

AUSTRALIA

Statutory Declarations Act

IN THE MATTER OF

Australian Patent Application No.
2019216339

STATUTORY DECLARATION

I, Dr. Charles Christian Kupatt of 1356 Tidalwalk Dr, Wilmington, NC 28409, USA, make the following declaration under the Statutory Declarations Act 1959:

1. I am the sole inventor of Australian Patent Application No. 2019216339 ('application 339').
2. I have been asked to provide remarks that explain the inventive concept of the claimed invention as defined in the specification of application 339'.
3. To understand as to why the claimed invention is inventive, it must be understood and appreciated as to the complexity of GABA's direct effect on the resistance to abiotic stresses in plants.
4. Applications of exogenous GABA have been shown to reduce susceptibility to drought, salinity and other stressors. There appears to be direct effects on the stomatal openings and systems that deal with damaging ROS, as well as other cellular imbalances. GABA is synthesized through a pathway known as the GABA Shunt from tricarboxylic acid cycle intermediates. It can also be synthesized from polyamines, through putrescine and/or spermidine catabolism. The pathway passes through several steps, first through 4-aminobutanol, which is converted to pyrroline, and dehydroxylated to GABA. Polyamines can also be catabolized to other compounds. The intermediaries noted above have various roles in plant metabolism. For example, 4-aminobutanal is a precursor to numerous terpenoid compounds, in part through pyrroline.
5. Polyamine homeostasis is a recognized activity of plant metabolism. Polyamines can be biosynthesized following several pathways, most starting with arginine or from methionine through S-adenosyl methionine. Any perturbation of polyamine levels, due to any particular pathway can maintain polyamine homeostasis. As noted above, putrescine can be converted to GABA through several intermediate steps. Aminoguanidine is an inhibitor of amino oxidases. This is the enzyme that converts putrescine to 4-aminobutanal. This could result in temporary increases in polyamine levels. The role of changes GABA biosynthesis in affecting polyamine levels should result in increases or decreases in activity in these biosynthesis pathways, regulating polyamine levels. This is well known by any true expert in polyamines.
6. As noted above, GABA has direct impacts on abiotic stress reduction. Any treatment, such as aminoguanidine, that reduces GABA levels would be expected to reduce

resistance to abiotic stresses. It would thus be counterintuitive to expect aminoguanidine to have a positive interaction with saturated dicarboxylic acids. Since any temporary change in polyamine levels would quickly be reversed to maintain homeostasis, it is difficult and not foreseeable to expect aminoguanidine to result in a synergism with saturated dicarboxylic acids as found in the current invention.

7. I now refer to the examples of the pending specification which demonstrate synergism between saturated medium chain dicarboxylic acids and aminoguanidine.
8. In the data submitted with the patent application, there are several examples of synergism between saturated medium chain-length dicarboxylic acids and aminoguanidine. In the instance of soybeans, each component alone provides 4.8 and 5.1 bushels per acre increased yield for dicarboxylic acids and aminoguanidine, respectively. The mixture provides a yield increase of 15.4 bushels per acre, more than either treatment alone, or even more than if the two were strictly additive in activity. In the example of corn, the compounds alone show a yield increase of 16.1 and 5.3 bushels per acre respectively for dicarboxylic acids and aminoguanidine. The mixture of the two provided 36 bushels per acre. Again, this is more than either alone, or more than if the effects were additive. In the case of the wheat trial, the respective ear weight yields were an increase of 0.16 g and a reduction of 0.32 g for dicarboxylic acids and aminoguanidine, respectively. This contrasts with an increase of 1.32 grams for the mixture, clearly much more than obtained with the other treatments alone or the additive effect of the treatments. In all instances reported in the patent, the data supports a strong synergism between saturated medium chain-length dicarboxylic acids and aminoguanidine.
9. Also, I wish to advise that Merriam-Webster defines synergism as “interaction of discrete agencies (such as industrial firms), agents (such as drugs), or conditions such that the total effect is greater than the sum of the individual effects.”
10. Due to the various biochemical pathways and steps between GABA, polyamines, and various secondary metabolites, it is difficult, if not impossible, to imagine all the various changes in plant biochemistry that might result in this synergistic interaction.
11. In response to the last statement made by the Examiner in the examination report dated 27 March 2023, I submit that none of D1, D2 and D3 teach a synergistic result from combining an aminoguanidine with a dicarboxylic acid. The person skilled in the art would not expect the synergistic result as found by me and disclosed in application 339’.
12. Furthermore, it has been proposed that aminoguanidine acts to stabilize dicarboxylic acids by acting as an antioxidant. This would not apply to the saturated dicarboxylic acids claimed in the current filing.
13. I have **enclosed** stability data of an aqueous solution of the saturated dicarboxylic acids in this filing. The data show complete stability in aqueous, demonstrating that the dicarboxylic acids are not subject to hydrolysis or oxidation.
14. I have also **enclosed** a copy of the following published article (PLEASE INCLUDE THE FULL REFERENCE HERE AND PROVIDE A FULL COPY TO ME BY EMAIL). It should be noted that this article describes the stability of saturated dicarboxylic acids to oxidation. This is not the case for unsaturated dicarboxylic acids, where the double bond in the chain is subject to oxidation.

Comentado [BA1]:

15. I submit that the addition of an antioxidant to saturated dicarboxylic acids would not be expected to result in a synergistic response, rather to just maintain activity, should they act as an antioxidant.

16. Taking all the above into account, it should be appreciated that the claimed invention of application 339' indeed possesses an inventive step.

17. I understand that a person who intentionally makes a false statement in a statutory declaration is guilty of an offence under section 11 of the *Statutory Declarations Act 1959*, and I believe that the statements in this declaration are true in every particular.

Declared on this [INSERT DAY AND MONTH] of 2023

Before me:

Declarant Signature

Witness Signature

Witness Name