Citral and related compounds: Human health tier II assessment

28 June 2013

Chemicals in this assessment

Chemical Name in the Inventory	CAS Number
2,6-Octadienal, 3,7-dimethyl-, (Z)-	106-26-3
2,6-Octadienal, 3,7-dimethyl-, (E)-	141-27-5
2,6-Octadienal, 3,7-dimethyl-	5392-40-5

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to

human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:**www.nicnas.gov.au**

Disclaimer

ACRONYMS & ABBREVIATIONS

Grouping Rationale

Citral (CAS No. 5392-40-5) is a mixture of two geometric isomers that are geranial (trans conformation approximately 55–70 %, CAS No. 141-27-5) and neral (cis conformation approximately 35–45 %, CAS No.106-26-3) (OECD, 2004). Citral and its two isomers are listed in AICS separately. Therefore, all three of these chemicals are considered together in this group assessment.

The toxicological information in this assessment refers to the isomeric mixture, citral, unless stated otherwise.

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacture information has been identified for citral or any of its isomers.

International

The following International uses have been identified via European Union Registration, Evaluation and Authorisation of Chemicals (EU REACH) Dossiers, the Organisation for Economic Cooperation and Development Screening information data set International Assessment Report (OECD SIAR), Galleria Chemica, the Substances and Preparations In the Nordic countries (SPIN), the European Commission Cosmetic Ingredients and Substances (CosIng) database, Personal Care Council Website (INCI Dictionary):

The chemical has reported cosmetic use including as a component of perfuming agents.

The maximum pragmatic concentrations recommended by the International Fragrance Association (IFRA) are 5 % in liquid soaps and shampoos and 2.5 % for baby diapers and hand washing (SCCP, 2008).

Citral has reported domestic use including:

- in polishes and wax blends;
- as a component of washing and cleaning products (including solvent based products);
- as a component of disinfectants; and
- in finger paints, scented clothes, erasers and paper articles.

Citral has reported commercial use including:

- in coatings, paints, thinners, and paint removers;
- as a component of inks and toners; and
- in fillers, putties, plasters and modelling clay.

Citral has reported site-limited use including as an intermediate in the synthesis of vitamin A.

The following non-industrial uses have been identified internationally:

- citral, neral and geranial as flavouring substances (EU Commission database of flavouring substances); and
- citral in pest control products.

Restrictions

Australian

No known restrictions have been identified.

International

The following were identified for citral:

- EU Cosmetic Directive 76/768/EEC Annex III Part 1—List of substances which cosmetic products must not contain except subject to the restrictions and conditions laid down: the presence of the substance must be indicated in the list of ingredients referred to in the Article 6(1)g when its concentration exceeds 0.001% in leave-on products and exceeds 0.01% in rinse-off products.

New Zealand Cosmetic Products Group Standard—Schedule 5—Components cosmetic products may contain with restrictions: the presence of the substance must be indicated in the list of ingredients referred to in the Part 2(2A) in Schedule 1 when its concentration exceeds 0.001% in leave-on products and exceeds 0.01% in rinse-off products.

Directive 2009/48/EC of the European Parliament (the 'Toy Directive')—List of allergenic fragrances toys shall not contain: Citral (No. 47).

Existing Worker Health and Safety Controls

Hazard Classification

Citral is classified as hazardous with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

Xi; R38 (irritation)

Xi; R43 (sensitisation)

Exposure Standards

Australian

No specific exposure standards are available.

International

The following are identified (Galleria Chemica):

An exposure limit (TWA) of 5–25 ppm in countries such as Canada, Sweden and USA.

Health Hazard Information

Unless specified, most of the toxicity data provided below are for citral. Considering that citral is a mixture of the two isomers, geranial and neral, toxicity data available for citral are also considered representative of geranial and neral toxicity.

Toxicokinetics

Citral is rapidly absorbed from the gastrointestinal tract. Much of an applied dermal dose of citral was lost due to its extreme volatility, but the chemical remaining on the skin was fairly well absorbed. It was rapidly metabolised and excreted as metabolites, neral and geranial. Urine was the major route of elimination (OECD, 2004).

Analysis of the metabolites has shown that geranial seems to be metabolised more rapidly than neral (Diliberto et al., 1990).

Acute Toxicity

Oral

Based on the data available for citral, all three chemicals in this group are considered to have low acute oral toxicity.

Citral has an LD50 of 6800 mg/kg bw in Sprague Dawley (SD) rats (OECD, 2004; REACH). Clinical signs observed at 3160, 4640, 6810 or 10000 mg/kg bw included apathy, staggering, salivation, and a poor general state.

Another study with female rats established an LD50 of 4950 mg/kg bw (OECD, 2004; REACH).

Dermal

Based on the data available for citral, all three chemicals in this group are considered to have low acute dermal toxicity.

The LD50 for citral is >2000 mg/kg bw in SD rats (OECD, 2004; REACH). Slight skin irritation and development of desquamation were observed in rats.

The LD50 for citral is 2250 mg/kg bw in rabbits. When the chemical was applied at 1.25, 2.5 or 5 g/kg bw, mortalities were observed in all test groups (OECD, 2004; REACH).

Inhalation

No data are available.

Corrosion / Irritation

Respiratory Irritation

No data are available from single exposure studies.

A developmental toxicity study in rats reported severe respiratory tract irritation from repeated exposure to aerosol/vapour mixture equivalent to about 68 ppm citral on gestation days 6–15 (Gaworski et al., 1992). This information is not considered adequate to warrant a hazard classification.

Skin Irritation

Citral is classified as hazardous with the risk phrase 'Irritating to skin' (Xi; R38) in HSIS (Safe Work Australia). Based on the data available for citral, this classification is supported for all three chemicals in this group.

Citral caused moderate erythema and oedema to the skin of rabbits (OECD, 2004). In an experiment with Vienna White rabbits (n=2), citral (>95 % purity) was applied occlusively to the skin for a duration of one minute, five minutes, two hours or 20 hours. During the eight-day observation period, visible and persistent skin inflammation was observed. Mean erythema and oedema scores of 2–4 were reported and the effects were not reversible within the observation period (OECD, 2004; REACH).

Eye Irritation

Based on the data available for citral, all three chemicals in this group are not considered to be eye irritants.

Citral (>95 % purity) was applied to one eye of each Vienna White rabbit (n=2) (OECD TG 405). The untreated eye of each animal was used as the control and the effects were evaluated using the Draize system. The following results at the 24 and 48 hour time points were reported: mean corneal score = 1 (fully reversible within seven days); mean iris score = 0; mean conjunctival redness score = 1.5 (not fully reversible within eight days); and mean chemosis score = 1.25 (fully reversible within seven days). Persistent redness and scar formation on the conjunctivae were noted during the test, with secretion and reversible chemosis being observed from 24 hours up to five days. As most of the eye effects were reversible within an observation period of eight days, except for conjunctival redness, citral was not considered an eye irritant (OCED, 2004; REACH).

Observation in humans

Samples of citral tested at 1–8 % produced no irritation after 48 hours in closed patch tests on 12 different panels of human subjects (OECD, 2004).

Based on a human patch test, both geranial and neral are reported to be slightly irritating to the skin (Hagvall et al., 2012). Solutions of 1 % geranial or neral gave positive skin irritation reactions in 0.63 % (6/948 patients) and 0.42 % (4/946 patients) respectively. At a 1.5 % concentration, geranial and neral showed 0.42 % (5/1204 patients) and 0.15 % (1/680 patients) positive skin reactions, respectively. Patients who produced positive skin reactions to geranial had previously experienced allergic reactions to products containing citral (Hagvall et al., 2012).

Sensitisation

Skin Sensitisation

Citral is classified as hazardous with the risk phrase 'May cause sensitisation by skin contact' (Xi; R43) in HSIS (Safe Work Australia). Based on the data available, this classification is supported for all three chemicals in this group.

In a mouse local lymph node assay (LLNA) (OECD TG 429), CBA mice received citral at 2.5, 5, 10, 25 or 50 % (in a vehicle with ethanol and diethyl phthalate 1:3). The stimulation index (SI) was reported as 2.8, 2.3, 5.1, 11.4 and 22.1 for 2.5, 5, 10, 25 and 50 % concentrations, respectively. The EC3 was estimated as 6.3 % indicating that the chemical is a skin sensitiser (REACH).

In a guinea pig maximisation test (OECD TG 406), female Pirbright White guinea pigs were treated with 25 % citral in paraffin oil DAB7 in the first intradermal induction and a second percutaneous induction. For the first and second challenges, 10 % and 5 % of the chemical in paraffin oil DAB7 were used, respectively. All animals produced a positive skin reaction following the second challenge. Clinical observations included slight to moderate erythema, desquamation, oedema, and scab formation (REACH).

Citral at 1 % in vaseline was sensitising to guinea pigs (OECD, 2004).

Both neral and geranial were reported as moderate skin sensitisers, based on LLNA responses for oxidation products of air-exposed geraniol. Geranial and neral gave EC3 values of 0.45 M (or 6.8%) and 0.64 M (or 9.7%), respectively (Hagvall et al., 2007).

Observation in humans

In a survey of sensitisation data (skin patch tests on humans conducted in the USA by member companies of the Soap and Detergent Association and by perfume suppliers), none of the personal care or domestic products containing citral induced hypersensitivity attributed to citral in humans. Skin sensitisation was induced in 22/174 tests conducted with 1–5 % pure citral in ethanol, but not with 0.5% citral in 82 test subjects (OECD, 2004).

Repeated Dose Toxicity

Oral

The chemicals are not expected to cause severe effects with repeated oral exposures. The repeated dose oral studies in rodents with citral reported no adverse effects at doses lower than 210 mg/kg bw/d with a 2-year exposure, or 335 mg/kg bw/d with a 14-week exposure.

In a 2-year study conducted on Fischer 344 rats (n=50 animals/sex/dose), the chemical (94 % purity) was administered in feed (nonirradiated NTP-2000) at doses of 0, 50, 100 or 210 mg/kg bw/d. Decreases in body weights compared to the vehicle controls were observed at week 49 (in males), or week 25 onwards (in females). Incidences of kidney mineralisation and angiectasis (lengthening of a blood or lymph vessel) were reported, but were considered to have minimal toxicological significance. The lowest observed adverse effect level (LOAEL) and no observed adverse effect level (NOAEL) were determined to be 210 mg/kg bw/d and 100 mg/kg bw/d, respectively (REACH).

In a 14-week study conducted on Fischer 344 rats (n=10 animals/sex/dose), the chemical (97.6 % purity) was administered with the feed at doses of 345, 820, 1785 or 1586 mg/kg bw/d (for males) or 335, 675, 1330 or 1215 mg/kg bw/d (for females). For the 1586 and 1215 mg/kg bw/d dose groups, clinical signs included listlessness, hunched posture, absent/slow paw reflex, and dull eyes. All treated males and females at 675 mg/kg bw/d showed a significant decrease in their final mean body weight. Moribundity was observed in the highest dose groups, which resulted in sacrifices in week two of the study. Histopathological analysis showed that effects on the forestomach, thymic atrophy, and lack of sperm cells in the testes were limited to the high dose groups that were moribund. Renal lesions in all treated males were also observed. The LOAEL was determined to be 345 mg/kg bw/d and 335 mg/kg bw/d for males and females, respectively (REACH).

Dermal

Only limited data are available.

In an experiment conducted on four different strains (F344, SD, Wistar, ACI/Ztm) of male rats, either intact or castrated, a 1M solution of citral in 70 % ethanol was applied to the shaved back skin at a final dose of 1 µL/g (or approximately 152 mg/kg bw) every 3–4 days for a 30-day duration. Histopathological analysis showed that the chemical induced benign prostatic hyperplasia in adolescent Wistar and SD rats. Combined treatment of the chemical with testosterone showed prostatic hyperplasia in all strains except the ACI/Ztm rats. Although no mortality data were reported in this study, significant changes such as abundance of interstitial stroma in the ventral prostrates of castrated rats, and irregular acinar growth in intact rats were reported at the test dose (Scolnik et al., 1994). The significance of the effects observed in this dermal study in rats was reported to be uncertain due to dramatic strain differences, and the work has primarily been performed in a single laboratory (OECD, 2004).

Inhalation

Only limited data are available.

Pregnant SD rats were exposed to citral vapour at 0, 10 or 34 ppm; or to an aerosol/vapour mixture at 68 ppm, on gestation days 6–15. Dams were sacrificed on gestation day 20 for the foetuses to be evaluated for malformations. Maternal toxicity was observed at 68 ppm with effects including mortalities, reduced body weights, salivation, ocular opacity and difficulty in breathing. These effects were attributed to severe respiratory tract irritation. In terms of the foetuses at the maternally toxic dose, a slight decrease in mean body weight and a slight increase in the incidence of hypoplastic bones were reported. However, the defects that were observed in the foetuses were within the normal historical range that was expected for the species, and no dose response relationship was established (Gaworski et al., 1992).

Genotoxicity

Based on the data available, all three chemicals in this group are not expected to be genotoxic.

Seven bacterial reverse mutation studies indicated negative results with and without metabolic activation. Two chromosomal aberration results in Chinese hamster ovary cells were negative, however, there was one positive sister chromatid exchange study in the same cells. Two in vivo micronucleus tests in rodents showed negative results (OECD, 2004).

Neral and geranial were cytotoxic towards human epidermic HaCat cell lines at 100 and 250 µL/mL, respectively (Koba et al., 2008).

Carcinogenicity

The data available for citral indicate equivocal evidence of carcinogenicity based on malignant lymphomas in female mice. As the malignant lymphomas were within the historical control ranges for mice receiving NTP-2000 and NIH-07 diets for two years (NTP, 2003), the chemical is not considered a carcinogen. Based on these results, all three chemicals in this group are not considered to be carcinogenic.

In a 2-year study, citral was given to F344/N rats at doses of 0, 1000, 2000, or 4000 ppm (approximately 50, 100 or 210 mg/kg bw/d, respectively) and to B6C3F1 mice at doses of 0, 500, 1000 or 2000 ppm (approximately 60, 120 or 260 mg/kg bw/d, respectively). No treatment related neoplastic changes were observed in male/female rats and female mice. Only female mice had a positive trend in incidences of malignant lymphoma (3/49, 5/50, 9/50, 12/50 at 0 (vehicle), 500, 1,000 and 2,000 ppm, respectively), which was significantly increased at the highest dose group. Tissues most commonly affected by malignant lymphoma were the spleen, mesenteric lymph nodes, thymus, and, to a lesser extent, the ovary (OECD, 2004, REACH).

The NTP report on carcinogenicity (NTP, 2003) stated that for citral, although the incidence of malignant lymphoma in the 2000 ppm group was significantly increased, it was within the historical ranges for control female mice given the NTP-2000 and NIH-07 diets for two years, and the incidence in the vehicle controls was at the lower end of these historical control ranges. Based on the total weight of evidence, the equivocal nature of carcinogenicity is supported because malignant lymphoma is a common

tumour in mice. Also, the increased incidence of lymphoma observed in the present study was marginal and within the historical control ranges for NTP-2000 and NIH-07 diets, and the incidence in the concurrent vehicle control group was at the low end of the historical control ranges.

Reproductive and Developmental Toxicity

Based on the data available for citral, all three chemicals are not considered to have reproductive or developmental toxicity.

In an experiment conducted in SD rats (12 animals/sex/dose), citral was administered by gavage in corn oil at 0, 40, 200 or 1000 mg/kg bw/d in males for 46 days, including before and during the mating period, and in females for 39–50 days including before and through mating, and gestation periods and until day three of lactation. Body weights of the pups in the 1000 mg/kg bw/d group were significantly decreased compared to the control. Effects that were observed in the parental animals at the 1000 mg/kg bw/d included hyperplasia in the forestomach of both sexes, pyelectasia (dilation of the renal pelvis) and testicular atrophy in males, and centrilobular necrosis in females. Cases of pyelectasia and ureteric dilation were observed in the offspring at 200 mg/kg bw/d. Significant decreases in body weight on days 0, 1, and 4 after birth were also observed in the offspring at 1000 mg/kg bw/d. The parental and developmental NOAEL was reported as 200 mg/kg bw/d (OECD, 2004; REACH).

In another experiment, no significant maternal or developmental effects were observed in pregnant SD rats exposed to citral aerosol/vapour by inhalation for six h/d on gestation days 6–15 at doses of 0, 10, 34 or 68 ppm. The chemical caused some maternal toxicity effects (reduced body weight gains, ocular opacity and breathing difficulty), but only at 68 ppm. The NOAEL for foetal toxicity was determined to be 68 ppm or approximately 7 mg/kg bw/d (OECD, 2004; REACH).

Other Health Effects

Endocrine Disruption

In a repeat dose dermal study, effects on prostrate were observed in Wistar and SD rats, but not in F344 and ACI/Ztm rats (see **Repeat dose toxicity** section). The significance of this finding was reported as uncertain due to dramatic strain differences, and the work has primarily been performed in a single laboratory (OECD, 2004).

Risk Characterisation

Critical Health Effects

The main critical health effects of the chemicals are skin irritation and skin sensitisation.

Public Risk Characterisation

The chemicals are reported to be used in cosmetic/domestic products overseas. Currently, there are no restrictions in Australia on using these chemicals in cosmetics or domestic products.

The skin irritation and sensitisation risks could be mitigated by implementing concentration limits for cosmetics and domestic products through scheduling.

Occupational Risk Characterisation

Given the critical health effects, the risk to workers from these chemicals is considered high unless adequate control measures to minimise occupational exposure to these chemicals are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine appropriate controls.

NICNAS Recommendation

Further risk management is required. Sufficient information is available to recommend that the chemicals be risk managed for public safety from the potential use in cosmetics and/or domestic products through scheduling, and occupational health and safety through classification and labelling.

Regulatory Control

Public Health

Appropriate scheduling and labelling is recommended to mitigate risks from the use of these chemicals at high concentrations in cosmetics and domestic products (such as polishes, paints, washing and cleaning products, finger paints and modelling clay). The matters for consideration for scheduling is the potential for skin sensitisation.

The maximum acceptable use limits calculated for citral using the dermal sensitisation Quantitative Risk Assessment (QRA) developed by the International Fragrance Association (IFRA) are: 0.05 % in deodorants, 0.6 % in hydroalcoholic products for unshaved skin, 7 % in liquid soaps, 8.2 % in shampoos and 100 % in baby diapers and hand dishwashing (Committee on Consumer Products (SCCP) Opinion, 2008). IFRA changed these limits to 5 % for liquid soaps and shampoos; and 2.5 % for baby diapers and hand dishwashing, as maximum pragmatic levels for practical management, and submitted these amended limits for SCCP opinion (SCCP, 2008). The SCCP concluded that it cannot endorse the proposed QRA approach for setting safe levels of exposure to citral, as it does not consider the consumers who have already been sensitised to fragrance ingredients and also it is unclear how the QRA model covers the significant proportion of the population that suffers from skin disease without prior sensitisation to fragrance ingredients.

The EU cosmetic regulations specify that the presence of citral must be indicated in the list of ingredients when its concentration exceeds 0.001 % in leave-on products and 0.01 % in rinse-off products.

Work Health and Safety

The chemicals are recommended for classification and labelling under the current approved criteria and adopted GHS as below. This assessment does not consider classification of physical hazards and environmental hazards. The existing hazard classifications for citral should also be applied to neral and geranial.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Irritation / Corrosivity	Irritating to skin (Xi; R38)*	Causes skin irritation - Cat. 2 (H315)
Sensitisation	May cause sensitisation by skin contact (Xi; R43)*	May cause an allergic skin reaction - Cat. 1 (H317)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for consumers

Products containing the chemicals should be used according to the instructions on the label.

Advice for industry

Control measures

Control measures to minimise the risk from dermal exposure to the chemicals should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemical is used. Examples of control measures which may minimise the risk include, but are not limited to:

- health monitoring for any worker who is at risk of exposure to the chemical if valid techniques are available to monitor the effect on the worker's health;
- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing Risks of Hazardous Chemicals in the Workplace—Code of Practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to assist with meeting obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((m)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (m)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of Safety Data Sheets for Hazardous Chemicals— Code of Practice* and *Labelling of Workplace Hazardous Chemicals—Code of Practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of the chemical has not been undertaken as part of this assessment.

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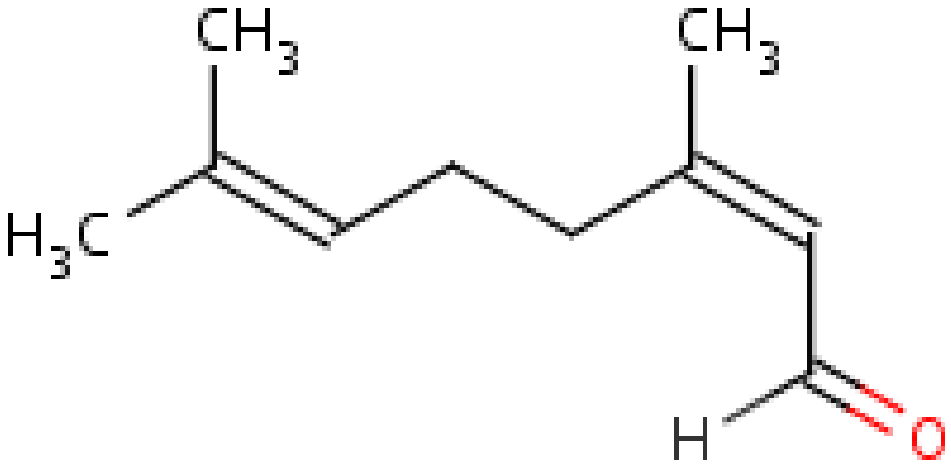
Last Update 28 June 2013

Chemical Identities

Chemical Name in the Inventory and Synonyms	**2,6-Octadienal, 3,7-dimethyl-, (Z)-** Neral
CAS Number	106-26-3
Structural Formula	

	
Molecular Formula	C10H16O
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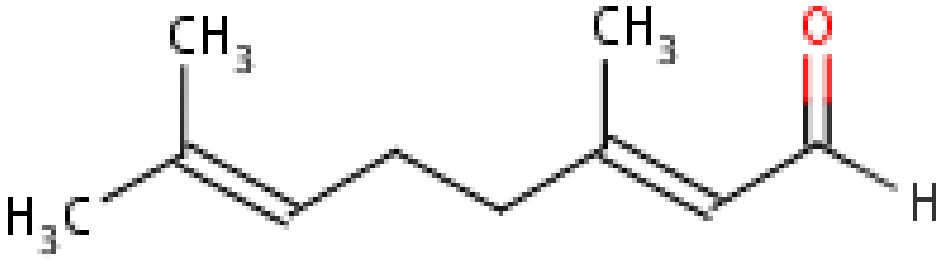
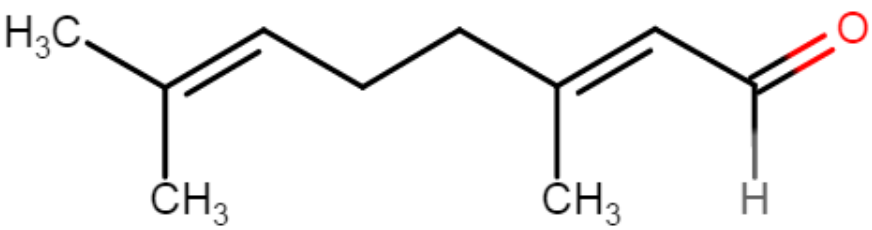
Chemical Name in the Inventory and Synonyms	**2,6-Octadienal, 3,7-dimethyl-, (E)-** Geranial
CAS Number	141-27-5
Structural Formula	

	
Molecular Formula	C10H16O
Molecular Weight	152.24

Chemical Name in the Inventory and Synonyms	**2,6-Octadienal, 3,7-dimethyl-** Citral 3,7-Dimethyl-trans-2,6-octadienal
CAS Number	5392-40-5
Structural Formula	
Molecular Formula	C10H16O
Molecular Weight	152.24

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