COMPOSITIONAL EQUIVALENCE BETWEEN HYBRID STACK MAIZE TC1507 × DAS-59122-7 AND CONVENTIONALLY BRED MAIZE

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INTRODUCTION

Transgenic maize events have been bred together using traditional methods to form a hybrid stack (TC1507 × DAS-59122-7). The TC1507 × DAS-59122-7 breeding stack comprises insect resistance (IR) traits, *cry1F* (Event TC1507), *cry34Ab1* and *cry35Ab1* (Event DAS-59122-7) genes from *Bacillus thuringiensis* which encode Cry1F, Cry34Ab1 and Cry35Ab1 proteins, respectively. This study examined compositional equivalency of forage and grain between the hybrid stack and conventional, non-transgenic maize.

MATERIAL AND METHODS

The test substance was hybrid seed containing events TC1507 and DAS-59122-7. The control substance was non-transgenic hybrid seed (isoline) of the same genetic background as the test substance line, except it did not contain events TC1507 or DAS-59122-7. The test system for this study was maize plants produced from the hybrid and control seed grown at two locations within the major maize growing regions of Brasil. The two field testing facilities, Mogi Mirim, SP and Indianópolis, MG, represent regions of diverse agronomic practices and environmental conditions for maize.

Forage and grain samples were analyzed at EPL Bio Analytical Services (Niantic, IL, USA) for nutrient content using a variety of methods. Analytical methods applied to compositional analysis were modeled on methods established by the Association of Official Analytical Chemists International, American Oil Chemists' Society and American Association of Cereal Chemists. The analytes examined for forage included proximate (ash, crude fat, moisture, crude protein, carbohydrate), calorie content, fiber (crude fiber, acid detergent fiber (ADF), and neutral detergent fiber (NDF)), minerals (calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium, and zinc), and amino acids. Grain was analyzed for the same components with the addition of the following: fatty acids, vitamins and anti-nutrients. The results of the nutritional analysis were examined using analysis of variance (ANOVA) (SAS Institute, Cary, NC, USA), and location means were compared with values reported in literature (Watson, 1982(1); Watson, 1987(2), ILSI Crop Composition Database, 2006(3), and OECD Consensus Document on Compositional Considerations for maize, 2002(4)).

RESULTS

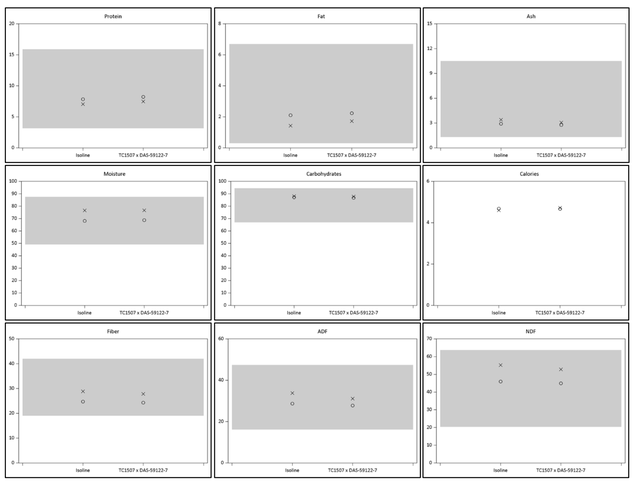


Figure 1. Proximate, calorie content and fiber (% dry-wt, except moisture: percent fresh-wt and calories: Kcal/g dry-wt) in TC1507×DAS-59122-7 and isoline maize forage.

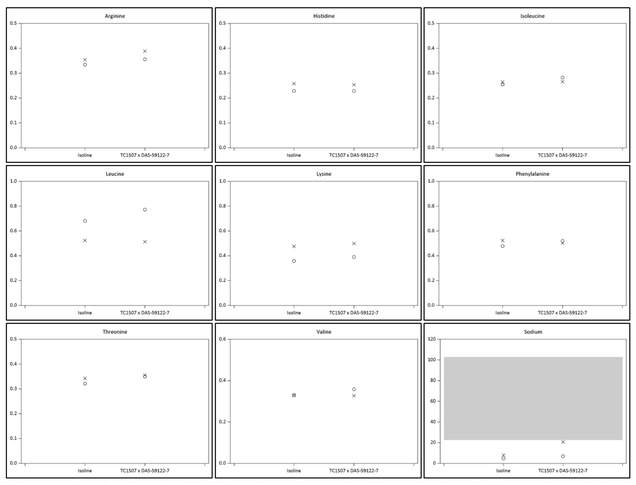


Figure 2. Amino Acids (% dry-wt) and minerals (mg/100 g dry-wt) in TC1507×DAS-59122-7 and isoline maize forage. Literature ranges not available for amino acids.

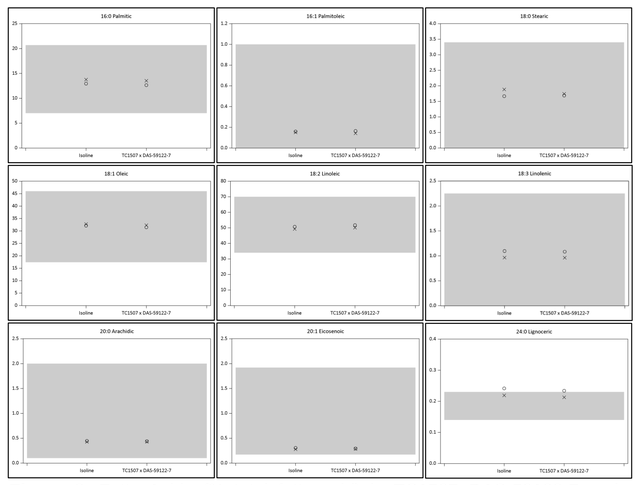


Figure 3. Fatty Acids (% total fatty acid) in TC1507×DAS-59122-7 and isoline maize grain.

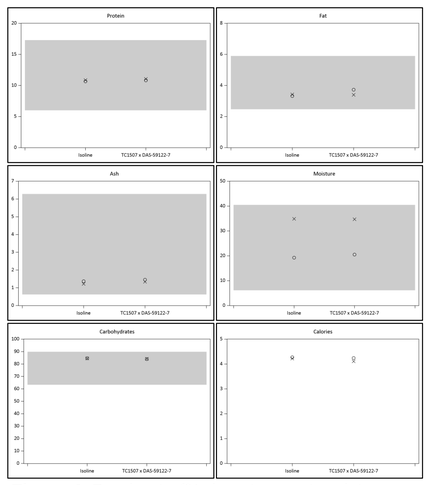


Figure 4. Proximate (% dry-wt except moisture: % fresh-wt) and calorie content (Kcal/g dry-wt) in TC1507×DAS-59122-7 and isoline maize grain.

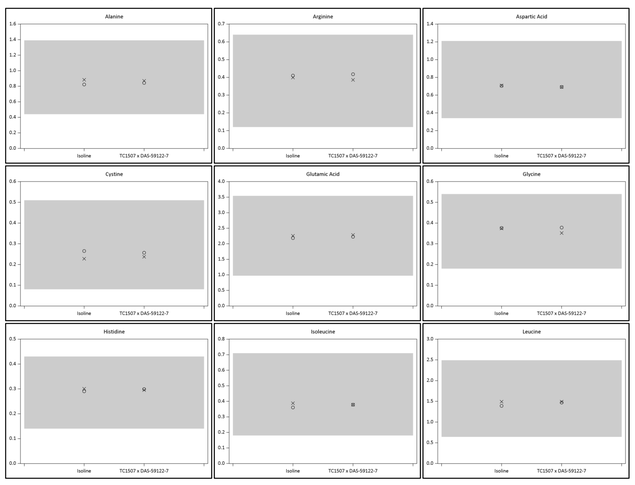
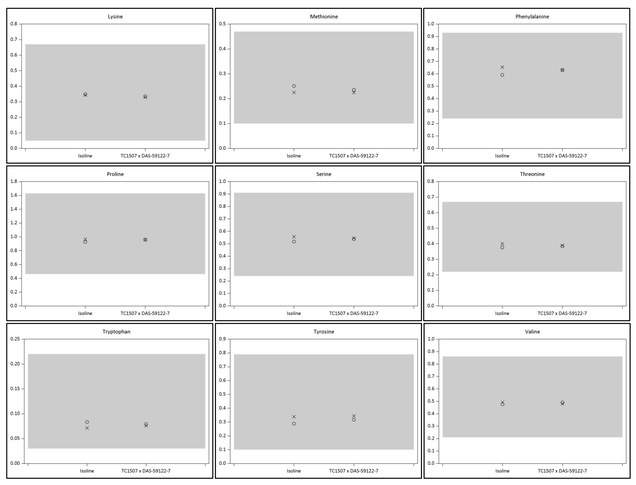


Figure 5. Amino Acids (% dry-wt) in TC1507×DAS-59122-7 and isoline maize grain.



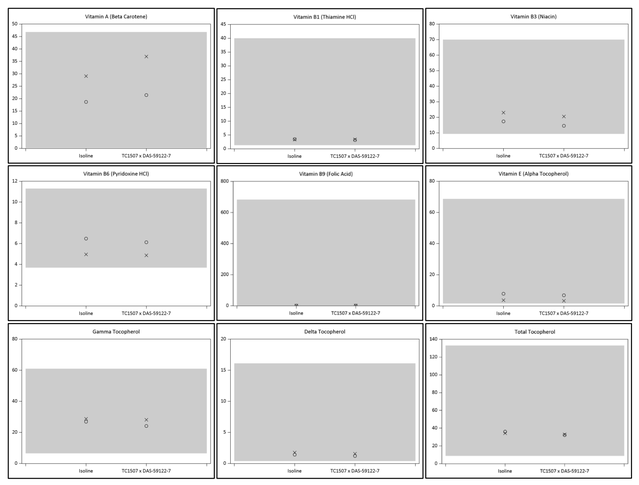


Figure 6. Vitamins (mg/Kg dry-wt) in TC1507×DAS-59122-7 and isoline maize grain.

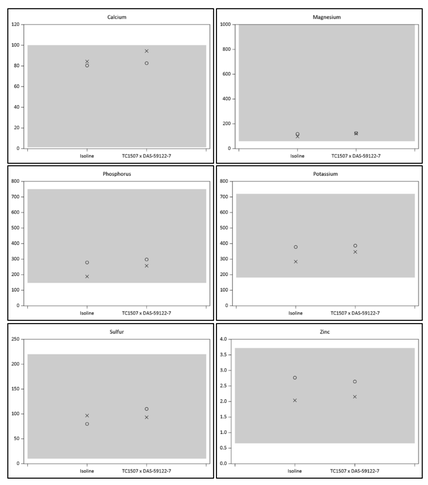


Figure 7. Minerals (mg/100 g dry-wt) in TC1507×DAS-59122-7 and isoline maize grain.

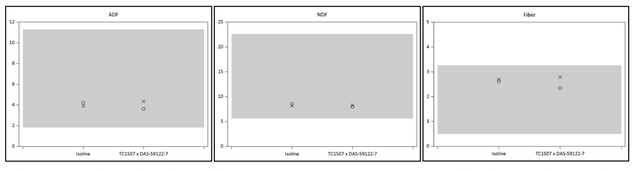


Figure 8. Fiber (% dry-wt) in TC1507×DAS-59122-7 and isoline maize grain.

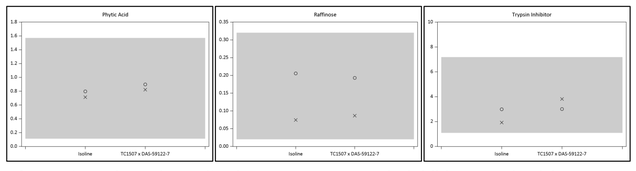


Figure 9. Anti-Nutrients (% dry-wt, except trypsin inhibitor: TIU/mg) in TC1507×DAS-59122-7 and isoline maize grain.

Note 1: Symbols for each location: ○ = Mogi Mirim; × = Indianópolis. Literature range is shaded for each analyte (when available).
Note 2: Analytes for which more than 50% of data was <LOQ were excluded from analysis: forage (copper, cystine, methionine and tryptophan) and grain (12:0 lauric, 14:0 myristic, 18:3 gamma linolenic, 20:2 eicosadienoic, 20:3 eicosadienoic, 20:4 arachidonic and 22:1 erucic, vitamin B_2, beta tocopherol).
Note 3: Results not shown for some fatty acids and minerals: <LOQ or trace amounts were detected.

CONCLUSIONS

The forage and grain composition profile for TC1507 × DAS-59122-7 maize was statistically indistinguishable from the non-transgenic control. Composition values were also within the reported literature range (when available) with exceptions for sodium in forage and 24:0 lignoceric in grain, where values did not differ from the control ($P > 0.05$). Analyte results from the non-transgenic crop demonstrate that current literature ranges could benefit from a broader sampling of environments and germplasm. In conclusion, composition results indicate substantial equivalence between TC1507 × DAS-59122-7 maize and conventional maize, and confirm the compositional safety of the transgenic hybrid stack.

REFERENCES

1. Watson, S. A. 1982. Maize: amazing maize, CRC handbook of processing and utilization in agriculture, vol. II, part 1. plant products I. A. Wolf (ed.) CRC Press Inc., pp. 3-29, Florida.

2. Watson, S. A. 1987. Structure and composition, maize: chemistry and technology, S.A. Watson and P. E. Ransted (eds.), American Association of Cereal Chemists, Inc., pp. 53-82, Minnesota.

3. ILSI (International Life Sciences Institute). 2006. ILSI Crop Composition Database. www.cropcomposition.org. Version 3.0, http://www.cropcomposition.org.

4. OECD.2002. Consensus document on compositional considerations for new varieties of maize (*Zea mays*): key food and feed nutrients, anti-nutrients and secondary plant metabolites. ENV/JM/MONO (2002) 25. 42p.

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