SUMMARY

The thesis describes the results of synthesis and antimicrobial activity studies on new α,β-unsaturated sulphones with benzopyran moiety and their cyclopropanated derivatives. The following units of work has been accomplished in the present investigation.

1. A series of new \([E]-3-[2\text{-arylsulphonyl} \text{ethenyl}] \text{-4H-1-benzopyran-4-ones}\) were prepared by the condensation of 3-formylchromones with arylsulphonylacetic acids in the presence of catalytic amounts of benzylamine in glacial acetic acid medium.

2. Another series of \([E]-7a-[2\text{-arylsulphonyl} \text{ethenyl}] \text{-1a,7a-dihydro-1-arylbazo[}\text{b}] \text{cyclopropa[e]pyran-7[1H]-ones}\) have been prepared in fairly high yields by treating \([E]-3[2\text{-arylsulphonyl} \text{ethenyl}] \text{-4H-1-benzopyran-4-ones}\) with dimethylsulphonium phenacylides in chloroform.

3. Infrared spectra of all these compounds have been recorded and an attempt has been made to correlate the spectral characteristics to the structural configuration of these compounds. All these compounds have shown characteristic bands in the region 1320-1310 cm\(^{-1}\) and 1140-1130 cm\(^{-1}\) for asymmetric and symmetric SO\(_2\) stretching respectively. A strong band in the region 975-960 cm\(^{-1}\) which is a characteristic absorption due to the \(=C-H\) out-of-plane deformation in trans disubstituted ethyleneic compounds, has been observed for all the compounds synthesised. All the cyclopropyl compounds prepared exhibited bands in the region 1080-1010 cm\(^{-1}\) (cyclopropane ring deformation mode) which may
be considered as a positive evidence for the presence of cyclopropane ring. \(\alpha,\beta\)-Unsaturated ethylenic sulphones, as well as their cyclopropanated ones showed characteristic bands in the region 1620-1600 cm\(^{-1}\) which may be considered as an evidence for the presence of ethylenic bond present in these compounds. This is a clear indication that cyclopropanation has not occurred at the ethylenic double bond of the side chain of the \(\alpha,\beta\)-unsaturated sulphones.

4. Nuclear magnetic resonance spectra (\(^1\)H and \(^{13}\)C NMR) of a select few compounds have been recorded and analysed. The unsaturated sulphones showed resonance signals in \(^1\)H NMR in the region 5.8-6.6 ppm which is characteristic of benzopyran moiety. The aromatic protons as well as the vinylic protons resonated in the region 6.3-7.9 ppm leading to the formation of complex multiplets. \(^1\)H NMR spectra of the cyclopropyl sulphones showed signals at 5.1-5.3 and 3.4-3.7 ppm accounting for the two protons on the cyclopropane ring. The J\(_{HA,HB}\) (4.5 cps) values indicate that these protons have trans configuration. \(^{13}\)C NMR spectra of two cyclopropyl compounds showed resonance signals around 66, 40 and 32 ppm which can be assigned for the cyclopropyl carbons.

5. The mass spectra for a few of the compounds from both of the series have been recorded and analysed. The spectra showed a presence of molecular ions and their fragments. The various fragmentation ions obtained in each of the compound clearly confirmed the structural assignments made to these compounds based on the method of preparation, Infrared and NMR spectral data.
6. About fifty-four compounds have been screened for their antimicrobial activities. All the new compounds have been found to possess high antifungal activity and may be explored for the preparation of effective fungicides.

7. New compounds synthesised during this investigation are

\[ (E)-3\text{-}2\text{-(Phenylsulphonyl)ethenyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 208-09^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Bromophenyl]sulphonyl]ethenyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 240-41^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Chlorophenyl]sulphonyl]ethenyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 230-31^\circ} \]

\[ (E)-3\text{-}2\text{-(Phenylsulphonyl)ethenyl-}6\text{-bromo-}4H\text{-}1\text{-benzopyran-4-one, m.p. 243-44^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Bromophenyl]sulphonyl]ethenyl-}6\text{-bromo-}4H\text{-}1\text{-benzopyran-4-one, m.p. 253-54^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Chlorophenyl]sulphonyl]ethenyl-}6\text{-bromo-}4H\text{-}1\text{-benzopyran-4-one, m.p. 256-57^\circ} \]

\[ (E)-3\text{-}2\text{-(Phenylsulphonyl)ethenyl-}6\text{-chloro-}4H\text{-}1\text{-benzopyran-4-one, m.p. 246-47^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Bromophenyl]sulphonyl]ethenyl-}6\text{-chloro-}4H\text{-}1\text{-benzopyran-4-one, m.p. 251-52^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Chlorophenyl]sulphonyl]ethenyl-}6\text{-chloro-}4H\text{-}1\text{-benzopyran-4-one, m.p. 239-40^\circ} \]

\[ (E)-3\text{-}2\text{-(Phenylsulphonyl)ethenyl-}6\text{-methyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 220-21^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Bromophenyl]sulphonyl]ethenyl-}6\text{-methyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 220-22^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Chlorophenyl]sulphonyl]ethenyl-}6\text{-methyl-}4H\text{-}1\text{-benzopyran-4-one, m.p. 215-16^\circ} \]

\[ (E)-3\text{-}2\text{-(Phenylsulphonyl)ethenyl-}6\text{-methoxy-}4H\text{-}1\text{-benzopyran-4-one, m.p. 181-82^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Bromophenyl]sulphonyl]ethenyl-}6\text{-methoxy-}4H\text{-}1\text{-benzopyran-4-one, m.p. 210-12^\circ} \]

\[ (E)-3\text{-}2\text{-[4-Chlorophenyl]sulphonyl]ethenyl-}6\text{-methoxy-}4H\text{-}1\text{-benzopyran-4-one, m.p. 208-10^\circ} \]
(E)-7a-[2-[(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 168-70°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 180-82°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 178-79°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-bromo-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 168-70°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-bromo-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 198-99°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-bromo-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 178-79°

(E)-7a-[2-[(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-5-chloro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 187-88°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-chloro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 192-93°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-chloro-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 200-01°

(E)-7a-[2-[(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 186-87°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 179-80°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 216-18°

(E)-7a-[2-[(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 205-06°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 198-99°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-benzoylbenzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 186-87°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-1-(4-chlorobenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 184-85°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-1-(4-chlorobenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 190-92°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl)ethenyl]-1a,7a-dihydro-1-(4-chlorobenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 203-04°
(E)-7a-[2-({Phenylsulphonyl}ethenyl)-1a,7a-dihydro-5-bromo-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 196-970

(E)-7a-[2-({4-Bromophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-bromo-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 178-790

(E)-7a-[2-({4-Chlorophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-bromo-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 201-020

(E)-7a-[2-({Phenylsulphonyl}ethenyl)-1a,7a-dihydro-5-chloro-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 189-900

(E)-7a-[2-({4-Bromophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-chloro-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 172-730

(E)-7a-[2-({4-Chlorophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-chloro-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 189-900

(E)-7a-[2-({Phenylsulphonyl}ethenyl)-1a,7a-dihydro-5-methyl-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 169-700

(E)-7a-[2-({4-Bromophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 192-930

(E)-7a-[2-({4-Chlorophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 218-200

(E)-7a-[2-({Phenylsulphonyl}ethenyl)-1a,7a-dihydro-5-methoxy-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 196-970

(E)-7a-[2-({4-Bromophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 194-950

(E)-7a-[2-({4-Chlorophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-{4-chlorobenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 186-870

(E)-7a-[2-({Phenylsulphonyl}ethenyl)-1a,7a-dihydro-1-{4-methylbenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 192-940

(E)-7a-[2-({4-Bromophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-1-{4-methylbenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 170-720

(E)-7a-[2-({4-Chlorophenyl}sulphonyl)ethenyl]-1a,7a-dihydro-1-{4-methylbenzoyl}benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 164-650
(E)-7a-[2-(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-5-methyl-1-(4-methylbenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 202-03°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl]ethenyl]-1a,7a-dihydro-5-methyl-1-(4-methylbenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 208-10°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl]ethenyl]-1a,7a-dihydro-5-methyl-1-(4-methylbenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 193-95°

(E)-7a-[2-(Phenylsulphonyl)ethenyl]-1a,7a-dihydro-5-methoxy-1-(4-methyl-benzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 205-06°

(E)-7a-[2-[(4-Bromophenyl)sulphonyl]ethenyl]-1a,7a-dihydro-5-methoxy-1-(4-methylbenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 176-78°

(E)-7a-[2-[(4-Chlorophenyl)sulphonyl]ethenyl]-1a,7a-dihydro-5-methoxy-1-(4-methylbenzoyl)benzo[b]cyclopropa[e]pyran-7(1H)-one, m.p. 171-72°