Pro Glu Gly Gln Tyr Ala Thr Asn Ala Asn Gly Asn Ala Arg  
 515 520 525  
 Ile Lys Glu Phe Lys Glu Met Val Leu Ser Leu His Arg Glu His Ile  
 530 535 540  
 Gly Val Asn Met Asp Val Val Tyr Asn His Thr Phe Ala Thr Gln Ile  
 545 550 555 560  
 Ser Asp Phe Asp Lys Ile Val Pro Glu Tyr Tyr Tyr Arg Thr Asp Asp  
 565 570 575  
 Ala Gly Asn Tyr Thr Asn Gly Ser Gly Thr Gly Asn Glu Ile Ala Ala  
 580 585 590  
 Glu Arg Pro Met Val Gln Lys Phe Ile Ile Asp Ser Leu Lys Tyr Trp  
 595 600 605  
 Val Asn Glu Tyr His Ile Asp Gly Phe Arg Phe Asp Leu Met Ala Leu  
 610 615 620  
 Leu Gly Lys Asp Thr Met Ser Lys Ala Ala Ser Glu Leu His Ala Ile  
 625 630 635 640  
 Asn Pro Gly Ile Ala Leu Tyr Gly Glu Pro Trp Thr Gly Gly Thr Ser  
 645 650 655  
 Ala Leu Pro Asp Asp Gln Leu Leu Thr Lys Gly Ala Gln Lys Gly Met  
 660 665 670  
 Gly Val Ala Val Phe Asn Asp Asn Leu Arg Asn Ala Leu Asp Gly Asn  
 675 680 685  
 Val Phe Asp Ser Ser Ala Gln Gly Phe Ala Thr Gly Ala Thr Gly Leu  
 690 695 700  
 Thr Asp Ala Ile Lys Asn Gly Val Glu Gly Ser Ile Asn Asp Phe Thr  
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 Ser Ser Pro Gly Glu Thr Ile Asn Tyr Val Thr Ser His Asp Asn Tyr  
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 Thr Leu Trp Asp Lys Ile Ala Leu Ser Asn Pro Asn Asp Ser Glu Ala  
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 Asp Arg Ile Lys Met Asp Glu Leu Ala Gln Ala Val Val Met Thr Ser  
 755 760 765  
 Gln Gly Val Pro Phe Met Gln Gly Gly Glu Glu Met Leu Arg Thr Lys  
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 Gly Gly Asn Asp Asn Ser Tyr Asn Ala Gly Asp Ala Val Asn Glu Phe

785                      790                      795                      800

Asp Trp Ser Arg Lys Ala Gln Tyr Pro Asp Val Phe Asn Tyr Tyr Ser  
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Gly Leu Ile His Leu Arg Leu Asp His Pro Ala Phe Arg Met Thr Thr  
820 825 830

Ala Asn Glu Ile Asn Ser His Leu Gln Phe Leu Asn Ser Pro Glu Asn  
835 840 845

Thr Val Ala Tyr Glu Leu Thr Asp His Val Asn Lys Asp Lys Trp Gly  
850 855 860

Asn Ile Ile Val Val Tyr Asn Pro Asn Lys Thr Val Ala Thr Ile Asn  
865 870 875 880

Leu Pro Ser Gly Lys Trp Ala Ile Asn Ala Thr Ser Gly Lys Val Gly  
885 890 895

Glu Ser Thr Leu Gly Gln Ala Glu Gly Ser Val Gln Val Pro Gly Ile  
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Ser Met Met Ile Leu His Gln Glu Val Ser Pro Asp His Gly Lys Lys  
915 920 925

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Gly Asn Gly Ala Ala Tyr Glu Phe Ser Gly Lys Asp Asp Phe Gly Val  
35 40 45

Lys Ala Asp Val Gln Val Pro Gly Asp Asp Thr Gln Val Gly Leu Ile  
50 55 60

Val Arg Thr Asn Asp Trp Ser Gln Lys Asn Thr Ser Asp Asp Leu His  
65 70 75 80

Ile Asp Leu Thr Lys Gly His Glu Ile Trp Ile Val Gln Gly Asp Pro  
85 90 95

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Asn Ile Tyr Tyr Asn Leu Ser Asp Ala Gln Ala Ala Ala Thr Pro Lys  
 100 105 110  
 Val Ser Asn Ala Tyr Leu Asp Asn Glu Lys Thr Val Leu Ala Lys Leu  
 115 120 125  
 Thr Asn Pro Met Thr Leu Ser Asp Gly Ser Ser Gly Phe Thr Val Thr  
 130 135 140  
 Asp Lys Thr Thr Gly Glu Gln Ile Pro Val Thr Ala Ala Thr Asn Ala  
 145 150 155 160  
 Asn Ser Ala Ser Ser Ser Glu Gln Thr Asp Leu Val Gln Leu Thr Leu  
 165 170 175  
 Ala Ser Ala Pro Asp Val Ser His Thr Ile Gln Val Gly Ala Ala Gly  
 180 185 190  
 Tyr Glu Ala Val Asn Leu Ile Pro Arg Asn Val Leu Asn Leu Pro Arg  
 195 200 205  
 Tyr Tyr Tyr Ser Gly Asn Asp Leu Gly Asn Val Tyr Ser Asn Lys Ala  
 210 215 220  
 Thr Ala Phe Arg Val Trp Ala Pro Thr Ala Ser Asp Val Gln Leu Leu  
 225 230 235 240  
 Leu Tyr Asn Ser Glu Thr Gly Pro Val Thr Lys Gln Leu Glu Met Gln  
 245 250 255  
 Lys Ser Asp Asn Gly Thr Trp Lys Leu Lys Val Pro Gly Asn Leu Lys  
 260 265 270  
 Asn Trp Tyr Tyr Leu Tyr Gln Val Thr Val Asn Gly Lys Thr Gln Thr  
 275 280 285  
 Ala Val Asp Pro Tyr Val Arg Ala Ile Ser Val Asn Ala Thr Arg Gly  
 290 295 300  
 Met Ile Val Asp Leu Glu Asp Thr Asn Pro Pro Gly Trp Lys Glu Asp  
 305 310 315 320  
 His Gln Gln Thr Pro Ala Asn Pro Val Asp Glu Val Ile Tyr Glu Val  
 325 330 335  
 His Val Arg Asp Phe Ser Ile Asp Ala Asn Ser Gly Met Lys Asn Lys  
 340 345 350  
 Gly Lys Tyr Leu Ala Phe Thr Glu His Gly Thr Lys Gly Pro Asp Asn  
 355 360 365

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Val Lys Thr Gly Ile Asp Ser Leu Lys Glu Leu Gly Ile Asn Ala Val  
370 375 380

Gln Leu Gln Pro Ile Glu Glu Phe Asn Ser Ile Asp Glu Thr Gln Pro  
385 390 395 400

Asn Met Tyr Asn Trp Gly Tyr Asp Pro Arg Asn Tyr Asn Val Pro Glu  
405 410 415

Gly Ala Tyr Ala Thr Thr Pro Glu Gly Thr Ala Arg Ile Thr Gln Leu  
420 425 430

Lys Gln Leu Ile Gln Ser Ile His Lys Asp Arg Ile Ala Ile Asn Met  
435 440 445

Asp Val Val Tyr Asn His Thr Phe Asn Val Gly Val Ser Asp Phe Asp  
450 455 460

Lys Ile Val Pro Gln Tyr Tyr Tyr Arg Thr Asp Ser Ala Gly Asn Tyr  
465 470 475 480

Thr Asn Gly Ser Gly Val Gly Asn Glu Ile Ala Thr Glu Arg Pro Met  
485 490 495

Val Gln Lys Phe Val Leu Asp Ser Val Lys Tyr Trp Val Lys Glu Tyr  
500 505 510

His Ile Asp Gly Phe Arg Phe Asp Leu Met Ala Leu Leu Gly Lys Asp  
515 520 525

Thr Met Ala Lys Ile Ser Lys Glu Leu His Ala Ile Asn Pro Gly Ile  
530 535 540

Val Leu Tyr Gly Glu Pro Trp Thr Gly Gly Thr Ser Gly Leu Ser Ser  
545 550 555 560

Asp Gln Leu Val Thr Lys Gly Gln Gln Lys Gly Leu Gly Ile Gly Val  
565 570 575

Phe Asn Asp Asn Ile Arg Asn Gly Leu Asp Gly Asn Val Phe Asp Lys  
580 585 590

Ser Ala Gln Gly Phe Ala Thr Gly Asp Pro Asn Gln Val Asn Val Ile  
595 600 605

Lys Asn Gly Val Met Gly Ser Ile Ser Asp Phe Thr Ser Ala Pro Ser  
610 615 620

Glu Thr Ile Asn Tyr Val Thr Ser His Asp Asn Met Thr Leu Trp Asp  
625 630 635 640

Lys Ile Ser Ala Ser Asn Pro Asn Asp Thr Gln Ala Asp Arg Ile Lys  
645 650 655

Met Asp Glu Leu Ala Gln Ala Val Val Phe Thr Ser Gln Gly Val Pro  
660 665 670

Phe Met Gln Gly Gly Glu Glu Met Leu Arg Thr Lys Gly Gly Asn Asp  
675 680 685

Asn Ser Tyr Asn Ala Gly Asp Ser Val Asn Gln Phe Asp Trp Ser Arg  
690 695 700

Lys Ala Gln Phe Glu Asn Val Phe Asp Tyr Tyr Ser Trp Leu Ile His  
705 710 715 720

Leu Arg Asp Asn His Pro Ala Phe Arg Met Thr Thr Ala Asp Gln Ile  
725 730 735

Lys Gln Asn Leu Thr Phe Leu Asp Ser Pro Thr Asn Thr Val Ala Phe  
740 745 750

Glu Leu Lys Asn His Ala Asn His Asp Lys Trp Lys Asn Ile Ile Val  
755 760 765

Met Tyr Asn Pro Asn Lys Thr Ala Gln Thr Leu Thr Leu Pro Ser Gly  
770 775 780

Asn Trp Thr Ile Val Gly Leu Gly Asn Gln Val Gly Glu Lys Ser Leu  
785 790 795 800

Gly His Val Asn Gly Thr Val Glu Val Pro Ala Leu Ser Thr Ile Ile  
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Leu His Gln Gly Thr Ser Glu Asp Val Ile Asp Gln Asn  
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Ser Ala Ala Ala Tyr Cys Gly Lys Asn Asn Asp Ala Pro Ala Gly Thr  
20 25 30

Asn Ile Thr Cys Thr Gly Asn Ala Cys Pro Glu Val Glu Lys Ala Asp  
Page 19

Ala Thr Phe Leu Tyr Ser Phe Glu Asp Ser Gly Val Gly Asp Val Thr  
50 55 60

Gly Phe Leu Ala Leu Asp Asn Thr Asn Lys Leu Ile Val Leu Ser Phe  
65 70 75 80

Arg Gly Ser Arg Ser Ile Glu Asn Trp Ile Gly Asn Leu Asn Phe Asp  
85 90 95

Leu Lys Glu Ile Asn Asp Ile Cys Ser Gly Cys Arg Gly His Asp Gly  
100 105 110

Phe Thr Ser Ser Trp Arg Ser Val Ala Asp Thr Leu Arg Gln Lys Val  
115 120 125

Glu Asp Ala Val Arg Glu His Pro Asp Tyr Arg Val Val Phe Thr Gly  
130 135 140

His Ser Leu Gly Gly Ala Leu Ala Thr Val Ala Gly Ala Asp Leu Arg  
145 150 155 160

Gly Asn Gly Tyr Asp Ile Asp Val Phe Ser Tyr Gly Ala Pro Arg Val  
165 170 175

Gly Asn Arg Ala Phe Ala Glu Phe Leu Thr Val Gln Thr Gly Gly Thr  
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Leu Tyr Arg Ile Thr His Thr Asn Asp Ile Val Pro Arg Leu Pro Pro  
195 200 205

Arg Glu Phe Gly Tyr Ser His Ser Ser Pro Glu Tyr Trp Ile Lys Ser  
210 215 220

Gly Thr Leu Val Pro Val Thr Arg Asn Asp Ile Val Lys Ile Glu Gly  
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Ile Asp Ala Thr Gly Gly Asn Asn Gln Pro Asn Ile Pro Asp Ile Pro  
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Ala His Leu Trp Tyr Phe Gly Leu Ile Gly Thr Cys Leu  
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 Ser Ala Ala Ala Tyr Cys Gly Lys Asn Asn Asp Ala Pro Ala Gly Thr  
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 Asn Ile Thr Cys Thr Gly Asn Ala Cys Pro Glu Val Glu Lys Ala Asp  
 35 40 45  
 Ala Thr Phe Leu Tyr Ser Phe Glu Asp Ser Gly Val Gly Asp Val Thr  
 50 55 60  
 Gly Phe Leu Ala Leu Asp Asn Thr Asn Lys Leu Ile Val Leu Ser Phe  
 65 70 75 80  
 Arg Gly Ser Arg Ser Ile Glu Asn Trp Ile Gly Asn Leu Asn Phe Asp  
 85 90 95  
 Leu Lys Glu Ile Asn Asp Ile Cys Ser Gly Cys Arg Gly His Asp Gly  
 100 105 110  
 Phe Thr Ser Ser Trp Arg Ser Val Ala Asp Thr Leu Arg Gln Lys Val  
 115 120 125  
 Glu Asp Ala Val Arg Glu His Pro Asp Tyr Arg Val Val Phe Thr Gly  
 130 135 140  
 His Ser Leu Gly Gly Ala Leu Ala Thr Val Ala Gly Ala Asp Leu Arg  
 145 150 155 160  
 Gly Asn Gly Tyr Asp Ile Asp Val Phe Ser Tyr Gly Ala Pro Arg Val  
 165 170 175  
 Gly Asn Arg Ala Phe Ala Glu Phe Leu Thr Val Gln Thr Gly Gly Thr  
 180 185 190  
 Leu Tyr Arg Ile Thr His Thr Asn Asp Ile Val Pro Arg Leu Pro Pro  
 195 200 205  
 Arg Glu Phe Gly Tyr Ser His Ser Ser Pro Glu Tyr Trp Ile Lys Ser  
 210 215 220  
 Gly Thr Leu Val Pro Val Arg Arg Arg Asp Ile Val Lys Ile Glu Gly  
 225 230 235 240  
 Ile Asp Ala Thr Gly Gly Asn Asn Gln Pro Asn Ile Pro Asp Ile Pro  
 245 250 255  
 Ala His Leu Trp Tyr Phe Gly Leu Ile Gly Thr Cys Leu  
 260 265

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