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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JIANGXIN WAN and YAFAN HUANG

Appeal 2019-006599
Application 13/381,202
Technology Center 1600

Before DONALD E. ADAMS, ERIC B. GRIMES, and JEFFREY N. FREDMAN, *Administrative Patent Judges*.

ADAMS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from Examiner's decision to reject claims 17–19 and 23 (Br. 5; *see also* Ans. [2] 3).[3] We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as "Performance Plants, Inc." (Appellant's April 16, 2019 Appeal Brief (Br.) 3).

[2] Examiner's July 5, 2019 Answer.

[3] Appellant's claims 30–37 stand withdrawn from consideration (Br. 5; *see also* Ans. 3).

STATEMENT OF THE CASE

Appellant's disclosure "relates to expression of a transcriptional regulator and transgenic plants having increased activity of the transcriptional regulator to produce a plant having a beneficial phenotype" (Spec. 1).[4] Appellant's claim 17 is reproduced below:

> 17. A method of producing a heat stress tolerant plant, comprising
>
> a) transforming a plant, a plant tissue culture, or a plant cell with a vector comprising a nucleic acid construct that comprises a nucleic acid sequence encoding a bHLH subgroup 1b polypeptide to obtain a transformed plant, a transformed plant tissue culture, or a transformed plant cell, wherein said bHLH subgroup 1b polypeptide is bHLH39,
>
> b) growing said transformed plant or regenerating a plant from said transformed plant tissue culture or transformed plant cell, and
>
> c) selecting a plant having increased heat stress tolerance relative to a wild type control from said transformed plant or regenerated plant from b) under a heat stress condition.

(Br. 19.)

Claims 17–19 and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Yuan,[5] Jiang,[6] and Abad.[7]

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[4] Appellant's December 28, 2011 Specification.
[5] Yuan et al., *FIT interacts with AtbHLH38 and AtbHLH39 in regulating iron uptake gene expression for iron homeostasis in Arabidopsis*, 18 Cell Research 385–397 (2008).
[6] Jiang et al., US 2007/0033671 A1, published Feb. 8, 2007.
[7] Abad et al., US 2006/0041961 A1, published Feb. 23, 2006.

ISSUE

Does the preponderance of evidence relied upon by Examiner support a conclusion of obviousness?

FACTUAL FINDINGS (FF)

Examiner made the following findings:

FF 1. Yuan discloses the transformation of Arabidopsis plants with a construct comprising "the AtbHLH39[8] (subgroup 1b protein) nucleic acid sequence under the control of the constitutive 35S promoter" to produce the transgenic plant, "ox39" (Ans. 4 (citing Yuan 390 and 394) (emphasis omitted)).

FF 2. Yuan disclosed that "[t]ransgenic plants overexpressing AtbHLH39 showed significantly increased expression in the roots in comparison to wild type plants" (Ans. 4 (emphasis omitted)).

FF 3. Yuan failed to disclose the selection of "a plant having increased heat stress tolerance as compared to a wild type control under heat stress conditions" and "a root specific promoter" (Ans. 4).

FF 4. Jiang discloses the transformation of plants with a construct comprising the constitutive 35S promoter operably linked to a nucleic acid, SEQ ID NO: 593, encoding the bHLH subgroup Ib polypeptide (AtbHLH38) (Ans. 5).

FF 5. Jiang discloses growing plants transformed with SEQ ID NO: 593 under normal and cold stress conditions, wherein "[p]lants overexpressing SEQ ID NO: 594 [AtbHLH38] produced larger seeds . . . and were more tolerant to cold stress than wild type plants" (Ans. 5 (emphasis omitted)).

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[8] Examiner finds that Yuan's AtbHLH39 nucleic acid sequence corresponds to Appellant's SEQ ID NO: 1 (Ans. 4).

FF 6. Jiang discloses the transformation of plants with a construct comprising the constitutive 35S promoter operably linked to a nucleic acid, SEQ ID NO: 661, encoding a bHLH polypeptide (SEQ ID NO: 662) from *Arabidopsis thaliana* (Ans. 5).

FF 7. Jiang discloses growing plants transformed with SEQ ID NO: 661 under normal and heat stress conditions, wherein "[p]lants overexpressing SEQ ID NO: 662 were larger and more tolerant to heat stress than wild type plants" (Ans. 5 (emphasis omitted); *see also id*. at 7 (Jiang discloses that "SEQ ID NO: 662 corresponds to clade G3086" and "that transgenic plants overexpressing . . . G3086 showed increased . . . heat stress tolerance.")).

FF 8. Jiang discloses "a polynucleotide sequence (SEQ ID NO: 1541) that shares 100% identity with the AtbHLH39 sequence set forth in [Appellant's] SEQ ID NO: 1" and, therefore, Examiner reasons that Jiang's SEQ ID NO: 1542 (encoded by SEQ ID NO: 1541) "must necessarily be a bHLH39 polypeptide" (Ans. 5 (emphasis omitted)).

FF 9. Jiang discloses "that SEQ ID NO: 594 (clade G2933) is paralogous to SEQ ID NO: 1541 (clade G2932)" (Ans. 7).

FF 10. Abad discloses "transforming plants with a construct comprising a nucleotide sequence encoding AtbHLH39," wherein plants overexpressing AtbHLH39 showed "improved '[e]arly growth and development' [and] are 'useful to produce transgenic plants that have advantages in or more processes including, but not limited to germination, seedling vigor, root growth and root morphology'" (Ans. 7–8 (emphasis omitted); *see id.* at 8 (Abad discloses "that plants 'starting from more robust seedlings are less susceptible to the fungal and bacterial pathogens . . . [and] are more resistant

to drought stress due to extensive and deeper root architecture.'") (alterations original, emphasis omitted)).

FF 11. Abad discloses that "[c]onditions which may result in water deficit stress include heat, drought, high salinity and PEG induced osmotic stress" (Ans. 8 (citing Abad ¶ 17)).

FF 12. Abad discloses that "[b]y manipulating the activity of . . . regulatory genes, i.e., multiple stress tolerance genes, the plant can be enabled to react to different kinds of stresses," such as improved "heat stress tolerance and cold stress tolerance" (Ans. 8 (citing Abad ¶ 76); *see id.* at 9; *see also* Abad ¶¶ 77–78)).

FF 13. Abad discloses constitutive, inducible, and root specific plant promoters (Ans. 9 (citing Abad ¶ 43)).

ANALYSIS

Based on the combination of Yuan, Jiang, and Abad, Examiner concludes that, at the time Appellant's invention was made, it would have been prima facie obvious

> to select plants that have been transformed with AtbHLH39, as taught by Yuan et al and Abad et al and further suggested by Jiang et al, for increased heat stress tolerance under heat stress conditions because it was known in the art that (i) bHLH proteins confer abiotic stress tolerance when overexpressed, including to heat stress (Jiang and Abad), (ii) overexpression of AtbHLH39 confers early plant growth and development characteristics including plant vigor and seedling weight (Abad), and (iii) it was suggested that improvements to the early plant growth and development will lead to increased abiotic stress tolerance (Abad).

(Ans. 9; *see also* FF 1–13.) We are not persuaded.

On this record, Examiner's findings establish that plants "overexpressing AtbHLH39[, i.e. Appellant's SEQ ID NO: 1,] showed

significantly increased expression in the roots in comparison to wild type plants," plants overexpressing AtbHLH39 showed "improved '[e]arly growth and development' [and] are 'useful to produce transgenic plants that have advantages in or more processes including, but not limited to germination, seedling vigor, root growth and root morphology'" (FF 2, 10).

Examiner's findings, however, do not establish that plants transformed with and expressing SEQ ID NO: 1541, which shares 100% identity with AtbHLH39 will exhibit an "increased tolerance to heat" relative to a wild type control (*see* Ans. 7; *see also* FF 8). On this record, Examiner failed to establish an evidentiary basis to support a conclusion that AtbHLH39 would confer an increase in heat stress tolerance to a plant relative to a wild type control (*see* FF 1–13). That other sequences may impact heat stress tolerance does not suggest that the claimed sequence will necessarily increase heat tolerance.

Thus, Examiner failed to establish an evidentiary basis on this record to support a conclusion that a person of ordinary skill in this art would have found it prima facie obvious to select plants expressing AtbHLH39 for heat stress tolerance, or otherwise grow such plants under a heat stress condition, as required by Appellant's claimed invention (*see* Br. 10 (Appellant contends that Examiner acknowledged "that Yuan is deficient in teaching selecting a plant having increased heat stress tolerance relative to a wild type control"); *id.* at 11 (Appellant contends that "Jiang makes no mention of transforming a plant with SEQ ID NO: 1541, let alone to confer heat stress tolerance, **and** selecting a plant transformed with SEQ ID NO: 1541 for heat stress tolerance"); *id.* at 11 (Appellant contends that "Abad would not have taught or suggested that bHLH39 would confer abiotic stress tolerance,

much less heat stress tolerance, due to the improved early plant growth and development traits")). "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

CONCLUSION

The preponderance of evidence relied upon by Examiner fails to support a conclusion of obviousness. The rejection of claims 17–19 and 23 under 35 U.S.C. § 103(a) as unpatentable over the combination of Yuan, Jiang, and Abad is reversed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
17–19, 23	103	Yuan, Jiang, Abad		17–19, 23

REVERSED