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Review Article

Medicinal Uses of Maslinic Acid: A Review

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Abstract

Maslinic Acid a characteristic compound of the triterpenoid bunch got from olive which forestalls the age of favorable to fiery cytokines and oxidative pressure, found in an assortment of common sources, going from home grown cures utilized in traditional medicine to consumable vegetables and organic products present in the Mediterranean eating routine. A few investigations have demonstrated that maslinic acid a wide scope of pharmacological effects such as Antimalarial Effect, Anti-Proliferative Activity, Antitumor Activity, Antifungal Activity, Antibacterial Activity, Anti-diabetic Effect, Antioxidant effect, Anti-inflammatory Activity, Cardio protective effect, Neuroprotection effect, Antiviral Activity, Antimicrobial Activity.

Keywords: Maslinic acid, Triterpene, edible source, Pharmacological Effects.

INTRODUCTION

Maslinic Acid (MA, 2-, 3-dihydroxyolean-12-en-28-oic acid) is a characteristic compound of the triterpenoid gathering, gotten from olive, and is known by the plant name *Olea europaea*.¹

The pharmacological activities of maslinic acid have been surveyed in various exploratory models, from tumor cell lines to creature models of a few illnesses, upheld by the absence of antagonistic impacts *in vivo* after the oral organization of the triterpene.²

In equal, because of an expanding interest to recognize new normal atoms with valuable impacts on wellbeing, maslinic acid has been disconnected not just from different plants utilized in customary natural medication, additionally from palatable vegetables and organic products. it as a triterpenoid carboxylic corrosive with sub-atomic equation C₃₀H₄₈O₄, essentially found in the leaves of the previously mentioned species, where it represented 25%-30% of the measure of triterpenoids in this tissue.³

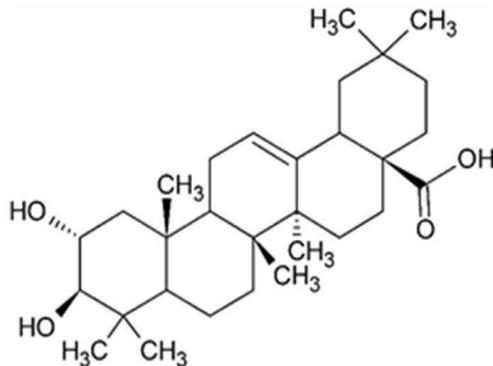


Figure 1: Chemical structure of Maslinic Acid

Maslinic acid content in edible sources such as **Fresh vegetables** (Eggplant, Spinach), **Aromatic herbs** (Leaf mustard, Brown mustard), **Fresh fruits** (Pomegranate),

Cooked legumes (Large lentils, Chickpeas), **Gordal** (plain green) etc.

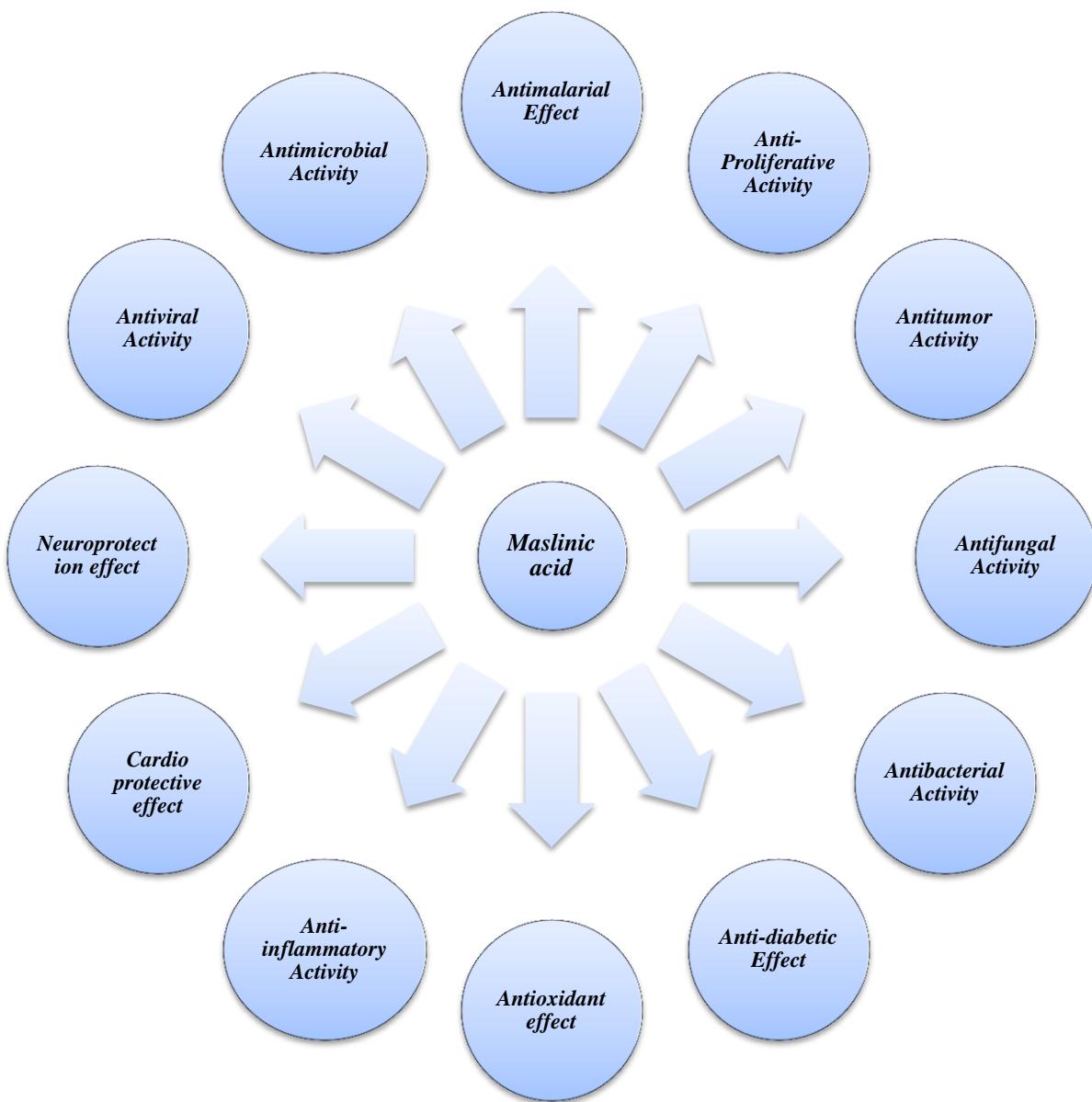


Figure 2: Pharmacological activities of Maslinic acid

PHARMACOLOGICAL ACTIVITIES OF MASLINIC ACID

The pharmacological activities of maslinic acid as shown in figure 2 and briefly discussed following are:-

Antimalarial Effect

This study shows that low poisonous characteristic pentacyclic triterpene for which a wide assortment of organic and helpful exercises have been accounted for. Past work uncovered that *Plasmodium falciparum* erythrocytic societies were repressed by MA, which had the option to frustrate the development from ring to schizont stage and, as a result, forestall the arrival of merozoites and the ensuing attack. We show here that MA adequately represses the proteolytic preparing of the merozoite surface protein complex, presumably by restraint of PfSUB1.⁴

Anti-Proliferative Activity

The study that exhibited interestingly the powerful enemy of proliferative movement of maslinic in the human colorectal adenocarcinoma cell line HT-29. The triterpene didn't show vague cytotoxicity up to 250 μ M, yet applied a

portion subordinate enemy of proliferative action with IC50 of 101.2 μ M at 72 h of openness.⁵

Antitumor Activity

The antitumor action of MA has gotten striking as of late, as proven by the higher number of studies that address this issue, contrasted with those about other organic impacts. By far most of distributed references relate to in vitro tests that show the counter proliferative as well as favorable to apoptotic impact of maslinic corrosive, along with conceivable components of activity that include diverse flagging pathways. This was performed with athymic nu/nu mice in which xenograft pancreatic cells were embedded. The subcutaneous organization of 10 and 50 mg/kg of the triterpene altogether diminished in a portion subordinate way both the volume and the heaviness of the tumors, which thusly showed an expanded number of apoptotic cells and a decreased articulation of two NF- κ B-controlled enemy of apoptotic qualities, Survivin and Bcl-xL.⁶

Antifungal Activity

Antifungal action of MA assessed through the agar-well dispersion technique with changes. Clean supplement agar

was filled clean standard Petri plates (20 mL) and afterward permitted to harden. The plates were immunized with 100 μ L of the microbial culture by spread plate method. By utilizing a sterile drill, four wells were punched.⁷

Antibacterial Activity

Antibacterial activities of MA arrangements on the principles (ciprofloxacin and amoxicillin), and the dissolvable (DMSO) were stacked into particular wells, and afterward the Petri plates were hatched at 37 °C for 24 h. Brooding was done at 34 °C for 48 h for the antifungal action tests.⁷

Anti-diabetic Effect

The character stick of MA in glucose digestion has additionally been widely considered. The principal proof of the inhibitory impact of the triterpene on glycogen phosphorylases (GP), which catalyze the initial step of glycogen breakdown. In a first in vitro test utilizing GPA (initiated type of the compound) disconnected from rodent liver, maslinic acid restrained the catalyst with an IC50 of 99 μ M, being 6-fold more intense than caffeine, a set up GP inhibitor. Based on the hypoglycemic movement of the triterpene was assessed *in vivo*, utilizing a mouse model of diabetes incited by adrenalin, which is known to by implication invigorate glycogenolysis and along these lines increment glucose blood fixation.⁸

Antioxidant effect

The antioxidant impact of MA was first assessed in a model of oxidative status actuated by CCl4, which incites lipid peroxidation. Pre-treatment of the rodents once day by day for 3 days with the triterpene at different dosages diminished by around 18% plasma levels of endogenous lipid peroxides, at the two portions, and by 6.5% and 19%, individually, the triterpene disengaged from the blossoms of Punica granatum forestalled the CuSO4-initiated oxidation of hare plasma LDL, checked by the development of dienes.⁹

Anti-inflammatory Activity

The anti-inflammatory effect of maslinic acid has been additionally demonstrated in essential cortical astrocytes, which could be meant a neuroprotective impact if further affirmed *in vivo*. Cells were refined with the different triterpene for 24 h prior to being presented to LPS. The concentration here was the TNF- α flagging pathway, which is to some degree intervened by NF- κ B. As recently depicted, this record factor is found in the cytosol, held by I κ B α . Under

incitement, I κ B α is phosphorylated and afterward the p65 subunit of the record factor is delivered, which permits its movement to the core.¹⁰

Cardio protective Effect

The cardioprotective impact of maslinic corrosive has likewise been tried in isoproterenol-instigated myocardial localized necrosis in Wistar rats. Animals that had been pre-treated with MA at (15 mg/kg) for 7 days showed an improved serum lipid profile with fundamentally diminished degrees of complete cholesterol, fatty substances, LDL-cholesterol, VLDL-cholesterol and expanded HDL-cholesterol. The movement of the heart marker catalysts creatine kinase (CK), ALT, AST and γ -glutamyl transferase (GGT) essentially diminished.¹¹

Neuroprotection Effect

This studied that maslinic acid forestalled mind harm after a transient ischemic scene in creatures. Since hyperglycemia is a danger factor for stroke .streptozotocin-initiated diabetic rodents were given the triterpene orally at few dosages for 14 days. At that point, a transient center cerebral vein impediment was performed and the results of the localized necrosis were assessed.¹²

Antiviral Activity

The methanol remove from the entire plant of *Geum japonicum* was found to restrain the human immunodeficiency infection (HIV-1) protease. Through show some effective triterpene acid alongside five known triterpene acids, epipomolic acid, maslinic acid, and euscaphic acid were detached. The design of the new compound was dictated by ghastly methods showed strong inhibitory action against HIV-1 protease. The methods such as HMBC, 1H-1H Cozy, NOE etc.¹³

Antimicrobial Activity

Six triterpenoids having a lupane or oleane skeleton were confined from leaves and youthful parts of *Licania heteromorpha* var. *heteromorpha* (from Venezuela). They were screened for action against a battery of microorganisms. Alphitolic corrosive, 3 β -O-trans-p-coumaroyl alphitolic corrosive, 3 β -O-trans-p-coumaroyl maslinic corrosive and 3 β -O-cis-p-coumaroyl maslinic corrosive showed action against Gram-positive microbes and yeasts. None of the 6 mixtures showed action against Gram-negative microscopic organisms.¹⁴

Table 1: Inflammatory modulating effect of maslinic acid.

Modulatory effect of maslinic acid	Inflammatory model
Maslinic acid-enriched diet inhibited the formation of polyps in the small intestines of ApcMin/+ mice by regulating genes associated with inflammation pathways	Spontaneous intestinal polyposis animal model. ¹⁵
Maslinic acid suppressed production of nitric oxide (NO) and inducible nitric oxide synthase (iNOS) gene expression, secretion of inflammatory cytokines interleukin-6, and tumour necrosis alpha (TNF- α)	Lipopolysaccharide- (LPS-) induced murine macrophages. ¹⁶
Maslinic acid inhibits the expression of iNOS and COX-2 as well as the release of proinflammatory mediators including NO and TNF- α	LPS-induced cortical astrocyte Cultures ¹⁷
Maslinic acid reduced NO levels and iNOS mRNA and protein expression	Oxygen-glucose deprivation-induced cortical neuron injury ¹⁸
Maslinic acid given in simple topical treatments showed reduction of discomfort and considerable increase of flexibility of the joint	COX-2-related pathologies such as arthrosis, arthritis, or fibromyalgia ¹⁹
Maslinic acid suppresses osteoclastogenesis by regulating receptor activator of NF- κ B ligand- (RANKL-) mediated NF- κ B and mitogen-activated protein kinase (MAPK) signaling pathways	Osteoclastogenesis and bone loss ²⁰
Maslinic acid reduced TPA-induced ear edema at the concentration of 0.13mg per ear	12-O-Tetradecanoylphorbol-13-acetate- (TPA-) induced ear edema ²¹

CONCLUSION

Maslinic acid is a bunch of Triterpene obtained from olive being normal elements of plant-based dietary examples, like the Mediterranean eating routine. Various examinations surveying its pharmacological impacts have brought interest up in health-enhancing properties like Antimalarial Effect, Anti-Proliferative Activity, Antitumor Activity, Antifungal Activity, Antibacterial Activity, Anti-diabetic Effect, Antioxidant effect, Anti-inflammatory Activity, Cardio protective effect, Neuroprotection effect, Antiviral Activity, Antimicrobial Activity. Further research study on MA revealed that new mechanism of action would be broad spectrum effects on biological activities of the triterpene.

Disclosure Statement

There are no conflicts of interest.

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