# Response surface survival analysis methodology for block design

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A new methodology is presented to fit a surface model in a block survival problem, the estimation of the parameters involved in the proposed model is performed where the variable of interest is the time until the occurrence of an event. Theoretical development is carried out for the construction, estimation and validation of assumptions, using as a basis the Cox proportional hazards model and the response surface methodology. An adaptation of the classical tie correction methods is also developed for the proposed methodology. To evaluate the performance of the proposed model in comparison with other models, a simulation study is conducted to investigate the performance, properties and suitability of the model in previously specified scenarios. The results show that by combining the proportional hazard model with the response surface methodology, it is possible to identify the levels of treatments that optimize the response variable. A mortality study is carried out on grafted Inchi plants, considering the following factors: nitrogen doses (9, 12 and 18 gr of urea (46% N) plant-1/application) and time of removal of the plastic covering the graft (60, 90 and 120 days after grafting). In addition, the sex of the donor plant is taken into account as a natural block that eliminates the effects of unknown sources. Finally, this methodology has the advantage of being able to include the block which allows reducing the experimental error, improving efficiency by detecting differences between treatments, allowing more reliable comparisons between treatments.

**Keywords**: Proportional hazard, response surface methodology, block design, tie correction, time to event.