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Abstract: A natural phenylalanine-rich cyclic peptide - cordyheptapeptide B was synthesized by coupling of *N*-methylated tetrapeptide and tripeptide units after proper deprotection at carboxyl and amino terminals followed by cyclization of linear heptapeptide fragment. Required tetrapeptide and tripeptide units were prepared by coupling of Boc-protected dipeptides *viz*. Boc-Phe-*N*(Me)Gly-OH and Boc-Leu-Ile-OH with respective dipeptide methyl ester Pro-*N*(Me)Phe-OMe and amino acid methyl ester hydrochloride *N*(Me)Phe-OMe.HCl. Cyclization of linear polypeptide unit was done by pentafluorophenyl ester method. The structure of synthesized cyclopeptide was elucidated by spectral as well as elemental analysis. The newly synthesized cyclopeptide was evaluated for its antimicrobial and cytotoxic potential, and found to exhibit potent cytotoxicity against *Dalton's lymphoma ascites* (DLA) and *Ehrlich's ascites carcinoma* (EAC) cell lines, in addition to good antidermatophyte activity against *Trichophyton mentagrophytes* and *Microsporum audouinii*. Moreover, cyclopeptide displayed moderate antimicrobial activity against gram negative bacteria *Pseudomonas aeruginosa* and *Klebsiella pneumonia*.

Key words: *Cordyceps* sp, Cyclic heptapeptide, Peptide synthesis, Cytotoxicity, Antidermatophyte activity, Antibacterial activity.

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