

## Abstract

Field experiment was conducted at horticultural research and teaching farm of Chuka University to evaluate the responses of watermelon to organic manure using Central Composite Design (CCD) to formulate optimal organic manure that maximizes growth and yield of watermelon. The objective was to optimize the multiple responses of watermelon to organic manure using desirability function. A 5-level-3-factor central composite design was employed where optimization required 20 experimental runs. The parameters assessed were vine length, number of branches per plant and fruit weight of watermelon. A statistical model of the second-order that best fits the data was used to achieve the objective. Desirability function approach for simultaneous optimization of several response variables was adopted in this study. The findings revealed that the process was well optimized, because the indices were very close or equal to the condition great value of one. The study found that the optimal values of watermelon responses are 93.73 t/ha of fruit weight at maturity, 9 branches/plant and vine length of 225.43 cm at 8 weeks. Based on the findings of the present study, it was recommended that farmers in the study area apply 17.64 t/ha, 11.17 t/ha and 18.05 t/ha of poultry, goat and cow manure, respectively, for increased growth and yield of watermelon. Further research may be commissioned with CCD, Box–Behnken and Doehlert design approach to plan the experiments for growth and yield of watermelon with an overall objective of optimizing the responses (such as number of fruits per plant and number of leaves per plant) of watermelon to organic manure (poultry manure, goat manure, rabbit manure and donkey manure). The study exemplified that the development of statistical models for crop production can be useful for predicting and understanding the effects of experimental factors.