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A STATISTICAL APPROACH TO MEDIUM OPTIMIZATION FOR
GROWTH AND TOXIN PRODUCTION BY THE BACTERIUM
BACILLUS THURINGIENSIS

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for the degree of Master of Technology in Biotechnology

at

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SUMMARY

A study has been made to determine the optimum medium composition, on a shake-flask scale, for maximum growth, sporulation and crystal protein toxin production by Bacillus thuringiensis. This medium-screening exercise was performed using statistical experimental design and mathematical modelling techniques. These techniques have been widely used in the chemical industry for process optimisation, but have only rarely been applied to microbiological studies. Thus, it was hoped to determine whether the techniques could be successfully applied to this situation.

Five nutrients were used for the medium-screening exercise, viz glucose, magnesium sulphate, ammonium chloride, yeast extract and potassium dihydrogen phosphate. The data obtained, and analysis of the data, provided strong evidence that these nutrients did not provide the complete growth requirements of the organism. For this reason, the optimum medium composition was not satisfactorily determined.

The modelling techniques used proved satisfactory, particularly in recognising interactions between nutrients, and pointing the experimenter in the correct direction, but because of the incomplete growth medium used their full potential for optimisation was not realised.

However, the work does suggest that the modelling techniques will have a role to play in microbiological exercises of this type,

provided that there is sufficient knowledge of the growth requirements of the organism under study.

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