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MODELING THE CORRELATION AND THE CAUSE-AND-EFFECT RELATIONSHIPS BETWEEN MORPHOLOGICAL TRAITS AND VEGETATION INDICES ON ELEPHANT GRASS CLONES VIA SPATIAL STATISTICS

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RESUMO

Excessive use on non-renewable energy sources is a major risk factor for environmental instability. Researching and encouraging the use of renewable energy sources, such as elephant grass is essential to reduce the humanity's carbon footprint. Recently, unmanned aerial vehicles has been standing out as a powerful tool for understanding the relationship between vegetation indices (VI's) and agronomic traits. However, statistical tests must be performed to evaluate the accuracy of these methods on making predictions. Also, spatial sources of variation should be accounted, in order to minimize residual variance. In this context, the aim of this work was to compare the correlation between morphological traits – plant height (cm), dry matter (Mg ha−1 year−1) and dry matter content (%) - and VI's measured on elephant grass clones. A non-spatial linear mixed model and the best-fitted model via spatial statistics were used to calculate and compare the correlation magnitude and the cause-effect of eight indices with these traits. 22 elephant grass genotypes were studied on a randomized block design with three replications, using a three 4-meter lines plot. For some traits, the most suitable residual model was the one that considered an auto-regressive correlation between rows and between columns. Dry matter content was the only trait that had significant correlation with some indices. In general, the spatial correction decreases the magnitude of the correlation between traits and the VI's. The largest difference in correlation's magnitude was observed for dry matter content and the EVI index (- 16%). Additionally, the path analyses showed that different vegetation indices contributed to explain the direct and indirect variations on dry matter content, when we compare the basic and the best-fitted model. Thus, spatial analysis was effective to identify the spatial influence on the correlation's magnitude and in the cause-and-effect relationships between morphological traits and vegetation indices.

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PALAVRAS-CHAVE: Forage breeding, High-throughput phenotyping, Quantitative genetics

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