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On the Efficacy of Silverberry (*Elaeagnus pyriformis*) for the Management of Oxidative Stress-Induced Male Infertility: an *ex vivo* Study

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ABSTRACT

Male infertility is a multifaceted medical condition that has a detrimental effect on reproductive health worldwide. Testicular dysfunction is mainly associated with oxidative damage caused by an unhealthy contemporary lifestyle. The present work utilized an *ex vivo* experimental model to examine the protective effect of resveratrol, derived from *Elaeagnus pyriformis* (EP) fruit, against H_2O_2-mediated oxidative testicular damage in rat. The pharmacological potential of EP fruit extract was evaluated using FTIR, GC-MS, and HR-Orbitrap LC-MS analyses to identify polyphenolic compounds. Resveratrol, a key polyphenol, was tested *ex vivo* at varying concentrations of 5 – 40 mg/L to assess its effects on antioxidant enzyme activity, lipid profile (TC, HDL-C, TG, LDL-C), and rat sperm viability under oxidative stress, employing acridine orange-propidium iodide dual staining. The results are corroborated by an *in-silico* molecular docking analysis, which revealed significant inhibitory potential of resveratrol (-7.8 kcal/mol) against the stress protein NOX2. Resveratrol treatment found to restore altered lipid metabolism, reduce NADPH oxidase (NOX) activity by 39–55%, upregulation of key enzymatic [superoxide dismutase (SOD; ~165–172%), catalase (CAT; ~16–38%)] and non-enzymatic antioxidants [glutathione (GSH; ~18.5–91.43%)], regenerate histological structures, and maintains sperm viability in an *ex vivo* model. This study investigated the protective effects of resveratrol, found in *Elaeagnus pyriformis*, against oxidative damage in the testes. The findings indicate the potential of EP to be an effective remedy for male infertility problems caused by stress.

Keywords: unhealthy diet, oxidative stress, underutilized fruit, bioactive compound, resveratrol, sperm viability

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References:

1. Hazra, B.; Sarkar, R.; Biswas, S.; Mandal, N. Comparative study of the antioxidant and reactive oxygen species scavenging properties in the extracts of the fruits of Terminalia chebula, Terminalia belerica and Emblica officinalis. BMC Complement. *Altern. Med.* **2010,** *10*, 1–15.
2. Higbee, J.; Solverson, P.; Zhu, M.; Carbonero, F. The emerging role of dark berry polyphenols in human health and nutrition. *Food Front.* **2022,** *3*, 3–27. DOI: 10.1002/fft2.128
3. James, L. P.; McCullough, S.S.; Knight, T.R.; et al. Acetaminophen toxicity in mice lacking NADPH oxidase activity: role of peroxynitrite formation and mitochondrial oxidant stress. *Free Radic. Res.* **2003,** *37*, 1289–1297.
4. Jung, C.; Maeder, V.; Funk, F.; Frey, B.; Sticher, H.; Frossard, E. Release of phenols from Lupinus albus L. roots exposed to Cu and their possible role in Cu detoxification. *PLANT SOIL.* **2003,** *252,* 301–312.
5. Jungnickel, M.K.; Marrero, H.; Birnbaumer, L.; Lémos, J.R.; Florman, H.M. Trp2 regulates entry of Ca^{2+} into mouse sperm triggered by egg ZP3. *Nat. Cell Biol.* **2001,** *3*, 499–502.

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