

## ***In vitro* Investigation of *Mucuna pruriens* Seed Extracts to Treat Erectile Dysfunction**

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<https://doi.org/10.12982/CMUJNS.2018.0011>

### ABSTRACT

*M. pruriens* seeds are a natural product with health benefits, including treating erectile dysfunction (ED). However, the active compounds and their mechanisms of action are unclear. In this study, we used polarity gradient extraction to isolate four fractions from the crude extract of *M. pruriens* seeds using hexane, EtOAc, BuOH, and water. All fractions were used to treat three cell lines: C6, Ea.hy926, and HCT-15. The water fraction significantly promoted nitric oxide (NO) production in C6 cells via neuronal nitric oxide synthase (nNOS) gene upregulation. *M. pruriens* fractions with high polarity promoted NO production in Ea.hy926 through the upregulation of endothelial NOS (eNOS) and inducible NOS (iNOS) genes. The BuOH and water fractions of *M. pruriens* extract were involved with cyclic GMP specific-phosphodiesterase (PDE5) and iNOS gene upregulation in HCT-15, which might result in maintenance of intracellular cGMP. According to the NIST library, 2,4-bis(1,1-dimethylethyl)-phenol, a phytochemical, may play a role in nNOS upregulation; this was only found in the water fraction. Protocatechuic acid, methyl ester, and  $\gamma$ -sitosterol were also found in the high-polar fractions of *M. pruriens* extract and might be involved with eNOS gene upregulation. The ability of *M. pruriens* extract to provoke NO production in neurons indicated the potential for using *M. pruriens* seeds as an alternative medicine for erectile dysfunction therapy.

**Keywords:** *Mucuna pruriens*, Erectile dysfunction, Nitric oxide, GC/MS

### INTRODUCTION

Erectile dysfunction (ED), or the failure to achieve or maintain sufficient penile erection for sexual intercourse (NIH, 1993), is one of the most common forms of deteriorating organ function among aging men (Prins et al., 2002). The trigger includes impaired function of vascular arteries and the smooth muscles or neurons within the penile tissues (Dean and Lue, 2005; Gratzke et al., 2010). In the cellular mechanism of a penile erection, nitric oxide (NO), which is produced by endothelial cells and neurons, plays an important role in cellular stimulation through activation via the NO/cGMP pathway; but NO is reduced in ED