Developing a tool for progeny tests based on digital images

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- Apomixis is a type of asexual reproduction in plants that implies the production of offspring without fertilization, guaranteeing the genetic homogeneity of crops, as well as of the seed produced.

- Currently, the use of tools such as **image capture and machine learning analysis** allows to improve the efficiency of the traditionals progeny tests by eliminating the bias and fatigue of human evaluators when performing evaluations on a large set of hybrids.

OBJETIVE

Develop an image capture and automatic learning tool that allows progeny testing based on plant morphology applied to the Tropical Forages Breeding program.

PROGRESS

Currently, the tropical forages breeding program is developing and testing a tool for such purpose and described below

Collecting a dataset of images of hybrids that exhibit apomictic reproduction, as well as images of hybrids that do not exhibit this type of reproduction (Figure 1A)

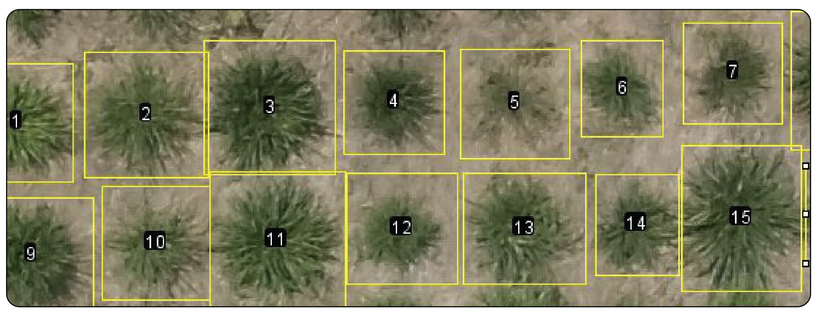

Figure 1A. Digital imaging from nadir perspective of plants.

Using morphometrics to describe and quantify differences in form between different plants (Figure 1B).

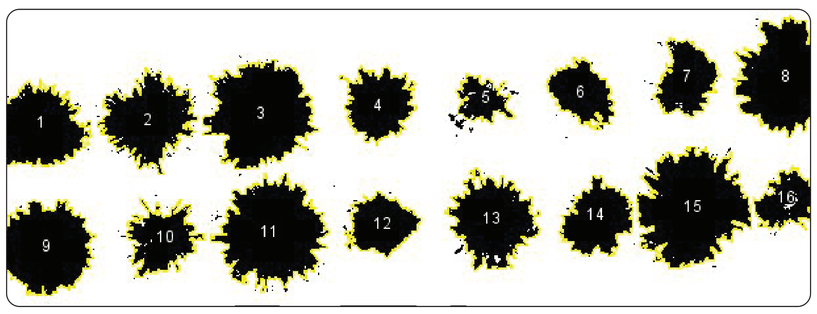

Figure 1B. Morphometrics to describe and quantify form of different plants.

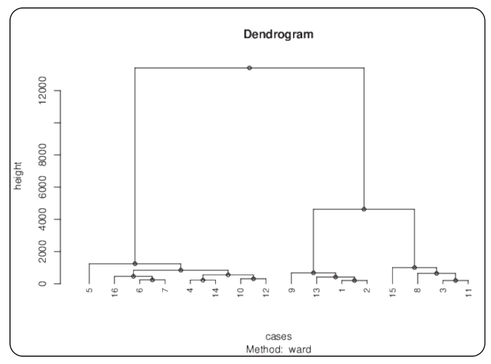

Figure 1C. Algorithms to describe similarities between plants .

Clustering of plants according to similarities (Figure 1C).

NEXT STEPS

We will use machine learning models to build a tool for testing for apomixes. Some popular options include convolutional neural networks (CNNs), which are particularly well-suited for image classification tasks, and support vector machines (SVMs), which are a type of supervised learning algorithm that can be used for classification tasks.

Once the model is trained, we'll evaluate its performance on the test set to see how well it can identify apomictic reproduction in forage hybrids. Different metrics will be used to evaluate the model's performance, such as accuracy, precision, and recall.

Once there is a model that performs well it is envisioned that a standalone app or a web-based app will be created to use digital images and machine learning for routinary progeny tests in the tropical forages program.

Acknowledgments

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