

Boronia

A Review by John C. Leffingwell, Ph.D.

This a part of our series on aroma materials produced by carotenoid degradation.



Boronia megastigma

There are approximately 95 species of Boronia (Family Rutaceae), all but one of which occurred originally only in Australia. The majority of Boronia species are found in southwestern Australia. The Brown Boronia (**Boronia megastigma**) is intensely fragrant (like Freesia and Osmanthus) and is valued in Australian floral arrangements for its intense aroma. The fragrance of B. megastigma is not as appreciated in the rest of Asia. Brown Boronia is produced almost exclusively in the area of Australia depicted.



The primary flower produced for both domestic & export is Boronia heterophylla which has fairly long stems of vibrant pink flowers and are more attractive than B. megastigma

yet still possesses good fragrance. *B. heterophylla* is cultivated in both south-east and southwest Australia for the cut flower trade. *B. heterophylla* is a shrub that often reaches 6 feet (2 meters) in height

In contrast, *B. megastigma* is a small shrub which rarely exceeds a 3 feet (1 meter) in height. It has small leaves which are also aromatic and small cup-shaped flowers. The flowers are about 80-100 mm diameter. Usually, the exterior of the petals is a dark chocolate-brown in colour while the interior is bright yellow. Although widely cultivated, *B. megastigma* is not really suitable for sub-tropical and tropical climates. Julie A. Plummer of the University of Western Australia has developed an interesting guide for The Rural Industries Research & Development Corporation that outlines growing considerations for *Boronia*s.

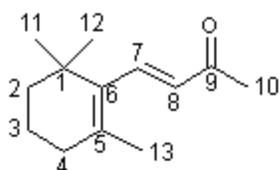
For flavor and fragrance use, the flowers of *Boronia megastigma* are collected, extracted with petroleum ether (a hydrocarbon fraction), concentrated into a waxy concentrate (a concrete) and then the concrete is re-extracted with alcohol, and concentrated to form *Boronia absolute*. The absolute is typically a dark green semi-fluid liquid that possesses a fruity, tea-like, slightly herbaceous odor. In perfumes, *boronia* is used in violet, mimosa and honeysuckle bases, while for flavors it adds body and naturalness to flavors such as raspberry, strawberry, peach, etc.

At one point in time, as many as 500 flower collecting stations were present in southwest Australia, where the flowers were collected from the wild, immersed in drums of petroleum ether and the drums sent to extraction stations (in Perth). This has been replaced with plantations that grow *B. megastigma* exclusively for production of the absolute. The best known of these is in Tasmania, an island off the southwestern tip of Australia.

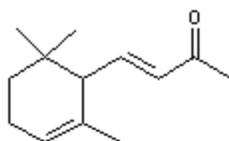
Recently, it has been shown by Robert Menary that increases in extract and volatiles after harvest from hydrolysis of glycosidically bound volatiles or de novo synthesis can increase the extract volatiles by as much as 20%.

While it has been known for many years that *boronia* contains beta-ionone, only in the last few years has a more complete accounting of other compounds derived from carotenoid degradation been documented. The following chart shows the aroma constituents formed via degraded carotenoids.

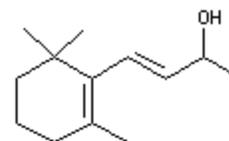
Boronia Constituents from Carotenoids



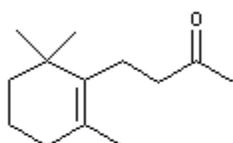
beta-ionone



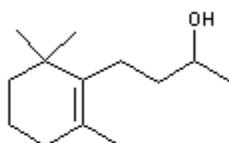
alpha-ionone
(E) & (Z) isomers



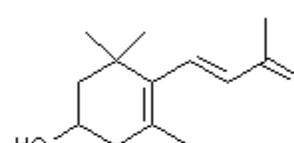
beta-ionol



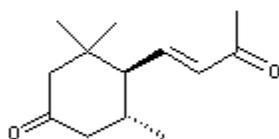
dihydro-beta-ionone



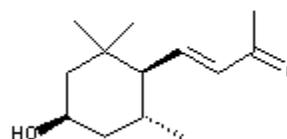
dihydro-beta-ionol



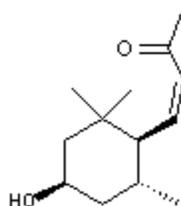
3-hydroxy-(E)-beta-ionone



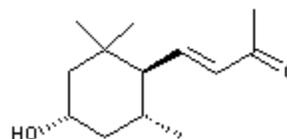
(E)-Megastigm-7-en-3,9-dione



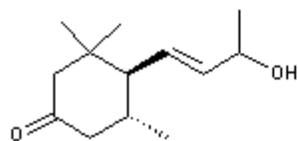
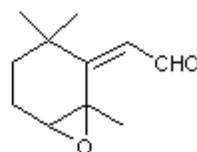
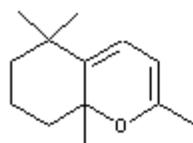
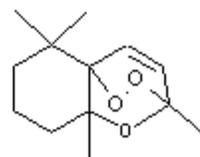
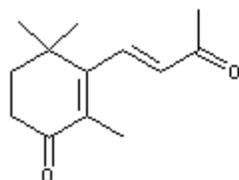
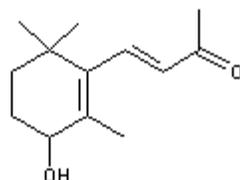
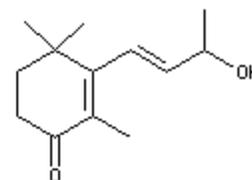
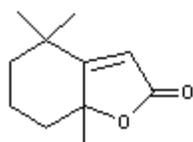
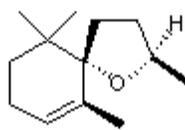
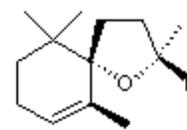
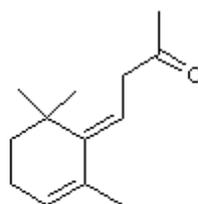
(E)-3a-hydroxymegastigm-7-en-9-one



(Z)-3a-hydroxymegastigm-7-en-9-one

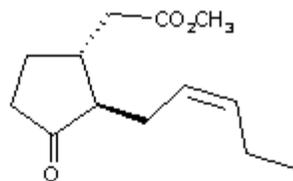


(E)-3b-hydroxymegastigm-7-en-9-one

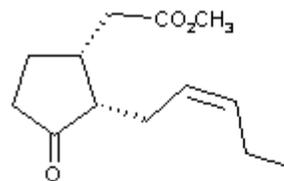
**(E)-9-hydroxymegastigm-7-en-3-one****4,5-epoxy-homocyclocitral****cyclic-beta-ionone
(a photoisomer of beta-ionone)****endoperoxide of cyclic-beta-ionone****4-oxo-(E)-beta-ionone****4-hydroxy-(E)-beta-ionone****4-oxo-(E)-beta-ionol****dihydroactinodiolide****theaspirane B****theaspirane A****(Z)-retro-alpha-ionone**

While aroma constituents formed from carotenoids are perhaps the most important to the aroma of boronia, the absolute also contains a number of linalool related materials (linalool, linalyl acetate and a series of 8-hydroxylinalool esters) and compounds in the methyl jasmonate series depicted below that undoubtedly impact the odor profile substantially.

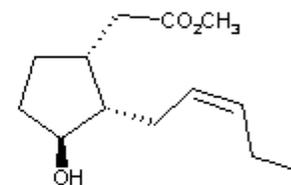
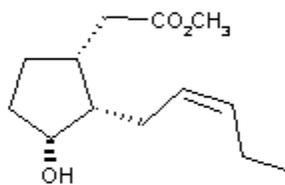
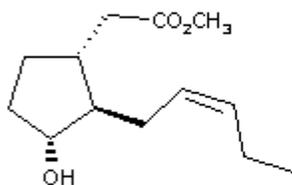
Methyl jasmonate & Related Compounds



(Z)-methyl jasmonate



(Z)-methyl epi-jasmonate



(anti)-delta-jasmonic acid lactone

(syn)-delta-jasmonic acid lactone

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