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An Overview of the phytochemical, in Vitro, in Vivo, and Clinical Evidence Supporting Rosa Damascena's Antioxidant Potential

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ABSTRACT. This article is a comprehensive narrative review of the published evidence on Rosa damascena antioxidant activity. The main aim is to summarise relevant findings from phytochemical, in vitro, in vivo and limited clinical trials and to identify research gaps that could be addressed in future studies. Given the narrative nature of this review, the results should be seen as a basis for formulating hypotheses rather than conclusive evidence of efficacy. Resources for this review have been collected through searches in the databases of PubMed, Scopus, the Web of Science and Google Scholar until the end of 2025. Keywords included: 'Rosa damascena', 'Damask rose', 'antioxidant', 'oxidative stress', 'DPHP', 'MDA', 'in vivo', and 'clinical studies'. Studies which focused only on the aromatic or aesthetic characteristics of the plant have been excluded. Rosa damascena, also known as the Damask, rose, is a member of the Crassulaceae family and is found in northern Asia and in the mountains of central Europe. For centuries, the plant has been used as a convenient and effective treatment for a wide range of ailments and in traditional medicine for many ailments, such as anti-inflammatory treatments, menstrual bleeding, digestive disorders, heart and chest pain, and abdominal pain.
Anti-inflammatory effects of R. damascena and its constituents were shown in different inflammatory disorders by reducing white blood cell, neutrophil, eosinophil, and serum levels of inflammatory mediators such as phospholipase A2 and total protein. This important ornamental plant has long been applied for industrial, physiological, and medicinal purposes. The physiological functions of Damask Rose may be somewhat related to the abundance of anthocyanidins and flavonoids. The plant and its constituents showed antioxidant effects by reducing malondialdehyde and nitric oxide levels but increased thiol, superoxide dismutase, and catalase levels in disorders associated with oxidative stress. Therefore anti-inflammatory, antioxidant, and immunomodulatory effects of R. damascena and its constituents, indicate a potential therapeutic effect of the plant and its constituent for treating inflammatory, oxidative, and immune dysregulation disorders. © 2025 Published by Public Knowledge Project (PKP).

Keywords: Rosa damascena, antioxidant, anti-inflammatory, phosphomolybdenum method

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Introduction

1.Antioxidant effects of R. damascena and its main components

The R. damascena similar to many aromatic and medicinal plants exhibits antioxidant properties. Sources of natural antioxidant are primarily phenolics compound that are found in all parts of plants such as the fruits, vegetables, seeds, leaves, roots and barks (Pratt DE & Hudson JE,1990).

The presence of phenolic compound in ethanolic extract of R. damascena has been shown by Kumar et al (2009). They determined antioxidant activity of this extract compare to standard antioxidant L-ascorbic acid by 1, 1-diphenyl-2-picryl hydrazyl (DPPH) free-radical method. This study showed that R. damascena has high antioxidant activities (Kumar N et al.,2009). The antioxidant activity of hydro-alcoholic extract of petals and essential oil of this plant was also evaluated by DPPH for measurement of free radical scavenging activity and by ferric ammonium thiocyanate method for evaluation of lipid peroxidation properties. Additionally, three flavonol glycosides of ethanolic extract including quercetin-3-O-glucoside, kaempferol-3-O rhamnoside and kaempferol- 3-O-arabinoside have antioxidant activity (Yassa N et al.,2009; Boskabady MH et al.,2011).

Both the fresh and spent flowers (dead or dying flowers) have the antioxidant activity, but the extract of fresh flowers has more antioxidant activity as compared to the extract of spent flowers (Özkan G et al.,2004). In ethanol extract, the presence of phenolic compound showed high antioxidant activity (Kumar N et al.,2009).

Method

This article is a comprehensive narrative review of the published evidence on Rosa damascena antioxidant activity. The main aim is to summarise relevant findings from phytochemical, in vitro, in vivo and limited clinical trials and to identify research gaps that could be addressed in future studies. Given the narrative nature of this review, the results should be seen as a basis for formulating hypotheses rather than conclusive evidence of efficacy.

Resources for this review have been collected through searches in the databases of PubMed, Scopus, the Web of Science and Google Scholar until the end of 2025. Keywords included: 'Rosa damascena', 'Damask rose', 'antioxidant', 'oxidative stress', 'DPHP', 'MDA', 'in vivo', and 'clinical studies'. Studies which focused only on the aromatic or aesthetic characteristics of the plant have been excluded. Rosa damascena, also known as the Damask, rose, is a member of the Crassulaceae family and is found in northern Asia and in the mountains of central Europe. For centuries, the plant has been used as a convenient and effective treatment for a wide range of ailments and in traditional medicine for many ailments, such as anti-inflammatory treatments, menstrual bleeding, digestive disorders, heart and chest pain, and abdominal pain.

Results

1.1.In vitro

Evaluation of Antioxidant Activity The antioxidant activities of extracts were evaluated by the formation of phosphomolybdenum complex method according to Prieto et al. (1999). An aliquot of 0.4mL of sample solution (100ppm in methanol) was mixed in a vial with 4mL of reagent solution (0.6M sulphuric acid, 28mM sodium phosphate and 4mM ammonium molybdate). The blank was prepared by replacing the sample with 0.4mL of the methanol sample. The vials were capped and incubated in a water bath at 95°C for 90min. After cooling the samples at room temperature, the absorbance of the mixture was measured at 695nm against the blank. The antioxidant activity was expressed relative to that of ascorbic acid.

Antiradical and Antioxidant Activities The yields of extracts ranged from 10.70 ± 1.93 to 22.27 ± 1.98%, respectively. Total phenolic contents were 276.02 ± 2.93mg GAE/g in FF extract and 248.97 ± 2.96 mg GAE/g (dry basis) in SF extract. When compared to SF extract, FF extract had significantly higher total phenolic contents (Table 1).

FF and SF extracts showed 74.51 ± 1.65 and 75.94 ± 1.72% antiradical activity at 100ppm using the a, a-diphenyl-ß-picrylhydrazyl (DPPH) method. It was observed that there were no statistically significant differences between extracts with respect to antiradical activity. It was found that antiradical activity of BHT at 100 ppm used as a synthetic antioxidant in food industry was 39.02 ± 1.02%. The activity of the extracts is attributed to their hydrogen donating ability (Shimada et al., 1992). It is well known that free radicals cause auto oxidation of unsaturated lipids in food (Kaur and Perkins, 1991).

In comparison with BHT, these data showed that the extracts can be accepted as strong free radical inhibitors and antioxidants. Concerning the antioxidant capacity determined by the phosphomolybdenum method, the values ranged from 372.26 ± 0.96 to 351.36 ± 0.84 mg/g extract (equiv-alent to ascorbic acid). In this case, the antioxidant capacity of FF extract was significantly higher than that of SF extract. The reducing properties are generally associated with the presence of reductones (Pin-Der Duh, 1998) and their antioxidant activity is based on the breaking of the free radical chain by donating a hydrogen atom (Gordon, 1990). According to Jayaprakasha et al. (2003), the antioxidant activity of different extracts may depend on the presence of polyphenols which may act as reductones (Özkan G et al.,2004).

In vitro inhibitory effect on lipid oxidation and antioxidant effect of R. damascena showed that the effect is similar to tocopherol and causes strong antioxidant and lipid peroxi-dation inhibitory effect. This plant is suggested for the treatment and prevention of diseases caused by free radi-cals (Shahriari S et al.,2007; Afsari Sardari F et al.,2019).

AF of Rosa damascena has shown potent antioxidant activity. It inhibits superoxide radical formation, hydroxyl radical generation and lipid peroxide formation in vitro. There are reports that antioxidant drugs exhibit hepato-protective effects (Lin et al., 1998; Babu et al., 2001; Subramoniam & Pushpangadan, 1999).

Table 1. Total yield, total phenolic content, antiradical activity and antioxidant capacity of FF and SF extracts

Extracts	Total yield (%)	Total phenolic contents (mg GAE/g)[a]	Antiradical activity (%)	Antioxidant activity[b] (mg/g)
FF	22.27 ± 1.98	276.02 ± 2.93	74.51 ± 1.65	372.26 ± 0.96
SF	10.70 ± 1.93	248.97 ± 2.96	75.94 ± 1.72	351.36 ± 0.84
BHT	—	—	39.02 ± 1.02	—

[a]mg of gallic acid equivalent per gram. [b]Determined by phosphomolybdenum method.

1.2.In vivo

It can be assumed that the observed antioxidant activity of R. damas-cena may be responsible for its hepatoprotective activity in vivo. The drug may be inhibiting free radical mediated peroxidative changes or scavenging their formation in vivo. In conclusion, the present study indicates that R. damas-cena possesses good antioxidant activity. The most active AF protected rats from the toxic effect of CCI in vivo. The protective effect is attributed to the antioxidant activity of the R. damascena flowers which extends in vivo. Further purification of the drug is needed for the identification of active principle which may be beneficial in a number of free radical mediated disease processes (C.R. Achuthan et al.,2003).

1.3.Clinical trials

Numerous studies have presented the antioxidative activity of R. damascena Mill (Mohammadpour T et al.,2015; Naziroglu M et al.,2013; Latifi G et al.,2015; Sharma M et al.,2012; Jafari M et al.,2008). but some have been medically considered as follows: Hepatoprotective effect: In one study, the daily oral administration of 250-1000 mg/kg of the aqueous extract, dose depen-dently reversed the biochemical, enzymatic and histopathological toxic effects of acetaminophen induced oxidative damage on rats liver (Sharma M et al.,2012). Anti-aging effect: Schriner et al. studied the effect of 5 mg daily oral intake of the aqueous extract on a fruit fly species for 2 weeks. They observed increased mean lifespan, down-regulation of heat shock proteins and antioxidant effects (Schriner SE et al.,2012). In another study with the same method but lower dosage, the anti-aging effect was shown without decrease in fecundity or metabolism; common confounders of the anti-aging ef-fect (Jafari M et al.,2008).

Six studies investigated the pain reducing effect of the plant but Bani and his colleagues presented the only high quality study. They compared the oral administration of R. damascena Mill. ethanolic extract versus NSAIDS and showed no significant difference between their effects in relieving primary dysmenorrheal pain (Bani S et al.,2014). Although the anti-nociceptive mechanism of R damascena Mill. is not fully understood, (Boskabady MH et al.,2011) its anti-inflammatory effects have been well exhibited by various basic and animal studies (Slavov A et al.,2013; Wedler J et al.,2016; Latifi G et al.,2015; Kim YW et al.,2015). In wound healing, the contribution of increased growth factors expression such as epidermal growth factor (EGF) and vascular endothelial growth factor (VEGF) and the decrease of pro-inflammatory cytokines by Rosa placenta extract has been shown (Kim YW et al.,2015).

In another animal study, the effectiveness of Damask rose hydro-alcoholic extract on healing colitis was better than its volatile oil, suggesting the structural arrangement of active components besides their quantities as major key factors for the various effects of the plant (Latifi G et al.,2015).

Although the inhibition of pro-inflammatory genes expression suggest the major role of polyphenolic enriched ingredients as im-munomodulators, the antioxidative effect of its flavonoids such as quercetin and kaempferol, mainly found in alcoholic extracts (Boskabady MH et al.,2011; Latifi G et al.,2015) may also describe R. damascena Mill as a potent analgesic adjuvant in inflammatory states (Hacimuftuoglu A et al.,2006).

Discussion

The current narrative review summarizes the body of research on Rosa damascena's antioxidant qualities, including phytochemical analyses, in vitro tests, in vivo animal research, and a few clinical studies. All of the information points to R. damascena's strong antioxidant potential, which is mostly due to its abundance of phenolic compounds, which include flavonoids like quercetin and kaempferol glycosides, especially in its ethanolic and hydro-alcoholic extracts. These components exhibit lipid peroxidation inhibition, free radical scavenging activity, and an improvement in endogenous antioxidant defenses (e.g. G. glutathione, catalase, and superoxide dismutase), both in animal systems and cellular models.

High levels of total phenolic content are regularly reported in in vitro studies (e.g. G., 276 mg GAE/g in fresh flower extracts) and potent DPPH radical scavenging activity—often surpassing synthetic antioxidants like BHT. Likewise, in vivo studies like those conducted by Achuthan et al. (2003) and Sharma and associates. (2012), which show notable decreases in malondialdehyde (MDA) and normalization of liver enzymes (ALT, AST), substantiate the hepatoprotective function of R. damascena against chemically induced oxidative stress. These results are consistent with the established relationship between protecting organs, especially the liver, and reducing oxidative stress.

Despite their limited quantity and methodological rigor, preliminary clinical and quasi-clinical evidence further points to possible advantages in pain management, anti-aging, and overall health. G. primary dysmenorrhea), as well as the healing of wounds. As an example, Bani et al. (2014) demonstrated comparable efficacy of R. damascena extract to NSAIDs in managing menstrual pain, possibly mediated through combined anti-inflammatory and antioxidant mechanisms. It should be noted, though, that there is still a dearth of human data, and most clinical claims are extrapolated from in vitro or animal models.

Notwithstanding these encouraging results, several limitations call for interpretation caution. First off, because this is a narrative review rather than a systematic review, there is no quantitative pooling of effect sizes in the synthesis, and the selection of studies may be biased. Second, it is challenging to evaluate the clinical significance of observed changes because many of the cited studies, especially preclinical ones, do not provide important statistical metrics like confidence intervals, precise p-values, or effect sizes. Third, the included studies' methodological quality (e.g. G. was not formally assessed (randomization, blinding, sample size justification), which restricts the capacity to give greater weight to studies with stronger evidence than to those with weaker evidence.

Furthermore, the plant now unquestionably belongs to the Rosaceae family, correcting a significant taxonomic error in the original manuscript that classified R. damascena under the family Crassulaceae. Even though they are small, these errors highlight how crucial botanical accuracy is to ethnopharmacological research.

To sum up, Rosa damascena exhibits strong antioxidant potential in a variety of experimental models, confirming its traditional folk medicine application for ailments involving inflammatory and oxidative pathways.

Nevertheless, rather than being confirmatory, the existing body of evidence generates hypotheses. Future research should place a high priority on thorough, well-reported clinical trials and systematic reviews with meta-analyses that follow PRISMA guidelines and incorporate official risk-of-bias assessments to move toward evidence-based recommendations. R. damascena is still a promising natural antioxidant agent that hasn't been proven yet.

Limitations and Future Directions

This article, which is a narrative review, is susceptible to selection bias due to its disregard for standard systematic review protocols (like PRISMA) and the lack of a systematic assessment of the caliber of the included studies. Additionally, the absence of quantitative data precludes a meta-analysis or an accurate assessment of efficacy (e.g. G. magnitude of effect, p values, or confidence intervals) in many the original studies. As a result, this review's conclusions are more provisional than final.

Conclusion

Rosa damascena's antioxidant potential is supported by evidence that is currently available, which includes phytochemical analyses, in vitro assays, in vivo animal studies, and a small number of clinical investigations. Significant free radical scavenging activity, lipid peroxidation inhibition, and endogenous antioxidant enzyme upregulation are all facilitated by its high phenolic compound content, especially flavonoids like quercetin and kaempferol glycosides. G. glutathione, catalase, and superoxide dismutase). Its observed hepatoprotective, anti-inflammatory, and anti-aging effects in experimental models are probably due to these mechanisms.

It is important to note, though, that most of the evidence currently available is preclinical and preliminary. There are few human studies, they frequently have methodological flaws, and they hardly ever provide quantitative effect sizes or confidence intervals. Additionally, this review should be viewed as hypothesis-generating rather than conclusive because it is narrative in nature and does not represent a systematic synthesis of the evidence.

Human randomized controlled trials with sound design should be given priority in future studies, as should systematic reviews with meta-analyses that follow PRISMA guidelines and incorporate official risk-of-bias evaluations. Rosa damascena may be considered a promising natural source of antioxidants with therapeutic potential until such high-quality evidence becomes available, but it has not yet been approved as a clinical intervention for disorders linked to oxidative stress.

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