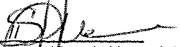


Application No.: 13/504,156

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted via the Office electronic filing system in accordance with 37 CFR § 1.6(a)(4).

Dated: 11/18/15 Signature: 
(Sarah Hupprich)

Docket No.: 091876-0014
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	:	Customer Number: 23630
Willem Hendrik LINDHOUT et al.	:	
	:	
Application No.: 13/504,156	:	Confirmation No.: 6337
	:	
Filed: July 10, 2012	:	Art Unit: 1663
	:	
For: Hybrid Seed Potato Breeding	:	Examiner: BOGGS, Russell T

RESPONSE TO FINAL OFFICE ACTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed May 18, 2015, please amend the above-identified U.S. patent application as directed herein. A Petition for Extension of Time (3 months), Request for Continued Examination (RCE) and the applicable fees are being filed concurrently herewith. Reconsideration and further examination of the present application in light of the following:

Amendments to the Specification begin on Page 2.

Amendments to the Drawings begin on Page 4.

Amendments to the Claims begin on Page 5.

Remarks/Arguments begin on Page 14.

AMENDMENTS TO THE SPECIFICATION

In the following amendment to the specification, [[deletions are double bracketed]] or ~~shown with strike through~~, and additions are underlined.

Please amend the paragraph at page 9, lines 3-9 as follows:

Proper (commercial) sources of tetraploid cultivars are provided through the European Cultivated Potato Database (ECPD) at ~~http://www.europotato.org/menu.php~~ and/or the Potato Pedigree Database of the expertise group Plant Breeding (a cooperation between the Laboratory of Plant breeding of Wageningen UR, the Netherlands) and the business unit Biodiversity and breeding of Plant Research International (PRI), Wageningen, the Netherlands at ~~http://www.plantbreeding.wur.nl/potatopedigree/~~.

Please amend the paragraph at page 50, lines 19-21 as follows:

Since the present inventors have access to the first draft sequence of the potato genome (~~www.potatogenome.net~~ www.potatogenome.net) it was possible to compare the mRNA with the genomic DNA sequence including the intervening sequences.

Please amend the paragraph at page 51, lines 2-5 as follows:

This resulted in 279 and 453 unique BLAST hits representing the occurrence of only one copy in the potato genome sequence of *Solanum tuberosum* Group Phureja DMI-3 516R44 (CIP801092) as known hitherto (Potato Genome Sequencing Consortium, ~~www.potatogenome.net~~ www.potatogenome.net).

Please amend the paragraph at page 51, lines 13-15 as follows:

A total of 100 sequences were then removed for having incomplete matches of only 35 up to 94 nucleotides within a scaffold of a doubled monoploid (DM-3 516R44; ~~www.potatogenome.net~~ www.potatogenome.net).

Please amend the paragraph at page 51, lines 20-23 as follows:

These SNPs even allowed to discriminate between the five genotype classes that occur in tetraploids (Voorrips et al, EAPR-EUCARPIA congress "Potato Breeding after completion of the DNA Sequence of the Potato Genome", 27-30 June 2010, Wageningen, the Netherlands, e-publication at <http://edepot.wur.nl/143559>, pg 42).

Please amend the paragraph at page 52, lines 2-5 follows:

The 100 SNP sequences selected as described above were used in a KASPar SNP genotyping system (KBioscience Ltd. Hoddesdon, UK; http://www.kbioscience.co.uk/lab%20services/SNP%20Genotyping/genotyping_chemistry.html).

Please amend the paragraph at page 52, lines 19-20 as follows:

All markers showed a high frequency of occurrence in the diploid potato germplasm used in this experiment (~~Appendix III~~) ([Table 6](#)).

Application No.: 13/504,156
Attorney Docket No.: 091876-0014

AMENDMENTS TO THE DRAWINGS

Please replace the originally filed drawing sheets with the replacement sheets submitted herewith.

AMENDMENTS TO THE CLAIMS

The below claim listing will replace all prior versions of the claims.

1. (Currently Amended) A diploid, fertile, self-compatible and essentially homozygous potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant; wherein at least 50% of the loci in said plants are homozygous, wherein self-compatibility in said potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*, and wherein at least 25% of the plants of said line produce seed-carrying berries.
2. (Canceled).
3. (Previously Presented) The potato line of claim 1, wherein said at least one agronomically desirable trait is insect tolerance, nematode resistance, disease resistance, herbicide tolerance, cold tolerance, drought tolerance, wet tolerance, tolerance to dry and wet rot, salinity tolerance, yellow flesh color or cold-sweetening resistance.
4. (Previously Presented) The potato line of claim 1, wherein plants of said line when mature attain an average fresh weight of the foliage and shoots of at least 500 grams per plant.
5. (Previously Presented) A plant of a line according to claim 1.
6. (Currently Amended) ~~A seed~~ Seeds or tubers of a plant according to claim 5.
7. (Currently Amended) ~~Seeds~~ according to claim 6, wherein said ~~seeds~~ are ~~is~~ a uniform hybrid potato ~~seeds~~.

8. (Currently Amended) A method for producing a diploid, fertile, self-compatible and essentially homozygous potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, comprising:

(a) providing a first potato plant, which first potato plant is a plant of a first diploid, self-compatible, ~~fertile and essentially homozygous~~ potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, wherein self-compatibility in said *Solanum tuberosum* potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*, selfing said plant of said diploid, self compatible potato line for at least 3 times while selecting for plants that produce fertile offspring to thereby provide a first potato plant of a first diploid, self-compatible, fertile and essentially homozygous potato line;

(b) providing a second potato plant, wherein said second potato plant is a plant of a diploid or tetraploid potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line which may have any level of homozygosity, said line of said second potato plant comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant;

(c) cross pollinating said first and second potato plant to provide seeds and collecting said seeds to thereby provide a hybrid offspring seed;

(d) growing said hybrid offspring seed into a population of hybrid offspring potato plant and selecting from said population plants producing tubers at a yield expressed in grams of fresh weight of at least 200 grams per plant, and

(e) selfing said hybrid offspring potato plant or backcrossing said hybrid offspring potato plant to a potato plant of said line of said first potato plant, for between 1 to 8 selfings or backcrosses, to thereby provide a diploid, fertile, self-compatible and essentially homozygous

potato breeding line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant;

and wherein at least 50% of the loci in said the plants provided in step (e) are homozygous.

9. (Previously Presented) The method of claim 8, wherein said steps (a)-(e) are repeated and wherein step (b) comprises the provision of a second potato plant, wherein said second potato plant is a donor for an additional agronomically desirable trait, wherein said trait is insect tolerance, nematode resistance, disease resistance, herbicide tolerance, cold tolerance, drought tolerance, wet tolerance, tolerance to dry and wet rot, salinity tolerance, yellow flesh color or cold-sweetening resistance.

10. (Canceled).

11. (Previously Presented) The method of claim 8, wherein said first potato plant is a plant of potato line NCIMB 41663, NCIMB 41664, NCIMB 41665, or NCIMB 41765, representative seeds of said line having been deposited with the NCIMB, Aberdeen, Scotland under breeders reference AGVD1, AGVD2, AGVD3, and AGVD17 respectively.

12. (Previously Presented) The method of claim 8, wherein said second potato plant is a plant of a second diploid, fertile, self-compatible and essentially homozygous potato line.

13. (Previously Presented) The method of claim 8, wherein said second potato plant is a plant of a second diploid, fertile, self-incompatible potato line.

14. (Currently Amended) [[A]] An essentially homozygous diploid potato breeding line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of

other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, more preferably an elite line, obtained by the method of claim 8.

15. (Currently Amended) A hybrid potato seed of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum* obtained by crossing plants of a first and second diploid potato breeding line according to claim 14, wherein said plants of said first and second diploid potato breeding line contain at least 20 % contrasting homozygous loci as determined by molecular marker analysis.

16. (Currently Amended) A method for producing a uniform hybrid potato seed, comprising:

(a) providing a first potato plant, which first potato plant is a plant of a first diploid, fertile, self-compatible and essentially homozygous potato line according to claim 1, of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said first potato plant having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant; wherein at least 50% of the loci in said first potato plant are homozygous; and wherein self-compatibility in said potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*,

(b) providing a second potato plant, wherein said second potato plant is a plant of a second diploid, fertile, self-compatible and essentially homozygous potato line according to claim 1, of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said second potato plant having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant; wherein at least 50% of the loci in said second potato plant are homozygous; and wherein self-compatibility in said potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*, and wherein said first and second plant

contain at least 20 % contrasting homozygous loci as determined by molecular marker analysis, and

(c) cross pollinating said first and second potato plant and allowing one of said parent plants to produce berries with seeds and collecting said seeds from said berries to provide a hybrid offspring seed.

17. (Canceled).

18. (Previously Presented) Method according to claim 16, wherein at least one of said first and second potato plants comprises at least one agronomically desirable trait selected from the group consisting of insect tolerance, nematode resistance, disease resistance, herbicide tolerance, cold tolerance, drought tolerance, wet tolerance, tolerance to dry and wet rot, salinity tolerance, yellow flesh color and cold-sweetening resistance.

19. (Currently Amended) The method of claim 16, wherein said first potato ~~line is a diploid, self-compatible and essentially homozygous offspring potato plant comprising the *Sti[[]]* gene, preferably wherein said first potato~~ plant is a plant of potato lines NCIMB 41663, NCIMB 41664, NCIMB 41665, or NCIMB 41765, representative seeds of said lines having been deposited with the NCIMB, Aberdeen, Scotland, or a diploid, self-compatible and essentially homozygous offspring potato plant thereof, wherein said diploid, self-compatible and essentially homozygous offspring plant is of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*.

20. (Currently Amended) The method of claim 16, wherein said second potato plant is a plant of a second diploid, self-compatible and essentially homozygous potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said second potato line comprising an additional agronomically desirable trait; and wherein said trait is insect tolerance, nematode

resistance, disease resistance, herbicide tolerance, cold tolerance, drought tolerance, wet tolerance, tolerance to dry and wet rot, salinity tolerance, yellow flesh color or cold-sweetening resistance.

21. (Original) A seed of potato lines NCIMB 41663, NCIMB 41664, NCIMB 41665, or NCIMB 41765, representative seeds of said line having been deposited with the NCIMB, Aberdeen, Scotland.
22. (Previously Presented) A seed produced by the method of claim 16.
23. (Previously Presented) A hybrid potato plant, or part thereof, produced by growing the seed of claim 16.
24. (Previously Presented) Pollen or an ovule of the plant of claim 23.
25. (Previously Presented) A tuber from the plant of claim 23.
26. (Previously Presented) A potato plant having all of the physiological and morphological characteristics of the plant of claim 23.
27. (Previously Presented) A tissue culture of the plant of claim 23.
28. (Previously Presented) A potato plant regenerated from the tissue culture of claim 27.
29. (Previously Presented) A method for producing a hybrid potato seed wherein the method comprises crossing a first potato plant with a second potato plant and harvesting a hybrid potato seed resulting from said crossing, wherein said first or second parent potato plant is the potato plant of claim 5, wherein said first and second parent potato have at least 20 % contrasting homozygous loci as determined by molecular genetic marker analysis.

30. (Previously Presented) A method of producing a hybrid potato plant, said method comprising producing a seed according to a method of claim 16 and growing said seed into a potato plant.
31. (Previously Presented) A potato plant produced by the method of claim 30, or a tuber thereof.
32. (Currently Amended) A set of 2 homozygous diploid, fertile, self-compatible and essentially homozygous potato lines of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum* according to claim 1 for intercrossing, comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, wherein each of said lines differ from another line in said set by having at least 20 % contrasting homozygous loci as determined by molecular genetic marker analysis; and wherein at least 50% of the loci in said plants are homozygous.
33. (Canceled).
34. (Currently Amended) A hybrid potato seed which seed, when sown produces a diploid, fertile, self-compatible and essentially heterozygous potato plant of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, said plant being obtained by:
- (a) providing a first diploid, fertile, self-compatible and essentially homozygous potato line comprising plants of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, wherein at least 50% of the loci in a plant of said first

potato line are homozygous; and wherein self-compatibility in said first potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*;

(b) providing a second diploid, fertile, self-compatible and essentially homozygous potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, wherein said first and second plant contain at least 20 % contrasting homozygous loci as determined by molecular marker analysis, and wherein at least 50% of the loci in a plant of said second potato line are homozygous; and wherein self-compatibility in said second potato line is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum* and

(c) cross pollinating said first and second potato plant and allowing at least one of said parent plants to produce berries with seeds and collecting said seeds from said berries to provide a hybrid offspring seed;

~~and wherein at least 50% of the loci in said plant are homozygous.~~

35. (New) A method for producing a diploid, fertile, self-compatible and essentially homozygous potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant, comprising:

(a) providing a first potato plant, which first potato plant is a plant of potato line NCIMB 41663, NCIMB 41664, NCIMB 41665, or NCIMB 41765, representative seeds of said line having been deposited with the NCIMB, Aberdeen, Scotland under breeders reference AGVD1, AGVD2, AGVD3, and AGVD17 respectively;

(b) providing a second potato plant, wherein said second potato plant is a plant of a diploid or tetraploid potato line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to

Solanum tuberosum, said potato line which may have any level of homozygosity, said line of said second potato plant comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant;

(c) cross pollinating said first and second potato plant to provide seeds and collecting said seeds to thereby provide a hybrid offspring seed;

(d) growing said hybrid offspring seed into a population of hybrid offspring potato plant and selecting from said population plants producing tubers at a yield expressed in grams of fresh weight of at least 200 grams per plant, and

(e) selfing said hybrid offspring potato plant or backcrossing said hybrid offspring potato plant to a potato plant of said line of said first potato plant, for between 1 to 8 selfings or backcrosses, to thereby provide a diploid, fertile, self-compatible and essentially homozygous potato breeding line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*, said potato line comprising plants having an average tuber yield expressed in grams of fresh weight of at least 200 grams per plant;

and wherein at least 50% of the loci in a plant provided in step (e) are homozygous.

36. (New) Starch, potato chips, or French fries produced from the tuber of any of claims 5, 25 or 31.

REMARKS/ARGUMENTS

Status of Claims

Claims 1, 3-9, 11-16 and 18-34 were pending in this application. Claims 1, 6-8, 14-16, 19, 20, 32 and 34 have been amended. Claim 33 is canceled without prejudice. New claims 35 and 36 are added.

Support for these amendments can be found throughout the application. For example, support for the amendment to claims 1, 8, 14-16, 19, 20, 32 and 34 is found at page 17, lines 14-17.

Support for the amendment to claim 1 is found at page 15, lines 29-31 and at page 28, lines 7-8 and at page 28, lines 13-14.

Support for new claim 35 can be found in the specification at page 7, lines 8-28; page 9, lines 10-13; page 17, lines 14-17 and page 21, lines 1-5.

Support for new claim 36 can be found in the specification at page 64, lines 20-21.

Claims 6 and 7 have been amended to correct informalities. No new matter is believed to be added herein.

Drawings

The drawings were objected to as Figure 3 was marginally legible and Figures 4-5 were not legible. Replacement sheets of drawings are submitted herewith. The dark boxes in Figures 4 and 5 have been deleted. Figures 3-5 have been amended in compliance with 37 CFR 1.121 (d). Amendments to the drawings are supported, for example, by original Figures 3, 4 and 5 of the application as filed. No new matter has been added.

Specification

The specification has been amended to delete the embedded hyperlink and/or other form of browser-executable code. The specification has been amended to correct informalities. The amendments do not add new matter.

Claim Objections

Claim 16 is objected to because it depends on claim 1 twice. Claim 16 has been amended to delete reference to claim 1 in both instances.

Rejections under 35 U.S.C. § 112, second paragraph

Claims 8-15, 33 and 34 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite, for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. According to the Examiner, claims 8, 33 and 34 are indefinite in the recitation of the term ‘said plants’.

Claim 33 was canceled. For clarity purposes, the term ‘said plants’ in claim 8 was replaced by the term ‘the plants provided in step (e)’. The phrase ‘and wherein at least 50% of the loci in said plant are homozygous’ was deleted in claim 34.

Rejections under 35 U.S.C. § 112, first paragraph

A. Claims 14-15 and 19-20 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

According to the Examiner, the claims are broadly drawn to a diploid, fertile, self-compatible and essentially homozygous potato line, or a seed thereof, comprising plants that have an average tuber yield of at least 200 g/plant. Independent method claims are drawn to a method

to produce such a line and a method for producing a uniform hybrid potato seed. Dependent claims relate to, e.g., crosses made, adding agronomically desirable traits, and potato lines deposited with the NCIMB in Aberdeen, Scotland. According to the Examiner, The applicant claims a large genus, whereas the instant application describes only four potato lines to use in the claimed methods.

Applicant respectfully disagrees. To advance prosecution, claims 14-15 and 19-20 have been amended.

Amended claim 14 is drawn to an essentially homozygous diploid potato breeding line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*.

Amended claim 15 is drawn to a hybrid potato seed of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*.

Claims 19 and 20 have been amended to further define the plant species as the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgression segments of other tuber-bearing *Solanum* species crossable to *Solanum tuberosum*.

Applicant describes the invention for the species *Solanum tuberosum* and *Solanum tuberosum* comprising introgressions from other tuber-bearing *Solanum* species. The applicant has shown that the methods as proposed are effective in generating a representative number of new plants that are essentially homozygous and have a high tuber yield for this potato species.

The Applicant has demonstrated that the methods can be used to produce a "diploid potato breeding line" of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgressions from other tuber-bearing *Solanum* species.

The Applicant has demonstrated that the methods can be used to produce a "hybrid potato seed" of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgressions from other tuber-bearing *Solanum* species.

Further, the Applicant has demonstrated that the methods can be used to produce offspring of a diploid potato breeding line of the species *Solanum tuberosum* or *Solanum tuberosum* comprising introgressions from other tuber-bearing *Solanum* species.

Example 4 discloses the development of homozygous diploid potato plants and then F1 hybrid progeny, as well as subsequent generations (*see* specification at page 58-62).

Reconsideration and further examination are respectfully requested.

B. Claims 1, 3-9, 12-16, 18-20 and 22-34 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

Applicant respectfully disagrees. To advance prosecution, claims 1, 6-8, 14-16, 19, 20, 32 and 34 have been amended.

The present invention discloses a provision of *S. tuberosum* plants that are homozygous and have a high tuber-yield. This combination has never been obtained. Therefore, there exists no hybrid breeding program for potato, such as present in, for instance, tomato.

In order to obtain homozygous *S. tuberosum* plants, several routes can in principle be followed. One such route is doubling haploids. However, this route has proven unsuccessful (*see* specification at paragraph bridging pages 36 and 37 and Example 1 at page 44, lines 5-14).

The essential problem that the invention solves is not the provision of self-compatibility in *S. tuberosum*. Self-compatibility is a trait that is known to be present in diploid *S. tuberosum* (*see* specification at page 15, lines 29-31). Cultivated potato (*Solanum tuberosum*) is usually self-incompatible, but self-compatibility can be introduced from related species (*see* specification at page 15, lines 29-31). The applicant has demonstrated that self-compatibility in

the potato lines obtained is introduced from tuber-bearing self-compatible *Solanum* species crossable to *S. tuberosum*.

In practice, the applicant has thus used the prior art teaching of introducing self-compatibility from related species. This is now indicated in claim 1, and the other rejected claims. It is therefore submitted that the rejection is overcome by amendment.

Reconsideration and further examination are respectfully requested.

Rejections under 35 U.S.C. § 103

Claims 1, 3-6, 8-9, 12-16, 18, 20, 22-26 and 29-34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Simmonds (*Potato Res* 40:191-214 ,1997) in view of Lippman & Zamir (*Trends Genet* 23(2):61-66 ,2006) in further view of Phumichai et al. (*Genome* 48:977-84 ,2005) in further view of Maris (*Euphytica* 46:15-33,1990), and in further view of Watanabe et al. (*Breed Sci* 46:329-36,1996).

According to the Examiner, based on the teachings of Simmonds and Lippman, it would be obvious to develop a diploid, fertile, and essentially homozygous potato line and furthermore it would be obvious to do this in a line from the species *Solanum tuberosum*. In the Examiner's opinion, introducing, e.g., the *Sli* gene as taught by Phumichai et al. into a self-incompatible cultivated diploid potato line would be obvious for one of ordinary skill in the art. According to the Examiner, breeding a potato line for a high yield of tubers per plant is an obvious step in view of Maris.

Applicant respectfully disagrees. Without acquiescing to the merits of the rejection and solely to expedite prosecution, claims 1, 6, 8, 14-16, 19, 20, 32 and 34 have been amended.

There is a general prejudice that production of homozygous true breeding lines of potato would not be possible (*see* specification at page 5, lines 1-28). The instant invention has overcome the prejudice that homozygous potato could not be developed due to inbreeding

depression (*see* specification at page 37, lines 21-32). Applicants have used a strategy of selfing and “selecting for plants that produce fertile offspring” (*see* for e.g., claim 8). This step of selecting for plants that produce fertile offspring has never been employed in potato breeding. This is because potato breeders select for vigour and high tuber yield.

Surprisingly, such successive rounds of selfing while selecting for plants that produce fertile offspring eventually resulted in plants with progressively improved fertility and vigour. Without wishing to be bound by theory, the applicant believes that this manner of selection indeed allowed the removal of a sufficient amount of deleterious genes from the *Solanum tuberosum* germplasm.

The results were unexpected, since selection for fertile plants has usually been associated with selecting for heterozygosity, not homozygosity as taught by Phumichai et al.

“The slower than expected decline in heterozygosity has been reported by Brouwer and Osborn (1997) with inbreeding diploid alfalfa and by Scotti et al. (2000) with inbreeding tetraploid alfalfa. Consequential selection for vigor and fertility during selfing has been suggested as the cause (Brouwer and Osborn 1997). We previously suggested that reproductive traits, such as flowering versus nonflowering and the degree of pollen production, were strongly correlated with heterozygosity, and selection for fertility favored the more heterozygous plants (Phumichai et al. 2004)”.

(*see* Phumichai et al. (*Genome* 48:977-84, 2005 at page 982, paragraph bridging the left and right columns).

The applicants were the first to follow the strategy that during the inbreeding process, the selection process of suitable offspring plants having an increased level of homozygosity should not be based on selecting vigorous plants having high tuber yields, but on selecting self-compatible plants having the highest level of fertility.

For any potato breeder, this is a fully counterintuitive process. Potato breeders attempt to maximize the vigor of the plant and in particular the tuber yield while minimizing the amount of flowers and berries produced. After all, and in contrast to for instance tomato, the berries have no agronomic value, and cultivation of flowering and berries-producing potato plants may

result in segregated seeds being shed that may grow into undesirable plants in commercial production fields. Hence, flowers, berries and viable seeds are not considered valuable and are selected against, while strong plants with high tuber yields are selected for further rounds of breeding.

The applicants demonstrated that an increase in vigor is possible when a sufficient level of fertility is attained, and that any premature selection for vigor, results in ushering or selection for deleterious genes. Based on this finding, the applicants made the first cross between a diploid self-compatible potato line (indicated as the self-incompatibility donor) and a diploid vigorous line of *S. tuberosum*, optionally backcrossed against the self-incompatibility donor, and continued the selfing process to increase the homozygosity, while again selecting for fertility. This resulted surprisingly in a method for producing essentially homozygous inbred and diploid *S. tuberosum* plants that were fertile and vigorous.

There are several breeding methods that could be followed, when developing a hybrid true potato seed. When attempting to provide improved potato breeding methods via homozygous diploids, the skilled person may, again, choose from a vast number of strategies other than repeated selfing or inbreeding, including doubling haploids, and ovule or anther culture. Also, a person of ordinary skill could chose to provide an improved “cultivated diploid potato” germplasm based on mixed *S. stenotomum* / *S. phureja* material as taught by Phumichai et al. However, the prior art does not teach or suggest that such a method would succeed based on *S. tuberosum* due to inbreeding depression. There is no reasonable expectation of success for inbreeding of *S. tuberosum* diploid material.

In view of the foregoing, the claims are not obvious. Reconsideration and further examination are respectfully requested.

CONCLUSION

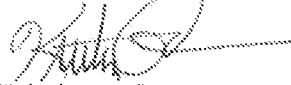
Application No.: 13/504,156
Attorney Docket No.: 091876-0014

Should the Examiner be of the view that an interview would expedite consideration of the application, request is made that the Examiner telephone the applicants' attorney at (617) 535 4453 in order that any outstanding issues be resolved.

Applicants have included the fee for a three-month extension of time fee and RCE. The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-1133, under Order No. 091876-0014 from which the undersigned is authorized to draw.

Respectfully submitted,

MCDERMOTT WILL & EMERY LLP



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