



Risk Assessment of Genetically Modified Carnation SHD-27531-4

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Authors' contributions

This work was carried out in collaboration among all authors. The opinion has been assessed and approved by the Panel on Genetically Modified Organisms of VKM. All authors read and approved the final manuscript.

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ABSTRACT

Carnation SHD-27531-4 is a genetically modified variety of *Dianthus caryophyllus* L. used as a decorative plant species. The red-purple colour of the flowers results from expression of the two newly introduced genes *df*r and *f* 3'5'h, encoding the enzymes dihydroflavonol 4reductase (DFR) and flavonoid 3',5'-hydroxylase (F3'5'H). The two enzymes enable the production of the pigments delphinidin and cyanidin (anthocyanidins) in the flower petals. Anthocyanidins and their sugar derivatives, anthocyanins, make up a large group of natural colours and are accepted food additives (E 163). The colours of most flowers, berries and fruits consist of a combination of anthocyanidins and anthocyanins.

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Carnation line SHD-27531-4 also contains a mutated herbicide tolerance gene from *Nicotiana tabacum*, coding for an acetolactate synthase (ALS) variant protein, used to facilitate the selection of GM plantlets during the genetic transformation process. Southern blot analysis and sequencing indicate only a single copy of the intended T-DNA insert in the SHD-27531-4 genome. Flanking sequences show no disruption of endogenous genes. In silico analyses show no significant homologies between the DFR, F3'5'H and ALS proteins and known toxins and IgE-bound allergens. No observed changes in the introduced trait, i.e. the particular flower colour, indicative of instability, have been reported during several generations of vegetatively propagated plants.

Considering that carnation SHD-27531-4 is not intended for cultivation or use as food or feed, the VKM GMO Panel considers the comparative analysis of the anthocyanidins delphinidin, cyanidin, petunidin and pelargonidin in the flower petals sufficient for the risk assessment. The reported morphological differences between SHD-27531-4 and the parent cultivar do not raise safety concerns.

Based on current knowledge and the scope of the application, the VKM GMO Panel concludes that the DFR, F3'5'H and ALS proteins and anthocyanidin pigments are unlikely to increase a potential health risk related to an accidental intake or other exposure routes to carnation SHD-27531-4 compared to the conventional counterpart or other non-GM carnations.

Likewise, the VKM GMO Panel concludes that carnation SHD-27531-4, based on current knowledge and the intended use as cut ornamental flowers, does not represent an environmental risk in Norway.

Keywords: *GMO; carnation (Dianthus caryophyllus L.); SHD-27531-4; anthocyanidin; anthocyanin; petal colour; dfr; f3'5'h; als; SuRB; health safety; environmental risk assessment; Directive 2001/18/EC; VKM; risk assessment; Norwegian Scientific Committee for Food Safety; Norwegian Environment Agency.*

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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