

# Insect Growth Regulator and Insecticidal Activity of $\beta$ -Dihydroagarofurans from *Maytenus* spp. (Celastraceae)

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From the aerial parts of *Maytenus disticha*, we have isolated 9 $\beta$ -benzoyloxy-1 $\alpha$ ,2 $\alpha$ ,6 $\beta$ ,8 $\alpha$ ,15-penta-acetoxy-dihydro- $\beta$ -agarofuran (**1**) and from seeds of *Maytenus boaria* 9 $\beta$ -furoyloxy-1 $\alpha$ ,6 $\beta$ ,8 $\alpha$ -triacetoxy-dihydro- $\beta$ -agarofuran (**2**). These compounds and their MeOH and hexane/ethyl acetate (1:1 v/v) extracts were evaluated for their effects on the fall armyworm (*Spodoptera frugiperda*). Toosendanin, a commercial insecticide derived from *Melia azedarach* was used as a positive control. When tested for activity using neonate larvae in a no-choice artificial diet bioassays, the agarofurans **1**, **2** and toosendanin as well as the MeOH and hexane/EtOAc extracts caused significant growth inhibitory effects with GC<sub>50</sub> of 7.55; 3.84; 1.75; 14.0 and 7.3 ppm at 7 days, respectively. Compounds **1** and **2** caused 100% larval mortality at 25 and 15 ppm, respectively. MeOH and hexane/EtOAc extracts caused 100% larval mortality at 25.0 ppm, respectively, they also increased the development time of surviving larvae and a significant delay for the time of pupation and adult emergence. These compounds showed comparable potency of activity with toosendanin. Acute toxicity against adults of *S. frugiperda* was also found, for hexane/EtOAc extract and **2** had the most potent activity with LD<sub>50</sub> value of 4.7 and 1.9 ppm, respectively. MeOH extract, hexane/EtOAc extract, **1** and **2** caused acetylcholinesterase inhibition with 78.0, 89.2, 79.3 and 100% inhibition at 15.0 ppm, respectively. Therefore, the furoyloxy agarofuran may be responsible for the insecticidal activity of these plants.