The effect of gamma irradiation on astaxanthin synthetase encoding gene in two mutant strains of Phaffia rhodozyma

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Background and Objectives

Astaxanthin, an orange-red carotenoid pigment, acts as a protective agent against oxidative damage to cells in vivo. The astaxanthin synthetase gene (crtS) size consists of 3995 bp. This gene has been suggested to catalyse β-carotene to astaxanthin in Phaffia rhodozyma. The aim of this research was to find any possible changes in this gene in two mutant strains, Gam1 and Gam2 (with high astaxanthin pigment production), previously created by gamma irradiation.

Materials and Methods

The astaxanthin synthetase gene sequence of Phaffia rhodozyma in the NCBI Gene bank was used to design primer. In Gam1, this gene was amplified using primers Asta F1, Asta R2, Asta F3, Asta R4. In Gam2, primers asta F1, asta R4 were used to amplify the gene. The amplified fragments were 8 sequenced using primers Asta F1, Asta R1, Asta F2, Asta R2, Asta F3, Asta R3 and Asta F4, Asta R4. Astaxanthin synthetase gene from two mutant strains, Gam1 and Gam2 were amplified using PCR. The amplified products were sequenced and aligned using the ClustalW software.

Conclusion

The comparison of this gene showed 98% and 99% similarities between the reference sequence and Gam1 and Gam2 mutant strains, respectively, whereas the comparison of this gene in Gam1 and Gam2 mutant strains showed 97% similarity. However, the deduced proteins showed 78% and 83% between the reference protein obtained from the wild type and Gam1 and Gam2, respectively. This similarity was 75% between the mutant strains.

Keywords: Astaxanthin, Phaffia rhodozyma, yeast, Astaxanthin synthetase, cytochrome P450