Insect antifeedant potent 5-methyl-2-furyl chalcones
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ABSTRACT
A series of substituted styryl 5-methyl-2-furyl ketones have been synthesized by closed-
aldol reaction. The purities of these chalcones were checked by their physical constants and
spectral data published earlier in literature. The insect antifeedant activities of these ketones
were studied using 4th instar larvae Achoea Janata L with castor leaf discs.

Introduction
The 2E chalcones are α,β-unsaturated ketones possess
methylene structural moiety and they belongs to biomolecules.
Many alkyl-alkyl, alkyl-aryl and aryl-aryl categories of
chalcones were synthesized [1] and extracted from natural
synthesizing chalcones such as Aldol, Crossed-Aldol, Claisen-
Schmidt, Knovenagal, Greener methods- Grinding of reactants,
solvent free and oxides of nanoparticle with microwave heating.
Due to C-C single bond rotation [3] of carbonyl and alkene
carbons, they exist as Es-cis and s-trans and Zs-cis and s-trans
conformers. This structural conformers of chalcones were
confirmed by NMR and IR spectroscopy. These chalcones
possess various multipronged activities [4]. Keto, alkene and the
polar substituents in aryl or styryl phenyl moieties in the
chalcones are responsible for their biological activities. The
various biological activities of chalcones are antibacterial[5],
antifungal[6], antioxidant[7], antiviral[8], antimalarial[9],
antiplasmodial[10], antituberclosis[11], antiproliferative[12],
antifungal[13], anti-inflammatory[14], antianalgescic and
sedative[15], and insect antifeedants[16]. Halogenated chalcones
possess insect antifeedant activities [16,17]. There is no report
available for the study of antifeedant of these chalcones in
literature in the past. Therefore, in the present study, the authors
wish to report the insect antifeedant activities of some
substituted styryl 5-methyl-2-furyl ketones.

Experimental
Synthesis of substituted styryl 5-methyl-2-furyl ketones[1a]
An appropriate equimolar quantity of 2-acetyl-5-methyl-
furion (0.01mol), various substituted benzaldehydes (0.01mol),
0.5g of sodium hydroxide and 20 ml of ethanol were warmed in
a 50 ml conning conical flask and shaken occasionally(Scheme
1).The obtained solid was filtered at the pump, washed with cold
water and crystallized from ethanol afford the respective
chalcones as glittering pale yellow solid. The purities of these
chalcones were checked by their physical constants, IR, 1H and

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Insect antifeedant activity
Chalcones possess various multipronged and Biological
activities. Generally compounds which are possess halo ketones
along with polar groups, they possess insect antifeedant
activities. Therefore the author wish to examine the insect
antifeedant activity of these chalcones and found to be they are
active as insect antifeedants. This test was performed with a 4th
instar larva Achoea Janata L against castor semilooper, were
reared as described on the leaves of castor RicinusCommuns in
the laboratory at the temperature range of 26°C ±1°C and a
relative humidity of 75-85%. The leaf – disc bioassay
method[18] was used against the 4th instar larve to measure the
antifeedant activity. The 4th instar larvae were selected for
testing because the larvae at this stage feed very voraciously.

Measurement of insect antifeedant activity of chalcones
Castor leaf discs of a diameter of 1.85cm were punched and
intact with the petioles. All synthesized chalcones were
dissolved in acetone at a concentration of 200 ppm dipped for 5
minutes. The leaf discs were air-dried and placed in one liter
beaker containing little water in order to facilitate translocation
of water. Therefore the leaf discs remains fresh throughout the
duration of the rest, 4th instar larvae of the test insect, which had

Scheme 1

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been preserved on the leaf discs of all chalcones and allowed to feed on them for 24 hours. The area of the leaf disc consumed was measured by Dethlers\cite{18} method. The observed antifeedant activity of chalcones were presented in Table 1.

The results of the antifeedant activity of chalcones presented in Table 1 reveals that all compounds were found to reflect satisfactory antifeedants. This test is performed with the insects which ate only two-leaf disc soaked under the solution of this compound. Compound 4 showed enough antifeedant activity but lesser than 3. Further compound 3 was subjected to measure the antifeedant activity at different 50, 100, 150 ppm concentrations and the observation reveals that as the concentrations decreased, the activity also decreased. It is observed from the results in Table 2 and that the chalcones 3 [4-Bromostyryl-5-methyl-2-furylketone] showed an appreciable antifeedant activity at 150 ppm concentration.

Acknowledgement

The authors thank to the Head, NMR Lab, Madurai Kamaraj University, Madurai for recording NMR spectra of all chalcones.

References


Table 1. Insect antifeedant activities of substituted styryl-5-methyl-2-furyl ketones

<table>
<thead>
<tr>
<th>Entry</th>
<th>R</th>
<th>4-Ch</th>
<th>6-Ch</th>
<th>8-Ch</th>
<th>10-Ch</th>
<th>12-Ch</th>
<th>6-Chm</th>
<th>8-Chm</th>
<th>12-Chm</th>
<th>2-Chm</th>
<th>Total leaf disc consumed in 24 hrs</th>
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Number of leaf discs consumed by the insect (Values are mean + SE of five).
Table 2. Insect antifeedant activity of compound 3 [4-Bromostyryl-5-methyl-2-furyl ketones] at 3 different concentrations

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<th>ppm</th>
<th>4-6</th>
<th>6-8</th>
<th>8-10</th>
<th>10-12</th>
<th>12am-6am</th>
<th>8am-12Nm</th>
<th>2pm-4pm</th>
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