wheat, corn, sorghum, oat, millet, legume, cabbage, cauliflower, broccoli, Brassica sp., beans, pea, pigeon-pea, potato, pepper, cucurbit, lettuce, sweet potato canola, soybean, alfalfa, peanuts, and sunflower. It is one feature of the present disclosure that codon optimized synthetic Bt *cry2Ai* genes are constructed using the most preferred eggplant, rice and legumes codons.

[0015] According to the present disclosure, the inventors have synthesized Bt insecticidal *Cry2Ai* crystal protein genes in which the codon usage has been altered in order to increase expression in plants, particularly in eggplant, rice, and legumes. However, rather than alter the codon usage to resemble a eggplant, rice or legumes gene in terms of overall codon distribution, the inventors have optimized the codon usage by using the codons which are most preferred in plants such as rice, eggplant, tomato, maize and legumes in the synthesis of the nucleotide sequences of the disclosure. The optimized plant preferred codon usage is effective for expression of high level of the Bt insecticidal protein in dicot plants such as eggplant and tomato; in monocots such as rice and in legumes such as chickpea and pigeon pea.

[0016] The codon optimized synthetic nucleotide sequences of the present disclosure have been derived from the *Bacillus thuringiensis* Cry2Ai protein having amino acid sequence as set forth in SEQ ID NO: 1 (NCBI GenBank: ACV97158.1). The protein having amino acid sequence as set forth in SEQ ID NO: 1 is active against various lepidopteran insects, including *Helicoverpa armigera* -the cotton bollworm and corn earworm, *Cnaphalocrocis medinalis* -the rice leaffolder, and *Scirpophaga incertulas* -the rice yellow stem borer and *Pectinophora gossypiella*.

[0017] While the present disclosure has been exemplified by the synthesis of eggplant, rice and legumes optimized Bt *cry2Ai* nucleotides for expression in rice, eggplant, and chickpea respectively, it is recognized that the eggplant optimized Bt *cry2Ai* nucleotides can be utilized to optimize expression of the protein in other plants such as tomato, maize and cotton as well. Further, it is recognized that the rice optimized Bt *cry2Ai* nucleotides can be utilized to optimize expression of the protein in other plants as well. Similarly it is recognized that the legume optimized Bt *cry2Ai* nucleotides can be utilized to optimize expression of the protein in other plants as well.

[0018] Accordingly, one of the aspects of the present disclosure is to provide a codon optimized synthetic nucleotide molecule encoding protein having the amino acid sequence as set forth in SEQ ID NO: 1, wherein said nucleotide molecule has a sequence as set forth in SEQ ID NO: 2.

[0019] Another aspect of the present disclosure is to provide a recombinant DNA comprising the codon optimized synthetic nucleotide molecule as disclosed herein, wherein the nucleotide molecule is operably linked to a heterologous regulatory element.

[0020] Another aspect of the present disclosure is to provide a DNA construct for expression of an insecticidal protein of interest comprising a 5' non-translated sequence, a coding sequence encoding an insecticidal Cry2Ai protein comprising the amino acid sequence of SEQ ID NO: 1, and a 3' non-translated region, wherein said 5' non-translated sequence comprises a promoter functional in a plant cell, said coding sequence is a codon optimized synthetic nucleotide molecule as disclosed herein, and wherein said 3' non-translated sequence comprises a transcription termination sequence and a polyadenylation signal.

[0021] Another aspect of the present disclosure is to provide a plasmid vector comprising the recombinant DNA disclosed herein, or the DNA construct as disclosed herein.

[0022] Another aspect of the present disclosure is to provide a host cell comprising the codon optimized synthetic nucleotide molecule as disclosed herein.

[0023] Another aspect of the present disclosure is to provide a method for conferring an insect resistance in a plant comprising

(a) inserting into a plant cell a codon optimized synthetic nucleotide molecule as disclosed herein, wherein the nucleotide molecule is operably linked to a (i) promoter functional in a plant cell and (ii) a terminator;

(b) obtaining a transformed plant cell from the plant cell of step (a), wherein said transformed plant cell comprises the said codon optimized synthetic nucleotide molecule as disclosed herein; and

(c) generating a transgenic plant from said transformed plant cell of step (b), wherein said transgenic plant comprises the said codon optimized synthetic nucleotide molecule as disclosed herein.

[0024] Another aspect of the present disclosure is to provide a transgenic plant comprising the codon optimized synthetic nucleotide molecule as disclosed herein.

[0025] Another aspect of the present disclosure is to provide a composition comprising *Bacillus thuringiensis* comprising the codon optimized synthetic nucleotide molecule as disclosed herein encoding Cry2Ai protein having amino acid sequence as set forth in SEQ ID NO: 1.

[0026] Another aspect of the present disclosure is to provide a method of controlling insect infestation in a crop plant and providing insect resistance management, wherein said method comprising contacting said crop plant with an insecticidally effective amount of the composition as disclosed herein.

[0027] Yet another aspect of the present disclosure is use of the codon optimized synthetic nucleotide molecule, the DNA construct or the plasmid as disclosed herein for production of insect resistant transgenic plants.

[0028] Yet another aspect of the present disclosure is use of the codon optimized synthetic nucleotide molecule as disclosed herein for production of insecticidal composition, wherein

I/We Claim:

1. A codon optimized synthetic nucleotide molecule encoding protein having amino acid sequence as set forth in SEQ ID NO: 1, wherein said nucleotide molecule has a sequence as set forth in SEQ ID NO: 2.
2. A recombinant DNA comprising the codon optimized synthetic nucleotide molecule as claimed in claim 1, wherein the nucleotide molecule is operably linked to a heterologous regulatory element.
3. The recombinant DNA as claimed in claim 2, wherein said codon optimized synthetic nucleotide sequence optionally comprises a selectable marker gene, a reporter gene or a combination thereof.
4. The recombinant DNA as claimed in claim 2, wherein said codon optimized synthetic nucleotide sequence optionally comprises a DNA sequence encoding a targeting or transit peptide for targeting to the vacuole, mitochondrium, chloroplast, plastid, or for secretion.
5. A DNA construct for expression of an insecticidal protein of interest comprising a 5' non-translated sequence, a coding sequence encoding an insecticidal Cry2Ai protein comprising the amino acid sequence of SEQ ID NO: 1, and a 3' non-translated region, wherein said 5' non-translated sequence comprises a promoter functional in a plant cell, said coding sequence is a codon optimized synthetic nucleotide molecule as claimed in claim 1, and wherein said 3' non-translated sequence comprises a transcription termination sequence and a polyadenylation signal.
6. A plasmid vector comprising the recombinant DNA as claimed in claim 3, or the DNA construct as claimed in claim 5.
7. A host cell comprising the codon optimized synthetic nucleotide molecule as claimed in claim 1.
8. The host cell as claimed in claim 7, wherein said host cell is a plant, bacterial, virus, fungi or a yeast cell.
9. The host cell as claimed in claim 8, wherein said bacterial cell is *Agrobacterium or E. coli.*
10. A method for conferring an insect resistance in a plant comprising:
    (a) inserting into a plant cell a codon optimized synthetic nucleotide molecule as claimed in claim 1, wherein the nucleotide molecule is operably linked to a (i) promoter functional in a plant cell and (ii) a terminator;
    (b) obtaining a transformed plant cell from the plant cell of step (a), wherein said transformed plant cell comprises the said codon optimized synthetic nucleotide molecule of claim 1; and
    (c) generating a transgenic plant from said transformed plant cell of step (b), wherein said transgenic plant comprises the said codon optimized synthetic nucleotide molecule of claim 1.

11. A transgenic plant comprising the codon optimized synthetic nucleotide molecule as claimed in claim 1.

12. The transgenic plant as claimed in claim 11, wherein said plant is selected from a group consisting of rice, wheat, corn, sorghum, oat, millet, legume, cotton, tomato, eggplant, cabbage, cauliflower, broccoli, Brassica sp., beans, pea, pigeonpea, potato, pepper, cucurbit, lettuce, sweet potato canola, soybean, alfalfa, peanuts, sunflower, safflower, tobacco, sugarcane , cassava , coffee, pineapple, citrus, cocoa, tea , banana and melon.

13. A tissue, seed or a progeny obtained from the transgenic plant as claimed in claim 11, wherein said seed or progeny comprises the codon optimized synthetic nucleotide molecule as claimed in claim 1.

14. A composition comprising *Bacillus thuringiensis* comprising the codon optimized synthetic nucleotide molecule as claimed in claim 1 encoding Cry2Ai protein having amino acid sequence as set forth in SEQ ID NO: 1.

15. The composition as claimed in claim 14, wherein said composition optionally comprises an additional insecticidal agent toxic to same insect pest but exhibiting a different mode of its insecticidal activity from said insecticidal protein.

16. The composition as claimed in claim 15, wherein said insecticidal agent is selected from the group consisting of a *Bacillus* toxin, a *Xenorhabdus* toxin, a *Photorhabdus* toxin, and a dsRNA specific for suppression of one or more essential genes in said insect pest.

17. A method of controlling insect infestation in a crop plant and providing insect resistance management, wherein said method comprises contacting said crop plant with a insecticidally effective amount of the composition as claimed in claim 14.

18. Use of the codon optimized synthetic nucleotide molecule as claimed in claim 1, the DNA construct as claimed in claim 5 or the plasmid as claimed in claim 6 for production of insect resistant transgenic plants.

19. Use of the codon optimized synthetic nucleotide molecule as claimed in claim 1 for production of insecticidal composition, wherein the composition comprises *Bacillus thuringiensis* cells comprising the said nucleotide sequences.