A measure of effectiveness of treatments based on Bayesian logistic regression models: an application to Agriculture

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In several studies, the relevant information focuses not only on a response variable, but also on other outputs with an important role in decision-making. In this context, an epidemiological experiment was carried out with tiger nuts (aka chufa), *Cyperus sculentus*, an herbaceous plant with edible tubers which are used to prepare a popular soft drink in Valencia, Spain. The aim of the study was to analyze the effectiveness of different chemical and thermal treatments for reducing black spots in harvested tubers with regard to their germination rate. Bayesian logistic regression models were considered for analyzing the number of asymptomatic tubers (non-black spots) and the number of germinated seeds. We combine the results obtained for the asymptomatic tubers rate and the germination rate. The weights of this combination may be modified by the researcher/farmer, according to their priority interest. The results individually show some antagonistic characteristics, but when combined their visualization is simpler. Thermal treatments have poor effectiveness when the germination rate is prioritized and furthermore, the chemical treatment with hydrochloric acid produces the best results; otherwise the best option is the chemical treatment with sodium hypochlorite and thermally untreated. In conclusion, our study has been very useful to measure the effect of the treatments based on different priorities; furthermore, the Bayesian perspective favors the intuitive interpretation of the results and it may also include other mechanisms for analysis, such as the construction of credible intervals for the combined probabilities.

Keywords: Bayesian inference; Asymptomatic tubers rate; Germination rate.