

Wetenschappelijke artikels Moringablاد en moringapoeder kanker.

1

Nutraceutical or Pharmacological Potential of *Moringa oleifera* Lam.

Kou X, Li B, Olayanju JB, Drake JM, Chen N.

Nutrients. 2018 Mar 12;10(3):343. doi: 10.3390/nu10030343.

PMID: 29534518 Free PMC article. Review.

Moringa oleifera Lam. (*M. oleifera*), which belongs to the Moringaceae family, is a perennial deciduous tropical tree, and native to the south of the Himalayan Mountains in northern India. ...

2

Biological, nutritional, and therapeutic significance of *Moringa oleifera* Lam.

Dhakad AK, Ikram M, Sharma S, Khan S, Pandey VV, Singh A.

Phytother Res. 2019 Nov;33(11):2870-2903. doi: 10.1002/ptr.6475. Epub 2019 Aug 27.

PMID: 31453658 Review.

The genus *Moringa* Adans. comprises 13 species, of which *Moringa oleifera* Lam. native to India and cultivated across the world owing to its drought and frost resistance habit is widely used in traditional phytomedicine and as rich source of essential nutrients. Wide ...

3

Moringa oleifera Leaf Extracts as Multifunctional Ingredients for "Natural and Organic" Sunscreens and Photoprotective Preparations.

Baldisserotto A, Buso P, Radice M, Dissette V, Lampronti I, Gambari R, Manfredini S, Vertuani S.

Molecules. 2018 Mar 15;23(3):664. doi: 10.3390/molecules23030664.

PMID: 29543741 Free PMC article.

Moringa oleifera has gained increasing popularity as a food supplement but not in the pharmaceutical and cosmetic area. The aim of this study was the preparation, characterization, and evaluation of extracts from the leaves of *Moringa oleifera* as a herbal sun ...

4

Cultivation, Genetic, Ethnopharmacology, Phytochemistry and Pharmacology of *Moringa oleifera* Leaves: An Overview.

Leone A, Spada A, Battezzati A, Schiraldi A, Aristil J, Bertoli S.

Int J Mol Sci. 2015 Jun 5;16(6):12791-835. doi: 10.3390/ijms160612791.

PMID: 26057747 Free PMC article. Review.

Moringa oleifera is an interesting plant for its use in bioactive compounds. ...Alimentary and medicinal uses of moringa are reviewed, alongside the production of biodiesel. Finally, being that the leaves are the most used part of the plant, the ...

5

Moringa oleifera: a food plant with multiple medicinal uses.

Anwar F, Latif S, Ashraf M, Gilani AH.

Phytother Res. 2007 Jan;21(1):17-25. doi: 10.1002/ptr.2023.

PMID: 17089328 Review.

Moringa oleifera Lam (Moringaceae) is a highly valued plant, distributed in many countries of the tropics and subtropics. ...The *Moringa* plant provides a rich and rare combination of zeatin, quercetin, beta-sitosterol, caffeoylquinic acid and kaempferol ...

6

Moringa oleifera Lam: Targeting Chemoprevention.

Karim NA, Ibrahim MD, Kntayya SB, Rukayadi Y, Hamid HA, Razis AF.

Asian Pac J Cancer Prev. 2016;17(8):3675-86.

PMID: 27644601 Free article. Review.

Moringa oleifera Lam, family Moringaceae, is a perennial plant which is called various names, but is locally known in Malaysia as "murungai" or "kelor". Glucomoringin, a glucosinolate with from *M. oleifera* is a major secondary metabolite compound. The seeds and l ...

7

Effects of *Moringa oleifera* Leaf Extract on **Human Promyelocytic Leukemia Cells** Subjected to Oxidative Stress.

Dilworth LL, Stennett D, Omoruyi FO.

J Med Food. 2020 Jul;23(7):728-734. doi: 10.1089/jmf.2019.0192. Epub 2019 Nov 26.

PMID: 31770059

Antioxidant indexes (malondialdehyde, reduced glutathione, superoxide dismutase, and catalase) were measured on days 1, 2, and 3. Supplementation with the moringa leaf extract at all concentrations resulted in significant reductions in lipid peroxidation in cells th ...

8

Bioactive Components in *Moringa Oleifera* Leaves **Protect against Chronic Disease**.

Vergara-Jimenez M, Almatrafi MM, Fernandez ML.

Antioxidants (Basel). 2017 Nov 16;6(4):91. doi: 10.3390/antiox6040091.

PMID: 29144438 Free PMC article. Review.

Moringa Oleifera (MO), a plant from the family Moringaceae is a major crop in Asia and Africa. ...In this review, we present information on the beneficial results that have been reported on the prevention and alleviation of these chronic conditions in various animal ...

9

Moringa oleifera as an Anti-Cancer Agent against **Breast and Colorectal Cancer** Cell Lines.

Al-Asmari AK, Albalawi SM, Athar MT, Khan AQ, Al-Shahrani H, Islam M.

PLoS One. 2015 Aug 19;10(8):e0135814. doi: 10.1371/journal.pone.0135814. eCollection 2015.

PMID: 26288313 Free PMC article.

In this study we investigated the anti-cancer effect of *Moringa oleifera* leaves, bark and seed extracts. When tested against MDA-MB-231 and HCT-8 cancer cell lines, the extracts of leaves and bark showed remarkable anti-cancer properties while surprisingly, s ...

10

Moringa oleifera leaf extract attenuates Pb acetate-induced **testicular** damage in rats.

Albasher G, Alrajhi R, Alshammry E, Almeer R.

Comb Chem High Throughput Screen. 2020 Sep 23. doi: 10.2174/1386207323666200923142831.

Online ahead of print.

PMID: 32964820

Pb exposure adversely affects many human organs, including the gonads, via oxidant and inflammatory marker propagation in affected tissues. *Moringa oleifera* leaf extract (MOE) is a rich source of antioxidants reported to have robust antiinflammatory properties. ...

11

The beneficial effects of *Moringa oleifera* leaf on reproductive performance in mice.

Zeng B, Luo J, Wang P, Yang L, Chen T, Sun J, Xie M, Li M, Zhang H, He J, Zhang Y, Xi Q.

Food Sci Nutr. 2019 Jan 22;7(2):738-746. doi: 10.1002/fsn3.918. eCollection 2019 Feb.

PMID: 30847152 Free PMC article.

Moringa oleifera is a tropical plant with high nutritional and medicinal value. Recent studies have reported its remarkable effects in inflammatory, antioxidative, and anti-diabetes modulations, but there was no significant report on its role in animal breeding. In ...

12

Moringa oleifera Aqueous Leaf Extract **Induces Cell-Cycle Arrest and Apoptosis** in Human **Liver Hepatocellular Carcinoma Cells.**

Tiloke C, Phulukdaree A, Gengan RM, Chaturgoon AA.

Nutr Cancer. 2019;71(7):1165-1174. doi: 10.1080/01635581.2019.1597136. Epub 2019 Apr 4.

PMID: 30945951

Aim: Hepatocellular carcinoma is one of the leading global epidemics. A medicinal tree, Moringa oleifera (MO), has been part of traditional treatments including cancer therapies. We investigated the apoptosis inducing effects of MO crude aqueous leaf extract (MOE) i ...

13

Assessment of the Anti-Hyperglycaemic, Anti-Inflammatory and Antioxidant Activities of the Methanol Extract of Moringa Oleifera in Diabetes-Induced Nephrotoxic Male Wistar Rats.

Omodanisi EI, Aboua YG, Oguntibeju OO.

Molecules. 2017 Mar 23;22(4):439. doi: 10.3390/molecules22040439.

PMID: 28333074 Free PMC article.

The leaf of this plant has been reported to possess antioxidant and medicinal properties that may be helpful in the treatment and management of diabetes and its associated complications. Diabetes was induced intraperitoneally in rats by a single dose of streptozotoc ...

14

The Beneficial Effects of a Polysaccharide from Moringa oleifera Leaf on Gut Microecology in Mice.

Wang F, Bao YF, Si JJ, Duan Y, Weng ZB, Shen XC.

J Med Food. 2019 Sep;22(9):907-918. doi: 10.1089/jmf.2018.4382. Epub 2019 Aug 7.

PMID: 31390269

Moringa oleifera is a natural plant with high nutritional and pharmacological value. Leaves of M. oleifera contain a variety of active substances. In our previous research, we had obtained a polysaccharide separated from M. oleifera leaf, namely MOs-2- ...

15

Phytochemical screening of Moringa oleifera leaf extracts and their antimicrobial activities.

Bagheri G, Martorell M, Ramírez-Alarcón K, Salehi B, Sharifi-Rad J.

Cell Mol Biol (Noisy-le-grand). 2020 Apr 20;66(1):20-26.

PMID: 32359378

Moringa oleifera is a tree native to tropical and subtropical regions of South India and used in traditional medicine. The aim of this study was characterize the phytochemicals present in M. oleifera leaf extracts and study their antimicrobial activities. Solvent ex ...

16

Identification of microRNAs and relative target genes in Moringa oleifera leaf and callus.

Pirò S, Matic I, Guidi A, Zanella L, Gismondi A, Cicconi R, Bernardini R, Colizzi V, Canini A, Mattei M, Galgani A.

Sci Rep. 2019 Oct 22;9(1):15145. doi: 10.1038/s41598-019-51100-4.

PMID: 31641153 Free PMC article.

Moringa oleifera Lam. plant has many medical and nutritional uses; however, little attention has been dedicated to its potential for the bio production of active compounds. ...In conclusion, this is the first comprehensive analysis of microRNAs in M. oleifera lea ...

17

Supplementation of Moringa oleifera leaf powder orally improved productive performance by enhancing the intestinal health in rabbits under chronic heat stress.

Khalid AR, Yasoob TB, Zhang Z, Yu D, Feng J, Zhu X, Hang S.

J Therm Biol. 2020 Oct;93:102680. doi: 10.1016/j.jtherbio.2020.102680. Epub 2020 Aug 10.
PMID: 33077107

Heat stress jeopardizes animal's growth and health mainly through induction of oxidative stress and inflammation. The current study investigated the effects of Moringa oleifera leaf powder (MOLP) supplementation on productive performance and intestinal health of rab ...

18

[Functional orientation of Moringa leaves based on text mining and molecular docking technology].
Sha ZJ, Tang SH, Li ZY, Yang B, Yang HJ.

Zhongguo Zhong Yao Za Zhi. 2020 Jan;45(2):331-340. doi: 10.19540/j.cnki.cjcmm.20191104.108.
PMID: 32237315 Chinese.

First, PubMedplus was used to analyze research data on Moringa leaves collected in PubMed and the indications of Moringa leaves were screened along with the hotspots and development tendency of Moringa leaves. Second, Arrowsmith was used ...

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The ameliorative impacts of Moringa oleifera leaf extract against oxidative stress and methotrexate-induced hepato-renal dysfunction.

Soliman MM, Aldhahrani A, Alkhedaide A, Nassan MA, Althobaiti F, Mohamed WA.

Biomed Pharmacother. 2020 Aug;128:110259. doi: 10.1016/j.biopha.2020.110259. Epub 2020 May 30.

PMID: 32485567

Moringa Oleifera (MO) is a herbal plant native to South Asia known for its anti-oxidative and anti-inflammatory properties. This study explored the protective effects of MO leaf extract (MOLE) against oxidative stress and hepatic and renal injuries caused by ...

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Bis (Isothiocyanatomethyl) Benzene, A Plant Derived Anti-Neoplastic Compound: Purified from Moringa Oleifera Leaf Extract.

Paul S, Basak P, Maity N, Guha C, Jana NK.

Anticancer Agents Med Chem. 2019;19(5):677-686. doi: 10.2174/1871520619666190206164137.

PMID: 30727916

BACKGROUND: Moringa oleifera lam, commonly known as "Sajina", is an indigenous species to India. In our folk medicine, it is used for the treatment of Canker (cancer). The Moringa oleifera leaf extract contains many phyto-compounds, with some being anti-neopl ...

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Moringa peregrina Leaves Extracts Induce Apoptosis and Cell Cycle Arrest of Hepatocellular Carcinoma.

Mansour M, Mohamed MF, Elhalwagi A, El-Itriby HA, Shawki HH, Abdelhamid IA.

Biomed Res Int. 2019 Jan 1;2019:2698570. doi: 10.1155/2019/2698570. eCollection 2019.

PMID: 30713850 Free PMC article.

In this study, we investigated the antimicrobial and the anticancer activity of the Moringa peregrina as well as Moringa oleifera leaves extracts grown locally in Egypt. ...In conclusion, results suggested that the Moringa peregrina and Moringa ...

22

Moringa Oleifera aqueous leaf extract down-regulates nuclear factor-kappaB and increases cytotoxic effect of chemotherapy in pancreatic cancer cells.

Berkovich L, Earon G, Ron I, Rimmon A, Vexler A, Lev-Ari S.

BMC Complement Altern Med. 2013 Aug 19;13:212. doi: 10.1186/1472-6882-13-212.

PMID: 23957955 Free PMC article.

Data of cell survival following combined treatments were analyzed with Calcosyn software.
RESULTS: Moringa Oleifera leaf extract inhibited the growth of all pancreatic cell lines tested. ...Lastly, Moringa Oleifera leaf extract synergistically enhanced ...

23

In vitro **anti-allergic activity** of Moringa oleifera Lam. extracts and their isolated compounds.
Abd Rani NZ, Kumolosasi E, Jasamai M, Jamal JA, Lam KW, Husain K.

BMC Complement Altern Med. 2019 Dec 11;19(1):361. doi: 10.1186/s12906-019-2776-1.

PMID: 31829185 Free PMC article.

BACKGROUND: Moringa oleifera Lam. is a commonly used plant in herbal medicine and has various reported bioactivities such as antioxidant, antimicrobial, anticancer and antidiabetes. It is rich in nutrients and polyphenols. The plant also has been traditionall ...

24

The Diversity of **Chemoprotective Glucosinolates** in Moringaceae (Moringa spp.).

Fahey JW, Olson ME, Stephenson KK, Wade KL, Chodur GM, Odee D, Nouman W, Massiah M, Alt J, Egner PA, Hubbard WC.

Sci Rep. 2018 May 22;8(1):7994. doi: 10.1038/s41598-018-26058-4.

PMID: 29789618 Free PMC article.

Glucosinolates (GS) are metabolized to isothiocyanates that may enhance human healthspan by protecting against a variety of chronic diseases. Moringa oleifera, the drumstick tree, produces unique GS but little is known about GS variation within M. oleifera, and even less i ...

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Histological Assessment of Palatal Donor Site **Wound Healing** after Application of Moringa oleifera Lamarck Leaf Extract in Rats.

Amaliya A, Muhaimina RK, Susanto A, Sutjiatmo AB.

Eur J Dent. 2019 May;13(2):248-254. doi: 10.1055/s-0039-1695065. Epub 2019 Sep 11.

PMID: 31509874 Free PMC article.

MATERIALS AND METHODS: The wounds were made with a punch biopsy instrument with a diameter of 4 mm. After wounding, the test groups received a topical gel of Moringa oleifera Lamarck 2% or 4% leaf extract, whereas control groups received povidone iodine gel and hydr ...

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Roles of Moringa oleifera Leaf Extract in Improving the Impact of High Dietary Intake of Monosodium Glutamate-Induced Liver Toxicity, Oxidative Stress, Genotoxicity, DNA Damage, and PCNA Alterations in Male Rats.

Albrahim T, Binobead MA.

Oxid Med Cell Longev. 2018 Dec 17;2018:4501097. doi: 10.1155/2018/4501097. eCollection 2018.

PMID: 30647808 Free PMC article.

The purpose of the study described in this paper was to explore how vetsin-induced hepatic toxicity, DNA fragmentation, damage, and oxidative stress modifications could be mitigated with moringa leaf extract (MLE). To that end, 40 male rats were separated into four ...

27

In Vitro Bioassay-Guided Identification of **Anticancer Properties** from Moringa oleifera Lam. Leaf against the **MDA-MB-231 Cell Line**.

Wisitpongpun P, Suphrom N, Potup P, Nuengchamnong N, Calder PC, Usuwanthim K.

Pharmaceuticals (Basel). 2020 Dec 15;13(12):464. doi: 10.3390/ph13120464.

PMID: 33333817 Free PMC article.

Moringa oleifera Lam. (MO) is a medicinal plant distributed across the Middle East, Asia, and Africa. ...This study aimed to perform bioassay-guided fractionation and identification of bioactive compounds from MO leaf against MDA-MB-231 breast cancer cells. M ...

28

Effects of aqueous and ethanolic leaf extracts from drumstick tree (*Moringa oleifera*) on gilthead seabream (*Sparus aurata* L.) leucocytes, and their cytotoxic, antitumor, bactericidal and antioxidant activities.

García-Beltrán JM, Mansour AT, Alsaqfi AS, Ali HM, Esteban MÁ.

Fish Shellfish Immunol. 2020 Nov;106:44-55. doi: 10.1016/j.fsi.2020.06.054. Epub 2020 Jul 31. PMID: 32739532

Aqueous and ethanolic extracts of drumstick, *Moringa oleifera*, leaves were evaluated in vitro to ascertain their principal active components and determine their immunostimulant, cytotoxic, antitumoral, bactericidal and antioxidant activities. ...The results as a who ...

29

HPLC analysis, cytotoxicity, and safety study of *Moringa oleifera* Lam. (wild type) leaf extract.

Saleem A, Saleem M, Akhtar MF, Ashraf Baig MMF, Rasul A.

J Food Biochem. 2020 Jul 29:e13400. doi: 10.1111/jfbc.13400. Online ahead of print.

PMID: 32729119

These results showed that the plant extract might be safe up to 2,000 mg/kg single dose. The long term use of the plant extract was mostly devoid of major system toxicities. ...It is widely used by local inhabitants for their health, food, agriculture, and cosmetic ...

30

Investigation of medicinal plants traditionally used as **dietary supplements**: A review on *Moringa oleifera*.

Matic I, Guidi A, Kenzo M, Mattei M, Galgani A.

J Public Health Afr. 2018 Dec 21;9(3):841. doi: 10.4081/jphia.2018.841. eCollection 2018 Dec 21.

PMID: 30854178 Free PMC article.

Phytonutrient rich foods are found in traditional African diet which is mostly vegetarian, and most of these food plants are often used for medicinal purposes. This review focuses on a peculiar plant *Moringa oleifera*, called the "Miracle Tree", considered to be one ...

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Anti-Cancer Effect of 3-Hydroxy-beta-Ionone Identified from *Moringa oleifera* Lam. Leaf on **Human Squamous Cell Carcinoma 15** Cell Line.

Luetragoon T, Pankla Sranujit R, Noysang C, Thongsri Y, Potup P, Suphrom N, Nuengchamnong N, Usuwanthim K.

Molecules. 2020 Aug 5;25(16):3563. doi: 10.3390/molecules25163563.

PMID: 32764438 Free PMC article.

Effective treatments still require improvement for cancer patients. Here, we investigated the anti-cancer effect of *Moringa oleifera* (MO) Lam. leaf extracts and their fractions, 3-hydroxy-beta-ionone on SCC15 cell line. SCC15 were treated with and without MO leaf ...

32

Moringa oleifera leaf extracts inhibit 6beta-hydroxylation of testosterone by CYP3A4.

Monera TG, Wolfe AR, Maponga CC, Benet LZ, Guglielmo J.

J Infect Dev Ctries. 2008 Oct 1;2(5):379-83. doi: 10.3855/jidc.201.

PMID: 19745507 Free PMC article.

BACKGROUND: *Moringa oleifera* is a tropical tree often used as a herbal medicine, including by people who test positive for HIV. ...RESULTS: Significant CYP3A4 inhibitory effects were found, with IC50 values of 0.5 and 2.5 mg/ml for leaf-methanol and leaf-wate ...

33

Moringa oleifera's Nutritious Aqueous Leaf Extract Has **Anticancerous Effects** by Compromising Mitochondrial Viability in an ROS-Dependent Manner.

Madi N, Dany M, Abdoun S, Usta J.

J Am Coll Nutr. 2016 Sep-Oct;35(7):604-613. doi: 10.1080/07315724.2015.1080128. Epub 2016 Jun 17.

PMID: 27314649

INTRODUCTION: *Moringa oleifera* (MO) is an important dietary component for many populations in West Africa and the Indian subcontinent. ...As such, in this study we aim to investigate the in vitro anticancerous effect of *Moringa oleifera*'s aqueous leaf extract ...

34

Stevens - Johnson syndrome (SJS) following Murunga leaf (*Moringa oleifera*) consumption.

Witharana EWRA, Wijetunga WMGASTB, Wijesinghe SKJ.

Ceylon Med J. 2018 Dec 31;63(4):188-189. doi: 10.4038/cmj.v63i4.8771.

PMID: 30669215 Free article. No abstract available.

35

The chemo-prophylactic efficacy of an ethanol *Moringa oleifera* leaf extract against **hepatocellular carcinoma** in rats.

Sadek KM, Abouzed TK, Abouelkhair R, Nasr S.

Pharm Biol. 2017 Dec;55(1):1458-1466. doi: 10.1080/13880209.2017.1306713.

PMID: 28345375 Free PMC article.

CONTEXT: Hepatocellular carcinoma (HCC) is among the most well-known threatening tumours around the world, and the outlook remains bleak. *Moringa oleifera* Lam. (Moringaceae) exhibits antitumor, antioxidant and hepatoprotective properties. OBJECTIVES: To assess the chemo-pr ...

36

In vitro bioaccessibility and bioavailability of iron from fenugreek, baobab and moringa.

Khoja KK, Aslam MF, Sharp PA, Latunde-Dada GO.

Food Chem. 2021 Jan 15;335:127671. doi: 10.1016/j.foodchem.2020.127671. Epub 2020 Jul 28.

PMID: 32745843

Iron bioavailability was determined using an in vitro simulated peptic-pancreatic digestion, followed by measurement of ferritin in Caco-2 cells. The highest amount of bioaccessible iron was obtained from moringa leaves (9.88% 0.45 and 8.44 0.01 mg/100 g), but the h ...

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Moringa olifeira Lam. Stimulates Activation of the Insulin-Dependent Akt Pathway. Antidiabetic Effect in a Diet-Induced Obesity (DIO) Mouse Model.

Attakpa ES, Sangaré MM, Béhanzin GJ, Ategbo JM, Seri B, Khan NA.

Folia Biol (Praha). 2017;63(2):42-51.

PMID: 28557705 Free article.

Insulinsensitive tissues (liver, skeletal muscle) were collected to investigate antidiabetic effects and examine the plant's molecular mechanisms. *Moringa olifeira* Lam. leaf extract prevented weight gain. It also reduced blood glucose in DIO mice. Glib and ...

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Hydrogen Sulfide (H₂S) Releasing Capacity of Isothiocyanates from *Moringa oleifera* Lam.

Wang X, Liu Y, Liu X, Lin Y, Zheng X, Lu Y.
Molecules. 2018 Oct 29;23(11):2809. doi: 10.3390/molecules23112809.
PMID: 30380667 Free PMC article.

In this study, we determined the total contents of GSs and ITCs and their specific profiles in different Moringa tissues including seeds, stems, leaves and roots. Seeds (seeds with shell and seed kernel) showed significantly higher levels of total GSs and ITCs than ...

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Medicinal Plants Used in Traditional Management of Cancer in Uganda: A Review of Ethnobotanical Surveys, Phytochemistry, and Anticancer Studies.

Omara T, Kiprop AK, Ramkat RC, Cherutoi J, Kagoya S, Moraa Nyangena D, Azeze Tebo T, Nteziyaremye P, Nyambura Karanja L, Jepchirchir A, Maiyo A, Jematia Kiptui B, Mbabazi I, Kiwanuka Nakiguli C, Nakabuye BV, Chepkemoi Koske M.

Evid Based Complement Alternat Med. 2020 Mar 15;2020:3529081. doi: 10.1155/2020/3529081. eCollection 2020.

PMID: 32256639 Free PMC article. Review.

An electronic survey in multidisciplinary databases revealed that 29 plant species belonging to 28 genera distributed among 24 families have been reported to be used in the management of cancer in Uganda. ...As per global reports, *Allium sativum* L., *Annona muricata* L., Car ...

40

Structural characterization and immune enhancement activity of a novel polysaccharide from *Moringa oleifera* leaves.

Li C, Dong Z, Zhang B, Huang Q, Liu G, Fu X.

Carbohydr Polym. 2020 Apr 15;234:115897. doi: 10.1016/j.carbpol.2020.115897. Epub 2020 Jan 27.

PMID: 32070517

A novel polysaccharide, designated as MOP-3, was extracted and isolated from the leaves of *Moringa oleifera*. Structural characterization showed that MOP-3 had a molecular weight (MW) of 4.033 10⁶ Da and was composed of arabinose, glucose and galactose with a molar ...

41

Hepatoprotective effect of *Moringa oleifera* leaves aquatic extract against lead acetate-induced liver injury in male Wistar rats.

Abdel Fattah ME, Sobhy HM, Reda A, Abdelrazek HMA.

Environ Sci Pollut Res Int. 2020 Dec;27(34):43028-43043. doi: 10.1007/s11356-020-10161-z. Epub 2020 Jul 28.

PMID: 32725563

Current research was performed to explore the hepatoprotective potential of *Moringa oleifera* leaves extract on lead acetate-induced hepatic injury. ...The first group was control, while the second, third, and fourth groups were given 200 mg/kg aqueous *Moringa* ...

42

Anticancer activity of plant leaves extract collected from a tribal region of India.

Kumar G, Gupta R, Sharan S, Roy P, Pandey DM.

3 Biotech. 2019 Nov;9(11):399. doi: 10.1007/s13205-019-1927-x. Epub 2019 Oct 12.

PMID: 31656737 Free PMC article.

In the present study, plant leaves from five species were collected, dried and extracted with solvents of increasing polarity, followed by assessment of their cytotoxicity in A549 non-small-cell lung cancer cells. ...*M. pinnata* leaves extract also displayed t ...

43

Wound healing of diabetic rats treated with Moringa oleifera extract.

Azevedo ÍM, Araújo-Filho I, Teixeira MMA, Moreira MDFC, Medeiros AC.

Acta Cir Bras. 2018 Sep;33(9):799-805. doi: 10.1590/s0102-865020180090000008.

PMID: 30328912

PURPOSE: To evaluate if Moringa oleifera leaf aqueous extract (ME) influences the healing of skin wounds of diabetic rats. METHODS: Wistar rats were used (6 rats/group). Group 1 received normal saline (NS) v.o. Group 2 received moringa extract (100mg/kg v.o) ...

44

Evaluation of cytotoxicity of Moringa oleifera Lam. callus and leaf extracts on **Hela cells**.

Jafarain A, Asghari G, Ghassami E.

Adv Biomed Res. 2014 Sep 23;3:194. doi: 10.4103/2277-9175.140668. eCollection 2014.

PMID: 25337524 Free PMC article.

In this study we sought to determine if callus and leaf extracts of M. oleifera possess any cytotoxicity. MATERIALS AND METHODS: Ethanol-water (70-30) extracts of callus and leaf of M. oleifera were prepared by maceration method. ...However, leaf extract of M ...

45

Probing Regenerative Potential of Moringa oleifera Aqueous Extracts Using In vitro Cellular Assays.

Fernandes EE, Pulwale AV, Patil GA, Moghe AS.

Pharmacognosy Res. 2016 Oct-Dec;8(4):231-237. doi: 10.4103/0974-8490.188877.

PMID: 27695260 Free PMC article.

The extract also had prominent angiogenic and hepatoprotective effects. The extract did not influence proliferation of cancer cell lines indicating its safety for human consumption and use in pharmaceuticals. The Moringa oleifera leaf extract showed relatively less po ...

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Immunomodulatory activity of methanolic leaf extract of Moringa oleifera in Wistar albino rats.

Nfambi J, Bbosa GS, Sembajwe LF, Gakunga J, Kasolo JN.

J Basic Clin Physiol Pharmacol. 2015 Nov;26(6):603-11. doi: 10.1515/jbcpp-2014-0104.

PMID: 26103628 Free PMC article.

BACKGROUND: Globally, Moringa oleifera is used by different communities to treat various ailments including modulation of the immune system though with limited scientific evidence. The aim was to study the immunomodulatory activity of M. oleifera methanolic leaf ext ...

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Antiproliferation and induction of apoptosis by Moringa oleifera leaf extract on human cancer cells.

Sreelatha S, Jeyachitra A, Padma PR.

Food Chem Toxicol. 2011 Jun;49(6):1270-5. doi: 10.1016/j.fct.2011.03.006. Epub 2011 Mar 6.

PMID: 21385597

Medicinal plants provide an inexhaustible source of anticancer drugs in terms of both variety and mechanism of action. Induction of apoptosis is the key success of plant products as anticancer agents. The present study was designed to determine the antiproliferative and ap ...

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A potential oral anticancer drug candidate, Moringa oleifera leaf extract, induces the apoptosis of human hepatocellular carcinoma cells.

Jung IL, Lee JH, Kang SC.

Oncol Lett. 2015 Sep;10(3):1597-1604. doi: 10.3892/ol.2015.3482. Epub 2015 Jul 10.

PMID: 26622717 Free PMC article.

It has previously been reported that cold water-extracts of *Moringa oleifera* leaf have anticancer activity against various human cancer cell lines, including non-small cell lung cancer. In the present study, the anticancer activity of *M. oleifera* leaf extract ...

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Moringa oleifera leaves ethanolic extract influences DNA damage signaling pathways to protect liver tissue from cobalt -triggered apoptosis in rats.

Khalil SR, El Bohi KM, Khater S, Abd El-Fattah AH, Mahmoud FA, Farag MR.

Ecotoxicol Environ Saf. 2020 Sep 1;200:110716. doi: 10.1016/j.ecoenv.2020.110716. Epub 2020 May 22.

PMID: 32450433

This study assessed the potential of *Moringa oleifera* leaves ethanol extract (MLEE) in attenuating the detrimental effects of cobalt dichloride (CoCl₂) on rat liver. ...

50

Moringa fruit inhibits LPS-induced NO/iNOS expression through suppressing the NF-kappa B activation in RAW264.7 cells.

Lee HJ, Jeong YJ, Lee TS, Park YY, Chae WG, Chung IK, Chang HW, Kim CH, Choi YH, Kim WJ, Moon SK, Chang YC.

Am J Chin Med. 2013;41(5):1109-23. doi: 10.1142/S0192415X13500754.

PMID: 24117072

In this study, we evaluated the anti-inflammatory effects of moringa (*Moringa oleifera* Lam.), a natural biologically active substance, by determining its inhibitory effects on pro-inflammatory mediators in lipopolysaccharide (LPS)-stimulated macrophage RAW264.7 cell ...

51

Elucidation of the potential of *Moringa oleifera* leaves extract as a novel alternate to the chemical coagulant in water treatment process.

Pandey P, Khan F, Mishra R, Singh SK.

Water Environ Res. 2020 Jul;92(7):1051-1056. doi: 10.1002/wer.1300. Epub 2020 Feb 14.

PMID: 31997480

Moringa oleifera showed significant removal capability in comparison to alum but slightly at higher dose, thus our results strongly supported the efficacy of *M. oleifera* leaves extracts as better alternative to chemical coagulant in water purification. ...Moringa ...

52

Physicochemical and nutraceutical properties of moringa (*Moringa oleifera*) leaves and their effects in an in vivo AOM/DSS-induced colorectal carcinogenesis model.

Cuellar-Nuñez ML, Luzardo-Ocampo I, Campos-Vega R, Gallegos-Corona MA, González de Mejía E, Loarca-Piña G.

Food Res Int. 2018 Mar;105:159-168. doi: 10.1016/j.foodres.2017.11.004. Epub 2017 Nov 6.

PMID: 29433203

Moringa (*Moringa oleifera*) is a plant that has generated great interest in recent years because of its attributed medicinal properties. ...This is the first study of the suppressive effect of moringa leaves in an in vivo model of AOM/DSS-induced ...

53

Nutritional and phytochemical profiles and biological activities of *Moringa oleifera* Lam. edible parts from Guinea-Bissau (West Africa).

Fernandes Â, Bancessi A, Pinela J, Dias MI, Liberal Â, Calhelha RC, Ćirić A, Soković M, Catarino L, Ferreira ICFR, Barros L.

Food Chem. 2021 Mar 30;341(Pt 1):128229. doi: 10.1016/j.foodchem.2020.128229. Epub 2020 Sep 28.

PMID: 33038772

Moringa oleifera is an edible medicinal plant used to fight malnutrition in Africa. ...

54

Modulatory effects of Moringa oleifera extracts against hydrogen peroxide-induced cytotoxicity and oxidative damage.

Sreelatha S, Padma PR.

Hum Exp Toxicol. 2011 Sep;30(9):1359-68. doi: 10.1177/0960327110391385. Epub 2010 Dec 9.

PMID: 21148198

The present study examined and assessed the hydrogen peroxide (H₂O₂)-mediated DNA damage in human tumor KB cells and also assessed the ability of Moringa oleifera leaf extracts to inhibit the oxidative damage. H₂O₂ imposed a stress on the membrane lipids whi ...

55

Moringa concanensis Nimmo extracts ameliorates hyperglycemia-mediated oxidative stress and upregulates PPAR γ and GLUT4 gene expression in liver and pancreas of streptozotocin-nicotinamide induced diabetic rats.

Balakrishnan BB, Krishnasamy K, Mayakrishnan V, Selvaraj A.

Biomed Pharmacother. 2019 Apr;112:108688. doi: 10.1016/j.biopha.2019.108688. Epub 2019 Feb 22.

PMID: 30798121

The current study investigates the effects of ethanolic extract of M. concanensis Nimmo leaves (EMCNL) with respect to its potent protective tissue damage, antioxidant properties in serum, liver and kidney, histopathological evaluation, and PPAR γ and GLUT4 gene expres ...

56

Bioactive Compounds in Moringa oleifera Lam. Leaves Inhibit the Pro-Inflammatory Mediators in Lipopolysaccharide-Induced Human Monocyte-Derived Macrophages.

Luetragoon T, Pankla Sranujit R, Noysang C, Thongsri Y, Potup P, Suphrom N, Nuengchamnong N, Usuwanthim K.

Molecules. 2020 Jan 2;25(1):191. doi: 10.3390/molecules25010191.

PMID: 31906558 Free PMC article.

Moringa oleifera (MO) is an important plant for traditional medicine. ...

57

Potential of Moringa oleifera in the Treatment of Benign Prostate Hyperplasia: Role of Antioxidant Defence Systems.

Ishola IO, Yemitan KO, Afolayan OO, Anunobi CC, Durojaiye TE.

Med Princ Pract. 2018;27(1):15-22. doi: 10.1159/000486349. Epub 2017 Dec 17.

PMID: 29248935 Free PMC article.

OBJECTIVE: This study sought to evaluate the protective effect of ethanolic leaf extract of Moringa oleifera on testosterone-induced benign prostatic hyperplasia (BPH) in male Sprague-Dawley rats. ...

58

Moringa oleifera methanolic leaves extract induces apoptosis and G0/G1 cell cycle arrest via downregulation of Hedgehog Signaling Pathway in human prostate PC-3 cancer cells.

Khan F, Pandey P, Ahmad V, Upadhyay TK.

J Food Biochem. 2020 Aug;44(8):e13338. doi: 10.1111/jfbc.13338. Epub 2020 Jun 25.

PMID: 32588472

We found that *M. oleifera* leaves methanolic extract exhibited significant anticancerous potential by inducing ROS-mediated apoptosis and activation of caspase-3 activity in prostate cancer. ...Altogether, these experimental findings demonstrated that *M. oleifera* may exert ...

59

The **Antiproliferative** Effect of *Moringa oleifera* Crude **Aqueous Leaf Extract** on Human Esophageal Cancer Cells.

Tiloke C, Phulukdaree A, Chuturgoon AA.

J Med Food. 2016 Apr;19(4):398-403. doi: 10.1089/jmf.2015.0113.

PMID: 27074620

Esophageal cancer (EC) is commonly diagnosed in South Africa (SA), with high incidences occurring in SA's black population. *Moringa oleifera* (MO), a multipurpose tree, is used traditionally for its nutritional and medicinal properties. ...We investigated the antiproliferat ...

60

Moringa oleifera from Cambodia Ameliorates Oxidative Stress, Hyperglycemia, and Kidney Dysfunction in Type 2 Diabetic Mice.

Tang Y, Choi EJ, Han WC, Oh M, Kim J, Hwang JY, Park PJ, Moon SH, Kim YS, Kim EK.

J Med Food. 2017 May;20(5):502-510. doi: 10.1089/jmf.2016.3792. Epub 2017 May 3.

PMID: 28467233

Recent reports have shown the antidiabetic effect of *Moringa oleifera* from various parts of the world. However, *M. oleifera* from Cambodia has never determined. ...These results indicate the potential antidiabetic benefits of *M. oleifera* ethanolic leaf extract....

61

The antiproliferative effect of *Moringa oleifera* crude **aqueous leaf extract** on cancerous human alveolar epithelial cells.

Tiloke C, Phulukdaree A, Chuturgoon AA.

BMC Complement Altern Med. 2013 Sep 16;13:226. doi: 10.1186/1472-6882-13-226.

PMID: 24041017 Free PMC article.

BACKGROUND: The incidence of lung cancer is expected to increase due to increases in exposure to airborne pollutants and cigarette smoke. *Moringa oleifera* (MO), a medicinal plant found mainly in Asia and South Africa is used in the traditional treatment of various a ...

62

Sperm abnormalities induced by pre-pubertal exposure to cyclophosphamide are effectively mitigated by *Moringa oleifera* leaf extract.

Nayak G, Vadinkar A, Nair S, Kalthur SG, D'Souza AS, Shetty PK, Mutalik S, Shetty MM, Kalthur G, Adiga SK.

Andrologia. 2016 Mar;48(2):125-36. doi: 10.1111/and.12422. Epub 2015 Apr 22.

PMID: 25904411

Moringa oleifera L. is a medicinal plant with potential antioxidant property. This study was aimed at investigating the chemoprotective effect of *Moringa oleifera* leaf extract (MOE) on cyclophosphamide (CP)-induced testicular toxicity. ...

63

Xanthine oxidase inhibitory activity and antihyperuricemic effect of *Moringa oleifera* Lam. leaf hydrolysate rich in phenolics and peptides.

Tian Y, Lin L, Zhao M, Peng A, Zhao K.

J Ethnopharmacol. 2021 Apr 24;270:113808. doi: 10.1016/j.jep.2021.113808. Epub 2021 Jan 12.

PMID: 33450289

ETHNOPHARMACOLOGICAL RELEVANCE: *Moringa oleifera* Lam. leaf (MOL), a rich source of protein and phenolics, was traditionally used to treat various diseases including headaches, fevers, sore throat and dyslipidemia. ...

64

Cytotoxic and apoptotic effects of different extracts of *Moringa oleifera* Lam on lymphoid and monocytoïd cells.

Potestà M, Minutolo A, Gismondi A, Canuti L, Kenzo M, Roglia V, Macchi F, Grelli S, Canini A, Colizzi V, Montesano C.

Exp Ther Med. 2019 Jul;18(1):5-17. doi: 10.3892/etm.2019.7544. Epub 2019 May 3.

PMID: 31258632 Free PMC article.

Moringa oleifera Lam. (MO) is one of the most well-known and widely distributed species of the Moringaceae family in African communities, and various preparations of *M. oleifera* are used for the treatment of several diseases. ...The pro-apoptotic effect of MO seed aqueous ...

65

Ethanollic Extract of *Moringa oleifera* Leaves Influences NF-kappaB Signaling Pathway to Restore Kidney Tissue from Cobalt-Mediated Oxidative Injury and Inflammation in Rats.

Abdel-Daim MM, Khalil SR, Awad A, Abu Zeid EH, El-Aziz RA, El-Serehy HA.

Nutrients. 2020 Apr 9;12(4):1031. doi: 10.3390/nu12041031.

PMID: 32283757 Free PMC article.

This study aimed to describe the protective efficacy of *Moringa oleifera* ethanollic extract (MOEE) against the impact of cobalt chloride (CoCl₂) exposure on the rat's kidney. ...

66

Ethanollic extract of *Moringa oleifera* leaves alleviate cyclophosphamide-induced testicular toxicity by improving endocrine function and modulating cell specific gene expression in mouse testis.

Nayak G, Rao A, Mullick P, Mutalik S, Kalthur SG, Adiga SK, Kalthur G.

J Ethnopharmacol. 2020 Sep 15;259:112922. doi: 10.1016/j.jep.2020.112922. Epub 2020 May 15.

PMID: 32422360

ETHNOPHARMACOLOGICAL RELEVANCE: *Moringa oleifera* Lam. is known for its nutritional and ethno medicinal values due to the presence of wide array of phytochemicals with multiple biological activities. We have previously reported that ethanollic extract of *Moringa oleifera* ...

67

Development of luminescent atacamite nanoclusters for bioimaging and photothermal applications.

Sahoo K, Khare D, Srikrishna S, Dubey AK, Kumar M.

Nanotechnology. 2020 Apr 9;31(26):265102. doi: 10.1088/1361-6528/ab7de5. Epub 2020 Mar 9.

PMID: 32150736

Fluorescent atacamite nanoclusters (FANCs) have been developed and modified with silica for *Drosophila* salivary gland tissue imaging and photothermally induced cell death of osteosarcoma MG-63 cells. FANCs were synthesized with *Moringa oleifera* leaf extract without ...

68

Effects of dietary fish meal replacement by fermented moringa (*Moringa oleifera* Lam.) leaves on growth performance, nonspecific immunity and disease resistance against *Aeromonas hydrophila* in juvenile gibel carp (*Carassius auratus gibelio* var. CAS III).

Zhang X, Sun Z, Cai J, Wang J, Wang G, Zhu Z, Cao F.

Fish Shellfish Immunol. 2020 Jul;102:430-439. doi: 10.1016/j.fsi.2020.04.051. Epub 2020 Apr 28.

PMID: 32360279

This study was aimed to evaluate the effects of partial replacement of fish meal by fermented moringa leaves (FMLs) on growth performance, serum biochemistry, antioxidant status, nonspecific immunity, and resistance against *Aeromonas hydrophila* in juvenile gibel car ...

69

Effect of partial replacement of alfalfa hay with Moringa species leaves on milk yield and composition of Najdi ewes.

Babiker EE, Al Juhaimi F, Ghafoor K, Mohamed HE, Abdoun KA.

Trop Anim Health Prod. 2016 Oct;48(7):1427-33. doi: 10.1007/s11250-016-1111-9. Epub 2016 Jul 26.

PMID: 27461475 Clinical Trial.

The present study was carried out to investigate changes in milk yield and composition of Najdi ewes fed 25 % Moringa oleifera (MOD) or Moringa peregrina (MPD) leaf diets as a supplement to alfalfa hay diet (AHD). ...The results obtained showed that the inclu ...

70

Mitochondria-mediated Caspase-dependent and Caspase-independent apoptosis induced by **aqueous extract** from Moringa oleifera leaves in human melanoma cells.

Do BH, Nguyen TPT, Ho NQC, Le TL, Hoang NS, Doan CC.

Mol Biol Rep. 2020 May;47(5):3675-3689. doi: 10.1007/s11033-020-05462-y. Epub 2020 May 5.

PMID: 32372172

Previous studies indicated the anti-cancer activity of aqueous extract of Moringa oleifera Lam. leaves (MOE) against a variety of cell lines. ...Furthermore, the related molecular mechanisms of the apoptosis were also examined. An aqueous extract of Moringa o ...

71

Moringa concanensis Nimmo ameliorates hyperglycemia in 3T3-L1 adipocytes by upregulating PPAR-gamma, C/EBP-alpha via Akt signaling pathway and STZ-induced diabetic rats.

Balakrishnan BB, Krishnasamy K, Choi KC.

Biomed Pharmacother. 2018 Jul;103:719-728. doi: 10.1016/j.biopha.2018.04.047. Epub 2018 Apr 24.

PMID: 29680740

Moringa concanensis Nimmo is a medicinal plant for treating various human illnesses including menstrual pain, high blood pressure, jaundice, inflammation, pain, fever, sore eyes, and cholesterol in Indian folk medicine. ...Also, the antihyperglycemic activity of the ...

72

Extract of Moringa oleifera leaves ameliorates streptozotocin-induced Diabetes mellitus in adult rats.

Yassa HD, Tohamy AF.

Acta Histochem. 2014 Jun;116(5):844-54. doi: 10.1016/j.acthis.2014.02.002. Epub 2014 Mar 20.

PMID: 24657072

The present study assessed the possible antioxidant and antidiabetic effects of an aqueous extract of M. oleifera leaves in treating streptozotocin-induced diabetic albino rats. The antidiabetic effects of aqueous extract of M. oleifera leaves were assessed histomor ...

73

Impact of conventional/non-conventional extraction methods on the untargeted phenolic profile of Moringa oleifera leaves.

Rocchetti G, Blasi F, Montesano D, Ghisoni S, Marcotullio MC, Sabatini S, Cossignani L, Lucini L.

Food Res Int. 2019 Jan;115:319-327. doi: 10.1016/j.foodres.2018.11.046. Epub 2018 Nov 23.

PMID: 30599948

The impact of different extraction methods, namely maceration, homogenizer-assisted extraction, rapid solid-liquid dynamic extraction, microwave-assisted extraction and ultrasound-assisted extraction, on polyphenols of *Moringa oleifera* leaves was studied. The phenol ...

74

Antidiabetic activities of aqueous ethanol and n-butanol fraction of *Moringa stenopetala* leaves in streptozotocin-induced diabetic rats.

Toma A, Makonnen E, Mekonnen Y, Debella A, Adisakwattana S.

BMC Complement Altern Med. 2015 Jul 18;15:242. doi: 10.1186/s12906-015-0779-0.

PMID: 26187590 Free PMC article.

The aim of this study was to investigate the antidiabetic activity of aqueous ethanol and n-butanol fraction of *Moringa stenopetala* leaves in streptozotocin (STZ) induced diabetic rats. METHODS: The aqueous ethanol extract and n-butanol fraction of *Moringa st* ...

75

Soluble extract from *Moringa oleifera* leaves with a new anticancer activity.

Jung IL.

PLoS One. 2014 Apr 18;9(4):e95492. doi: 10.1371/journal.pone.0095492. eCollection 2014.

PMID: 24748376 Free PMC article.

Moringa oleifera has been regarded as a food substance since ancient times and has also been used as a treatment for many diseases. ...Due to the increasing attention on natural products, such as those from plants, and the advantages of oral administration of anticancer dr ...

76

Moringa oleifera induced potentiation of serotonin release by 5-HT(3) receptors in experimental ulcer model.

Debnath S, Biswas D, Ray K, Guha D.

Phytomedicine. 2011 Jan 15;18(2-3):91-5. doi: 10.1016/j.phymed.2010.06.003. Epub 2010 Jul 16.

PMID: 20637582

ETHNOPHARMACOLOGICAL RELEVANCE: *moringa oleifera* (Moringaceae), a perennial plant is widely cultivated throughout the world. ...AIM OF THE STUDY: the aim of the present study was to assess the efficacy of its aqueous leaf extract on protection of gastric ulce ...

77

Significant Decreased Expressions of CaN, VEGF, SLC39A6 and SFRP1 in MDA-MB-231 Xenograft Breast Tumor Mice Treated with *Moringa oleifera* Leaves and Seed Residue (MOLSr) Extracts.

Lim WF, Mohamad Yusof MI, Teh LK, Salleh MZ.

Nutrients. 2020 Sep 30;12(10):2993. doi: 10.3390/nu12102993.

PMID: 33007803 Free PMC article.

Moringa oleifera is a miracle plant with many nutritional and medicinal properties.

Chemopreventive values of the combined mixture of *moringa* leaves and seed residue (MOLSr) at different ratios (M1S9, M1S1 and M9S1) were investigated. ...

78

Identification of potential targets for Thymidylate Synthase and Amp-C betalactamase from of non-alkaloidal fractions of *Moringa oleifera* leaves.

Kumari C, Virk AK, Kumari S, Gupta T, Rolta R, Li X, Kulshrestha S.

Curr Pharm Biotechnol. 2021 Jan 11. doi: 10.2174/138920102266621011120208. Online ahead of print.

PMID: 33430724

METHODS: In the present investigation, ethanolic extract of Moringa leaves was prepared and then fractionated on the presence/absence of alkaloids. ...The present finding demonstrated that Moringa oleifera is an excellent plant candidate to be used for ...

79

Identification and characterization of a potent anticancer fraction from the leaf extracts of Moringa oleifera L.

Krishnamurthy PT, Vardarajalu A, Wadhvani A, Patel V.

Indian J Exp Biol. 2015 Feb;53(2):98-103.

PMID: 25757240

Anticancer potential of Moringa oleifera L. extracts have been well established. However, there are no reports on the isolated molecules/fractions from these extracts which are responsible for the anticancer/cytotoxic activity. ...We have also successfully isolated and cha ...

80

Review: an exposition of medicinal preponderance of Moringa oleifera (Lank.).

Hussain S, Malik F, Mahmood S.

Pak J Pharm Sci. 2014 Mar;27(2):397-403.

PMID: 24577932 Review.

This review acquaints with the consequence of fera (Moringaceae), a fast growing medicinal plant wide spread in tropical regions with height ranging from 5-10m. ...Flavanoids and phenolics such as gallic acid, chlorogenic acid, ferulic acid, kaempferol, ellagic acid, querc ...

Page 9

81

Moringa oleifera Gold Nanoparticles Modulate Oncogenes, Tumor Suppressor Genes, and Caspase-9 Splice Variants in A549 Cells.

Tiloke C, Phulukdaree A, Anand K, Gengan RM, Chuturgoon AA.

J Cell Biochem. 2016 Oct;117(10):2302-14. doi: 10.1002/jcb.25528. Epub 2016 Mar 11.

PMID: 26923760

Gold nanoparticles (AuNP's) facilitate cancer cell recognition and can be manufactured by green synthesis using nutrient rich medicinal plants such as Moringa oleifera (MO). Targeting dysregulated oncogenes and tumor suppressor genes is crucial for cancer therapeutics. We ...

82

Protective Effects of Moringa oleifera on HBV Genotypes C and H Transiently Transfected Huh7 Cells.

Feustel S, Ayón-Pérez F, Sandoval-Rodriguez A, Rodríguez-Echevarría R, Contreras-Salinas H, Armendáriz-Borunda J, Sánchez-Orozco LV.

J Immunol Res. 2017;2017:6063850. doi: 10.1155/2017/6063850. Epub 2017 Oct 26.

PMID: 29214184 Free PMC article.

Huh7 cells were treated with an aqueous extract of M. oleifera (leaves) at doses of 0, 30, 45, or 60 mug/mL. The replicative virus and TGF-beta1, CTGF, CAT, IFN-beta1, and pgRNA expressions were measured by real time. ...

83

Bioactive Extract from Moringa oleifera Inhibits the Pro-inflammatory Mediators in Lipopolysaccharide Stimulated Macrophages.

Fard MT, Arulselvan P, Karthivashan G, Adam SK, Fakurazi S.

Pharmacogn Mag. 2015 Oct;11(Suppl 4):S556-63. doi: 10.4103/0973-1296.172961.

PMID: 27013794 Free PMC article.

Nevertheless, the chronic inflammation can trigger various inflammatory associated diseases/disorder. *Moringa oleifera* is a widely grown plant in most tropical countries and it has been recognized traditionally for several medicinal benefits. ...CONCLUSION: These fi ...

84

Local knowledge, use pattern and geographical distribution of *Moringa oleifera* Lam. (Moringaceae) in Nigeria.

Popoola JO, Obembe OO.

J Ethnopharmacol. 2013 Nov 25;150(2):682-91. doi: 10.1016/j.jep.2013.09.043. Epub 2013 Oct 2. PMID: 24096203

MATERIALS AND METHODS: Ethnobotanical data were collected through face to face interviews, semi structured questionnaires and discussions with selected people who had knowledge about the plant. The fidelity level (FL %) and use value for different use categories of Mori ...

85

Characteristic single glucosinolates from *Moringa oleifera*: Induction of detoxifying enzymes and lack of genotoxic activity in various model systems.

Förster N, Mewis I, Glatt H, Haack M, Brigelius-Flohé R, Schreiner M, Ulrichs C.

Food Funct. 2016 Nov 9;7(11):4660-4674. doi: 10.1039/c6fo01231k.

PMID: 27775133

Leaves of *Moringa oleifera* are used by tribes as biological cancer medicine. Scientific investigations with *M. oleifera* conducted so far have almost exclusively used total plant extracts. Studies on the activity of single compounds are missing. ...

86

Health Benefits of Uses and Applications of *Moringa oleifera* in Bakery Products.

Milla PG, Peñalver R, Nieto G.

Plants (Basel). 2021 Feb 6;10(2):318. doi: 10.3390/plants10020318.

PMID: 33562157 Free PMC article. Review.

Moringa oleifera belongs to the Moringaceae family and is the best known of the native *Moringa oleifera* genus. ...These characteristics allow it to have pharmacological properties, including anti-diabetic, anti-inflammatory, anticarcinogenic, antioxidant, cardioprot ...

87

Ethanol extract of *Moringa oleifera* Lam. leaves protect the pre-pubertal spermatogonial cells from cyclophosphamide-induced damage.

Nayak G, Honguntikar SD, Kalthur SG, D'Souza AS, Mutalik S, Setty MM, Kalyankumar R, Krishnamurthy H, Kalthur G, Adiga SK.

J Ethnopharmacol. 2016 Apr 22;182:101-9. doi: 10.1016/j.jep.2016.02.003. Epub 2016 Feb 10.

PMID: 26875643

The leaves are highly nutritious and are known to possess various biological activities.

MATERIALS AND METHODS: Pre-pubertal Swiss albino male mice were injected with single dose of cyclophosphamide (CP, 200mg/kg body weight) or ethanol extract of *Moringa oleifera* ...

88

Immunomodulatory activity of methanolic leaf extract of *Moringa oleifera* in animals.

Sudha P, Asdaq SM, Dhamingi SS, Chandrakala GK.

Indian J Physiol Pharmacol. 2010 Apr-Jun;54(2):133-40.

PMID: 21090530

The aim of the present study was to investigate the immunomodulatory action of methanolic extract of *Moringa oleifera* (MEMO) in an experimental model of immunity. The cellular immunity was evaluated using neutrophil adhesion test, cyclophosphamide induced neutropenia and c ...

89

The protective effect of *Moringa oleifera* leaves against cyclophosphamide-induced urinary bladder toxicity in rats.

Taha NR, Amin HA, Sultan AA.

Tissue Cell. 2015 Feb;47(1):94-104. doi: 10.1016/j.tice.2014.12.002. Epub 2014 Dec 23.

PMID: 25595312

It is known to cause urinary bladder damage due to inducing oxidative stress. *Moringa oleifera* (Mof) is commonly known as drumstick tree. *Moringa* leaves have been reported to be a rich source of beta-carotene, protein, vitamin C, calcium, and potassium. ...Bi ...

90

Application of structured triacylglycerols in food products for value addition.

More SB, Gogate PR, Waghmare JS.

Heliyon. 2020 Oct 12;6(10):e05198. doi: 10.1016/j.heliyon.2020.e05198. eCollection 2020 Oct.

PMID: 33088961 Free PMC article.

The oxidative stability studies of all the products in the presence of natural antioxidants from moringa leaves and pomegranate peel using the peroxide value test and rancimat analysis demonstrated similar stability to the standard marketed product. Application of ...

91

The toxicity of extracts of plant parts of *Moringa stenopetala* in HEPG2 cells in vitro.

Mekonnen N, Houghton P, Timbrell J.

Phytother Res. 2005 Oct;19(10):870-5. doi: 10.1002/ptr.1720.

PMID: 16261516

The cytotoxicity of extracts from a widely used species of plant, *Moringa stenopetala*, was assessed in HEPG2 cells, by measuring the leakage of lactate dehydrogenase (LDH) and cell viability. ...A highly significant ($p < 0.001$) decrease in HEPG2 viability was fou

...

92

Cardioprotective effect of magnetic hydrogel nanocomposite loaded N, alpha-L-rhamnopyranosyl vincosamide isolated from *Moringa oleifera* leaves against doxorubicin-induced cardiac toxicity in rats: in vitro and in vivo studies.

Cheraghi M, Namdari M, Daraee H, Negahdari B.

J Microencapsul. 2017 Jun;34(4):335-341. doi: 10.1080/02652048.2017.1311955. Epub 2017 Jun 28.

PMID: 28406043

Cardioprotective effect of N, alpha-L-rhamnopyranosyl vincosamide (VR), isolated from the leaves of *Moringa oleifera* plant in doxorubicin (Dox)-induced cardiac toxicity rats was evaluated. ...

93

Cytotoxicity, Antioxidant and Apoptosis Studies of Quercetin-3-O Glucoside and 4-(beta-D-Glucopyranosyl-14-alpha-L-Rhamnopyranosyloxy)-Benzyl Isothiocyanate from *Moringa oleifera*.

Maiyo FC, Moodley R, Singh M.

Anticancer Agents Med Chem. 2016;16(5):648-56. doi: 10.2174/1871520615666151002110424.

PMID: 26428271

Moringa oleifera, from the family Moringaceae, is used as a source of vegetable and herbal medicine and in the treatment of various cancers in many African countries, including Kenya. The present study involved the phytochemical analyses of the crude extracts of *M.oleifera* ...

94

An ethyl acetate fraction of *Moringa oleifera* Lam. Inhibits human macrophage cytokine production induced by cigarette smoke.

Kooltheat N, Sranujit RP, Chumark P, Potup P, Laytragoon-Lewin N, Usuwanthim K. *Nutrients*. 2014 Feb 18;6(2):697-710. doi: 10.3390/nu6020697.

PMID: 24553063 Free PMC article.

Moringa oleifera Lam. (MO) has been reported to harbor anti-oxidation and anti-inflammatory activity and useful in the treatment of inflammatory diseases. ...An ethyl acetate fraction of MO (MOEF) was prepared from fresh leaves extract of *Moringa* and shown to ...

95

Novel drug delivery system of plant extract for the management of diabetes: an antidiabetic study.

Momoh MA, Chime SA, Kenechukwu FC.

J Diet Suppl. 2013 Sep;10(3):252-63. doi: 10.3109/19390211.2013.822454. Epub 2013 Aug 9.

PMID: 23931725

MATERIAL AND METHODS: The ***Moringa oleifera* powdered leaf** was formulated into tablets by direct compression. ...**CONCLUSIONS:** This study has shown that *Moringa oleifera* leaves formulated into tablets possess good physicochemical and antidiabetic properti ...

96

Chemopreventive and **anti-leukemic effects** of ethanol extracts of *Moringa oleifera* leaves on wistar rats bearing benzene induced leukemia.

Akanni EO, Adedeji AL, Adedosu OT, Olaniran OI, Oloke JK.

Curr Pharm Biotechnol. 2014;15(6):563-8. doi: 10.2174/1389201015666140717090755.

PMID: 25051949

This study is an attempt to determine the chemopreventive and antileukemic activities of ethanol extracts of *Moringa oleifera* leaves on benzene induced leukemia bearing rats. Leukemia was induced by intravenous injection of 0.2 mL benzene solution 48 hourly for 4 we ...

97

In vitro Evaluation of Cytotoxic Activities of Essential Oil from *Moringa oleifera* Seeds on HeLa, HepG2, MCF-7, CACO-2 and L929 Cell Lines.

Elsayed EA, Sharaf-Eldin MA, Wadaan M.

Asian Pac J Cancer Prev. 2015;16(11):4671-5. doi: 10.7314/apjcp.2015.16.11.4671.

PMID: 26107222 Free article.

Moringa oleifera Lam. (Moringaceae) is widely consumed in tropical and subtropical regions for their valuable nutritional and medicinal characteristics. Recently, extensive research has been conducted on leaf extracts of *M. oleifera* to evaluate their potential cytot ...

98

Evaluation of the polyphenol content and antioxidant properties of methanol extracts of the leaves, stem, and root barks of *Moringa oleifera* Lam.

Atawodi SE, Atawodi JC, Idakwo GA, Pfundstein B, Haubner R, Wurtele G, Bartsch H, Owen RW. *J Med Food*. 2010 Jun;13(3):710-6. doi: 10.1089/jmf.2009.0057.

PMID: 20521992

Medicinal plants have been shown to have both chemopreventive and/or therapeutic effects on cancer and other diseases related to oxidative damage. *Moringa oleifera* Lam., known in the Hausa and Igala languages of Nigeria as "Zogale" and "Gerged," respectively, and drumstic ...

99

Attenuation of lead-induced oxidative stress in rat brain, liver, kidney and blood of male Wistar rats by *Moringa oleifera* seed powder.

Velaga MK, Daughtry LK, Jones AC, Yallapragada PR, Rajanna S, Rajanna B.

J Environ Pathol Toxicol Oncol. 2014;33(4):323-37. doi:

10.1615/jenvironpatholtoxiconcol.2014011656.

PMID: 25404379

Moringa oleifera is a tree belonging to Moringaceae family and its leaves and seeds are reported to have ameliorative effects against metal toxicity. ...Male Wistar rats (100-120 g) were divided into four groups: control (2000 ppm of sodium acetate for 2 weeks), exp ...

100

Micellarization and intestinal cell uptake of beta-carotene and lutein from drumstick (*Moringa oleifera*) leaves.

Pullakhandam R, Failla ML.

J Med Food. 2007 Jun;10(2):252-7. doi: 10.1089/jmf.2006.250.

PMID: 17651060

The leaves and pods of the drumstick tree are used as food and medicine in some Asian and African countries. ...Caco-2 cells accumulated beta-carotene and lutein from micelles generated during digestion of drumstick leaves in a time- and concentration-dependent mann ...

101

Chemical characterization, antioxidant, cytotoxicity, Anti-Toxoplasma gondii and antimicrobial potentials of the Citrus sinensis seed oil for sustainable cosmeceutical production.

Atolani O, Adamu N, Oguntoye OS, Zubair MF, Fabiyi OA, Oyegoke RA, Adeyemi OS, Areh ET, Tarigha DE, Kambizi L, Olatunji GA.

Heliyon. 2020 Feb 13;6(2):e03399. doi: 10.1016/j.heliyon.2020.e03399. eCollection 2020 Feb.

PMID: 32099925 Free PMC article.

'Green' preparation of medicinal soaps devoid of any synthetic additives was made from underutilized tropical seed of Citrus sinensis seed oil and some natural additives comprising of natural honey, Ocimum gratissimum leaves extract, Moringa oleifera seed oil and co ...

102

Optimization, formulation, and characterization of mult flavonoids-loaded flavanosome by bulk or sequential technique.

Karthivashan G, Masarudin MJ, Kura AU, Abas F, Fakurazi S.

Int J Nanomedicine. 2016 Jul 27;11:3417-34. doi: 10.2147/IJN.S112045. eCollection 2016.

PMID: 27555765 Free PMC article.

Three widely established and therapeutically valuable flavonoids, such as quercetin (Q), kaempferol (K), and apigenin (A), were quantified in the ethyl acetate fraction of Moringa oleifera leaves extract and were commercially obtained and incorporated in a single fl ...

103

Immunomodulatory effect of Moringa oleifera Lam. extract on cyclophosphamide induced toxicity in mice.

Gupta A, Gautam MK, Singh RK, Kumar MV, Rao ChV, Goel RK, Anupurba S.

Indian J Exp Biol. 2010 Nov;48(11):1157-60.

PMID: 21117458

Immunomodulatory effect of ethanolic extract (50%) of M. oleifera leaves (MOE) has been studied in normal and immunosuppressed mice models. ...

104

Evaluation of aqueous leaves extract of Moringa oleifera Linn for **wound healing** in albino rats.

Rathi BS, Bodhankar SL, Baheti AM.
Indian J Exp Biol. 2006 Nov;44(11):898-901.
PMID: 17205710

Aqueous extract of leaves of *M. oleifera* was investigated and rationalised for its wound healing activity. ...

105

In vivo **radioprotective effect** of *Moringa oleifera* leaves.

Rao AV, Devi PU, Kamath R.

Indian J Exp Biol. 2001 Sep;39(9):858-63.

PMID: 11831365

Radioprotective property of *Moringa oleifera* leaves was investigated in healthy adult Swiss albino mice. Animals were injected (ip) with 150 mg/kg body weight of 50% methanolic extract (ME) of *M. oleifera* leaves, as a single dose, or in 5 daily fractions of 3 ...

106

Niaziminin, a thiocarbamate from the leaves of *Moringa oleifera*, holds a strict structural requirement for inhibition of tumor-promoter-induced Epstein-Barr virus activation.

Murakami A, Kitazono Y, Jiwajinda S, Koshimizu K, Ohigashi H.

Planta Med. 1998 May;64(4):319-23. doi: 10.1055/s-2006-957442.

PMID: 9619112

Three known thiocarbamate (TC)- and isothiocyanate (ITC)-related compounds have been isolated from the leaves of *Moringa oleifera*, a traditional herb in southeast Asia, as inhibitors of tumor promoter teleocidin B-4-induced Epstein-Barr virus (EBV) activation in Raj ...

107

Evaluation of antioxidant and anticancer activity of copper oxide nanoparticles synthesized using medicinally important plant extracts.

Rehana D, Mahendiran D, Kumar RS, Rahiman AK.

Biomed Pharmacother. 2017 May;89:1067-1077. doi: 10.1016/j.biopha.2017.02.101. Epub 2017 Mar 11.

PMID: 28292015

Copper oxide (CuO) nanoparticles were synthesized by green chemistry approach using different plant extracts obtained from the leaves of *Azadirachta indica*, *Hibiscus rosa-sinensis*, *Murraya koenigii*, *Moringa oleifera* and *Tamarindus indica*. In order to compare ...

108

Bioactivity evaluation against *Artemia salina* Leach of medicinal plants used in Brazilian Northeastern folk medicine.

Arcanjo DD, Albuquerque AC, Melo-Neto B, Santana LC, Medeiros MG, Citó A.

Braz J Biol. 2012 Aug;72(3):505-9. doi: 10.1590/s1519-69842012000300013.

PMID: 22990821

This paper reports the bioactivity of ethanol extracts from seven medicinal plants from the Northeast of Brazil (*Acmella uliginosa*, *Ageratum conyzoides*, *Eugenia uniflora*, *Plectranthus neochilus*, *Moringa oleifera*, *Justicia pectoralis* and *Equisetum* sp.) against *Artemia salina* ...

109

Biologically synthesised silver nanoparticles from three diverse family of plant extracts and their anticancer activity against epidermoid A431 carcinoma.

Nayak D, Pradhan S, Ashe S, Rauta PR, Nayak B.

J Colloid Interface Sci. 2015 Nov 1;457:329-38. doi: 10.1016/j.jcis.2015.07.012. Epub 2015 Jul 7.

PMID: 26196716

HYPOTHESIS: Biological synthesis of silver nanoparticles is a cost effective natural process where the phytochemicals specifically phenols, flavonoids and terpenoids present in the plant extracts act as capping and reducing agent. Due to their nano size regime the silver n ...

110

Inhibitory effects of crude extracts from some edible Thai plants against replication of hepatitis B virus and human liver cancer cells.

Waiyaput W, Payungporn S, Issara-Amphorn J, Panjaworayan NT.

BMC Complement Altern Med. 2012 Dec 6;12:246. doi: 10.1186/1472-6882-12-246.

PMID: 23216691 Free PMC article.

RESULTS: Buffer and hydroalcoholic extracts from *C. formosum* (leaf) reduced cell viability of HepG2 cells and they also inhibited HBV cccDNA. ...In addition, leaves of *M. Oleifera* extracted by hydroalcoholic solvent drastically decreased the level of cccDNA in trans ...

111

Bioactivity of phytochemicals in some lesser-known plants and their effects and potential applications in livestock and aquaculture production systems.

Makkar HP, Francis G, Becker K.

Animal. 2007 Oct;1(9):1371-91. doi: 10.1017/S1751731107000298.

PMID: 22444893

As a result of this, scientists have intensified efforts in exploiting plants, plant extracts or natural plant compounds as potential natural alternatives for enhancing the livestock productivity. This paper discusses work on the effects of various phytochemicals an ...

Wetenschappelijke artikels Jojoba en kanker

Genezen van ziektes zoals kanker en reuma door herstel van de balans tussen de diverse cellulaire groeifactoren en hun receptoren door simmondsines uit Jojoba.

Het ontstaan van bepaalde ziektes wordt in vele gevallen veroorzaakt door het uit balans geraken van moleculen die betrokken zijn bij cellulaire interacties; meer bepaald van de cellulaire groeifactoren en de receptoren hiervoor. Voor de mens zijn er reeds meer dan 20 groeifactoren beschreven alsook een 4-tal verschillende receptorgroepen waarop deze kunnen binden 1,2. Doordat verschillende celtypen over verschillende groeifactor/receptor combinaties beschikken, ontstaat een complex mechanisme dat de groei en vernieuwing van de verschillende celtypen controleert en reguleert³.

De basic Fibroblast Growth Factor (bFGF of FGF-2) is zo'n cellulaire groeifactor die een belangrijke rol speelt bij zowel de ontwikkeling als bij de regulatie van tal van biochemische processen in het lichaam van de volwassene.

Alhoewel het bFGF een cruciale rol speelt in celvernieuwing en verjonging, kan de activiteit van het bFGF echter ook zodanig ontregeld geraken dat bepaalde cellen tot vermenigvuldiging aangezet worden waar dit eigenlijk helemaal niet meer wenselijk is. In veel gevallen is dit te wijten aan een verhoogde expressie van bepaalde receptoren in cellen waardoor deze extra gestimuleerd worden om te gaan delen, wat uiteindelijk leidt tot het ontstaan van tumoren in geval van kanker 5,6 of ontstoken gewrichten in geval van reuma 7. Het bFGF kan dus verschillende (gunstige en minder gunstige) invloeden uitoefenen afhankelijk van het receptortype waar deze op bindt 8.

Verstoring in de activiteit van de bFGF of overexpressie van ongunstige receptoren waarop deze kan binden, ontstaat vnl. door veroudering 9, genetische aanleg 10, blootstelling aan bepaalde toxische stoffen 11 of door tekorten aan bepaalde essentiële voedingsstoffen voortgekomen door een verkeerd voedingspatroon en/of ongezonde levensgewoonte 12, doch veelal door een combinatie van deze factoren. Naast overbelasting van de spieren waarbij melkzuur geproduceerd

wordt, speelt ongezonde voeding eveneens een belangrijke rol bij de verzuring van het lichaam¹³; deze verzuring leidt op zijn beurt tot een stimulatie van het bFGF en de VEGF (Vascular Endothelial Growth Factor)¹⁴. Een verhoogde bFGF-activiteit heeft dus bij bepaalde celtypen op zijn beurt tot gevolg dat de angiogenese eveneens overgestimuleerd wordt en dat de p53 tumorsuppressor activiteit onderdrukt wordt ¹⁵.

Angiogenese¹⁶ is het proces waarbij nieuwe bloedvaatjes gevormd worden; in normale omstandigheden speelt angiogenese een belangrijke rol wanneer veel voedsel naar bepaalde weefsels moet gevoerd worden zoals bij de foetale ontwikkeling, wondheling of zones in het lichaam waar zuurstoftekort optreedt door slechte doorbloeding. Bij bepaalde aandoeningen kunnen zieke cellen echter zelf de angiogenese gaan stimuleren, veelal door stimulatie van het VEGF dat op zijn beurt gestimuleerd werd door het bFGF. Een overvloedige aanmaak van ongewenste bloedvaatjes kan dan leiden tot zwelling, pijn en zelfs gewrichtsschade zoals bij reuma het geval is. Tumoren gaan ook zelf nieuwe bloedvaatjes naar zich toe trekken zodat ze meer energie kunnen opnemen waardoor ze sneller kunnen groeien en vervolgens via het bloedvatstelsel sneller kunnen uitzaaien.

Het p53 tumorsuppressor eiwit¹⁷ zorgt bij de celdeling voor een controle op de DNA-replicatie; als er fouten in het DNA optreden kan dit tot kanker leiden. Het p53 zorgt voor herstel van beschadigd DNA of eliminatie van cellen met beschadigd DNA. Hoe hoger de activiteit van het p53, hoe beter het lichaam beschermd is tegen het ontstaan van kankers.

Overstimulatie door bFGF en de daarmee geassocieerde overstimulatie van de angiogenese (aanmaak ongewenste bloedvaten) en de verminderde activiteit van het p53 (verminderde controle op DNA-fouten) vormen bijgevolg een gemeenschappelijke onderliggende oorzaak bij de ontwikkeling van ziektes zoals kanker ¹⁸ en reuma ¹⁹. Het is bovendien ook geweten dat mensen die al reuma hebben significant meer kans hebben om daarbovenop ook nog eens kanker te ontwikkelen dan mensen zonder reuma ²⁰

Het is dan ook aannemelijk om ziektes die mede ontstaan zijn door een ontsporing van de cellulaire groeifactorenbalans te gaan genezen door deze balans te gaan herstellen; het onderdrukken van de overgestimuleerde bFGF cellen heeft tot gevolg dat de overmatige angiogenese ²¹ terug genormaliseerd wordt en dat de activiteit van het p53 terug toeneemt ²²

Welnu, bepaalde metaboliëten van de simmondsinmoleculen uit de jojobaplant bezitten de natuurlijke eigenschap om de balans van het verstoorde bFGF te herstellen door te binden op de receptor voor het bFGF die vnl. voorkomt op cellen die geassocieerd zijn met het ontstaan van ziektes zoals kanker en reuma. Het mechanisme hiervoor werd reeds beschreven²³

De toediening van simmondsines heeft echter geen noemenswaardige nevenwerkingen in tegenstelling tot deze die gekend zijn bij klassieke chemotherapiën en reumamedicatie. De inname van Simmondsines wordt best gecombineerd met een levensstijl die bFGF ontsporing voorkomt; i.e. stoppen met roken, verandering van voedsel waarbij minder verzuring van het lichaam optreedt of inname van extra voedingssupplementen die mogelijke andere tekorten aanvullen.

Bovendien blijkt er bij toediening van simmondsines een bloedverdunnend effect op te treden. Dun bloed dringt dieper door in de weefsels en voorkomt zones met zuurstoftekort waarin tumoren gunstiger kunnen ontwikkelen. De eerder beschreven metaboliëten van de simmondsinmoleculen zijn gelijkaardig doch veel minder irriterend dan die welke vrijkomen bij de afbraak van aspirines²⁴. Het bloedverdunnend effect van simmondsines is dus veiliger dan dat van vb. aspirine omdat er veel minder kans is op irritatie en bijgevolg veel minder kans op gastro-intestinale bloedingen. André d'Oosterlynck & Stefaan Raes

Deze tekst is tot stand gekomen met de consultancy van dr. B. De Paepe (Dept. of Pediatrics and Medical Genetics, Ugent).

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Ryckx M., Simmondsines: angiogeneseremmers bekomen uit planten. Promotor: Prof. Dr. Tom Boterberg .Scriptie voorgedragen in de 2de Master in het kader van de opleiding Master of medicine, Ugent 1MASTER OF MEDICINE IN DE GENEESKUNDE academiejaar 2012 – 2013. https://libstore.ugent.be/fulltxt/RUG01/002/061/574/RUG01-002061574_2013_0001_AC.pdf

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D'Oosterlynck, A. (2011) Simmondsin for Use as an Angiogenesis Inhibitor, PCT application No. PCT/EP2003/07270 (granted on 21 July, 2011; filed on July 7, 2003, claiming priority of the Belgian patent application No. 2002/0428 filed on July 8, 2002); US 7,387,999B2 (June 17, 2008).

27. D'Oosterlynck, A. & Raes, S. (2008) The Effect of Simmondsin Derivates, YOEME cvba, Westerring 12, 9700 Oudenaarde, 95 pp

En als uitsmijter een artikel door de uitvinder van het patent over de isolatie van simmondsines

Werking simmondsines André d' Oosterlynck

Korte beschrijving na 15 jaar wetenschappelijk onderzoek op Jojoba – Simmondsia Chinensis
Door : André d'Oosterlynck

Inleiding : Ik heb in 1987 deze studie aangevangen door de wetenschappelijke publicaties (ca. 174) te bestuderen over dit onderwerp. Na bestuderen en vergelijken van de resultaten en conclusies, vervolgde ik met mijn deel van de studie in het ontrafelen van enkele contradictorische data en feiten. Dat onderzoek leidde tot nieuwe en boeiende resultaten.

Bio-activiteit van de Simmondsines (S'ns) :

Simmondsines kunnen geïsoleerd worden uit de jojoba perskoek die tot nu toe weggegooid werden nadat de olie uit de jojobazaden geëxtraheerd werd. Het gebruik van deze oraal inneembare, natuurlijke bio-actieve producten heeft reeds spectaculaire resultaten opgeleverd De S'ns hebben meerdere bio-actieve eigenschappen.

Alhoewel het patentbeschermd "Use of Simmondsin as an Angiogenesis inhibitor" (gebruik van Simmondsine als een angiogenese inhibitor) een nieuw licht werpt op de Jojoba business moeten we vaststellen dat de jojoba industrie tot op heden nog niet echt geïnteresseerd is om deze nieuwe weg in te slaan :

- Ze moeten nl. investeren in een solvent extractor om de overblijvende olie uit de perskoek te verwijderen. Deze extractor vraagt een hogere investering dan de klassieke olie persinstallatie. Bovendien moet deze extractor bediend worden door hoog opgeleide mensen waardoor deze installatie aanvankelijk een lage return geeft op de investering. Bespreking van de cijfers die het voordeel van deze beschermde visie moeten ondersteunen:

De jaarlijkse wereldproductie van Jojobazaden wordt geschat op 10.000 ton.

Samenstelling van de zaden: - 50% ' jojoba olie' (productie van 4500 ton/jaar).

- 50% Suikers, proteïnes, schilfragmenten, ferulaat anti-oxidanten, Simmondsines en vocht.
Samenstelling van de perskoek biomassa na uitpersen van de olie:

- 25% suikers (3 hexosen, 2 pentosen)
- 20% proteïnes
- 20% bruine schil fragmenten
- 11-15% achtergebleven jojoba olie
- 10% simmondsines
- 5-10% vochtigheid

Isolatie van de Simmondsines :

1) De eerste stap bestaat uit het verwijderen van de resterende olie. Onder de gegeven conditie dat de industriële site 1000 ton/ jaar kan verwerken, zal de waarde van de geëxtraheerde olie reeds na enkele jaren tot een break-even leiden. Deze investering is absoluut noodzakelijk om olievrije perskoek te produceren. Deze is absoluut noodzakelijk als grondstof voor de isolatie van simmondsines op een eenvoudige en economisch verantwoorde manier.

2) De tweede stap bestaat uit de extractie van de Simmondsines uit de olievrije perskoek. Deze bewerkingen zijn door mijzelf bestudeerd en hebben geleid tot een procedure op labschaal om quasi pure simmondsines te isoleren.

Schatting van de economische waarde van Simmondsine: Momenteel is de waarde van de perskoek minimaal; de resterende olie (11 à 15%) eruit halen via extractie eist te hoge verwerkingskosten. De winstmarge van een olie-extractor is lager dan die van een olie-persinstallatie. Daarom is de olievrije simmondsinehoudende perskoek waardeloos en wordt ze nu gewoon weggegooid. Nochtans hebben de simmondsines een groot potentieel en kunnen ze de olie-extractie uit de perskoek rendabel maken waarbij de olie eerder beschouwd zal worden als een bijproduct. Voorbeeld: De gezuiverde simmondsines hebben de eigenschap om bepaalde orgaanfuncties te stimuleren en zijn de eerst beschreven angiogenese inhibitoren zonder nefaste bijwerkingen. Eén verjongingskuur van 6 weken, gebruik makend van 50 ml tinctuur die 20% simmondsines bevat (10g/50ml) wordt arbitrair geschat op 50 € (consumentenprijs). Gedoseerd aan 15 druppels/dag zijn er binnen de 20 à 30 dagen reeds significante effecten op het organisme zoals aangetoond via de bloedanalyses.

Nota: Het feit dat ik een exclusieve bescherming geniet door het internationale patent "THE USE OF SIMMONDSINE AS AN ANGIOGENESIS INHIBITOR", maakt het geen verschil uit door wie of waar de simmondsines geïsoleerd worden. Ik beschik over de exclusieve rechten om exploitatielicenties te verlenen omtrent dit specifiek geclaimd gebruik.



(12) **United States Patent**
D'Oosterlynck et al.

(10) **Patent No.:** **US 7,387,999 B2**
(45) **Date of Patent:** **Jun. 17, 2008**

(54) **SIMMONDSIN FOR USE AS ANGIOGENESIS INHIBITOR**

WO WO94/25035 A1 * 11/1994

OTHER PUBLICATIONS

(75) Inventors: **André D'Oosterlynck**, Museumlaan 17, B-9830, Sint-Martens-Latem (BE);
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(73) Assignee: **André D'Oosterlynck**, Sint-Martens-Latem (BE)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 368 days.

Primary Examiner—S. Anna Jiang

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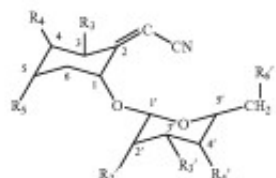
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(57) **ABSTRACT**

Methods of inhibiting angiogenesis in humans and animals by administering a effective amount of a secondary plant metabolite from jojoba, having the general formula I shown below, are disclosed. Preferred compounds having general formula I include 4-desmethylsimmondsin, 5-desmethylsimmondsin, 4,5-didesmethylsimmondsin, 4,5-dimethylsimmondsin, 4-desmethylsimmondsin-2'-ferulate, 5-desmethylsimmondsin-2'-ferulate, 4,5-didesmethylsimmondsin-2'-ferulate and 4,5-dimethylsimmondsin-2'-ferulate. Such compounds can be synthesized chemically according to well known techniques or can be isolated from refined and de-oiled jojoba flour by conventional extraction techniques using polar solvents such as a ketone or a low boiling point alcohol. Pharmaceutical compositions for inhibiting angiogenesis or for treating angiogenesis-related diseases in humans or animals are disclosed



General Formula I

12 Claims, 16 Drawing Sheets

