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NEMATICIDAL ACTIVITY OF ESSENTIAL OIL OF *PELARGONIUM GRAVEOLENS* AGAINST THE ROOT-KNOT NEMATODE *MELOIDOGYNE INCOGNITA*

by

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Summary. Nematicidal activity of essential oil of *Pelargonium graveolens* L. (cv. Algerian) and its major constituents namely citronellol, geraniol and linalool was determined against the root-knot nematode *Meloidogyne incognita*. Geraniol was found to be the most effective constituent which was followed by citronellol and linalool.

Essential oil of *Pelargonium graveolens* L. is known to possess antibacterial (Nigam, 1982) and antifungal (Raghavaiah and Jayaramaiah, 1987) properties. Its nematicidal properties have not been reported so far. We have investigated the nematicidal activity of essential oil of *P. graveolens* (Cv. Algerian) and of its major constituents citronellol, geraniol and linalool against the root-knot nematode *Meloidogyne incognita* (Kofoid *et* White) Chitw.

Materials and methods

One kg of freshly harvested leaves of *P. graveolens* was hydrodistilled for four hours to extract essential oil. The distillate was separated from water using a separating funnel and dried over anhydrous sodium sulphate. One ml of the essential oil was dissolved in methanol to give a 10% (v/v) solution and one ml of this was emulsified in nine ml of 0.3% Tween-20. One ml of this emulsion was transferred to a petri dish and three drops of streptomycin solution (25 mg/10 ml) was added to it. Two hundred freshly hatched second stage juveniles of the root-knot nematode *M. incognita* suspended in one ml distilled water were added to the petri dish which was then covered with a lid and kept at room temperature. Mortality of the nematodes was tested twenty four hours after incubation. One ml methanol in 0.3% Tween-20 served as the control. Each treatment was replicated thrice.

The major constituents of the essential oil used in the studies were determined by GLC analysis using a Hewlett

Packard Gas Chromatograph equipped with FID and Stainless steel column (6' X 1/8") packed with 10% carbowax 20 M - adsorbed on chromosorb W (80-100 mesh). The operating conditions were set as follows. Detector and injector temperature 240 °C, column temperature 165-185 °C at a rate of 2 °C/min. The major constituents of the oil were identified as citronellol, geraniol and linalool by comparing their retention times with those of authentic samples under the same operating conditions. The abundance of the constituents were calculated from peak areas by area normalisation. Authentic samples of citronellol and geraniol supplied by Aldrich Co. Ltd., and linalool by Sigma Co. Ltd., were used in the present studies.

A series of concentrations (125, 250, 500, 1000, 2000 and 4000 µl/l) of the essential oil and its three constituents namely citronellol, geraniol and linalool were prepared by diluting with methanol and assayed for their nematicidal activity against the root-knot nematode *M. incognita* as described earlier.

Results and discussion

The relative abundance of the major constituents of essential oil of *P. graveolens* as determined by GLC analysis were citronellol 41.3%, geraniol 9.9%, linalool 12.7% and other minor constituents 36.1%. Based on our results on GLC analysis of the essential oil of *P. graveolens*, the effective concentration of essential oil which gave 100% mortality (2000 µl/l) will correspond to 826 µl/l of citronel-

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lol, 254 $\mu\text{l/l}$ of linalool and 198 $\mu\text{l/l}$ of geraniol (Fig. 1). Linalool and geraniol at these concentrations exhibited hardly any significant nematocidal activity and citronellol showed less than 85% mortality. This shows that the combined effect of these constituents also play a role in the nematocidal activity as observed in the case of essential oil of cymbopogon grasses by Sangwan *et. al.* (1985). There can also be other constituents present in the essential oil which contribute to its nematocidal activity.

Essential oils are generally considered to have low mammalian toxicity (Sangwan *et. al.*, 1990). In this connec-

tion, essential oil of *P. graveolens* and its major constituents can be effectively utilised for the design of safer nematocides by further chemical modifications.

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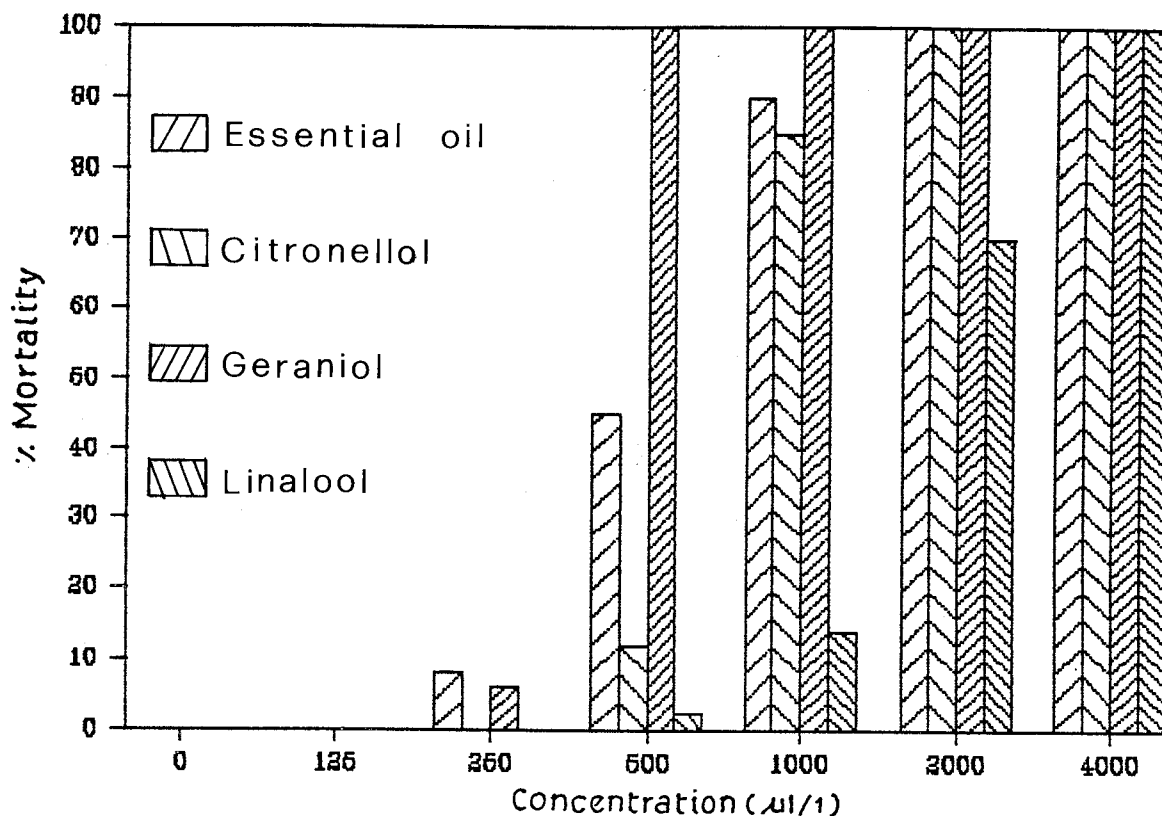


Fig. 1 - Nematocidal activity of essential oil of *Pelargonium graveolens* and its major constituents against the second stage juveniles of *M. incognita*.

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