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# Yield forecasting in cardamom (*Elettaria cardamomum* Maton) plantations under intensive management

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**Abstract**

A study was undertaken to develop a model for forecasting the yield in cardamom plantations under intensive management. Thirteen biometrical characters namely tillers per clump, tiller height, leaves per tiller, vegetative buds per clump, bearing tillers per clump, panicles per clump, panicle length, racemes per panicle, capsules per raceme, seeds per capsule, leaf length, leaf breadth and recovery percentage were chosen as explanatory variables and they exhibited a precision of about 82%. Step down regression resulted in the retention of only four characters namely, panicles per clump, racemes per panicle, capsules per raceme and leaf breadth with which yield can be estimated with around 77% precision.

**Key words**: cardamom, *Elettaria cardamomum*, multiple regression, yield forecasting

Yield forecasting is very essential to device marketing strategies of agricultural crops. Various forecasting methods were developed for annual crops (Singh *et al.* 1979). Studies were also made in a few perennial crops viz. cocoa (Vernon 1971), coconut (Arulraj *et al.* 1979), cashew (George *et al.* 1982) and clove (Martin & Riley 1989). Sankaran *et al.* (1996) developed a model for the yield estimation of cardamom under average management. Presently, owing to attractive price for the produce, most of the cardamom plantations are under intensive management and the above said model does not work under such situations. Hence attempts were made to estimate the yield in cardamom under intensive management based on biometrical observations.

One hundred and ten yielding plants were selected at random from a well managed plantation wherein cultural practices for intensive management were followed. Thirteen biometrical characters namely tillers clump$^{-1}$ ($x_1$), tiller height ($x_2$), leaves tiller$^{-1}$ ($x_3$), vegetative buds clump$^{-1}$ ($x_4$), bearing tillers clump$^{-1}$ ($x_5$), panicles clump$^{-1}$ ($x_6$), panicle length ($x_7$), racemes panicle$^{-1}$ ($x_8$), capsules raceme$^{-1}$($x_9$), seeds capsule$^{-1}$ ($x_{10}$), leaf length ($x_{11}$), leaf breadth ($x_{12}$) and recovery percentage ($x_{13}$) were recorded from the selected plants. The actual yield (Y) of individual plants was also recorded and used as the dependent variable for analysis. Step down regression is one of the methods for eliminating less important characters in a multiple regression model. A step down multiple regression equation of the form $Y = b_0 + Ób_ix_i$ was worked out based on the method suggested by Wonnacot & Wonnacot (1970). The regression coefficients were tested for significance and the independent variables were deleted one by one on the basis of the significance of the partial regression coefficients. The model was refined using the most significant attributes which are easy to record in the plantations such as panicles clump$^{-1}$, racemes panicle$^{-1}$, capsules raceme$^{-1}$ and leaf breadth.

The regression model after eliminating the non-significant variables resulted in the following model.

$$Y = -2.577 + .0105x_6^{**} + .0251x_8^{**} + .105x_9^{**} + .116x_{12}^{**} \ (R^2 = 0.77)$$

This model was verified in the field with twelve promising clones which revealed a mean precision of 87.6 per cent (Table 1).

The price behaviour in cardamom is highly seasonal and hence early information on the production that can be expected is essential in deciding the market strategies. Further, the international prices and local production figures do have a direct bearing on the current year prices (Tomy & Naidu 1992). Since harvest of cardamom continues for a longer period, recording the yield of individual plants may not be feasible all the time. In this context the model proposed is very relevant for estimating the production well in advance and thereby to make a market commitment for better returns for the produce.

**Table 1.** Observed and estimated yield in cardamom

| Clone | Observed yield (kg plant$^{-1}$) | Estimated yield (kg plant$^{-1}$) | Precision (%) |
|---|---|---|---|
| ICRI-2 | 0.91 | 1.05 | 86.6 |
| MCC-21 | 1.24 | 1.13 | 91.1 |
| MCC-73 | 2.05 | 1.86 | 90.7 |
| MCC-85 | 1.06 | 0.94 | 88.7 |
| MCC-260 | 1.19 | 1.02 | 85.7 |
| MCC-346 | 1.06 | 1.19 | 89.1 |
| MHC-13 | 1.27 | 1.13 | 88.9 |
| MHC-18 | 1.17 | 0.93 | 79.5 |
| MHC-22 | 1.38 | 1.29 | 93.5 |
| MHC-23 | 1.61 | 1.38 | 85.7 |
| MHC-24 | 1.73 | 1.42 | 82.1 |
| MHC-26 | 2.29 | 2.04 | 89.1 |

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