

Product Data Sheet

Product Name: Withaferin A

Cat. No.: GC17309

Chemical Properties

Cas. No. 5119-48-2

Chemical Name (4S,4aR,5aR,6aS,6bS,9R,9aS,11aS,11bR)-4-hydroxy-9-((S)-1-((R)-5-(hydroxymethyl)-4-methyl-6-oxo-3,6-dihydro-2H-pyran-2-yl)ethyl)-9a,11b-dimethyl-5a,6,6a,6b,7,8,9,9a,10,11,11a,11b-dodecahydrocyclopenta[1,2]phenanthro[8a,9-b]oxiren-1(4H)-one

SMILES O[C@@H](C=C1)[C@@]23O[C@@H]2C[C@@H]([C@H]4[C@@]5(C)[C@@H]([C@H](C)[C@@H](CC(C)=C6CO)OC6=O)CC4)[C@H](CC5)[C@]3(C1=O)C

Formula C₂₈H₃₈O₆

M.Wt 470.6

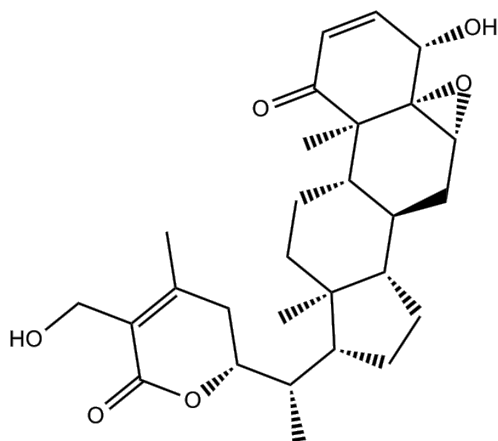
Solubility DMF: 5 mg/ml, DMSO:50mg/ml,
DMSO:PBS(pH7.2) (1:1): 0.5 mg/ml

Storage 4°C, protect from light

General tips For obtaining a higher solubility , please warm the tube at 37 °C and shake it in the ultrasonic bath for a while. Stock solution can be stored below -20°C for several months.

Shipping Condition Evaluation sample solution : ship with blue ice All other available size: ship with RT , or blue ice upon request.

Structure



Protocol

Cell experiment [1]:

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Cell lines MPM

Preparation Method MPM cells were treated with 5μM dose of Withaferin A for 72h. Then viable/live cells were determined by MTT assay to evaluate cell proliferation.

Reaction
Conditions 5μM; 72h

Applications Withaferin A treatment inhibits MPM cell proliferation.

Animal experiment [2]:

Animal models 129 Svej male mice

Preparation Method Isoproterenol (50mg/kg) was injected subcutaneously into 129 Svej male mice for 2 consecutive days, while Withaferin A (4mg/kg) was administered intraperitoneally daily for 14 days. 24h after the last injection, hearts were removed, weighed, fixed and processed for histopathologic analysis.

Dosage form 4mg/kg; 14d; i.p.

Applications Withaferin A was greatly reduced Isoproterenol-induced heart necrosis compared to animals treated with Isoproterenol alone.

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References:

- [1]. Yang H, Wang Y, Cheryan VT, et al. Withaferin A inhibits the proteasome activity in mesothelioma in vitro and in vivo. PLoS One. 2012;7(8):e41214. doi: 10.1371/journal.pone.0041214. Epub 2012 Aug 17. PMID: 22912669; PMCID: PMC3422308.
- [2]. Challa AA, Vukmirovic M, Blackmon J, et al. Withaferin-A reduces type I collagen expression in vitro and inhibits development of myocardial fibrosis in vivo. PLoS One. 2012;7(8):e42989. doi: 10.1371/journal.pone.0042989. Epub 2012 Aug 10. PMID: 22900077; PMCID: PMC3416765.

Background

Withaferin A is a steroidal lactone generally obtained from *Withania somnifera* (L.) Dunal, commonly known as Ashwagandha^[1]. Withaferin A can inhibit NF- κ B at a very low concentration in endothelial cells^[2] and exhibits a broad spectrum of biological activities, including antioxidant, anti-inflammatory, antibacterial, antistress, cardioprotective, neuroprotective, and anticancer activities^[3]. Withaferin A is commonly utilized in cancer research due to its anticancer activities against various cancer cell lines and preclinical cancer models, achieved by modulating the expression and activity of different oncogenic proteins^[4].

Withaferin A potently inhibited cell proliferation in human MPM cells, treatment with Withaferin A at 5 μ M for 72h significantly inhibited cell growth^[5]. In MCF-7 cells, treatment with Withaferin A at 2.5 μ M for 24h can increase in the level of total as well as S15 phosphorylated p53, which has been implicated in apoptosis induction^[6].

Withaferin A (4mg/kg; 14d; i.p.) treatment can inhibit Isoproterenol-induced myocardial fibrosis in mice and significantly reduce heart necrosis^[7]. Treatment with Withaferin A (4mg/kg; 10d; i.p.) significantly reduced murine solid tumour growth and improved survival rate of tumour bearing mice^[8].

References:

- [1]. Paul S, Chakraborty S, Anand U, et al. *Withania somnifera* (L.) Dunal (Ashwagandha): A comprehensive review on ethnopharmacology, pharmacotherapeutics, biomedical and toxicological aspects. Biomed Pharmacother. 2021 Nov;143:112175. doi: 10.1016/j.biopha.2021.112175. Epub

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- [2]. Mohan R, Hammers HJ, Bargagna-Mohan P, et al. Withaferin A is a potent inhibitor of angiogenesis. *Angiogenesis*. 2004;7(2):115-22. doi: 10.1007/s10456-004-1026-3. PMID: 15516832.
- [3] Tewari D, Chander V, Dhyan A, et al. Withania somnifera (L.) Dunal: Phytochemistry, structure-activity relationship, and anticancer potential. *Phytomedicine*. 2022 Apr;98:153949. doi: 10.1016/j.phymed.2022.153949. Epub 2022 Jan 19. PMID: 35151215.
- [4]. Kumar S, Mathew SO, Aharwal RP, et al. Withaferin A: A Pleiotropic Anticancer Agent from the Indian Medicinal Plant Withania somnifera (L.) Dunal. *Pharmaceuticals (Basel)*. 2023 Jan 22;16(2):160. doi: 10.3390/ph16020160. PMID: 37259311; PMCID: PMC9966696.
- [5]. Yang H, Wang Y, Cheryan VT, et al. Withaferin A inhibits the proteasome activity in mesothelioma in vitro and in vivo. *PLoS One*. 2012;7(8):e41214. doi: 10.1371/journal.pone.0041214. Epub 2012 Aug 17. PMID: 22912669; PMCID: PMC3422308.
- [6]. Hahm ER, Lee J, Huang Y, et al. Withaferin a suppresses estrogen receptor- α expression in human breast cancer cells. *Mol Carcinog*. 2011 Aug;50(8):614-24. doi: 10.1002/mc.20760. Epub 2011 Mar 22. PMID: 21432907; PMCID: PMC3129407.
- [7]. Challa AA, Vukmirovic M, Blackmon J, et al. Withaferin-A reduces type I collagen expression in vitro and inhibits development of myocardial fibrosis in vivo. *PLoS One*. 2012;7(8):e42989. doi: 10.1371/journal.pone.0042989. Epub 2012 Aug 10. PMID: 22900077; PMCID: PMC3416765.
- [8]. Abeesh P, Vishnu WK, Guruvayoorappan C. Preparation and characterization of withaferin A loaded pegylated nanoliposomal formulation with high loading efficacy: In vitro and in vivo anti-tumour study. *Mater Sci Eng C Mater Biol Appl*. 2021 Sep;128:112335. doi: 10.1016/j.msec.2021.112335. Epub 2021 Jul 27. Erratum in: *Mater Sci Eng C Mater Biol Appl*. 2021 Nov;130:112432. doi: 10.1016/j.msec.2021.112432. PMID: 34474886.

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