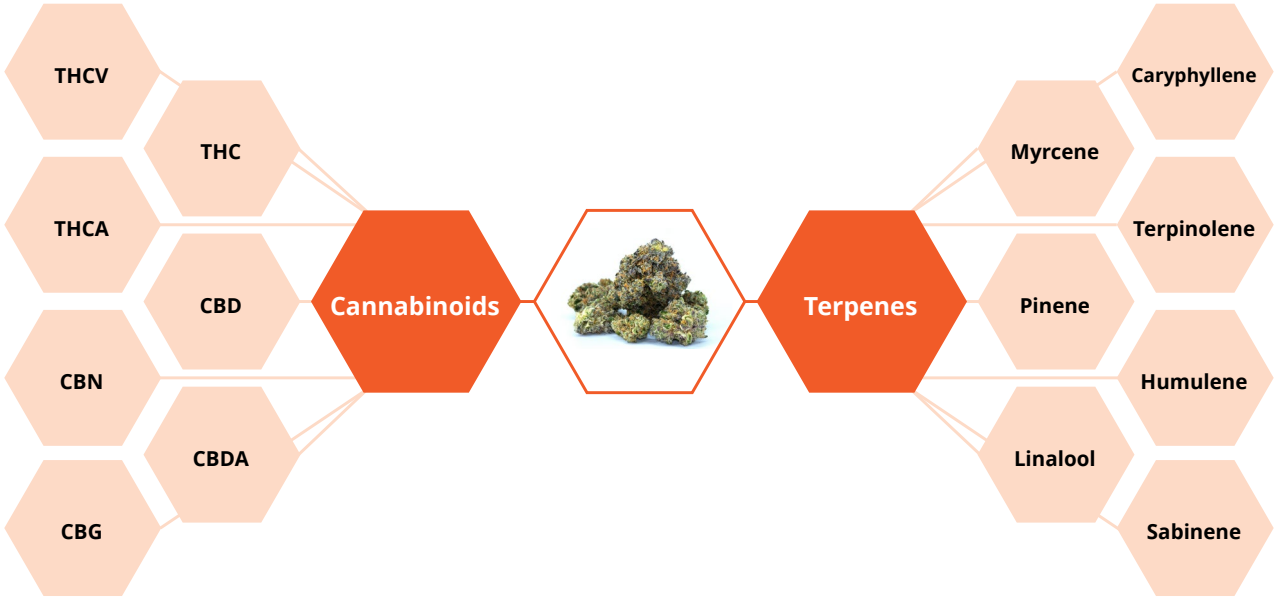
AUSTRALIAN NATURAL THERAPEUTICS GROUP

TERPENES

Terpenes are aromatic compounds found in many plants, although many people commonly associate them with cannabis because cannabis plants contain relatively high concentrations of them.

ANTG

ENTOURAGE EFFECT



These aromatic constituents create the characteristic scent of many plants, such as pine, lavender, and the smell of fresh orange peel. Not surprisingly, essential oils from various plants are full of terpenes, with the unique fragrance of most plants being due to a combination of different terpenes. In nature, these terpenes protect the plants from animals grazing on them, as well as from other pathogenic microbes.

However, terpenes may also offer some health benefits to the human body. Researchers have found nearly 200 distinct terpenes in Cannabis plants. They are important because they affect the human body in a myriad of ways that are only now being fully understood.

The cannabis plant contains many phytochemical compounds, each with their own effect and benefit. In fact, over 700 different phytochemical constituents have been characterised across various Cannabis chemovars. (1) It has been posited that the activity of these compounds may change when others are present. The entourage effect is a term commonly used to describe the synergistic effects of the various chemical compounds found in cannabis.

Examples of the entourage effect:

In a randomised controlled trial of oromucosal cannabis-based extracts in patients with intractable pain despite optimized opioid treatment, (2) a tetrahydrocannabinol (THC) predominant extract failed to demarcate favourably from placebo, whereas a whole plant extract (i.e. nabiximols) with both THC and cannabidiol (CBD) demonstrated effectiveness with statistical significance, (2) the only significant difference being the presence of CBD in the latter.

Further, a recent study (3) of several human breast cancer cell lines in culture and implanted tumours demonstrated the superiority in anti-tumour activity of a botanical cannabis preparation compared to pure THC; the former containing small concentrations of cannabigerol (CBG) and tetrahydrocannabinolic acid (THCA). The authors concluded that such multi-target approaches could conceivably be more effective in diseases as complex as cancer. (3)

The entourage effects between cannabinoids and terpenes is currently in early stages of research, however one example of this is proposed in the paper *Taming THC: potential cannabis synergy and phytocannabinoid□terpenoid entourage effects,* (4) where Dr Russo suggests that *"data would support the hypothesis that myrcene is a prominent sedative terpenoid in cannabis, and combined with THC, may produce the 'couchlock' phenomenon of certain chemotypes."*

There has been a shift in the way cannabis is being described to the public. Instead of classifying cannabis varieties by physical characteristics (i.e. Sativa vs Indica), the discussion is centred around their chemotype (phytochemical profile) – which is a much more accurate predictor of potential pharmacological effects.

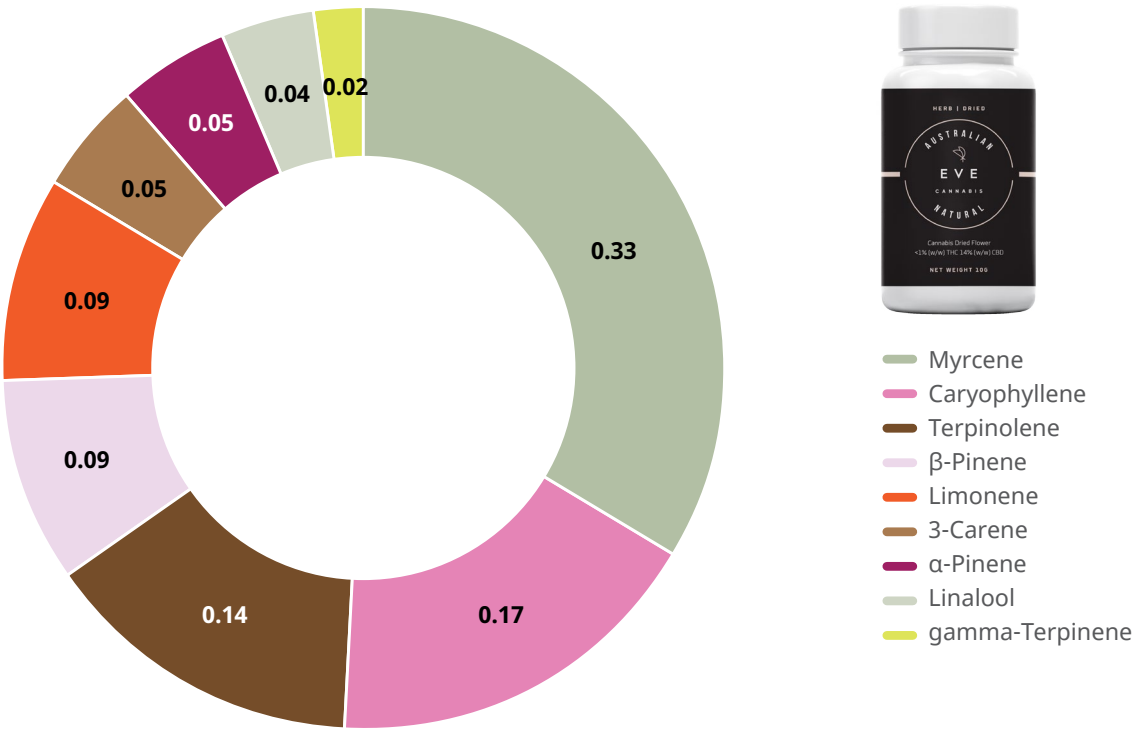
TERPENES FOUND IN ANTG PRODUCTS

TERPENE	AROMA	EFFECTS
β-Myrcene	Earthy, fruity, clove like	• Analgesic (5, 6) • Antioxidant (7, 8) • Antibacterial (7) • Anti-inflammatory (6, 9) • Sedative, muscle relaxant, hypnotic (10)
β-Caryophyllene	Spicy	• Analgesic (11) • Antidepressant (12) • Anti-inflammatory (13) • Anti-proliferative (14) • Antioxidant (14) • Anxiolytic (15) • Neuroprotective (16) • Gastric cytoprotective (17)
Terpinolene	Smoky, woody	• Antibacterial (18) • Anti-inflammatory (19) • anti-fungal (20) • Sedative (21) • anti-proliferative (22) • antioxidant effects (22)
Limonene	Citrus, lemon, orange	• Antidepressant (23, 24) • Antifungal (25, 26) • Anti-inflammatory (27, 28) • Anti-proliferative, Apoptosis of breast cancer cells (4, 29) • Anxiolytic via 5-HT1A (30, 31) • Gastro-oesophageal reflux (reduces acid reflux) (32) • Immunostimulant via inhalation (24)
3-Carene	Sweet, earthy, piney undertones	• Anti-inflammatory (33) • Antifungal (34) • Bone-healing properties (Increased bone metabolism) (35)
α-Pinene	Pine, fresh mountain air, slightly woody	• Antibiotic resistance modulation (36) • Antimicrobial (37) • Antioxidant (38) • Antiallergic (39) • Anti-inflammatory (40, 41) • Bronchodilatory (42) • Acetylcholinesterase inhibitor, aiding memory (4, 43)

TERPENE	AROMA	EFFECTS
Linalool	Spicy	• Analgesic via adenosine A2A (44) • Antidepressant (45) • Anti-convulsant / anti-glutamate (46) • Anti-inflammatory (47) • Anxiolytic (48) • Sedative (inhaled) (49)
gamma-Ter-pinene	Smoky, woody	• Anti-inflammatory (50)
Selina	Herbal, woody	• Potential antimicrobial effects are currently being studied
Humulene	"hoppy"	• Analgesic (51) • Antibacterial (52) • Anti-inflammatory (51) • Anti-proliferative (53)
β-Selinene	Herbal	• Antioxidant (54)

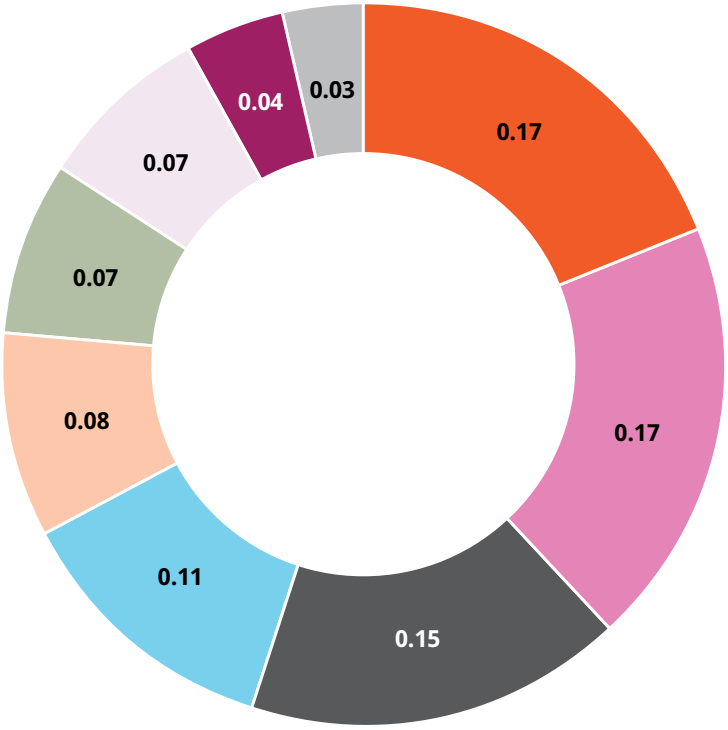
EVE TERPENE PROFILE

% W/W



MARIPOSA TERPENE PROFILE

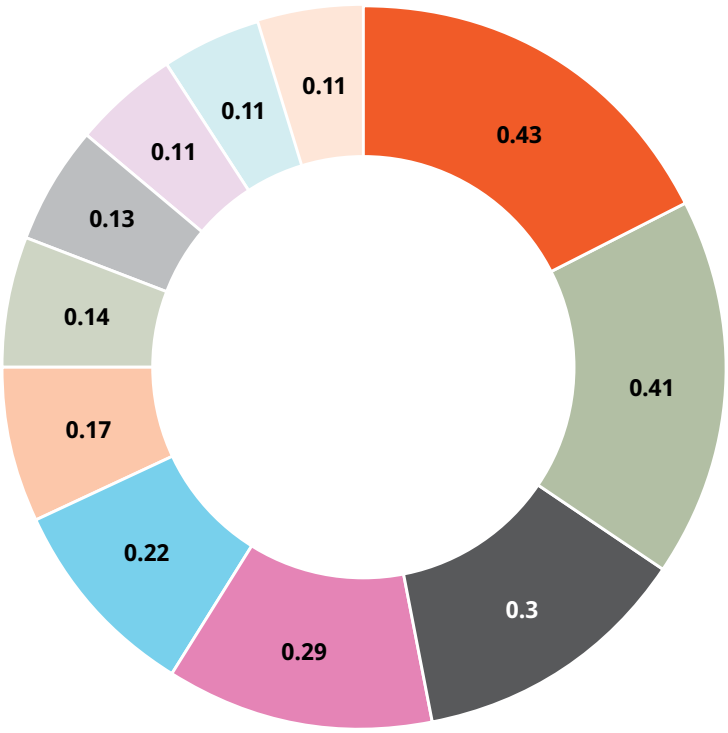
% W/W



- Limonene
- Caryophyllene
- Selina-3,7(11)-diene
- Selina-4(15),7(11)-diene
- Humulene
- Myrcene
- β-Pinene
- α-Pinene
- Germacrene B

SOLACE PROFILE

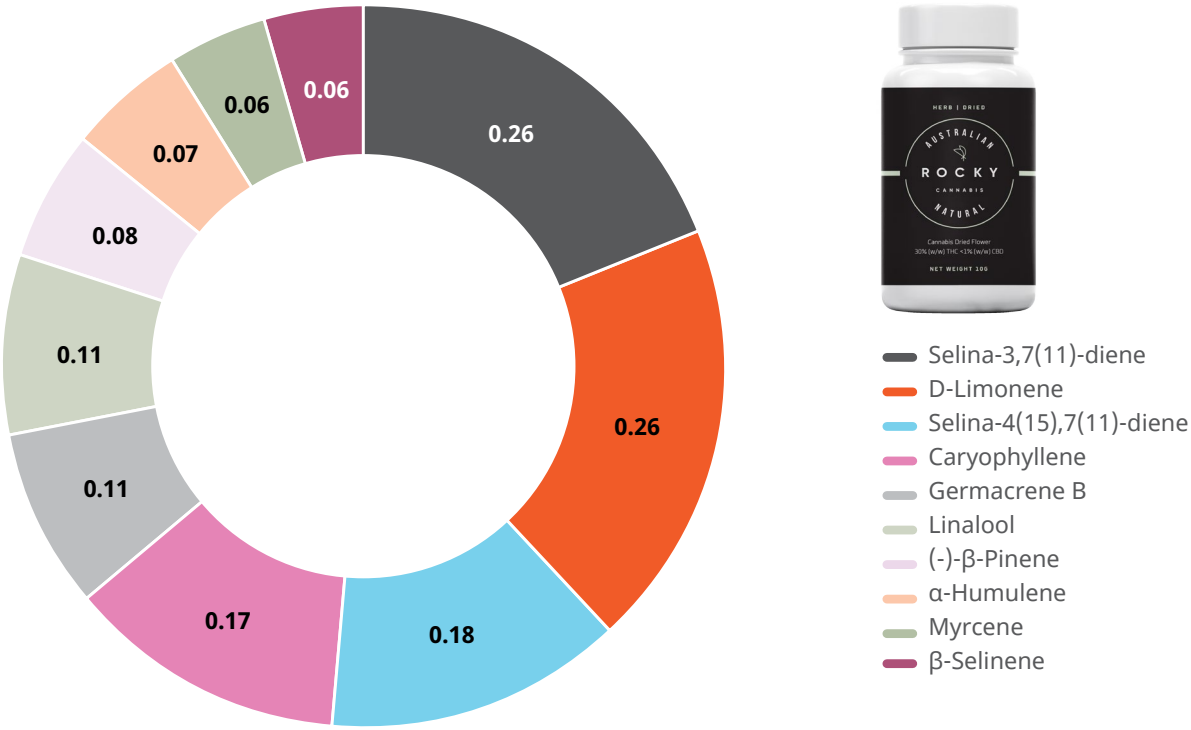
% W/W



- Limonene
- Myrcene
- Selina-3,7(11)-diene
- Caryophyllene
- Selina-4(15),7(11)-diene
- Humulene
- Linalool
- Germacrene B
- β-Pinene
- α-Bulnesene (δ-Guaiene)
- Guaia-6,9-diene

ROCKY TERPENE PROFILE

% W/W



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