(54) Title: PRODUCTION AND USE OF SPECIALTY CANNABIS WITH BD/BT GENOTYPE AND A BETA CARYOPHYLLENE-DOMINANT TERPENE PROFILE

The invention provides specialty cannabis having a tetrahydrocannabinol (THC) content that is at least 3% and a cannabidiol (CBD) content that is at least 3%, a BT allele and a BD allele, a terpene profile in which beta caryophyllene is the dominant terpene, and a terpene oil content greater than 1%. Also provided are uses of the specialty cannabis and products developed from the specialty cannabis.


Published:

with international search report (Art. 21(3))


Title: BREEDING, PRODUCTION, PROCESSING AND USE OF SPECIALTY CANNABIS

FIG. 13

![Diagram of cannabis breeding process]

Abstract: The invention provides compositions and methods for the breeding, production, processing and use of specialty cannabis. The plants are characterized partially by a genotype and partially by certain contents or metabolites such as cannabidiol (CBD), myrcene, tetrahydrocannabiol (THC), cannabinol (CBC), cannabinol (CBDV), tetrahydrocannabinol (THCV), cannabigerol (CBG) and terpene oil.
What is claimed is:

1. A terpene producing, diploid cannabis plant cell from a female inflorescence of (i) a cannabis plant, (ii) an asexual clone of the plant, or (iii) a part of the plant, wherein said cannabis plant, asexual clone of the plant or part of the plant produces the female inflorescence, said inflorescence comprising:
   a) a tetrahydrocannabinol (THC) content that is at least 3% and a cannabidiol (CBD) content that is at least 3%;
   b) a B\text{7} allele and a B\text{D} allele;
   c) a terpene profile in which beta caryophyllene is the dominant terpene; and
   d) a terpene oil content greater than 1%;

wherein the terpene profile is defined as terpinolene, alpha phellandrene, beta ocimene, carene, limonene, gamma terpinene, alpha pinene, alpha terpinene, beta pinene, fenchol, camphene, alpha terpineol, alpha humulene, beta caryophyllene, linalool, caryophyllene oxide, and myrcene, and wherein the terpene oil content is the additive content of the terpenes in the terpene profile; wherein the THC, CBD, and terpene oil content are measured by gas chromatography-flame ionization detection (GC-FID) and calculated based on dry weight of the inflorescence, and wherein samples of seed that produce plants comprising a), b), c) and d) have been deposited under NCIMB Nos. 42248 and 42249.

2. The cannabis plant cell of claim 1, wherein the terpene oil content is greater than 1.5%.

3. The cannabis plant cell of any one of claims 1-2, wherein the female inflorescence comprises a maximum terpene oil content of 2.17%.

4. The cannabis plant cell of any one of claims 1-3, wherein the THC content is at least 4%.

5. The cannabis plant cell of any one of claims 1-4, wherein the THC content is at least 6%.

6. The cannabis plant cell of any one of claims 1-5, wherein the CBD content is at least 5%.

7. Use of a first cannabis plant, wherein the first cannabis plant comprises the plant cell of any one of claims 1-6, for crossing with a second cannabis plant to produce an F1 seed, wherein the F1 seed produces an F1 plant comprising a female F1 inflorescence, wherein said F1 inflorescence comprises: a B\text{7} allele and a B\text{D} allele, at least 3% THC content, at
least 3% CBD content, a beta caryophyllene dominant terpene profile, and a terpene oil content greater than 1%, wherein the terpene profile is defined as terpinolene, alpha phellandrene, beta ocimene, carene, limonene, gamma terpinene, alpha pinene, alpha terpinene, beta pinene, fenchol, camphene, alpha terpeneol, alpha humulene, beta caryophyllene, linalool, caryophyllene oxide, and myrcene, and wherein the terpene oil content is the additive content of the terpenes in the terpene profile; wherein the THC, CBD, and terpene oil content are measured by gas chromatography-flame ionization detection (GC-FID) and calculated based on dry weight of the F1 inflorescence.

8. The use of claim 7, wherein said F1 inflorescence comprises a maximum terpene oil content of 2.17%.

9. Use of a cannabis seed, cutting or plant cell from a first cannabis plant or an asexual clone thereof, said first cannabis plant comprising the plant cell according to any one of claims 1-6, to produce a second cannabis plant, wherein the second cannabis plant produces a new female inflorescence, said new inflorescence comprising: a B_T allele and a B_D allele, at least 3% THC content, at least 3% CBD content, a beta caryophyllene dominant terpene profile, and a terpene oil content greater than 1%, wherein the terpene profile is defined as terpinolene, alpha phellandrene, beta ocimene, carene, limonene, gamma terpinene, alpha pinene, alpha terpinene, beta pinene, fenchol, camphene, alpha terpeneol, alpha humulene, beta caryophyllene, linalool, caryophyllene oxide, and myrcene, and wherein the terpene oil content is the additive content of the terpenes in the terpene profile; and wherein the THC, CBD, and terpene oil content are measured by gas chromatography-flame ionization detection (GC-FID) and calculated based on dry weight of the new inflorescence.

10. The use of claim 9, wherein said new inflorescence comprises a maximum terpene oil content of 2.17%.

11. A cannabis extract produced from the inflorescence of the cannabis plant of any one of claims 1-6, wherein the extract comprises the plant cell of any one of claims 1-6.

12. The cannabis extract of claim 11, wherein said extract is kief, hashish, or bubble hash.
13. A non-viable edible product comprising the cannabis plant or part thereof of any one of claims 1-6, wherein the plant or part thereof comprises the plant cell of any one of claims 1-6.

14. A non-viable edible product comprising the cannabis extract of any one of claims 11-12.

15. The cannabis plant cell of any one of claims 1-6, wherein the cannabis plant was generated from a seed deposited under NCIMB No. 42248.

16. The cannabis plant cell of any one of claims 1-6, wherein the cannabis plant was generated from a seed deposited under NCIMB No. 42249.

17. The cannabis plant cell of any one of claims 1-6, wherein the cannabis plant was generated from a seed deposited under any one of NCIMB Nos. 42248 and 42249.

18. A non-viable compressed cannabis pellet for smoking or vaporization, wherein the pellet comprises the cannabis plant cell of any one of claims 1-6 or 15-17.

19. A non-viable compressed cannabis pellet for smoking or vaporization, wherein the pellet comprises cannabis extract from any one of claims 11-12.

20. The non-viable compressed cannabis pellet of any one of claims 18-19, wherein the pellet is in the shape of a truncated cone.

21. The non-viable compressed cannabis pellet of claim 20, wherein said truncated cone has a height of 2.0 millimeters, a smaller base diameter of 4.0 millimeters, and a larger base diameter of 6.0 millimeters.

22. The non-viable compressed cannabis pellet of any one of claims 18-19, wherein the pellet is in the shape of a donut.

23. The non-viable compressed cannabis pellet of claim 22, wherein said donut has a height of 2.0 millimeters, an inner donut diameter of 1.5 millimeters, and an outer donut diameter of 6 millimeters.
24. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating Brachial Plexus Avulsion in a patient, wherein said patient experiences symptom relief due to said cannabis with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B7/B7 genotype.

25. The use of claim 24, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

26. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating seizures in a patient, wherein said patient experiences a reduced number of seizures due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B7/B7 genotype.

27. The use of claim 26, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

28. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating arthritis in a patient, wherein said patient experiences joint pain relief due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B7/B7 genotype.

29. The use of claim 28, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprise the plant cell of any one of claims 1-6 or 15-17.

30. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating motion sickness in a patient, wherein said patient experiences reduced motion sickness symptoms due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B7/B7 genotype.
31. The use of claim 30, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

32. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating neuropathic pain in a patient, wherein said patient experiences reduced pain symptoms due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_{1}/B_{1} genotype.

33. The use of claim 32, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

34. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for weight loss in a patient wishing to lose weight, wherein said patient experiences accelerated weight loss due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_{1}/B_{1} genotype.

35. The use of claim 34, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

36. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating depression in a patient, wherein said patient experiences reduced symptoms due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_{1}/B_{1} genotype.

37. The use of claim 36, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

38. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating irritable bowel syndrome in a patient, wherein said patient experiences...
reduced symptoms due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_T/B_T genotype.

39. The use of claim 38, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

40. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating pain from cancer in a patient, wherein said patient experiences reduced pain symptoms due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_T/B_T genotype.

41. The use of claim 40, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

42. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for improving cholesterol in a patient, wherein said patient experiences a lowering of cholesterol and/or increase in HDL cholesterol due to said cannabis, with reduced tetrahydrocannabinol (THC) side effects compared to use of a cannabis plant cell comprising a B_T/B_T genotype.

43. The use of claim 42, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.

44. Use of a prescribed amount of the cannabis plant cell defined in any one of claims 1-6 or 15-17 for treating psychosis related diseases in a patient, wherein said patient experiences reduced psychosis symptoms due to said cannabis, with reduced THC side effects compared to use of a cannabis plant cell comprising a B_T/B_T genotype.

45. The use of claim 44, wherein the cannabis plant cell is in a form of a cannabis extract or an edible product and the cannabis extract or the edible product comprises the plant cell of any one of claims 1-6 or 15-17.
46. A bubble packaging for storing and shipping cannabis comprising:
   (i) a sealable storage space comprising (a) a non-viable plant part, 
   wherein the non-viable plant part comprises the plant cell of any one of claims 1-6 or 
   15-17 or (b) the extract as defined in any one of claims 11-12; and
   (ii) a modified atmosphere within said sealable space;
   wherein said bubble packaging increases the shelf life of said non-viable plant part or 
   extract, beyond that of a control cannabis plant part or extract, which is unpackaged or 
   placed in a traditional jar or bag without the modified atmosphere.

47. The bubble packaging for storing and shipping cannabis of claim 46, wherein said 
   modified atmosphere comprises a vacuum.

48. A method of vaporizing cannabis, said method comprising: placing the cannabis plant cell 
   as defined in any one of claims 1-6 or 15-17, in a zero-point delivery device, turning the 
   zero-point delivery device on, and vaporizing said cannabis.

49. A dry, non-viable (i) cannabis plant or (ii) part thereof, wherein said cannabis plant or part 
   thereof, comprises a female inflorescence, said inflorescence comprising:
   a) a tetrahydrocannabinol (THC) content that is at least 3% and a cannabidiol 
      (CBD) content that is at least 3%;
   b) a B\textsubscript{T} allele and a B\textsubscript{D} allele;
   c) a terpene profile in which beta caryophyllene is the dominant terpene; and
   d) a terpene oil content greater than 1%;
   wherein the terpene profile is defined as terpinolene, alpha phellandrene, beta ocimene, 
   carene, limonene, gamma terpinene, alpha pinene, alpha terpinene, beta pinene, fenchol, 
   camphene, alpha terpineol, alpha humulene, beta caryophyllene, linalool, caryophyllene 
   oxide, and myrcene, and wherein the terpene oil content is the additive content of the 
   terpenes in the terpene profile; wherein the THC, CBD, and terpene oil content are 
   measured by gas chromatography-flame ionization detection (GC-FID) and calculated 
   based on dry weight of the inflorescence, and wherein samples of seed that produce plants 
   comprising a), b), c) and d) have been deposited under NCIMB NOs. 42248 and 42249.

50. The dry, non-viable (i) cannabis plant or (ii) part thereof of claim 49, wherein the terpene 
   oil content is greater than 1.5%.
51. The dry, non-viable (i) cannabis plant or (ii) part thereof of any one of claims 49-50, wherein the inflorescence comprises a maximum terpene oil content of 2.17%.

52. The dry, non-viable (i) cannabis plant or (ii) part thereof of any one of claims 49-51, wherein the THC content is at least 4%.

53. The dry, non-viable (i) cannabis plant or (ii) part thereof of any one of claims 49-52, wherein the THC content is at least 6%.

54. The dry, non-viable (i) cannabis plant or (ii) part thereof of claims 49-53, wherein the CBD content is at least 5%.

55. An assemblage of dry, non-viable female inflorescences from (i) cannabis plants or (ii) parts of the plants, wherein said inflorescences comprise:
   a) a tetrahydrocannabinol (THC) content that is at least 3% and a cannabidiol (CBD) content that is at least 3%;
   b) a Br allele and a B0 allele;
   c) a terpene profile in which beta caryophyllene is the dominant terpene; and
   d) a terpene oil content greater than 1%;
wherein the terpene profile is defined as terpinolene, alpha phellandrene, beta ocimene, carene, limonene, gamma terpinene, alpha pinene, alpha terpinene, beta pinene, fenchol, camphene, alpha terpineol, alpha humulene, beta caryophyllene, linalool, caryophyllene oxide, and myrcene, and wherein the terpene oil content is the additive content of the terpenes in the terpene profile; wherein the THC, CBD, and terpene oil content are measured by gas chromatography-flame ionization detection (GC-FID) and calculated based on dry weight of the inflorescences, and wherein samples of seed that produce plants comprising a), b), c) and d) have been deposited under NCIMB NOs. 42248 and 42249.

56. The assemblage of dry, non-viable female inflorescences of claim 55, wherein the terpene oil content is greater than 1.5%.

57. The assemblage of dry, non-viable female inflorescences of any one of claims 55-56, wherein the inflorescences comprise a maximum terpene oil content of 2.17%.
58. The assemblage of dry, non-viable female inflorescences of any one of claims 55-57, wherein the THC content is at least 4%.

59. The assemblage of dry, non-viable female inflorescences of any one of claims 55-58, wherein the THC content is at least 6%.

60. The assemblage of dry, non-viable female inflorescences of any one of claims 55-59, wherein the CBD content is at least 5%.
FIG. 2

Cultivar Feedback Survey

<table>
<thead>
<tr>
<th>Volunteer:</th>
<th>Sample ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = Extremely Unpleasant – 10 = Extremely Pleasant</td>
<td></td>
</tr>
<tr>
<td><strong>How would you rate the aroma?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you describe the aroma?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>How would you rate the flavor?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you describe the flavor?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>1 = Extremely Weak – 10 = Extremely Strong</strong></td>
<td></td>
</tr>
<tr>
<td><strong>How would you rate the mind high?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate the body high?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>1 = Extremely Low – 10 = Extremely High</strong></td>
<td></td>
</tr>
<tr>
<td><strong>How would you rate your level of intoxication?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your feeling of calmness?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your feeling of alertness?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of anxiety?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your ability to focus?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of mood enhancement?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your energy level?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of hunger?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of thirst?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of physical comfort?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of emotional comfort?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your ability to function normally?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>How would you rate your level of sedation?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>1 = Extremely Brief – 10 = Extremely Long</strong></td>
<td></td>
</tr>
<tr>
<td><strong>How would you rate the length of your effects?</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>1 = Extremely Low – 10 = Extremely High</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Rate the perceived level of positive effects you attribute to this sample.</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>Rate the perceived level of negative effects you attribute to this sample.</strong></td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>Comments:</strong></td>
<td></td>
</tr>
</tbody>
</table>
Relative Terpene Profiles of Week 5 Volunteer Trials

- terpinolene
- alpha phellandrene
- beta ocimene
- carene
- limonene
- gamma terpinene
- alpha pinene
- alpha terpinene
- beta pinene
- fenchol
- camphene
- alpha terpineol
- alpha humulene
- beta caryophyllene
- linalool
- cary oxide
- myrcene

Blend A: 1.73% Oil
Blend B: 1.64% Oil
Blend C: 1.59% Oil
Blend D: 1.65% Oil
Blend E: 1.64% Oil
Blend F: 1.64% Oil
"Harlequin" Control: 0.67% Oil

FIG. 4
Relative Terpene Profiles of Week 7 Volunteer Trials

- Blend A: 1.31% Oil, non-myrcene dominant
- Blend B: 1.84% Oil, non-myrcene dominant
- Blend C: 1.50% Oil, non-myrcene dominant
- Blend D: 1.29% Oil, non-myrcene dominant
- Blend E: 2.07% Oil, non-myrcene dominant
- Blend F: 1.35% Oil, non-myrcene dominant
- Control: 1.16% Oil

Terpenes:
- terpinolene
- alpha phellandrene
- beta ocimene
- carene
- limonene
- gamma terpinene
- alpha pinene
- alpha terpinene
- beta pinene
- fenchol
- camphene
- alpha terpineol
- alpha humulene
- beta caryophyllene
- linalool
- cary oxide
- myrcene
Relative Terpene Profiles of Week 3 Volunteer Trials

Comparison A  Comparison B  Comparison C  Comparison D  Comparison E  Comparison F

- terpinolene
- alpha phellandrene
- beta ocimene
- carene
- limonene
- gamma terpinene
- alpha pinene
- alpha terpinene
- beta pinene
- fenchol
- camphene
- alpha terpineol
- alpha humulene
- beta caryophyllene
- linalool
- cary oxide
- myrcene
Volunteer Feedback Results for Weeks 3-4
Effect of THCV

Effects of Smoking Blended Cannabis Samples
FIG. 10

COMPUTING APPARATUS
102

ENVIRONMENT MANAGEMENT SYSTEM
104

PATIENT MANAGEMENT SYSTEM
106
FIG. 12

ZONE TO BE MONITORED

ON-SITE PC OR/AND CENTRALIZED COMPUTER

BIDIRECTIONAL DATA TRANSMISSION (ENCRYPTED)

WIRELESS SENSOR MESH NETWORK CONSISTING OF SENSORS/ACTUATORS, GATEWAYS & ROUTERS.
b = diameter of larger base

t = diameter of smaller base

h = height of cone
FIG. 19

with sludge

"Connecting Circuit"