

Product Data Sheet

Product Name: Nigerose

Cat. No.: GF05558

Chemical Properties

Cas. No. 497-48-3

Formula $C_{12}H_{22}O_{11}$

M.Wt 342.3

Solubility Storage Store at -20°C, stored under nitrogen

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]:

Cell lines Caco-2 (human intestinal colorectal adenocarcinoma cells) and HepG2 (hepatoma G2 liver cells) coculture model

Caution: Product has not been fully validated for medical applications. For research use only.

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Preparation Method Caco-2 cells were seeded in 24-well transwell inserts and differentiated for at least 3 weeks. HepG2 cells were seeded at a density of 5×10^4 cells per well in collagen-coated 24-well plates. Cells were cocultured for 24h followed by a 24h exposure. Caco-2 and HepG2 cells were cultured in DMEM supplemented with 10% heat-inactivated FBS, 1% non-essential amino acids and 1% penicillin/streptomycin at 37°C and 10% CO₂.

Reaction Conditions 14mM; 24h

Applications Nigerose significantly increased resazurin conversion in Caco-2 cells. In the coculture model with dietary fatty acids, there was a non-significant trend towards higher median fat accumulation with Nigerose compared to control.

Animal experiment [2]:

Animal models BDF1 and C57BL/6 mice

Preparation Method BDF1 mice were intraperitoneally injected with Nigerose 17 hours prior to intravenous inoculation with 1×10^6 EL-4 tumor cells. C57BL/6 mice were given Nigerose solution as drinking fluid for 7 days before tumor inoculation.

Dosage form 0.08mg; i.p.; single injection; 0.20% in drinking water; oral; 7 days

Applications Nigerose significantly inhibited EL-4 tumor growth in the liver and improved the survival curve of tumor-bearing mice.

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References:

- [1] van Laar A, Grootaert C, Van Nieuwerburgh F, et al. Metabolism and Health Effects of Rare Sugars in a CACO-2/HepG2 Coculture Model. *Nutrients*. 2022 Jan 30;14(3):611.
- [2] Murosak S, Muroyama K, Yamamoto Y, et al. Nigeroooligosaccharides augments natural killer activity of hepatic mononuclear cells in mice. *Int Immunopharmacol*. 2002 Jan;2(1):151-9.

Background

Nigerose is a disaccharide composed of two glucose units linked by an α -1,3 glycosidic bond. Nigerose possesses immunoenhancing activity, acts as a prebiotic to promote the growth of beneficial intestinal flora, and may exert antioxidant effects by activating the Nrf2 pathway. Nigerose can be used in research related to functional foods, prebiotic development, enzymology studies, nanodrug delivery, and immunomodulation^[1-4].

In vitro, Caco-2/HepG2 co-cultured cells were treated with Nigerose (14mM) for 24 hours. Nigerose significantly increased resazurin conversion in Caco-2 cells. When co-exposed with a 0.5mM palmitic/oleic fatty acid mixture, Nigerose showed a small but non-significant effect on fat accumulation^[5]. HL-60 cells were treated with Nigerose (300 μ M) for 1 or 24 hours. Nigerose increased cellular glutathione reductase activity, decreased lactate dehydrogenase activity and lipid oxidation, and alleviated protein carbonylation or oxidation^[6].

In vivo, C57BL/6 mice were treated with Nigerose (2.57% diet or 0.18% drinking water) together with nigerosyl glucose and nigerosyl maltose for 14 days. Nigerose significantly enhanced *L. plantarum* L-137-induced IL-12 production and IL-2-stimulated IFN- γ production, and improved the resistance of mice to 5-fluorouracil-induced endogenous infection^[7]. BDF1 mice were treated with Nigerose (0.08mg; intraperitoneal injection) together with nigerosyl glucose and nigerosyl maltose for 17 hours, or C57BL/6 mice were treated with Nigerose (0.20% drinking water orally) together with nigerosyl glucose and nigerosyl maltose for 7 days. Nigerose significantly inhibited EL-4 tumor growth in the liver^[8].

References:

- [1] Ofman TP, Küllmer F, van der Marel GA, et al. An Orthogonally Protected Cyclitol for the Construction of Nigerose- and Dextran-Mimetic Cyclophellitols. *Org Lett*. 2021 Dec 17;23(24):9516-

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- [3] McAlister D, Doyle RJ, Taylor KG. Inhibition by maltose, isomaltose, and nigerose of the synthesis of high-molecular-weight D-glucans by the D-glucosyltransferases of *Streptococcus sobrinus*. *Carbohydr Res*. 1989 Apr 1;187(1):131-8.
- [4] Contour-Galceran MO, Guillot JM, Ortiz-Mellet C, et al. Synthesis of sulfur-linked analogues of nigerose, laminarabiose, laminaratriose, gentiobiose, gentiotriose, and laminaran trisaccharide Y. *Carbohydr Res*. 1996 Feb 7;281(1):99-118.
- [5] van Laar A, Grootaert C, Van Nieuwerburgh F, et al. Metabolism and Health Effects of Rare Sugars in a CACO-2/HepG2 Coculture Model. *Nutrients*. 2022 Jan 30;14(3):611.
- [6] Al-Otaibi NAS, Cassoli JS, Martins-de-Souza D, et al. Human leukemia cells (HL-60) proteomic and biological signatures underpinning cryo-damage are differentially modulated by novel cryo-additives. *Gigascience*. 2019 Mar 1;8(3):giy155.
- [7] Murosaki S, Muroyama K, Yamamoto Y, et al. Immunopotentiating activity of nigerooligosaccharides for the T helper 1-like immune response in mice. *Biosci Biotechnol Biochem*. 1999 Feb;63(2):373-8.
- [8] Murosaki S, Muroyama K, Yamamoto Y, et al. Nigerooligosaccharides augments natural killer activity of hepatic mononuclear cells in mice. *Int Immunopharmacol*. 2002 Jan;2(1):151-9.

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