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Expression and production of recombinant frutalin in different expression systems and evaluation of its biomedical applications

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Frutalin is the α-D-galactose-binding lectin expressed in breadfruit seeds (*Artocarpus incisa*). This lectin may be used in cancer diagnostics/therapeutics due to its potential ability to recognise specific carbohydrates expressed in cancer cells membranes and/or cells surface receptors. However, frutalin extraction from plant seeds is a time-consuming process and typically results in a heterogeneous mixture of different natural isoforms. To overcome these limitations, frutalin was cloned and expressed in *Pichia pastoris* [1] and *Escherichia coli* [2]. Recombinant frutalin was detected in cultures of these microorganisms by SDS-PAGE and Western blot analysis. The higher recombinant frutalin yield was obtained in the *P. pastoris* expression system (up to 20 mg/L). Molecular and biological differences were found between each recombinant and native frutalin. Potential biomedical applications for native frutalin and recombinant frutalin produced in *P. pastoris* were studied. Recombinant frutalin demonstrated higher capacity than native frutalin to differentiate malign from benign human prostate diseases by immunohistochemistry (with a significant positive statistical correlation, $P<0.00001$), in spite of its lower carbohydrate-binding affinity [3]. In addition, native and recombinant frutalin showed an identical magnitude of cytotoxicity on HeLa cervical cancer cells growth (IC_{50}=100 μg/mL, 24 h), by inducing cell apoptosis and inhibiting cell proliferation and migration. Interaction studies conducted by confocal microscopy showed that native and recombinant frutalin were internalised and targeted to HeLa cell's nucleus within 1 h of incubation. Therefore, frutalin with promising application in cancer diagnosis and therapy might be obtained from the recombinant *P. pastoris* expression system in alternative to its natural source.

References

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