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In *SILICO* Approach to Design Potential Small Interfering RNA (siRNA) against Plant Pathogens and Diseases

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Abstract:
Among the members of single-stranded and double-stranded DNA and RNA viruses, those belonging to the family of plant genomes, cause various diseases in cereals and other economically important plants and also considered asa major constraint in agricultural production across the globe. These viruses are counter acted by plant defence mechanism through RNAi. There have been increasing interests in the use of siRNA as a tool for conferring resistance against plant-infecting viruses by silencing the target genes in a sequence specific manner. In this study, highly cited bioinformatics tools viz., siRNA Target Finder, Genscript, siDESIGNCenter, siRNA-wizard and siRNA Selection Server, combined with different algorithms namely Tuschl, Reynolds, Ui-Tei and their combinations were used to screen and design putative siRNAs against the genes of five different plant viruses. BLAST was performed to confirm that the designed siRNAs do not have any homology to other plants. In the present study, 18 most promising siRNAs were identified computationally based on GC%, thermodynamic properties and secondary structures having high potential of targeted gene silencing and will be useful for chemical synthesis. This study also reveals that above 70% efficient siRNAs were obtained with bioinformatics tools using machine learning techniques.

Keywords: *Plant Pathogens, siRNA, BLAST, Efficacy*

1. Introduction

Viruses belonging to the family of plant genome are considered as the most destructive pathogens affecting huge reduction in the yield of legumes, cereals and other economically important crops, such as cotton (*Gossypiumhirsutum*), cassava (*Manihotesculenta*), maize (*Zea mays*), common bean (*Phaseolus vulgaris*) and tomato (*Solanumlycopersicum*) in tropical as well as in the subtropical regions and has become a major threat to agriculture across the globe. Considering the significant impact of these plant viruses on crop production, the development of an efficient and effective control strategy against the Gemini viruses and viral plant are of immense importance. Over the last few decades, several means of management, such as physical, biological and chemical strategies have been inducted.

Biotechnological methods such as transgenic approaches [1-3], are also adopted to manage the Gemini viral diseases of plants. Although to some extent, success has been achieved by using these means [4], most of these approaches have their drawbacks and pitfalls, including serious environmental concerns and market acceptability.

RNA interfering (RNAi) is an interesting and widely used tool for the molecular virologists to manage plant viruses. With the increase of high-throughput technologies, it becomes relatively more convenient to characterize the small non-coding RNAs and for RNA silencing. Several plant viruses have been successfully controlled using RNAi-based methods over the last decade [5-7]. The general methods of RNA silencing in plants involves a sequence-specific inhibition of expression of the target genes at a transcriptional or a post-transcriptional levels, known as transcriptional gene silencing (TGS) and post-transcriptional gene silencing (PTGS), respectively. However, in case of antiviral defence, RNAi works at the post-transcriptional level. In PTGS, the 21- 24 nucleotide long small interfering RNAs (siRNA) molecules silence the gene expression by specific cleavage of target RNA which is homologous to target genes [8-10]. The siRNA-mediated RNA silencing, in addition to its function as a natural antiviral defence mechanism, also plays regulatory roles in plants' development process [11-12].

Various studies have shown that PTGS and are good targets for RNA silencing in homology dependent manner [13]. The strategy involves expressing or inducing the short (21-24 nt) siRNA molecules in the plants which are capable of initiating the homology-

dependent gene silencing in a sequence specific manner [14]. Even chemically synthesized siRNA duplexes, when introduced into the plants, have shown great promises in achieving effective target RNA cleavage [15].

Therefore, an *in silico* approach has been used for screening and designing of efficient siRNAs to counter the diseases caused by plant viruses. The present study emphasized on ten viral genes from five different plant viruses such as Srilankan Cassava Mosaic virus-(Ker 20) and Cotton Leaf Curl Rajasthan virus (Family: Geminiviridae), Cauliflower Mosaic Virus Isolate W260 (Family: Caulimoviridae), Cucumber Mosaic Virus (Family: Bromoviridae) and Tobacco Mosaic Virus (Family: Virgaviridae) infecting crops species such as cassava, cauliflower, cotton, cucumber and tobacco respectively. The process of screening and designing of efficient or putative siRNAs consist of series of steps involving several bioinformatics tools accompanied with novel algorithms. Among the bioinformatics tools some are using selection parameter to design effective siRNA and some are using Machine Learning algorithm in the process of improving the success rate effective targeting. Support Vector Machine (SVM), Artificial Neural Network (ANN), etc., are machine learning algorithms which can be a good approach while training a biologically validated siRNA dataset with adequate volume[16].To cross check the silencing efficiency and the off target effect of putative siRNAs, BLAST [17] search was performed against the known plant genome. To have a stable, broad and effective resistance against these selected plant viruses, screening and design of effective and potential siRNA are of great importance in modern plant-biology prospective.

2. Material and Methods

2.1. Retrieval of Target Viral Gene Sequences

In the present study, two different viral genes from each of the five viral plants have been selected. The complete sequences of the two viral genes namely *coat protein* (*CP*) and *transcriptional activator protein (TrAP)* (GenBank Accession No: AJ579307) from *SriLankan cassava mosaic virus* (SLCMV); *CP* and *TrAP* protein from *Cauliflower mosaic virus* (CaMV)(GenBank Accession No: JF809616), *CP* and *TrAP* from *Cotton leaf curl Burewala virus* (CLCuBuV) (GenBank No: JF509750); *2b protein* (GenBank Accession No: EU888910) and *CP* (GenBank Accession No: JQ013954) from *Cucumber mosaic cucumo virus Egyptian isolate* (CMV-Gera-EG); *CP* and *movement protein* (*MP*) from *Tobacco mosaic virus* (TMV) (GenBank Accession No:AF273221) were retrieved from the GenBank (http://www.ncbi.nlm.nih.gov/genbank/) database of NCBI. The information about the various plant viruses and their genes were collected from Plant Virus Online database (http://www.dpvweb.net). The complete information of the two genes for each virus, taken in the present investigation, is summarized in Table 1.

Sl. No	Source Virus Genome/ Family	Gene Name	Gene length (nt)	GenBank Accession number	References
1	Sri Lankan cassava mosaic virus - [Ker20] Family: Geminiviridae (Single Stranded DNA Virus)	Coat protein AV1	771	AJ579307.1	Dutt et al., (2005)
		Transcription activator protein AC2	408	AJ579307.1	Dutt et al., (2005)
2	Cauliflower mosaic virus isolate W260 Family: Caulimoviridae (Double Standed DNA Virus)	Capsid protein	1464	JF809616.1	Froissart,R (2011)
		Transcription activator protein	1563	JF809616.1	Froissart,R (2011)
3	Cotton leaf curl Rajasthan virus Family: Geminiviridae (Single Stranded DNA Virus)	Coat protein V1	771	JF509750.1	Rajagopalan et al.,(2012)
		Transcription activator protein C2	453	JF509750.1	Rajagopalan et al., (2012)
4	Cucumber mosaic virus Family: Bromoviridae (Single Stranded RNA virus)	2b protein	336	EU888910.1	Raj et al., (2008)
		Coat Protein CP	657	JQ013954.1	Sofy et al., (2011)
5	Tobacco mosaic virus Family: Virgaviridae (Single Stranded RNA virus)	Coat Protein	480	AF273221.1	Holt et al., (1990)
		Movement protein	807	AF273221.1	Holt et al., (1990)

Table 1: Viral protein coding genes of different plant viruses selected for designing potential siRNA

2.2. Target Identification and Rational Design of Candidate siRNA

The first and foremost step in design of siRNA is the identification of various target sequence for candidate siRNAs within the viral genes. The various targets were screened based on algorithms incorporated in five highly cited siRNA design tools namely siRNA Target Finder (Ambion, USA) (http://www.ambion.com/techlib/misc/siRNa finder.html) implements siRNA design guidelines described by Tuschl and colleagues [18], Genscript (https://www.genscript.com/ssl-bin/app/rnai), Dharmaconsi DESIGN Center (http://www.dharmacon.com/designcenter/DesignCenterPage.aspx), siRNA Wizardv3.1 (http://www.sirnawizard.com/design.php) and siRNA Selection Server (http://sirna.wi.mit.edu/) [19] using default settings. Several multi stringent criteria as recommended by Birmingham et al., 2007 [20] and Elbashir et al., 2001 [21] was employed in order to screen the best candidate siRNAs which in turn significantly improves the likelihood of identifying functional siRNA. This approach would enhance the target specificity and adapt siRNA designs for more sophisticated experimental design in RNAi mediated gene silencing.

2.3. Cross Validation of Candidate siRNAs by BLAST Search against mRNA Database

The candidate siRNAs were selected to design putative siRNAs for efficient silencing viral genes, where these sequences do not reveal any remote homology to any other gene sequences *i.e.*, target site having more than 16 nt contiguous base pair with any other organism. In addition, to ensure and reduce the off-target cleavage effect of the designed siRNAs in plant gene, BLASTn search was performed against non-redundant (NR) database of NCBI of the selected 21-24 nt long candidate siRNA sequences. Cases where the candidate siRNA showed any homology to any of the plant genes from the database, were discarded from the list of candidate siRNAs, that could be an efficient silencing tool against the target viruses, so as to avoid any unintended effect on endogenous gene expression.

2.4. GC Content, ΔG value and siRNA Secondary Structure Prediction

The short listed siRNAs were further screened for estimation of GC percentage and secondary structures prediction to design the efficient siRNA. The i-Score designer tool (http://www.med.nagoya-u.ac.jp/neurogenetics/i_Score/i_score.html) [22] was used to calculate the GC % and ΔG value of the most stable secondary structure of siRNA strand according to the RNA mfold algorithm [23]. The secondary structure and free energy of folding of each putative siRNA was computed using RNAfold web server (http://rna.tbi.univie.ac.at/cgi-bin/RNAfold.cgi) [24].

2.5. Estimation of the Binding Energy of the Duplex

The thermodynamic stability of the duplex formed between the siRNA and its target is one of the major factors in determining the degree of its efficiency, as well as its possible off-target effects. To estimate thermodynamics properties of the short listed putative siRNA duplexes (*i.e.* between the predicted siRNA molecules and the target genes), the RNAup web server (http://rna.tbi.univie.ac.at/cgi-bin/RNAup.cgi) [25] was used. RNAup programme uses an extension of the standard partition-function approach to predict the RNA secondary structures and to compute the energy of RNA-RNA interactions.

The detailed work flow for screening and designing of siRNA sequences have been shown in the Figure 1.

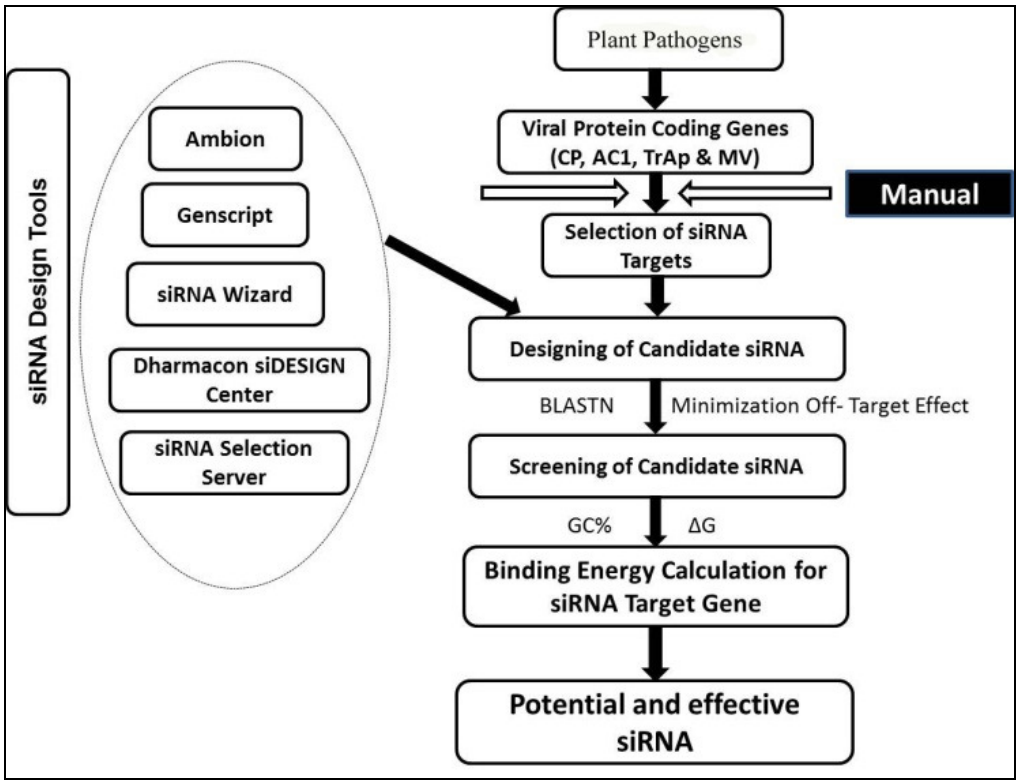

Figure 1: Various phases for designing siRNA for plant pathogens with high efficiency and sensitivity

3. Results and Discussions

Viral genes are multifunctional in nature, and effect on various endogenous processes for the successful infection. The genome of many Gemini viruses consists of two circular genomes of similar size but of different nucleotide sequence, known as DNA-A and DNA-B [25]. Among the viral proteins, replication initiation protein (AC1/ Rep) plays an essential role in replication [26-27] and also acts as an elicitor of the hypersensitive response (HR) which is detrimental to the virus life cycle [28]. Transcriptional activator protein called TrAP/ AC2 is a multifunctional protein involved in regulation of expression of other viral proteins [29], and also possibly involved in suppression of the endogenous post-transcriptional gene-silencing [30]. In fact most of the viral proteins such as TrAp, AC1, CP (coat protein) and MP (movement protein) are required for virus infection including virus movement, viral replication,

and can be recognised in plants and elicit HR [31-32].

The viral gene sequences of different plant viruses infecting various crops were downloaded from GenBank of NCBI are reported in Table 1. Therefore, to select various target sequence for siRNA within the viral genes, a stretch of nucleotides with 5´AA dinucleotide or triplet AAG/C with 18/19 nucleotides were scanned manually. In addition to this a stretch of 4 T's or A's in the target sequence were avoided as it may act as a termination signal for RNA polymerase III [33].

For the selection of the siRNA, following optimal parameters such as oligonucleotides should have 30-50% GC content, no G residues in the overhang and extra UU or dTdT dinucleotide at the 3´-ends were considered for best and accurate results.

Several rules for designing rational siRNA proposed by different group's such as Tuschl et al., [18], Reynolds et al., [34], Chalk et al., [35] and Amarzguioui et al., [36], provides a strong impact on the first generation of siRNA, mostly based on the information of GC content, preference or avoidance of specific nucleotides at specific positions and siRNA sequence motifs. So to assess the correctness of the manually selected oligonucleotides, they were subjected to various siRNA target finder and design softwares which implements the different rules described above. Five highly accessed and efficient siRNA design tools *viz.*, siRNA Target Finder (Ambion), Genscript, Dharmaconsi DESIGN Center, siRNA Wizard and siRNA Selection Server were used in the present study. A number of filtering procedure described by Birmingham et al., 2007 [20] and Elbashir et al., 2001 [21] was employed to screen the best possible candidate siRNA from the number of siRNA generated by different softwares. The 562 siRNA sequences satisfying the mixed rules of Ui-Tei[37], Hsieh [38] , s-Biopredsi[39],i-Score [22] and Reynolds [34] were considered for further analyses.

A cross homology search of 562 candidate siRNA against non-redundant database of NCBI through BLAST was performed and 60 putative siRNAs were screened out. Cross homology search revealed that the designed siRNAs showed a similarity of 95-100% to considered plant viruses but not to any other gene of the plant genome, thus assured silencing of only selected viral plant genes can be achieved through the designed siRNA. Also the target sites of the designed siRNAs were scanned against various completed genomes databases (riceand Arabidopsis).

Inconsistent results may be obtained with regards to the effects of GC content and secondary structure on siRNA efficiency and functionality. However, it is recommended to consider siRNA sequences with low GC content ranging from 31%-58% [39, 40, 34, 36]. Furthermore, the 60 putative siRNA were assessed for their possible folding pattern using RNAfold server, a widely used server to predict minimum free energy (MFE) structures and base pair probabilities of RNA molecules. These structures are predicted using a loop-based energy model and the dynamic programming algorithm reported by Zuker et al., 1981 [41].

Out of the 60 putative siRNA, only 18 siRNA sequences showed zero free energy of folding at room temperature (37°C) [Table 2]. Previous study by Shao et al., 2007 [42], it has been reported that the RNA molecule should have minimum free energy of folding for their stability. Therefore, the RNA molecule with positive energy may be more accessible for target site and have high potential to bind with target site and lead to an effective gene silencing. Whereas, the rest of 42 siRNA sequences are also having less than -1 kcal free energy of folding. The effective 18 siRNA sequences with GC%, free energy of folding and free energy of binding with target has been shown in Table 2.

Sl. No	Location of siRNA within gene	Length of siRNA	siRNA sequences	Gene	Virus	Software Used	Minimum energy (kcal/mol)	GC%	Total free energy of binding (kcal/mol)	Secondary Structure
1	364-382	19	ATAAGGAGCGCGATAAATA	coat protein	Tobacco Mosaic virus	Genscript/ML	0.00	37.0	-5.68	Fig 2 A
2	995-1013	19	TCAAGAACACAGAGAAAGA	TAV protein	Cauliflower Mosaic virus	Genscript/ML	0.00	37.0	-7.06	Fig 2 B
3	352-370	19	GGTAAGATATGGATGGATG	coat protein	Cotton Leaf Curl Virus	Genscript/ML	0.00	42.0	-6.55	Fig 2 C
4	144-164	21	TCTCAGACTATTCCGCTTCCT	2b protein	Cucumber Mosaic Virus	Genscript/ML	0.00	47.62	-8.36	Fig 2 D
5	477-495	19	AGTCCAAGCCAACAACAAA	coat protein	Cucumber Mosaic Virus	siDesign	0.00	42.0	-5.14	Fig 2 E
6	162-182	21	AAACCTTCACCACAAGTAACT	coat protein	Tobacco Mosaic Virus	Genscript /Statistical Methd	0.00	38.1	-4.75	Fig 2 F
7	379-397	21	GACCAAGAAUCAUACGAAU	coat protein	Cassava Mosaic Virus	Genscript/ML	0.00	37.0	-5.31	Fig 2 G
8	156-174	19	CCGCTTCCTACCGTTCAAT	2b protein	Cucumber Mosaic Virus	Ambion	0.00	52.64	-11.26	Fig 2 H
9	154-172	19	CCGCUUCCUACCGUUCAAU	2b protein	Cucumber Mosaic Virus	Genscript/ML	0.00	53.0	-11.26	Fig 2 I
10	491-509	19	GCAGCAGAAAUCGGAUUGA	coat protein	Cauliflower Mosaic virus	Genscript/ML	0.00	47.0	-6.89	Fig 2 J
11	391-409	19	GTAGAATTGATCAGAGGAA	coat protein	Tobacco Mosaic Virus	Genscript/ML	0.00	37.0	-6.37	Fig 2 K
12	353-373	21	GCAAGATATGGATGGATGAAA	coat protein	Cassava Mosaic Virus	siRNA_wizard	0.00	38.1	-8.21	Fig 2 L
13	819-839	21	AAGACAGAACTGGCGGATTTC	coat protein	Cauliflower Mosaic virus	Genscript/ML	0.00	47.62	-8.71	Fig 2 M
14	120-140	21	AAACAACAGGCATGGACAAAC	coat protein	Cotton Leaf Curl Virus	Genscript/ML	0.00	42.86	-9.84	Fig 2 N
15	382-400	19	ACGAAGAATCACACGAATA	TAV protein	Cotton Leaf Curl Virus	siDesign	0.00	37.0	-7.60	Fig 2 O
16	378-398	21	TAAGACGAAGAATCACACGAA	coat protein	Cotton Leaf Curl Virus	Genscript/ML	0.00	38.1	-6.11	Fig 2 P
17	381-401	19	AAGACGAAGAATCACACGAAT	coat protein	Cotton Leaf Curl Virus	Genscript/ML	0.00	38.1	-6.11	Fig 2 Q
18	957-975	19	GGTTAAAGATGCAGTCAAA	TAV protein	Cauliflower Mosaic virus	Genscript/ML	0.00	37.1	-6.92	Fig 2 R

Table 2: List of high potential siRNA sequences developed for the viral coding genes of plantviruses, with their sequence features (%GC, Minimum energy, Free energy of binding)

The thermodynamics study of RNA-RNA interactions might be one of the important aspects for siRNA efficiency. The 60 putative siRNA sequences were subjected to RNA-RNA interaction study with their respective targets to cross validate the results. RNA up tool of Vienna website was used to predict free energy of RNA-RNA interactions; where the Vienna suite offers various tools with the state-of-the-art algorithms for RNA folding, prediction and comparison of RNA-RNA interactions. The free energy of interaction (binding) between each siRNA sequence and its target was calculated. It was reported previously by Schubert et al., 2005 [43] that the efficiency RNAi correlates well with the binding energies of siRNAs and their respective mRNA target. Muecksteinet. al.,[44] reported that if the optimal free energy of binding (BE) is highly favourable then the RNA molecule will bind almost exclusively to the intended target site. It has also been reported that the poor stepwise decrease of the target accessibility is directly correlated to a poor optimal BE and decreased silencing efficiency [19]. In this case a total of 18 siRNA sequences of their respective genes were found to be more promising with BE [Table 2]. The secondary structure of the mRNA target site plays a vital role in siRNA efficiency prediction. Thus secondary structures as listed in Table 2 are shown in Figure 2 by using the RNAfold program of the Vienna RNA package.

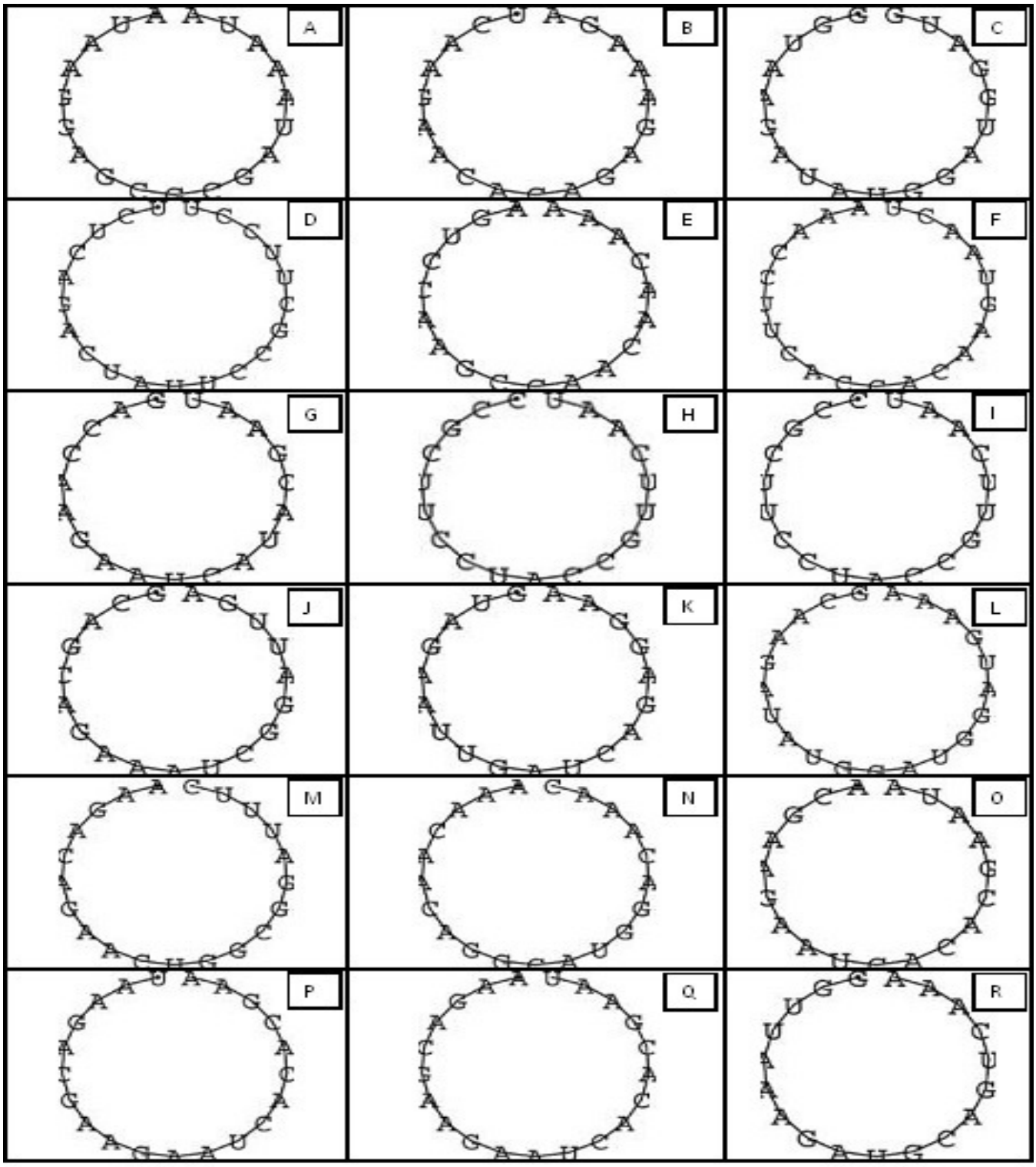

Figure 2: (A-R).siRNA secondary structures.

The other 42 numbers of putative siRNA along with their features have been reported in Table3. Therefore, these potential siRNA may qualify as high quality candidate for silencing the viral protein coding genes and may be used for effective silencing of plant viruses.

Sl. No.	Location of siRNA within gene	Length of siRNA	DNA sequence for targeted siRNA	Minimum energy (kcal/mol)	GC%	Total free energy of binding with the target
1	121-139	19	CAACAGGCATGGACAAACA	-0.28	47	-9.92
2	1240-1260	21	ATCTGCAATATCGAAGGCCAT	-0.31	42.86	-11.32
3	12-30	19	CACCGAGAUUGUUCAGAUA	-0.31	42	-7.03
4	188-206	19	CGGAACTGATAGAGATGTA	-0.33	42	-5.41
5	569-587	19	CAGAAGAAGTCGTTGATGA	-0.38	42	-8.67
6	140-158	19	CCTCTCTACCTAGTGATAA	-0.39	42.11	-6.31
7	558-576	19	CATGGAACTTACAGAAGAA	-0.40	37	-9.32
8	1259-1279	21	ATTACGCCAACGAATGTCCTA	-0.41	42.86	-6.60
9	810-830	21	GTTCACCACTGATAATGAGAA	-0.42	38.1	-6.46
10	247-267	21	AAGACGAAAGCGATTCAGGAG	-0.43	47.62	-5.35
11	341-361	21	GACCATCAAGATACAATGAGA	-0.43	38.1	-5.34
12	54-72	19	GGCCGACCCAATAGAGTTA	-0.43	53	-6.24
13	52-70	19	GGCCGACCCAAUAGAGUUA	-0.43	53	-6.71
14	200-218	19	ACTTTAAGGTGTACAGGTA	-0.44	37	-5.93
15	53-71	19	TGGTGGAGGTGAAGAGACA	-0.45	53	-8.03
16	424-444	21	GATCGTAGACCTGTTGATAAA	-0.46	38.1	-10.60
17	54-72	19	CGATCTAGTAAGAGCAAAA	-0.55	37	-5.67
18	79-97	19	CGCGGAUGCUAACUUUAGA	-0.58	47	-8.48
19	66-84	19	GATCTTACCGTCGATGTTT	-0.59	42.11	-7.12
20	545-563	19	GCUGACGCAUAUACAACAA	-0.61	42	-7.49
21	13-31	19	GCTGCCGATATCGTCATTT	-0.62	47.37	-8.19
22	212-230	19	GCUCCUGGUAAAGAAUCAA	-0.63	42	-9.55
23	259-179	21	GGTAAGGTCATGTGCATCTCT	-0.65	47.62	-11.57
24	475-495	21	GGAGTCCAAGCCAACAACAAA	-0.65	47.62	-7.42
25	547-567	21	GCTGACGCATATACAACAAGT	-0.68	42.86	-7.45
26	316-334	19	GGTAAGAGATTTTGTGTCA	-0.70	37	-8.51
27	75-93	19	GCAGGUCUCACAAGAAGAA	-0.75	47	-5.97
28	285-303	19	AGTATGAGCAGCCGCAATT	-0.77	47	-8.15
29	11-29	19	ACGCAGGCGCAATGACAAA	-0.77	53	-8.00
30	483-503	21	AATGAACCTAGTACAGCTACG	-0.78	42.86	-6.70
31	582-602	21	AAGGAACAGGCTTTAGTTAGG	-0.79	42.86	-9.27
32	544-564	21	GCAGCTGACGCATATACAACA	-0.80	47.62	-7.30
33	4-22	19	GAATTGAACGCAGGCGCAA	-0.81	52.64	-10.37
34	523-543	21	GCTGATATAGGTGACATGAGA	-0.83	42.86	-9.25
35	93-111	19	GGUUGUGGUUGAAGCGUAU	-0.87	47	-9.12
36	159-177	19	GCUGGAUGAUCCUGAAAUA	-0.89	42	-7.63
37	641-658	18	GAGGCUGGCAAGUAUGAA	-0.90	47	-9.45
38	103-123	21	TTGAAGCGTATCTGGATGGTT	-0.91	42.86	-12.45
39	6-26	21	TTACAGTATCACTACTCCATC	-0.93	38.1	-3.69
40	7-27	21	AATTGAACGCAGGCGCAATGA	-0.96	47.62	-10.23
41	307-325	19	GCCACTCTCGGATCTTACT	-0.97	52.64	-6.73
42	1040-1058	19	GGAGAAGCUUCAGUAGAAU	-1.03	42	-6.23

Table 3: Predicted putative siRNA sequences along with their features

Numerous algorithms have been developed to determine the siRNA silencing activity. However, a very few have sustained to a level of specificity and sensitivity. These algorithms can be divided into first generation and second generation. In the "first generation", the siRNA efficacy is determined on the basis of thermodynamic stability, secondary structure of mRNA and target positions. On the other hand, the second generation tools were developed by using eminent data mining techniques to interpret glossed records of siRNA with their experimental inhibition. The second generation models (whether neural network or linear regression based or hybrid) perform significantly better than the first generation models.

In the present study, it has been observed that out of 18 effective siRNA sequences, 13 siRNA sequences were obtained from the bioinformatics software using machine learning algorithms [Table 2].

4. Conclusions

Plant pathogens are considered as eminent threat to agricultural practices across the globe and one of the major constrain to the development of virus resistant crop plants. The economically important cereals crops are prone to various plant diseases, resulting million dollar loss every year thereby affects the global economy. To feed the ever increasing population, development of virus resistance crop plants is of immense importance and needs much more attention in Agriculture. As siRNA mediated gene silencing of viral genes have been proven to become a pivotal tool in the development of virus resistance crop plants. Thus, it is of interest to design effective and efficient siRNA to silence the most casual agents of virus infection and replication in cereal crops. The availability of high-throughput computational tools along with optimised algorithms has heralded to design and characterise efficient siRNA against these viral genes.

In the present scenario the viral genes of plant viruses from four different families are considered as the most important targets for silencing through RNAi technology. The present study involves screening and design of promising siRNA against five different selected viruses considering two genes from each virus. The target and putative siRNA were selected from these genes manually and also with five different approaches by satisfying all the criteria of siRNA designing with high functionality and specificity. A list of 18 most promising potential siRNA have been obtained by satisfying all biosafety and structural criteria and that will be a valuable repository for chemical synthesis and insect feeding assay. As these siRNA represent the 18 most potential from 562 possible siRNA in terms bioactivity and safety, it will considerably reduce the cost of chemical synthesis and time complexity. It is also found that out of 18 efficient siRNA sequences, more than 70% siRNA were obtained with the Bioinformatics tool using Machine Learning Techniques.

With the great potential of RNAi techniques in the continuous development of high throughput RNAi screening, it is important to improve the siRNA designing rules as well as to construct reliable siRNA efficacy prediction model. Machine learning algorithms like Support Vector Machine (SVM) and Artificial Neural Network (ANN) can outperform when trained with sufficient volume of biologically validated siRNA dataset.

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Annexure

Sl No.	Start Point	siRNA sequences	GC%	Minimum Energy	Frequency of the ensembel	Ensemble Diversity	Total free energy of binding	Energy from duplex formation	Software Used	Virus	Gene
1	13	CCAGCAGATATCATCATTT	36.85	-0.13 kcal/mol	81.17 %	0.94	-6.08 kcal/mol	-6.20 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
2	131	GGACAAACAGGCCCATGAA	52.64	-0.41 kcal/mol	51.04 %	1.55	-12.24 kcal/mol	-18.21 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
3	329	GCGTTAAGTCCGTTTATAT	36.85	-0.58 kcal/mol	39.29 %	1.98	-5.36 kcal/mol	-8.69 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
4	338	CCGTTTATATCCTGGGCAA	47.37	-1.10 kcal/mol	27.41 %	3.81	-10.99 kcal/mol	-16.93 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
5	351	GGGCAAGATATGGATGGAT	47.37	-0.07 kcal/mol	89.56 %	0.37	-9.34 kcal/mol	-12.57 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
6	423	GGATCGTAGGCCTGTTGAT	52.64	-0.53 kcal/mol	42.42 %	2.48	-10.38 kcal/mol	-19.24 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
7	513	GCATCGTGATCGTTATCAA	42.11	-1.05 kcal/mol	48.11 %	2.38	-9.25 kcal/mol	-15.76 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
8	574	GCGAGCAAGGAACAGGCTT	57.9	-1.77 kcal/mol	54.83 %	1.42	-7.45 kcal/mol	-9.80 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
9	639	GCAAGAGGCTGGCAAGTAT	52.64	-1.19 kcal/mol	38.57 %	3.28	-10.10 kcal/mol	-11.53 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
10	694	GCGTGTACTCATGCCTCTA	52.64	-4.72 kcal/mol	96.50 %	0.08	-5.82 kcal/mol	-13.09 kcal/mol	Ambioin	Cassava Mosaic Virus	coat protein
11	229	TTTGAGTCCAGACACGATGTG	47.62	-0.69 kcal/mol	32.62 %	3.91	-9.06 kcal/mol	-15.56 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
12	271	TGCATCTCTGATGTCACTCGT	47.62	-3.15 kcal/mol	77.92 %	0.76	-8.08 kcal/mol	-13.99 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
13	255	TATAGGTAAGGTCATGTGCAT	38.1	-0.47 kcal/mol	46.32 %	2.19	-11.15 kcal/mol	-17.46 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
14	230	TTGAGTCCAGACACGATGTGG	52.38	-1.09 kcal/mol	27.84 %	4.15	-9.24 kcal/mol	-20.77 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
15	571	TATGCGAGCAAGGAACAGGCT	52.38	-0.86 kcal/mol	34.07 %	2.13	-7.45 kcal/mol	-9.80 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
16	544	TGGAGTGCCACTGTCACTGGT	57.14	-2.52 kcal/mol	31.33 %	4.88	-9.27 kcal/mol	-14.11 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
17	623	ATGTTGTGTATAACCAGCAAG	38.1	-4.09 kcal/mol	45.23 %	1.6	-3.65 kcal/mol	-14.50 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
18	275	TCTCTGATGTCACTCGTGGAG	52.38	-2.84 kcal/mol	57.83 %	4.25	-6.21 kcal/mol	-12.12 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
19	483	TGAACCTAGTACAGCTACGGT	47.62	-3.93 kcal/mol	58.37 %	0.88	-4.10 kcal/mol	-11.00 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
20	274	ATCTCTGATGTCACTCGTGGA	47.62	-1.57 kcal/mol	46.49 %	4.63	-7.48 kcal/mol	-12.12 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
21	9	AAGCGACCAGCAGATATCATC	47.62	-1.24 kcal/mol	79.87 %	0.81	-6.53 kcal/mol	-14.10 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
22	582	AAGGAACAGGCTTTAGTTAGG	42.86	-0.79 kcal/mol	27.79 %	3.45	-9.27 kcal/mol	-16.02 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
23	543	AAGTGGAGTGCCACTGTCACT	52.38	-5.88 kcal/mol	74.90 %	1.68	-4.23 kcal/mol	-6.90 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
24	487	AACCTAGTACAGCTACGGTGA	47.62	-4.32 kcal/mol	70.55 %	0.72	-5.68 kcal/mol	-15.76 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
25	226	AATCGTTTGAGTCCAGACACG	47.62	-3.22 kcal/mol.	96.28 %	0.20	-6.32 kcal/mol	-9.50 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
26	743	AATCTACTTCTACGATTCGGT	38.1	-0.51 kcal/mol	43.47 %	2.82	-7.86 kcal/mol	-12.21 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
27	483	AATGAACCTAGTACAGCTACG	42.86	-0.78 kcal/mol	33.16 %	3.08	-6.70 kcal/mol	-11.95 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
28	316	GGTAAGAGGTTTTGCGTTA	42	-1.68 kcal/mol	54.10 %	1.54	-10.94 kcal/mol	-12.87 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
29	121	AGACAAGCCTGGACAAAC	47	-0.12 kcal/mol	82.37 %	0.58	-8.37 kcal/mol	-8.61 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
30	639	GCAAGAGGCTGGCAAGTAT	53	-1.19 kcal/mol	38.57 %	3.28	-10.10 kcal/mol	-11.53 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
31	338	CCGTTTATATCCTGGGCA	47	-1.10 kcal/mol	27.41 %	3.81	-10.99 kcal/mol	-16.93 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
32	575	CGAGCAAGGAACAGGCTTT	53	-2.17 kcal/mol	75.42 %	1.01	-7.45 kcal/mol	-9.80 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
33	353	GCAAGATATGGATGGATGA	42	-0.14 kcal/mol	79.09 %	0.93	-7.51 kcal/mol	-9.94 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
34	494	CAGCTACGGTGAAGAACAT	47	-0.81 kcal/mol	26.85 %	2.34	-11.00 kcal/mol	-18.77 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
35	381	GACCAAGAATCATACGAAT	37	-0.10 kcal/mol	84.84 %	0.53	-5.31 kcal/mol	-9.25 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
36	491	GTACAGCTACGGTGAAGAA	47	-0.74 kcal/mol	30.11 %	2.39	-9.26 kcal/mol	-15.76 kcal/mol	siDesign	Cassava Mosaic Virus	coat protein
37	6	GAAGCGACCAGCAGATATCAT	47.62	-1.21 kcal/mol	83.64 %	0.56	-6.56 kcal/mol	-14.10 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
38	11	GACCAGCAGATATCATCATTT	38.1	-0.14 kcal/mol	80.17 %	0.99	-7.64 kcal/mol	-14.10 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
39	16	GCAGATATCATCATTTCAACT	33.33	-0.20 kcal/mol	72.60 %	1.5	-5.35 kcal/mol	-11.31 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
40	198	GGGATGTGAAGGCCCATGTAA	52.38	-2.70 kcal/mol	84.89 %	1.63	-8.00 kcal/mol	-10.95 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
41	205	GAAGGCCCATGTAAGGTTCAA	47.62	-2.29 kcal/mol	45.12 %	3.06	-7.30 kcal/mol	-9.60 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
42	249	GGTCCATATAGGTAAGGTCAT	42.86	-0.93 kcal/mol	35.99 %	3.16	-7.48 kcal/mol	-12.59 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
43	259	GGTAAGGTCATGTGCATCTCT	47.62	-0.65 kcal/mol	34.84 %	3.18	-11.57 kcal/mol	-18.06 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
44	353	GCAAGATATGGATGGATGAAA	38.1	-0.00 kcal/mol	79.13 %	0.93	-8.21 kcal/mol	-10.64 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
45	401	GTGTGATGTTCTTCCTTGTAA	38.1	-0.18 kcal/mol	75.12 %	0.81	-9.86 kcal/mol	-17.92 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
46	422	GGGATCGTAGGCCTGTTGATA	52.38	-1.84 kcal/mol	57.29 %	1.92	-9.07 kcal/mol	-19.24 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
47	423	GGATCGTAGGCCTGTTGATAA	47.62	-0.66 kcal/mol	34.32 %	2.9	-10.25 kcal/mol	-19.24 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
48	576	GAGCAAGGAACAGGCTTTAGT	47.62	-2.14 kcal/mol	67.66 %	2.04	-7.92 kcal/mol	-16.02 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
49	578	GCAAGGAACAGGCTTTAGTTA	42.86	-1.09 kcal/mol	32.56 %	4.26	-8.97 kcal/mol	-16.02 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
50	639	GCAAGAGGCTGGCAAGTATGA	52.38	-1.21 kcal/mol	37.34 %	3.4	-10.13 kcal/mol	-11.53 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
51	693	GGCGTGTACTCATGCCTCTAA	52.38	-8.22 kcal/mol	97.18 %	0.06	-2.58 kcal/mol	-8.70 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	coat protein
52	206	GGCCCAUGUAAGGUUCAAU	47	-2.00 kcal/mol	32.17 %	3.03	-7.52 kcal/mol	-9.60 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
53	641	GAGGCUGGCAAGUAUGAA	47	-0.90 kcal/mol	61.69 %	1.32	-9.45 kcal/mol	-14.73 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
54	574	GAGCAAGGAACAGGCUUU	47	-2.10 kcal/mol	72.72 %	1.07	-7.46 kcal/mol	-15.52 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
55	237	GACACGAUGUGGUCCAUAU	47	-1.67 kcal/mol	28.82 %	4.05	-9.16 kcal/mol	-16.56 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
56	379	GACCAAGAAUCAUACGAAU	37	-0.00 kcal/mol	84.84 %	0.53	-5.31 kcal/mol	-9.25 kcal/mol	Genscript	Cassava Mosaic Virus	coat protein
57	9	GACCAGCAGAUAUCAUCAU	42	-0.11 kcal/mol	84.32 %	0.72	-7.67 kcal/mol	-14.10 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
58	349	GGGCAAGAUAUGGAUGGAU	47	-0.07 kcal/mo	89.56 %	0.37	-9.34 kcal/mol	-12.57 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
59	492	CAGCUACGGUGAAGAACAU	47	-0.81 kcal/mol	26.85 %	2.34	-11.00 kcal/mol	-18.77 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
60	508	CAUGCAUCGUGAUCGUUAU	42	-1.39 kcal/mol	73.09 %	1.65	-9.61 kcal/mol	-14.74 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
61	196	GGGAUGUGAAGGCCCAUGU	58	-2.68 kcal/mol	88.20 %	1.16	-8.02 kcal/mol	-10.95 kcal/mol	whitehead	Cassava Mosaic Virus	coat protein
62	20	GCCAGGTCTGAGGCTGTAA	57.9	-3.39 kcal/mol	86.22 %	1.45	-7.24 kcal/mol	-16.03 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
63	39	GGTCGTCCAGACCTTGAAA	52.64	-5.11 kcal/mol	97.81 %	0.05	-7.17 kcal/mol	-13.10 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
64	95	GGTTGTGGTTGAAGCGTAT	47.37	-0.87 kcal/mol	55.26 %	2.45	-9.12 kcal/mol	-14.92 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
65	108	GCGTATCTGGATGGTTATT	42.11	-0.63 kcal/mol	36.04 %	3.4	-12.23 kcal/mol	-17.88 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
66	152	GGCTGTCGTGCTGGATGAT	57.9	-2.95 kcal/mol	48.01 %	4.04	-11.77 kcal/mol	-21.86 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
67	161	GCTGGATGATCCTGAAATA	42.11	-0.89 kcal/mol	53.31 %	1.47	-7.63 kcal/mol	-14.50 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
68	197	CCCAGATATATACGCCATT	42.11	-0.00 kcal/mol	99.28 %	0.03	-10.16 kcal/mol	-13.56 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
69	321	GCCGAATGGCCTTACGCTT	57.9	-3.06 kcal/mol	91.44 %	0.65	-9.21 kcal/mol	-17.63 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
70	345	CCCTGTGTTGGACCTTGAT	52.64	-1.22 kcal/mol	70.44 %	1.38	-7.95 kcal/mol	-10.80 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
71	346	CCTGTGTTGGACCTTGATT	47.37	-1.75 kcal/mol	92.09 %	0.37	-8.78 kcal/mol	-12.20 kcal/mol	Ambioin	Cassava Mosaic Virus	TAV protein
72	272	TTGATGTGCACGTAGTATGAG	42.86	-1.44 kcal/mol	41.85 %	1.78	-9.23 kcal/mol	-14.10 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
73	103	TTGAAGCGTATCTGGATGGTT	42.86	-0.91 kcal/mol	22.84 %	3.7	-12.45 kcal/mol	-18.38 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
74	28	TGAGGCTGTAAGGTCGTCCAG	57.14	-3.51 kcal/mol	51.02 %	2.27	-10.25 kcal/mol	-18.03 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
75	319	TCGCCGAATGGCCTTACGCTT	57.14	-3.34 kcal/mol	93.93 %	0.44	-8.94 kcal/mol	-17.63 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
76	259	ATGGTTGTGGCAGTTGATGTG	47.62	-0.81 kcal/mol	51.34 %	2.07	-11.27 kcal/mol	-13.20 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
77	205	TATACGCCATTCATCGCCTGA	47.62	-0.56 kcal/mol	40.35 %	2.27	-9.16 kcal/mol	-13.16 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
78	275	ATGTGCACGTAGTATGAGCAG	47.62	-2.61 kcal/mol	51.05 %	3.84	-8.11 kcal/mol	-14.10 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
79	256	TCCATGGTTGTGGCAGTTGAT	47.62	-3.00 kcal/mol	85.49 %	0.44	-9.14 kcal/mol	-13.20 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
80	206	ATACGCCATTCATCGCCTGAG	52.38	-0.74 kcal/mol	30.17 %	3.09	-9.54 kcal/mol	-22.51 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
81	353	TGGACCTTGATTGGAACCTGA	47.62	-2.14 kcal/mol	49.26 %	1.7	-7.82 kcal/mol	-11.62 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
82	19	AACGCCAGGTCTGAGGCTGTA	57.14	-4.13 kcal/mol	58.19 %	1.46	-6.61 kcal/mol	-16.13 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
83	256	AATCCATGGTTGTGGCAGTTG	47.62	-3.02 kcal/mol	82.43 %	0.65	-7.61 kcal/mol	-11.60 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
84	327	AATGGCCTTACGCTTAGCTGC	52.38	-1.63 kcal/mo	36.02 %	3.61	-11.04 kcal/mol	-18.03 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
85	18	AAACGCCAGGTCTGAGGCTGT	57.14	-3.87 kcal/mol	39.50 %	1.72	-6.87 kcal/mol	-16.13 kcal/mol	Genscript	Cassava Mosaic Virus	TAV protein
86	106	AAGCGTATCTGGATGGTTA	42	-1.11 kcal/mol	37.04 %	3.69	-12.85 kcal/mol	-18.98 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
87	322	CCGAATGGCCTTACGCTTA	53	-1.37 kcal/mol	54.89 %	1.87	-11.30 kcal/mol	-18.03 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
88	95	GGTTGTGGTTGAAGCGTAT	47	-0.87 kcal/mol	55.26 %	2.45	-9.12 kcal/mol	-14.92 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
89	293	CAGCCGCAATTGAGGTCTA	53	-3.26 kcal/mol	77.55 %	0.84	-12.97 kcal/mol	-22.88 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
90	64	CAGCATTGATGTAGTCCCA	47	-0.42 kcal/mol	50.38 %	2.24	-5.17 kcal/mol	-12.13 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
91	94	AGGTTGTGGTTGAAGCGTA	47	-1.24 kcal/mol	30.24 %	1.73	-9.58 kcal/mol	-16.54 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
92	190	GGAACCTCCCAGATATATA	42	-1.02 kcal/mol	43.11 %	2.33	-11.71 kcal/mol	-16.12 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
93	350	TGTTGGACCTTGATTGGAA	42	-1.57 kcal/mol	89.46 %	0.51	-8.59 kcal/mol	-11.82 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
94	285	AGTATGAGCAGCCGCAATT	47	-0.77 kcal/mol	54.90 %.	1.55	-8.15 kcal/mol	-17.61 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
95	366	GAACCTGAGTAGAGCGGCT	58	-0.85 kcal/mol	25.15 %	3.1	-10.24 kcal/mol	-21.38 kcal/mol	siDesign	Cassava Mosaic Virus	TAV protein
96	108	GCGTATCTGGATGGTTATTAT	38.1	-0.64 kcal/mol	35.50 %	3.45	-12.22 kcal/mol	-17.88 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
97	267	GGCAGTTGATGTGCACGTAGT	52.38	-2.44 kcal/mol	67.28 %	1.25	-9.56 kcal/mol	-15.44 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
98	268	GCAGTTGATGTGCACGTAGTA	47.62	-1.90 kcal/mol	72.62 %	2.05	-10.11 kcal/mol	-15.44 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
99	271	GTTGATGTGCACGTAGTATGA	42.86	-1.44 kcal/mol	41.41 %	2.01	-9.23 kcal/mol	-14.10 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
100	295	GCCGCAATTGAGGTCTACTCT	52.38	-2.90 kcal/mol	61.46 %	2.34	-10.28 kcal/mol	-18.58 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
101	351	GTTGGACCTTGATTGGAACCT	47.62	-2.13 kcal/mol	49.52 %	1.75	-8.03 kcal/mol	-11.82 kcal/mol	siRNA_wizard	Cassava Mosaic Virus	TAV protein
102	159	GCUGGAUGAUCCUGAAAUA	42	-0.89 kcal/mol	53.31 %	1.47	-7.63 kcal/mol	-14.50 kcal/mol	whitehead	Cassava Mosaic Virus	TAV protein
103	342	GCCCUGUGUUGGACCUUGA	58	-1.27 kcal/mol	64.57 %	1.33	-7.20 kcal/mol	-9.79 kcal/mol	whitehead	Cassava Mosaic Virus	TAV protein
104	38	GUCGUCCAGACCUUGAAAU	47	-1.68 kcal/mol	88.16 %	0.69	-10.54 kcal/mol	-13.10 kcal/mol	whitehead	Cassava Mosaic Virus	TAV protein

105	265	GGCAGUUGAUGUGCACGUA	53	**-2.44** kcal/mol	**67.81** %	**1.19**	**-9.57 kcal/mol**	**-15.44 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
106	291	CAGCCGCAAUUGAGGUCU	53	**-3.22** kcal/mol	**82.75** %	**0.59**	**-13.01 kcal/mol**	**-22.88 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
107	93	GGUUGUGGUUGAAGCGUAU	47	**-0.87** kcal/mol	**55.26** %	**2.45**	**-9.12 kcal/mol**	**-14.92 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
108	156	CGUGCUGGAUGAUCCUGAA	53	**-1.14** kcal/mol	**35.14** %	**2.96**	**-9.91 kcal/mol**	**-17.10 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
109	107	CGUAUCUGGAUGGUUAUUA	37	**-0.63** kcal/mol	**35.80** %	**3.31**	**-10.92 kcal/mol**	**-16.12 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
110	290	GCAGCCGCAAUUGAGGUCU	58	**-3.23** kcal/mol	**81.51** %	**0.69**	**-12.70 kcal/mol**	**-22.58 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
111	41	GUCCAGACCUUGAAAUCCA	47	**-0.15** kcal/mol	**78.45** %	**0.85**	**-9.26 kcal/mol**	**-11.30 kcal/mol**	whitehead	Cassava Mosaic Virus	TAV protein
112	140	CCTCTCTACCTAGTGATAA	42.11	**-0.39** kcal/mol	**52.91** %	**2.25**	**-6.31 kcal/mol**	**-6.70 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
113	204	GGAAGAATCAGAATTCCTT	36.85	**-2.15** kcal/mol	**78.72** %	**1.91**	**-2.86 kcal/mol**	**-3.80 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
114	312	GGAGATTCCCAAAGAAGAA	42.11	**-1.07** kcal/mol	**39.71** %	**2.67**	**-4.39 kcal/mol**	**-6.50 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
115	589	GCCAAGGAGTTAATCCGAA	47.37	**-2.53** kcal/mol	**95.57** %	**0.16**	**-4.52 kcal/mol**	**-5.60 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
116	668	CCATGTTCTTAGGACTAAA	36.85	**-1.01** kcal/mol	**31.41** %	**3.60**	**-5.79 kcal/mol**	**-11.37 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
117	829	GCGGATTTCCCAGGATATA	47.37	**-0.94** kcal/mol	**30.34** %	**2.68**	**-6.67 kcal/mol**	**-12.84 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
118	926	GCATCTACAGCTTAGGTTT	42.11	**-1.38** kcal/mol	**53.89** %	**3.08**	**-6.88 kcal/mol**	**-11.20 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
119	999	GCAGAAGAAGTTGAAGAAA	36.85	**-0.20** kcal/mol	**72.37** %	**1.14**	**-7.85 kcal/mol**	**-8.60 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
120	1229	GCAGATGTTGGATCTGCAA	47.37	**-8.01** kcal/mol	**97.98** %	**0.04**	**-5.19 kcal/mol**	**-5.20 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
121	1293	GGAGAAGGCTCATATCCTT	47.37	**-2.11** kcal/mol	**60.56** %	**3.37**	**-5.96 kcal/mol**	**-7.50 kcal/mol**	Ambioin	Cauliflower Mosaic virus	coat protein
122	224	TAGCAATAGGAGAAACATCTG	38.1	**-1.02** kcal/mol	**50.45** %	**2.24**	**-4.21 kcal/mol**	**-6.50 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
123	1240	ATCTGCAATATCGAAGGCCAT	42.86	**-0.31** kcal/mol	**60.93** %	**1.52**	**-11.32 kcal/mol**	**-13.31 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
124	688	TACTCCGACAACAAGGTTGCT	47.62	**-2.34** kcal/mol	**57.19** %	**3.83**	**-6.44 kcal/mol**	**-10.30 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
125	17	TAGACAGGACCATTAACCGGT	47.62	**-1.40** kcal/mol	**32.02** %	**3.08**	**-6.43 kcal/mol**	**-14.33 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
126	1259	ATTACGCCAACGAATGTCCTA	42.86	**-0.41** kcal/mol	**51.70** %	**2.07**	**-6.60 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
127	1291	TCGGAGAAGGCTCATATCCTT	47.62	**-2.09** kcal/mol	**62.04** %	**3.29**	**-9.02 kcal/mol**	**-13.65 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
128	676	TTAGGACTAAACTACTCCGAC	42.86	**-1.40** kcal/mol	**37.87** %	**2.68**	**-6.47 kcal/mol**	**-10.30 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
129	691	TCCGACAACAAGGTTGCTGAG	52.38	**-2.49** kcal/mol	**45.32** %	**4.93**	**-5.41 kcal/mol**	**-6.20 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
130	1248	TATCGAAGGCCATTACGCCAA	47.62	**-3.51** kcal/mol	**98.25** %	**0.06**	**-5.98 kcal/mol**	**-10.50 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
131	436	ATAGGAATGCTCAACATCGAC	42.86	**-0.48** kcal/mol	**46.04** %	**2.35**	**-5.94 kcal/mol**	**-9.20 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
132	193	AAGACTCGATCTCGGAAGAAT	42.86	**-1.00** kcal/mol	**19.67** %	**3.51**	**-6.91 kcal/mol**	**-9.32 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
133	1255	AAGGCCATTACGCCAACGAAT	47.62	**-3.51** kcal/mol	**98.25** %	**0.06**	**-6.12 kcal/mol**	**-10.50 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
134	819	AAGACAGAACTGGCGGATTTC	47.62	**-0.00** kcal/mol	**77.33** %	**1.05**	**-8.71 kcal/mol**	**-9.90 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
135	247	AAGACGAAAGCGATTCAGGAG	47.62	**-0.43** kcal/mol	**49.50** %	**1.92**	**-5.35 kcal/mol**	**-8.13 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
136	889	AAGCGTTAACACGCTTTAGAC	42.86	**-5.98** kcal/mol	**54.36** %	**0.86**	**-2.10 kcal/mol**	**-2.10 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
137	286	AAGTTCGAATGGACCGAACAG	47.62	**-4.53** kcal/mol	**94.58** %	**0.62**	**-4.01 kcal/mol**	**-4.60 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
138	1029	AAGTGCTGTAGCATCGGAGAA	47.62	**-2.90** kcal/mol	**85.22** %	**0.98**	**-8.21 kcal/mol**	**-14.09 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
139	185	AACTACCGAAGACTCGATCTC	47.62	**-1.03** kcal/mol	**58.41** %	**1.99**	**-6.23 kcal/mol**	**-14.38 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
140	33	AACCGGTTCTGGTATAATCTG	42.86	**-2.57** kcal/mol	**46.83** %	**0.94**	**-8.57 kcal/mol**	**-17.61 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
141	217	AATTCCTTCTAGCAATAGGAG	38.1	**-4.34** kcal/mol	**80.21** %	**2.53**	**-3.10 kcal/mol**	**-7.10 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
142	106	AAGCGTATCTGGATGGTTA	42	**-1.11** kcal/mol	**37.04** %	**3.69**	**-9.69 kcal/mol**	**-17.51 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
143	322	CCGAATGGCCTTACGCTTA	53	**-1.37** kcal/mol	**54.89** %	**1.87**	**-9.33 kcal/mol**	**-17.54 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
144	95	GGTTGTGGTTGAAGCGTAT	47	**-0.87** kcal/mol	**55.26** %	**2.45**	**-9.56 kcal/mol**	**-11.58 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
145	293	CAGCCGCAATTGAGGTCTA	53	**-3.26** kcal/mol	**77.55** %	**0.84**	**-4.24 kcal/mol**	**-7.30 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
146	64	CAGCATTGATGTAGTCCCA	47	**-0.42** kcal/mol	**50.38** %	**2.24**	**-7.50 kcal/mol**	**-9.30 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
147	94	AGGTTGTGGTTGAAGCGTA	47	**-1.24** kcal/mol	**30.24** %	**1.73**	**-9.19 kcal/mol**	**-11.58 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
148	190	GGAACCTCCCAGATATATA	42	**-1.02** kcal/mol	**43.11** %	**2.33**	**-6.98 kcal/mol**	**-17.55 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
149	350	TGTTGGACCTTGATTGGA	42	**-1.56** kcal/mol	**90.30** %	**0.42**	**-7.62 kcal/mol**	**-8.90 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
150	285	AGTAAGAGCAGCCGCAAAT	47	**-0.77** kcal/mol	**54.90** %	**1.55**	**-7.60 kcal/mol**	**-11.80 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
151	366	GAACCTGAGTAGAGCGGCT	58	**-0.85** kcal/mol	**25.15** %	**3.1**	**-9.81 kcal/mol**	**-15.31 kcal/mol**	siDesign	Cauliflower Mosaic virus	coat protein
152	58	GATTGTCTCTCAGAAAGTCAA	38.1	**-2.58** kcal/mol	**53.95** %	**1.61**	**-8.32 kcal/mol**	**-12.26 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
153	119	GGGACCAAATTATTGATCTAA	33.33	**-1.62** kcal/mol	**42.68** %	**1.84**	**-5.73 kcal/mol**	**-7.40 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
154	133	GATCTAACCTCTCTACCTAGT	42.86	**-0.13** kcal/mol	**81.17** %	**0.82**	**-6.80 kcal/mol**	**-13.09 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
155	166	GTCGAACAGGTTATGACAACT	42.86	**-1.40** kcal/mol	**27.49** %	**3.07**	**-5.41 kcal/mol**	**-6.10 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
156	226	GCAATAGGAGAAACATCTGAA	38.1	**-1.05** kcal/mol	**47.99** %	**2.5**	**-4.80 kcal/mol**	**-5.90 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
157	250	GAAAGCGATTCAGGAGAAGAA	42.86	**-0.50** kcal/mol	**44.49** %	**2.3**	**-5.48 kcal/mol**	**-8.33 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
158	337	GAAGGACCATCAAGATACAAT	38.1	**-0.07** kcal/mol	**89.04** %	**0.35**	**-7.78 kcal/mol**	**-8.40 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
159	341	GACCATCAAGATACAATGAGA	38.1	**-0.43** kcal/mol	**49.75** %	**1.68**	**-5.34 kcal/mol**	**-9.41 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
160	381	GGACCGGTACTTTCCAACTCA	52.38	**-1.41** kcal/mol	**26.84** %	**3.48**	**-7.01 kcal/mol**	**-14.83 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
161	382	GACCGGTACTTTCCAACTCAA	47.62	**-1.00** kcal/mol	**52.63** %	**1.99**	**-7.42 kcal/mol**	**-14.83 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	coat protein
162	1261	CGCCAACGAAUGUCCUAAU	47	**-0.36** kcal/mol	**55.94** %	**1.31**	**-6.58 kcal/mol**	**-6.90 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
163	461	GCCAAUCGAAGAACUUUAA	37	**-0.03** kcal/mol	**95.07** %	**0.2**	**-5.89 kcal/mol**	**-9.66 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
164	1287	GCUCGGAGAAGGCUCAUAU	53	**-1.96** kcal/mol	**76.77** %	**1.92**	**-6.98 kcal/mol**	**-10.92 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
165	1336	GCCCAUUGAAGAACCCUAU	47	**-0.06** kcal/mol	**91.12** %	**0.3**	**-5.59 kcal/mol**	**-7.19 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
166	491	GCAGCAGAAAUCGGAUUGA	47	**-0.00** kcal/mol	**82.58** %	**0.83**	**-6.89 kcal/mol**	**-11.10 kcal/mol**	Genscript	Cauliflower Mosaic virus	coat protein
167	139	CUCUCUACCUAGUGAUAAU	37	**-0.42** kcal/mol	**50.29** %	**2.38**	**-6.29 kcal/mol**	**-6.70 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
168	627	CCGGCGACAUCAUAGAACA	53	**-0.02** kcal/mol	**96.84** %	**0.11**	**-6.40 kcal/mol**	**-6.40 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
169	1040	GGAGAAGCUUCAGUAGAAU	42	**-1.03** kcal/mol	**49.86** %	**3.2**	**-6.23 kcal/mol**	**-12.30 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
170	517	GACCAAUAGAGAAGACUAU	37	**-0.56** kcal/mol	**40.24** %	**2.02**	**-4.69 kcal/mol**	**-5.20 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
171	1230	GAUGUUGGAUCUGCAAUAU	37	**-3.27** kcal/mol	**64.38** %	**0.78**	**-6.14 kcal/mol**	**-19.02 kcal/mol**	whitehead	Cauliflower Mosaic virus	coat protein
172	82	GCAAGAGCTAACGGCTCTT	52.64	**-7.31** kcal/mol	**37.35** %	**0.95**	**-2.71 kcal/mol**	**-21.00 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
173	207	GCAAACGGCTCCTGGTAAA	52.64	**-0.65** kcal/mol	**34.94** %	**2.52**	**-10.39 kcal/mol**	**-15.13 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
174	373	GCTCCTCTCAGGGCAGAAT	57.9	**-4.16** kcal/mol	**47.37** %	**3.28**	**-6.57 kcal/mol**	**-18.21 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
175	436	GGTCCACACGCCGGTATAT	57.9	**-1.93** kcal/mol	**80.89** %	**1.09**	**-5.30 kcal/mol**	**-7.30 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
176	520	GCCACTATTACAGAGGCAA	47.37	**-3.77** kcal/mol	**75.66** %	**0.7**	**-5.55 kcal/mol**	**-22.95 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
177	541	GCAGCAGCTGACGCATATA	52.64	**-1.21** kcal/mol	**22.85** %	**3.28**	**-6.89 kcal/mol**	**-8.10 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
178	544	GCAGCTGACGCATATACAA	47.37	**-0.80** kcal/mol	**44.18** %	**1.80**	**-7.30 kcal/mol**	**-8.10 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
179	859	GCTAACCCACAGATGGTTA	47.37	**-2.61** kcal/mol	**60.44** %	**2.19**	**-7.19 kcal/mol**	**-9.80 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
180	930	CCAGGAGATCAAATACCTT	42.11	**-0.72** kcal/mol	**43.16** %	**1.94**	**-6.22 kcal/mol**	**-11.80 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
181	1436	GCGATAAAGGAAAGGCTAT	42.11	**-0.43** kcal/mol	**49.90** %	**1.45**	**-6.98 kcal/mol**	**-7.50 kcal/mol**	Ambioin	Cauliflower Mosaic virus	TAV protein
182	418	TACTACGTTGTGTATAACGGT	38.1	**-2.72** kcal/mol	**59.76** %	**1.68**	**-6.62 kcal/mol**	**-9.30 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
183	517	TTTGCCACTATTACAGAGGCA	42.86	**-4.64** kcal/mol	**57.62** %	**1.05**	**-4.28 kcal/mol**	**-22.55 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
184	875	TTAGAGAGGCCTACGCAGCAG	57.14	**-1.01** kcal/mol	**43.90** %	**2.4**	**-4.28 kcal/mol**	**-22.55 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
185	1058	AAGGCTTGCTTCATAAACCAA	38.1	**-0.75** kcal/mol	**29.69** %	**3.69**	**-8.84 kcal/mol**	**-10.60 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
186	1433	ATTGCGATAAAGGAAAGGCTA	38.1	**-0.48** kcal/mol	**45.59** %	**1.57**	**-6.65 kcal/mol**	**-7.20 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
187	47	TAGAGCTCGATCTAGTAAGAG	42.86	**-2.01** kcal/mol	**71.29** %	**1.99**	**-6.24 kcal/mol**	**-6.30 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
188	1154	TTGAGGACCTAACAGAACTCG	47.62	**-2.00** kcal/mol	**38.08** %	**1.36**	**-5.00 kcal/mol**	**-7.30 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
189	425	TTGTGTATAACGGTCCACACG	47.62	**-2.45** kcal/mol	**29.49** %	**5.48**	**-6.29 kcal/mol**	**-7.10 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
190	1451	CTATCGTTAAAGATGCCTCTG	42.86	**-1.76** kcal/mol	**65.60** %	**1.88**	**-7.46 kcal/mol**	**-14.10 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
191	1120	ACAGAGTCTAAGGCCATGGAG	52.38	**-1.85** kcal/mol	**48.13** %	**4.27**	**-9.62 kcal/mol**	**-15.54 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
192	86	AAGAGCTAACGGCTCTTCGCA	52.38	**-7.52** kcal/mol	**50.25** %	**0.89**	**-4.21 kcal/mol**	**-5.90 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
193	1060	AAGGCTTGCTTCATAAACCAA	38.1	**-0.75** kcal/mol	**29.69** %	**3.69**	**-8.84 kcal/mol**	**-10.60 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
194	1182	AAGACTGGCGAACAGTTCATA	42.86	**-5.12** kcal/mol	**82.26** %	**0.56**	**-4.80 kcal/mol**	**-4.80 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
195	796	AAGGTGACGATACCATGTTCA	42.86	**-2.29** kcal/mol	**45.30** %	**2.93**	**-7.16 kcal/mol**	**-15.92 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
196	1449	AAGGCTATCGTTAAAGATGCC	42.86	**-5.99** kcal/mol	**87.03** %	**0.34**	**-2.38 kcal/mol**	**-2.40 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
197	1444	AAGGAAAGGCTATCGTTAAAG	38.1	**-0.49** kcal/mol	**45.04** %	**2.43**	**-7.18 kcal/mol**	**-7.50 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
198	1525	AAGAAGACGTTCCAACCACGT	47.62	**-1.23** kcal/mol	**36.15** %	**3.09**	**-5.68 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
199	1192	AACAGTTCATACAGAGTCTCT	38.1	**-0.63** kcal/mol	**36.01** %	**3.04**	**-7.21 kcal/mol**	**-8.13 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
200	18	AAACTCCTCATGCAAGAGAAA	38.1	**-1.81** kcal/mol	**70.76** %	**2.26**	**-7.03 kcal/mol**	**-12.13 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
201	1462	AAGATGCCTCTGCCGACAGTG	57.14	**-1.34** kcal/mol	**49.19** %	**2.55**	**-10.15 kcal/mol**	**-17.45 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
202	957	GGTTAAAGATGCAGTCAAA	37	**-0.00** kcal/mol	**66.75** %	**1.4**	**-6.92 kcal/mol**	**-14.63 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
203	993	CATCAAGAACACAGAGAA	37	**-0.07** kcal/mol	**89.45** %	**0.39**	**-6.51 kcal/mol**	**-9.26 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
204	207	GCAAACGGCTCCTGGTAAA	53	**-0.65** kcal/mol	**34.94** %	**2.52**	**-10.39 kcal/mol**	**-15.13 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
205	470	GTACAAAGGCGGCAACAAA	47	**-0.13** kcal/mol	**80.43** %	**0.66**	**-7.18 kcal/mol**	**-7.31 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
206	1443	AGGAAAGGCTATCGTTAAA	37	**-0.36** kcal/mol	**55.79** %	**1.62**	**-7.12 kcal/mol**	**-7.50 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
207	1343	CGGGAAACCTCCTCGGATT	58	**-4.49** kcal/mol	**62.09** %	**2.08**	**-4.87 kcal/mol**	**-13.13 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
208	995	TCAAGAACACAGAGAAAGA	37	**-0.00** kcal/mol	**95.33** %	**0.18**	**-7.06 kcal/mol**	**-9.99 kcal/mol**	Genscript	Cauliflower Mosaic virus	TAV protein
209	1092	GATCGGAGTCTCTAAGAAA	42	**-0.58** kcal/mol	**39.13** %	**3.16**	**-7.75 kcal/mol**	**-12.03 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
210	1436	GCGATAAAGGAAAGGCTAT	42	**-0.43** kcal/mol	**49.90** %	**1.45**	**-6.98 kcal/mol**	**-7.50 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
211	54	CGATCTAGTAAGAGCAAAA	37	**-0.55** kcal/mol	**41.20** %	**1.86**	**-5.67 kcal/mol**	**-6.20 kcal/mol**	siDesign	Cauliflower Mosaic virus	TAV protein
212	207	GCAAACGGCTCCTGGTAAAGA	52.38	**-0.73** kcal/mol	**30.78** %	**2.81**	**-10.31 kcal/mol**	**-15.13 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
213	214	GCTCCTGGTAAAGAATCAACA	42.86	**-0.65** kcal/mol.	**35.05** %.	**2.9**	**-9.55 kcal/mol**	**-9.70 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
214	499	GGAGTTGCACATAAGAAGTTT	38.1	**-0.20** kcal/mol	**72.39** %	**1.35**	**-6.56 kcal/mol**	**-6.70 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein

215	544	GCAGCTGACGCATATACAACA	47.62	**-0.80** kcal/mol	**44.14** %	**1.81**	**-7.30 kcal/mol**	**-8.10 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
216	547	GCTGACGCATATACAACAAGT	42.86	**-0.68** kcal/mol	**54.21** %	**1.5**	**-7.45 kcal/mol**	**-8.10 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
217	570	GCAAACAGATAGGTTGAACTT	38.1	**-0.72** kcal/mol	**30.92** %	**3.23**	**-8.28 kcal/mol**	**-9.00 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
218	747	GGACGACTTCCTCTATCTCTA	47.62	**-1.16** kcal/mol	**55.96** %	**2.79**	**-7.33 kcal/mol**	**-16.40 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
219	810	GTTCACCACTGATAATGAGAA	38.1	**-0.42** kcal/mol	**50.97** %	**2.35**	**-6.46 kcal/mol**	**-8.35 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
220	954	GAAGGTTAAAGATGCAGTCAA	38.1	**-0.78** kcal/mol	**54.31** %	**2.41**	**-6.40 kcal/mol**	**-14.63 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
221	983	GGACTAACTGCATCAAGAACA	42.86	**-0.36** kcal/mol	**55.67** %	**1.26**	**-7.37 kcal/mol**	**-12.90 kcal/mol**	siRNA_wizard	Cauliflower Mosaic virus	TAV protein
222	1093	CGGAGUCUCUAAGAAAUUA	37	**-0.36** kcal/mol	**55.68** %	**2.13**	**-7.92 kcal/mol**	**-12.03 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
223	371	GCUCCUCUCAGGGCAGAAU	58	**-4.16** kcal/mol	**47.37** %	**3.28**	**-6.57 kcal/mol**	**-18.21 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
224	1367	CCAGCUAUCUGUCACUUU	42	**-0.52** kcal/mol	**42.85** %	**2**	**-9.40 kcal/mol**	**-11.30 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
225	834	GCCUCUUCAAUUUCAGAA	37	**-0.26** kcal/mol	**65.69** %	**1.56**	**-8.34 kcal/mol**	**-15.08 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
226	211	GGCUCCUGGUAAAGAAUCA	47	**-0.53** kcal/mol	**42.12** %	**3**	**-10.50 kcal/mol**	**-15.13 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
227	212	GCUCCUGGUAAAGAAUCAA	42	**-0.63** kcal/mol	**36.00** %	**2.84**	**-9.55 kcal/mol**	**-9.70 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
228	443	GCCGGUAUAUACGAUGACU	47	**-0.48** kcal/mol	**45.59** %	**1.78**	**-8.59 kcal/mol**	**-12.51 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
229	545	GCUGACGCAUAUACAACAA	42	**-0.61** kcal/mol	**60.84** %	**0.99**	**-7.49 kcal/mol**	**-8.10 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
230	1182	CUGGCGAACAGUUCAUACA	47	**-2.26** kcal/mol	**90.62** %	**0.81**	**-5.15 kcal/mol**	**-11.91 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
231	1308	GGGCAAUUGAGACUUUCCA	47	**-0.81** kcal/mol	**31.68** %	**3.54**	**-7.65 kcal/mol**	**-15.55 kcal/mol**	whitehead	Cauliflower Mosaic virus	TAV protein
232	13	GCTGCCGATATCGTCATTT	47.37	**-0.62** kcal/mol	**36.47** %	**2.62**	**-8.19 kcal/mol**	**-12.22 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
233	16	GCCGATATCGTCATTTCTA	42.11	**-0.35** kcal/mol	**56.62** %	**1.83**	**-6.35 kcal/mol**	**-6.74 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
234	127	GCATGGACAAACAGGCCTA	52.64	**-1.93** kcal/mol	**80.48** %	**0.76**	**-9.73 kcal/mol**	**-17.96 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
235	131	GGACAAACAGGCCTATGAA	47.37	**-0.30** kcal/mol	**61.20** %	**1.19**	**-9.28 kcal/mol**	**-15.60 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
236	351	GGGTAAGATATGGATGGAT	42.11	**-0.02** kcal/mol	**96.46** %	**0.14**	**-9.11 kcal/mol**	**-16.64 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
237	362	GGATGGATGAGAACATTAA	36.85	**-1.84** kcal/mol	**67.90** %	**1.79**	**-6.18 kcal/mol**	**-11.32 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
238	524	GGTATCAAGTTCTGCGCAA	47.37	**-0.46** kcal/mol	**47.33** %	**2.17**	**-9.31 kcal/mol**	**-12.89 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
239	562	GGTGGACAATACGCTTCAA	47.37	**-2.80** kcal/mol	**72.22** %	**0.84**	**-5.37 kcal/mol**	**-14.48 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
240	574	GCTTCAAAGGAACAGGCTT	47.37	**-1.18** kcal/mol	**28.17** %	**3.55**	**-7.57 kcal/mol**	**-9.00 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
241	588	GGCTTTGGTCAAGAAGTTT	42.11	**-3.36** kcal/mol	**47.18** %	**1.4**	**-5.24 kcal/mol**	**-7.10 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	coat protein
242	275	TTAGTGATGTTACTCGTGGTA	38.1	**-1.15** kcal/mol	**34.95** %	**4.02**	**-8.26 kcal/mol**	**-12.21 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
243	378	TAAGACGAAGAATCACACGAA	38.1	**-0.00** kcal/mol	**75.12** %	**0.88**	**-6.11 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
244	557	TCACCGGTGGACAATACGCTT	52.38	**-2.87** kcal/mol	**75.84** %	**0.65**	**-5.17 kcal/mol**	**-13.30 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
245	689	ATATGGCTTGTACTCACGCTA	42.86	**-3.47** kcal/mol	**64.92** %	**0.88**	**-5.88 kcal/mol**	**-15.34 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
246	522	TAGGTATCAAGTTCTGCGCAA	42.86	**-0.68** kcal/mol	**33.43** %	**3.17**	**-9.10 kcal/mol**	**-12.89 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
247	547	TATGCAACTGTCACCGGTGGA	52.38	**-2.11** kcal/mol	**31.57** %	**2.28**	**-5.51 kcal/mol**	**-18.66 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
248	214	TGTAAGGTTCAGTCGTTTGAG	42.86	**-1.53** kcal/mol	**42.17** %	**1.69**	**-5.86 kcal/mol**	**-10.10 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
249	690	TATGGCTTGTACTCACGCTAG	47.62	**-4.11** kcal/mol	**83.09** %	**0.53**	**-5.24 kcal/mol**	**-15.34 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
250	377	TTAAGACGAAGAATCACACGA	38.1	**-0.13** kcal/mol	**80.46** %	**0.71**	**-6.10 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
251	429	TAGACCTGTTGATAAACCTCA	38.1	**-0.67** kcal/mol	**33.82** %	**2.69**	**-10.39 kcal/mol**	**-13.90 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
252	182	AAGTCCAGACGTTCCTAGAGG	52.38	**-0.64** kcal/mol	**41.62** %	**2.64**	**-7.26 kcal/mol**	**-10.00 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
253	381	AAGACGAAGAATCACACGAAT	38.1	**-0.00** kcal/mol	**74.92** %	**0.9**	**-6.11 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
254	49	AAGTACGCCGGCGTCTGAACT	57.14	**-1.60** kcal/mol	**44.49** %	**2.76**	**-11.00 kcal/mol**	**-15.71 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
255	9	AAGCGAGCTGCCGATATCGTC	57.14	**-2.66** kcal/mol	**77.18** %	**1.59**	**-5.56 kcal/mol**	**-6.60 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
256	390	AATCACACGAATAGTGTGATG	38.1	**-9.10** kcal/mol	**84.53** %	**0.29**	**-1.87 kcal/mol**	**-3.30 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
257	48	AAAGTACGCCGGCGTCTGAAC	57.14	**-1.53** kcal/mol	**49.41** %	**2.05**	**-9.74 kcal/mol**	**-21.50 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
258	554	AACTGTCACCGGTGGACAATA	47.62	**-2.57** kcal/mol	**64.79** %	**2.84**	**-7.13 kcal/mol**	**-20.81 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
259	120	AAACAACAGGCATGGACAAAC	42.86	**-0.00** kcal/mol	**77.10** %	**0.72**	**-9.84 kcal/mol**	**-15.65 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
260	306	CCATAGAGTTGGTAAGAGA	42	**-2.44** kcal/mol	**93.10** %	**0.22**	**-5.14 kcal/mol**	**-9.72 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
261	426	TCGTAGACCTGTTGATAAA	37	**-0.07** kcal/mol	**89.46** %	**0.45**	**-10.98 kcal/mol**	**-13.90 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
262	338	CTGTTTATGTGTTGGGTAA	37	**-0.18** kcal/mol	**75.14** %	**1.44**	**-10.53 kcal/mol**	**-14.62 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
263	174	GTACAGAAGTCCAGACGTT	47	**-0.14** kcal/mol	**80.11** %	**0.82**	**-6.56 kcal/mol**	**-11.30 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
264	356	AGATATGGATGGATGAGAA	37	**-0.09** kcal/mol	**86.65** %	**0.65**	**-6.51 kcal/mol**	**-9.60 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
265	382	ACGAAGAATCACACGAATA	37	**-0.17** kcal/mol	**76.32** %	**0.84**	**-5.16 kcal/mol**	**-6.06 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
266	316	GGCCGTCCCAATAGTGTTT	37	**-0.70** kcal/mol	**37.64** %	**3.1**	**-5.89 kcal/mol**	**-9.31 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
267	581	AGGAACAGGCTTTGGTCAA	47	**-1.62** kcal/mol	**70.54** %	**2.43**	**-7.16 kcal/mol**	**-14.79 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
268	121	CAACAGGCATGGACAAACA	47	**-0.28** kcal/mol	**63.85** %	**1.16**	**-9.92 kcal/mol**	**-15.85 kcal/mol**	siDesign	Cotton Leaf Curl Virus	coat protein
269	352	GGTAAGATATGGATGGATG	42	**-0.00** kcal/mol	**91.96** %	**0.38**	**-6.55 kcal/mol**	**-9.60 kcal/mol**	Genscript	Cotton Leaf Curl Virus	coat protein
270	131	GGACAAACAGGCCTATGAACA	47.62	**-0.31** kcal/mol	**60.30** %	**1.25**	**-9.27 kcal/mol**	**-15.60 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
271	362	GGATGGATGAGAACATTAAGA	38.1	**-1.84** kcal/mol	**68.05** %	**1.77**	**-6.18 kcal/mol**	**-11.32 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
272	370	GAGAACATTAAGACGAAGAAT	33.33	**-0.02** kcal/mol	**96.96** %	**0.11**	**-6.99 kcal/mol**	**-7.72 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
273	422	GAGATCGTAGACCTGTTGATA	42.86	**-0.48** kcal/mol	**45.61** %	**2.40**	**-10.58 kcal/mol**	**-13.90 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
274	424	GATCGTAGACCTGTTGATAAA	38.1	**-0.46** kcal/mol	**47.23** %	**2.18**	**-10.60 kcal/mol**	**-13.90 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
275	537	GCGCAAATGGTATGCAACTGT	47.62	**-1.53** kcal/mol	**35.79** %.	**4.76**	**-7.07 kcal/mol**	**-8.50 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
276	539	GCAAATGGTATGCAACTGTCA	42.86	**-1.63** kcal/mol	**30.52** %	**5.29**	**-4.61 kcal/mol**	**-9.36 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
277	684	GCTTTATATGGCTTGTACTCA	38.1	**-1.72** kcal/mol	**82.36** %	**0.97**	**-9.00 kcal/mol**	**-18.47 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
278	710	GCAACCCTGTTTATGCTACGT	47.62	**-0.76** kcal/mol	**29.31** %	**3.2**	**-8.45 kcal/mol**	**-12.00 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	coat protein
279	492	CGGCGACUGUGAAGAAUGU	53	**-0.57** kcal/mol	**39.83** %	**2.66**	**-6.91 kcal/mol**	**-10.60 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
280	560	GGUGGACAAUACGCUUCAA	47	**-2.80** kcal/mol	**72.22** %	**0.84**	**-5.37 kcal/mol**	**-14.48 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
281	360	GGAUGGAUGAGAACAUUAA	37	**-1.84** kcal/mol	**67.90** %	**1.79**	**-6.18 kcal/mol**	**-11.32 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
282	561	GUGGACAAUACGCUUCAAA	42	**-1.33** kcal/mol	**58.51** %	**3.17**	**-6.84 kcal/mol**	**-14.48 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
283	156	CCAGGAUGUACAGGAUGUA	47	**-0.69** kcal/mol	**32.72** %	**2.59**	**-8.38 kcal/mol**	**-11.77 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
284	379	GACGAAGAAUCACACGAAU	42	**-0.18** kcal/mol	**74.75** %	**0.9**	**-6.11 kcal/mol**	**-6.90 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
285	206	GGUCCAUGUAAGGUUCAGU	47	**-1.28** kcal/mol	**33.28** %	**1.52**	**-8.03 kcal/mol**	**-13.71 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
286	155	CCCAGGAUGUACAGGAUGU	53	**-0.40** kcal/mol.	**52.31** %	**1.7**	**-8.27 kcal/mol**	**-11.37 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
287	268	GUGUGUUAGUGAUGUUACU	37	**-0.73** kcal/mol	**30.51** %	**3.31**	**-8.08 kcal/mol**	**-11.61 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
288	9	GAGCUGCCGAUAUCGUCAU	53	**-0.64** kcal/mol	**35.38** %	**2.71**	**-6.58 kcal/mol**	**-10.62 kcal/mol**	whitehead	Cotton Leaf Curl Virus	coat protein
289	16	CCGAGATTGTTCAGATATT	36.85	**-0.41** kcal/mol	**51.67** %	**2.11**	**-7.73 kcal/mol**	**-12.40 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
290	87	GGTCGTCCAGATTCGGAAT	52.64	**-2.59** kcal/mol	**74.01** %	**2.23**	**-4.53 kcal/mol**	**-6.20 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
291	158	GGATCCTGATCGTGAGTAT	47.37	**-0.34** kcal/mol	**57.30** %	**1.69**	**-7.45 kcal/mol**	**-12.14 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
292	245	CCCAGATATATGCGCCATT	47.37	**-0.17** kcal/mol	**75.38** %	**0.95**	**-9.00 kcal/mol**	**-11.15 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
293	258	GCCATTCCCTGCTTGAGCT	57.9	**-0.89** kcal/mol	**45.21** %	**3.00**	**-5.17 kcal/mol**	**-12.36 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
294	316	GCAGTTGATTGACAGATAA	36.85	**-0.38** kcal/mol	**54.10** %	**2.18**	**-5.59 kcal/mol**	**-9.22 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
295	386	GCTTCCCTGTGTTGTACTT	47.37	**-0.42** kcal/mol	**50.87** %	**1.56**	**-5.81 kcal/mol**	**-6.80 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
296	390	CCCTGTGTTGTACTTTGAT	42.11	**-0.08** kcal/mol	**87.69** %	**0.66**	**-6.18 kcal/mol**	**-7.20 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
297	391	CCTGTGTTGTACTTTGATT	36.85	**-0.08** kcal/mol	**88.03** %.	**0.65**	**-6.18 kcal/mol**	**-7.20 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
298	414	CCTGAGTACATGGGTCTAT	47.37	**-1.92** kcal/mol	**42.88** %	**3.38**	**-7.07 kcal/mol**	**-13.25 kcal/mol**	Ambioin	Cotton Leaf Curl Virus	TAV protein
299	76	TGAGGCTGTAAGGTCGTCCAG	57.14	**-3.51** kcal/mol	**51.02** %	**2.27**	**-6.43 kcal/mol**	**-13.14 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
300	404	TTGATTGGTACCTGAGTACAT	38.1	**-2.73** kcal/mol	**95.21** %	**0.26**	**-6.73 kcal/mol**	**-13.71 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
301	195	TGGACGGTTGACGTGGCTGAT	57.14	**-3.00** kcal/mol	**52.06** %	**2.92**	**-6.15 kcal/mol**	**-12.06 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
302	184	TTCGTCGTGAATGGACGGTTG	52.38	**-5.15** kcal/mol	**66.89** %	**0.79**	**-3.34 kcal/mol**	**-6.70 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
303	311	TTGTGGCAGTTGATTGACAGA	42.86	**-1.07** kcal/mol	**17.76** %	**4.65**	**-5.66 kcal/mol**	**-10.17 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
304	304	TCCATGGTTGTGGCAGTTGAT	47.62	**-3.00** kcal/mol	**85.49** %	**0.44**	**-7.13 kcal/mol**	**-14.24 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
305	183	ATTCGTCGTGAATGGACGGTT	47.62	**-5.20** kcal/mol	**61.59** %	**0.96**	**-3.34 kcal/mol**	**-6.70 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
306	403	TTTGATTGGTACCTGAGTACA	38.1	**-2.72** kcal/mol	**96.03** %	**0.22**	**-6.74 kcal/mol**	**-13.71 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
307	312	TGTGGCAGTTGATTGACAGAT	42.86	**-0.88** kcal/mol	**23.84** %	**3.97**	**-5.84 kcal/mol**	**-10.17 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
308	401	ACTTTGATTGGTACCTGAGTA	38.1	**-0.91** kcal/mol	**26.73** %	**3.66**	**-8.15 kcal/mol**	**-9.60 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
309	68	AAGACCAGTCTGAGGCTGTAA	47.62	**-3.71** kcal/mol	**83.56** %	**0.71**	**-9.45 kcal/mol**	**-16.12 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
310	195	AATGGACGGTTGACGTGGCTG	57.14	**-2.24** kcal/mol	**41.55** %	**4.27**	**-7.32 kcal/mol**	**-12.46 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
311	304	AATCCATGGTTGTGGCAGTTG	47.62	**-3.02** kcal/mol	**82.43** %	**0.65**	**-7.11 kcal/mol**	**-14.24 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
312	67	AAAGACCAGTCTGAGGCTGTA	47.62	**-3.71** kcal/mol	**83.56** %	**0.71**	**-8.99 kcal/mol**	**-21.19 kcal/mol**	Genscript	Cotton Leaf Curl Virus	TAV protein
313	306	CCATAGAGTTGGTAAGAGA	42	**-2.44** kcal/mol	**93.10** %	**0.22**	**-6.05 kcal/mol**	**-9.81 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
314	426	TCGTAGACCTGTTGATAAA	37	**-0.07** kcal/mol	**89.46** %	**0.45**	**-8.86 kcal/mol**	**-10.91 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
315	338	CTGTTTATGTGTTGGGTAA	37	**-0.18** kcal/mol	**75.14** %	**1.44**	**-8.93 kcal/mol**	**-9.55 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
316	174	GTACAGAAGTCCAGACGTT	47	**-0.14** kcal/mol	**80.11** %	**0.82**	**-8.64 kcal/mol**	**-12.73 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
317	356	AGATATGGATGGATGAGAA	37	**-0.09** kcal/mol	**86.65** %	**0.65**	**-11.85 kcal/mol**	**-13.89 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
318	382	ACGAAGAATCACACGAATA	37	**-0.00** kcal/mol	**76.32** %	**0.84**	**-7.60 kcal/mol**	**-10.51 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
319	316	GGCCGTCCCAATAGTGTTA	37	**-0.70** kcal/mol	**37.64** %	**3.1**	**-8.51 kcal/mol**	**-11.54 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
320	581	AGGAACAGGCTTTGGTCAA	47	**-1.62** kcal/mol	**70.54** %	**2.43**	**-9.63 kcal/mol**	**-16.16 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
321	121	CAACAGGCAAGGACAAACT	47	**-0.28** kcal/mol	**63.85** %	**1.16**	**-10.12 kcal/mol**	**-12.90 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
322	352	GGTAAGATATGGATGGATG	42	**-0.05** kcal/mol	**91.96** %	**0.38**	**-9.22 kcal/mol**	**-12.68 kcal/mol**	siDesign	Cotton Leaf Curl Virus	TAV protein
323	200	GGTTGACGTGGCTGATGATCT	52.38	**-1.14** kcal/mol	**18.42** %	**5.08**	**-7.95 kcal/mol**	**-16.69 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein
324	201	GTTGACGTGGCTGATGATCTT	47.62	**-0.80** kcal/mol	**31.91** %	**2.59**	**-8.29 kcal/mol**	**-16.69 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein

325	207	GTGGCTGATGATCTTGAAATA	38.1	**-0.05** kcal/mol	**91.68** %	**0.31**	**-10.31 kcal/mol**	**-12.90 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein
326	209	GGCTGATGATCTTGAAATAAA	33.33	**-0.04** kcal/mol	**94.43** %	**0.20**	**-10.22 kcal/mol**	**-12.80 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein
327	313	GTGGCAGTTGATTGACAGATA	42.86	**-0.70** kcal/mol	**32.02** %	**3.34**	**-6.02 kcal/mol**	**-10.17 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein
328	315	GGCAGTTGATTGACAGATAAT	38.1	**-0.40** kcal/mol	**52.47** %	**2.39**	**-5.58 kcal/mol**	**-9.22 kcal/mol**	siRNA_wizard	Cotton Leaf Curl Virus	TAV protein
329	207	GGCUGAUGAUCUUGAAAUA	37	**-0.03** kcal/mol	**95.57** %	**0.15**	**-10.23 kcal/mol**	**-12.80 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
330	341	CCCGCAUUCAAGAUCUACU	47	**-0.02** kcal/mol	**97.18** %	**0.1**	**-6.61 kcal/mol**	**-6.70 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
331	314	GCAGUUGAUUGACAGAUAA	37	**-0.38** kcal/mol	**54.10** %	**2.18**	**-5.59 kcal/mol**	**-9.22 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
332	313	GGCAGUUGAUUGACAGAUA	42	**-0.38** kcal/mol	**54.17** %	**2.15**	**-5.60 kcal/mol**	**-9.22 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
333	339	CACCCGCAUUCAAGAUCUA	47	**-0.01** kcal/mol	**98.93** %	**0.04**	**-6.90 kcal/mol**	**-11.17 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
334	204	CGUGGCUGAUGAUCUUGAA	47	**-0.64** kcal/mol	**57.22** %	**1.74**	**-9.01 kcal/mol**	**-12.20 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
335	156	GGAUCCUGAUCGUGAGUAU	47	**-0.34** kcal/mol	**57.30** %	**1.69**	**-7.45 kcal/mol**	**-12.14 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
336	412	CCUGAGUACAUGGGUCUAU	47	**-1.92** kcal/mol	**42.88** %	**3.38**	**-7.07 kcal/mol**	**-13.25 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
337	78	GCUGUAAGGUCGUCCAGAU	53	**-1.27** kcal/mol	**24.41** %	**3.77**	**-8.09 kcal/mol**	**-14.02 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
338	12	CACCGAGAUUGUUCAGAUA	42	**-0.31** kcal/mol	**60.55** %	**1.55**	**-7.03 kcal/mol**	**-11.60 kcal/mol**	whitehead	Cotton Leaf Curl Virus	TAV protein
339	4	GAATTGAACGCAGGCGCAA	52.64	**-0.81** kcal/mol	**51.02** %	**1.99**	**-10.37 kcal/mol**	**-11.50 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
340	77	GCAGGTCTCACAAGAAGAA	47.37	**-0.75** kcal/mol	**29.56** %	**3.2**	**-5.97 kcal/mol**	**-7.70 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
341	135	GCGTTCGAATCTCAGACTA	47.37	**-0.42** kcal/mol	**50.68** %	**2.52**	**-10.09 kcal/mol**	**-13.93 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
342	155	TCCGCTTCCTACCGTTCAA	52.64	**-0.11** kcal/mol	**83.48** %	**0.58**	**-11.26 kcal/mol**	**-18.20 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
343	156	CCGCTTCCTACCGTTCAAT	52.64	**-0.00** kcal/mol	**83.46** %	**0.58**	**-11.26 kcal/mol**	**-18.20 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
344	158	GCTTCCTACCGTTCAATCA	47.37	**-0.06** kcal/mol	**90.15** %	**0.33**	**-11.31 kcal/mol**	**-18.20 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
345	162	CCTACCGTTCAATCAGGTA	47.37	**-2.67** kcal/mol	**76.51** %	**0.81**	**-8.08 kcal/mol**	**-14.12 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
346	174	TCAGGTAGATGGTTCGGAA	47.37	**-0.47** kcal/mol	**46.35** %	**2.4**	**-6.68 kcal/mol**	**-12.87 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
347	222	GGTGGAATTGTCCGAGTCT	52.64	**-2.32** kcal/mol	**43.26** %	**1.53**	**-7.48 kcal/mol**	**-18.47 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
348	294	GGATTGGTTCGCTGGTAAT	47.37	**-0.48** kcal/mol	**46.25** %	**2.94**	**-8.43 kcal/mol**	**-9.90 kcal/mol**	Ambioin	Cucumber Mosaic Virus	2b protein
349	32	TCGAACTCCAACTGGCTCGTA	52.38	**-2.49** kcal/mol	**62.69** %	**2.1**	**-6.91 kcal/mol**	**-16.62 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
350	144	TCTCAGACTATTCCGCTTCCT	47.62	**-0.00** kcal/mol	**86.22** %	**0.47**	**-8.36 kcal/mol**	**-11.80 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
351	22	ATGACAAACGTCGAACTCCAA	42.86	**-2.56** kcal/mol	**76.64** %	**0.48**	**-5.86 kcal/mol**	**-9.58 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
352	160	TTCCTACCGTTCAATCAGGTA	42.86	**-2.67** kcal/mol	**76.47** %	**0.81**	**-8.08 kcal/mol**	**-14.12 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
353	253	TTCACGTTACCAGCGGAAGAA	47.62	**-3.18** kcal/mol	**39.08** %	**1.78**	**-5.15 kcal/mol**	**-21.30 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
354	179	TAGATGGTTCGGAACTGATAG	42.86	**-0.73** kcal/mol	**30.59** %	**3.36**	**-5.87 kcal/mol**	**-6.90 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
355	290	ACACGGATTGGTTCGCTGGTA	52.38	**-2.35** kcal/mol	**29.69** %	**4.28**	**-8.56 kcal/mol**	**-18.14 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
356	217	AGCGTGGTGGAATTGTCCGAG	57.14	**-2.30** kcal/mol	**44.27** %	**2.03**	**-8.06 kcal/mol**	**-20.88 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
357	150	ACTATTCCGCTTCCTACCGTT	47.62	**-0.11** kcal/mol	**83.08** %	**0.59**	**-11.21 kcal/mol**	**-16.16 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
358	169	TTCAATCAGGTAGATGGTTCG	42.86	**-2.22** kcal/mol	**59.29** %	**1.53**	**-4.55 kcal/mol**	**-10.61 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
359	30	AACGTCGAACTCCAACTGGCT	52.38	**-1.02** kcal/mol	**50.85** %	**2.6**	**-8.29 kcal/mol**	**-16.44 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
360	37	AACTCCAACTGGCTCGTATGG	52.38	**-1.31** kcal/mol	**37.03** %	**3.77**	**-7.28 kcal/mol**	**-13.13 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
361	144	AATCTCAGACTATTCCGCTTC	42.86	**-0.09** kcal/mol	**86.85** %	**0.46**	**-8.37 kcal/mol**	**-11.80 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
362	23	AATGACAAACGTCGAACTCCA	42.86	**-2.56** kcal/mol	**76.53** %	**0.49**	**-5.86 kcal/mol**	**-9.58 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
363	12	ATCGCAGGCGCAATGTCAAAC	52.38	**-0.78** kcal/mol	**54.33** %	**1.56**	**-8.00 kcal/mol**	**-14.55 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
364	174	AATCAGGTAGATGGTTCGGAA	42.86	**-2.07** kcal/mol	**55.25** %	**1.57**	**-5.09 kcal/mol**	**-12.87 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
365	7	AATTGAACGCAGGCGCAATGA	47.62	**-0.96** kcal/mol	**40.10** %	**3.29**	**-10.23 kcal/mol**	**-11.50 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
366	87	CAAGAAGAATCGACGGGAA	47	**-0.39** kcal/mol	**52.71** %	**1.46**	**-5.74 kcal/mol**	**-6.44 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
367	188	CGGAACTGATAGAGATGTA	42	**-0.33** kcal/mol	**58.96** %	**1.46**	**-5.41 kcal/mol**	**-6.30 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
368	266	CGGAAGAAGACCATGATTT	42	**-0.28** kcal/mol	**63.36** %	**1.11**	**-5.41 kcal/mol**	**-7.21 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
369	53	TGGTGGAGGTGAAGAGACA	53	**-0.45** kcal/mol	**48.54** %	**1.32**	**-8.03 kcal/mol**	**-14.15 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
370	293	CGGATTGGTTCGCTGGTAA	53	**-1.17** kcal/mol	**33.52** %	**3.89**	**-9.93 kcal/mol**	**-18.34 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
371	61	GTGAAGAGACAGAGACGCA	53	**-0.41** kcal/mol	**51.63** %	**1.9**	**-6.41 kcal/mol**	**-6.80 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
372	267	GGAAGAAGACCATGATTTT	37	**-0.32** kcal/mol	**59.03** %	**1.61**	**-5.44 kcal/mol**	**-7.21 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
373	23	TGACAAACGTCGAACTCCA	47	**-2.35** kcal/mol	**66.83** %	**0.60**	**-6.08 kcal/mol**	**-9.58 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
374	11	ACGCAGGCGCAATGACAAA	53	**-0.77** kcal/mol	**54.47** %	**1.55**	**-8.00 kcal/mol**	**-14.55 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
375	136	CGTTCGAATCTCAGACTAT	42	**-0.42** kcal/mol	**50.92** %	**2.47**	**-7.37 kcal/mol**	**-8.10 kcal/mol**	siDesign	Cucumber Mosaic Virus	2b protein
376	9	GAACGCAGGCGCAATGACAA	52.38	**-0.78** kcal/mol	**54.22** %	**1.56**	**-8.61 kcal/mol**	**-9.60 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
377	55	GTGGAGGTGAAGAGACAGAGA	52.38	**-0.46** kcal/mol	**47.03** %	**1.42**	**-5.69 kcal/mol**	**-7.35 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
378	74	GACGCAGGTCTCACAAGAAGA	52.38	**-2.14** kcal/mol	**80.15** %	**1.11**	**-4.58 kcal/mol**	**-7.70 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
379	133	GCGCGTTCGAATCTCAGACTA	52.38	**-0.46** kcal/mol	**47.77** %	**2.58**	**-10.05 kcal/mol**	**-13.93 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
380	135	GCGTTCGAATCTCAGACTATT	42.86	**-0.43** kcal/mol	**50.12** %	**2.56**	**-10.08 kcal/mol**	**-13.93 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
381	189	GGAACTGATAGAGATGTACCA	42.86	**-1.22** kcal/mol	**70.26** %	**1.92**	**-5.57 kcal/mol**	**-12.30 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
382	222	GGTGGAATTGTCCGAGTCTGA	52.38	**-2.35** kcal/mol	**40.69** %	**1.81**	**-7.44 kcal/mol**	**-18.47 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	2b protein
383	75	GCAGGUCUCACAAGAAGAA	47	**-0.75** kcal/mol	**29.56** %	**3.2**	**-5.97 kcal/mol**	**-7.70 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
384	154	CCGCUUCCUACCGUUCAAU	53	**-0.00** kcal/mol	**83.46** %	**0.58**	**-11.26 kcal/mol**	**-18.20 kcal/mol**	Genscript	Cucumber Mosaic Virus	2b protein
385	12	CAGGCGCAAUGACAAACGU	53	**-0.33** kcal/mol	**58.41** %	**1.69**	**-5.91 kcal/mol**	**-6.30 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
386	253	CACGUUACCAGCGGAAGAA	53	**-1.76** kcal/mol	**29.21** %	**1.65**	**-6.56 kcal/mol**	**-21.30 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
387	261	CAGCGGAAGAAGACCAUGA	53	**-0.72** kcal/mol	**50.92** %	**1.92**	**-6.76 kcal/mol**	**-11.20 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
388	132	CGCGUUCGAAUCUCAGACU	53	**-0.49** kcal/mol	**45.46** %	**2.66**	**-10.03 kcal/mol**	**-13.93 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
389	186	CGGAACUGAUAGAGAUGU	42	**-0.30** kcal/mol	**61.76** %	**1.28**	**-5.41 kcal/mol**	**-6.30 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
390	218	GUGGUGGAAUUGUCCGAGU	53	**-2.27** kcal/mol	**46.77** %	**1.37**	**-7.53 kcal/mol**	**-18.47 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
391	53	GUGGAGGUGAAGAGACAG	53	**-0.46** kcal/mol	**47.21** %	**1.41**	**-5.70 kcal/mol**	**-7.35 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
392	133	GCGUUCGAAUCUCAGACUA	47	**-0.42** kcal/mol	**50.68** %	**2.52**	**-10.09 kcal/mol**	**-13.93 kcal/mol**	whitehead	Cucumber Mosaic Virus	2b protein
393	108	GCAGCAGCTTTCGCGACTT	57.9	**-2.20** kcal/mol	**61.92** %	**1.76**	**-8.63 kcal/mol**	**-17.26 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
394	111	GCAGCTTTCGCGACTTAAT	47.37	**-1.11** kcal/mol	**36.96** %	**2.04**	**-5.13 kcal/mol**	**-13.10 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
395	120	GCGACTTAATAAGACGTTA	36.85	**-1.73** kcal/mol	**50.09** %	**1.71**	**-4.68 kcal/mol**	**-11.88 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
396	139	GCAGCTGGTCGTCCAACTA	57.9	**-2.74** kcal/mol	**57.83** %	**1.21**	**-5.80 kcal/mol**	**-12.11 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
397	142	GCTGGTCGTCCAACTATTA	47.37	**-1.91** kcal/mol	**60.36** %	**1.71**	**-5.04 kcal/mol**	**-17.01 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
398	151	CCAACTATTAACCACCCAA	42.11	**-0.00** kcal/mol	**99.82** %	**0.01**	**-6.29 kcal/mol**	**-6.30 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
399	200	GGTACACGTTCACATCTAT	42.11	**-0.12** kcal/mol	**81.83** %	**0.61**	**-4.48 kcal/mol**	**-14.55 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
400	385	CCTGCCTCCTCGGACTTAT	57.9	**-1.08** kcal/mol	**33.05** %	**2.73**	**-5.95 kcal/mol**	**-8.50 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
401	447	GGTACTGGTTTATCAGTAT	36.85	**-5.45** kcal/mol	**41.24** %	**0.93**	**-5.02 kcal/mol**	**-18.01 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
402	521	GCGCTGATATAGGTGACAT	47.37	**-3.11** kcal/mol	**71.14** %	**0.63**	**-7.17 kcal/mol**	**-12.30 kcal/mol**	Ambioin	Cucumber Mosaic Virus	coat protein
403	368	TGACAGTCCGTAAAGTTCCTG	47.62	**-0.23** kcal/mol	**68.55** %	**1.46**	**-7.23 kcal/mol**	**-13.48 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
404	449	TACTGGTTTATCAGTATGCCG	42.86	**-4.00** kcal/mol	**37.68** %	**1.9**	**-5.93 kcal/mol**	**-19.39 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
405	117	TTCGCGACTTAATAAGACGTT	38.1	**-1.81** kcal/mol	**51.69** %	**1.59**	**-5.21 kcal/mol**	**-11.44 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
406	311	TTTCGCGCATTCAAATTCGAG	42.86	**-0.38** kcal/mol	**54.06** %	**2.50**	**-5.90 kcal/mol**	**-10.90 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
407	116	TTTCGCGACTTAATAAGACGT	38.1	**-1.37** kcal/mol	**39.55** %	**2.15**	**-5.65 kcal/mol**	**-11.44 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
408	499	TTGTATGATCTTTCGGCGATG	42.86	**-1.76** kcal/mol	**24.63** %	**2.60**	**-7.39 kcal/mol**	**-13.00 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
409	457	TATCAGTATGCCGCATCTGGA	47.62	**-2.89** kcal/mol	**62.94** %	**2.08**	**-7.42 kcal/mol**	**-18.26 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
410	272	TACTACCTGATTCAGTCACGG	47.62	**-2.02** kcal/mol	**70.09** %	**1.53**	**-6.81 kcal/mol**	**-10.40 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
411	418	TCTGCTATGTTCGCGGACGGA	57.14	**-4.43** kcal/mol	**80.68** %	**0.83**	**-7.83 kcal/mol**	**-22.27 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
412	313	TCGCGCATTCAAATTCGAGTT	42.86	**-1.01** kcal/mol	**60.80** %	**2.2**	**-7.05 kcal/mol**	**-9.01 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
413	484	AAGCCAACAACAAACTGTTGT	38.1	**-4.10** kcal/mol	**32.16** %	**4.69**	**-3.70 kcal/mol**	**-4.10 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
414	132	AAGACGTTAGCAGCTGGTCGT	52.38	**-2.22** kcal/mol	**43.17** %	**5.10**	**-8.88 kcal/mol**	**-15.51 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
415	266	AAGGTTGCTACTACCTGATTC	42.86	**-2.96** kcal/mol	**76.56** %	**0.58**	**-7.01 kcal/mol**	**-10.31 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
416	20	AACCAGAGCGCGTTGTAACCG	57.14	**-0.34** kcal/mol	**57.66** %	**2.12**	**-12.34 kcal/mol**	**-18.90 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
417	16	AATCAACCAGAGCGCGTTGTA	47.62	**-2.06** kcal/mol	**91.15** %	**0.53**	**-10.62 kcal/mol**	**-18.90 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
418	570	AAAGACGATGCGCTCGAGACG	57.14	**-1.17** kcal/mol	**64.32** %	**2.12**	**-11.03 kcal/mol**	**-18.90 kcal/mol**	Genscript	Cucumber Mosaic Virus	coat protein
419	199	GGGTACACGTTCACATCTA	47	**-0.31** kcal/mol	**60.10** %	**1.94**	**-6.06 kcal/mol**	**-16.35 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
420	525	TGATATAGGTGACATGAGA	37	**-0.02** kcal/mol	**96.20** %	**0.17**	**-6.81 kcal/mol**	**-8.51 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
421	290	CGGAATATGATAAGAAGCT	37	**-0.07** kcal/mol	**89.85** %	**0.33**	**-5.46 kcal/mol**	**-5.80 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
422	329	GAGTTAATCCTTTGCCGAA	42	**-0.32** kcal/mol	**59.23** %	**1.93**	**-6.45 kcal/mol**	**-13.97 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
423	352	GATTCTACCGTGTGGGTGA	53	**-3.71** kcal/mol	**60.05** %	**1.98**	**-6.43 kcal/mol**	**-13.62 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
424	440	CCTCACCGGTACTGGTTTA	53	**-2.50** kcal/mol	**44.17** %	**1.26**	**-11.12 kcal/mol**	**-20.00 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
425	109	CAGCAGCTTTCGCGACTTA	53	**-2.15** kcal/mol	**66.16** %	**1.23**	**-5.71 kcal/mol**	**-14.26 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
426	477	AGTCCAAGCCAACAACAAA	42	**-0.00** kcal/mol	**86.10** %	**0.49**	**-5.14 kcal/mol**	**-7.50 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
427	513	GGCGATGCGCGCTGATATA	58	**-3.97** kcal/mol	**76.40** %	**0.84**	**-7.80 kcal/mol**	**-18.51 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
428	587	CGGACGAGCTAGTACTTCA	53	**-0.77** kcal/mol	**28.58** %	**2.92**	**-9.91 kcal/mol**	**-12.50 kcal/mol**	siDesign	Cucumber Mosaic Virus	coat protein
429	108	GCAGCAGCTTTCGCGACTTAA	52.38	**-2.20** kcal/mol	**61.27** %	**1.77**	**-8.62 kcal/mol**	**-17.26 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
430	111	GCAGCTTTCGCGACTTAATAA	42.86	**-1.11** kcal/mol	**36.95** %	**2.04**	**-5.13 kcal/mol**	**-13.10 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
431	139	GCAGCTGGTCGTCCAACTATT	52.38	**-2.76** kcal/mol	**55.86** %	**1.33**	**-5.77 kcal/mol**	**-12.11 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
432	175	GTAGGGAGTGAACGCTGTAGA	52.38	**-1.00** kcal/mol	**52.36** %	**3.1**	**-11.14 kcal/mol**	**-18.15 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
433	194	GACCTGGGTACACGTTCACAT	52.38	**-1.66** kcal/mol	**55.96** %	**2.23**	**-8.75 kcal/mol**	**-10.41 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
434	199	GGGTACACGTTCACATCTATT	42.86	**-0.32** kcal/mol	**59.40** %	**1.98**	**-6.05 kcal/mol**	**-16.35 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein

435	315	GCGCATTCAAATTCGAGTTAA	38.1	**-0.98** kcal/mol	**63.47** %	**1.89**	**-7.58 kcal/mol**	**-9.51 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
436	475	GGAGTCCAAGCCAACAACAAA	47.62	**-0.65** kcal/mol	**48.55** %	**1.63**	**-7.42 kcal/mol**	**-11.41 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
437	521	GCGCTGATATAGGTGACATGA	47.62	**-3.11** kcal/mol	**71.10** %	**0.64**	**-7.17 kcal/mol**	**-12.30 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
438	523	GCTGATATAGGTGACATGAGA	42.86	**-0.83** kcal/mol	**49.99** %	**2.43**	**-9.25 kcal/mol**	**-12.10 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
439	588	GGACGAGCTAGTACTTCATGT	47.62	**-0.81** kcal/mol	**26.74** %	**3.12**	**-9.91 kcal/mol**	**-15.81 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
440	589	GACGAGCTAGTACTTCATGTT	42.86	**-0.65** kcal/mol	**34.67** %	**3.18**	**-10.29 kcal/mol**	**-14.50 kcal/mol**	siRNA_wizard	Cucumber Mosaic Virus	coat protein
441	407	GCCGCCAUCUCUGCUAUGU	58	**-0.20** kcal/mol	**72.22** %	**1.22**	**-6.60 kcal/mol**	**-7.10 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
442	361	GUGGGUGACAGUCCGUAAA	53	**-2.01** kcal/mol	**26.86** %	**2.34**	**-7.08 kcal/mol**	**-10.50 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
443	383	CCUGCCUCCUCGGACUUAU	58	**-1.08** kcal/mol	**33.05** %	**2.73**	**-5.95 kcal/mol**	**-8.50 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
444	363	GGGUGACAGUCCGUAAAGU	53	**-1.46** kcal/mol	**34.38** %	**2.17**	**-6.16 kcal/mol**	**-9.04 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
445	439	CUCACCGGUACUGGUUUAU	47	**-2.48** kcal/mol	**46.08** %	**0.91**	**-11.15 kcal/mol**	**-20.00 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
446	586	GGACGAGCUAGUACUUCAU	47	**-0.77** kcal/mol	**28.61** %	**2.95**	**-9.89 kcal/mol**	**-15.81 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
447	79	CGCGGAUGCUAACUUUAGA	47	**-0.58** kcal/mol	**39.33** %	**2.14**	**-8.48 kcal/mol**	**-10.41 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
448	519	GCGCUGAUAUAGGUGACAU	47	**-3.11** kcal/mol	**71.14** %	**0.63**	**-7.17 kcal/mol**	**-12.30 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
449	438	CCUCACCGGUACUGGUUUA	53	**-2.50** kcal/mol	**44.17** %	**1.26**	**-11.12 kcal/mol**	**-20.00 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
450	118	GCGACUUAAUAAGACGUUA	37	**-1.73** kcal/mol	**50.09** %	**1.71**	**-4.68 kcal/mol**	**-11.88 kcal/mol**	whitehead	Cucumber Mosaic Virus	coat protein
451	53	GGGCCGACCCAATAGAGTT	57.9	**-3.23** kcal/mol	**95.15** %	**0.27**	**-3.95 kcal/mol**	**-12.26 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
452	56	CCGACCCAATAGAGTTAAT	42.11	**-0.17** kcal/mol	**76.31** %	**1.03**	**-3.71 kcal/mol**	**-5.10 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
453	121	GCTCGAACTGTCGTTCAAA	47.37	**-2.49** kcal/mol	**86.05** %	**1.49**	**-3.62 kcal/mol**	**-4.30 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
454	185	GGTTCCCTGACAGTGACTT	52.64	**-0.66** kcal/mol	**34.14** %	**3.88**	**-10.21 kcal/mol**	**-18.14 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
455	237	GCTAGTCACAGCACTGTTA	47.37	**-1.75** kcal/mol	**66.80** %	**2.63**	**-4.08 kcal/mol**	**-4.90 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
456	259	GCATTCGACACTAGAAATA	36.85	**-0.54** kcal/mol	**48.94** %	**1.55**	**-4.15 kcal/mol**	**-6.10 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
457	316	GCCGAAACGTTAGATGCTA	47.37	**-0.19** kcal/mol	**73.31** %	**1.14**	**-5.27 kcal/mol**	**-6.20 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
458	361	GCCATAAGGAGCGCGATAA	52.64	**-1.04** kcal/mol	**48.61** %	**2**	**-4.73 kcal/mol**	**-12.92 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
459	362	CCATAAGGAGCGCGATAAA	47.37	**-1.03** kcal/mol	**80.65** %	**0.63**	**-4.65 kcal/mol**	**-7.51 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
460	368	GGAGCGCGATAAATAATTT	36.85	**-0.04** kcal/mol	**93.43** %	**0.22**	**-5.65 kcal/mol**	**-7.51 kcal/mol**	Ambioin	Tobacco Mosaic Virus	coat protein
461	320	AAACGTTAGATGCTACTCGTA	38.1	**-1.23** kcal/mol	**42.50** %	**3.43**	**-4.57 kcal/mol**	**-6.20 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
462	31	TTCGTGTTCTTGTCATCAGCG	47.62	**-0.56** kcal/mol	**40.34** %	**3.18**	**-4.87 kcal/mol**	**-20.00 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
463	6	TTACAGTATCACTACTCCATC	38.1	**-0.93** kcal/mol	**49.55** %	**1.88**	**-3.69 kcal/mol**	**-5.60 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
464	420	TAATCGGAGCTCTTTCGAGAG	47.62	**-3.52** kcal/mol	**43.17** %	**2.10**	**-5.06 kcal/mol**	**-19.19 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
465	339	TAGAGTAGACGACGCAACGGT	52.38	**-0.43** kcal/mol	**49.88** %	**1.6**	**-7.25 kcal/mol**	**-9.00 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
466	251	TGTTAGGTGCATTCGACACTA	42.86	**-1.82** kcal/mol	**42.98** %	**3.95**	**-4.76 kcal/mol**	**-7.24 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
467	211	TACAGGTACAATGCGGTATTA	38.1	**-1.85** kcal/mol	**47.86** %	**2.06**	**-7.10 kcal/mol**	**-9.62 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
468	253	TTAGGTGCATTCGACACTAGA	42.86	**-2.21** kcal/mol	**26.76** %	**5.20**	**-4.27 kcal/mol**	**-7.41 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
469	408	AACCGGATCTTATAATCGGAG	42.86	**-2.88** kcal/mol	**28.16** %	**2.14**	**-4.21 kcal/mol**	**-8.30 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
470	145	TTCAGTGAGGTGTGGAAACCT	47.62	**-3.72** kcal/mol	**59.65** %	**0.71**	**-5.69 kcal/mol**	**-6.10 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
471	410	AACCGGATCTTATAATCGGAG	42.86	**-2.88** kcal/mol	**28.16** %	**2.14**	**-4.21 kcal/mol**	**-8.30 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
472	323	AACGTTAGATGCTACTCGTAG	42.86	**-1.28** kcal/mol	**39.21** %	**3.93**	**-4.53 kcal/mol**	**-6.20 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
473	118	AACAAGCTCGAACTGTCGTTC	47.62	**-1.88** kcal/mol	**63.82** %	**3.28**	**-4.22 kcal/mol**	**-5.10 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
474	423	AATCGGAGCTCTTTCGAGAGC	52.38	**-5.25** kcal/mol	**78.66** %	**1.4**	**-7.21 kcal/mol**	**-23.07 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
475	322	AAACGTTAGATGCTACTCGTA	38.1	**-1.23** kcal/mol	**42.50** %	**3.43**	**-4.57 kcal/mol**	**-6.20 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
476	162	AAACCTTCACCACAAGTAACT	38.1	**-0.00** kcal/mol	**86.10** %	**0.66**	**-4.75 kcal/mol**	**-5.00 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
477	362	CCATAAGGAGCGCGATAAA	47	**-1.03** kcal/mol	**80.65** %	**0.63**	**-4.65 kcal/mol**	**-7.51 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
478	360	GGCCATAAGGAGCGCGATA	58	**-1.18** kcal/mol	**38.95** %	**2.39**	**-8.58 kcal/mol**	**-16.92 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
479	200	ACTTTAAGGTGTACAGGTA	37	**-0.44** kcal/mol	**48.92** %	**2.54**	**-5.93 kcal/mol**	**-11.63 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
480	259	GCATTCGACACTAGAAATA	37	**-0.54** kcal/mol	**48.94** %	**1.55**	**-4.15 kcal/mol**	**-6.10 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
481	364	ATAAGGAGCGCGATAAATA	37	**-0.00** kcal/mol	**99.78** %	**0.01**	**-5.68 kcal/mol**	**-7.51 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
482	391	GTAGAATTGATCAGAGGAA	37	**-0.00** kcal/mol	**80.75** %	**0.69**	**-6.37 kcal/mol**	**-17.81 kcal/mol**	Genscript	Tobacco Mosaic Virus	coat protein
483	257	GTGCATTCGACACTAGAAA	42	**-0.78** kcal/mol	**33.00** %	**2.79**	**-4.00 kcal/mol**	**-6.10 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
484	415	TCTTATAATCGGAGCTCTT	37	**-0.32** kcal/mol	**59.89** %	**1.81**	**-6.26 kcal/mol**	**-7.80 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
485	54	GGCCGACCCAATAGAGTTA	53	**-0.43** kcal/mol	**49.40** %	**1.92**	**-6.24 kcal/mol**	**-11.76 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
486	194	ACAGTGACTTTAAGGTGTA	37	**-0.46** kcal/mol	**47.27** %	**2.39**	**-7.73 kcal/mol**	**-8.30 kcal/mol**	siDesign	Tobacco Mosaic Virus	coat protein
487	54	GGCCGTCCCAATAGTGTTAAT	47.62	**-0.44** kcal/mol	**49.14** %	**1.93**	**-6.24 kcal/mol**	**-11.76 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
488	55	GCCGACCCAATAGAGTTAATT	42.86	**-0.18** kcal/mol	**75.13** %	**1.08**	**-3.70 kcal/mol**	**-5.10 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
489	158	GGAAACCTTCACCACAAGTAA	42.86	**-0.47** kcal/mol	**46.85** %	**2.3**	**-4.79 kcal/mol**	**-5.00 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
490	185	GGTTCCCTGACAGTGACTTTA	47.62	**-0.67** kcal/mol	**33.81** %	**3.92**	**-10.60 kcal/mol**	**-16.50 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
491	186	GTTCCCTGACAGTGACTTTAA	42.86	**-0.23** kcal/mol	**68.74** %	**1.68**	**-10.14 kcal/mol**	**-17.64 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
492	257	GTGCATTCGACACTAGAAATA	38.1	**-0.79** kcal/mol	**32.44** %	**2.85**	**-3.99 kcal/mol**	**-6.10 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
493	259	GCATTCGACACTAGAAATAGA	38.1	**-0.96** kcal/mol	**47.04** %	**2.74**	**-3.74 kcal/mol**	**-6.10 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
494	316	GCCGAAACGTTAGATGCTACT	47.62	**-0.24** kcal/mol	**67.28** %	**1.44**	**-5.24 kcal/mol**	**-6.20 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
495	360	GGCCATAAGGAGCGCGATAAA	52.38	**-1.18** kcal/mol	**38.94** %	**2.39**	**-8.58 kcal/mol**	**-16.92 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
496	361	GCCATAAGGAGCGCGATAAAT	47.62	**-1.04** kcal/mol	**48.60** %	**2.01**	**-4.73 kcal/mol**	**-12.92 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	coat protein
497	53	GCCGACCCAAUAGAGUUAA	47	**-0.17** kcal/mol	**75.91** %	**1.04**	**-3.70 kcal/mol**	**-5.10 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
498	54	CCGACCCAAUAGAGUUAAU	42	**-0.17** kcal/mol	**76.31** %	**1.03**	**-3.71 kcal/mol**	**-5.10 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
499	52	GGCCGACCCAAUAGAGUUA	53	**-0.43** kcal/mol	**49.40** %	**1.92**	**-6.24 kcal/mol**	**-11.76 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
500	211	CAGGUACAAUGCGGUAUUA	42	**-1.82** kcal/mol	**50.78** %	**1.23**	**-7.34 kcal/mol**	**-9.82 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
501	359	GCCAUAAGGAGCGCGAUAA	53	**-1.04** kcal/mol	**48.61** %	**2**	**-4.73 kcal/mol**	**-12.92 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
502	255	GUGCAUUCGACACUAGAAA	42	**-0.78** kcal/mol	**33.00** %	**2.79**	**-4.00 kcal/mol**	**-6.10 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
503	257	GCAUUCGACACUAGAAAUA	37	**-0.54** kcal/mol	**48.94** %	**1.55**	**-4.15 kcal/mol**	**-6.10 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
504	457	GACCUCUGGUCCUGCAACU	58	**-2.94** kcal/mol	**94.31** %	**0.22**	**-6.14 kcal/mol**	**-17.81 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
505	128	GUCGUUCAAAGACAAUUCA	37	**-2.04** kcal/mol	**93.54** %	**0.45**	**-4.18 kcal/mol**	**-6.40 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
506	154	GUGGAAACCUUCACCACAA	47	**-3.56** kcal/mol	**76.70** %	**2.88**	**-2.97 kcal/mol**	**-4.40 kcal/mol**	whitehead	Tobacco Mosaic Virus	coat protein
507	66	GATCTTACCGTCGATGTTT	42.11	**-0.59** kcal/mol	**38.63** %	**2.54**	**-8.30 kcal/mol**	**-12.01 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
508	187	GATAGTGGATACGTCTGTT	42.11	**-2.71** kcal/mol	**51.04** %	**1.31**	**-3.79 kcal/mol**	**-9.33 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
509	307	GCCACTCTCGGATCTTACT	52.64	**-0.97** kcal/mol	**76.21** %	**0.77**	**-5.88 kcal/mol**	**-19.53 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
510	316	GGATCTTACTACACAGCAG	47.37	**-0.29** kcal/mol	**82.00** %	**0.62**	**-6.15 kcal/mol**	**-9.40 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
511	448	GCGGGTTTCTGTCCGCTTT	57.9	**-6.36** kcal/mol	**47.18** %	**0.80**	**-4.04 kcal/mol**	**-6.60 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
512	459	TCCGCTTTCTCTGGAGTTT	47.37	**-2.11** kcal/mol	**37.10** %	**4.2**	**-8.21 kcal/mol**	**-20.62 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
513	555	GCCCATGGAACTTACAGAA	47.37	**-0.32** kcal/mol	**59.90** %	**1.31**	**-6.45 kcal/mol**	**-9.03 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
514	595	GAAGATGTCCCTATGTCAA	42.11	**-0.88** kcal/mol	**45.97** %	**2.54**	**-6.67 kcal/mol**	**-10.67 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
515	603	CCCTATGTCAATCAGGCTT	47.37	**-1.54** kcal/mol	**41.36** %	**3.75**	**-9.60 kcal/mol**	**-16.05 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
516	618	GCTTGCAAAGTTTCGATCT	42.11	**-0.48** kcal/mol	**46.07** %	**2.16**	**-6.06 kcal/mol**	**-8.29 kcal/mol**	Ambioin	Tobacco Mosaic Virus	Movement Protein
517	372	TTATGCTATAACCAGCCAGGA	42.86	**-1.71** kcal/mol	**60.08** %	**2.11**	**-5.38 kcal/mol**	**-9.97 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
518	475	TTTGTGTCGGTGTGTATTGTT	38.1	**-0.21** kcal/mol	**71.01** %	**1.65**	**-6.56 kcal/mol**	**-8.70 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
519	620	TTGCAAAGTTTCGATCTCGAA	38.1	**-1.66** kcal/mol	**56.19** %	**1.1**	**-5.78 kcal/mol**	**-7.49 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
520	523	AGAGAGAAGATTACAAACGTG	38.1	**-0.13** kcal/mol	**80.64** %	**0.83**	**-2.94 kcal/mol**	**-8.27 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
521	465	TTCTCTGGAGTTTGTGTCGGT	47.62	**-1.23** kcal/mol	**69.02** %	**1.67**	**-11.18 kcal/mol**	**-14.47 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
522	148	TTGTCAGAGGTGAACCTTCTT	42.86	**-3.41** kcal/mol	**31.82** %	**4.5**	**-7.41 kcal/mol**	**-15.42 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
523	314	TCGGATCTTACTACACAGCAG	47.62	**-0.10** kcal/mol	**84.77** %	**0.55**	**-6.27 kcal/mol**	**-9.50 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
524	614	TCAGGCTTGCAAAGTTTCGAT	42.86	**-1.95** kcal/mol	**21.48** %	**2.52**	**-5.53 kcal/mol**	**-13.42 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
525	675	TAGTAGTAGTGATCGGTCAGT	42.86	**-0.53** kcal/mol	**42.33** %	**1.87**	**-12.05 kcal/mol**	**-19.51 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
526	139	AATGAGTCATTGTCAGAGGTG	42.86	**-0.80** kcal/mol	**37.74** %	**3.4**	**-7.97 kcal/mol**	**-15.03 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
527	96	AAGAGTGTCATGTGTTCCAAA	38.1	**-0.13** kcal/mol	**81.02** %	**0.93**	**-5.64 kcal/mol**	**-8.56 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
528	287	AAGGATGGAAAGAGCCGACGA	52.38	**-1.36** kcal/mol	**65.74** %	**1.16**	**-7.39 kcal/mol**	**-11.40 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
529	565	AACTTACAGAAGAAGTCGTTG	38.1	**-0.79** kcal/mol	**38.21** %	**3.26**	**-5.59 kcal/mol**	**-11.87 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
530	36	AATGAGTTTATCGACCTGACA	38.1	**-0.68** kcal/mol	**33.22** %	**2.98**	**-7.74 kcal/mol**	**-10.73 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
531	141	AATGAGTCATTGTCAGAGGTG	42.86	**-0.80** kcal/mol	**37.74** %	**3.40**	**-7.97 kcal/mol**	**-15.03 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
532	286	AAAGGATGGAAAGAGCCGACG	52.38	**-1.36** kcal/mol	**65.89** %	**1.15**	**-7.38 kcal/mol**	**-11.40 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
533	614	AATCAGGCTTGCAAAGTTTCG	42.86	**-1.63** kcal/mol	**30.71** %	**1.97**	**-6.25 kcal/mol**	**-13.82 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
534	650	AAAGAGTGATGTCCGTAAAGG	42.86	**-0.80** kcal/mol	**27.10** %	**1.81**	**-6.21 kcal/mol**	**-7.51 kcal/mol**	Genscript	Tobacco Mosaic Virus	Movement Protein
535	569	CAGAAGAAGTCGTTGATGA	42	**-0.38** kcal/mol	**54.33** %	**2.39**	**-8.94 kcal/mol**	**-15.56 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
536	517	GGTTTGAGAGAGAAGATTA	37	**-0.72** kcal/mol	**36.52** %	**2.75**	**-4.03 kcal/mol**	**-13.11 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
537	143	AGTCATTGTCAGAGGTGAA	42	**-2.64** kcal/mol	**79.69** %	**1.06**	**-5.53 kcal/mol**	**-8.92 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
538	689	GGTCAGTGCCGAACAAGAA	53	**-1.76** kcal/mol	**65.85** %	**2.01**	**-5.58 kcal/mol**	**-14.28 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
539	558	CATGGAACTTACAGAAGAA	37	**-0.40** kcal/mol	**52.02** %	**1.9**	**-6.36 kcal/mol**	**-9.03 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
540	180	GCTTATTGATAGTGGATAC	37	**-0.49** kcal/mol	**44.97** %	**2.54**	**-7.08 kcal/mol**	**-12.40 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
541	654	TGATGTCCGTAAAGGGAAA	42	**-3.37** kcal/mol	**88.62** %	**0.76**	**-3.34 kcal/mol**	**-9.60 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
542	694	GTGCCGAACAAGAACTATA	42	**-0.17** kcal/mol.	**76.15** %	**0.81**	**-5.80 kcal/mol**	**-12.67 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
543	557	CCATGGAACTTACAGAAGA	42	**-0.38** kcal/mol	**53.88** %	**1.81**	**-6.38 kcal/mol**	**-9.03 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein
544	279	GGACAAAAGGATGGAAAGA	42	**-0.05** kcal/mol	**91.65** %	**0.28**	**-6.33 kcal/mol**	**-9.87 kcal/mol**	siDesign	Tobacco Mosaic Virus	Movement Protein

545	180	GCTTATTGATAGTGGATACGT	38.1	**-0.73** kcal/mol	**30.41** %	**4.12**	**-6.95 kcal/mol**	**-12.40 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
546	306	GGCCACACTCGGATCATACTA	52.38	**-1.16** kcal/mol	**55.44** %	**1.48**	**-7.52 kcal/mol**	**-16.82 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
547	361	GTCGTTCCCAATTATGCTATA	38.1	**-0.34** kcal/mol	**57.26** %	**1.79**	**-6.78 kcal/mol**	**-9.90 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
548	528	GAAGATTACAAACGTGAGAGA	38.1	**-1.17** kcal/mol	**76.47** %	**1.3**	**-3.90 kcal/mol**	**-14.98 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
549	594	GGAAGATGTCCCTATGTCAAT	42.86	**-1.33** kcal/mol	**35.84** %	**4.1**	**-8.98 kcal/mol**	**-13.59 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
550	609	GTCAATCAGGCTTGCAAAGTT	42.86	**-1.19** kcal/mol	**27.76** %	**4**	**-6.96 kcal/mol**	**-14.60 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
551	689	GGTCAGTGCCGAACAAGAACT	52.38	**-1.79** kcal/mol	**62.69** %	**2.43**	**-5.55 kcal/mol**	**-14.28 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
552	694	GTGCCGAACAAGAACTATAGA	42.86	**-0.17** kcal/mol	**76.13** %	**0.81**	**-5.80 kcal/mol**	**-12.67 kcal/mol**	siRNA_wizard	Tobacco Mosaic Virus	Movement Protein
553	478	GUCGGUGUGUAUUGUUUAU	37	**-0.22** kcal/mol	**69.51** %	**1.71**	**-7.02 kcal/mol**	**-9.40 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
554	692	GUGCCGAACAAGAACUAUA	42	**-0.17** kcal/mol	**76.15** %	**0.81**	**-5.80 kcal/mol**	**-12.67 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
555	553	GCCCAUGGAACUUACAGAA	47	**-0.32** kcal/mol	**59.90** %	**1.31**	**-6.45 kcal/mol**	**-9.03 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
556	552	GGCCCAUGGAACUUACAGA	53	**-0.33** kcal/mol	**58.28** %	**1.4**	**-6.43 kcal/mol**	**-9.03 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
557	548	GGAGGGCCCAUGGAACUUA	58	**-3.47** kcal/mol	**75.75** %	**0.62**	**-6.31 kcal/mol**	**-13.87 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
558	448	GGGUUUCUGUCCGCUUUCU	53	**-1.55** kcal/mol	**29.75** %	**2.99**	**-8.21 kcal/mol**	**-12.20 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
559	355	CAAGGUCGUUCCCAAUUAU	42	**-1.03** kcal/mol	**58.58** %	**1.69**	**-7.56 kcal/mol**	**-11.62 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
560	782	GUCGCCGAAUCGGAUUCGU	58	**-2.45** kcal/mol	**29.39** %	**4.56**	**-8.36 kcal/mol**	**-17.52 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
561	150	CAGAGGUGAACCUUCUUAA	42	**-3.40** kcal/mol	**32.25** %	**4.41**	**-6.45 kcal/mol**	**-12.91 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein
562	1	GGCUCUAGUUGUUAAAGGA	42	**-0.47** kcal/mol	**46.76** %	**2.42**	**-8.80 kcal/mol**	**-11.42 kcal/mol**	whitehead	Tobacco Mosaic Virus	Movement Protein