

**Kafirin biofilm quality:
Effect of sorghum variety and milling
fractions**

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**SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE DEGREE**

MSc (Agric) Food Science and Technology

**IN THE
DEPARTMENT OF FOOD SCIENCE
FACULTY OF NATURAL AND AGRICULTURAL SCIENCES
UNIVERSITY OF PRETORIA
SOUTH AFRICA**

MAY 2003

DECLARATION

I declare that the dissertation herewith submitted for the degree MSc (Agric) Food Science and Technology at the University of Pretoria, has not previously been submitted by me for a degree at any other university or institution of higher education.

Laura da Silva

ABSTRACT

**Kafirin biofilm quality:
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**By
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Degree: MSc (Agric) Food Science and Technology

Research was done to determine if sorghum bran could be a potential source of kafirin for biofilm preparation. Condensed tannin-free red and white sorghum were decorticated by abrasion until approximately 10% or 25% grain by weight was removed. Kafirin was extracted from the different milling fractions using hot aqueous ethanol with alkali and reducing agent. Kafirin and commercial zein were defatted and free-standing biofilms were prepared by casting in hot aqueous ethanol with added plasticizer.

Compared to whole grain and extraction flours, the brans were darker and considerably higher in protein, fat and polyphenols. This is due to the removal of these components from the grain during abrasive decortication, and their being concentrated in the bran. However, the yield of kafirin from the brans was somewhat lower, due to the fact that kafirin is located solely in the endosperm. The protein extracted from the different dry milling fractions was pure kafirin. However, the purity of the different kafirin preparations was found to differ. Kafirin extracted from the brans was less pure, containing higher levels of fat, non-starch polysaccharides and polyphenols compared to kafirin extracted from whole grain and extraction flours. Higher levels of polyphenols in the kafirin extracted from the brans resulted in the bran kafirin being highly coloured, particularly kafirin from red sorghum bran.

All the kafirin preparations, including those from bran, were able to form biofilms. Kafirin biofilms were stronger, but had poorer elongation compared to zein biofilm. This could be due to the presence of β - and γ -kafirin polypeptides in the kafirin, resulting in high levels of disulphide cross-linking in these films. It is possible that better plasticization could improve the elongation properties of all kafirin biofilms. Kafirin biofilms also had poorer water barrier properties compared to the zein biofilm, possibly related to the fact that the kafirin biofilms were thicker. Higher levels of contaminants in the bran kafirin biofilms resulted in these “multicomponent” films being more highly coloured, less clear and flexible, with stronger odour and rougher surface texture, compared to the other kafirin biofilms. High levels of polyphenols in bran kafirin biofilms could be beneficial by imparting antioxidant activity, possibly prevent oxidative rancidity of the fats in the biofilms and high fat foods such as nuts. Furthermore, the high levels of fats in kafirin prepared from bran could improve the mechanical and water barrier properties of these films, due to the plasticizing and hydrophobic properties of the fats, respectively.

ACKNOWLEDGEMENTS

I would sincerely like to thank:

Prof. John R. N. Taylor for his guidance and advice in the planning and practical approach to this project; for his patience, constructive criticism and quick response with regards to reviewing the thesis.

Mrs. Janet Taylor and Mr. Naushad Emmambux, for their friendship, guidance and support.

The staff of the Department of Food Science, for their support and encouragement.

CSIR, BIO/CHEMTEK for the use of their pilot plant facilities.

European Union (project ICA4-CT-2001-10062) for funding this project.

University of Pretoria and National Research Foundation for financial support.

My husband and best friend, José, for his support and encouragement over the last two years.

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