

Starch Yield Based on Physical Dimensions and Age of Sago Palm: A Mathematical Model

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Abstract

This study employed firefly algorithm (FA) to generate a mathematical model of sago palm's potential starch yield based on the physical dimensions, namely, diameter breast height (DBH), palm height, and age. Three environmental conditions (i.e., dry, wet, and submerged) were taken into consideration in the modelling process using the general linear and nonlinear models. Moreover, the resulting models were assessed using sum of squared residuals (SSR) as FA's fitness function and mean absolute percentage error (MAPE) for the models' accuracy. Results show that general linear models are the best fit models for the sago palms growing in the three different environmental conditions with respect to the considered parameters. These models were used to quantitatively describe the underlying relationships between the starch yield with respect to the physical dimensions and age in order to determine the maximum potential starch yield of sago palm for the different environmental conditions. The models estimate that the maximum potential starch yield for dry, wet, and submerged environmental conditions are as follows: 0.75 m, 0.35 m, and 0.75 m for DBH, respectively; 10.5 m for palm height for all three; and 11.5 years, 15.5 years, and 15.5 years for age, respectively. These results will be able to aid farmers and potential investors in maximizing their sago starch produce. This will also help them as a guide for identifying harvestable sago palms which can be incorporated in their harvest plan.