

# UNVEILING THE THERAPEUTIC POTENTIAL OF VERBASCOSIDE TO COMBAT DIABETIC WOUND

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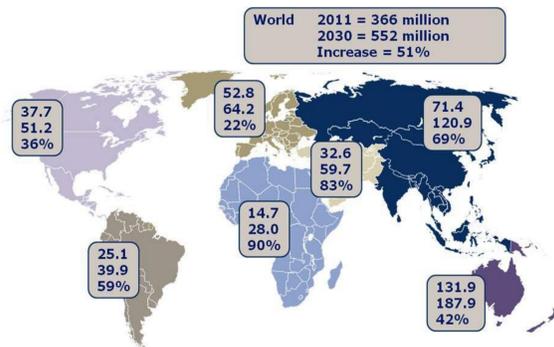
Diabetes is a multifaceted metabolic disease which impedes wound healing process leading to chronic ulcers in the lower extremities mostly. This class of wounds obstructs maturation of granulating tissues due to the vascular damage resulting in ischemia, continuous production of pro-inflammatory cytokines and impaired angiogenic response, microvascular complications, macrophage activation, keratinocytes, fibroblast migration & proliferation, production of growth factors, increased serum matrix metalloproteinase, impaired collagen accumulation, dysregulated neuropeptide expression in the skin combining suppressed inflammatory response. With these complex molecular mechanisms in background and despite considerable advances made in understanding them over the years, diabetic wounds continue to present a daunting challenge and health care burden. So the search for alternative approaches or drugs, particularly from natural products, is of key importance.

Phenylethanoid glycoside like verbascoside a water-soluble polyphenolic compound has antioxidant, anti-inflammatory and antineoplastic properties with numerous wound-healing and neuroprotective properties. It activates antioxidant enzymes along with the increase in keratinocytes migration and inhibition of inflammation mediators. Verbascoside also possesses the highest combinatory activity (wound healing, anti-inflammatory and anti-nociceptive). It also possesses anti-diabetic and antioxidant activity. Hence, the purpose of this review is to highlight the health benefit role, functional property and therapeutic uses of this phenylethanoid glycoside which holds a great promise as a wound healing candidate in case of diabetes.

**Keywords:** Diabetic wound; Phenylethanoid glycoside; Verbascoside; Anti-oxidant; Anti-inflammatory.

## Introduction

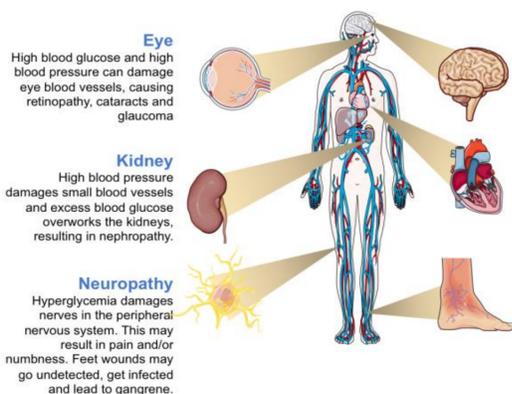
### The Diabetes Epidemic: Global Projections, 2010–2030



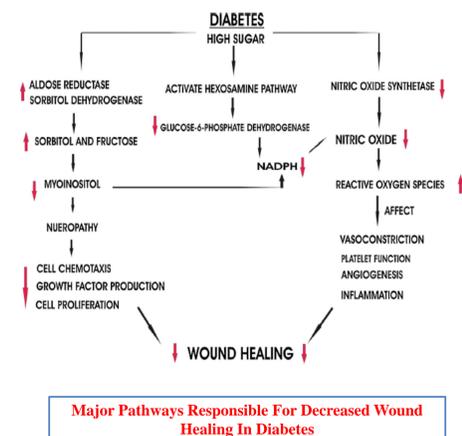
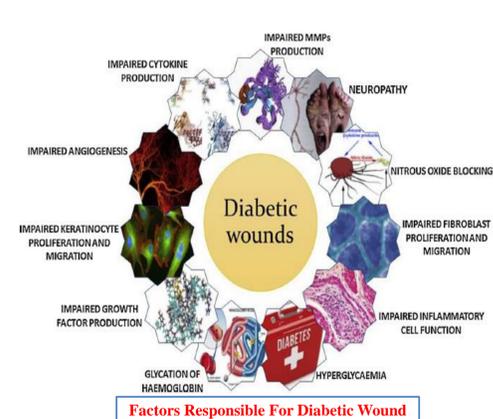
- The diabetic foot is initiated by ulceration of the skin.
- Repeated mechanical agitation and minor trauma are the primary causes.
- Interaction of neuropathy, ischemia, and infection is seen.
- Neuropathy affects sensory, motor, and autonomic pathways.
- Some of the pathogenic factors for neuropathy include hyperglycemia, oxidative stress, etc.
- Above mentioned factors contribute to microvascular disease and neural dysfunction.
- 15% of diabetic patients develop foot ulcers during their lifetime
- Non-healing ulcers are responsible for 85% of non-traumatic lower extremity amputation.
- Limb amputation in diabetic patients is 10 to 20 times more than that of a healthy individual.

## Major Complications of Diabetes

### Microvascular



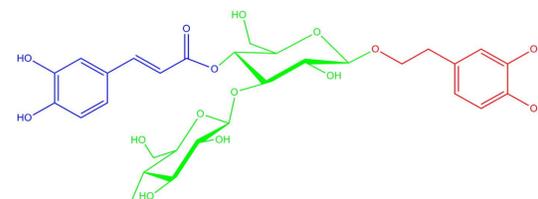
### Macrovascular



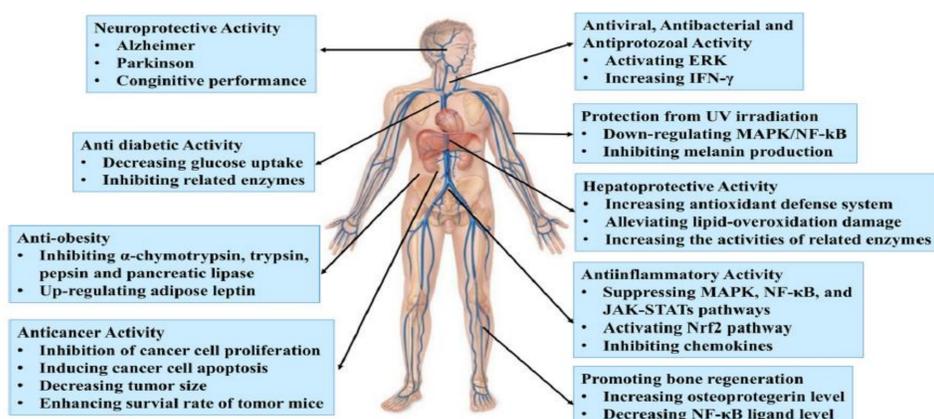
## General View on PhGs with Special Reference to Verbascoside

- Phenylethanoid glycosides (PhGs) are generally water-soluble phenolic compounds that occur naturally.
- PhGs have been isolated from different parts of the medicinal plants, as well as from suspension cell cultures, callus tissues, and hairy roots cultures.
- They are reported from the families like Acanthaceae, Asteraceae, Berberidaceae, etc.
- For instance, 69 PhGs have been isolated from *Cistanche herba* and 51 PhGs from *Forsythiae fructus*.
- Verbascoside (also known as acteoside), another PhG is widely distributed in the families like Lamiaceae, Plantaginaceae, etc.
- PhGs possess antibacterial, anticancer, antidiabetic and other properties.
- Despite the promising benefits, PhGs have failed to fulfill their therapeutic applications due to their poor bioavailability.

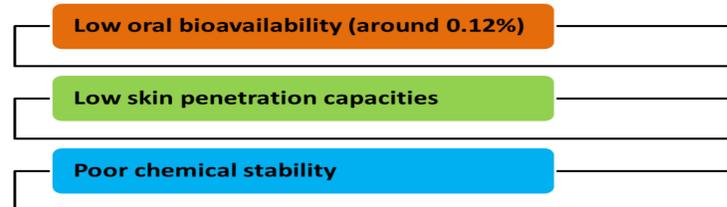
- Verbascoside is a phenylethanoid glycoside.
- It is a naturally occurring water-soluble compounds widely distributed in the plant kingdom.
- Structurally, it has cinnamic acid (C6-C3) and hydroxyphenylethyl (C6-C2) moieties that are attached to a  $\beta$ -glucopyranose (apiose, galactose, etc.) via a glycosidic bond.



Chemical structure of Verbascoside. Phenylethanoid (in red) and caffeic acid (in blue) moieties attached to  $\alpha$ -rhamnopyranosyl- $\beta$ -glucopyranose (in green).

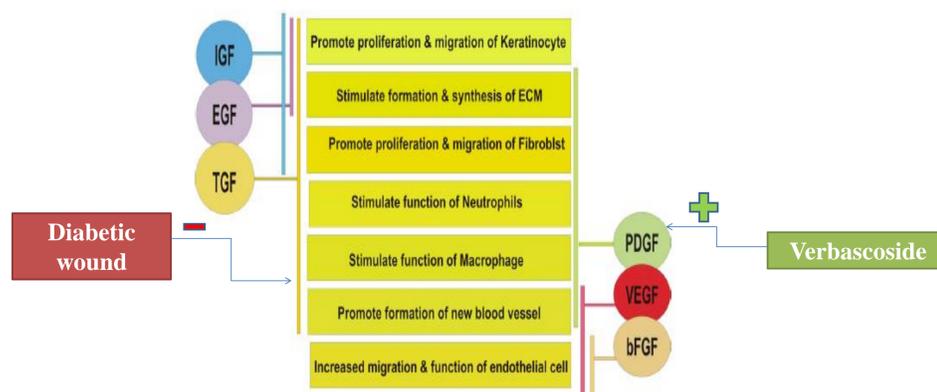


A summary of the potential health benefits of phenylethanoid glycosides



Limitations of phenylethanoid glycosides

## Potential Role of Verbascoside in Diabetic Wound



## Conclusion

- There are several pharmacological or therapeutic properties of Verbascoside.
- Some of the previously proven activities include antioxidant, anti-inflammatory, antineoplastic, anti-diabetic, etc.
- Verbascoside increases keratinocytes migration and inhibits inflammation, hence it is a potential candidate for wound healing
- Due to its potential healing activities when it comes to diabetic wound, it can be used in that aspect.
- There is a lack of research in this field although it holds promising future.

## References

- Wu L, Georgiev MI, Cao H, Nahar L, El-Seedi HR, Sarker SD, Xiao J, Lu B. Therapeutic potential of phenylethanoid glycosides: A systematic review. *Medicinal Research Reviews*. 2020 Nov;40(6):2605-49.
- Patel S, Srivastava S, Singh MR, Singh D. Mechanistic insight into diabetic wounds: Pathogenesis, molecular targets and treatment strategies to pace wound healing. *Biomedicine & Pharmacotherapy*. 2019 Apr 1;112:108615.
- Alipieva K, Korkina L, Orhan IE, Georgiev MI. Verbascoside—A review of its occurrence, (bio) synthesis and pharmacological significance. *Biotechnology advances*. 2014 Nov 1;32(6):1065-76.



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