Toxicological profile for

Carrot juice, extract, seed oil

This ingredient has been assessed to determine potential human health effects for the consumer. It was considered not to increase the inherent toxicity of the product and thus is acceptable under conditions of intended use.

1. Name of substance and physico-chemical properties

1.1. IUPAC systematic name

.Not applicable

1.2. Synonyms

8015-88-1: Carrot oil; UNII-595AO13F11; Carrot seed oil; Oils, carrot; Carrot seed oil (Daucus carota L.); Daucus carota oil; Daucus oil; FEMA No. 2244; Oils, carrot seed; Queen ann's lace oil; Wild carrot oil; Carrots; Daucus carota; (PubChem, a)

84929-61-3: Carrot extract; Daucus carota sativa extract; Extract of carrot; Carrot, ext.; EINECS 284-545-1; Daucus carota; Carrots; (PubChem, b)

1.3. Molecular formula

Unspecified" (PubChem)" :**84929-61-3 ,8015-88-1**

1.4. Structural Formula

.Not applicable

1.5. Molecular weight (g/mol)

.Not applicable

1.6. CAS registration number

No CAS, 8015-88-1, 84929-61-3

1.7. Properties

1.7.1. Melting point

(°C): <25 (CAS RN 8015-88-1) (EPISuite, 2017)

1.7.2. Boiling point

(°C): 126 at 2.5 mmHg or 289 (estimated) (CAS RN 8015-88-1) (EPISuite, 2017)

1.7.3. Solubility

mg/L at 25°C (estimated) (CAS RN 8015-88-1) (EPISuite, 2017) 8.507

1.7.4. pKa

.No data available to us at this time

1.7.5. Flashpoint

.(°C): No data available to us at this time

1.7.6. Flammability limits (vol/vol%)

.No data available to us at this time

1.7.7. (Auto)ignition temperature

.(°C): No data available to us at this time

1.7.8. Decomposition temperature

.(°C): No data available to us at this time

1.7.9. Stability

.No data available to us at this time

1.7.10. Vapor pressure

mmHg at 25°C (estimated) (CAS RN 8015-88-1) (EPISuite, 2017) 0.000273

1.7.11. log Kow

(estimated) (CAS RN 8015-88-1) (EPISuite, 2017) 4.81

2. General information

2.1. Exposure

Carrot oil (CAS RN 8015-88-1) is listed as an ingredient in inside the home products (<1%) and carrot extract (CAS RN 84929-61-3) is listed as an ingredient in personal care products by the .CPID

Carrot seed oil, carrot seed absolute, carrot seed, carrot seed oil rectified and carrot seed oil terpenless (all CAS RN 8015-88-1) are listed as fragrance ingredients by IFRA and carrot oil (CAS .RN 8015-88-1) in the US EPA InertFinder Database

Daucus carota sativa seed oil (CAS RN 8015-88-1/84929-61-3) is used as a skin conditioning - ,emollient, fragrance and skin conditioning ingredient

Daucus carota sativa juice, root, root extract, root powder, callus culture extract (all CAS RN and hydrolyzed carrot hydrolyzed carrot root extract ,84929-61-3) and root cell culture lysate extract (no CAS RN), and Daucus carota flower water (no CAS RN) as skin conditioning ,ingredients

Daucus carota leaf extract (CAS RN 84929-61- Daucus carota sativa leaf extract (no CAS RN) and ,3) as skin conditioning – miscellaneous ingredients

,Daucus carota fruit oil (CAS RN 84929-61-3) as a perfuming ingredient

Daucus carota sativa root protoplasts (CAS RN 84929-61-3) as a skin conditioning - emollient, ,humectant and skin conditioning ingredient

Daucus carota sativa extract (CAS RN 84929-61-3) as a perfuming and skin conditioning ,ingredient

Daucus carota sativa root water and Daucus carota sativa water (CAS RN 84929-61-3) as ,fragrance ingredients

Daucus carota sativa seed extract (CAS RN 84929-61-3) as a skin conditioning - emollient and skin ,conditioning ingredient

Daucus carota sativa flower extract (no CAS RN) as a humectant, skin conditioning and skin ,protecting ingredient

,Daucus carota sativa root juice (no CAS RN) as a humectant and skin conditioning ingredient

Daucus carota sativa leaf/stem extract (no CAS RN) as an antimicrobial, deodorant and skin ,conditioning agent

Daucus carota sativa callus lysate (no CAS RN) as an antioxidant

Daucus carota sativa root powder (CAS RN 84929-61-3) as skin conditioning agent.

Daucus carota sativa root juice (no CAS RN) as humectant and skin conditioning.

Daucus carota sativa root vesicles (no CAS RN) as skin conditioning – emollient, hair conditioning, skin conditioning – humectant, skin conditioning – miscellaneous, skin protecting agent.

Daucus carota sativa powder (no CAS RN) as antioxidant)

Daucus carota sativa vesicles (no CAS RN) as skin conditioning – emollient, hair conditioning, skin protecting, skin conditioning – humectant.

.in cosmetics in the EU …

.As taken from CosIng

:Carrot oil (CAS RN 8015-88-1)

Reported levels from use as a flavouring (ppm): (FEMA, 1994)

Food category	Usual	Max	Food category	Usual	Max
Alcoholic beverages	12.42	14.55	Hard candy	0.08	0.08
Baked goods	10.37	19.98	Meat products	20.42	29.30
Chewing gum	3.00	3.00	Nonalcoholic beverages	2.15	4.37
Condiments, relishes	17.03	22.42	Soft candy	7.07	13.24
Frozen dairy	5.76	8.01	Soups	0.10	13.24
Gelatins, puddings	3.51	6.26			

.Estimated intake from flavouring use: 0.00038 mg/kg bw/day

.As taken from Burdock, 2010

:Medicinal natural health products

Carrot (Daucus carota) root powder (no CAS RN listed) is used as a colour additive and flavour ;enhancer

Carrot (Daucus carota) seed oil (no CAS RN listed) is used as a flavour enhancer for oral use and ;a fragrance ingredient, skin-conditioning agent and emollient for topical use

;Daucus carota powder (no CAS RN listed) is used as a natural flavour enhancer for oral use

Daucus carota sativa (carrot) root extract (no CAS RN listed) is used as a colour additive, flavour ;enhancer and skin-conditioning agent

Daucus carota sativa (carrot) root protoplasts (no CAS RN listed) are used as a skin-conditioning ;agent - humectant for topical use

Daucus carota sativus atrorubens (black carrot) juice (no CAS RN listed) is used as a colour ;additive

Daucus carota sativus (carrot) root juice (no CAS RN listed) is used as a colour additive and flavour .enhancer

.As taken from Health Canada, 2021

2.2. Combustion products

.This ingredient was investigated in a pyrolysis study. Results are given in JTI Study Report (s)

Compound	Two stage heating		One stage heating	
	Abundance	%Area	Abundance	%Area
formic acid + 2,5-dimethylfuran	13512309	5.48	11481736	6.28
acetic acid	47767227	19.37	46796965	25.59
acetol	8936585	3.63	7692666	4.21
furfural	6221912	2.52	4614583	2.52
furfuryl alcohol	8730939	3.54	8695730	4.76
methyl-2,5-furandione-3	2710287	1.10	trace	trace
lactic acid	12648808	5.13	8921847	4.88
H-pyran-2,6(3H)-dione2	3104194	1.26	trace	trace
dimethyl-4-hydroxy-3(2H)-furanone + unknown-2,5	6625356	2.69	4390190	2.40
unknown	3149897	1.28	trace	trace
-4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl	43298455	17.56	32034644	17.52
-4H-Pyran-4-one, 3,5-dihydroxy-2-methyl	6422852	2.61	3077124	1.68
unknown	6201214	2.52	4008470	2.19
hydroxymethylfurfural-5	36694742	14.88	28200362	15.42
unknown	1592727	0.65	2744338	1.50
unknown	.n.d	.n.d	2664343	1.46
gamma-nonalactone	10417092	4.23	8124653	4.44
hydroquinone	2579207	1.05	2664343	1.46
unknown	7760305	3.15	6297097	3.44

% Total area		92.6		99.8

2.3. Ingredient(s) from which it originates

The volatile oil is obtained by steam distillation from crushed carrot seeds. The colour additive, carrot oil is obtained by hexane extraction of edible carrots and subsequent removal of hexane by .vacuum distillation

.As taken from Burdock, 2010

Daucus carota sativa seed oil (CAS RNs 8015-88-1/84929-61-3) and Daucus carota sativa seed extract (CAS RN 84929-61-3) are the oil obtained from and an extract of the seeds of the carrot, .Daucus carota L. var. sativa, Umbelliferae, respectively

Daucus carota fruit oil (CAS RN 84929-61-3) is an essential oil obtained from the seeds of the .carrot, Daucus carota L., Umbelliferae

Daucus carota sativa extract and callus culture extract (both CAS RN 84929-61-3) are extracts of the whole and a culture of the callus cells of the carrot, Daucus carota L. subsp. Sativus, Apiaceae, respectively

Daucus sativa juice (CAS RN 84929-61-3) is the liquid expressed from the fresh pulp of the carrot, .Daucus carota L. var. sativa, Umbelliferae

Daucus carota leaf extract (CAS RN 84929-61-3) is an extract of the leaves of the Carrot, Daucus .carota L., Umbelliferae

Daucus carota sativa leaf extract (no CAS RN) is the extract of the leaves of Daucus carota sativa. Daucus carota sativa root extract (CAS RN 84929-61-3) is an extract of the roots of the carrot, .Daucus carota L. var. sativa, Umbelliferae

Daucus carota sativa root (CAS RN 84929-61-3) is the plant material derived from the roots of the .carrot, Daucus carota L. var. sativa, Umbelliferae

Daucus carota sativa root powder (CAS RN 84929-61-3) is the powder obtained from the dried, .ground roots of the carrot, Daucus carota L. var. sativa, Umbelliferae

Daucus carota sativa root protoplasts (CAS RN 84929-61-3) are the protoplasts obtained from the .roots of the carrot, Daucus carota L., Apiaceae

Daucus carota sativa root water (CAS RN 84929-61-3) is an aqueous solution of the steam .distillate obtained from the roots of Daucus carota L. var. Sativa, Umbelliferae

Daucus carota sativa water (CAS RN 84929-61-3) is an aqueous solution of the steam distillate .obtained from the roots of carrot, Daucus carota L., Apiaceae

Daucus carota sativa (carrot) flower extract (no CAS RN) is the extract of the flowers of Daucus .carota sativa, Apiaceae

Daucus carota sativa leaf/stem extract (no CAS RN) is the extract of the leaves and stems of .Daucus carota sativa, Apiaceae

Daucus carota sativa (carrot) root juice (no CAS RN) is the juice expressed from the roots of .Daucus carota sativa (carrot), Apiaceae

(no CAS RN) is the hydrolysate of Daucus carota sativa (carrot) extract Hydrolyzed carrot extract derived by acid, enzyme or other method of hydrolysis

Hydrolyzed carrot root extract (no CAS RN) is the hydrolysate of Daucus carota sativa, Apiaceae, .root extract derived by acid, enzyme or other method of hydrolysis

Daucus carota sativa root cell culture lysate (no CAS RN) is a lysate of a suspension of the .cultured root cells of Daucus carota sativa, Apiaceae

Daucus carota sativa callus lysate (no CAS RN) are the lysed cells derived from the callus of .Daucus carota sativa, Apiaceae, grown in culture

Daucus carota flower water (no CAS RN) is an aqueous solution of the steam distillate obtained .from the flowers of the wild carrot Daucus carota

.As taken from CosIng (Cosmetic substances and ingredients database)

3. Status in legislation and other official guidance

Carrot oil (Daucus carota L.) (CAS RN 8015-88-1) is included on the US FDA's list of Substances Added to Food (formerly EAFUS) as a color or coloring adjunct and flavoring agent or adjuvant, is generally recognised as safe under 21 CFR section 182.20 (essential oils, oleoresins (solvent-free), and natural extractives (including distillates)) and is also included under 73.300 (colour additives .exempt from certification) (FDA, 2024)

.There is a REACH dossier on carrot, ext. (CAS RN 84929-61-3) (ECHA)

Oils, carrot (CAS RN 8015-88-1) and Daucus carota sativa (carrot) root extract (no CAS RN) are .not registered under REACH (ECHA)

Carrot seed oil (CAS RN 8015-88-1) and carrot, ext. (CAS RN 84929-61-3) are not classified for .packaging and labelling under Regulation (EC) No. 1272/2008 (ECHA, 2025)

Carrot oil (CAS RN 8015-88-1) is listed in the US EPA InertFinder Database as approved for .pesticide products fragrance use

in the US EPA Toxic Substances Control Act (TSCA) , Oils, carrot (CAS RN 8015-88-1) are listed .2024 CDR TSCA Inv Active and FIFRA-Inerts inventories

US EPA Substance Registry Services (SRS) – TSCA and CDR lists.

Carrot oil (FEMA no. 2244) has been given GRAS (generally recognized as safe) status by FEMA C .(Hall and Oser, 1965). Its GRAS status was affirmed in 2020 (Fukushima S et al. 2020)

Daucus carota, Daucus carota subsp. carota and Daucus carota subsp. sativus (no CAS RNs listed) are classified as Natural Health Products (NHPs) for medicinal use under Schedule 1 item 1 .(plant or plant material) of the NHP Regulations

Carrot (Daucus carota) seed oil (no CAS RN listed) is classified as a Natural Health Product (NHP) .for medicinal use under Schedule 1 item 2 (an extract) of the NHP Regulations

.As taken from Health Canada, 2021

4. Metabolism/Pharmacokinetics

4.1. Metabolism/metabolites

The effects of carrot juice consumption on serum alpha- and beta-carotene, total carotenoid and retinol levels were studied in 10 adult volunteers, age 23–48 years. Five subjects consumed 16 ounces of juice per day for 7 days and then 8 ounces every other day for the next 7 days. Another group of 5 subjects consumed 16 ounces of juice per day for 7 days and then received no carrot juice for the next 7 days. Blood serum collected from both groups at the start of the study and after day 7 and day 14 was analyzed by HPLC and spectrophotometry for carotenoid and retinol concentration. When consumption of carrot juice was continuous, alpha-carotene and total carotenoids increased at 1 week and stabilized, while beta-carotene continued to increase over the

course of the 2 weeks. When carrot juice consumption occurred for 1 week and was then terminated, alpha-and beta-carotene rose at 1 week and then stabilized, while total carotenoids rose at 1 week and returned to baseline level after the week of withdrawal. Serum retinol levels did .not change for either group throughout the study period (Kim (Jun) et al. 1988)

Evidence suggests that higher plasma carotenoid concentrations are protective in relation to breast cancer recurrence. This simple randomized carrot juice intervention study was designed to test the hypothesis that daily intake of 8 ounces of fresh BetaSweet (anthocyanin-rich) or Balero orange carrot juice would increase plasma total carotenoid concentrations to levels previously shown to be associated with reduced breast cancer recurrence. It was hypothesized that regular carrot juice intake would be associated with reductions in oxidative stress (8-iso-PGF2α) and inflammation (thromboxane B2, prostaglandin E2 metabolites, and hsC-reactive protein). Sixty-nine overweight breast cancer survivors consumed fresh carrot juice made from study-provided carrots for 3 wk. Total plasma carotenoids increased by 1.65 and 1.38 umol/L for the BetaSweet and Balero carrot juice, respectively. Rise in total plasma carotenoids for the overall sample was inversely associated with 8-iso-PGFα (OR: 0.13; 95% CI: 0.20 to 0.75; no differences were shown by carrot variety. These results suggest daily intake of fresh carrot juice is a simple and effective approach to increasing plasma total carotenoids and in turn reducing oxidative stress, but not inflammatory markers, in women previously treated for breast cancer (Butalla et al. 2012). “Background: Asymmetric α-carotene, a provitamin A carotenoid, is cleaved to produce retinol (vitamin A) and α-retinol (with negligible vitamin A activity). The vitamin A activity of α-carotene-containing foods is likely overestimated because traditional analytic methods do not separate α-retinol derivatives from active retinol. Objective: This study aimed to accurately characterize intestinal α-carotene cleavage and its relative contribution to postprandial vitamin A in humans after consumption of raw carrots. Design: Healthy adults (n = 12) consumed a meal containing 300 g raw carrot (providing 27.3 mg β-carotene and 18.7 mg α-carotene). Triglyceride-rich lipoprotein fractions of plasma were isolated and extracted, and α-retinyl palmitate (αRP) and retinyl palmitate were measured over 12 h postprandially via high-performance liquid chromatography-tandem mass spectrometry. The complete profile of all α-retinyl esters and retinyl esters was measured at 6 h, and total absorption of α- and β-carotene was calculated. Results: αRP was identified and quantified in every subject. No difference in preference for absorption of β- over α-carotene was observed (adjusting for dose, 28% higher, P = 0.103). After absorption, β-carotene trended toward preferential cleavage compared with α-carotene (22% higher, P = 0.084). A large range of provitamin A carotenoid conversion efficiencies was observed, with α-carotene contributing 12-35% of newly converted vitamin A (predicted contribution = 25.5%). In all subjects, a majority of α-retinol was esterified to palmitic acid (as compared with other fatty acids). Conclusions: α-Retinol is esterified in the enterocyte and transported in the blood analogous to retinol. The percentage of absorption of α-carotene from raw carrots was not significantly different from β-carotene when adjusting for dose, although a trend toward higher cleavage of β-carotene was observed. The results demonstrate large interindividual variability in α-carotene conversion. The contribution of newly absorbed α-carotene to postprandial vitamin A should not be estimated but should be measured directly to accurately assess the vitamin A capacity of α-carotene-containing foods.” As taken from Cooperstone JL et al. 2018. Am. J. Clin. Nutr. 106(1), 59-66. PubMed, 2018

4.2. Absorption, distribution and excretion

Bioavailability of beta-carotene is highly variable and depends on the source, the formulation and other nutritional factors. It was the aim of the study to compare beta-carotene plasma response to b-carotene dosing with two commercially available drinks, containing beta-carotene from carrot juice or as water dispersible beta-carotene powder. Design In a randomized, parallel group study design, 4 volunteers per group received daily beta-carotene doses of 6-7 or 18-22 mg of either drink over 6 weeks. Blood samples for determination of carotenoid and vitamin A plasma concentrations were collected before supplementation and over the dosing period. Apparent

steady-state beta-carotene concentrations were attained after 40 days of supplementation. Consumption of the beverage containing beta-carotene as a water dispersible powder resulted in a higher response of beta-carotene plasma concentrations with increments of 3.84 +/- 0.60 micromol/L (P<0.05, dose: 7.2 mg/d) and 5.04 +/- 0.72 micromol/L (P<0.05, dose: 21.6 mg/d), respectively, in comparison to the carrot juice-based drink with increments of 0.42 +/- 0.33 micromol/L (dose: 6 mg/d) and 1.71 +/- 0.55 micromol/L (dose: 18 mg/d), respectively. beta-carotene was cleared from the plasma with an apparent half-life of 6-11 days. Plasma concentrations of alpha-carotene, beta-cryptoxanthin, lutein, zeaxanthin, and lycopene remained almost unchanged, whereas retinol plasma concentrations increased slightly. By contrast, with the exception of elevated 13-cis-retinoic acid in one group (21.6 mg/d, water dispersible powder), the concentrations of all-trans-retinoic acid, and the oxo-derivatives or retinoic acid were not significantly affected by b-carotene supplementation. The results confirm that the relative bioavailability of beta-carotene depends largely on the source of b-carotene and demonstrate the superior bioavailability of beta-carotene powder in comparison to that in carrot juice (Thürmann et .al. 2002)

A sensory panel of at least 8 participants smelled the breastmilk of 5 mothers who had been given “ was strongest 2 hours carrots 500 mL of carrot juice. The consensus of a panel was that the odor of after ingesting the carrot juice. The mothers were presented with timed samples of their own breastmilk and judged that the taste of carrot was strongest at 3 hours after carrot juice ingestion .[10]

Twelve women were given fresh carrot paste containing 15 mg of all-trans beta-carotene daily for 3 days. Milk samples were collected on 3 days at least 3 hours after the meal containing the beta-carotene. Milk beta-carotene levels increased by an average of about 80% over the 3-day ”period.[11]

.As taken from LactMed, 2018

4.3. Interactions

Carrot juice had no inhibitory effect on human liver microsomal CYP3A (midazolam-1’-hydroxylase) .activity in vitro (Kim et al. 2006)

Carotenoid intake and tissue levels have been frequently associated with reduced risk of chronic “ diseases. However, their bioavailability is low and influenced by many dietary related parameters. Divalent mineral cations have been suggested to interfere with carotenoid digestion and to hamper micellarization, a prerequisite for their uptake, via complexation of bile salts and precipitation of fatty acids. In the present investigation, we have evaluated the effects of increasing concentrations of magnesium (0-300 mg L-1), calcium (0-1500 mg L-1), zinc (0-200 mg L-1), and sodium (0-1500 mg L-1; control monovalent cation), on carotenoid bioaccessibility from frequently consumed food items rich in carotenoids (tomato juice, carrot juice, apricot nectar, spinach and field salad), following simulated gastro-intestinal digestion. In addition, physicochemical parameters of digesta (macroviscosity, surface tension), micelle size, and zeta-potential were evaluated. All divalent minerals (DM) reduced bioaccessibility of total carotenoids ($P < 0.01$), as well as of individual carotenoids. Calcium and magnesium led to reductions of up to 100% at the 2 highest concentrations. Curiously, sodium increased ($P < 0.01$) carotenoid bioaccessiblity of most investigated matrices. The absolute value of the zeta-potential decreased with increasing concentrations of DM, suggesting a decreased stability of the colloidal digesta dispersion. Viscosity decreased, except for apricot nectar samples, while surface tension increased with DM concentration ($P < 0.05$). Thus, at physiological ranges, calcium and magnesium could negatively impact carotenoid bioavailability, while for zinc, negative effects were only seen at supplemental concentrations. The potential negative effects of DM on carotenoid bioavailability should be further

studied in vivo.” As taken from Corte-Real J. et al. 2017. Food Funct. 8(3), 1008-1019. PubMed, 2018

The present study aimed to investigate the effects of different levels of dietary supplementation of “ rocket (Eruca Sativa) seeds, carrot (Daucus Carota L) seeds or bay laurel (Bay laurel Nobilis L)., leaves and their mixed between them on some reproductive and productive traits, antioxidant status of doe rabbits and their offspring's, during the pregnancy and lactation periods, under the same conditions. Forty eight New Zealand White (NZW) doe rabbits about 6-7 months old (2.890-3.070 kg) were randomly allotted to eight dietary groups (6 rabbits in each treatment group). The first group was fed a basal diet as control group,(T1); while the experimental second to eighth groups were fed the basal diet supplemented with 1.0% rocket seed (T2); 1.0% carrot seed (T3); 1.0% bay laurel leaf (T4); 0.5% rocket seed+0.5% carrot seed (T5); 0.5% carrot seed+0.5% bay laurel leaf (T6); 0.5% rocket seed+0.50% bay laurel leaf (T7) and 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaf (T8), respectively. The experimental period lasted for 16 weeks. Live body weights of does before and after parturition days and at first day of lactation were significantly higher (P=0.05, 0.002 and 0.01) in all treated rabbits as compared to control group respectively, while the response of does live body weights at weaning day was not significant. All treated groups had significantly higher total feed intake during pregnancy and lactation when compared to the control group. During pregnancy constantly plasma, antioxidant capacity and endogenous antioxidant enzymes in terms of glutathione peroxidase (GPx) and superoxide dismutase (SOD) were higher in treated groups compared to the control group, however the effect was significant in some treated groups. Hence, lipid peroxidation in terms of TBARs was significantly reduced in all treated groups compared to control. Metabolic and sex hormones (T3 and E2) were significantly leveled up in all treated groups, while the effect on progesterone (P4) hormone was significantly higher for some treatments. During lactation period weekly and total milk yield were higher in treated groups. The improvement of milk yield was significant increased in T3, T4, T7 and T8 compared to the control group. During lactation period data on plasma antioxidant, constituents and hormones followed the same trends as in these concerning pregnancy periods, where treated groups surpassed the control group and favored the parameters evaluated. Litter size and weight at weaning significantly (P=0.01 and 0.004) increased for all feed additives compared to control, respectively. The same trends were observed in litters weight gain fed diets supplemented with different feed additives. Means of pre- weaning survival rate (%) from birth to weaning age in the treatments groups were better significantly than control group. Conclusively, the findings of this study demonstrated that dietary supplementation of feed additives rocket seeds and carrot seeds or Bay leaves individually or in combinations improved reproductive or productive performance of does, antioxidant status hormone function during pregnancy and lactation period of doe rabbits. Moreover, offspring of rabbits the best results were obtained supplementing 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaf/ diet of litter weight at weaning.” As taken from .Basyony MM and Azoz AA. 2017. Egyptian Journal of Rabbit Science 27(2), 463-484

Doxorubicin (Dox), has an importance as antitumor antibiotic, but it’s using is limited by the “ development of cardiomyopathy. Free radicals are involved in acute doxorubicin-induced toxicity and inflammatory condition in cardiac tissue. The study aimed to determine the protective effect of beetroot and/or carrot juices in acute Dox induced cardiac injury in adult male rats. Animals were randomly separated into 5 groups, G1control received normal saline I.P, G2 received single dose of Dox 20 mg/kg I.P, the other three groups also received doxorubicin 20 mg/kg I.P as single dose after four weeks cumulative doses of beetroot juice (10 mg/kg), carrot juice (10 mg/kg) and mixture of equal volumes of two juices respectively. Serum CK-MB, LDH, C-RP, Homocysteine and cardiac troponin-I were examined by ELIZA. Heart tissue histopathology, DNA damage of cardiac cell and oxidative stress and inflammatory markers were determined in all rats after 48hrs from doxorubicin injection. Doxorubicin induced cardiac injury was evidenced by a significant elevation in serum markers of heart function (CK-MB, LDH, Homocysteine and cardiac troponin-I), oxidative stress and inflammatory markers (MDA, CAT, IL-6 and CRP). Also cardiac cell’s DNA damage was indicated by significant changes in comet assay parameters. All these results was confirmed by

heart tissue histopathology. While, administration of beetroot and carrot juices protect heart tissue from damage by oxidative and inflammatory condition. Moreover mixing of two juices was more effective." As taken from El-Masry S and El-Rhman AA. 2017. World Journal of Pharmacy and .Pharmaceutical Sciences 6(12), 109-126

The carrot plant (Daucus carota) and its components are traditionally reported for the management " of gastric ulcers. This study was performed to evaluate the role of carrot when administered concurrently with a conventional antiulcer treatment, pantoprazole, in alleviating gastric and duodenal ulcers in female experimental animals. The study involved standard animal models to determine the ulcer preventive effect using pylorus ligation, ethanol, and stress induced acute gastric ulcer models and duodenal ulcer models involving cysteamine. Acetic acid-induced chronic gastric ulcer and indomethacin-induced gastric ulcer models were used to evaluate the ulcer healing effect. Carrot fruit (500 mg/kg) and its co-administration with pantoprazole produced significant protection in an ethanol- and stress-induced acute gastric ulcer and cysteamine-induced duodenal ulcer. The healing of the acetic acid-induced chronic gastric ulcer was also augmented with this combination. Both total proteins and mucin contents were significantly increased in indomethacin-induced gastric ulcers. Similarly, in pylorus ligation, the pepsin content of gastric juice, total acidity, and free acidity were reduced. Overall, both ulcer preventive effects and ulcer healing properties of the pantoprazole were significantly enhanced in animals who received the co-administration of carrot fruit (500 mg/kg)." As taken from Asdaq SMB et al. 2020. Molecules 25(22), 5287. PubMed, 2021

In the present study, modulating effect of carrot juice against lead nitrate induced clastogenicity in " bone marrow cells of mice. When animals were administered with various doses of carrot juice 20, 40, 80 ml/kg body weight, the results showed antimutagenic nature of plant extract. There was a significant increase in the percentage of chromosomal aberrations in 40mg/kg body weight lead nitrate treated animals. However when animals were co-administered for seven days prior to the priming experiment the frequency of chromosomal aberrations showed a decrease after the treatment of carrot juice. Thus the results clearly indicate protective nature of carrot juice against lead nitrate induced cytogenetic damage in somatic cells of mice." As taken from Jaddu KK and .Wutan Huatan Jisuan Jishu XVI(V), 460-470 .Devi KR. 2020

Objective: The liver is exposed to many harmful agents, which cause hepatotoxicity due to " oxidative stress. Acrylamide is a carcinogenic agent and has toxic effects on the liver. In this study we aimed to examine whether black carrot juice might protect rat liver from toxicities of acrylamide. Method: Thirty-two male Wistar albino rats were divided into four equal groups as follows: control, acrylamide, black carrot juice and acrylamide + black carrot juice All the treatments were administered every other day for 30 days. Liver tissues were analysed for routine histopathology and apoptosis whereas serum samples were evaluated for oxidation state. Results: In the acrylamide group, severe histopathological damage, including hepatocyte degeneration, sinusoidal dilatation, and passive hyperemia, along with a significant increase in caspase-3 immunoreactivity was observed. Biochemically the serum total antioxidant status decreased significantly, and the serum total oxidant status increased significantly. The histopathological examination revealed significant amelioration of tissue damage in the acrylamide + black carrot juice group as compared with that in the acrylamide group. Moreover, total oxidant status decreased significantly, whereas the total antioxidant status increased significantly. Caspase-3 immunoreactivity also decreased insignificantly. Conclusion: Black carrot juice appears to exhibit therapeutic effects against acrylamide-induced hepatotoxicity due to its antioxidant properties." As taken from Yalçin A and .Pekmez H. 2020. Ankara Sağlık Bilimleri Dergisi 9(1), 207-216

5. Toxicity

5.1. Single dose toxicity

.No data available to us at this time

5.2. Repeated dose toxicity

Antioxidant properties of carotenoids are thought to be at least partly responsible for the protective effects of fruits and vegetables rich in carotenoids against colon cancer. There are large amounts of in vitro data supporting this hypothesis. But there is little known about the antioxidant effects of carotenoid-rich food in vivo particularly in the gastrointestinal tract. In a randomized, crossover trial, healthy men (n = 22) who were consuming a low-carotenoid diet drank 330 mL/d tomato juice or carrot juice for 2 wk. Antioxidant capacity was assessed by the "lag time" of ex vivo LDL oxidation induced by copper and lipid peroxidation as determined by measurements of malondialdehyde (MDA) in plasma and feces using HPLC with fluorescence detection. Although consumption of both carotenoid-rich juices for 2 wk increased the carotenoid level in plasma and feces ($P<0.001$), the antioxidant capacity of LDL tended to be increased by only approximately 4.5% ($P = 0.08$), and lipid peroxidation in the men's plasma and feces was not affected. Thus, processes other than lipid peroxidation could be responsible for the preventive effects of tomatoes and carrots against colon .cancer (Briviba et al. 2004)

Our objective was to evaluate the effect of daily supplementation with foods high in vitamin C and beta carotene on plasma vitamin levels and oxidation of low-density lipoprotein (LDL) in cigarette smokers. Fifteen normolipidemic male cigarette smokers who did not usually take vitamin supplements were recruited into the study. Throughout the study, subjects consumed a diet rich in polyunsaturated fatty acids, which provided 36% of energy as fat: 18% from meat, dairy products, vegetable oils, and fat spreads and 18% from walnuts (68 g/day). Subjects consumed a vitamin-free drink daily for 3 weeks; then for 3 weeks they consumed daily supplements of orange juice (145 mg vitamin C) and carrot juice (16 mg beta carotene). Vitamin-rich food supplements raised plasma levels of ascorbic acid (1.6-fold; P <.01) and beta carotene (2.6-fold; P <.01). Malondialdehyde, one end product of oxidation, was lower in copper-oxidized LDL after vitamin supplementation (mean +/- standard error = 65.7 +/- 2.0 and 57.5 +/- 2.9 mumol/g LDL protein before and after supplementation, respectively; P <.01). Rate of LDL oxidation and lag time before the onset of LDL oxidation were not affected by antioxidant supplementation. In habitual cigarette smokers, antioxidant vitamins, which can be feasibly provided from food, partly protected LDL from oxidation despite a diet rich in polyunsaturated fatty acids (Abbey et al. 1995).
Evidence suggests that higher plasma carotenoid concentrations are protective in relation to breast cancer recurrence. This simple randomized carrot juice intervention study was designed to test the hypothesis that daily intake of 8 ounces of fresh BetaSweet (anthocyanin-rich) or Balero orange carrot juice would increase plasma total carotenoid concentrations to levels previously shown to be associated with reduced breast cancer recurrence. It was hypothesized that regular carrot juice intake would be associated with reductions in oxidative stress (8-iso-PGF2α) and inflammation (thromboxane B2, prostaglandin E2 metabolites, and hsC-reactive protein). Sixty-nine overweight breast cancer survivors consumed fresh carrot juice made from study-provided carrots for 3 wk. Total plasma carotenoids increased by 1.65 and 1.38 umol/L for the BetaSweet and Balero carrot juice, respectively. Rise in total plasma carotenoids for the overall sample was inversely associated with 8-iso-PGFα (OR: 0.13; 95% CI: 0.20 to 0.75; no differences were shown by carrot variety. These results suggest daily intake of fresh carrot juice is a simple and effective approach to increasing plasma total carotenoids and in turn reducing oxidative stress, but not inflammatory markers, in women previously treated for breast cancer (Butalla et al. 2012).
High consumption of fruits and vegetables has been suggested to provide some protection to smokers who are exposed to an increased risk of numerous cancers and other degenerative diseases. Carrot is the most important source of dietary β-carotene. Therefore, the objective of this study was to investigate whether carrot juice supplementation to smokers can protect against lymphocyte DNA damage and to compare the effect of supplementation of capsules containing purified β-carotene or a placebo (simple lactose). The study was conducted in a randomized and placebo-controlled design. After a depletion period of 14 days, 48 smokers were supplemented with

either carrot juice (n = 18), purified β-carotene (n = 16) or placebo (n = 14). Each group was supplemented for 8 weeks with approximately 20.49 mg of β-carotene/day and 1.2 mg of vitamin C/day, as carrot juice (300 ml/day) or purified β-carotene (20.49 mg of β-carotene, 1 capsule/day). Lymphocyte DNA damage was determined using the COMET assay under alkaline conditions and damage was quantified by measuring tail moment (TM), tail length (TL), and% DNA in the tail. Lymphocyte DNA damage was significantly decreased in the carrot juice group in all three measurements. The group that received purified β-carotene also showed a significant decrease in lymphocyte DNA damage in all three measurements. However, no significant changes in DNA damage was observed for the placebo group except TM (P = 0.016). Erythrocyte antioxidant enzyme was not significantly changed after supplementation. Similarly plasma lipid profiles were not different after carrot juice, β-carotene and placebo supplementation. These results suggest that while the placebo group failed to show any protective effect, carrot juice containing beta-carotene or purified β-carotene itself had great antioxidative potential in preventing damage to lymphocyte DNA in smokers (Lee et al. 2011).
Anthocyanins, phenolic acids and carotenoids are the predominant phytochemicals present in purple carrots. These phytochemicals could be useful in treatment of the metabolic syndrome since anthocyanins improve dyslipidaemia, glucose tolerance, hypertension and insulin resistance; the phenolic acids may also protect against CVD and β-carotene may protect against oxidative processes. In the present study, we have compared the ability of purple carrot juice and β-carotene to reverse the structural and functional changes in rats fed a high-carbohydrate, high-fat diet as a model of the metabolic syndrome induced by diet. Cardiac structure and function were defined by histology, echocardiography and in isolated hearts and blood vessels; liver structure and function, oxidative stress and inflammation were defined by histology and plasma markers. High-carbohydrate, high-fat diet-fed rats developed hypertension, cardiac fibrosis, increased cardiac stiffness, endothelial dysfunction, impaired glucose tolerance, increased abdominal fat deposition, altered plasma lipid profile, liver fibrosis and increased plasma liver enzymes together with increased plasma markers of oxidative stress and inflammation as well as increased inflammatory cell infiltration. Purple carrot juice attenuated or reversed all changes while β-carotene did not reduce oxidative stress, cardiac stiffness or hepatic fat deposition. As the juice itself contained low concentrations of carotenoids, it is likely that the anthocyanins are responsible for the antioxidant and anti-inflammatory properties of purple carrot juice to improve glucose tolerance as well as cardiovascular and hepatic structure and function (Poudyal et al. 2011).

The dietary fibre product examined is a pectic polysaccharide extract from carrot (Daucus carota), “ enriched for pectin fragments comprising mainly rhamnogalacturonan-I (RG-I) (abbreviated product name cRG-I). To assess the safety of cRG-I for use as food ingredient, repeated-dose oral toxicity and in vitro genotoxicity studies were conducted. In the subchronic toxicity study (OECD test guideline 408), Wistar Hannover rats received cRG-I at dietary levels (w/w) of 0%, 2.5%, 5% and 10% for 13 weeks. cRG-I induced no adverse effects in this study. The NOAEL was 10% in the diet (equivalent to 6.9 and 7.8 g cRG-I/kg body weight/day in male and female rats, respectively).” As taken from Jonker D et al. 2020. Food Chem. Toxicol. 139, 111243. PubMed, 2020

5.3. Reproduction toxicity

Nursing mothers ingested either 300 mL of carrot juice (n = 20) or water (n = 18) 2 to 3 hours before nursing daily for a week. Their infants were then tested for their acceptance of cereal prepared with either carrot juice or water. The infants who had been exposed to carrots in breastmilk consumed less flavored cereal relative to plain cereal than the control infants and they spent less time feeding. The authors interpreted these results to be a form of sensory-specific

satiety in which the infants become less responsive to a flavor that they have been extensively .exposed to in the very recent past

Seventeen nursing mothers were given 300 mL of carrot juice or water for 4 days per week for 3 consecutive weeks during the first 2 months of lactation. Other study groups received carrot juice during the last trimester of pregnancy or water during pregnancy and breastfeeding as a placebo. At a mean of 5.6 months postpartum, the infants were tested twice, once with cereal prepared with carrot juice and once with cereal prepared with water. Infants whose mothers received carrot juice during lactation scored higher on measures of acceptance of carrot-flavored cereal and took in more cereal than those whose mothers received water, but the latter difference did not reach .statistical significance. These effects were similar, but stronger among infants exposed prenatally

.As taken from LactMed, 2018

The present study aimed to investigate the effects of different levels of dietary supplementation of " rocket (Eruca Sativa) seeds, carrot (Daucus Carota L) seeds or bay laurel (Bay laurel Nobilis L)., leaves and their mixed between them on some reproductive and productive traits, antioxidant status of doe rabbits and their offspring's, during the pregnancy and lactation periods, under the same conditions. Forty eight New Zealand White (NZW) doe rabbits about 6-7 months old (2.890-3.070 kg) were randomly allotted to eight dietary groups (6 rabbits in each treatment group). The first group was fed a basal diet as control group,(T1); while the experimental second to eighth groups were fed the basal diet supplemented with 1.0% rocket seed (T2); 1.0% carrot seed (T3); 1.0% bay laurel leaf (T4); 0.5% rocket seed+0.5% carrot seed (T5); 0.5% carrot seed+0.5% bay laurel leaf (T6); 0.5% rocket seed+0.50% bay laurel leaf (T7) and 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaf (T8), respectively. The experimental period lasted for 16 weeks. Live body weights of does before and after parturition days and at first day of lactation were significantly higher (P=0.05, 0.002 and 0.01) in all treated rabbits as compared to control group respectively, while the response of does live body weights at weaning day was not significant. All treated groups had significantly higher total feed intake during pregnancy and lactation when compared to the control group. During pregnancy constantly plasma, antioxidant capacity and endogenous antioxidant enzymes in terms of glutathione peroxidase (GPx) and superoxide dismutase (SOD) were higher in treated groups compared to the control group, however the effect was significant in some treated groups. Hence, lipid peroxidation in terms of TBARs was significantly reduced in all treated groups compared to control. Metabolic and sex hormones (T3 and E2) were significantly leveled up in all treated groups, while the effect on progesterone (P4) hormone was significantly higher for some treatments. During lactation period weekly and total milk yield were higher in treated groups. The improvement of milk yield was significant increased in T3, T4, T7 and T8 compared to the control group. During lactation period data on plasma antioxidant, constituents and hormones followed the same trends as in these concerning pregnancy periods, where treated groups surpassed the control group and favored the parameters evaluated. Litter size and weight at weaning significantly (P=0.01 and 0.004) increased for all feed additives compared to control, respectively. The same trends were observed in litters weight gain fed diets supplemented with different feed additives. Means of pre- weaning survival rate (%) from birth to weaning age in the treatments groups were better significantly than control group. Conclusively, the findings of this study demonstrated that dietary supplementation of feed additives rocket seeds and carrot seeds or Bay leaves individually or in combinations improved reproductive or productive performance of does, antioxidant status hormone function during pregnancy and lactation period of doe rabbits. Moreover, offspring of rabbits the best results were obtained supplementing 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaf/ diet of litter weight at weaning." As taken from .Basyony MM and Azoz AA. 2017. Egyptian Journal of Rabbit Science 27(2), 463-484

In this study, the effect of carrot puree with enhanced levels of chlorogenic acid, obtained from " carrots treated with wounding stress, on Lactobacillus concentration in microbiota, cognitive and brain development in two generations of rats was evaluated. Wistar rats were randomly assigned three different diets: control, 90% (w/w) control + 10% carrot puree (CP), and 90% control + 10%

wounding stress carrot puree (WSCP). Wounding stress enhanced chlorogenic acid concentration ~4 times when compared to untreated CP (522 mg/kg). Rats treated with WSCP and CP diets increased the counts of Lactobacillus in the gut microbiota as compared with the control group ($p < 0.019$) of the second generation. Myelin content of WSPC was significantly higher than control and CP groups in the first generation. In the second generation, myelin raised to 204 mg/g in WSCP group and this group had the highest RNA content. Overall, results indicate that WSCP improves brain development by increasing myelin concentration and RNA." As taken from López-Martínez CyTA - Journal of Food 18(1), 68-75 .JM et al. 2020

5.4. Mutagenicity

High consumption of fruits and vegetables has been suggested to provide some protection to smokers who are exposed to an increased risk of numerous cancers and other degenerative diseases. Carrot is the most important source of dietary β-carotene. Therefore, the objective of this study was to investigate whether carrot juice supplementation to smokers can protect against lymphocyte DNA damage and to compare the effect of supplementation of capsules containing purified β-carotene or a placebo (simple lactose). The study was conducted in a randomized and placebo-controlled design. After a depletion period of 14 days, 48 smokers were supplemented with either carrot juice (n = 18), purified β-carotene (n = 16) or placebo (n = 14). Each group was supplemented for 8 weeks with approximately 20.49 mg of β-carotene/day and 1.2 mg of vitamin C/day, as carrot juice (300 ml/day) or purified β-carotene (20.49 mg of β-carotene, 1 capsule/day). Lymphocyte DNA damage was determined using the COMET assay under alkaline conditions and damage was quantified by measuring tail moment (TM), tail length (TL), and% DNA in the tail. Lymphocyte DNA damage was significantly decreased in the carrot juice group in all three measurements. The group that received purified β-carotene also showed a significant decrease in lymphocyte DNA damage in all three measurements. However, no significant changes in DNA damage was observed for the placebo group except TM ($P = 0.016$). Erythrocyte antioxidant enzyme was not significantly changed after supplementation. Similarly plasma lipid profiles were not different after carrot juice, β-carotene and placebo supplementation. These results suggest that while the placebo group failed to show any protective effect, carrot juice containing beta-carotene or purified β-carotene itself had great antioxidative potential in preventing damage to lymphocyte .DNA in smokers (Lee et al. 2011)

The genetic toxicity of β-carotene was investigated, to provide the scientific basis for its safe use. Ames test, sub-plus and without S9 metabolic activation system in 2 parallel tests, the tested compds. with 5 dose groups, and the revertant colonies were scored. Cell micronucleus test of marrow was used. The tested compds. located 3 dose groups, and the micronucleus polychromatic erythrocytes of marrow were obsd. and measure. Mouse sperm morphol. test located 3 dose groups. The deform nos. of sperm due to different doses of β-carotene were noted. The neg. control test group and pos. control group were located above 3 tests. Ames test located a single blank control group. In Ames test, the no. of revertant colonies due to β-carotene was less than that of the control group. The micronucleus test showed there were no significant difference in micronucleus rate and deform nos. of sperm between β-carotene groups and neg. control group ($P>0.05$), but there was a significant difference between neg. control group and pos. control group ($P<0.01$). The β-carotene was not mutagenic to tested strains, somatic cell and germ cells in mice (Li et al. 2012).

A package of three in vitro genotoxicity tests (Ames, mouse lymphoma and micronucleus assay in “ human peripheral blood lymphocytes) was negative for induction of point mutation and

chromosome damage. An initial Ames test showed a weak positive response in Salmonella typhimurium strain (TA1537). This response was non-reproducible and attributed to microbial contamination as subsequent tests with an irradiated batch of cRG-I including a repeat Ames test were negative. cRG-I was therefore considered to be non-mutagenic." As taken from Jonker D et al. 2020. Food Chem. Toxicol. 139, 111243. PubMed, 2020 *5.5. Cytotoxicity*

5.5. Cytotoxicity

New therapies for leukaemia are urgently needed. Carrots have been suggested as a potential treatment for leukaemia in traditional medicine and have previously been studied in other contexts as potential sources of anticancer agents. Indicating that carrots may contain bioactive compounds, which may show potential in leukaemia therapies. This study investigated the effects of five fractions from carrot juice extract (CJE) on human lymphoid leukaemia cell lines, together with five purified bioactive compounds found in Daucus carota L, including: three polyacetylenes (falcarinol, falcarindiol and falcarindiol-3-acetate) and two carotenoids (beta-carotene and lutein). Their effects on induction of apoptosis using Annexin V/PI and Caspase 3 activity assays analysed via flow cytometry and inhibition of cellular proliferation using Cell Titer Glo assay and cell cycle analysis were investigated. Treatment of all three lymphoid leukaemia cell lines with the fraction from carrot extracts which contained polyacetylenes and carotenoids was significantly more cytotoxic than the 4 other fractions. Treatments with purified polyacetylenes also induced apoptosis in a dose and time responsive manner. Moreover, falcarinol and falcarindiol-3-acetate isolated from Daucus carota L were more cytotoxic than falcarindiol. In contrast, the carotenoids showed no significant effect on either apoptosis or cell proliferation in any of the cells investigated. This suggests that polyacetylenes rather than beta-carotene or lutein are the bioactive components found in Daucus carota L and could be useful in the development of new leukemic therapies. Here, for the first time, the cytotoxic effects of polyacetylenes have been shown to be exerted via induction of apoptosis .and arrest of cell cycle (Zaini et al. 2012)

"Black carrots contain anthocyanins possessing enhanced physiological activities. Explants of young black carrot shoots were cultured in Murashige and Skoog (MS) medium for callus initiation and were transferred to new MS medium supplemented with four different combinations of 2,4-dichlorophenoxyacetic acid and kinetin. Subsequently, the lyophilized calli and black carrot harvested from fields were subjected to ultrasound extraction with ethanol at a ratio of 15:1 (w:v). Obtained extracts were applied to various human cancer cell lines including MCF-7 SK-BR-3 and MDA-MB-231 (human breast adenocarcinomas), HT-29 (human colon adenocarcinoma), PC-3 (human prostate adenocarcinoma), Neuro 2A (Musmusculus neuroblastoma) cancer cell lines and VERO (African green monkey kidney) normal cell line by MTT assay. The highest cytotoxic activity was achieved against Neuro-2A cell lines exhibiting viability of 38-46% at 6.25 µg/ml concentration for all calli and natural extracts. However, a significantly high IC50 value of 170.13 µg/ml was attained in normal cell line VERO indicating that its natural counterpart is an ideal candidate for treatment of brain cancer without causing negative effects to normal healthy cells." As taken from Sevimli-Gur C et al. 2013. Plant Foods Hum. Nutr. 68(3), 293-8. PubMed, 2014

BACKGROUND: In this study, we used Daucus carota oil extract (DCOE) to target acute myeloid " leukemia (AML) cells. All the AML cell lines tested were sensitive to the extract while peripheral mononuclear cells were not. Analysis of mechanism of cell death showed an increase in cells positive for annexinV and for active caspases, indicating that DCOE induces apoptotic cell death in AML. Inhibition of the MAPK pathway decreased sensitivity of AML cells to DCOE, indicating that cytotoxicity may be dependent on its activity. In conclusion, DCOE induces selective apoptosis in

AML cells". As taken from Tawil M et al. 2015. Asian Pac. J. Cancer Prev. 16(2), 761-7. PubMed, 2015

The essential oil of Daucus carota subsp. carota from Portugal, with high amounts of geranyl " acetate (29.0%), α-pinene (27.2%), and 11αH-himachal-4-en-1β-ol (9.2%), was assessed for its biological potential. The antimicrobial activity was evaluated against several Gram-positive and Gram-negative bacteria, yeasts, dermatophytes, and Aspergillus strains. The minimal inhibitory concentration (MIC) and minimal lethal concentration (MLC) were evaluated showing a significant activity towards Gram-positive bacteria (MIC = 0.32-0.64 µL/mL), Cryptococcus neoformans (0.16 µL/mL), and dermatophytes (0.32-0.64 µL/mL). The inhibition of the germ tube formation and the effect of the oil on Candida albicans biofilms were also unveiled. The oil inhibited more than 50% of filamentation at concentrations as low as 0.04 µL/mL (MIC/128) and decreased both biofilm mass and cell viability. The antioxidant capacity of the oil, as assessed by two in chemico methods, was not relevant. Still, it seems to exhibit some anti-inflammatory potential by decreasing nitric oxide production around 20% in LPS-stimulated macrophages, without decreasing macrophages viability. Moreover, the oils safety profile was assessed on keratinocytes, alveolar epithelial cells, macrophages, and hepatocytes. Overall, the oil demonstrated a safety profile at concentrations below 0.64 µL/mL. The present work highlights the bioactive potential of D. carota subsp. carota suggesting its industrial exploitation." As taken from Alves-Silva JM et al. 2016. Evid. Based Complement. Alternat. Med. 2016, 9045196. Pubmed, 2016

CONTEXT: Wild carrot, Daucus carota L. ssp. carota (Apiacae), is widely distributed throughout " the world and has various uses in traditional medicine in Lebanon. OBJECTIVE: The present study aimed to fractionate and analyze the chemical composition of the Daucus carota oil extract (DCOE) fractions and to evaluate their antioxidant and hepatoprotective properties in vitro and in vivo. MATERIALS AND METHODS: DCOE was chromatographed on silica gel column to produce four fractions: pentane (F1), 50:50 pentane:diethyl ether (F2), diethyl ether (F3), and 93:7 chloroform: methanol (F4). Qualitative and quantitative analyses of oil fractions were performed by GC-MS and HPLC techniques. The in vitro antioxidant properties were assessed using DPPH, FIC, and ferric-reducing antioxidant power (FRAP) assays. The hepatoprotective property was determined by examining the levels of serum markers (alanine transaminase (ALT) and aspartate transaminase (AST)) and hepatic antioxidant (superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST)) enzymes in CCl4-intoxicated mice pretreated with intraperitoenal 50, 100, or 200 mg/kg b.w. of the oil fractions for 5 d. RESULTS: GCMS analysis of F2 revealed the presence of 2-himachalen-6-ol (61.4%) which is reported for the first time in Daucus carota species. F3 and F4 were rich in phenolics and flavonoids and demonstrated significant DPPH activity (IC50 = 0.29 and 0.38 mg/ml, respectively) and high FRAP values (225.11 and 437.59 µmol FeSO4/g, respectively). The sesquiterpene-rich fraction F1 had the highest FIC ability (IC50 = 0.28 mg/ml). Pretreatment with F1 and F4 reversed the CCl4-induced decrease in SOD, CAT, and GST levels and reduced significantly hepatic damage. DISCUSSION AND CONCLUSION: The current results suggested that wild carrot oil fractions exhibited a unique chemical composition and possessed significant antioxidant activities as well as hepatoprotective effects against CCl4-induced hepatotoxicity." As taken from Shebaby WN et al. 2015. Pharm. Biol. 53(9) 1285-94. PubMed, 2016

New agents that are effective against common pathogens are needed particularly for those " resistant to conventional antimicrobial agents. Essential oils (EOs) are known for their antimicrobial activity. Using the broth microdilution method, we showed that (1) two unique blends of Cinnamomum zeylanicum, Daucus carota, Eucalyptus globulus and Rosmarinus officinalis EOs (AB1 and AB2; cinnamon EOs from two different suppliers) were active against the fourteen Gram-positive and -negative bacteria strains tested, including some antibiotic-resistant strains. Minimal inhibitory concentrations (MICs) ranged from 0.01% to 3% v/v with minimal bactericidal concentrations from <0.01% to 6.00% v/v; (2) a blend of Cinnamomum zeylanicum, Daucus carota, Syzygium aromaticum, Origanum vulgare EOs was antifungal to the six Candida strains tested, with MICs ranging from 0.01% to 0.05% v/v with minimal fungicidal concentrations from 0.02% to

0.05% v/v. Blend AB1 was also effective against H1N1 and HSV1 viruses. With this dual activity, against H1N1 and against S. aureus and S. pneumoniae notably, AB1 may be interesting to treat influenza and postinfluenza bacterial pneumonia infections. These blends could be very useful in clinical practice to combat common infections including those caused by microorganisms resistant to antimicrobial drugs." As taken from Brochot A et al. 2017. Microbiologyopen 6(4). PubMed, 2018

The essential oils (EOs) of green seeds from Daucus carota subsp. maximus growing wild in " Pantelleria Island (Sicily, Italy) were characterized. EOs were extracted by steam distillation, examined for their inhibitory properties against food-borne Gram-positive and Gram-negative bacteria and analyzed for the chemical composition by gas chromatography (GC) and mass spectrometry (MS). Undiluted EOs showed a large inhibition spectrum against Gram-positive strains and also vs. Acinetobacter spp. and Stenotrophomonas maltophilia. The minimum inhibition concentration (MIC) was in the range 1.25 - 2.50 µl/ml for the most sensitive strains. The chemical analysis indicated that D. carota subsp. maximus EOs included 34 compounds (five monoterpene hydrocarbons, six oxygenated monoterpenes, 14 sesquiterpene hydrocarbons, four oxygenated sesquiterpenes, camphorene and four other compounds), accounting for 95.48% of the total oil, and that the major chemicals were carotol, β-bisabolene, and isoelemicin." As taken from Gaglio R et al. 2017. Chem. Biodivers. 14(5). PubMed, 2018

Antimicrobial properties of plants essential oils are continuously investigated to use them as " potential drug candidates to overcome the problem of microbial drug resistance. The aim of this research is to study the antimicrobial effects of the essential oils of ten Apiaceous fruits [Pimpinella anisum L. (anise), Carum carvi L. (caraway), Apium graveolens L. (celery), Coriandrum sativum L. (coriander), Cuminum cyminum L. (cumin), Anethum graveolens L. (dill), Foeniculum vulgare L. (fennel), Petroselinum crispum L. (pasley), Daucus carota L. var. sativus (yellow carrot) and Daucus carota L. var. boissieri (red carrot)]. Results of agar-well diffusion method revealed that the maximum inhibition zones were obtained with cumin, coriander and caraway oils against the standard bacterial strains Escherichia coli, Bordetella bronchiseptica followed by Staphylococcus aureus. Results of viable count time-kill method revealed that coriander oil had the highest antimicrobial activity with more than 99.99% killing of the exposed cells of the standard E. coli and Bordetella bronchiseptica standard strains. GC/MS was carried out to identify the chemical composition of the most active oils. The percentage of identified compounds by GC/MS was 92.5%, 99.43% and 98.66% for cumin, coriander and caraway oils, respectively. Monoterpenes were the Future Journal of .most abundant components in the three oils." As taken from Khalil N et al. 2018 .Pharmaceutical Sciences. 4(1), 88-92

In the present study, an attempt was made to investigate the efficiency of different solvents and at " different temperatures viz., water, hot water and hexane for extraction of total phenolics from carrot (Daucus carota L.). These extracts were also evaluated for free radical scavenging activity by DPPH method and antibacterial activity by well diffusion method. The results revealed that hot water extract contained the highest amount of total phenolics (0.34 mg GAE/g fwb) and exhibited the highest DPPH free radical scavenging activity with IC50 value (14.89 mg/ml). The antibacterial activities of different solvents were tested against the bacterial strains Micrococcus luteus (Gram-positive), Escherichia coli and Pseudomonas aeruginosa (Gram-negative) by observing the zone of inhibition. The hexane extract showed more activity against M. luteus, zone of diameter 19.27±0.90 mm and water extract showed more activity against E. coli, zone of diameter 11.70±0.50 mm Annals of Agri. Bio. .compared to other solvent extracts." As taken from Singh S et al. 2017 .Research 22(2), 158-161

Background: The antibacterial/antifungal toxicity of Daucus carota (carrot) seeds was evaluated " using selected multi-drug resistant bacteria and yeast of clinical origin. Methods: The active constituents of the Daucus carota seeds were extracted using conventional Plant Tissue Homogenization method using cold distilled water, Ethanol and Methanol as solvents. Varying concentrations (5-250 mg/ml) of the three extracts were assayed for antimicrobial activity against the selected isolates- Salmonella typhi, Staphylococcus aureus, Escherichia coli, Klebseilla

pneumoniae and Candida albicans; the agar well diffusion method was used. The antibiogram profile of the organisms was also obtained through disc diffusion method. Results: Similar activity was observed in the methanolic and ethanolic extracts while cold distilled water showed no activity on any of the isolates. The antibiotic susceptibility results showed that the isolates used are highly multi-drug resistant. Ofloxacin exhibited the most pronounced activity against all the isolates. Gentamicin and erythromycin both showed activity on Escherichia coli and Salmonella typhi. Lower concentrations of both extracts presented no inhibitory effects on the test organisms, thus resulting in high MIC values recorded for both extracts. Also, the extracts showed no bactericidal action against the isolates. Conclusions: Observations from this research therefore affirm that Daucus carota seeds possess antimicrobial properties that may be explored as a source of future antimicrobial compounds." As taken from Anibijuwon II et al. 2017. International Archives of .BioMedical and Clinical Research 3(2), 41-45

The study describes the component composition and antimicrobial activity of essential oils from " different part of wild carrot (Daucus carota L. subsp. carota, family Apiaceae), growing in Uzbekistan. The essential oils from fruits and aerial parts enriched with oxygenated sesquiterpenes (70.0-88.0%), with high content of carotol (68.3-78.3%). The extracted from fruits essential oils possess expressed activity against opportunistic pathogenic fungus of Candida albicans." As taken from Asilbekova DT et al. 2017. American Journal of Essential Oils and Natural Products 5(4), 09-.13

Black carrot (Daucus carota L. ssp. sativus var. atrorubens Alef.) is a valuable source of " carbohydrates, minerals and vitamins and contains also high amounts of anthocyanins giving the characteristic deep-purple color. These latter compounds are known as natural dyes used in the food and pharmaceutical industry that have recently attracted much attention for their healthful properties. The aim of this work was to investigate for the first time the polyphenolic profile and biological properties of a black carrot crude extract (BCCE) through an in-depth analysis of the main polyphenolic classes evaluating its antioxidant, cytoprotective and anti-angiogenic properties. Twenty five polyphenols were quantified by LC-DAD-FLD-MS/MS analysis (anthocyanins 78.06%, phenolic acids 17.89% and other flavonoids 4.06%) with polyglycosylated cyanidins as major components. In addition, BCCE showed a strong antioxidant and free radical scavenging activity particularly in the hydrogen transfer-based assays (ORAC and β-carotene bleaching) and a significant increase in the cell viability. Furthermore, BCCE exhibited a strong anti-angiogenic activity at the highest concentration assayed on the chick chorioallantoic membrane (50μg/egg). In conclusion, the obtained results demonstrated the antioxidant, cytoprotective and anti-angiogenic properties of BCCE, which highlight that the higher biological activity of BCCE is probably due to the synergic effects exerted by various polyphenolic classes." As taken from Smeriglio A et al. 2018. Fitoterapia 124, 49-57. PubMed, 2018

Carrots' genotype and growing conditions influence their potential properties to fight against " cardiovascular and metabolic diseases. The present study evaluated the influence of carrot genotypes contrasted by root color (Bolero, Presto, Karotan, Deep Purple, Kintoki and Blanche des Vosges) growing under standard, water-restricted, biotic stress (Alternaria dauci inoculation), and combined stress conditions (water restriction and A. dauci inoculation). The effect of carrots' polyphenol and carotenoid content was assessed on endothelial and smooth muscle cells, hepatocytes, adipocytes and macrophages functions (oxidative stress, apoptosis, proliferation, lipid accumulation and inflammation). Independently of varieties or growing conditions, all carrot extracts affected vascular cells' oxidative stress and apoptosis, and metabolic cells' oxidative stress and lipid accumulation. Three clusters were revealed and displayed beneficial properties mostly for adipocytes function, smooth muscle cells and hepatocytes, and endothelial cells and hepatocytes, respectively. Karotan and Presto varieties exhibited endothelial tropism while Blanche des Vosges targeted adipocytes. Carrots under biotic stress are more efficient in inducing beneficial effects, with the Bolero variety being the most effective. However, extracts from carrots which grew under combined stress conditions had limited beneficial effects. This report underscores the use of certain

carrot extracts as potential effective nutraceutical supplements for metabolic diseases." As taken Nutrients 12(2), 337. PubMed, 2021 .from Soleti R et al. 2020

5.6. Carcinogenicity

Overwhelming evidence indicates that consumption of fruits and vegetables with antioxidant properties correlates with reduced risk for cancers, including leukemia. Carrots contain beneficial agents, such as β-carotene and polyacetylenes, which could be effective in the treatment of leukemia. This study investigated the effect of carrot juice extracts on myeloid and lymphoid leukemia cell lines together with normal hematopoietic stem cells. Leukemia cell lines and nontumor control cells were treated with carrot juice extracts for up to 72 hours in vitro. Induction of apoptosis was investigated by using annexin V/propidium iodide staining followed by flow cytometric analysis, and results were confirmed by using 4'-6-diamidino-2-phenylindole morphology. Effects on cellular proliferation were investigated via cell cycle analysis and cell counts. Treatment of leukemia cell lines with carrot juice extract induced apoptosis and inhibited progression through the cell cycle. Lymphoid cell lines were affected to a greater extent than were myeloid cell lines, and normal hematopoietic stem cells were less sensitive than most cell lines. This study has shown that extracts from carrots can induce apoptosis and cause cell cycle arrest in leukemia cell lines. The findings suggest that carrots may be an excellent source of bioactive .chemicals for the treatment of leukemia (Zaini et al. 2011)

In a randomized cross-over trial with 22 healthy male volunteers fed carrot juice for 2 weeks, only minor changes in the excretion of a faecal marker relevant to colon carcinogenesis were seen (Schnabele et al. 2008).
In a case-controlled study of Korean women, there was no association between breast cancer risk and dietary intake of carrots or carrot juice (Do et al. 2007).
“Daucus carota L. ssp. carota (Apiacea) is used in traditional medicine in Lebanon and in different regions throughout the world. The present study investigates the in vitro anticancer activities of Daucus carota oil extract (DCOE) on four human cancer cell lines as well as its in vitro antioxidant activity. DCOE was extracted from the dried umbels with 50:50 acetone-methanol. The oil extract was analyzed by gas chromatography-mass spectrometry and screened for its antioxidant properties in vitro using 1,1-diphenyl-2-picryl hydrazyl free radical scavenging assay (DPPH), ferrous ion chelating assay (FIC) and the ferric reducing antioxidant power assay (FRAP). The anticancer activity of the oil extract against human colon (HT-29, Caco-2) and breast (MCF-7, MDA-MB-231) cancer cell lines was evaluated using the trypan blue exclusion method and the WST-1 cell proliferation assay. DCOE exhibited antioxidant activity in all assays used. The FRAP value was 164±5.5µmol FeSO(4) /g, and the IC(50) values for DPPH and FIC assays were 2.1±0.03mg/ml and 0.43±0.02mg/ml, respectively. Also, DCOE demonstrated a significant increase in cell death and decrease in cell proliferation. The effect of DCOE on the cell lines exhibited time and dose-dependent responses. The present study established that DCOE possesses both antioxidant and promising anticancer activities”. As taken from Shebaby WN et al. 2013. Phytother Res. 27(5), 737-44. PubMed, 2013

“Daucus carota L. ssp. carota (Apiacea) is widely distributed throughout the world and has many uses in traditional medicine. OBJECTIVE: The present study investigates the chemopreventive effects of oil extract of D. carota umbels on 7,12-dimethyl benz(a)anthracene (DMBA)-induced skin cancer in mice. MATERIALS AND METHODS: D. carota oil extract (DCOE) was prepared by extracting the dried umbels with 50:50 acetone:methanol. Skin papilloma were initiated by DMBA

and promoted by 12-O-tetradecanoyl phorobol-13-acetate (TPA). The extract was administered to animals via gavage (0.02mL of 100% oil), intraperitoneal (0.3mL of 2% oil), and topical (0.2mL of 5, 50, and 100% oil) routes for 20 weeks. Tumor appearance, incidence, yield, and volume were compared with those of a non-treated control group. RESULTS: Topical 100% treatment delayed tumor appearance, and inhibited tumor incidence and yield by 40 and 89%, respectively. Topical 50% treatment inhibited tumor incidence and yield by 30 and 83%, respectively, whereas the 5% treatment inhibited tumor yield by 36%. Tumor volume was decreased by 99, 91, and 70% following topical treatments with 100, 50, and 5% oil, respectively. Intraperitoneal treatment inhibited tumor yield by 43%, and decreased tumor volume by 85%, whereas gavage treatment showed minimal effects on both. Intraperitoneal and topical treatment decreased infiltration and hyperplasia with an increase in the level of hyperkeratosis. CONCLUSION: These findings demonstrate that DCOE has remarkable antitumor activity against DMBA-induced skin cancer compared with non-treated animals paving the ground for further investigations". As taken from Zeinab RA et al. 2011. Pharm. Biol. 49, 955-961. PubMed, 2013

The aim of this study was to evaluate the chemopreventive potential of purple carrot extract " following rat tongue carcinogenesis induced by 4-nitroquinoline 1-oxide (4NQO). For this purpose, histopathological analysis, proliferative status, antioxidant activity and inflammatory status were investigated in this setting. A total of 20 male rats were distributed into four groups as follows (n = 5 per group): Group 1—free access to water and commercial diet for 12 weeks; Group 2—received 4NQO at 50 ppm dose in drinking water daily and commercial diet for 12 weeks; Group 3—free access to water and received diet supplemented with purple carrot extract (0.1 g/kg) for 12 weeks; and Group 4—received 4NQO at 50 ppm dose in drinking water daily and diet supplemented with purple carrot extract (0.1 g/kg) for 12 weeks. Histopathological analysis revealed that animals treated with purple carrot extract reduced the oral lesions such as dysplasia and squamous cell carcinoma. Animals with oral pre-neoplastic lesions and treated with purple carrot extract decreased ki-67 and 8-OHdG immunoexpression. Moreover, pNFκBp50 and MyD88 protein expressions were decreased after purple carrot treatment associated or not with 4NQO exposure. SOD-Mn mRNA levels increased with treatment with purple carrot extract as well. In conclusion, our results demonstrated that purple carrot extract was able to protect oral lesions induced by 4NQO in Wistar rats as a result of antioxidant activity, anti-inflammatory potential and antiproliferative and antimutagenic actions." As taken from Soares GR et al. 2018. Medical Oncology 35(4), 54. PubMed, 2018

Abstract: Many Arabian medicinal plants possessed anticancer activitys by many mechanisms as " tested by different anticancer tests. These plants included: Adonis aestivalis, Ailanthus altissima, Alhagi maurorum, Allium cepa, Allium sativum, Allium schoenoprasum, Althaea officinalis, Althaea rosea, Ammannia baccifera, Anagyris foetida, Anchusa italica, Antirrhinum majus, Apium graveolens, Arctium Lappa, Aristolochia maurorum, Artemisia campestris, Arundo donax, Asclepias curassavica, Asparagus officinalis, Astragalus hamosus, Bauhinia variegata, Bellis perennis, Betula alba, Bidens tripartita, Brassica rapa, Bryonia dioica, Bryophyllum calycinum, Caccinia crassifolia, Caesalpinia crista, Calendula officinalis, Calotropis procera, Canna indica, Capparis spinosa, Capsella bursa-pastoris, Capsicum annuum , Capsicum frutescens, Carthamus tinctorius, Casuarina equisetifolia, Celosia cristata, Chenopodium album, Chrozophora tinctoria, Cicer arietinum, Cichorium intybus, Citrullus colocynthis, Citrus species, Clerodendron inerme, Clitoria ternatea, Convolvulus arvensis, Convolvulus scammonia, Corchorus aestuans, Corchorus capsularis, Coriandrum sativum, Coronilla scorpioides, Coronilla varia, Cotoneaster racemiflora, Crocus sativus, Cuminum cyminum, Cupressus sempervirens, Cuscuta planiflora, Cydonia oblonga, Cynodon dactylon, Cyperus rotuntdus, Dactyloctenium aegyptium, Datura metel , Daucus carota, Delphinium brunonianum, Desmostachya bipinnata, Dianthus caryophyllus, Digitalis lanata , Digitalis purpurea, Dodonaea viscosa, Lablab purpureus, Echinochloa crus-galli, Equisetum arvense, Erigeron canadensis, Erodium cicutarium, Eryngium creticum, Eucalyptus species, Eupatorium cannabinum, Euphorbia hirta, Euphorbia macroclada, Fagopyrum esculentum, Ficus carica , Ficus cunia and Ficus religiosa. The current paper will discuss the anticancer effects of

some medicinal plants as a first part of this review." As taken from Al-Snafi AE. 2017. IOSR Journal .of Pharmacy 7(4), 63-102

BACKGROUND: We aimed to estimate the association between dietary carrot intake and risk of " breast cancer by conducting a meta-analysis of epidemiologic studies. METHODS: Relevant studies were identified by searching databases through September 2017. We included studies that reported risk estimates with 95% confidence intervals for the association between dietary carrot intake and breast cancer risk. Random-effects models were used to calculate the summary risk estimates. Publication bias was estimated using Begg's funnel plot and Egger's regression asymmetry test. RESULTS: A total of 10 articles met the eligibility criteria and were included in the meta-analysis involving 13,747 cases. The combined odds ratios (ORs) of breast cancer for the highest compared with the lowest dietary carrot intake was 0.79 (95% CI: 0.68, 0.90), and a significant heterogeneity was observed. In the subgroup analyses separated by study design, the inverse associations were more pronounced in the case-control studies than in the cohort studies, while the associations did not significantly differ by geographical region, study quality, exposure assessment. Omission of any single study had little effect on the combined risk estimate. CONCLUSION: The overall current literatures suggested that dietary carrot intake was associated Chen H et al. 2018. Medicine (Baltimore) with decreased risk of breast cancer." As taken from 97(37), e12164. PubMed, 2019

5.7. Irritation/immunotoxicity

Beta-carotene has been shown to enhance immune functions in humans. Whether vegetables rich in carotenoids, such as beta-carotene or lycopene, modulate immune functions in healthy humans is presently not known. The objective of this study was to investigate the effects of a low-carotenoid diet supplemented with either tomato (providing high amounts of lycopene) or carrot juice (providing high amounts of alpha- and beta-carotene) on immune functions in healthy men. In a blinded, randomized, cross-over study, male subjects on a low-carotenoid diet consumed 330 ml/day of either tomato juice (37.0 mg/day lycopene) or carrot juice (27.1 mg/day beta-carotene and 13.1 mg/day alpha-carotene) for 2 weeks with a 2-week depletion period after juice intervention. Immune status was assessed by measuring lytic activity of natural killer (NK) cells, secretion of cytokines (IL-2, IL-4, TNFalpha), and proliferation by activated peripheral blood mononuclear cells. Juice consumption resulted in relatively fast responses in plasma carotenoid concentrations ($P<0.0002$) which were not accompanied by concomitant changes in immune functions. For IL-2, NK cell cytotoxicity, and lymphocyte proliferation, maximum responses were observed during depletion periods. The highest production rate was measured only for TNFalpha at the end of the first intervention period. Juice intervention did not modulate the secretion of IL-4. Increased plasma carotenoid concentrations after vegetable juice consumption are accompanied by a time-delayed modulation of immune functions in healthy men consuming a low-carotenoid diet .(Watzl et al. 2003)

Fifty-three patients having contact dermatitis on the fingertips showed positive patch tests with several vegetables the commonest being garlic, onion, tomato, and carrot in that order of frequency. Of several preparations, made from garlic onion, tomato, and carrot, the juices used as such gave the maximum number of positive patch test reactions. Lyophilization of the juices led to false-negative patch tests in some cases. Patch tests in the controls were positive in some cases but these were probably cases of latent hypersensitivity, because some of them, like the patients, showed positive reactions even with the diluted juices. The antigens in garlic and onion were extractable in water, ether, acetone, or alcohol and were also present in the essential oils of these vegetables. Infrared spectra of the essential oils of garlic and onion were similar and showed straight chain acids, esters, and methylene groups. Clinically, there was no suggestion of cross-sensitivity between onion and garlic (Sinha et al. 1977).
Prolonged contact with raw or cooked carrots can produce allergic dermatitis. The irritant is found

in the raw carrot, in the dried carrot residue, in the carrot juice ,and in the heated carrot (240 F., 15 pounds' at 6.8 Kg. pressure, two and one-half hours). The active principle is soluble in ether and in water. Proper precautions would reduce the incidence of dermatitis (Peck et al. 1944). According to a short abstract, a man experienced a severe anaphylactic reaction within moments of drinking a glass of freshly prepared carrot juice. He had no previous oral or systemic symptoms from the ingestion of peeled raw or cooked carrot (Harris, 1995).

BACKGROUND: Immediate hypersensitivity reactions to root vegetables of the Umbelliferae plant " family (Apiaceae) is well known. Delayed-type hypersensitivity is rarely reported. OBJECTIVE: To report the first case of systemic contact dermatitis caused by root vegetables and some chemical implications. MATERIALS AND METHODS: Prick and patch testing were performed with fresh vegetables and selected allergens, and this was followed by high-performance liquid chromatography-mass spectrometry (MS)/MS analysis of the falcarinol syringe. RESULTS: The patient was contact-sensitive to celeriac, parsnip, and carrot, but tested negative to falcarinol. Subsequent analysis showed that the syringe contained falcarinol. CONCLUSION: The non-occupational sensitization resulting from both direct and systemic contact with Apiaceae root vegetables was apparently not caused by falcarinol." As taken from Paulsen E et al. 2014. Contact Dermatitis 70(2), 98-103. PubMed, 2014

Type of Test	**Route of Exposure**	**Species Observed**	**Dose Data**	**Reaction Severity**	**Reference**
Standard Draize test	Administration onto the skin	Rodent - rabbit	500 mg/24H	Mild	FCTXAV Food and Cosmetics Toxicology. (London, UK) V.1-19, 1963-81. For publisher information, see FCTOD7. Volume(issue)/page/year: 14,705,1976
Standard Draize test	Administration onto the skin	Rodent - guinea pig	100%	Mild	FCTXAV Food and Cosmetics Toxicology. (London, UK) V.1-19, 1963-81. For publisher information, see FCTOD7. Volume(issue)/page/year: 14,705,1976

.As taken from RTECS, 1997

"At the individual basis, the summarized carrot allergen threshold of our patient group started at 0.55 mg. By probit analysis, this was downcalculated to an estimated threshold dose of 0.165 mg (lower confidence limit, 0.015 mg; higher confidence limit, 0.500 mg) for 10% of the patients (ED10) on population level. Also, 10% of the carrot-allergic patients are predicted to react with objective symptoms at a cumulative dose of 18.98 mg of carrot (lower confidence limit, 2.22 mg; higher confidence limit, 51.79 mg). This value is in a range comparable to the results of other recent studies, revealing an ED10 for whole hen's egg (43 mg),8 whole hazelnut (143 mg),8 and whole peanut (106 and 12 mg),8,9 respectively. In these foods, the main allergens are known to represent a substantial proportion of the total protein composition. To our knowledge, this is the first threshold dose study including a quantification of the individual allergens in the food used for challenges. This seems to be relevant because allergen contents contained in fresh foods may vary considerably,

for example, because of storage time and conditions.
In an upcoming study, it is planned to repeat this approach by using double-blind, placebo-controlled food challenge and to determine the ‘‘true lowest observed adverse effect level’’ and the ‘‘no observed adverse effect level’’ thresholds for carrot-allergic patients.” As taken from Foetisch et al. 2013. J Allergy Clin Immunol. 131(6), 1711-3. PubMed, 2012

“The essential oil of Daucus carota subsp. carota from Portugal, with high amounts of geranyl acetate (29.0%), α-pinene (27.2%), and 11αH-himachal-4-en-1β-ol (9.2%), was assessed for its biological potential. The antimicrobial activity was evaluated against several Gram-positive and Gram-negative bacteria, yeasts, dermatophytes, and Aspergillus strains. The minimal inhibitory concentration (MIC) and minimal lethal concentration (MLC) were evaluated showing a significant activity towards Gram-positive bacteria (MIC = 0.32-0.64 µL/mL), Cryptococcus neoformans (0.16 µL/mL), and dermatophytes (0.32-0.64 µL/mL). The inhibition of the germ tube formation and the effect of the oil on Candida albicans biofilms were also unveiled. The oil inhibited more than 50% of filamentation at concentrations as low as 0.04 µL/mL (MIC/128) and decreased both biofilm mass and cell viability. The antioxidant capacity of the oil, as assessed by two in chemico methods, was not relevant. Still, it seems to exhibit some anti-inflammatory potential by decreasing nitric oxide production around 20% in LPS-stimulated macrophages, without decreasing macrophages viability. Moreover, the oils safety profile was assessed on keratinocytes, alveolar epithelial cells, macrophages, and hepatocytes. Overall, the oil demonstrated a safety profile at concentrations below 0.64 µL/mL. The present work highlights the bioactive potential of D. carota subsp. carota suggesting its industrial exploitation.” As taken from Alves-Silva JM et al. 2016. Evid. Based Complement. Alternat. Med. 2016, 9045196. Pubmed, 2016

Phytophotodermatitis is a clinical diagnosis from phototoxicity of the skin induced by contact with “ plants or their extracts. Phytophotodermatitis maypresent with burning, erythema, patches, plaques, vesicles, bullae, or hyperpigmented patches in welldemarcated and unusual shapes. Inquiring about occupation, hobbies, and plant or plant extract contact is essential to establishing the diagnosis. Herein we present a case of phytophotodermatitisafter use of carrot extract-containing sunscreen presenting as a hyperpigmented patch in a geometric distribution with accentuation of pigment within the dynamic rhytides.” As taken from Bosanac SS et al. 2018. Dermatol. Online J. 24(1), 13030/qt2nv2d1n0. PubMed, 2018

Plant-derived foods are the most common allergenic sources in adulthood. Owing to the rapidly “ increasing prevalence of plant food allergies in industrialized countries, the environmental factors are suspected to play a key role in development of allergic sensitization. The present article provides an overview of ways by which chemicals may influence the development and severity of allergic reactions to plant foods, with especial focus on plant allergens up-regulated under chemical stress. In plants, a substantial part of allergens have defense-related function and their expression is highly influenced by environmental stress and diseases. Pathogenesis-related proteins (PR) account for about 25% of plant food allergens and some are responsible for extensive cross-reactions between plant-derived foods, pollen and latex allergens. Chemicals released by anthropogenic sources such as agriculture, industrial activities and traffic-related air pollutants are potential drivers of the increasing sensitization to allergenic PRs by elevating their expression and by altering their immunogenicity through post-translational modifications. In addition, some orally-taken chemicals may act as immune adjuvants or directly trigger non-IgE mediated food allergy. Taken together, the current literature provides an overwhelming body of evidence supporting the fact that plant chemical exposure and chemicals in diet may enhance the allergenic properties of certain plant-derived foods.” As taken from Shahali Y and Dadar M. 2018. Food and Chemical .Toxicology 115, 365-374

Scope: The major carrot allergen Dau c 1 belongs to the group of pathogenesis related class 10 " (PR-10) proteins and is homologous to the birch pollen allergen Bet v 1. In contrast to most other PR-10 allergens, Dau c 1 can elicit Bet v 1 independent sensitization. Although Dau c 1 is considered heat labile, allergic reactions against cooked carrots are possible. Methods and results: The pH and temperature stability as well as the allergenic potential before and after treatment of

purified natural (n) Dau c 1 and different recombinant (r) isoallergens is investigated: rDau c 1.0104, rDau c 1.0105, rDau c 1.0201, rDau c 1.0301. All proteins except rDau c 1.0201 are able to refold at physiological pH. pH conditions around the pI (4.4-5.5) or the presence of the carrot matrix reduce the refolding capacity. Below the pI, most isoallergens are heat resistant and still able to cause mediator release, indicating allergenicity. Moreover, cooked carrot extract is still able to provoke mediator release due to remaining soluble Dau c 1. Conclusion: Patients allergic to carrots should avoid processed carrot containing foodstuff because heating or pH treatment do not Jacob T et al. 2020. Mol. Nutr. Food completely abolish the allergenicity of Dau c 1." As taken from Res. 64(18), e2000334. PubMed, 2021

5.8. All other relevant types of toxicity

Daucus carota L. ssp. carota (Apiacea) is used in traditional medicine in Lebanon and in different " regions throughout the world. The present study investigates the in vitro anticancer activities of Daucus carota oil extract (DCOE) on four human cancer cell lines as well as its in vitro antioxidant activity. DCOE was extracted from the dried umbels with 50:50 acetone-methanol. The oil extract was analyzed by gas chromatography-mass spectrometry and screened for its antioxidant properties in vitro using 1,1-diphenyl-2-picryl hydrazyl free radical scavenging assay (DPPH), ferrous ion chelating assay (FIC) and the ferric reducing antioxidant power assay (FRAP). The anticancer activity of the oil extract against human colon (HT-29, Caco-2) and breast (MCF-7, MDA-MB-231) cancer cell lines was evaluated using the trypan blue exclusion method and the WST-1 cell proliferation assay. DCOE exhibited antioxidant activity in all assays used. The FRAP value was 164±5.5µmol FeSO(4) /g, and the IC(50) values for DPPH and FIC assays were 2.1±0.03mg/ml and 0.43±0.02mg/ml, respectively. Also, DCOE demonstrated a significant increase in cell death and decrease in cell proliferation. The effect of DCOE on the cell lines exhibited time and dose-dependent responses. The present study established that DCOE possesses both antioxidant and promising anticancer activities". As taken from Shebaby WN et al. 2013. Phytother Res. 27(5), 737-44. PubMed, 2013

"The involvement of sodium-hydrogen exchangers (NHE) has been described in the pathophysiology of diseases including ischemic heart and brain diseases, cardiomyopathy, congestive heart failure, epilepsy, dementia, and neuropathic pain. Synthetic NHE inhibitors have not achieved much clinical success; therefore, plant-derived phytoconstituents may be explored as NHE inhibitors. Methods: In the present study, the NHE inhibitory potential of hydroalcoholic and alkaloidal fractions of Malus domestica, Musa×paradisiaca, Daucus carota, and Symphytum officinale was evaluated. The different concentrations of hydroalcoholic and alkaloidal extracts of the selected plants were evaluated for their NHE inhibitory activity in the platelets using the optical swelling assay. Results: Among the hydroalcoholic extracts, the highest NHE inhibitory activity was shown by M. domestica (IC50=2.350±0.132 µg/mL) followed by Musa×paradisiaca (IC50=7.967±0.451 µg/mL), D. carota (IC50=37.667±2.517 µg/mL), and S. officinale (IC50=249.330±155.1 µg/mL). Among the alkaloidal fractions, the highest NHE inhibitory activity was shown by the alkaloidal fraction of Musa×paradisiacal (IC50=0.010±0.001 µg/mL) followed by D. carota (IC50=0.024±0.002 µg/mL), M. domestica (IC50=0.031±0.005 µg/mL), and S. officinale (IC50=4.233±0.379 µg/mL). The IC50 of alkaloidal fractions was comparable to the IC50 of synthetic NHE inhibitor, EIPA [5-(N-ethyl-N-isopropyl)amiloride] (IC50=0.033±0.004 µg/mL). Conclusions: It may be concluded that the alkaloidal fractions of these plants possess potent NHE inhibitory activity and may be exploited for their therapeutic potential in NHE activation-related pathological complications." As taken from Verma V et al. 2013. J. Basic Clin. Physiol. Pharmacol. 2, 1-10. PubMed, 2014

CONTEXT: Wild carrot, Daucus carota L. ssp. carota (Apiacae), is widely distributed throughout “ the world and has various uses in traditional medicine in Lebanon. OBJECTIVE: The present study aimed to fractionate and analyze the chemical composition of the Daucus carota oil extract (DCOE) fractions and to evaluate their antioxidant and hepatoprotective properties in vitro and in vivo. MATERIALS AND METHODS: DCOE was chromatographed on silica gel column to produce four fractions: pentane (F1), 50:50 pentane:diethyl ether (F2), diethyl ether (F3), and 93:7 chloroform: methanol (F4). Qualitative and quantitative analyses of oil fractions were performed by GC-MS and HPLC techniques. The in vitro antioxidant properties were assessed using DPPH, FIC, and ferric-reducing antioxidant power (FRAP) assays. The hepatoprotective property was determined by examining the levels of serum markers (alanine transaminase (ALT) and aspartate transaminase (AST)) and hepatic antioxidant (superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST)) enzymes in CCl4-intoxicated mice pretreated with intraperitoenal 50, 100, or 200 mg/kg b.w. of the oil fractions for 5 d. RESULTS: GCMS analysis of F2 revealed the presence of 2-himachalen-6-ol (61.4%) which is reported for the first time in Daucus carota species. F3 and F4 were rich in phenolics and flavonoids and demonstrated significant DPPH activity (IC50 = 0.29 and 0.38 mg/ml, respectively) and high FRAP values (225.11 and 437.59 µmol FeSO4/g, respectively). The sesquiterpene-rich fraction F1 had the highest FIC ability (IC50 = 0.28 mg/ml). Pretreatment with F1 and F4 reversed the CCl4-induced decrease in SOD, CAT, and GST levels and reduced significantly hepatic damage. DISCUSSION AND CONCLUSION: The current results suggested that wild carrot oil fractions exhibited a unique chemical composition and possessed significant antioxidant activities as well as hepatoprotective effects against CCl4-induced hepatotoxicity.” As taken from Shebaby WN et al. 2015. Pharm. Biol. 53(9) 1285-94. PubMed, 2016

The essential oil of Daucus carota subsp. carota from Portugal, with high amounts of geranyl “ acetate (29.0%), α-pinene (27.2%), and 11αH-himachal-4-en-1β-ol (9.2%), was assessed for its biological potential. The antimicrobial activity was evaluated against several Gram-positive and Gram-negative bacteria, yeasts, dermatophytes, and Aspergillus strains. The minimal inhibitory concentration (MIC) and minimal lethal concentration (MLC) were evaluated showing a significant activity towards Gram-positive bacteria (MIC = 0.32-0.64 µL/mL), Cryptococcus neoformans (0.16 µL/mL), and dermatophytes (0.32-0.64 µL/mL). The inhibition of the germ tube formation and the effect of the oil on Candida albicans biofilms were also unveiled. The oil inhibited more than 50% of filamentation at concentrations as low as 0.04 µL/mL (MIC/128) and decreased both biofilm mass and cell viability. The antioxidant capacity of the oil, as assessed by two in chemico methods, was not relevant. Still, it seems to exhibit some anti-inflammatory potential by decreasing nitric oxide production around 20% in LPS-stimulated macrophages, without decreasing macrophages viability. Moreover, the oils safety profile was assessed on keratinocytes, alveolar epithelial cells, macrophages, and hepatocytes. Overall, the oil demonstrated a safety profile at concentrations below 0.64 µL/mL. The present work highlights the bioactive potential of D. carota subsp. carota suggesting its industrial exploitation.” As taken from Alves-Silva JM et al. 2016. Evid. Based Complement. Alternat. Med. 2016, 9045196. Pubmed, 2016

New agents that are effective against common pathogens are needed particularly for those “ resistant to conventional antimicrobial agents. Essential oils (EOs) are known for their antimicrobial activity. Using the broth microdilution method, we showed that (1) two unique blends of Cinnamomum zeylanicum, Daucus carota, Eucalyptus globulus and Rosmarinus officinalis EOs (AB1 and AB2; cinnamon EOs from two different suppliers) were active against the fourteen Gram-positive and -negative bacteria strains tested, including some antibiotic-resistant strains. Minimal inhibitory concentrations (MICs) ranged from 0.01% to 3% v/v with minimal bactericidal concentrations from <0.01% to 6.00% v/v; (2) a blend of Cinnamomum zeylanicum, Daucus carota, Syzygium aromaticum, Origanum vulgare EOs was antifungal to the six Candida strains tested, with MICs ranging from 0.01% to 0.05% v/v with minimal fungicidal concentrations from 0.02% to

0.05% v/v. Blend AB1 was also effective against H1N1 and HSV1 viruses. With this dual activity, against H1N1 and against S. aureus and S. pneumoniae notably, AB1 may be interesting to treat influenza and postinfluenza bacterial pneumonia infections. These blends could be very useful in clinical practice to combat common infections including those caused by microorganisms resistant As taken from Brochot A et al. 2018. Microbiologyopen6(4). PubMed, 2018 ".to antimicrobial drugs

The essential oils (EOs) of green seeds from Daucus carota subsp. maximus growing wild in " Pantelleria Island (Sicily, Italy) were characterized. EOs were extracted by steam distillation, examined for their inhibitory properties against food-borne Gram-positive and Gram-negative bacteria and analyzed for the chemical composition by gas chromatography (GC) and mass spectrometry (MS). Undiluted EOs showed a large inhibition spectrum against Gram-positive strains and also vs. Acinetobacter spp. and Stenotrophomonas maltophilia. The minimum inhibition concentration (MIC) was in the range 1.25 - 2.50 µl/ml for the most sensitive strains. The chemical analysis indicated that D. carota subsp. maximus EOs included 34 compounds (five monoterpene hydrocarbons, six oxygenated monoterpenes, 14 sesquiterpene hydrocarbons, four oxygenated sesquiterpenes, camphorene and four other compounds), accounting for 95.48% of the total oil, As taken from Gaglio R ".and that the major chemicals were carotol, β-bisabolene, and isoelemicin et al. 2017. Chem. Biodivers. 14(5). PubMed, 2018

Black carrot (Daucus carota L. ssp. sativus var. atrorubens Alef.) is a valuable source of " carbohydrates, minerals and vitamins and contains also high amounts of anthocyanins giving the characteristic deep-purple color. These latter compounds are known as natural dyes used in the food and pharmaceutical industry that have recently attracted much attention for their healthful properties. The aim of this work was to investigate for the first time the polyphenolic profile and biological properties of a black carrot crude extract (BCCE) through an in-depth analysis of the main polyphenolic classes evaluating its antioxidant, cytoprotective and anti-angiogenic properties. Twenty five polyphenols were quantified by LC-DAD-FLD-MS/MS analysis (anthocyanins 78.06%, phenolic acids 17.89% and other flavonoids 4.06%) with polyglycosylated cyanidins as major components. In addition, BCCE showed a strong antioxidant and free radical scavenging activity particularly in the hydrogen transfer-based assays (ORAC and β-carotene bleaching) and a significant increase in the cell viability. Furthermore, BCCE exhibited a strong anti-angiogenic activity at the highest concentration assayed on the chick chorioallantoic membrane (50µg/egg). In conclusion, the obtained results demonstrated the antioxidant, cytoprotective and anti-angiogenic properties of BCCE, which highlight that the higher biological activity of BCCE is probably due to the synergic effects exerted by various polyphenolic classes." As taken from Smeriglio A et al. 2018. Fitoterapia 124, 49-57. PubMed, 2018

BACKGROUND: Black carrot is known to be effective against Type 2 diabetes. The phenolic " compounds present in black carrot are responsible for this property, but limited information was available about the mechanism of action and target enzymes. OBJECTIVE: The present study aims at understanding molecular interactions of phenolic compounds of black carrot with enzymes involved in glucose metabolism in human to identify the potential inhibitor that can be used as candidate drug molecule to control diabetes. METHOD: In vitro assay for inhibition of α-amylase, α-glucosidase and DPP-IV was carried out using black carrot purified extract and the standard inhibitor acarbose and vildagliptin, recpectively. The inhibition activity of selected phenolic compounds was also studied by in silico docking with all these three enzymes for the proper understanding of interactions. Encapsulation of purified black carrot extract was also carried out. RESULTS: In vitro IC50 value of purified extract was found to be better than the standard inhibitor acarbose for α-amylase and α-glucosidase, and vildagliptin for DPP-IV. Similarly, docking scores of few anthocyanin molecules were found to be higher than their respective inhibitors, suggesting more effective inhibition. Among anthocyanin molecules of black carrot, cyanidin 3-xylosyl galactoside was found to be the potential drug to inhibit these enzymes, whereas dipeptidyl peptidase IV was identified as the best target to control diabetes with anthocyanins of black carrot. CONCLUSION: Anthocyanins from black carrot were found to be effective to control diabetes and very first time we propose that cyanidin 3-xylosyl galactoside is the best potential molecule for

inhibiting enzymes involved in glucose metabolism. The study also shows the encapsulation of anthocyanin compounds using β-cyclodextrin.” As taken from Karkute SG et al. 2018. Medicinal Chemistry 14(6), 641-649. PubMed, 2019

In the present study, an attempt was made to investigate the efficiency of different solvents and at “ different temperatures viz., water, hot water and hexane for extraction of total phenolics from carrot (Daucus carota L.). These extracts were also evaluated for free radical scavenging activity by DPPH method and antibacterial activity by well diffusion method. The results revealed that hot water extract contained the highest amount of total phenolics (0.34 mg GAE/g fwb) and exhibited the highest DPPH free radical scavenging activity with IC50 value (14.89 mg/ml). The antibacterial activities of different solvents were tested against the bacterial strains Micrococcus luteus (Gram-positive), Escherichia coli and Pseudomonas aeruginosa (Gram-negative) by observing the zone of inhibition. The hexane extract showed more activity against M. luteus, zone of diameter 19.27±0.90 mm and water extract showed more activity against E. coli, zone of diameter 11.70±0.50 mm Annals of Agri. Bio. .compared to other solvent extracts.” As taken from Singh S et al. 2017 .Research 22(2), 158-161

Background: The antibacterial/antifungal toxicity of Daucus carota (carrot) seeds was evaluated “ using selected multi-drug resistant bacteria and yeast of clinical origin. Methods: The active constituents of the Daucus carota seeds were extracted using conventional Plant Tissue Homogenization method using cold distilled water, Ethanol and Methanol as solvents. Varying concentrations (5-250 mg/ml) of the three extracts were assayed for antimicrobial activity against the selected isolates- Salmonella typhi, Staphylococcus aureus, Escherichia coli, Klebseilla pneumoniae and Candida albicans; the agar well diffusion method was used. The antibiogram profile of the organisms was also obtained through disc diffusion method. Results: Similar activity was observed in the methanolic and ethanolic extracts while cold distilled water showed no activity on any of the isolates. The antibiotic susceptibility results showed that the isolates used are highly multi-drug resistant. Ofloxacin exhibited the most pronounced activity against all the isolates. Gentamicin and erythromycin both showed activity on Escherichia coli and Salmonella typhi. Lower concentrations of both extracts presented no inhibitory effects on the test organisms, thus resulting in high MIC values recorded for both extracts. Also, the extracts showed no bactericidal action against the isolates. Conclusions: Observations from this research therefore affirm that Daucus carota seeds possess antimicrobial properties that may be explored as a source of future antimicrobial compounds.” As taken from Anibijuwon II et al. 2017. International Archives of .BioMedical and Clinical Research 3(2), 41-45

The study describes the component composition and antimicrobial activity of essential oils from “ different part of wild carrot (Daucus carota L. subsp. carota, family Apiaceae), growing in Uzbekistan. The essential oils from fruits and aerial parts enriched with oxygenated sesquiterpenes (70.0-88.0%), with high content of carotol (68.3-78.3%). The extracted from fruits essential oils possess expressed activity against opportunistic pathogenic fungus of Candida albicans.” As taken from Asilbekova DT et al. 2017. American Journal of Essential Oils and Natural Products 5(4), 09-.13

Objectives To evaluate efficacy of carrot seed on sexual dysfunction of women with HSDD " compared with placebo. Methods In this randomized double-blind clinical trial, 68 participants randomly assigned to the intervention group which took 500 mg carrot seed three times a day for 12 weeks versus placebo. Participants in two groups filled Female Sexual Function Index (FSFI) questionnaire at baseline, week six and 12. Repeated measure analysis of variance (ANOVA) test was used for statistical analysis. Results Thirty women in carrot seed group and thirty women in placebo group completed 12 weeks of the study. In general, carrot seed compared to placebo improved the total score of FSFI 7.329 ± 0.830 ($p < 0.001$), desire 4.1±0.7 ($p < 0.001$), lubrication 4.7±0.4 ($p = 0.019$), arousal 4.1±0.08 ($p < 0.001$), satisfaction 4.8±1.1 ($p < 0.001$), orgasm 3.9±0.9 ($p < 0.001$) and pain 5.4±1($p < 0.001$). No adverse event was reported in this study. Conclusions Women with HSDD may benefit from six weeks' treatment with carrot seed for improvement of

sexual dysfunction. Further large clinical studies are warranted to confirm efficacy of this herbal Complement. Ther. Med. 54, 102543. PubMed, 2021 .drug." As taken from Sadeghi S et al. 2020

Daucus carota seed is medicinally useful in the management of disease such as diabetes mellitus, " which is associated with oxidative stress. This study investigated the phytochemical constituents, in vitro and in vivo antioxidant activities of aqueous fraction (AQF) and ethyl acetate fraction (EAF) of D. carota seed in triton X-100 induced oxidative stress. The fractions were obtained by partitioning aqueous extract of the seed in ethyl acetate. Oxidative stress was induced by intraperitoneal injection of triton X-100, after oral administration of the fractions in mice. The results revealed the presence of alkaloids, tannins and phenolics in AQF and EAF. AQF and EAF demonstrated significant in vitro antioxidant activities comparable to butylated hydroxytolune (BHT) with IC50 values of 0.30, 0.38 and 0.92 mg/ml respectively for DPPH scavenging activities. Induction of oxidative stress by triton X-100 caused increased malondialdehyde concentration in plasma and liver of experimental mice, which was significantly decreased ($p<0.05$) in the plasma of mice pre-administered with AQF and EAF. No significant change ($p>0.05$) was observed in the nitric oxide level in mice treated with AQF and EAF compared with triton X-100 control. The fractions caused a significant decrease ($p<0.05$) in plasma activities of glutathione (GSH), superoxide dismutase (SOD) and catalase (CAT) but no significant alteration ($p>0.05$) in plasma glutathione peroxidase (GPx) and glutathione-S-transferase (GST). The pre-administration also resulted in decreased SOD and increased GPx ($p<0.05$) in the liver, but no significant alteration ($p>0.05$) in liver GST activity and GSH concentration. The results revealed that AQF and EAF of D. carrot seed possesses phytochemicals, which could be responsible for the enhancement of antioxidant defense system in vivo and alleviation of triton X-100 induced oxidative stress." As taken from Tijjani H et al. .2020a. Scientific African 8, e00429

Daucus carota (carrot) seed is used medicinally in the treatment and management of diabetes " mellitus, in which oxidative stress and hyperlipidemia are associated complications. The study evaluated the antioxidant and antihyperlipidemic effects of aqueous seed extract of D. carota aqueous extract (AQEDCS) in triton ×100-induced hyperlipidemic mice. The in vitro antioxidant activities of the extract (0.2–1.0 mg/ml) were evaluated using total antioxidant capacity, 2,2-diphenyl-1-picrylhydrazyl, nitric oxide, and ferric ion scavenging. In vivo antioxidant and antihyperlipidemic properties of AQEDCS extract were evaluated using triton ×100-induced oxidative stress and hyperlipidemia in mice. AQEDCS contains alkaloids, tannins, phenols, and produced significant antioxidant effects in vitro compared to Vitamin C. AQEDCS significantly ($P < 0.05$) decreased levels of plasma cholesterol, triacylglycerol, low-density lipoprotein, coronary artery, cardiac, and atherogenic indices and increased circulating high-density lipoprotein levels when compared to untreated hyperlipidemic mice. AQEDCS significantly ($P < 0.05$) decreased the level of malondialdehyde compared to untreated hyperlipidemic mice. AQEDCS and simvastatin decreased ($P < 0.05$) reduced glutathione concentration in plasma, with no difference ($P > 0.05$) in the liver of mice compared to untreated hyperlipidemic mice. Similarly, no significant difference ($P > 0.05$) was observed in plasma nitrite levels, superoxide dismutase, and glutathione S-transferase except in AQEDCS mice that received 100 mg/kg body weight dose of AQEDCS extract when compared with non-induced control. The results indicated that AQEDCS possesses antioxidant and antihyperlipidemic effects, and could complement antioxidant defense system in vivo during oxidative stress as well as prevent further complications that could arise from hyperlipidemia during its usage for diabetes mellitus treatments." As taken from Tijjani H et al. 2020b. J. App. Biol. .Biotech. 8(1), 76-83

6. Functional effects on

6.1. Broncho/pulmonary system

The essential oil of Daucus carota subsp. carota from Portugal, with high amounts of geranyl “ acetate (29.0%), α-pinene (27.2%), and 11αH-himachal-4-en-1β-ol (9.2%), was assessed for its

biological potential. The antimicrobial activity was evaluated against several Gram-positive and Gram-negative bacteria, yeasts, dermatophytes, and Aspergillus strains. The minimal inhibitory concentration (MIC) and minimal lethal concentration (MLC) were evaluated showing a significant activity towards Gram-positive bacteria (MIC = 0.32-0.64 µL/mL), Cryptococcus neoformans (0.16 µL/mL), and dermatophytes (0.32-0.64 µL/mL). The inhibition of the germ tube formation and the effect of the oil on Candida albicans biofilms were also unveiled. The oil inhibited more than 50% of filamentation at concentrations as low as 0.04 µL/mL (MIC/128) and decreased both biofilm mass and cell viability. The antioxidant capacity of the oil, as assessed by two in chemico methods, was not relevant. Still, it seems to exhibit some anti-inflammatory potential by decreasing nitric oxide production around 20% in LPS-stimulated macrophages, without decreasing macrophages viability. Moreover, the oils safety profile was assessed on keratinocytes, alveolar epithelial cells, macrophages, and hepatocytes. Overall, the oil demonstrated a safety profile at concentrations below 0.64 µL/mL. The present work highlights the bioactive potential of D. carota subsp. carota suggesting its industrial exploitation." As taken from Alves-Silva JM et al. 2016. Evid. Based Complement. Alternat. Med. 2016, 9045196. Pubmed, 2016

6.2. Cardiovascular system

BACKGROUND: High prevalence of obesity and cardiovascular disease is attributable to sedentary lifestyle and eating diets high in fat and refined carbohydrate while eating diets low in fruit and vegetables. Epidemiological studies have confirmed a strong association between eating diets rich in fruits and vegetables and cardiovascular health. The aim of this pilot study was to determine whether drinking fresh carrot juice influences antioxidant status and cardiovascular risk markers in .subjects not modifying their eating habits

METHODS: An experiment was conducted to evaluate the effects of consuming 16 fl oz of daily freshly squeezed carrot juice for three months on cardiovascular risk markers, C-reactive protein, insulin, leptin, interleukin-1α, body fat percentage, body mass index (BMI), blood pressure, antioxidant status, and malondialdehyde production. Fasting blood samples were collected pre-test and 90 days afterward to conclude the study. RESULTS: Drinking carrot juice did not affect ($P > 0.1$) the plasma cholesterol, triglycerides, Apo A, Apo B, LDL, HDL, body fat percentage, insulin, leptin, interleukin-1α, or C-reactive protein. Drinking carrot juice decreased ($P = 0.06$) systolic pressure, but did not influence diastolic pressure. Drinking carrot juice significantly ($P<0.05$) increased the plasma total antioxidant capacity and decreased ($P<0.05$) the plasma Drinking carrot juice may protect the cardiovascular :malondialdehyde production. CONCLUSION system by increasing total antioxidant status and by decreasing lipid peroxidation independent of .any of the cardiovascular risk markers measured in the study (Potter et al. 2011) Carrot seed oil has been reported to exhibit vasodilatory and smooth-muscle relaxant activities on isolated animal organs. It also depressed cardiac action in frog and dog hearts, among other .activities (Yeung & Foster, 2003)

"Black carrot (Daucus carota L. ssp. sativus var. atrorubens Alef.) is a valuable source of carbohydrates, minerals and vitamins and contains also high amounts of anthocyanins giving the characteristic deep-purple color. These latter compounds are known as natural dyes used in the food and pharmaceutical industry that have recently attracted much attention for their healthful properties. The aim of this work was to investigate for the first time the polyphenolic profile and biological properties of a black carrot crude extract (BCCE) through an in-depth analysis of the main polyphenolic classes evaluating its antioxidant, cytoprotective and anti-angiogenic properties. Twenty five polyphenols were quantified by LC-DAD-FLD-MS/MS analysis (anthocyanins 78.06%, phenolic acids 17.89% and other flavonoids 4.06%) with polyglycosylated cyanidins as major

components. In addition, BCCE showed a strong antioxidant and free radical scavenging activity particularly in the hydrogen transfer-based assays (ORAC and β-carotene bleaching) and a significant increase in the cell viability. Furthermore, BCCE exhibited a strong anti-angiogenic activity at the highest concentration assayed on the chick chorioallantoic membrane (50μg/egg). In conclusion, the obtained results demonstrated the antioxidant, cytoprotective and anti-angiogenic properties of BCCE, which highlight that the higher biological activity of BCCE is probably due to the synergic effects exerted by various polyphenolic classes." As Taken from Smeriglio A et al. 2018. Fitoterapia 124, 49-57. PubMed, 2018 "Carrots are a good source of essential nutrients and bioactive phytochemicals including carotenoids, phenolic compounds and polyacetylenes such as falcarinol. In this study, we investigated the inhibitory effect of a carrot extract on blood platelet aggregation in vitro and the effect of raw diced or juiced carrots on platelet aggregation in a human study. Carrot extract significantly reduced the platelet aggregation in vitro in blood obtained from healthy donors. In a randomised crossover human study, healthy volunteers consumed either 100 g of freshly diced carrots or 100 mL of freshly juiced carrots (with pulp). There was no significant effect on blood platelet aggregation in the participants at 2, 5, 8 and 24 h after the carrot meal due to wide interindividual variations. Further research is required to understand diet, genetics and lifestyle factors that may impact the physiological effects of falcarinol on platelet aggregation and blood flow." As taken from Herath TD et al. 2020. International Journal of Food Science and Technology 56(4), 1829-1836.

6.3. Nervous system

Dysmenorrhea is pain during menstruation, usually with felt cramp and concentrated in the lower " abdomen. Pain complaints from mild to severe. Based on the causes, dysmenorrhea was divided into two, namely primary and secondary dysmenorrhea. The method to treat dysmenorrhea was used painkillers, take a rest, take a deep breath, calm down, exercise lightly, eat vegetables and fruits, compress the pain parts with hot water. One of nonfarmacology method is use carrot juice. The purpose of this research is to find out carrot juice can reduce primary dysmenorrhea pain on adolescent girls in dorm Poltekkes Kemenkes Pontianak. This research was used the quasy experiment method with a pre and post test without control approach. The sampling technique was used purposive sampling. Data collections conduct from May to June 2019 used the NRS questionnaire, Sheet Procedure for Giving Carrot Juice. Data was analyzed by Wilcoxon test. The research results showed that before be given carrot juice, the middle value of primary dysmenorrhea pain was 6.00. After be given carrot juice, the middle value of primary dysmenorrhea pain was 2.00, which means there is a difference in pain around 4.00 and a value of p = 0,000 (p. 0.05). The conclusion is there are differences in the pain of primary dysmenorrhea before and after .Jurnal Kebidanan 10(1), 25-29 .be given carrot juice." As taken from Damayanti DF et al. 2020

Dysmenorrhoea is menstrual pain which is characterized by lower abdominal pain that occurs " before menstruation and during menstruation. Dysmenorrhoea if not treated immediately will affect the mental and physical function of the individual, so it must be treated immediately with pharmacological or non-pharmacological therapy. Non-pharmacological therapy, namely herbal treatments such as carrot juice and red ginger cooking water. Carrots contain beta carotene and vitamin E which can reduce the increased production of prostaglandin hormones. Meanwhile, red ginger contains the chemical gingerol which can block prostaglandins so that it can reduce menstrual pain. The purpose of this study was to determine the difference in the effectiveness of giving carrot juice and red ginger to menstrual pain (dysmenorrhea) in adolescents. Pre-experimental research design of two groups pre test-post test. Data collection tool with pain scale questionnaire. Data analysis was performed univariate with frequency distribution and bivariate with Wilcoxon test with computerized assistance. The sample in this study were 36 respondents who were taken using purposive sampling. The group giving red ginger boiled water was more effective in dealing with menstrual pain in adolescents than giving carrot juice." As taken from Ramayanti ED .et al. 2020. Jurnal Penelitian Perawat Profesional 2(4), 417-424

The carrot is one of the most consumed vegetable species worldwide, and its root is known for its content of anthocyanins, which possess antioxidant and antiinflammatory properties. This study evaluated the neuroprotective effect of purple carrot extract (CAR) in rats on the reserpine (RES)-induced progressive parkinsonism model.

Male rats (6-month-old) received orally the CAR (400 mg/kg) or vehicle and subcutaneously RES (0.01 mg/kg) or vehicle for 28 days (Preventive Phase). From the 29th day, rats received CAR or vehicle daily and RES (0.1 mg/kg) or vehicle every other day (for 23 days, Protective phase). Behavioral tests were conducted throughout the treatment. Upon completion, the animals' brain were processed for tyrosine hydroxylase (TH) immunohistochemical assessment.

Our results showed that the chronic treatment of CAR protected against motor disabilities, reducing the time of catalepsy behavior and decreasing the frequency of oral movements, possibly by preserving TH levels in the Ventral Tegmental Area (VTA) and SNpc.

CAR extract is effective to attenuate motor symptoms in rats associated with increased TH+ levels in the Ventral Tegmental Area (VTA) and SNpc, indicating the potential nutraceutical benefits of CAR extract in a progressive parkinsonism model induced by RES.

As taken from Custódio-Silva AC et. al. Cent Nerv Syst Agents Med Chem. 2024.

6.4. Other organ systems, dependent on the properties of the substance

Carrot juice was administered orally to BALB/c mice immunized intraperitoneally with dinitrophenylated (DNP)-OVA for about 1 month. The titers of DNP-specific IgE, DNP-specific IgG, and the levels of total IgE in mouse sera were determined. The DNP-specific IgE production by mice fed carrot juice was significantly inhibited. On the other hand, the DNP-specific IgG production and the level of total IgE in mice fed carrot juice were not significantly different from those in control mice. We also examined the effect of feeding carrots on immediate-type hypersensitivity. One hour after antigen stimulation, the ears of mice fed carrots swelled less than those of control mice. Furthermore, the rise in serum histamine in the mice fed carrots under active systemic anaphylaxis was lower than in controls. We then examined the pattern of cytokine production by spleen cells from mice followed by restimulation with DNP-OVA in vitro. The spleen cells from the mice fed carrots produced more interferon-gamma than those from the control group. In contrast, the spleen cells from the mice fed carrots produced less interleukin-4 than those from the control group. Furthermore, the interleukin-12 production of the spleen cells from mice fed carrots was also higher than that of the control group. These findings suggest that feeding carrots improves the helper T cell (Th)1/Th2 balance, inhibiting specific IgE production and antigen-induced anaphylactic .response (Akiyama et al. 1999)

“CONTEXT: Daucus carota Linn (Apiaceae), a useful vegetable, is traditionally used in treating kidney and hepatic dysfunctions. OBJECTIVE: To evaluate the protective and curative potential of D. carotaroot extract on renal ischemia reperfusion injury in rats. MATERIALS AND METHODS: Wistar rats were selected with 8 + 8 groups (n = 6). Renal pedicles of rats were occluded for 45 min and allowed for reperfusion period. In protective and curative studies, 14 days prior and 14 days after the induction of ischemia/reperfusion (I/R), rats received petroleum ether extract (PEE 250 and 500 mg/kg), fractional methanol extract (FME 250 and 500 mg/kg) and direct methanol extract (DME 250 and 500 mg/kg) ofDaucus carotaroot, orally, once daily. RESULTS: PEE at a dose of 500 mg/kg significantly (P<0.001) reduced the levels of serum creatinine (0.853-3.090 mg/dl), uric acid (300-3.500.1 mg/dl) and urea (58.26-132.00 mg/dl) compared to disease control. FME at a dose of 500 mg/kg body weight significantly (P<0.001) reduced the levels of serum creatinine (0.960-3.090 mg/dl), uric acid (700-3.500.1 mg/dl) and urea (77.17-132.00 mg/dl) compared to disease control. DME at a dose of 500 mg/kg body weight significantly (P<0.001) reduced the levels of serum creatinine (173-3.090.1 mg/dl), uric acid (2.267-

3.500 mg/dl) and urea (84.75-132.00 mg/dl) compared to disease control. DISCUSSION AND CONCLUSION: Findings demonstrate that postconditioning with the D.carotaroot extract significantly improves kidney function in I/R rats."As taken from Afzal M et al. 2013. Pharm. Biol. 51(7), 856-62. PubMed, 2014

"Carrots (Daucus carota) contain alpha- and beta-carotene. A poultice of raw carrotsapplied to the breast has been used to treat uncomplicated breast engorgement during breastfeeding;]2[]1[however, as with topical cabbage leaves, evidence of efficacy is lacking because engorgement tends to improve over time regardless of treatment.[3] Both beta-carotene and carrot flavor are transmitted into breastmilk. Carrot intake can improve maternal and breastmilk beta-carotene and vitamin A status,]5[]4[but excessive maternal intake ofcarrotscan lead to a harmless, reversible discoloration of the breastfed infant's skin. Exposure to carrot flavor in breastmilk can improve the future acceptance of carrotsby the infant.

The .carrots a week as raw and cooked carrots A nursing mother was eating 2 to 3 pounds of mother's skin was yellow in color, but her sclera were clear. At 2 months of age, her breastfed infant was diagnosed as having jaundice because of a yellow coloration of the skin. Breastfeeding was discontinued and the infant's skin returned to a normal color. The mother continued her diet and examination of the maternal serum found elevated levels of beta-carotene which was probably "]12[.the cause of her infant's skin discoloration

.As taken from LactMed, 2018

BACKGROUND AND AIMS: During the last decade, there has been a growing interest in replacing " synthetic antioxidants by natural ones because they are cheaper and safe. The main aim of this work was to investigate the possible role of carrot, mango, and wheat extracts against carbon tetrachloride (CCl4)-induced oxidative stress and hepatotoxicity. METHODS: Forty albino rats were recruited and divided into 5 groups. Group 1 was fed a basal diet and group 2 was fed a basal diet and CCl4. Groups 3, 4, and 5 were treated with carrot, mango, and wheat extracts, respectively, in addition to a basal diet and CCl4. RESULTS: Hepatocellular toxicity decreased significantly following treatment. Lipid profile and liver enzymes markers decreased remarkably and total protein and high-density lipoprotein (HDL) increased dramatically. The oxidative stress has decreased noticeably through the decrease in Malondialdehyde (MDA). Microscopic examination of the treated rats exhibited a normal histopathological structure. CONCLUSION: These data suggest that carrot, mango, and wheat extracts could be used as nutraceuticals for the prophylaxis and treatment against hepatotoxicity and oxidative stress. This is the first study of its kind that highlights the importance of including such plants in the dairy and food industry for the prevention of hepatocellular toxicity and oxidative stress. ." As taken from Ebeid HM et al. 2015. J. Am. Coll. Nutr. 34(3) 228-31. PubMed, 2016

"CONTEXT: Wild carrot, Daucus carota L. ssp. carota (Apiacae), is widely distributed throughout the world and has various uses in traditional medicine in Lebanon. OBJECTIVE: The present study aimed to fractionate and analyze the chemical composition of the Daucus carota oil extract (DCOE) fractions and to evaluate their antioxidant and hepatoprotective properties in vitro and in vivo. MATERIALS AND METHODS: DCOE was chromatographed on silica gel column to produce four fractions: pentane (F1), 50:50 pentane:diethyl ether (F2), diethyl ether (F3), and 93:7 chloroform: methanol (F4). Qualitative and quantitative analyses of oil fractions were performed by GC-MS and HPLC techniques. The in vitro antioxidant properties were assessed using DPPH, FIC, and ferric-reducing antioxidant power (FRAP) assays. The hepatoprotective property was determined by

examining the levels of serum markers (alanine transaminase (ALT) and aspartate transaminase (AST)) and hepatic antioxidant (superoxide dismutase (SOD), catalase (CAT), and glutathione-S-transferase (GST)) enzymes in CCl4-intoxicated mice pretreated with intraperitoenal 50, 100, or 200 mg/kg b.w. of the oil fractions for 5 d. RESULTS: GCMS analysis of F2 revealed the presence of 2-himachalen-6-ol (61.4%) which is reported for the first time in Daucus carota species. F3 and F4 were rich in phenolics and flavonoids and demonstrated significant DPPH activity (IC50 = 0.29 and 0.38 mg/ml, respectively) and high FRAP values (225.11 and 437.59 µmol FeSO4/g, respectively). The sesquiterpene-rich fraction F1 had the highest FIC ability (IC50 = 0.28 mg/ml). Pretreatment with F1 and F4 reversed the CCl4-induced decrease in SOD, CAT, and GST levels and reduced significantly hepatic damage. DISCUSSION AND CONCLUSION: The current results suggested that wild carrot oil fractions exhibited a unique chemical composition and possessed significant antioxidant activities as well as hepatoprotective effects against CCl4-induced hepatotoxicity." As taken from Shebaby WN et al. 2015. Pharm. Biol. 53(9) 1285-94. PubMed, 2016

The essential oil of Daucus carota subsp. carota from Portugal, with high amounts of geranyl " acetate (29.0%), α-pinene (27.2%), and 11αH-himachal-4-en-1β-ol (9.2%), was assessed for its biological potential. The antimicrobial activity was evaluated against several Gram-positive and Gram-negative bacteria, yeasts, dermatophytes, and Aspergillus strains. The minimal inhibitory concentration (MIC) and minimal lethal concentration (MLC) were evaluated showing a significant activity towards Gram-positive bacteria (MIC = 0.32-0.64 µL/mL), Cryptococcus neoformans (0.16 µL/mL), and dermatophytes (0.32-0.64 µL/mL). The inhibition of the germ tube formation and the effect of the oil on Candida albicans biofilms were also unveiled. The oil inhibited more than 50% of filamentation at concentrations as low as 0.04 µL/mL (MIC/128) and decreased both biofilm mass and cell viability. The antioxidant capacity of the oil, as assessed by two in chemico methods, was not relevant. Still, it seems to exhibit some anti-inflammatory potential by decreasing nitric oxide production around 20% in LPS-stimulated macrophages, without decreasing macrophages viability. Moreover, the oils safety profile was assessed on keratinocytes, alveolar epithelial cells, macrophages, and hepatocytes. Overall, the oil demonstrated a safety profile at concentrations below 0.64 µL/mL. The present work highlights the bioactive potential of D. carota subsp. carota suggesting its industrial exploitation." As taken from Alves-Silva JM et al. 2016. Evid. Based Complement. Alternat. Med. 2016, 9045196. Pubmed, 2016

BACKGROUND: Adipose tissue, an endocrine organ, plays a vital role not only in energy " homeostasis, but also in the development and/or progression of various metabolic diseases, such as insulin resistance, type 2 diabetes and non-alcoholic fatty liver disease (NAFLD), via several factors and mechanisms, including inflammation. This study tested, whether carrot juice administration affected the adipose tissue development and its inflammatory status in a high fructose diet-induced rat model. For this purpose, male weanling Wistar rats were divided into four groups and fed either control or high fructose diet of AIN-93G composition with or without carrot juice ingestion for an 8 week period. RESULTS: Administration of carrot juice did not affect the adiposity and cell size of visceral fat depot; retroperitoneal white adipose tissue (RPWAT), which was corroborated with unaltered expression of genes involved in adipogenic and lipogenic pathways. However, it significantly reduced the high fructose diet-induced elevation of plasma free fatty acid (FFA) ($P \leq 0.05$), macrophage chemoattractant protein 1 (MCP1) ($P \leq 0.01$) and high sensitive C-reactive protein (hsCRP) ($P \leq 0.05$) levels. CONCLUSION: Carrot juice administration attenuated the high fructose diet-induced elevation of levels of circulatory FFA and pro-inflammatory mediators; MCP1 and hsCRP without affecting the adiposity and cell size of visceral fat depot; RPWAT." As taken from Mahesh M et al. 2017. J. Sci Food Agric. 97(5), 1582-1591. PubMed, 2018

The objective of our study was to explore the deleterious effects of diabetes on the visual functions " of the retina and to address whether the administration of vitamin A and carrot root extract (CE) confer retinal protection in hyperglycemic rats via modulation of oxidative stress, biochemical alternations, and retinal neurotransmission. Fifty male Wistar albino rats weighing 180 ± 12.41 g

were randomized into five groups (n = 10): controls, diabetic group (injected with 40 mg/kg dissolved in 0.1 sodium citrate buffer), diabetic group treated with vitamin A (2,500 IU/kg, low dose), diabetic group treated with vitamin (5,000 IU/kg, high dose), and diabetic groups administered CE (200 mg/kg/every other day). Our findings showed that, compared to controls, diabetic rats showed a significant decrease in their retinal thickness, increased apoptotic ganglion cells, and a noticeable degeneration of their synaptic layers. The inner retina displayed increased activity of neovascularization; however, the outer retina exhibited vacuolar degeneration of the photoreceptor cell layer. Our biochemical assessments showed reduced levels of CAT, SOD, and GST along with increased lipid peroxidation. Concurrently, cellular angiogenic and stress markers were significantly elevated associated with increased apoptotic activities as evidenced by increased expressions of annexin-V and PARP. Furthermore, the neurotransmitter content of the retina was altered in diabetic rats compared to controls and diabetic-treated groups. Paradoxically, vitamin A and CE supplementation attenuate these retinal insults in diabetic animals and normalized aforementioned assayed parameters; evidencing that both treatments exerted ameliorative impacts and restored visual functions by diminishing oxidative stress and neuronal degeneration. PRACTICAL APPLICATIONS: Diabetes is a complex disease that involves various physiological perturbations especially visual functions. In our study, we showed that vitamin A and carrot root extract (CE) confer remarkable protection against retinal degeneration in STZ-induced diabetic rats. Our findings showed that the chemical and phytochemical ingredients of the vitamin A and CE substantially attenuated the histopathological changes, oxidative stress, inflammatory reactions, and cellular death in diabetic rats. These favorable changes are attributable to the high content of retinoic acid, carotenoids, and phenolic compounds that effectively regulates the production of visual pigments, increases the antioxidant defense system, and diminishes the pro-inflammatory and apoptotic pathways. Thus, the nutritional values of vitamin A and CE represent promising therapeutic choices to mitigate the retinal-induced diabetic insults." As taken from El-Mansi AA et al. 2021. J. Food Biochem. Epub ahead of print. PubMed, 2021

Urolithiasis is a burgeoning disease that results from pathological biomineralization. :Background" Daucus carota L. is a widely consumed food crop with reported nephroprotective and diuretic activity. Its potential for Ashmari bhedan (destruction of stone/calculi) or treatment of urinary calculi has been explored traditionally. However, no scientific evidence is available to prove its antiurolithiatic efficacy. Moreover, establishing the antiurolithiatic effects of D. carota, an extensively consumed commodity with numerous health benefits, would provide a beneficial dietary measure for the prevention and cure of urolithiasis. Objective: The study aimed at investigating in vivo antiurolithiatic potential of hydroethanolic extract of D. carota roots against calcium oxalate urolithiasis. Materials and methods: Ethylene glycol and ammonium chloride induced hyperoxaluria model of urolithiasis in male Wistar rats was used for the study. Urine and serum parameters and, kidney histopathology was used to determine the antilithic efficacy of D. carota root extract. Results: D. carota extract significantly ameliorated abnormal urinary levels of calcium, oxalate, phosphate, magnesium, citrate, protein and uric acid in lithogenic rats. Serum BUN, creatinine and uric acid levels; and calcium, phosphate and oxalate deposition in kidney tissue were also rendered normal following D. carota treatment. D. carota extract also prevented oxidative stress mediated renal tissue degeneration both prophylactically and curatively. Conclusion: This study suggests antiurolithiatic effect of D. carota roots, which can be attributed to its anticrystallization property, ability to ameliorate urine and serum biochemistry and renal cellularity." As taken from Bawari S et al. 2020. J. Ayurveda Integr. Med. 11(3), 308-315. PubMed, 2021 ***7. Addiction***

7. Addiction

.JTI is not aware of any information that demonstrates that this ingredient has any addictive effect

8. Burnt ingredient toxicity

Tobacco smoke condensates from cigarettes containing carrot juice and an additive free, reference cigarettes were tested in a battery of in vitro and/or in vivo test(s). Within the sensitivity and specificity of the bioassay(s) the activity of the condensate was not changed by the addition of .carrot juice. Table below provides tested level(s) and specific endpoint(s)

Endpoint	Tested level (ppm)	Reference
Smoke chemistry	1,000	JTI KB Study Report(s)
	6,620	& Gaworski et al., 2011 Coggins et al., 2011b
	5	Carmines et al., 2002 & Rustemeier et al., 2002
In vitro genotoxicity	1,000 500	JTI KB Study Report(s)
	5	Carmines et al., 2002 & Röemer et al., 2002
	6,620	& Gaworski et al., 2011 Coggins et al., 2011b
In vitro cytotoxicity	1,000 500	JTI KB Study Report(s)
	6,620	& Gaworski et al., 2011 Coggins et al., 2011b
	5	Carmines et al., 2002 & Röemer et al., 2002
Inhalation study	1,000 500	JTI KB Study Report(s)
	5	Carmines et al., 2002 et al & Vanscheeuwijck et al., 2002
Skin painting	500	JTI KB Study Report(s)

9. Heated/vapor emissions toxicity

9. Heated/vapor emissions toxicity

Aerosol from heated tobacco stick(s) containing Carrot juice, extract, seed oil was tested in aerosol of in vitro test(s). Under the test conditions and within the sensitivity and chemistry and a battery and/or gas vapor specificity of the bioassay(s), the activity of the total particulate matter (TPM) phase (GVP) were not increased by the addition of this ingredient when compared to TPM and/or GVP from reference combustible cigarettes. The table below provides the highest tested level(s) :and specific endpoint(s)

Endpoint	Tested level (mg/stick)	Reference
Aerosol chemistry	0.0116	Labstat International Inc. (2021a) Labstat International Inc. (2023a) JTI Heated Tobacco Stick Study Report(s)

In vitro genotoxicity	0.0116	Labstat International Inc. (2021b) Labstat International Inc. (2023b) JTI Heated Tobacco Stick Study Report(s)
In vitro cytotoxicity	0.0116	Labstat International Inc. (2021b) Labstat International Inc. (2023b) JTI Heated Tobacco Stick Study Report(s)

10. Ecotoxicity

10.1. Environmental fate

:EPISuite provides the following data for CAS RN 8015-88-1

Henrys Law Constant (25 deg C) [HENRYWIN v3.20]:

: Bond Method	2.87E-005 atm-m3/mole (2.91E+000 Pa-m3/mole)
:Group Method	2.94E-006 atm-m3/mole (2.98E-001 Pa-m3/mole)
Henrys LC [via VP/WSol estimate using User-Entered or :Estimated values]	HLC: 9.390E-006 atm-m3/mole (9.514E-001 Pa-m3/mole) VP: 0.000273 mm Hg (source: MPBPVP) WS: 8.51 mg/L (source: WSKOWWIN)

Log Octanol-Air Partition Coefficient (25 deg C) [KOAWIN v1.10]:

:Log Kow used	)KowWin est(4.81
:Log Kaw used	)HenryWin est(2.931-
:Log Koa (KOAWIN v1.10 estimate)	7.741
:Log Koa (experimental database)	None

Probability of Rapid Biodegradation (BIOWIN v4.10):

Biowin3 (Ultimate : Biowin2 (Non-Linear Model) :Biowin1 (Linear Model) Biowin5 (MITI Linear : Biowin4 (Primary Survey Model) :Survey Model) Biowin7 (Anaerobic Linear :Biowin6 (MITI Non-Linear Model) : Model) :Model)	2.2835 0.0267 0.2738 3.2200)weeks-months(- 0.1154 0.2541)weeks(0.9507
:Ready Biodegradability Prediction	NO

Hydrocarbon Biodegradation (BioHCwin v1.01):

!Structure incompatible with current estimation method

Sorption to aerosols (25 Dec C)[AEROWIN v1.00]:

:Vapor pressure (liquid/subcooled)	Pa (0.000273 mm 0.0364 Hg)
:Log Koa (Koawin est)	7.741
Octanol/air (Koa) :Mackay model :Kp (particle/gas partition coef. (m3/ug)) :model	1.35E-005 8.24E-005

:Fraction sorbed to airborne particulates (phi)

:Junge-Pankow model	0.00297
:Mackay model	0.00655
:Octanol/air (Koa) model	0.00108

Atmospheric Oxidation (25 deg C) [AopWin v1.92]: Hydroxyl Radicals Reaction:

= OVERALL OH Rate Constant	E-12 cm3/molecule-sec 105.6739
= Half-Life	Days (12-hr day; 1.5E6 OH/cm3) 0.101
= Half-Life	Hrs 1.215

:Ozone Reaction

= OVERALL OH Rate Constant	E-17 cm3/molecule-sec 43.000000
= Half-Life	Days (at 7E11 mol/cm3) 0.027
= Half-Life	Min 38.378
!Reaction With Nitrate Radicals May Be Important	
)Koa method(0.00108 Fraction sorbed to airborne particulates (phi): 0.00476 (Junge-Pankow, Mackay avg) Note: the sorbed fraction may be resistant to atmospheric oxidation	

Soil Adsorption Coefficient (KOCWIN v2.00):

: Koc	L/kg (MCI method) 1361
:Log Koc	)MCI method(3.134

: Koc	L/kg (Kow method) 1494
:Log Koc	)Kow method(3.174

Aqueous Base/Acid-Catalyzed Hydrolysis (25 deg C) [HYDROWIN v2.00]: Rate constants can NOT be estimated for this structure!
Volatilization from Water: Henry LC: 2.94E-006 atm-m3/mole (estimated by Group SAR Method)

:Half-Life from Model River	hours (12.44 days) 298.5
:Half-Life from Model Lake	hours (140.9 days) 3381

Removal In Wastewater Treatment:

:Total removal	percent 70.81
:Total biodegradation	percent 0.63
:Total sludge adsorption	percent 70.13
:Total to Air	percent 0.04

)using 10000 hr Bio P,A,S(
:Level III Fugacity Model

	)percent(Mass Amount	)hr(Half-Life	)kg/hr(Emissions
Air	0.0235	0.506	1000
Water	17.9	900	1000
Soil	80.7	1.8e+003	1000
Sediment	1.36	8.1e+003	0

Persistence Time: 1.05e+003 hr

The Ecological Categorization Results from the Canadian Domestic Substances List simply state .that carrot oils (CAS RN 8015-88-1) are of uncertain persistence in the environment

Data accessed March 2017 on the OECD website

10.2. Aquatic toxicity

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that carrot oils (CAS RN 8015-88-1) are not inherently toxic to aquatic organisms and are of low .ecotoxicological concern

Data accessed March 2017 on the OECD website

:ECOSAR Version 1.11 reports the following aquatic toxicity data for CAS RN 8015-88-1

Values used to Generate ECOSAR Profile

Log Kow: 4.806 (EPISuite Kowwin v1.68 Estimate) Wat Sol: 14.19 (mg/L, EPISuite WSKowwin v1.43 Estimate)

ECOSAR v1.11 Class-specific Estimations

Neutral Organics

ECOSAR Class	Organism	Duration	End Pt	mg/L (ppm) Predicted
: Neutral Organics	Fish	hr-96	LC50	0.551
: Neutral Organics	Daphnid	hr-48	LC50	0.406
: Neutral Organics	Green Algae	hr-96	EC50	0.882
: Neutral Organics	Fish		ChV	0.073
: Neutral Organics	Daphnid		ChV	0.081
: Neutral Organics	Green Algae		ChV	0.411
: Neutral Organics	Fish (SW)	hr-96	LC50	0.706
: Neutral Organics	Mysid	hr-96	LC50	0.078
: Neutral Organics	Fish (SW)		ChV	0.425
: Neutral Organics	Mysid (SW)		ChV	0.003

10.3. Sediment toxicity

.No data available to us at this time

10.4. Terrestrial toxicity

:Record for carrot oils (CAS RN 8015-88-1)

Spec. Sci. Name Spec. Common Name	Resp. Site Exp. Dur. (Days)	Media Type Test .Loc	Exp. Type Chem. .Anal	# Dose Res. Sample Unit	Endpoint BAF/BCF	Effect Effect .Meas	.Signif Sig. Level	Dose Dose Stat. .Meth
Listronotus oregonensis Carrot Weevil	2	NONE LAB	SP U	2	NR-ZERO	MOR MORT		A 10 % v/v

.As taken from the EPA ECOTOX database

:ECOSAR Version 1.11 reports the following terrestrial toxicity data for CAS RN 8015-88-1

Values used to Generate ECOSAR Profile

Log Kow: 4.806 (EPISuite Kowwin v1.68 Estimate) Wat Sol: 14.19 (mg/L, EPISuite WSKowwin v1.43 Estimate)

ECOSAR v1.11 Class-specific Estimations

Neutral Organics

ECOSAR Class	Organism	Duration	End Pt	Predicted mg/L (ppm)
: Neutral Organics	Earthworm	day-14	LC50	* 197.830

Note: * = asterisk designates: Chemical may not be soluble enough to measure this predicted effect. If the effect level exceeds the water solubility by 10X, typically no effects at saturation (NES) .are reported

10.5. All other relevant types of ecotoxicity

:EPISuite provides the following data for CAS RN 8015-88-1

Bioaccumulation Estimates (BCFBAF v3.01):

:Log BCF from regression-based method	)BCF = 688.8 L/kg wet-wt(2.838
:Log Biotransformation Half-life (HL)	days (HL = 6.346 days) 0.8025
:Log BCF Arnot-Gobas method (upper trophic)	)BCF = 1809(3.257
:Log BAF Arnot-Gobas method (upper trophic)	)BAF = 2012(3.304
:log Kow used	)estimated(4.81

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that carrot oils (8015-88-1) are of uncertain bioaccumulative potential in the environment.

Data accessed March 2017 on the OECD website

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12. Other information

EPISuite provides the following data for CAS RN 8015-88-1:

Bioaccumulation Estimates (BCFBAF v3.01):

Log BCF from regression-based method:	2.838 (BCF = 688.8 L/kg wet-wt)
Log Biotransformation Half-life (HL):	0.8025 days (HL = 6.346 days)
Log BCF Arnot-Gobas method (upper trophic):	3.257 (BCF = 1809)
Log BAF Arnot-Gobas method (upper trophic):	3.304 (BAF = 2012)
log Kow used:	4.81 (estimated)

The Ecological Categorization Results from the Canadian Domestic Substances List simply state that carrot oils (8015-88-1) are of uncertain bioaccumulative potential in the environment.

Data accessed March 2017 on the OECD website: http://webnet.oecd.org/CCRWeb/Search.aspx

13. Last audited

March 2025

EO Carrot seed

Safety Data Sheet

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Issue date: 8/3/2023 Revision date: 5/7/2024 Supersedes version of: 8/3/2023 Version: 2.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance (UVCB)
Substance name	:	EO Carrot seed
IUPAC name	:	Carrot, ext.
EC-No.	:	284-545-1
CAS-No.	:	84929-61-3
Product code	:	20145
Product group	:	Trade product

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Intended for general public

Main use category	:	Professional use,Consumer use
Use of the substance/mixture	:	Fragrance raw material

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

De Hekserij
Spoorstraat 57
8271 RG IJsselmuiden
Nederland
www.hekserij.nl

1.4. Emergency telephone number

No additional information available

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Skin corrosion/irritation, Category 2	H315
Serious eye damage/eye irritation, Category 1	H318
Skin sensitisation, Category 1	H317
Aspiration hazard, Category 1	H304
Hazardous to the aquatic environment – Chronic Hazard, Category 3	H412

Full text of H- and EUH-statements: see section 16

Adverse physicochemical, human health and environmental effects

Causes skin irritation. May cause an allergic skin reaction. Causes serious eye damage. May be fatal if swallowed and enters airways. Harmful to aquatic life with long lasting effects.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS05 GHS07 GHS08

Signal word (CLP) : Danger

Hazard statements (CLP) : H304 - May be fatal if swallowed and enters airways.
H315 - Causes skin irritation.
H317 - May cause an allergic skin reaction.
H318 - Causes serious eye damage.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements (CLP) : P261 - Avoid breathing dust, fume, gas, mist, spray, vapours.
P264 - Wash hands thoroughly after handling.
P272 - Contaminated work clothing should not be allowed out of the workplace.
P273 - Avoid release to the environment.
P280 - Wear protective gloves.
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER, a doctor.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331 - Do NOT induce vomiting.
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P405 - Store locked up.
P501 - Dispose of contents and container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

2.3. Other hazards

Contains no PBT and/or vPvB substances ≥ 0.1% assessed in accordance with REACH Annex XIII

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : UVCB
Name : EO Carrot seed
CAS-No. : 84929-61-3
EC-No. : 284-545-1

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
EO Carrot seed	CAS-No.: 84929-61-3 EC-No.: 284-545-1	100	See section 2.1
Sabinene	CAS-No.: 3387-41-5 EC-No.: 222-212-4	5.001 – 10	Acute Tox. 4 (Oral), H302
Caryophyllene beta	CAS-No.: 87-44-5 EC-No.: 201-746-1	5.001 – 10	Skin Sens. 1B, H317 Asp. Tox. 1, H304 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Caryophyllene oxide	CAS-No.: 1139-30-6 EC-No.: 214-519-7	5.001 – 10	Aquatic Chronic 2, H411
l-.beta.-Bisabolene	CAS-No.: 495-61-4 EC-No.: 610-461-5	5.001 – 10	Skin Irrit. 2, H315 Skin Sens. 1, H317 Asp. Tox. 1, H304
Geranyl acetate	CAS-No.: 105-87-3 EC-No.: 203-341-5 REACH-no: 01-2119973480-35	1.001 – 5	Skin Irrit. 2, H315 Skin Sens. 1B, H317 Aquatic Chronic 3, H412
Geraniol	CAS-No.: 106-24-1 EC-No.: 203-377-1 REACH-no: 01-2119552430-49	1.001 – 5	Skin Irrit. 2, H315 Eye Dam. 1, H318 Skin Sens. 1, H317

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Pinene alpha	CAS-No.: 80-56-8 EC-No.: 201-291-9	1.001 – 5	Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Skin Sens. 1B, H317 Asp. Tox. 1, H304
Pinene beta	CAS-No.: 127-91-3 EC-No.: 204-872-5	1.001 – 5	Flam. Liq. 3, H226 Skin Irrit. 2, H315 Skin Sens. 1B, H317 Asp. Tox. 1, H304
Limonene D- (nat)	CAS-No.: 5989-27-5 EC-No.: 227-813-5 EC Index-No.: 601-096-00-2	1.001 – 5	Flam. Liq. 3, H226 Skin Irrit. 2, H315 Skin Sens. 1B, H317 Asp. Tox. 1, H304 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Camphene	CAS-No.: 79-92-5 EC-No.: 201-234-8	1.001 – 5	Flam. Sol. 1, H228 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Linalool	CAS-No.: 78-70-6 EC-No.: 201-134-4 EC Index-No.: 603-235-00-2 REACH-no: 01-2119474016-42	0.101 – 1	Skin Irrit. 2, H315 Eye Irrit. 2, H319 Skin Sens. 1B, H317
p-Cymene	CAS-No.: 99-87-6 EC-No.: 202-796-7 EC Index-No.: 601-094-00-1	0.101 – 1	Flam. Liq. 3, H226 Acute Tox. 3 (Inhalation), H331 Asp. Tox. 1, H304 Aquatic Chronic 2, H411
Methyl eugenol	CAS-No.: 93-15-2 EC-No.: 202-233-0	0.101 – 1	Acute Tox. 4 (Oral), H302 Muta. 2, H341 Carc. 2, H351

Full text of H- and EUH-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Call a physician immediately.
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing.
First-aid measures after skin contact : Wash skin with plenty of water. Take off contaminated clothing. If skin irritation or rash occurs: Get medical advice/attention.
First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician immediately.
First-aid measures after ingestion : Do not induce vomiting. Call a physician immediately.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects after inhalation : Although no appropriate human or animal health effects data are known to exist, this material is expected to be an inhalation hazard.
Symptoms/effects after skin contact : Irritation. May cause an allergic skin reaction.
Symptoms/effects after eye contact : Serious damage to eyes.
Symptoms/effects after ingestion : Risk of lung oedema.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray. Dry powder. Foam. Carbon dioxide.
Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard : No fire hazard.
Explosion hazard : No direct explosion hazard.
Hazardous decomposition products in case of fire : Toxic fumes may be released.

5.3. Advice for firefighters

Firefighting instructions : Fight fire from safe distance and protected location. Do not enter fire area without proper protective equipment, including respiratory protection.
Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Stop leak if safe to do so. Notify authorities if product enters sewers or public waters. Absorb spillage to prevent material damage.

6.1.1. For non-emergency personnel

Protective equipment : Wear recommended personal protective equipment.
Emergency procedures : Ventilate spillage area. Avoid contact with skin and eyes. Avoid breathing dust/fume/gas/mist/vapours/spray.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".
Emergency procedures : Evacuate unnecessary personnel. Stop leak if safe to do so.

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment : Absorb spilled material with sand or earth. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Stop leak without risks if possible.
Methods for cleaning up : Take up liquid spill into absorbent material.
Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Not expected to present a significant hazard under anticipated conditions of normal use.
Precautions for safe handling : Ensure good ventilation of the work station. Avoid contact with skin and eyes. Wear personal protective equipment. Avoid breathing dust/fume/gas/mist/vapours/spray.

Hygiene measures : Wash contaminated clothing before reuse. Contaminated work clothing should not be allowed out of the workplace. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Keep in a cool, well-ventilated place away from heat.
Storage conditions : Store locked up.
Packaging materials : Store always product in container of same material as original container.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 National occupational exposure and biological limit values

No additional information available

8.1.2. Recommended monitoring procedures

No additional information available

8.1.3. Air contaminants formed

No additional information available

8.1.4. DNEL and PNEC

No additional information available

8.1.5. Control banding

No additional information available

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Appropriate engineering controls:
Ensure good ventilation of the work station.

8.2.2. Personal protection equipment

Personal protective equipment:
Wear recommended personal protective equipment.

Personal protective equipment symbol(s):

8.2.2.1. Eye and face protection

Eye protection:
Safety glasses

8.2.2.2. Skin protection

Skin and body protection:
Wear suitable protective clothing

Hand protection:
Protective gloves

8.2.2.3. Respiratory protection

Respiratory protection:
In case of insufficient ventilation, wear suitable respiratory equipment

8.2.2.4. Thermal hazards

No additional information available

8.2.3. Environmental exposure controls

Environmental exposure controls:
Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Colour	:	Not available
Odour	:	Not available
Odour threshold	:	Not available
Melting point	:	< -20 °C Decomposition: 'no'
Freezing point	:	Not available
Boiling point	:	≈ 223.7 °C Atm. press.: 101325 Pa Decomposition: 'no'
Flammability	:	Non flammable.
Lower explosion limit	:	Not available
Upper explosion limit	:	Not available
Flash point	:	≈ 72 °C Atm. press.: 101325 Pa
Auto-ignition temperature	:	Not available
Decomposition temperature	:	Not available
pH	:	Not available
Viscosity, kinematic	:	Not available
Solubility	:	Not available
Partition coefficient n-octanol/water (Log Kow)	:	Not available
Vapour pressure	:	9.41 mbar Temp.: 25 °C
Vapour pressure at 50°C	:	Not available
Density	:	Not available
Relative density	:	Not available
Relative vapour density at 20°C	:	Not available
Particle characteristics	:	Not applicable

9.2. Other information

9.2.1. Information with regard to physical hazard classes

No additional information available

9.2.2. Other safety characteristics

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

The product is non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

EO Carrot seed (84929-61-3)	
LD50 oral	> 5000 mg/kg bodyweight Animal: mouse, Guideline: OECD Guideline 401 (Acute Oral Toxicity)

Sabinene (3387-41-5)	
LD50 oral rat	300 – 2000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 423 (Acute Oral toxicity - Acute Toxic Class Method)

Caryophyllene beta (87-44-5)	
LD50 oral	> 5000 mg/kg bodyweight Animal: mouse, Animal sex: male, Remarks on results: not determinable due to absence of adverse toxic effects

l-.beta.-Bisabolene (495-61-4)	
LD50 oral rat	> 5000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity)

Geranyl acetate (105-87-3)	
LD50 oral rat	6330 mg/kg bodyweight Animal: rat, 95% CL: 5450 - 7340
LD50 dermal rabbit	> 2000 mg/kg

Geraniol (106-24-1)	
LD50 oral rat	3600 mg/kg bodyweight Animal: rat, 95% CL: 2840 - 4570
LD50 dermal rabbit	> 5000 mg/kg bodyweight Animal: rabbit

Pinene alpha (80-56-8)	
LD50 dermal rat	> 2000 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 402 (Acute Dermal Toxicity), Guideline: EU Method B.3 (Acute Toxicity (Dermal))

Limonene D- (nat) (5989-27-5)	
LD50 oral rat	> 2000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 423 (Acute Oral toxicity - Acute Toxic Class Method)

Camphene (79-92-5)	
LD50 dermal rabbit	> 2000 mg/kg bodyweight Animal: rabbit

Linalool (78-70-6)	
LD50 oral rat	2790 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 401 (Acute Oral Toxicity), Remarks on results: other:, 95% CL: 2440 - 3180
LD50 dermal rabbit	5610 mg/kg bodyweight Animal: rabbit, Guideline: OECD Guideline 402 (Acute Dermal Toxicity), 95% CL: 3578 - 8374

p-Cymene (99-87-6)	
LD50 dermal rabbit	> 5000 mg/kg bodyweight Animal: rabbit, Guideline: other:

Methyl eugenol (93-15-2)	
LD50 oral rat	2500 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 423 (Acute Oral toxicity - Acute Toxic Class Method)
LD50 dermal rat	> 2000 mg/kg bodyweight Animal: rat, Animal sex: female, Guideline: OECD Guideline 402 (Acute Dermal Toxicity)

Skin corrosion/irritation : Causes skin irritation.
Serious eye damage/irritation : Causes serious eye damage.
Respiratory or skin sensitisation : May cause an allergic skin reaction.
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified

Geraniol (106-24-1)	
NOAEL (chronic, oral, animal/male, 2 years)	60 mg/kg bodyweight Animal: mouse, Animal sex: male, Guideline: OECD Guideline 453 (Combined Chronic Toxicity / Carcinogenicity Studies)

Reproductive toxicity : Not classified
STOT-single exposure : Not classified
STOT-repeated exposure : Not classified

Geranyl acetate (105-87-3)	
NOAEL (oral, rat, 90 days)	2000 mg/kg bodyweight Animal: rat, Guideline: other:

Geraniol (106-24-1)	
NOAEL (dermal, rat/rabbit, 90 days)	300 mg/kg bodyweight Animal: rat, Guideline: other:, Guideline: other:

Linalool (78-70-6)	
NOAEL (dermal, rat/rabbit, 90 days)	250 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 411 (Subchronic Dermal Toxicity: 90-Day Study)

Methyl eugenol (93-15-2)	
NOAEL (oral, rat, 90 days)	> 300 mg/kg bodyweight Animal: rat, Guideline: OECD Guideline 422 (Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test)

Aspiration hazard : May be fatal if swallowed and enters airways.

Linalool (78-70-6)	
Viscosity, kinematic	5191.86 mm²/s

11.2. Information on other hazards

No additional information available

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Harmful to aquatic life with long lasting effects.
Hazardous to the aquatic environment, short–term (acute) : Not classified
Hazardous to the aquatic environment, long–term (chronic) : Harmful to aquatic life with long lasting effects.

Sabinene (3387-41-5)	
EC50 - Crustacea [1]	≈ 3960 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	> 1000 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)

Caryophyllene beta (87-44-5)	
EC50 - Crustacea [1]	> 0.17 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	> 0.033 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
l-.beta.-Bisabolene (495-61-4)	
EC50 96h - Algae [1]	0.02 mg/l Test organisms (species): other:
Geranyl acetate (105-87-3)	
LC50 - Fish [1]	68.12 mg/l Test organisms (species): Leuciscus idus
EC50 - Crustacea [1]	14.1 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	3.72 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)
ErC50 algae	3.72 mg/l Species: Desmodesmus subspicatus 72 h
Geraniol (106-24-1)	
LC50 - Fish [1]	≈ 22 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio)
EC50 - Crustacea [1]	10.8 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	13.1 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)
ErC50 algae	≈ 13.1 mg/l
NOEC chronic fish	≈ 10 mg/l
NOEC chronic algae	≈ 1 ml/l
Pinene alpha (80-56-8)	
LC50 - Fish [1]	0.303 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio)
EC50 - Crustacea [1]	0.475 mg/l Test organisms (species): Daphnia magna
Limonene D- (nat) (5989-27-5)	
LC50 - Fish [1]	720 µg/l Test organisms (species): Pimephales promelas
LC50 - Fish [2]	702 µg/l Test organisms (species): Pimephales promelas
EC50 - Crustacea [1]	0.307 mg/l Test organisms (species): Daphnia magna
EC50 - Crustacea [2]	0.51 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	0.32 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	0.214 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
Camphene (79-92-5)	
LC50 - Fish [1]	0.72 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio)
EC50 - Crustacea [1]	0.72 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	1.75 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
Linalool (78-70-6)	
LC50 - Fish [1]	27.8 mg/l Test organisms (species): Oncorhynchus mykiss (previous name: Salmo gairdneri)
EC50 - Crustacea [1]	59 mg/l Test organisms (species): Daphnia magna

Linalool (78-70-6)	
EC50 96h - Algae [1]	88.3 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)
EC50 96h - Algae [2]	156.7 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)

p-Cymene (99-87-6)	
LC50 - Fish [1]	48 mg/l Test organisms (species): Cyprinodon variegatus
EC50 - Crustacea [1]	3.7 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	4.03 mg/l Test organisms (species): Scenedesmus capricornutum
EC50 72h - Algae [2]	2.01 mg/l Test organisms (species): Scenedesmus capricornutum

Methyl eugenol (93-15-2)	
EC50 - Crustacea [1]	≈ 38 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	≈ 22 mg/l Test organisms (species): Raphidocelis subcapitata (previous names: Pseudokirchneriella subcapitata, Selenastrum capricornutum)
EC50 72h - Algae [2]	9.6 mg/l Test organisms (species): Raphidocelis subcapitata (previous names: Pseudokirchneriella subcapitata, Selenastrum capricornutum)
EC50 96h - Algae [1]	8.3 mg/l Test organisms (species): Raphidocelis subcapitata (previous names: Pseudokirchneriella subcapitata, Selenastrum capricornutum)
EC50 96h - Algae [2]	11.972 mg/l Test organisms (species):

12.2. Persistence and degradability

EO Carrot seed (84929-61-3)	
Persistence and degradability	Not rapidly degradable

Sabinene (3387-41-5)	
Persistence and degradability	Not rapidly degradable

Caryophyllene beta (87-44-5)	
Persistence and degradability	Not rapidly degradable

Caryophyllene oxide (1139-30-6)	
Persistence and degradability	Not rapidly degradable

l-.beta.-Bisabolene (495-61-4)	
Persistence and degradability	Not rapidly degradable

Geranyl acetate (105-87-3)	
Persistence and degradability	Not rapidly degradable

Geraniol (106-24-1)	
Persistence and degradability	Not rapidly degradable

Pinene alpha (80-56-8)	
Persistence and degradability	Not rapidly degradable

Pinene beta (127-91-3)	
Persistence and degradability	Not rapidly degradable

Limonene D- (nat) (5989-27-5)	
Persistence and degradability	Not rapidly degradable

Camphene (79-92-5)	
Persistence and degradability	Not rapidly degradable

Linalool (78-70-6)	
Persistence and degradability	Not rapidly degradable

p-Cymene (99-87-6)	
Persistence and degradability	Not rapidly degradable

Methyl eugenol (93-15-2)	
Persistence and degradability	Not rapidly degradable

12.3. Bioaccumulative potential

Geraniol (106-24-1)	
Partition coefficient n-octanol/water (Log Pow)	≈ 2.6

Linalool (78-70-6)	
Partition coefficient n-octanol/water (Log Pow)	≥ 2.84

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Endocrine disrupting properties

No additional information available

12.7. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Regional waste regulation : Disposal must be done according to official regulations.
Waste treatment methods : Dispose of contents/container in accordance with licensed collector's sorting instructions.
Sewage disposal recommendations : Disposal must be done according to official regulations.
Product/Packaging disposal recommendations : Disposal must be done according to official regulations.
Additional information : Do not re-use empty containers.

SECTION 14: Transport information

In accordance with ADR / IMDG / IATA / ADN / RID

ADR	IMDG	IATA	ADN	RID
14.1. UN number or ID number				
Not regulated for transport				

ADR	IMDG	IATA	ADN	RID
14.2. UN proper shipping name				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.3. Transport hazard class(es)				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.4. Packing group				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
14.5. Environmental hazards				
Not regulated	Not regulated	Not regulated	Not regulated	Not regulated
No supplementary information available				

14.6. Special precautions for user

Overland transport
Not regulated

Transport by sea
Not regulated

Air transport
Not regulated

Inland waterway transport
Not regulated

Rail transport
Not regulated

14.7. Maritime transport in bulk according to IMO instruments

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

REACH Annex XVII (Restriction List)

EU restriction list (REACH Annex XVII)		
Reference code	**Applicable on**	**Entry title or description**
3(a)	Pinene beta ; Limonene D- (nat) ; p-Cymene	Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 2.1 to 2.4, 2.6 and 2.7, 2.8 types A and B, 2.9, 2.10, 2.12, 2.13 categories 1 and 2, 2.14 categories 1 and 2, 2.15 types A to F
3(b)	EO Carrot seed ; Sabinene ; Caryophyllene beta ; l-.beta.-Bisabolene ; Geranyl acetate ; Geraniol ; Pinene alpha ; Pinene beta ; Limonene D- (nat) ; Linalool ; p-Cymene ; Methyl eugenol	Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10

EU restriction list (REACH Annex XVII)		
Reference code	**Applicable on**	**Entry title or description**
3(c)	EO Carrot seed ; Caryophyllene beta ; Caryophyllene oxide ; Geranyl acetate ; Limonene D- (nat) ; p-Cymene	Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard class 4.1
40.	Pinene beta ; Limonene D- (nat) ; Camphene ; p-Cymene	Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not.

REACH Annex XIV (Authorisation List)

Not listed on REACH Annex XIV (Authorisation List)

REACH Candidate List (SVHC)

Not listed on the REACH Candidate List

PIC Regulation (Prior Informed Consent)

Not listed on the PIC list (Regulation EU 649/2012)

POP Regulation (Persistent Organic Pollutants)

Not listed on the POP list (Regulation EU 2019/1021)

Ozone Regulation (1005/2009)

Not listed on the Ozone Depletion list (Regulation EU 1005/2009)

Dual-Use Regulation (428/2009)

Contains no substance subject to the COUNCIL REGULATION (EC) No 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items.

Explosives Precursors Regulation (2019/1148)

Contains no substance(s) listed on the Explosives Precursors list (Regulation EU 2019/1148 on the marketing and use of explosives precursors)

Drug Precursors Regulation (273/2004)

Contains no substance(s) listed on the Drug Precursors list (Regulation EC 273/2004 on the manufacture and the placing on market of certain substances used in the illicit manufacture of narcotic drugs and psychotropic substances)

15.1.2. National regulations

Netherlands

SZW-lijst van kankerverwekkende stoffen	:	EO Carrot seed is listed
SZW-lijst van mutagene stoffen	:	EO Carrot seed is listed
SZW-lijst van reprotoxische stoffen – Borstvoeding	:	The substance is not listed
SZW-lijst van reprotoxische stoffen – Vruchtbaarheid	:	The substance is not listed
SZW-lijst van reprotoxische stoffen – Ontwikkeling	:	The substance is not listed

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Abbreviations and acronyms:	
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road

Abbreviations and acronyms:	
ATE	Acute Toxicity Estimate
BCF	Bioconcentration factor
BLV	Biological limit value
BOD	Biochemical oxygen demand (BOD)
COD	Chemical oxygen demand (COD)
DMEL	Derived Minimal Effect level
DNEL	Derived-No Effect Level
EC-No.	European Community number
EC50	Median effective concentration
EN	European Standard
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
LC50	Median lethal concentration
LD50	Median lethal dose
LOAEL	Lowest Observed Adverse Effect Level
NOAEC	No-Observed Adverse Effect Concentration
NOAEL	No-Observed Adverse Effect Level
NOEC	No-Observed Effect Concentration
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational Exposure Limit
PBT	Persistent Bioaccumulative Toxic
PNEC	Predicted No-Effect Concentration
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SDS	Safety Data Sheet
STP	Sewage treatment plant
ThOD	Theoretical oxygen demand (ThOD)
TLM	Median Tolerance Limit
VOC	Volatile Organic Compounds
CAS-No.	Chemical Abstract Service number
N.O.S.	Not Otherwise Specified
vPvB	Very Persistent and Very Bioaccumulative
ED	Endocrine disrupting properties

Full text of H- and EUH-statements:	
Acute Tox. 3 (Inhalation)	Acute toxicity (inhal.), Category 3
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Aquatic Acute 1	Hazardous to the aquatic environment – Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment – Chronic Hazard, Category 1

Full text of H- and EUH-statements:	
Aquatic Chronic 2	Hazardous to the aquatic environment – Chronic Hazard, Category 2
Aquatic Chronic 3	Hazardous to the aquatic environment – Chronic Hazard, Category 3
Asp. Tox. 1	Aspiration hazard, Category 1
Carc. 2	Carcinogenicity, Category 2
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
Flam. Liq. 3	Flammable liquids, Category 3
Flam. Sol. 1	Flammable solids, Category 1
H226	Flammable liquid and vapour.
H228	Flammable solid.
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H341	Suspected of causing genetic defects.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.
Muta. 2	Germ cell mutagenicity, Category 2
Skin Irrit. 2	Skin corrosion/irritation, Category 2
Skin Sens. 1	Skin sensitisation, Category 1
Skin Sens. 1B	Skin sensitisation, category 1B

Safety Data Sheet (SDS), EU

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.