

***Ocimum gratissimum* as an Analgesic and Hepatoprotective Plant**

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Any kind of metabolic abnormality in insulin pathway causes health problems, which makes the body highly vulnerable to other disease like diabetes, dyslipidemia, hypertension and liver disorders (Marchesini *et al.*, 2003; Lim and Kim, 2008; Pervez, 2000). This altogether with hepatitis B-C infection, aggressively increases the risk of liver failure and mortality. Liver is involved in anabolic/catabolic reactions of several proteins, lipids, blood cells and toxic compounds, thus any problematic effects on it will cause heavy burden on human health. As it is the 3rd leading disease, causing mortality in Minnesota, USA; impaired fasting glucose and cirrhosis increase the death rate of liver patients (Adams *et al.*, 2005). Liver disorders are usually linked with an increase in its enzyme concentration (Harris, 2005). For example in diabetes 2 patients, diseased liver has elevated levels of serum aminotransferases, Alanine aminotransferase (ALT), Alkaline Phosphatase (AP) and Aspartate aminotransferase (AST) etc. The increase in these enzyme levels is a major cause for end stage liver disease and patient's death (Ekstedt *et al.*, 2006). Hence metabolic problems severely affect liver, which needs great attention and plants can efficiently behave as hepatoprotectants (Garba *et al.*, 2006), which is likely to be due to their phytochemical composition. *Ocimum gratissimum* is medicinally important plant; it has large variety of phytochemicals and possesses analgesic effects (Okiemy-Andissa *et al.*, 2004; Vieira *et al.*, 2001). It is used in folk medicines and its analgesic effective concentrations, when used in combination with other herbs do not cause any toxicity in mice body (Iroanya *et al.*, 2010). Moreover it is also responsible for anti-inflammatory effects in mice. The methanolic extracts of its leaves have anti-ulcer activity and are able to protect the rat's stomach from ethanol and indomethacin-induced ulcers (Akah *et al.*, 2007). Its extract has concentration dependant relaxation effect on the rabbit jejunum and does not cause any sign of acute toxicity. Its methanolic extract is rich with flavonoids, tannins, saponins, steroids, alkaloid etc., which are responsible for its gastroprotective effects. Thus it is a rich source of phytochemicals and may also be helpful in the treatment of liver diseases.

Many practitioners consider *O. gratissimu* leaves as a good remedial source and Uhegbu *et al.* (2012) studied its claimed analgesic and hepatoprotective activities. For analgesic studies, a concentration dependant effect of its methanolic extracts was examined on mice when subjected to thermal-induced pain. These extracts delayed the time of pain perception from 3.2 ± 0.25 sec (pretreatment reading) to 11.56 ± 0.15 sec (after treatment reading for extract's maximum concentration used). All other (100 and 200 mg kg⁻¹) concentration were also effective and their effects were non-significantly different from the maximum (300 mg kg⁻¹) concentration and standard drug: acetylsalicylic acid. Thus *O. gratissimum* extracts was effective in lowering the pain at all concentrations. Its extract also showed distinctive hepatoprotection against CCl₄ caused liver toxicity. The CCl₄ implementation damaged liver's veins and cells architecture; it also caused necrosis in many liver cells mainly due to increase in fat and some degrading enzymes. But the application of *O. gratissimum*'s methanolic extract conserved the liver cells and tissues from its adverse damage, as its application maintained the cells-veins arrangement and their physiology as well. Thus *O. gratissimum* protected the anatomical structure of liver from cytotoxication. However this was not all, its extract also protected the liver from the extensive increase in catabolic enzymes level, which were AST, ALT and ALP. The increase in enzymes level damaged the liver tissue and the application of plants methanolic extract lowered their level. Highest remedial effect was on ALP enzyme level, as the extract lowered its level from 55.4 ± 0.27 to 30.2 ± 0.01 , while its value in healthy group was 26.2 ± 1.32 . The extracts effect on other enzymes (AST and ALT) was also significant and their levels were non-significantly different from healthy control group. Thus it can be said that enzyme level lowering activity of *O. gratissimum* extracts, made it an important hepatoprotective agent. As the determination of enzyme levels are important to estimate the liver's health (Somchit *et al.*, 2005; Satyapal *et al.*, 2008). Moreover its use as analgesic agent would also help in lowering the demands of acetylsalicylic acid, because the use of acetylsalicylic acid could severely damage liver (Bjornsson and Olsson, 2005). Acetylsalicylic acid was also responsible for ecotoxicity (Cleuvers, 2004) and its reduction would protect environment. Thus *O. gratissimum*'s analgesic and hepatoprotective property would help in saving the lives from acetylsalicylic acid caused toxicity.

So, it can be said that *O. gratissimum* is medicinally important plant; it has analgesic, gastroprotective and anti-inflammatory effects. Moreover the therapeutically effective concentration of its extracts does not cause acute toxicity or death of tested animal, thus its use may be safe for humans also. According to Uhegbu *et al.* (2012), its

methanolic extracts were excellent hepatoprotectant and its analgesic property was comparable to that of acetylsalicylic acid (a potential cytotoxic pain killer). Thus its use will favor the human health more than acetylsalicylic acid; hence there should be more research on its possible cytotoxic levels and effective phytochemicals. This will guide the medicinal chemists for developing safer painkiller or hepatoprotective drug.

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